LONG-TERM PROJECTIONS OF SUPPLY AND DEMAND FOR AGRICULTURAL PRODUCTS IN ISRAEL

I. GENERAL VIEW AND SUMMARY

YAIR MUNDLAK

FALK PROJECT FOR ECONOMIC RESEARCH IN ISRAEL

Long-Term Projections of Supply and Demand for Agricultural Products in Israel

by

Yair Mundlak

This volume summarizes long-term projections of supply and demand for Israel agriculture obtained by a research team directed by Dr. Yair Mundlak. The major part of the project consisted of investigations into specific branches of Israeli agriculture. These branch studies appear as a separate volume. In the present volume the methodology and the general approach are laid out, the results are presented and some policy implications are discussed.

The demand projections are based on estimates of the growth in population and per capita income by Dr. Nadav Halevi which are presented at the end of this volume.

One of the more interesting findings of this study is that the average annual rate of growth of agricultural production in the period 1960–1965 will be 8 per cent as compared with 14 per cent in the period 1949-61. The rate of growth is expected to decrease further in the period 1965–1975 to an average level of 5-6 per cent per annum.

On the policy side, it is claimed that agriculture in Israel can function efficiently without government intervention and it is therefore suggested that the policy of intervention in

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I

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PROJECTIONS OF POPULATION AND INCOME

by

NADAV HALEVI

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The views expressed herein are those of the authors and do not necessarily reflect those of the United States Department of Agriculture.

PREFACE

THIS VOLUME summarizes and analyzes the results of a study of the supply and demand for agricultural products in Israel for the years 1965 and 1975. The research was financed in part by the United States Department of Agriculture. It was conducted by The Falk Project (now the Maurice Falk Institute for Economic Research in Israel) in cooperation with the Department of Agricultural Economics of the Hebrew University.

The work was carried out by a team of students and teachers of the Hebrew University, under the author's direction. Professor Sidney Hoos of the University of California served as advisor to the research team. This volume is based primarily on the detailed analyses of specific products or branches prepared by the members of the research group: Shaul Ben-David, Tuvia Blumenthal, David Braude, Uzi Goldenberg, Eitan Hochman, Yoav Kislev, David Levhari, Mark Wilsker, and Dan Yaron. Their respective contributions are listed in the Table of Contents. While each member of the group concentrated on his own study, there was a spirit of teamwork and cooperation which resulted in valuable mutual stimulation. From this exchange I greatly benefited. At the same time, the individual members of the group are not to be held responsible for the policy conclusions here presented.

The individual studies of the group are published as a companion volume to this one in the original Hebrew version. Insofar as the English version is concerned, mimeographed copies of these studies are available upon request. The demand projections are based on population and income estimates prepared by Dr. Nadav Halevi, which appear at the end of this volume.

The statistical calculations of this study — and the individual projections in particular — were for the most part completed by the end of 1961. For various technical reasons, publication has been delayed until now. However, in order to make the findings available to the interested public as soon as possible, two progress reports were published: the first appeared in the Falk Project Fifth Report, July 1961, and the second appeared as a mimeographed project report in October 1962. In addition, the draft of this volume was circulated for criticism and review among members of the Joint Planning Center of the Ministry of Agriculture and the Jewish Agency, and to

the staff of the Foreign Agricultural Service of the United States Department of Agriculture. At the early stages of the work, branch studies were also made available to the Settlement Department of the Jewish Agency.

Despite this long delay in publication, it is hoped that the part of this study which deals with the 1965 projections will be of interest for the detailed methodological approach which it sets out. This approach has also been used in deriving the 1975 projection. Furthermore, the values projected for 1965 can more accurately be thought of as averages for the three year period, 1964–1966, since no account can be taken of random disturbances which vary from year to year. Thus the final results corresponding to the present projection will not be known until late in 1967, when the returns for 1966 will have been made.

The 1975 projections are based on those for 1965, but they were computed in less detail. Clearly, it would now be desirable to make detailed projections for 1970 in the same way as we have done for 1965.

This project would not have been possible without the assistance rendered by various persons and organizations in collecting data. I would like to thank all those who helped us, in particular the Ministries of Agriculture, Finance, and Commerce and Industry, the Central Bureau of Statistics, the Research Department of the Bank of Israel, the Settlement Department of the Jewish Agency, and the Agricultural Research Station. Special thanks are due to Nissan Liviatan, who made available the basic data of the family surveys and the findings on income elasticity calculated by him for his Falk Project study on *Consumption Patterns in Israel*, which has since been published.

The analysis itself required a considerable amount of calculation, which was executed on a computer under the able organization of Uri Regev.

The valuable comments offered by Professors Sidney Hoos and Simon Kuznets on the individual studies as well as on this volume are highly appreciated. Suggestions made by my colleagues at the Falk Project and by various staff members of the Foreign Agricultural Service also helped improve the presentation.

Most of this volume was written during my stay at the University of California, Berkeley, in 1962. I am indebted to the Department of Agricultural Economics there for the many technical facilities put at my disposal. In particular, I am grateful to the stenographic pool for their skillful efforts.

This book was edited by Morris Gradel, while the tables were carefully checked by Susanne Freund.

Rehovot, May 1964 YAIR MUNDLAK

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II. BRANCH STUDIES[1]

[1] Published separately in mimeograph form.

ABBREVIATIONS

CBS	Central Bureau of Statistics
FP	Falk Project
GNP	Gross National Product
NAUS	Unpublished series compiled by National Accounts Unit of Central Bureau of Statistics (now the National Accounts Division)[1]
NDP	Net Domestic Product
NNP	Net National Product
SAI	Statistical Abstract of Israel
SAIS	Statistical Abstract of Israel, series on physical production (see p. 44)
SBI	Statistical Bulletin of Israel
SITC	Standard International Trade Classification

[1] This series was published in a revised form as this book went to press.

CHAPTER 1

SUMMARY AND CONCLUSIONS

1. *Introduction*

Since the establishment of the State of Israel considerable attention has been devoted to agricultural policies. With the founding of the State the major problem was that of fostering food production in order to supply the rapidly growing population. This problem was particularly acute because the traditional sources of supply had stopped their trade with Israel. The resulting change in the sources of food imports had an unfavorable effect on the developing deficit in the balance of payments. The rapid expansion in agricultural production on veteran farms, as well as the large-scale settlement program, solved the immediate food shortage, but at the same time created new problems which, until then, had not been familiar in Israel. Production increased relatively faster than consumption, and there was a danger that farm prices would decline. As a result, policies in various forms aimed at controlling expansion in production were initiated and these still exist at present.

Such problems are not peculiar to Israel and are well known in other countries; they have their origin in the uneven growth of supply and demand and in the measures taken to reconcile the two. Whatever approach is taken in making the required adjustments should depend on the evaluation of future developments of supply and demand. It is the purpose of this study to make projections for the more important agricultural products for the years 1965 and 1975.

The ultimate object of the study is to derive equilibrium projections, that is, to determine the quantities to be consumed and produced under the assumption that prices will be allowed to vary so that supply (domestic and foreign) will equal demand (domestic and foreign). As a step toward this goal, we first projected 1965 consumption under the assumption that relative prices will remain at their 1960 level. The calculations, which are referred to as the demand projections, reflect the projected changes in population and in per capita disposable income, and the effect of time trend. Although demand projections constitute only a preliminary stage in our work, they

are presented for two reasons: (1) it is sometimes felt that better information exists on demand than on supply, and it is therefore desirable to separate the demand projections from the equilibrium projections, and (2) the present agricultural policy relies heavily on production planning which basically attempts to hold prices unchanged. This means that changes in production should be allowed to meet changes in demand as given by the demand projection. Thus, this part of the study provides some basic information necessary for planning.

A similar procedure is followed in deriving the production projections. First, domestic supply is projected under the assumption that 1960 relative prices will prevail in 1965. These estimates reflect changes in productivity and in wage rates as well as production trends. The final step involves equating total supply (domestic and foreign), and total demand (domestic and foreign). The result is the equilibrium projection referred to.

The principal approach in this study has been to base the projections on past relationships between the projected variables and their determinants. This required a detailed empirical analysis of these relationships. The analysis was done separately for each important product. The common denominator of the various analyses is the formulation and the statistical approach to the estimation.

The principal demand for agricultural production arises in the domestic market, and most of the analysis is therefore concerned with this market. In addition, a detailed study was made of the foreign demand for citrus products, which are agriculture's major export item. In order to arrive at production projections some assumptions were made as to the future exports of other agricultural products.

In estimating demand, it has been assumed that per capita consumption of a particular product is determined by its price, prices of related products, per capita income, trend, consumption pattern, and sometimes by other variables such as temperature. To measure the effects of these variables, the demand equations were estimated. The degree of refinement and the variables considered were determined by the nature of the product in question and the available data. In general, two sources of data were utilized: (1) time series, and (2) the findings of the family budget surveys conducted in the years 1956/57 and 1959/60.[1]

The second source was used for deriving estimates of the effect of per capita income on per capita consumption, whereas the first source was used for deriving estimates of the effects of the other variables and some-

[1] In utilizing information from this source, we have largely relied on Nissan Liviatan's study on *Consumption Patterns in Israel*, FP, 1964.

times for deriving additional estimates of the effect of income. Our projections were derived from the estimates obtained from these analyses. That is, if one knows the quantitative effect of each variable and if information is available on its future value, future per capita consumption can be calculated. However, the future values of these variables are not known, and must be projected. Furthermore, in order to obtain total (rather than per capita) consumption, it is also necessary to project the size of the population. Projections of population and per capita income were therefore made. These, derived by Nadav Halevi, are also based on past developments as well as on certain assumptions with respect to future developments in the economy as a whole.

The determination of future trends in consumer behavior (tastes) can only be based on certain assumptions that are admittedly arbitrary by nature. From Liviatan's study[2] it is known that there exist differences in consumer behavior between demographic groups. However, no major change is expected to take place in the composition of the population. Consequently, this information is not explicitly considered.

The purpose of a supply analysis is to determine what quantities will be produced at various prices. The quantity produced at any given price is determined by the amount of scarce resources, such as water and land, by the level of productivity, and by the prices of purchased inputs. When productivity rises, other things remaining equal, there will be an increase in the quantity produced. The effect of productivity on supply is of prime importance and for that reason was explicitly considered in an attempt to evaluate the effect of possible changes in productivity on future production. In general, projected changes are based on past developments as reflected in aggregate data. In view of the great importance of the poultry and dairy branches, the available information was supplemented by surveys which were conducted in a sample of farms.

Detailed and conclusive analysis of farmers' response to price was made for three products: vegetables, poultry meat, and eggs. The results indicate that there exists a response to price and that the direction of the response accords with theoretical considerations; that is, an increase in price brings about more production, whereas a decrease in price acts conversely. From this finding it has been deduced that a similar response exists also in other products. The production projections were based on this assumption as well as on the projected yields. This was the case for poultry products, milk, vegetables, and some other products such as tobacco and forage.

2 *Ibid.*

In the case of fruit, it has been assumed that production in 1965 will be largely determined by the 1960 planted area, since subsequent plantings will have little effect, if any, on the 1965 production. For 1975, fruit production was projected on the basis of the projected change in consumption in the period 1965–75.

It should be clear that there is a limit to the expansion in total production which stems from the fact that the available quantities of land and water are limited. This factor was taken into account in the following way. It is assumed that at a given price level, the production of perishables such as vegetables, milk and fruit will be more profitable than that of industrial or other field crops. Clearly, this price level depends on the price of non-perishable field crops. The production of the perishables was first determined, and their land and water requirements were then obtained from this estimate and subtracted from the projected quantities of land and water available to agriculture: the residual is the amount of land and water that will be available for cash field crops other than forage. The projected composition was obtained under the assumption that land and water will be utilized so as to secure for farmers the highest possible income from their limited resources. The solution was obtained by mathematical programming.

Domestic production is not the only source of products such as grains, beef, sugar, and oil seeds, an important part of whose total supply is imported. It was assumed that the supply function of imported products is perfectly elastic, that is, that Israel's imports do not affect international prices.

The structure of Part I of the report is as follows:

Chapter 2 deals with past agricultural development and the disposal of agricultural products.

Chapter 3 describes the general formulation of the study and deals with some technical problems.

Chapters 4 *and* 5 bring together the various projections, which are tested in the light of our knowledge of the behavior of the aggregates in question. The work concludes with a paper on *Projections of Population and Income for 1965 and 1975* by Nadav Halevi.

The present Chapter mainly deals with the final projections. The explanation of the computational methods and steps involved appears in Chapters 4 and 5 and in the individual reports. Some of the more important implications of the study are discussed after the presentation of the results.

2. *Projected Income, Population, and Consumption in 1965*

The empirical findings of the demand analyses are summarized in Table 37 and are discussed in Chapter 2. We here summarize briefly the most important of the findings reflected in the projections.

The partial effect of income on consumption, other variables remaining unchanged, is measured by income elasticity, which measures the percentage change in consumption associated with a 1 per cent change in income. The results indicate that the effect of income on consumption varies among commodities. Low and even negative income elasticities were obtained for wheat products (especially bread) and for oils (especially edible oil). This means that when income rises, we can expect a decrease in the consumption of products whose income elasticity is negative, or no change in the consumption of products whose income elasticity is zero. A low income elasticity was also obtained for the vegetable group. Higher income elasticities were obtained for animal products. For all milk products income elasticity is about 0.59. For eggs the figure was in the range of 0.3 to 0.7. The income elasticities of meat are the highest among animal products, but there are variations between items: the elasticity of poultry meat, whose consumption is relatively high, is around 0.3, whereas that of fresh beef, whose consumption is relatively low, is around 1.4. A rather high elasticity of 0.7 is also observed for fresh fruit. But here again, there are differences between varieties.

Income elasticity for food as a whole is in the range of 0.5 to 0.6; an increase in income is thus likely to have a significant effect on food consumption.

The partial effect of the price of the product on its consumption is represented by the price elasticity. In general the estimated price elasticities are negative, a decrease in price being associated with an increase in consumption. The lowest (absolute) values were obtained for the price elasticities of most dairy products. Higher values were obtained for eggs and some kinds of cigarette. Elasticities of about –1 were obtained for 'all vegetables' and cotton. Higher values were obtained for 'all summer fruit' and poultry meat.

The price elasticity for food as a whole is about –0.6. This means that a decline in the price of food will lead to an increase in its consumption. However, the rate of increase in the consumption of each product that will accompany a general price decline will not be according to the elasticities quoted since consumption depends not only on the price of a given product but also on the prices of related products. In order to take the latter into account, cross elasticities were computed. Even after prices of related commodities are considered, in most products an increase in consumption is expected to accompany a decrease in price.

TABLE 1. *Domestic Consumption: 1960, and 1965 and 1975 Projections*

	Per capita consumption (kilograms[a])			*Composition of consumption in 1965 (per cent)*	*Total consumption*			
	Actual	*Projected*			*Thousands of tons[b]*		*Index, 1960 = 100*	
	1960 (1)	*1965* (2)	*1975* (3)	(4)	*1965* (5)	*1975* (6)	*1965* (7)	*1975* (8)
All food				**100.0**				
Bread and cereals	138.0	119.6	98.8	11.9	302.3	331.0	103	113
Meat	27.7	33.5	38.5	22.1	84.7	129.1	144	220
Other than poultry	*10.7*	*13.0*	*15.8*	*12.4*	*32.9*	*52.9*	145	233
Poultry	*17.0*	*20.5*	*22.7*	*9.7*	*51.8*	*76.2*	144	212
Fish	10.4	10.9	11.3	4.1	27.6	37.9	125	172
Milk and milk products	145.8	164.2	173.4	11.3	415.0	580.9	134	188
Eggs	345	385	401	6.5	973	1,343	133	184
Oils	16.0	15.7	14.6	3.9	39.7	48.9	117	144
Fresh fruit	123.0	157.9	170.6	14.4	399.2	571.5	153	219
Fresh vegetables and potatoes	136.7	143.0	143.0	9.4	361.5	479.0	125	166
Other foods				16.4				
Cigarettes	1,249	1,200	1,200		3.0	4.0	115	152
Cotton	4.8[c]	6.1	7.2		15.4	24.1	152[d]	237[d]

[a] Except for milk (in liters), and eggs and cigarettes (in units).

[b] Except for milk (in millions of liters), and eggs (in millions). The figures for cigarettes refer to tobacco.

[c] 1958.

[d] 1958 = 100.

SOURCE: Columns (1), (2), and (5) — Table 58.
Columns (3), (4), and (6) — Table 60.

The domestic consumption projections are based on the following income and population forecasts derived by Halevi:

	Population (thousands)	*As per cent of 1960*	*Per capita disposable income (1961 IL)*	*As per cent of 1960*
1965	2,528	119	2,065	120
1975	3,350	158	2,620	152

The final consumption projections are presented in Table 1. The general picture is that of a decrease in wheat products, a slight decrease in oils, and an increase in other products. The greatest increase is expected to take place in the consumption of meat other than poultry.

Columns (7) and (8) of Table 1 indicate that a considerable expansion in domestic demand is expected for most products. The significance of this finding will become clearer below.

3. *Production Projections*

The general approach followed in deriving the production projections has already been outlined. The problems involved in the empirical supply analysis make it difficult to give a brief account of the results as has been done with demand. We therefore here confine ourselves mainly to a discussion of the implications of the projections.

The production projections are summarized in Table 2. The 1965 projections are final equilibrium projections. For 1975, we have chosen one of several alternative projections which are discussed later. In general, it has been assumed that domestic consumption will continue to be the main outlet for most agricultural products. In some cases, allowance was made for exports, but in general this is not a large share of total production.

In 1965 total agricultural production is expected to be about 48 per cent above 1960. This amounts to expansion at an average annual rate of about 8 per cent as compared with 14 per cent realized in the period 1949–61. The lower rate of expansion is attributable to two major limitations: (1) there will be no significant increase in the amount of water and land; this implies (2) that further expansion in production would have to take place by increasing production of products which require intensive application of labor and capital. Such expansion will have to adjust to changes in demand for the products in question.

In the period 1951 to 1961 cultivated land increased at an average annual rate of 2.2 per cent, whereas water consumption in agriculture increased at

TABLE 2. *Production: 1965 and 1975 Projections*

	Value of production millions of 1959 IL			*Index*		
	Actual	*Projected*		*1960 = 100*		*1965 = 100*
	1960	*1965*	*1975*	*1965*	*1975*	*1975*
Field crops	122.4	193.5	294.0	158	240	152
Vegetables and potatoes	62.3	66.7	88.4	107	142	133
Citrus	113.7	154.6	335.3	136	295	217
Other fruit	71.9	155.6	222.8	216	310	143
Milk	83.1	112.1	157.0	135	189	140
Eggs	93.2	103.5	134.4	111	144	130
Meat	153.3	233.4	326.9	152	213	140
Poultry	*74.6*	*112.7*	*167.1*	151	224	148
Other	*78.7*	*120.7*	*159.8*	153	203	132
Fish	18.6	26.8	33.5	144	180	125
Miscellaneous	32.0	45.0	60.0	141	187	133
Exports not included above[a]		20.0	20.0			100
TOTAL	**750.5**	**1,111.2**	**1,672.3**	148	223	150

[a] In 1960 all exports were included in figures above.
SOURCE: Tables 56 and 65.

an average annual rate of 9.0 per cent. However, the rate of increase in these two factors was not steady; it was considerable in the early part of the period and very low in recent years. This was associated with a lower rate of expansion of production in recent years. Thus, in the five-year period 1956–61 production increased by 72 per cent as compared with 107 per cent in the preceding five-year period, 1951–56. Of course, such an evaluation of past performance very much oversimplifies the process of expansion in production and may be misleading as regards the net contribution of land and water. This subject is discussed in somewhat more detail in Chapter 2. It is only intended here to point out that expansion in these two factors was associated with expansion of the scale of operation in agriculture as a whole. This, of course, was also associated with a considerable increase in labor and capital which contributed significantly to the increased production.

The two restrictions on expansion are also reflected in the 1975 projections. The projections in Table 2 call for a 50 per cent increase in production in the period 1965–75. This amounts to an annual rate of growth of 4.2

per cent. This projection assumes a slight increase in water available to agriculture, and the slow development of agricultural exports other than citrus, and makes a conservative estimate of the rise in productivity. Some other assumptions were suggested and have been evaluated, and their implications for total agricultural production were examined. These alternative projections are discussed below.

The direct implication of the fact that there would be no significant increase of land and water is that production could be increased further by (1) increasing the amount of labor and capital and (2) raising the productivity of resources.

The first possibility implies, in the main, expansion in production of products which require relatively less land and water and relatively larger quantities of labor or capital, and which we may call labor-capital-intensive. An extreme example is poultry which requires very little land and water and whose production could be expanded by further application of labor and capital. However, it is in the shift to labor- and capital-intensive crops that limitations from the demand side are encountered. These products are mainly sold in the domestic markets where increasing supply results in declining prices, thus curbing further expansion. This has, in fact, occurred in recent years, and the problem is discussed further in Chapter 2. It is in this sense that it was stated above that demand imposes a limitation on further expansion of production. The products whose projections were affected by this limitation are milk (mainly cows' milk), eggs, poultry meat, vegetables, some fruits (bananas and melons), and, indirectly, beef[3]. The projections for these products assume that prices will be at an equilibrium level so that production will equal consumption.

There is no such restriction on field crops such as small grains, sugar beet, and cotton, where there is an intensive international trade, and whose prices are not affected by production in Israel. Here, however, it is the availability of land and water which largely determines the level of production, and the production estimates were based on the projected quantities of land and water not required for other purposes; thus, they also reflect the demand limitations on other products.

The foregoing discussion suggests that a shift of resources to labor- and capital-intensive crops would depend on the development of new outlets for these products. The major one seems to be the export market. At present, the major agricultural export is citrus. In his analysis, Levhari suggests that the projected increase in citrus production would have only a small

[3] Since most beef is produced jointly with milk, the demand limitations on milk production affect the level of beef production.

depressing effect on prices and that expansion within the range contemplated by the government could be justified.

Serious attempts have been made in recent years to establish exports of other perishables such as vegetables, some fruits, and poultry products. It is difficult at present to evaluate the outcome of such attempts, and only conservative allowances were made in our projections. In view of the importance of such activities for the future development of agriculture, it is very likely that the possibilities of expanding agricultural exports will be constantly explored and that in the future export production will be expanded. Should this develop faster than assumed in our projections, it would be mainly by drawing on resources here envisaged as engaged in field crops.

We turn now to consider productivity. The discussion in Chapter 2 indicates that in the period 1952–61 the annual rate of increase in production which was not explained by the increase in inputs was 5.3 to 5.7 per cent. That means that the increase in productivity accounted for about 40 to 48 per cent of the annual increase in total production[4].

We have already noted that there will be no substantial increase in land and water[5]. It is also assumed that there will be only a slight increase in the labor force engaged in agricultural production. Thus, the principal increase in inputs would be of capital. It is further estimated that capital stock will expand more slowly than in the past. All this implies that productivity will rise in the future. This is a rather general statement. For the purpose of projections, more specific assumptions had to be made on the different rates of growth of each branch and on the nature of the increases.

The branch estimates were based largely on past performance and assumed a rather moderate productivity increase; that is, they call for performance at a lower level than that which has already been achieved by the better farmers. It is, however, realized that the adoption of better practices requires time and that past achievements do not suggest that more liberal assumptions should be used.

Yet, in view of the land and water limitation, it is possible that both farmers and the government will devote greater efforts to raising productivity. It is now well recognized that the development of more productive practices and their dissemination among farmers can be accelerated by the allocation of more resources. It is very likely that additional resources diverted to research and extension work will bring a higher rate of return than, say, that achieved by resources engaged in developing marginal land or marginal

[4] In the same period the average annual rate of systematic increase in production was 13.2 per cent.

[5] See Chapters 4 and 5.

water sources. Should increasing efforts be made to speed up improvements in productivity, the results will be felt mainly after 1965, and their possible effect on the 1975 projections should therefore be examined. This was done by considering two assumptions of increase in yields in addition to those used in deriving the 1975 projections appearing in Table 2. The latter involved separate estimates for each branch and usually call for an annual increase in yield of the order of 1 to 2 per cent. The additional assumptions considered refer only to total agricultural production and call for an annual increase in production of (a) 1 per cent and (b) 2 per cent over and above the original assumption.

These assumptions are evaluated together with assumptions on the development of water sources and exports. For water, we consider the possibility of an increase of about 9 per cent (100 million cubic meters) over the present projection for 1970[6] in the amount of water to be available to agriculture by 1975. For exports, we assume a rapid development that will make it possible to increase the rate of growth of production by 0.5 per cent per year. These projections are summarized in Table 66. There it is seen that the various projections of the annual rate of expansion range from 4.2 per cent to 7.2 per cent, and Table 2 shows the lowest of these. The highest calls for a total agricultural production of IL 2.222 million (at 1959 prices) in 1975.

It may seem that the range is of considerable magnitude. However, it is difficult to narrow it down as it depends to a large extent on exogenous factors not analyzed in this study, the chief of which is concerned with the policy for investment in activities directed towards increasing productivity. However, to conclude with some plausible indications, we would suggest an annual increase of about 5 to 6 per cent which would reflect an increase in productivity and exports and some development of water sources. The possible effect of such changes on the composition of production is discussed briefly in Chapter 5. There it is suggested that there would be only small changes in the production level of perishable products for domestic consumption, and the slack would be taken by export products and field crops.

4. *Projection of Imports and Exports of Major Agricultural Commodities*

The dependence of Israel agriculture on foreign trade is shown in the summary Table 3. It is seen that Israel will continue to import wheat and animal feeds as well as oil seed in relatively large quantities. It will also import tobacco and beef to supplement domestic production. Cotton,

[6] See Chapter 5.

TABLE 3. *Consumption, Production and Imports (Exports) of Selected Commodities: 1965 and 1975 Projections*

(Thousands of tons[a]*)*

	1965			*1975*		
	Consumption	*Production*	*Imports or exports*	*Consumption*	*Production*	*Imports or exports*
Wheat	345	81	264	387	81	306
Wheat flour	248	248	—	271	271	—
Other edible cereals[b]	15.2	0.5	14.7	18.4	0.4	18.0
Feed grains[c]	421	132	289	540	132	408
Oil[d]	37	37	—	46	46	—
Oil seeds[e] (i)	232	39	193	286	58	228
(ii)	487	39	448	487	58	429
Cotton fibers	15.4	22.8	–7.4	24.1	33.0	–8.9
Tobacco	3.0	2.1[f]	0.9	4.0	2.0[f]	2.0
Citrus[g]	155	830	–675	216	1,800	–1,584
Nonfat dry milk	0	0	0	0	0	0
Butter	5.0	5.0	—	10.0	10.0	—
Cheese — hard	7.0	7.0	—	12.0	12.0	—
Cheese — soft	15.5	15.5	—	23.0	23.0	—
Meats (other than poultry)[h]	32.9	24.2	8.7	52.9	32.5	20.4
Poultry meat[h]	51.8	52.3	–0.5	76.2	76.5	–0.3
Eggs (millions)[i]	973	1,237	–200	1,343	1,607	–190

[a] Unless otherwise specified.

[b] Mainly rice.

[c] Sorghum, corn, and barley, and 16,000 tons of wheat (see note a, Table 59).

[d] For domestic consumption.

[e] (i) For domestic consumption; (ii) under the assumption of full utilization of existing processing capacity.

Imported seeds are mainly soybeans; domestically produced seeds are cotton seeds.

[f] 88 per cent of projected production; the remaining 12 per cent is wastage.

[g] About 20–30 per cent of the export will be in terms of processed products, mainly juices.

[h] Edible parts.

[i] The difference between production and consumption, and exports is the projected hatching requirement.

which was imported in the past, will become an export commodity. The import of perishable products, and semiperishable dairy products is expected to disappear. On the other hand, it is possible that some perishables will be exported. As in the past, citrus will be the major export commodity and exports are expected to be double the level of the late 1950's.

5. *Implications of the Study for Agricultural Policies*

a. *Product market*

The projections were obtained largely under the assumption that market prices will be allowed to reach equilibrium without outside intervention. This may seem unrealistic in view of past experience. The principal aim of agricultural policy in recent years has been to raise farm income. This policy has taken various forms such as so-called surpluses being eliminated from the market and either destroyed (vegetables) or dumped at a loss (export of eggs), practices which required heavy subsidies. The distaste of the public for such measures and the pressure to reduce subsidies have led more recently to attempts to control production at the preproduction stage. This is done by setting production quotas that will result in a production level corresponding to a predetermined price. By and large, such schemes were implemented in products produced for the domestic market when it was felt that over-production would depress prices to such an extent that farm income would be badly affected. Subsidies were also used to encourage the production of industrial crops. This was done either directly, as in cotton, or indirectly, as in sugar beet, where the government purchased refined sugar at a price above the import price. This made it possible for the factories to pay a higher price to the sugar beet growers than they would otherwise have done.

The general objection to such policies is related to the concept of economic efficiency. This term refers to a situation in which resources are so used that their marginal contribution to production, evaluated at prices paid by consumers, is equal to their cost, the latter being determined by other activities in which resources could be engaged. In less technical terms, it means that if farmers could earn more by shifting their resources from the production of one product to that of another, this would be a desirable move. However, it also implies that the earnings of the resources employed in the production of a given product should reflect the price that consumers are willing to pay for the product and not an arbitrary decision of the policy makers.

It is clear that production controls restrict the flow of resources to more

profitable activities, for otherwise there would have been no need for controls. It is also clear that price subsidization does not remunerate resources according to consumers' demand but instead taxes consumers and transfers this tax to the producers in the form of subsidies.

The shortcomings of the present policy suggest that alternatives should be considered. It is therefore desirable to examine the possibility of eliminating direct intervention in the working of the market forces. Briefly, this can be done by referring to our projections.

We can start by indicating that the problem of overproduction should be viewed in the light of developments which take place over time. That is, consumption of agricultural products is constantly increasing, and should production remain unchanged, whatever overproduction exists in one year would be eliminated in the following years. For example, as early as 1952, there were vegetable surpluses. If, however, production had remained unchanged at the 1952 level, there would have been no surpluses in the following years. The same statement can be made with respect to the present situation in all branches. The projected expansion in consumption would more than suffice to eliminate any overproduction (at the level of 1960 prices) if supply remained unchanged. Such an evaluation is, of course, unjustifiable and misleading because the supply conditions do not remain unchanged. It has been presented here to assist in focusing our attention on the nature of the problem of changes in supply conditions.

It is clear that the productivity of resources in agriculture has constantly risen and is expected to continue to rise. This means that if prices did not change, there would be a tendency to increase production. Thus, if productivity rises at such a rate that the resulting production grows faster than consumption, prices will have to decline. Such a decline in prices would induce an increase in the consumption of the products whose prices decline and would also tend to induce a diversion of resources to other products. That is, a price-decline may reduce production to below what would have been obtained had the price remained unchanged, and resources would move to the production of other products. Thus, in a situation where productivity increases, the price-decline serves two functions: (1) that of expanding consumption and (2) that of distributing the effect of the productivity-increase to other activities by causing a shift in allocation of resources.

In this context, it may be asked whether the transition from controlled to free production should not extend over a long period so that gradual adjustment to the new circumstances can be made. This question should be evaluated within the context of the relevant developments over time. Since

consumption continues to expand, relaxation of production controls does not imply that production will have to decline as compared with the past. It only means that future expansion should be in line with developments on the demand side. In fact, the 1965 projections indicate that in most cases, only small price adjustments will be required for market prices to reach equilibrium without outside intervention. Let us illustrate this for the products that were subject to considerable support in recent years.

Projected equilibrium wholesale prices of vegetables are from 0 to 7 per cent below their 1960 level[7]. The price elasticity of vegetables (about –1) means that a decline in price will encourage an increase in consumption. On the other hand, the alternative cost of water is expected to increase and, therefore, a decrease in price will result in the movement of resources to other branches, mainly field crops. The major problem that exists with vegetables is not that of constant overproduction but rather of fluctuations in production which sometimes result in a large supply for short periods. It is not intended here to discuss possible means of dealing with this problem. However, we may note that if there is a policy of price support, the same income to farmers could be secured by direct subsidies that will amount to the difference between the market price and the support price, as by purchasing surpluses. When the demand is elastic, such a program requires a smaller subsidy than that of surplus purchasing, since increased sales are associated with a relatively smaller decrease in price. Indeed, Ben-David's study indicates that variations of 2 to 5 kilograms in the monthly per capita marketings of tomatoes were associated with only small variations in prices. Yet, in some months, surpluses were purchased when monthly per capita marketing was in the neighborhood of 2 kilograms.

The equilibrium point for eggs was obtained under the assumption that exports of eggs will decline from 400 million eggs in 1960 to 200 million in 1965. This reflects the assumption that a small export can take place without subsidies. At the same time, domestic consumption will rise from 730 million eggs in 1960 to 973 million eggs in 1965, thus providing an outlet for the eggs previously exported. In consequence, 1965 production will be at about the 1960 level. At the same time, prices are projected to decline by only 4.4 per cent.

The basic problems that developed in this branch were a result of government intervention, and are related to the fact that the supply elasticity of eggs is relatively high. When a support price is established above the equi-

[7] The range reflects different assumptions with respect to level of yield in 1965.

librium price, large surpluses develop. On the other hand, the fact that the supply elasticity is high implies that a small decrease in price is likely to bring production into line with consumption.

That egg production can be free of control is best illustrated by poultry meat, which is produced by the same farmers who produce eggs. The production of poultry meat has been free of direct control, although it has been somewhat indirectly affected by the intervention in egg production. In spite of being free of control, production of poultry meat has constantly increased; and this can be taken as support of the view that the industry can not only survive but also expand rapidly without control. The equilibrium price of poultry meat is projected to remain at the 1960 level, whereas production is expected to rise from 46,000 tons in 1960 to 69,000 tons in 1965, an increase of 50 per cent.

No equilibrium projection was made for milk, as the supposition is that the government will continue to control production in this branch. A brief examination of the relevant findings indicates that demand elasticity for most milk products is relatively low. On the other hand, the data suggest that the supply elasticity is relatively high. Consequently, it is inferred that the reduction or abolition of subsidies will result in some increase in the price to consumers without much affecting consumption. At the same time, there will be some decline in farm prices, which may result in the withdrawal of some of the farms in which the opportunity cost of dairy production is relatively high. This implies some concentration of production within the more efficient farms. Such a process will make it possible for other farmers to concentrate on the production of other products. Of course, an argument may be developed that the process will result in the loss of an important source of income for those farmers who must withdraw from milk production. The answer to this argument is that the problem of farmers who lack the necessary quantity of resources in order to earn sufficient income requires a direct approach and should not be tackled through the manipulation of milk prices. It should also be borne in mind that it is the large, and very likely the more efficient, farmers who enjoy the subsidies. Consequently, it is doubtful whether the marginal producers have any substantial gain from the subsidies.

The problem of supporting the production of sugar beet and cotton is somewhat different. It seems that with the prevailing exchange rate, cotton production can be expanded to the extent that available water allows. If the purpose of the subsidy in the past was that of creating a more realistic exchange rate, this function has now been fulfilled by the recent devaluation of the Israel pound. It is therefore projected that the crop can be produced

without support. Unfortunately, the same conclusion cannot be drawn with respect to sugar beet. The government has been paying the sugar factories considerably more than the international price. It is therefore desirable for the sugar beet policy to be reexamined.

It is clear that the removal of direct control of agricultural production will involve the abolition of production quotas. As stated, production quotas lead to misallocation of resources. Furthermore, their existence interferes with such specialization in production as location and the quantity and quality of the various resources at the farmers' disposal would render possible.

b. *The factor market*

The foregoing discussion has some further implications. Distortion in the allocation of resources may be caused not only by regulation of the product market but also by regulation of the factor market. One aspect of this regulation is concerned with the pricing of imported concentrate feeds. Concentrate feeds are mainly used in the production of livestock products. For poultry they constitute the only source of feeds whereas for cattle they are used in combination with forage grown by the producers of livestock products. Within a certain range substitution between forage and concentrated feeds is possible and the actual combination used depends on the price ratio of the two. The price of forage reflects, in part, the cost of its production, which depends on the cost of the various resources used for its production, including the opportunity cost of land and water. The price of concentrated feeds is determined by the international prices and by the effective exchange rate applied. Before the recent devaluation of the Israel pound, the effective exchange rate was higher than the official rate; and the proceeds obtained from this difference were used as a source for financing the subsidies to the final products.

As seen from the tables on the projected utilization of land and water, the projected production of forage for 1965 requires a considerable amount of these two factors. The quantity of water to be used for forage production is about 70 per cent of the quantity to be used for other field crops. Forage production was projected on the basis of past practices, and no attempt was made to examine the relation between forage production and the projected price of feeds. It is, however, desirable to discuss, in a qualitative way, the possible effect of the price of feeds on this solution.

Since some substitution between forage production and imported feeds is possible, it is clear that an increase in the price of feeds would encourage an increase in forage production and a decrease in the feed imports, whereas a decline in the feed prices would have the opposite effect.

It is therefore clear that pricing feeds at a higher level than their actual cost for the purpose of financing subsidies has the effect of reducing the amount of land and water available to other products. It is true that such a procedure discourages the import of feeds, and thus it might be concluded that it is in line with the objective of reducing the trade deficit of the economy as a whole. The conclusion is, however, erroneous. Imports are reduced at the cost of using land and water resources which could be used for producing other import substitutes, such as industrial crops or export products. One of the more interesting results of Yaron's projections of the field crop branch is that it is more desirable to use the irrigated land for the production of industrial crops than for small grains. Industrial crops are used either for import substitution or for export. Consequently, any reduction in the land and water available for their production would have a detrimental effect on the trade deficit.

The implication of this comment is only part of our more general discussion which stated that prices should not be determined at a level different from the equilibrium level. That is, the same effective exchange rate should be used for pricing imported feeds as is used for other imports, as well as for other exports. Of course, the policy of differential exchange rates is not a product of agricultural policy. However, differential exchange rates also affect allocation of agricultural resources, and it is for this reason that they were commented on.

This, of course, is not the only impact that the exchange rate has on the utilization of agricultural resources. From the discussion in Section 3 it emerges that a higher exchange rate is likely and could result in an increase of production of exports or import substitutes. Consequently, it is likely to relieve the pressure of production on domestic consumption. But, again, the determination of such an exchange rate is outside the sphere of agricultural policy, and reference is made here to this subject only to show how agriculture is affected by such decisions.

c. *Land and water*

There is one more aspect of the problem of resource allocation, which is not directly related to price determination, and which is concerned with the distribution of land and water among farms.

One way of obtaining higher production from a given quantity of land and water is to increase the efficiency of their utilization. This problem has various aspects. First, efficiency could be improved on each farm by allocating water in such a way that its contribution on the margin would be equal in all alternative uses. This may call for reducing the rate of irriga-

tion and thereby increasing the irrigated area. This also calls for the selection of a production mix that will maximize the returns from a given quantity of resources. With such an approach, it is recognized that the opportunity cost of the various resources should be considered rather than the actual cost that farmers pay for the limited resources. Such improvements in efficiency can be accelerated by extension work supplemented by research. However, they would be fully achieved only if there were no restrictions on the production of the various products. It is such restrictions that reduce regional variations in farming patterns.

The second aspect of the problem is related to equating the marginal contribution of resources among the various farms. Such an equality is a rather difficult goal to achieve in the institutional framework of Israel agriculture. Nevertheless, it should be mentioned. The difficulty arises because land and water are not purchased in the free market but are allocated in fixed quantities to farmers. Since there are interfarm differences in efficiency, rigid allocation of such resources does not result in equal marginal contribution of resources. Consequently, there would be a gain in output if redistribution of resources were allowed to take place. This of course, may violate the accepted notion that there should be equal distribution of resources resulting in equal distribution of income in agriculture. However, it should be realized that equal distribution of income in agriculture has been only an ideal and not a reality and, for all we know, wide differences in income exist. Furthermore, strict adherence to such a notion would require allocation of more of the resources to the less efficient farms so that the additional resources would compensate for their inefficiency. The absurdity of such a possibility only reflects the operational inappropriateness of the concept. If this is recognized, then one cannot escape the question: why not allow resources to flow to the more efficient farms? Such a move would require permitting the transfer of rights. This may appear to violate deep, entrenched beliefs which have presumably dictated policies for a long time, but so do other measures taken with respect to agriculture such as inequality in the distribution of production quotas.

d. *Conclusion*

The foregoing comments are not intended to provide a detailed plan for agricultural policy, a task which lies completely beyond the scope of this study. It is recognized that the change in approach and emphasis in agricultural policy has repercussions other than economic. However, only future discussion and re-evaluation of policies will indicate whether these additional aspects necessarily imply the policies which have been pursued in the past.

To conclude, the purpose of the discussion in this section was to indicate the scope for agricultural policies which would result in a more efficient operation, by economic standards, of the agricultural sector. On the basis of our projections, it is judged that agriculture would adjust to such policies with relative ease. Thus, these policies can be suggested not only on the basis of general principles but also on the basis of their operational feasibility.

6. *Retrospect — Limitations and Evaluation*

We turn finally to a consideration of the accuracy and reliability of our projections. To the student of empirical studies in economics, these comments may be redundant. Only a glance at the problems mentioned will lead him to consider the analysis and the results as a frame of reference. The following qualifications are, therefore, directed mainly towards the reader who is not familiar with empirical studies in economics.

As repeatedly indicated, our ultimate object has been to project future values of consumption and production. These projections are very likely subject to error — it is not claimed that they will coincide with the actual values that will be realized in the future. The pitfalls are numerous, and they are found at various stages of our work. They start with the question of the reliability of the data used for analyzing the various economic relationships, and with the whole question of estimating economic relationships. Following this, there is the problem of projecting the values of the noneconomic variables (exogenous to the markets considered). At various stages judgment had to be injected, either by the choice of assumptions, formulations, or projection of the values of the exogenous variables. It is difficult to point out a single phase of the study which may be considered free of possible errors. Of course, the various errors do not simply accumulate, as they may offset each other. Yet, this is small comfort, especially as the direction of the various errors is not known.

A possible approach to the study would have been to consider projections under various assumptions. This was actually done in some of the studies, and some of the alternatives are also reported. However, by and large, it has been preferred to single out the assumptions and projections which seemed to be most feasible after careful study of the subject. At the same time, the results are reported in such a way as to make it possible for readers who prefer different assumptions to construct their own projections.

All these comments apply to the task of constructing a specific projection of the variables in question. However, for most readers, the exercise of constructing a point projection as such may have only minor significance.

Their major interest may lie — and for obvious reasons — in the general picture obtained with respect to the overall development of agriculture and the delineation of the problem areas in the future. This, in fact, should be the concern of the policy makers for whom it may not be so important to get an exact projection of the price or consumption of a particular product in 1965 or 1975 as to know what will be the differential expansion in consumption or production, or what are the limitations to rapid expansion in production in the future and the possible ways of overcoming them. This information is provided in the present study, and it is for this reason that we have also briefly suggested some of its possible implications for drafting a policy more in line with the country's major objective, namely the attainment of economic independence.

Of course, important as the projection of overall trends may be, there is still need for some reliable projection of specific variables. In general, more precision is required, and, at the same time, is more easily achieved, for short-term projections. In fact, one may expect the 1965 projection to be more reliable than the 1975 projections. It should however be kept in mind that most of the empirical analyses were completed in the middle of 1961 and that the latest data analyzed were, in most cases, for 1959/60. Thus, greater precision could easily be obtained by bringing the projections up to date when new data are available. In fact, a continuous analysis of the agricultural developments may not only improve our projections but may increase our knowledge of the underlying forces which determine this development. It is such knowledge that is essential for the formulation of policies which will be in line with the ultimate goals of the State; in its absence long-term policies give place to short-run policies which, in many cases, are not in line with the ultimate objectives.

The purpose of these comments was to warn against identifying the projections too closely with the final outcome. But it is also intended to point out that the projections utilize the existing information; and rejecting them on the grounds that possible errors are admitted would imply ignoring information that the present data contain. The choice that policy makers are faced with is not whether or not to act on the basis of projections but rather whether to utilize the projections suggested by the data and economic analysis or to replace them by subjective evaluation. There is no doubt that past developments are explained, to a large extent, by economic analysis, and there is also little doubt that future development will be determined by economic forces. It is, therefore, believed that a refusal to face the conclusions of economic analysis is likely to lead to bigger mistakes than those that will arise from their acceptance.

CHAPTER 2

MAJOR TRENDS IN AGRICULTURE

1. *The Background*

The development of agriculture in recent years reflects, among other things, the impact of the large immigration that began to flow into Israel immediately after the establishment of the State in 1948. In the period 1949 to 1960, the population rose from 1.046 to 2.117 millions, that is, it more than doubled. The steepest increase took place in the years 1948 to 1951.

One of the immediate effects of the expansion in population was a considerable increase in the demand for food, for which there was already excess demand, as a result of the fact that the traditional sources of supply of agricultural produce — the Arab sector of Palestine and the neighboring countries — stopped trading with Israel upon the formation of the State. An expanding population, living under severe austerity, called for expanding agricultural production. This situation had considerable influence on agricultural policy from the very beginning of the State.

The food shortage promoted attempts to foster food production, major emphasis being given to the establishment of new settlements. Thus, the increased demand called for movement of the labor force into agriculture.

An indication of the shift into agriculture is provided in Table 4. The data are on rural population and not on the population whose main source of income is in agriculture[1]. For *kibbutzim* and *moshavim*, the discrepancy between the two series is likely to be smaller than for the private sector[2]. For these two types of settlement the trend of increase in population is expected to be highly correlated with the trend of increase in the number of families actively engaged in agriculture. The trend in the other types of settlement, which are mainly private, gives only a rough indication of the trend in the population engaged in agricultural production. Data on the size of the labor force employed in agriculture are given in Table 16. Unfortunately, the series starts only in 1950 and thus does not cover the years

[1] However, from 1957, new definitions were introduced which reduced the gap between the two concepts (see SAI, *No.* 9, p. XVII).

[2] See the appendix to this Chapter for a brief description of the main farm types in Israel.

TABLE 4. *Jewish Rural Settlements and Population: 1948–60*[a]

Type of Settlement	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1957*[b]	*1958*	*1959*	*1960*
A. *Number of settlements*														
Moshavim	104	157	218	233	274	295	302	316	333	347	335	344	345	347
Cooperative moshavim		25	27	28	27	29	24	27	25	25	21	20	19	19
Kibbutzim	177	211	214	217	217	227	223	225	228	230	228	228	228	229
Other types[c]	45	63	95	128	151	147	159	164	157	144	159	148	142	128
TOTAL	**326**	**456**	**554**	**606**	**669**	**698**	**708**	**732**	**743**	**746**	**743**	**740**	**734**	**723**
B. *Rural population (thousands)*														
Moshavim	30.1	45.4	68.0	85.8	100.6	95.9	108.7	113.7	124.0	134.4	123.9	121.7	117.9	115.1
Cooperative moshavim		2.8	3.6	4.0	4.5	4.9	3.8	4.8	4.2	4.5	3.7	3.9	3.6	3.6
Kibbutzim	54.2	63.5	66.7	68.2	69.1	73.3	76.1	77.8	79.7	80.1	79.9	78.6	77.9	78.0
Other types[c]	26.3	49.3	86.1	152.7	156.5	171.9	172.0	174.9	172.0	177.8	114.3	120.4	121.7	125.7
TOTAL	**110.6**	**161.0**	**224.4**	**310.7**	**330.7**	**346.0**	**360.6**	**371.2**	**379.9**	**396.8**	**321.8**	**324.6**	**321.1**	**322.4**

[a] End of year figures except for 1948 (November 1st).

[b] New definitions were introduced in 1957 (see *SAI No. 9*). For comparison, 1957 is shown according to both the old and the new definitions.

[c] Consists mainly of private farms.

SOURCE: *SAI* — 1948–57: *No. 9*, pp. 13–15.
1958–60: *Nos. 10–12*.

1948 and 1949, when a major expansion took place. Furthermore, the estimates for the first few years of the series are far from being accurate. It is for this reason that we choose to deal with the figures on rural population and settlements.

In spite of the limitations mentioned above, it is believed that the data in Table 4 show the trend of development. It is interesting to note that the total number of rural settlements increased from 326 in 1948 to 698 in 1953, and their population rose in the same period from 110,600 to 346,000, whereas in 1960 there were 723 settlements with a population of 322,400[3]. Thus, in the first few years following the establishment of the State there was a major expansion in the number of settlements and in their population. The peak was reached in 1957 and 1958 and thereafter there was some decline in the number of settlements and in population.

We may note in passing that the flow of immigration into agriculture changed the relative importance of the various types of farm organization. We do not dwell at any length on this point here, but elsewhere the effect of farm types on production is considered. The table indicates that a major expansion took place in the number of moshav farms, whereas the expansion in kibbutzim was much more moderate. The moshavim and kibbutzim together account for a major portion of production in some of the more important branches.

The consequences of the two factors — expansion in (1) population in general and (2) agriculture in particular — are well reflected in the developments of agriculture up to now, as will become clear in our subsequent discussion. That is not to say that other factors had no effect. We shall now examine in some detail the various forces at work during the period. Our introductory remarks on the impact of immigration were mainly intended to emphasize the importance of a variable which is peculiar to the Israel situation and which has important repercussions in our projection.

2. *Production*

The extent to which agricultural production responded to the developments discussed above can best be seen from the data on agricultural production which are summarized in the tables of this Chapter. Table 5 shows that value of production increased considerably over the years. There was a continuous increase in the general price level, and the data of production in fixed prices are therefore more indicative of changes in production.

[3] In making the comparison it must be remembered that the 1960 figures are based on a narrower definition of rural population (see Table 4 and footnote 1).

TABLE 5. *Agricultural Production at Current Prices: 1949–61*[a]

(*IL millions*)

	1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
1. Field crops	6.7	11.2	13.6	41.7	51.2	80.7	79.1	110.1	135.0	123.9	138.4	124.6	161.3
2. Vegetables and potatoes	5.3	7.0	10.4	23.5	32.0	39.2	45.2	54.0	59.7	65.5	58.7	60.6	67.2
3. Citrus fruit	6.9	7.5	8.6	16.1	31.1	67.3	62.6	75.4	87.7	100.0	106.2	110.7	111.6
4. Other fruit	3.2	3.1	4.3	14.8	18.9	26.3	29.3	42.1	42.8	57.9	58.7	78.7	100.6
5. Milk	7.2	8.2	10.5	20.2	32.3	41.2	46.5	55.9	62.3	74.1	78.6	84.5	95.3
6. Eggs	6.7	7.9	9.3	13.3	20.2	26.7	36.3	39.6	58.8	84.4	85.2	93.7	109.3
7. Meat (live weight)	3.8	4.7	4.8	8.6	15.2	24.0	48.5	67.1	82.7	111.0	130.8	146.4	163.7
8. Fish	1.6	2.3	3.1	5.7	7.9	9.4	11.6	12.0	14.5	17.5	17.3	18.8	19.7
9. Miscellaneous[b]	3.0	4.4	6.4	11.1	14.5	17.0	18.3	26.5	33.1	47.2	39.1	31.8	36.1
10. TOTAL	**44.4**	**56.3**	**71.0**	**155.0**	**223.3**	**331.8**	**377.4**	**482.7**	**576.6**	**681.5**	**713.0**	**749.8**	**864.8**

[a] Years are agricultural years in this and subsequent tables unless otherwise specified: for example, 1961 refers to the period 1.10.60–30.9.61.

[b] Includes honey, changes in livestock inventory, and miscellaneous.

SOURCE: *SAI* — 1949 and 1950: *No. 12*, pp. 194–95.
1951–61: *No. 13*, pp. 206–07.

TABLE 6. *Agricultural Production at Constant Prices: 1949–61*
(*Millions of 1949 IL*)

	1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
1. Field crops	6.7	10.4	7.9	16.1	16.7	21.6	21.7	27.6	34.3	30.8	36.7	33.4	42.5
2. Vegetables and potatoes	5.3	8.0	9.1	11.4	13.1	14.3	14.8	16.2	17.0	18.5	18.4	19.5	18.5
3. Citrus fruits	6.9	7.5	8.4	8.0	9.5	12.8	11.4	12.8	13.0	13.5	16.5	17.5	14.8
4. Other fruit	3.2	2.8	2.7	5.1	5.4	6.8	5.7	9.4	9.1	11.9	13.5	14.4	19.8
5. Milk	7.2	8.8	9.9	11.5	12.7	14.7	16.2	17.1	18.3	21.1	24.7	26.0	27.0
6. Eggs	6.7	9.0	10.8	10.1	10.2	11.4	14.2	14.5	17.7	24.8	29.3	31.5	37.2
7. Meat (live weight)	3.8	5.2	5.1	5.2	6.0	7.2	12.8	17.8	17.8	25.9	32.8	37.3	42.4
8. Fish	1.6	2.7	3.3	3.6	3.4	4.1	4.9	5.0	5.2	5.7	6.0	6.3	6.8
9. Miscellaneous[a]	3.0	3.8	4.0	4.2	4.4	4.8	4.8	6.3	7.4	10.4	10.0	9.0	8.9
10. TOTAL	**44.4**	**58.2**	**61.2**	**75.2**	**81.4**	**97.7**	**106.5**	**126.7**	**139.8**	**162.6**	**187.9**	**194.9**	**217.9**

[a] See note b to Table 5.

SOURCE: *SAI* — 1949–54: *Nos. 9–12.*
1955–61: *No. 13*, p. 216.

The rise in production, measured in 1949[4] prices, was from IL 44.4 million in 1949 to IL 217.9 million in 1961 (Table 6). That is, production in 1961 was 4.9 times that of 1949. The average annual compounded rate of growth was 14.2 per cent.

The data on production include intermediate products in agriculture, and the effect of this inclusion on the rate of growth of production should be examined. To deal with this problem, data on output are presented in Table 8. In this discussion we use the term output to represent production net of intermediate products which are consumed in agriculture. Thus the data on output yield an unduplicated total of agricultural production available to other sectors or to exports. The data on production in Table 8 differ from those which appear in Table 5[5]. The former is used in the present discussion because the series was constructed by the Central Bureau of Statistics unit which also constructed the series on intermediate products and inputs; internal consistency of definitions is thus secured.

It appears from Table 8 that for the period as a whole production of intermediate products increased at a lesser rate than total output. This means that output increased somewhat more, in relative terms, than production.

To gauge the contribution of agriculture to national product, we subtract purchases from other sectors, taxes, and depreciation to obtain value added. The results are then deflated by the implicit price index of agricultural production. Over the period 1954–61 the relative growth in net value added was very similar to that in production (see Table 21). This is also more directly reflected in the relative stability of the weight of net value added in total production, which fluctuated between 46 and 50 per cent.

The question is then posed: what were the main factors associated with the rapid expansion in agricultural output? An answer to this question would allow us to evaluate the prospects for future expansion and might also shed light on possible measures encouraging such expansion. We shall deal with various aspects of this question in our subsequent discussion and will be in a better position to summarize them after this is done.

4 Here and subsequently agricultural years; see Table 5, note a.

5 The series in Table 8 differs from that in Table 5 in the following respects: (a) it includes all investment items originating in agriculture, specifically appreciation of orchards, improvement of land due to drainage or the installation of irrigation pipes on farms, as well as the increase in livestock, which is the only investment item included in Table 5; (b) it includes compensation paid to farmers for low yields in drought years, whereas the series in Table 5 does not; (c) different prices are employed in some cases, mainly in the evaluation of home consumption, and of marketing through unorganized channels.

TABLE 7. *Agricultural Production at 1949 Prices: 1949–61*

(*Index and IL millions*)

	1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
A. *Index (1954 = 100)*													
1. Field crops	31	48	37	75	77	100	100	127	158	142	169	154	196
2. Vegetables and potatoes	37	56	64	79	91	100	103	114	119	130	129	136	130
3. Citrus fruit	54	58	66	62	74	100	89	100	102	105	129	136	115
4. Other fruit	48	41	39	75	78	100	83	137	133	174	198	211	289
5. Milk	49	60	68	79	87	100	111	117	125	144	168	177	184
6. Eggs	58	79	94	88	89	100	124	127	155	217	257	276	326
7. Meat (live weight)	53	72	72	72	84	100	178	248	248	360	456	520	590
8. Fish	39	67	81	87	84	100	121	122	126	138	146	156	167
9. Miscellaneous[a]	62	79	83	89	93	100	101	131	155	218	209	188	187
10. TOTAL	45	60	63	77	83	100	109	130	143	166	192	199	223
B. *Millions of 1949 IL*													
TOTAL	44.4	58.2	61.2	75.2	81.4	97.7	106.5	126.7	139.8	162.6	187.9	194.9	217.9

[a] See note b to Table 5.

SOURCE: Computed from unrounded figures underlying Table 6.

TABLE 8. *Value Added in Agriculture: 1952–61*[a]

	1952	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
A. *IL millions*										
1. Total production	*193.5*	*267.1*	*376.6*	*424.2*	*529.6*	*632.3*	*741.0*	*781.3*	*835.8*	*925.5*
2. *less* Own inputs	36.6	47.9	70.9	70.7	93.6	108.4	104.2	106.5	98.6	121.4
3. Total output (1. *less* 2.)	*156.8*	*219.2*	*305.7*	*353.5*	*436.1*	*523.9*	*636.9*	*674.8*	*737.2*	*804.1*
4. *less* Raw materials	46.8	73.7	106.2	127.1	161.7	187.5	228.0	254.3	291.8	300.7
5. Gross value added (3. *less* 4.)	*110.0*	*145.5*	*199.5*	*226.4*	*274.4*	*336.4*	*408.9*	*420.5*	*445.4*	*503.4*
6. *less* Depreciation	13.5	18.5	24.3	27.7	32.1	37.0	40.3	42.7	45.6	51.0
7. Net value added (5. *less* 6.)	**96.5**	**127.0**	**175.2**	**198.7**	**242.3**	**299.4**	**368.6**	**377.8**	**399.8**	**452.4**
B. *Selected indicators*										
8. Implicit price index for agricultural production (1952 = 100)	100.0	133.0	164.6	171.8	185.0	200.0	203.4	184.0	186.9	192.7
9. Net value added in 1952 prices										
a. IL millions (7.÷8.)	96.5	95.5	106.4	115.7	131.0	149.7	181.2	205.3	213.9	234.8
b. Index (1954 = 100)	90.7	89.8	100.0	108.7	123.1	140.7	190.3	193.0	201.0	220.7
10. Net value added as per cent of total production (7.÷1.)	50	48	47	47	46	47	50	48	48	49

[a] 1952–56 data are for calendar years. All figures include subsidies. Figures in panel A may not add owing to rounding.

SOURCES: Lines 1, 2, 4 and 6: CBS (unpublished data).
Line 8: Table 24, line 2.
Line 9b: Calculated from line 9a.

One of the features revealed by the production data is the wide annual fluctuation in the rate of growth. For instance, the quantity index for total production, as shown in Table 7 (1954 = 100), rose from 45 in 1949 to 60 in 1950, an increase of 31 per cent. In 1951, the increase over 1950 was only 5 per cent, whereas in 1952 it went up to 23 per cent. Such a two-year cycle, with smaller fluctuations, is observed for most of the remaining period.

Some of the year-to-year variations in the rate of growth of agricultural production are explained by the effect of drought and other environmental conditions. Such factors affected to a large extent the production of field crops, which constitute the bulk of production on unirrigated land. Thus, in 1951 — a year of serious drought — the quantity index of field crops was 37, as compared with 48 in 1950 and 75 in 1952. In 1953, another year of relatively small growth, the index of field crop production was 77, as compared with 100 in 1954. Again, in 1955 the index remained at a level of 100. In 1958 and 1960 the index of field crop production even dropped below the level of the preceding year. Environmental conditions are reflected in other branches as well. The question is how to separate such effects from others, and specifically from supply response by farmers. It seems that production of citrus and other fruits can be used as another illustration of the environmental effect on production since in both these branches area has increased throughout the period and there was practically no destruction of output. Thus, in years when production in these branches dropped below the preceding year, the influence of such factors was dominant.

In other branches, the influence of the environmental conditions was less significant; and the annual variations there reflect, among other things, supply response by farmers — as for instance, was found by Ben-David in vegetables or by Hochman in poultry. For reasons which are discussed in the individual reports and elsewhere in this Chapter and in Chapter 3, it was impossible to explain annual variations in the output of other branches in terms of prices. Yet this does not imply that such response does not exist. In fact, the overall trend in the composition of agricultural production, as shown in Table 9, can be attributed to allocation in line with the relative profitability of the various branches. The data in Table 9 do not reveal the whole of this response, as in citrus and other fruit there was a considerable expansion in area which had not yet borne fruit and was therefore not reflected in the production figures. But even if this is taken into consideration, the figures are striking; the weight of vegetables went down from 16 per cent in 1953 to 9 per cent in 1961, and that of meat went up from 7 per cent in 1953 to 19 per cent in 1960.

TABLE 9. *Composition of Agricultural Production: 1949–61*

(*Per cent*)

	1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
1. Field crops	15	18	13	21	20	22	21	22	25	19	20	17	20
2. Vegetables and potatoes	12	14	15	15	16	15	14	13	12	12	10	10	9
3. Citrus fruit	16	13	14	11	12	13	11	10	9	8	9	9	7
4. Other fruit	7	5	4	7	7	7	5	7	6	7	7	8	9
5. Milk	16	15	16	15	16	15	15	14	13	13	13	13	12
6. Eggs	15	15	18	14	12	12	13	11	13	15	16	16	17
7. Meat (live weight)	9	9	8	7	7	7	12	14	13	16	17	19	19
8,9. Fish and miscellaneous	10	11	12	10	10	9	9	9	9	10	8	8	7
10. TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

SOURCE: Computed from Table 6 (to which the line numbering refers).

TABLE 10. *Production of Field Crops at Current Prices: 1949–61*

	1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
A. *IL millions*													
Cereals and pulses	2.6	3.9	2.9	15.6	19.3	35.4	25.4	46.8	53.1	41.4	40.2	20.4	38.3
Roughage	2.8	4.1	6.6	12.8	16.2	22.8	25.4	28.9	38.1	38.2	41.8	40.2	42.5
Industrial crops	0.5	1.2	2.9	6.5	8.5	14.7	20.0	21.6	30.3	31.1	41.7	51.7	65.5
Miscellaneous[a]	0.8	2.0	1.2	6.8	7.2	7.8	8.3	12.8	13.5	13.2	14.7	12.3	15.0
TOTAL	**6.7**	**11.2**	**13.6**	**41.7**	**51.2**	**80.7**	**79.1**	**110.1**	**135.0**	**123.9**	**138.4**	**124.6**	**161.3**
B. *Per cent*													
Cereals and pulses	39	35	21	37	38	44	32	42	39	33	29	16	24
Roughage	42	36	49	31	31	28	32	26	28	31	30	32	26
Industrial crops	7	11	21	16	17	18	25	20	23	25	30	42	41
Miscellaneous[a]	12	18	9	16	14	10	11	12	10	11	11	10	9
TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

[a] Mainly melons and pumpkins.

SOURCE: See sources to Table 5.

The structure of Israel's agricultural production is well illustrated in Table 9. Perishable products constitute the major part of total output. The weight of field crops has been around 20 per cent in most years. Field crops is the only branch which produces nonperishable products, but not all its products are nonperishable. This can be seen from the figures on the production of field crops by major group in Table 10. Forage production (roughage) accounted for about 30 per cent of the total value of field crops. Since roughage is grown in connection with dairy production and there are few transactions in roughage feeds, it would be more appropriate to consider it, for the present purpose, as part of the dairy branch. If we also take into account the fact that most of the miscellaneous category consists of melons, then we see that nonperishable cash crops constitute only about 60 per cent of field crop production. The nonperishable products consist mostly of small grains and industrial crops. Small grains are mainly grown on unirrigated land, and their area has declined somewhat in recent years. The major expansion took place in industrial crops: cotton, peanuts and sugar beet. Of these three, cotton and sugar beet are relatively new crops in Israel. They were first produced to a significant extent in 1955, since when their production has gone up considerably[6]. Such rapid expansion illustrates the great ability of farmers in Israel, assisted by research and extension work, to adopt new crops and new technology in general. This is well reflected by the level of yields which compares favorably with that in countries where these crops have been grown for many years.

The success in physical adoption of industrial crops gives only a partial explanation of the expansion, which also reflects the fact that the increased production of other crops led to a decline in their relative prices and this curbed further expansion. Thus a way was sought to employ the productive capacity of agriculture. In the early 1950's it was thought that this capacity should be directed to further production of small grains, mainly corn on irrigated fields. But with the introduction of industrial crops it became clear that the latter bring higher returns and at present they absorb all the residual factors of production, mainly irrigated land, which are not engaged in the production of perishables. This position has had its influence on the construction of our forecast as is explained in Chapter 3.

3. *Land and Water*

The cultivated area in recent years has been around 4 million dunams (Table 11). Except for the period 1949–51, immediately following the estab-

6 For a more detailed description of the development, see the discussion by Yaron in Part II of this study.

TABLE 11. *Cultivated Area*[a] *— Total, Irrigated, and Unirrigated: 1949–61*

	1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
A. *Thousands of dunams*													
Irrigated	300	375	470	540	650	760	890	965	1,100	1,185	1,235	1,305	1,360
Unirrigated	1,350	2,105	2,880	2,935	2,900	2,800	2,700	2,720	2,720	2,755	2,870	2,770	2,790
TOTAL	**1,650**	**2,480**	**3,350**	**3,475**	**3,550**	**3,560**	**3,590**	**3,685**	**3,820**	**3,940**	**4,105**	**4,075**	**4,150**
B. *Index (1954 = 100)*													
Irrigated	39	49	62	71	86	100	117	127	145	156	163	172	179
Unirrigated	48	75	103	105	104	100	96	97	97	98	102	99	100
TOTAL	46	70	94	98	100	100	101	104	107	111	115	114	117

[a] Crop area; that is, an area is included as many times as it is sown.

SOURCE: *SAI* — 1949–57: *Nos. 9*, *11*, and *12*.
1958–61: *No. 13*, p. 184.

lishment of the State, the increase in total cultivated area has been less than the increase in other inputs; cultivated area in 1961 was only 24 per cent above 1951. In part, this rise was the result of bringing under cultivation additional land, mainly in low-rainfall regions or shallow land in the hill regions; and in part it reflects the increase in irrigated land, where each dunam is sown, on the average, more than once a year. Since the data in Table 11 are in terms of crop area rather than physical units, any increase in the number of crops grown on one unit of land is reflected in an increase in total cultivated land.

The major change was in irrigated land, which rose by about three times from 1951 to 1961. This is to be compared to the 24 per cent increase in total cultivated land in the same period. At the same time there was a slight decline in unirrigated land. The expansion in irrigated land reflects to a large extent the development of water projects, which increased the supply of water to agriculture. Total water used by agriculture is shown in Table 12.

TABLE 12. *Water Used by Agriculture: 1949–61*

1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Millions of cubic meters												
257	332	413	468	563	660	760	830	830	1,000	990	1,060	1,025
Index: 1954 = 100												
39	50	63	71	85	100	115	126	126	152	150	161	155

SOURCE: *SAI* — 1949–52: *Nos. 11* and *12*.
1953–61: *No. 13*, p. 224.

In the years 1950–56, the relative increase in water consumption was similar to that of irrigated land, and there is no significant trend in the ratio of water to land. For these years, the average amount of water used per dunam of irrigated land fluctuated between 854 and 885 cubic meters. In the period 1957–61 water consumption rose less than irrigated land. This means that a somewhat smaller amount of water was used per dunam; the lowest quantity, 717 cubic meters, is observed in 1961. Some of the annual fluctuations are due to supplementary irrigation in drought years of crops which are

normally grown unirrigated and classified as such. If this factor is taken into account, the data suggest a trend of decline in the amount of water per irrigated dunam. This is of importance in view of the fact that, at present, the prospects are for only a slight increase in the supply of water to agriculture. Further expansion of irrigated land will therefore have to be accompanied by a decrease in the rate of water application.

It is difficult to indicate, without going into somewhat detailed analysis, whether the declining rates are due to the application of smaller quantities of water to the same crops or to a change in the composition of crops. The requirements of industrial crops are less than for some of the crops traditionally grown in the country. Hence, the decline in rates of water application is due, at least in part, to the relative expansion of industrial crops. There is, however, another possibility. Recent research and intensive extension work have indicated that water application may be reduced for various crops.

In this connection it may be interesting to refer to results obtained in a study of established moshavim[7]. The trend there was in the reverse direction: the average amount of water per irrigated dunam went up from 610 cubic meters in 1954 to 729 cubic meters in 1958. At the same time, the amount of water available to the sample farms rose by 37 per cent. However, the distinctive feature here is that in both years the average amount is considerably smaller than that observed for the country as a whole.

The unirrigated area is mainly used for growing forage and small grains, and this will on the whole continue to be so in the future. Utilization of the irrigated area is different, as is shown in Table 13.

The expansion of the irrigated area brought a considerable change in the relative importance of the various crops. The area of field crops other than forage, which are mainly industrial crops, increased from 4,000 dunams in 1949 to 264,000 dunams in 1961[8]. As shown in Table 14, the industrial crops category accounted for only 1 per cent of total irrigated land in 1949 and for 19 per cent in 1961.

Irrigated land allocated to forage and to vegetables was in 1961 about four times the 1949 area. In vegetables, most of the expansion took place up to 1953, when the area was 187,000 dunams. Since then, the area has changed little except for some annual variations. As Ben-David points out in his study (see Part II), the fast expansion in the first few years is accounted for by two factors. Firstly, the short production period of vegetables made it possible to expand production without delay to remedy the food shortage

7 Y. Mundlak, *Economic Analysis of Established Family Farms*, FP, 1964, Table 14, p. 39.

8 For composition of the area of field crops, see Yaron.

TABLE 13. *Utilization of Cultivated Land Under Irrigation*[a]*: 1949–61*

(*Thousands of dunams*)

	1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
1. Roughage	62	74	106	114	130	140	166	183	211	245	275	266	244
2. Other field crops[b]	4	9	19	23	56	92	153	160	211	207	193	218	264
3. Vegetables and potatoes	53	86	113	150	187	200	183	197	196	202	195	198	194
4. Citrus fruit	125	132	133	135	139	164	195	213	246	275	295	328	340
5. Other fruit	25	26	33	41	54	72	90	98	119	135	148	165	182
6. Fish ponds	15	22	27	30	35	35	37	40	41	43	46	49	53
7. Miscellaneous[c]	16	26	39	47	49	57	66	74	76	78	83	81	83
8. TOTAL	**300**	**375**	**470**	**540**	**650**	**760**	**890**	**965**	**1,100**	**1,185**	**1,235**	**1,305**	**1,360**

[a] Crop area: that is, an area is included as many times as it is sown.

[b] Including groundnuts.

[c] Auxiliary farms, nurseries, flowers, etc.

SOURCE: *SAI — Nos. 5, 6, 8–13.*

The following annual tables from this source were used:

(a) Area under cultivated irrigation.

(b) Area of fruit plantations.

(c) Cultivated area of field crops.

(d) Cultivated area of groundnuts.

The table was built up from these as follows:

Line 1: From (c).

Line 2: Total irrigated field crops from (a) *less* roughage from (c) *plus* groundnuts from (d).

Line 3: Vegetables, potatoes and groundnuts from (a) *less* groundnuts from (d).

Line 4: From (b).

Line 5: Total irrigated orchards from (a) *less* citrus from (b).

Line 6, 7 and 8: From (a).

TABLE 14. *Utilization of Cultivated Land Under Irrigation*[a]*: 1949–61*

(*Per cent*)

	1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
A. *Per cent*													
1. Roughage	21	20	23	21	20	18	19	19	19	21	22	20	18
2. Other field crops[b]	1	2	4	4	9	12	17	17	19	17	15	17	19
3. Vegetables and potatoes	18	23	24	28	29	26	21	20	18	17	16	15	14
4. Citrus fruit	42	35	28	25	21	22	22	22	22	23	24	25	25
5. Other fruit	8	7	7	8	8	9	10	10	11	11	12	13	14
6. Fish ponds	5	6	6	6	4	5	4	4	4	4	4	4	4
7. Miscellaneous[c]	5	7	8	8	9	8	7	8	7	7	7	6	6
8. TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
B. *Thousands of dunams*													
TOTAL	300	375	470	540	650	760	890	965	1,100	1,185	1,235	1,305	1,360

[a] [b] [c] See notes to Table 13.

SOURCE: Table 13.

of the growing population. Secondly, vegetable production requires relatively little capital input and a considerable labor input and was a suitable branch for the new settlements established at the time. The population growth was much slower in later years, and per capita consumption changed very little, so that the increase in productivity made it possible to meet the increase in demand. The expansion of the forage area paralleled, in general, the expansion in the dairy herd. This can be seen from the table on forage area per dairy cow given by Kislev (see Part II). The upward trend in forage area per dairy cow in the years 1953–57 reflects a change in the composition of the herd. Over the years, with the increase in meat production, the number of calves, heifers, steers, and beef animals increased considerably, relative to the number of dairy cows, and this led to higher feed requirements. The trend in forage per dairy cow was reversed after 1958. In part, this reflects a change in the composition of feeds, with an increase in the concentrate component, and in part an increase in productivity in forage production.

There was also considerable expansion in fruit area. Fruit other than citrus increased from 25,000 dunams in 1949 to 182,000 dunams in 1961. More than half of the additional area was added in the last five years; as we shall see, this is a response to the shortage of fruit, and the consequent high prices. A somewhat smaller absolute increase took place in the citrus area, mainly in the first few years. This was partly due to reluctance to increase exports of citrus as it was believed that the demand was inelastic, which meant that additional exports would have decreased the total revenue of the growers. This policy was later abandoned, and considerable expansion took place, the citrus area more than doubling from 1954 to 1961.

An important aspect when considering the allocation of irrigated land is the problem of domestic consumption. Irrigated land is used for the production of citrus, field crops and perishable crops, the latter being — on the whole — for domestic consumption, although small quantities of fruit and vegetables are exported and small quantities of citrus fruit are consumed locally. This situation has implications for the future, in that further expansion of domestic demand for perishable products would have to be met by the following means: (1) by increasing irrigated area, (2) by increasing yields, and (3) from export crops or those used as import substitutes. The prospects are for only a slight increase in water and hence for additional irrigated land; we leave aside this possibility for the moment. The potential for increase in yields will be discussed below. If we assume for the time being that the first two possibilities will not allow sufficient expansion in perishables for domestic consumption, we are then left with reducing the

TABLE 15. *Utilization of Cultivated Land Under Irrigation*[a]*: 1949–61*

(*Index*)

	1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
A. *Index: (1954 = 100)*													
1. Roughage	44	53	76	81	93	100	119	131	151	175	196	190	174
2. Other field crops[b]	4	10	21	25	61	100	166	174	229	225	210	237	287
3. Vegetables and potatoes	26	43	56	75	94	100	92	98	98	101	98	99	97
4. Citrus fruit	76	80	81	82	85	100	119	130	150	168	180	200	207
5. Other fruit	35	36	46	57	75	100	125	136	165	188	206	229	253
6. Fish ponds	43	63	77	86	100	100	106	114	117	123	131	140	151
7. Miscellaneous[c]	28	46	68	82	86	100	116	130	133	137	146	142	146
8. TOTAL	39	49	62	71	86	100	117	127	145	156	163	172	179
B. *Thousands of dunams*													
TOTAL	300	375	470	540	650	760	890	965	1,100	1,185	1,235	1,305	1,360

[a] [b] [c] See notes to Table 13.

SOURCE: Table 13.

area of either citrus or field crops. Since the competitive position of citrus seems to be favorable at present, the main reserve for irrigated land is that now used for field crops[9]. This evaluation is admittedly somewhat invalid — at least in the long run. It is possible that some of the perishable products which are produced and consumed domestically could be imported at a price which is lower than their cost of production when the opportunity cost of irrigated land is considered. This hypothesis deserves careful examination which can only be made on the basis of our final results. For the time being it is ignored, and in so doing we follow the present pattern, as was stated above. To what extent, if at all, there will be any need to draw on land now devoted to field crops we shall see below. However, it is clear that, given the demand functions for the various products and given the amount of available water, the level of yields will be one of the determinants of any change that would have to be made in the pattern of land utilization. This point is discussed in more detail later.

4. *Labor and Capital Inputs*

As mentioned earlier, the data on the employed labor force in agriculture for the first few years of the period investigated are inaccurate. However, the employed labor force follows the trend in rural population and is believed to reflect the actual trend. Keeping this reservation in mind, we see from Table 16 that the employed labor force in agriculture in 1961 was only 29 per cent higher than in 1954, and that there were only small changes in the years 1959–61.

On the other hand, the amount of capital stock rose faster and was 85 per cent higher in 1961 than in 1954, so that the amount of capital per worker increased. In this respect, the trend in agriculture was similar to that of the economy as a whole.

Since our main purpose in presenting the data on capital stock is to give some indication of the changes in the productive capacity of agriculture, we have chosen to deal with gross capital stock net of estimated discards[10]. This is justified by the fact that most of the capital assets are relatively new and their productive capacity does not depreciate according to the depreciation of market values which reflect other factors as well. For similar reasons, the investment and stock in regional or state irrigation

[9] See David Levhari (Part II of this study) for a discussion on the competitive position of the citrus industry.

[10] The data are taken from A.L. Gaathon, *Capital Stock, Employment and Output in Israel, 1950–1959*, Bank of Israel, Special Studies No. 1, Jerusalem, 1961. The reader is referred to this source for a description of the methods of calculation.

TABLE 16. *Gross Capital Stock, Investment and Employed Labor Force in Agriculture and All Sectors: 1950–61*[a]

	1950	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
A. *Gross investment*[b] *(millions of 1957 IL)*												
1. All nondwelling sectors	338	398	360	293	288	378	430	459	513	581	610	735
2. Agriculture	54	52	44	47	56	72	97	82	103	92	80	92
3. Irrigation	54	62	66	86	76	47	38	41	50	52	63	60
B. *Gross capital stock*[c] *(millions of 1957 IL)*												
1. All nondwelling sectors	1,462	1,800	2,198	2,558	2,851	3,139	3,517	3,948	4,407	4,920	5,502	6,111
2. Agriculture	487	541	594	638	685	741	813	910	992	1,096	1,188	1,268
3. Irrigation	146	200	262	328	414	490	537	576	617	667	719	782
C. *Employed civilian labor force (thousands)*												
1. All sectors	398	496	544	544	564	584	598	642	655	680	702	735
2. Agriculture	65	79	91	91	94	103	106	105	115	120	120	122
D. *Gross capital stock per employed person (thousands of 1957 IL)*												
1. All nondwelling sectors (B.1 ÷ C.1)	3.7	3.6	4.0	4.7	5.1	5.4	5.9	6.1	6.7	7.2	7.8	8.3
2. Agriculture (B.2 ÷ C.2)	7.5	6.9	6.5	7.0	7.3	7.2	7.6	8.7	8.6	9.2	9.9	10.4

E. *Agriculture as per cent of total*												
a. Gross investment[b] (A.2÷A.1)	16.1	13.1	12.4	16.0	19.5	19.2	22.5	17.9	20.1	15.9	13.2	12.5
b. Gross capital stock[c] (B.2÷B.1)	33.3	30.1	27.0	24.9	24.0	23.6	23.1	23.0	22.5	22.3	21.6	20.8
c. Employed civilian labor force (C.2÷C.1)	16.2	15.9	16.7	16.7	16.7	17.6	17.8	16.3	17.6	17.6	17.1	16.5
F. *Agriculture* (*index, 1954 = 100*)												
a. Gross investment[b] (A.2)	97	93	79	84	100	129	173	147	184	165	143	164
b. Gross capital stock[c] (B.2)	71	79	87	93	100	108	119	133	145	160	174	185
c. Employed civilian labor force (C.2)	69	84	96	96	100	109	113	111	122	127	127	129
d. Gross capital stock per employed person (D.2)	104	94	90	97	100	99	105	120	119	126	136	142

[a] Calendar years.
[b] Net of discards.
[c] Beginning-of-year stock.

SOURCE: *Gross investment and capital stock*:

A.L. Gaathon, *Capital stock, Employment and Output in Israel, 1950–1959*, Bank of Israel, Jerusalem, 1961, Appendix Table A–6. 1961 and revised 1960 stock figures were kindly supplied by Dr. Gaathon.

Employed civilian labor force:

Nadav Halevi's essay in this volume, quoting A.L. Gaathon, *op. cit.*, (Appendix C) for 1950–57, and Bank of Israel, *Annual Report: 1962*, p. 148, Table VIII–7, for 1958–61.

projects were reported separately[11]. When comparing factors of production with output, it is appropriate to consider the amount of water used in agriculture rather than stock tied up in countrywide projects.

The amount of capital per worker was more or less stable until 1955 and started to increase in 1956. The relative stability in the first few years indicates that investment was sufficient to match the increased labor force resulting from the large-scale settlement program. This does not mean that new settlements are established with the same capital stock that is found on the veteran farms. The initial endowment of productive assets is given to new settlements over a period of several years, and even this is not equivalent in size to the capital stock on veteran farms. Thus, in the first few years the new settlements possessed a small amount of capital as compared with the veteran settlements[12]. It is difficult to say to what extent the gap was closed later, but it seems that investment continued on all farms, and it is very likely that a considerable difference in capital stock per worker still exists between the new and veteran settlements.

It would have been desirable to get a clear view of the sources of financing the investment. Did it mainly come from public funds, from savings in other private sectors of the economy, or from saving within agriculture? No complete answer is possible and only fragmentary indications can be given. The share of direct public finance in gross domestic capital formation in agriculture in recent years was (per cent):[13]

1955	82	*1959*	78
1957	57	*1960*	86
1958	75	*1961*	84.

The remainder was financed from private sources. The share of public finance is relatively high if we consider that agriculture is not a new industry and as such does not require special support in the way of public finance. However, this interpretation is not completely valid since the figures quoted here include investment in water projects and land betterment. It would seem impractical to expect agriculture to carry the financial burden of water projects, while land betterment and afforestation may be considered as marginal to the agricultural sector. It has not yet been established that

[11] Investment and stock in regional or state irrigation projects are not included in the figures related to agriculture in sections D, E, and F of Table 16, but appear in the total for all sectors.

[12] For a description of development in veteran moshavim, see Mundlak, *op. cit.*, Chapter 2.

[13] Bank of Israel, *Annual Reports*: *1958*, p. 111; *1959*, p. 143; *1960*, p. 138; *1961*, p. 187. This includes all donations channeled through public institutions.

such activities can be justified economically, and for this reason it is very likely that they would not have been undertaken by the private sector. This abstention does not itself justify public intervention; it is indeed questionable whether economic justification could be provided. We merely point out that the motivation for such activities is probably not economic.

In view of the low rate of establishment of new settlements in recent years and in the future, it is likely that public finance investment on farms (excluding public projects) will decline somewhat and will have to be replaced by other sources. It is difficult to say how much the agricultural sector will contribute: this depends mainly on the sector's savings, and there are in fact no suitable data on which to base a prediction.

However, it is interesting to note that a large proportion of the investment on farms[14] originated, in gross terms, in agriculture. The proportion of investment that comes from agricultural production fluctuated between 60 and 70 per cent in recent years. Should this investment be financed in the future from private saving, it would represent a potential source for finance. This, however, has not been the case in the past.

The breakdown of investment by major group is given in Table 17. The expansion in livestock and orchards is well reflected in these data. The livestock item includes only the increase in the number of animals, the structures for animals being included in the unspecified item.

Another form of capital, not included in the stock data, is working capital, whose amount is directly related to expenditure on raw materials. The data on raw materials appear in Table 18 in current IL, and in per cent of total in Table 19. The feed component, which is the biggest single item, constantly increased its weight: from 24 per cent of inputs other than depreciation and taxes in 1952 to 49 per cent in 1961. This reflects the increase in the weight of livestock products in total production, as was seen earlier. The factor second in importance is water, whose weight remained fairly stable over the period.

An indication of the quantity changes of the various items is provided by Table 20, which shows the data at fixed prices. The volume of feeds in 1961 was about five times that in 1952, whereas quantity of other items only doubled. Insecticides, which showed a similar relative increase to that of feeds, are another exception. This reflects, in part, the expansion in cotton production which requires extensive application of insecticides.

Without going into detailed analysis it is impossible to indicate whether

[14] Investment originating in agriculture means capital formation by labor and capital engaged in agricultural production. This includes appreciation of livestock, orchards, etc.

TABLE 17. *Gross Investment*[a] *in Agriculture: 1954–61*[b]

(*Millions of 1955 IL*)

	1954	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Investment on farms								
Orchards	12.2	18.2	20.1	24.9	27.0	25.3	22.7	21.9
Machinery	10.2	13.3	16.1	14.8	15.4	20.2	18.3	20.4
Livestock	8.2	7.7	10.5	17.4	23.7	15.8	5.7	10.6
Other[c]	17.2[d]	45.9	40.7	31.5	36.0	33.3	29.3	20.8
TOTAL	**47.8**	**85.1**	**87.4**	**88.6**	**102.1**	**94.6**	**76.0**	**73.7**
Public projects								
Land betterment and drainage	4.6	8.4	6.9	9.7	9.8	10.7	9.3	7.1
Afforestation	4.4	4.6	4.4	8.2	10.9	10.1	9.9	7.5
TOTAL	**9.0**	**13.0**	**11.3**	**17.9**	**20.7**	**20.8**	**19.2**	**14.6**

[a] These figures differ from those of Table 16 in that: (i) they are not net of discards; (ii) in Table 16, irrigation systems on farms are included in 'irrigation'.

[b] Calendar years.

[c] Includes farm structures, fish ponds, irrigation systems on farms (but not regional projects), and miscellaneous.

[d] In 1954, investment in irrigation systems is not included.

SOURCE: CBS (unpublished data).

TABLE 18. *Purchases by Agriculture from Other Sectors*[a]*: 1952–61*[b]

(*IL millions*)

	1952	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Purchased feeds	10.5	24.1	32.4	45.6	63.1	75.0	99.6	112.0	140.9	140.6
Water	6.7	9.4	12.8	15.5	18.3	22.3	27.6	30.0	34.4	33.6
Packing materials	5.1	9.1	18.7	16.2	19.5	20.3	20.4	24.1	24.7	22.2
Fertilizers	4.9	5.0	9.3	9.8	12.4	13.4	15.7	16.3	16.9	16.3
Transportation	4.4	5.5	7.5	9.0	11.0	12.7	14.7	16.4	16.9	18.8
Machine parts	4.0	5.4	6.3	7.4	9.7	11.3	13.5	15.1	14.4	18.6
Fuel	2.7	3.5	4.4	5.3	5.6	7.3	7.9	8.9	9.3	10.6
Insecticides	1.6	2.2	3.1	3.6	5.1	7.9	9.1	9.6	10.8	13.2
Seeds	1.2	2.4	3.3	4.3	4.0	3.7	3.7	4.2	4.1	4.5
Services	1.5	2.0	2.7	3.1	3.6	4.0	4.9	5.2	6.0	6.4
Pipes and parts	1.1	1.3	1.4	1.5	1.6	1.6	1.6	1.6	1.3	1.2
Miscellaneous	0.5	0.5	0.5	0.9	0.9	0.9	1.6	1.7	1.4	1.8
Subtotal	*44.2*	*70.4*	*102.4*	*122.2*	*154.8*	*180.6*	*220.5*	*245.2*	*281.2*	*287.9*
Taxes	2.6	3.3	3.8	4.9	6.9	7.1	7.7	9.2	10.7	12.9
Depreciation	13.5	18.5	24.3	27.7	32.1	37.0	40.3	42.7	45.6	51.0
TOTAL	**60.3**	**92.2**	**130.5**	**154.8**	**193.8**	**224.5**	**268.3**	**297.0**	**337.4**	**351.7**

[a] Excluding interest.

[b] 1952–56 data for calendar years, and 1957–61 for agricultural years. Figures may not add owing to rounding.

SOURCE: CBS (unpublished data).

TABLE 19. *Purchases by Agriculture from Other Sectors*[a]*: 1952–61*[b]

(*Per cent*)

	1952	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Purchased feeds	17.4	26.1	24.8	29.5	32.5	33.5	37.1	37.7	41.8	40.0
Water	11.1	10.2	9.8	10.0	9.4	9.9	10.3	10.1	10.2	9.5
Packing materials	8.5	9.9	14.3	10.5	10.1	9.0	7.6	8.1	7.3	6.3
Fertilizers	8.1	5.4	7.2	6.3	6.4	5.9	5.8	5.5	5.0	4.6
Transportation	7.3	5.9	5.7	5.8	5.7	5.6	5.5	5.5	5.0	5.4
Machine parts	6.6	5.9	4.8	4.8	5.0	5.0	5.0	5.1	4.3	5.3
Fuel	4.5	3.8	3.4	3.4	2.9	3.2	2.9	3.0	2.7	3.0
Insecticides	2.7	2.4	2.4	2.3	2.6	3.5	3.4	3.2	3.2	3.8
Seeds	2.0	2.6	2.5	2.8	2.1	1.7	1.4	1.4	1.2	1.3
Services	2.5	2.2	2.1	2.0	1.8	1.8	1.8	1.8	1.8	1.8
Pipes and parts	1.8	1.4	1.1	1.0	0.8	0.7	0.6	0.5	0.4	0.3
Miscellaneous	0.8	0.5	0.4	0.5	0.5	0.5	0.7	0.6	0.4	0.5
Taxes	4.3	3.6	2.9	3.1	3.6	3.2	2.9	3.1	3.2	3.7
Depreciation	22.4	20.1	18.6	18.0	16.6	16.5	15.0	14.4	13.5	14.5
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

[a] [b] See notes to Table 18.

SOURCE: Computed from unrounded figures underlying Table 18.

TABLE 20. *Purchases by Agriculture from Other Sectors*[a]*: 1952–61*[b]

(Millions of 1955 IL)

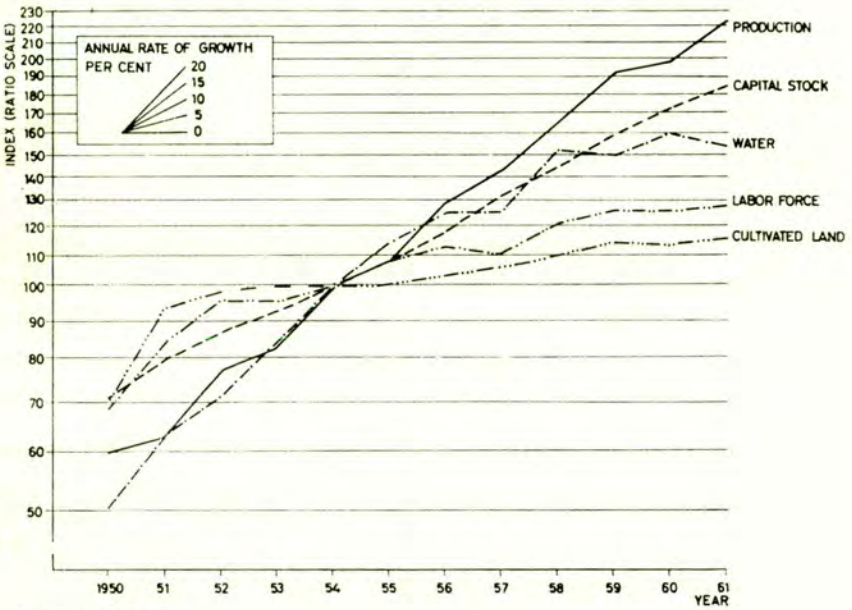
	1952	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Purchased feeds	22.3	33.5	36.4	45.6	56.8	63.6	80.3	88.9	112.7	111.6
Water	10.3	11.9	14.1	15.5	17.4	17.2	19.5	20.3	22.3	20.6
Packing materials	10.2	12.6	18.3	16.2	18.4	18.6	19.3	23.2	24.5	21.5
Fertilizers	6.7	6.0	9.6	9.8	12.3	12.2	13.3	13.8	14.1	13.3
Transportation	6.1	6.9	8.2	9.0	10.6	11.3	13.1	15.2	15.8	17.2
Machine parts	6.3	7.0	7.2	7.4	8.2	9.2	9.7	10.9	10.0	11.1
Fuel	4.8	4.9	5.2	5.3	5.5	5.9	5.9	6.6	6.0	6.6
Insecticides	2.4	2.6	3.2	3.6	4.9	7.2	8.1	8.5	9.9	11.9
Seeds	1.8	2.5	3.3	4.3	4.0	3.5	3.4	3.6	3.6	3.6
Services	2.3	2.5	2.8	3.1	3.6	3.8	4.5	4.6	5.1	5.2
Pipes and parts	1.4	1.8	1.5	1.5	1.5	1.4	1.3	1.3	1.0	0.9
Miscellaneous	0.6	0.7	0.5	0.9	0.8	0.9	1.5	1.4	1.2	1.5
Subtotal	*75.2*	*92.9*	*110.3*	*122.2*	*144.0*	*154.8*	*179.9*	*198.3*	*226.2*	*225.0*
Depreciation	25.0	25.3	26.4	27.7	29.4	32.5	34.2	35.6	37.1	39.6
TOTAL	**100.2**	**118.2**	**136.7**	**149.9**	**173.4**	**187.3**	**214.1**	**233.9**	**263.3**	**264.6**

[a] [b] See notes to Table 18.

SOURCE: Each line of Table 18 deflated by the corresponding unrounded price index underlying Table 23. The lines 'total' and 'subtotal' are the sum of the deflated figures.

resources were used efficiently according to economic criteria; that is, whether there was sufficient application of all inputs that could be varied in quantity. Nevertheless, it should be pointed out that the data on the whole show that agriculture in Israel is advanced in the sense that intensive

FIGURE 1. *Selected Agricultural Inputs* (*Index 1954 = 100*)



SOURCE: Table 21.

use is made of fertilizers, insecticides, and machinery and other factors which are required to secure high yields. Perhaps the relative increase in the use of insecticides can be used as an illustration of this point. Whether this increase is attributable to the expansion in cotton area or not does not affect this conclusion, for in any case it indicates that, when required, advanced practices are introduced.

5. *Productivity*

From the foregoing discussion it is clear that the increase in output was associated with an increase in all agricultural inputs. The various inputs did not all rise at the same rate, as can be seen from Table 21 and from Figure 1. The contribution of the various inputs to the rise in output cannot be measured without estimating the production function for agriculture as a whole. This, however, is somewhat difficult to carry out, for reasons which will not be discussed here in detail. It should, however, be mentioned

TABLE 21. *Agricultural Inputs and Production – Quantity Indexes: 1950-61*[a]

(1954 = 100)

	1950	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*	*Average annual rate of growth (per cent)*[b]
1. Value added			91	90	100	109	123	141	170	193	201	221	11.8
2. Production	60	63	77	83	100	109	130	143	166	192	199	223	13.2
3. Cultivated land	70	94	98	100	100	101	104	107	111	115	114	117	2.4
4. Water	50	63	71	85	100	115	126	126	152	150	161	155	8.8
5. Labor force	69	84	96	96	100	109	113	111	122	127	127	129	3.8
6. Capital stock	71	79	87	93	100	108	119	133	145	160	174	185	9.2
7. Raw materials			67	84	100	111	132	143	167	185	212	212	13.7

[a] Agricultural or calendar year, depending on source table.

[b] Obtained from semi-logarithmic regressions on time of the variables, computed for 1952–61.

SOURCE: Line 1: Table 8, line 9b.
Line 2: Table 7, line 10.
Line 3: Table 11 (total).
Line 4: Table 12.
Line 5: Table 16, line F.c.
Line 6: Table 16, line F.b.
Line 7: Computed from Table 20, from the sum of all items other than water and depreciation.

that in view of the pronounced upward trend in all the variables they are highly correlated[15]. With such high correlations, it is difficult to obtain reliable estimates from the available number of observations.

But even without estimating the production function it is clear that agricultural productivity rose. By this we mean that production increased proportionately more than inputs. As stated, the various inputs did not grow at the same rate. Therefore, in order to compare the growth-rates of production and inputs the latter must be aggregated, with weights assigned according to the contribution of each input to production. But this is exactly what we cannot know without estimating the production function. The weights are therefore here approximated by the share of each input in total expenditure.

Usually the rate of expansion is computed from the actual data. Thus, if there are unsystematic errors in the measurement of inputs or output, this will be reflected in the results[16]. It seems, therefore, more desirable to take into account only the systematic component. This can be done by correlating each of the variables with time and obtaining the systematic rate of growth of each of the variables. The results obtained from such an analysis appear in the last column of Table 21. Thus, the average compounded annual rates of the systematic growth in the period 1952–61 were (in per cent): production, 13.2; value added, 11.8; land, 2.4; water, 8.8; labor force, 3.8; capital (fixed reproducible assets), 9.2; and raw materials, 13.7. Thus, except for raw materials, the rates of growth in both production and value added were considerably higher than in inputs. Only raw materials showed a rate somewhat higher than that observed for production. But, if we take value added, the contribution of raw materials is more or less allowed for[17]. It is therefore possible to obtain a lower limit of the increase in productivity by comparing the rate of growth of production with that of the input which shows the highest rate. In our case it is capital (9.2 per cent). This gives a rate of increase in productivity of 3.7 per cent per year. This, of course, would have been the effect of productivity if all agricultural inputs had increased at the same rate as capital. But since the rate of growth in the other inputs was lower, we have to aggregate them

15 Except in one case, the correlation coefficients are higher than 0.9 and are mostly higher than 0.95.

16 For an application of the conventional method in the study of Israel data see Gaathon, *op. cit.*

17 Strictly speaking, this is not necessarily so, as the contribution of raw materials is not necessarily the same as their value, and therefore subtracting them from production need not eliminate their functional contribution. This, however, is a common procedure in such studies.

as indicated above. Using the shares in expenditure as weights, we find that the systematic increase in all inputs was at the average annual rate of 7.5 per cent. Thus, the increase in production which is unexplained by the increase in inputs is 113.2/107.5 or 5.3 per cent per year. To arrive at a similar measure for value added, somewhat different weights have to be used. If we attribute the whole of the increase in value added as in the first calculation, we get a residual (productivity) rate of increase of 5.7 per cent per year. Of course, not all the increase in value added should be attributed to labor and to capital, which in this case includes only fixed reproducible productive assets. But changing the weights and taking into account the contribution of raw materials would not have greatly affected the results.

From both these calculations we see that productivity accounts for about 40 to 48 per cent of the annual increase in production. This agrees with Gaathon's conclusions for the period 1952–59, although the methods differ somewhat[18]. The limitations of such aggregate measures are clear and are discussed in the literature. The method used here overcomes only some of the difficulties, mainly those associated with unsystematic year-to-year variations in the data. But problems of aggregation still exist, and for this reason it is desirable to refer briefly to whatever information is available on the subject.

In a study of established moshav farms, an average annual rate of increase in productivity of 2.3 per cent was obtained for the period 1954–58[19]. It was, however, argued that the rate of 4 per cent which was observed for the period 1954–56 is more typical for this group. The sample farms, on which the calculations were based, concentrated mainly on the production of dairy and poultry products. Thus, the problem of product aggregation is less serious here. Also, the data used in the study are more detailed and can on the whole be considered more precise than the global data used here. The comparison of such a result with that obtained for agriculture as a whole is subject to reservations but is nevertheless of some value. In view of the extensive settlement program that took place in Israel (reviewed in Section 1) one would expect agriculture as a whole to show a higher rate of increase in productivity than established moshavim. The new farmers

[18] Gaathon's conclusion with respect to agriculture is "that about two fifths to one half of the annual increase in gross output or net product was brought about by the rise in productivity". (Gaathon, *op. cit.*, p. 32).

[19] Mundlak, *op. cit.*, p. 21. The approach used here was to construct an index of productivity for each year in the period covered. This index measures the level of production in a given year, after allowing for the level of inputs used in that year.

were unskilled, and their performance in the first few years was lower than that of veteran farmers operating established farms[20]. It is often stated that the gap in performance between new and veteran farmers closes over time, and therefore the overall increase in agricultural productivity should be higher than that of the established farms.

Another difference may be a result of the introduction of new products, such as industrial crops or beef herds. These products were not produced by the farmers included in the sample of moshavim and are therefore not reflected in their productivity increase. But, the fact that the acreage of these crops expanded rapidly would imply that the agricultural resources brought higher returns from them than was obtained from some of the other crops. It would thus seem reasonable to assume that there was a pronounced increase in production which cannot be accounted for by the increase in conventional inputs.

To shed further light on the question, we turn now to a summary of the results obtained in the studies for some of the individual branches. These, however, do not always coincide with the concept of productivity discussed above. Thus far, we have said that there was an increase in productivity if output increased more than aggregate input. As there were no data on inputs in each branch, with the exception of the dairy branch, we have only a partial view; it is possible to observe only the increase in yields. In the case of crops, this is the increase in average production per unit of land. In the case of dairy cows, it is the increase in production per cow. Without information to the contrary, it is possible to attribute increased yields to a more intensive application of other inputs. It is, however, believed that by and large the total application of other inputs decreased. This does not mean that certain inputs, such as insecticides, did not rise. Nevertheless, when all inputs are considered together, it is believed that their volume declined.

In field crops, Yaron observed the following average (not compounded) increase in yields per dunam (in per cent per year): wheat, 4: barley, 3; unirrigated sorghum, 16; irrigated corn, 11. Sugar beet and cotton yields also rose, but the rates of increase were not calculated. In vegetables, Ben-David reports the lowest yields for 1953; there was a decline until then

[20] For a discussion of the performance of the new farms in the first few years, see H. Halperin and D. Yaron, *Immigrant Moshavim*, Faculty of Agriculture, Rehovot, 1957 (Hebrew). Gaathon obtains little or no increase in productivity for the period 1950–52. Much of the settlement program was implemented in 1948–52. Thus, 1950–52 can be considered as a period in which the experience of a large proportion of farmers ranged from none to, at the most, three years.

and an increase thereafter. The average yield for all vegetables and potatoes in 1960 was 56 per cent higher than in 1953. In potatoes, the increase in the same period was 31 per cent and in tomatoes, 219 per cent. In some of the other vegetables, the aggregate data show no, or a smaller, increase. However, for the branch as a whole the rise was considerable.

Kislev reports an annual compounded rate of increase in milk per cow of 3.8 per cent in 1953–60 for the branch as a whole. In the same period, the rate of increase was 5.5 per cent for registered herds and 6.0 per cent for a sample of kibbutzim. In a sample of established moshavim it was 3.4 per cent in the period 1953–58. The dairy branch is an illustration of an increase in yield associated with a considerable decline in inputs. The introduction of milking machines and milking barns considerably reduced labor input. In the sample of kibbutzim that was taken by Kislev, the number of working days per milking cow per year dropped from 37.3 in 1949 to 18.4 in 1960. In 1949, out of the 13 kibbutzim in the sample, 6 used portable milking machines and 7 used hand milking. In 1960, 12 used milking barns and 1 used portable milking machines.

Using the same measure of productivity as used in the established moshavim study, Kislev obtains for the sample of kibbutzim an annual rate of increase in productivity of 4 per cent for the period 1949–60 and 5.2 to 6.0 per cent for the period 1951–60.

Kislev also reports a small increase in the yield of irrigated forage. In tobacco, the data prepared by Wilsker show no distinct trend.

The data for other branches did not allow any calculation of yields or input savings over time. Nevertheless, the authors suggest that productivity did rise[21]. Whether productivity will in the future rise at the same rate as in the past, and in which branches, it is difficult to say. In fact, it is difficult to point exactly to the sources of increase in productivity. As used here, and in other studies of this subject, productivity is a catchall variable which reflects the changes in production which are not explained by conventional inputs. Thus, various names can be provided for the sources that lie behind this unexplained residual. However, detailed classification has limited value in our case unless it can be substantiated by empirical evidence. As this is not available, there seems to be little point in digressing further on the subject.

6. *Farm Prices — A General View*

In stating above that agricultural production increased rapidly, the implicit yardstick was the rate of expansion of agricultural or total production

[21] See the discussions by Goldenberg on summer fruits and by Hochman on poultry.

in other countries. Thus, the emphasis was on the actual physical growth in production. When such an increase in production is observed, the questions that follow are: (1) how this expansion stood in relation to demand, and (2) what effect it had on the prices of agricultural products in relation to the prices of other products and to the prices of inputs used by the agricultural sector. It is recalled that production in 1961 was 4.9 times that of 1949, whereas the 1961 population was only 2.1 times that of 1949. The corresponding figures when 1961 is compared with 1954 are 2.2 and 1.3. Of course, the population is not the only determinant of demand for agricultural products, and domestic production is not the only component of supply. What these figures suggest is that a considerable increase in consumption and/or a considerable change in the sources of supply of agricultural products should have taken place. More specifically, they suggest that some changes took place in per capita consumption and in the composition of foreign trade in agricultural products.

Before reviewing consumption and foreign trade, we examine a related problem: the effect of increased production on farm prices. The level of farm prices is determined not only by production but rather by total supply (domestic and foreign) and total demand (domestic and foreign). And to make it clear at this point, neither function — supply or demand — has remained constant over time. Thus, the prices to be discussed are determined by various factors in addition to domestic production. Nevertheless, for a variety of reasons it is desirable at this point to discuss the behavior of farm prices. First, the increase in agricultural production was one of the more important factors at work during the period. Second, and in connection with the first, domestic supply is influenced by prices received by farmers for their production and paid by farmers for inputs used. Thus, it will be possible to relate in a general way the increase in production to the terms of trade of this sector. Of course, as the two are not independent, the statement could be reversed. But we will dwell on this aspect in the course of the discussion.

Table 22 shows the implicit indexes of prices received by farmers for various groups of products and for total production. It is seen that prices of agricultural production increased constantly and in 1961 were at almost four times the 1949 level. Since, however, there was a general increase in the price level in the economy, the change in nominal prices does not reflect the change in real prices. To get an indication of the real change, we compare the price index for agricultural production to that for all products, which we measure by the implicit price index of the GNP. The relevant data (based on 1952) appear in Table 24. A comparison of the two price indexes

TABLE 22. *Implicit Price Indexes for Agricultural Production: 1949–61*

(1949 = 100)

	1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
1. Field crops	100	108	171	259	306	373	365	399	394	402	377	373	380
2. Vegetables and potatoes	100	87	114	207	244	274	306	332	351	353	319	311	362
3. Citrus fruit	100	100	103	200	327	525	547	590	673	744	642	634	755
4. Other fruit	100	110	161	289	353	384	518	448	470	488	433	546	509
5. Milk	100	94	106	175	253	281	286	327	340	351	319	325	354
6. Eggs	100	87	87	132	199	234	256	272	331	340	290	298	294
7. Meat (live weight)	100	92	93	166	252	334	379	376	464	428	359	392	386
8. Fish	100	84	92	161	229	231	234	240	281	310	291	295	289
9. Miscellaneous[a]	100	118	163	261	328	356	378	423	448	452	391	354	405
10. TOTAL	100	97	116	206	274	339	354	381	412	419	379	385	397

[a] See Table 5, note b.

SOURCE: Computed from unrounded figures underlying Tables 5 and 6 (current price figures *divided by* 1949 price figures).

TABLE 23. *Purchases by Agriculture from Other Sectors*[a]*: 1952–61*[b]

(*Price indexes: 1955 = 100*)

	1952	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Purchased feeds	47	72	89	100	111	118	124	126	125	126
Water	65	79	91	100	105	130	141	148	154	163
Packing materials	50	72	102	100	106	109	105	104	101	103
Fertilizers	73	84	97	100	101	109	117	118	119	123
Transportation	72	80	92	100	104	112	112	108	107	109
Machine parts	63	77	87	100	119	123	139	139	144	168
Fuel	56	72	85	100	102	124	133	134	154	161
Insecticides	67	85	97	100	104	109	112	113	109	111
Seeds	65	96	99	100	101	107	109	117	114	125
Services[c]	64	81	95	100	101	106	110	113	117	122
Pipes and parts Miscellaneous	79	72	96	100	109	116	124	125	127	127
Depreciation	54	73	92	100	109	114	118	120	123	129

[a] [b] See notes to Table 18.

[c] 1958 and 1959 figures obtained by interpolation between adjacent values.

SOURCE: CBS (unpublished data).

TABLE 24. *Selected Price Indexes: 1950–61*[a]

(*1952 = 100*)

	1950	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
A. *Selected indicators*												
1. Gross national product	57.4	68.1	100.0	127.1	136.4	143.4	156.3	171.9	179.6	185.5	191.1	206.1
2. Agricultural production	47.1	56.3	100.0	133.0	164.6	171.8	185.0	200.0	203.4	184.0	186.9	192.7
3. Raw materials			100.0	128.9	157.8	170.0	182.8	198.5	208.5	210.3	211.4	217.6
4. Gross investment	41.1	55.9	100.0	132.6	154.6	170.5	190.7	202.5	205.7	207.7	216.1	231.3
5. Daily wage rates in agriculture		60.6	100.0	121.8	134.5	140.0	166.2	171.9	177.8	177.8	183.4	212.7
B. *Agricultural production relative to:*												
6. Gross national product (2. ÷ 1.)	82	83	100	105	121	120	118	116	113	99	98	93
7. Raw materials (2. ÷ 3.)			100	103	104	101	101	101	98	87	88	89
8. Gross investment (2. ÷ 4.)	114	101	100	100	106	101	97	99	99	89	86	83
9. Daily wage rates in agriculture (2. ÷ 5.)		93	100	109	122	123	111	116	114	103	102	91

[a] Lines 1 and 4 — calendar years; line 2 — agricultural years; line 3 — 1952–56, calendar, and 1957–61, agricultural; line 5 — October of each year (see also sources).

SOURCE: Line 1: 1950–58: Don Patinkin, *The Israel Economy: The First Decade*, FP, 1960, p. 47.
1959–61: Obtained by applying the percentage change in gross national product prices as reported in Bank of Israel, *Annual Report; 1962*, p. 13, Table II–1.
Line 2: Table 22, line 10.
Line 3: Obtained by dividing the subtotal line of Table 18 by the subtotal line of Table 20. The results were then converted to the 1952 base.
Line 4: Bank of Israel, *Annual Report 1961*, p. 69.
Line 5: *SAI*: 1951–55: *Nos. 7* and *9–12*. 1956–61: *No. 13*, p. 427.
The source gives daily wage rates of permanent workers for October of each year. Since in most cases we deal with agricultural years, the rate for October of one year should be applied for the following year. We have not done this, assuming that the rates were already effective in the preceding year.

indicates that agricultural prices increased faster than all prices until 1954. From 1955, the real price index of agricultural production declined, but it was not until 1959 that nominal prices dropped, thereafter remaining steady in 1960 and rising again in 1961. This means that since 1955 agricultural prices have risen more slowly than has the general price-level.

A more direct indication, though subject to serious limitations, of the terms of trade of agriculture is obtained by comparing the changes in prices received with changes in prices paid for inputs. Table 23 shows the price indexes for various inputs. The implicit price index for all raw materials is given in Table 24. In the same table we also include the price indexes for total investment, not only of agriculture, and an index of the quoted wage rates for agricultural labor. A comparison of the price index of agricultural products with that of raw materials shows a pattern similar to that observed in the comparison with GNP prices. That is, farm prices increased faster than input prices until 1954 and more slowly thereafter, except in 1961. A comparison with the price of investment, which represents here the price of capital goods in the economy as a whole, shows some slight fluctuations around a real price index of 100 for the years 1951–58, with farm prices rising more slowly in 1959–61. The comparison with wage rates of agricultural labor shows again a faster rate of increase in agricultural prices until 1954 and a slower increase thereafter, except in 1957.

These comparisons show that since 1955 agricultural prices have in general risen more slowly than other prices. This can be interpreted as a worsening in the terms of trade of agriculture. However, if any norm is attached to such an interpretation, account should be taken of the position of agriculture at the beginning of the period; 1952–54 was still a period of austerity and thus resulted in a specially favorable position for agriculture. Consequently, the subsequent trend can be considered as a necessary adjustment accompanying the transition from a sellers' market to more normal conditions. That is, it would not be reasonable to expect farm prices to remain at the same level relative to other prices as they were in 1952–54. But even if 1952 is taken as the base for comparison, it is seen that only in 1959–61 were other prices at a somewhat higher level than agricultural prices.

In the foregoing discussion we have followed an interpretation that is often made of movements of various price series. However, this is subject to various reservations related to the measures employed and to the validity of the concepts used. A comprehensive discussion of these would take us beyond the scope of this study, and for this reason we only comment briefly on some of the more important issues.

The relative variations of various prices are represented by index numbers and as such are subject to what may be called economic bias[22]. Whatever is said on the direction of such a bias rests on the assumption that the production function and the resources that determine the transformation curves are held constant. When these change, a more detailed analysis of the nature of the change would be required before any statement on even the direction of the economic bias (see note 22) could be made.

It is therefore impossible to apply this discussion to our period, since it is one marked by major changes in the productivity and volume of resources employed.

Leaving aside the technical index number problem, we should observe that there are other limitations to the use of changes in price indexes as a measure of terms of trade. When productivity increases, farm income may rise in spite of a decline in farm prices and a rise in input prices. In fact, it is easy to construct a model which shows that with no other changes taking place in the economy, an increase in agricultural productivity will lead to lower prices received by farmers, to higher prices paid for inputs, and to higher farm income. Thus, the price movements by themselves shed

22 A true price index of output should show the change in price obtained for a composite output when the bundle of resources available to producers is fixed. That is, given a transformation curve, the price index should show the change in returns to the bundle of resources which determines the transformation curve. But with the Paasche index, the denominator is current production evaluated at base-period prices. Thus, it ignores the fact that with base-period prices the optimum pattern of production differs from the current one, and optimum production represents higher returns than those of the denominator of the price index. As a consequence, the product price index used inflates the improvements in the terms of trade of producers. This applies to both the GNP and the farm price indexes, and therefore the bias (the difference between the 'true' index and the computed one) is in the same direction in both cases. It is not known, however, whether the relative bias is the same in both cases and therefore whether the ratio is biased and, if so, in what direction.

A bias of a similar nature exists also in the price index of inputs. Holding production fixed, inputs can be substituted for each other along the isoquants. If a change in the price index of inputs should represent a change in the terms of trade of producers, it should be a ratio of expenditure on inputs in the current period relative to the base period. In the Paasche index, the denominator is not cost in the base period but rather cost in the current period evaluated at base-period prices and therefore is higher than (or equal to, in the case of fixed input ratios) the optimum for the base period. Hence, the input price index is biased downward when used as an indicator of the terms of trade. It now emerges that a ratio of output price index to input price index inflates the terms of trade, since the numerator is biased upward and the denominator is biased downward. The actual bias is not known.

little light on the movement of farm income. Yet, they do reflect the net effect of the adjustment of the economy to increased production.

Furthermore, even if production is fixed in two periods, a comparison of input and output prices does not reveal the changes in farm income, for the index of input prices indicates the variations in prices of purchased factors of production. But such factors of production account for only part of the total production; the residual represents returns to farmers' own resources and profits. Thus, increasing farm prices and input prices by 1 per cent will leave their ratio unchanged but will increase the nominal value of the residual. Whether this is an improvement in farmers' welfare or not depends on the prices of the commodities purchased with this residual, for, say, private consumption. Thus, there can be a change in real income when production is fixed and the ratio of output to input prices remains unchanged.

This discussion only suggests the limitations involved in measuring farmers' welfare by price indexes without taking into account the other factors involved. By implication, it also suggests that the best way to observe the behavior of farm income over time is to measure it directly. The purpose of this discussion is to warn against misinterpretation of the results here reported. But this holds *a fortiori* for current attempts to use price measures of the terms of trade of the agricultural sector for the purpose of price support policies.

7. *Farm Prices and the Development of the Major Branches*

We turn now to an examination of the price movements in each branch and to a general discussion of the factors affecting prices. As already noted, the prices observed were determined not only by market forces — supply and demand — but were also affected by government intervention. Detailed discussions of the situation in each branch are given in the relevant studies. Therefore, we only attempt to summarize here some of the more important features to which we shall refer later in our analysis. The present discussion is based on some of the findings for demand which are further dealt with in a later section.

The indexes of prices received by farmers, by major branch, are shown in Table 22. Table 25 gives the price indexes for each branch relative to the price index of total agricultural production. It is seen that in general the prices of fruit (citrus and other) rose more than all agricultural prices, whereas the prices of vegetables, milk, eggs, and fish rose less. Meat prices in general increased less at the beginning of the period and somewhat more at the end, whereas the reverse was true of field crops.

TABLE 25. *Relative Prices of Agricultural Production: 1950–61*

(*Price index of total agricultural production = 100*)

	1950	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
1. Field crops	111	147	126	112	110	103	105	96	96	99	97	96
2. Vegetables and potatoes	90	98	100	89	81	86	87	85	84	84	81	91
3. Citrus fruit	103	89	97	119	155	155	155	163	178	169	165	190
4. Other fruit	113	139	140	129	113	146	118	114	116	114	142	128
5. Milk	97	91	85	92	83	81	86	83	84	84	84	89
6. Eggs	90	75	64	73	69	72	71	80	81	77	77	74
7. Meat (live weight)	95	80	81	92	99	107	99	113	102	105	102	97
8. Fish	87	79	78	84	68	66	63	68	74	77	77	73
9. Miscellaneous[a]	122	141	127	120	105	107	111	109	108	103	92	102

[a] See Table 5, note b.

SOURCE: Computed from Table 22 by dividing the implicit price index for each item by the implicit price index for the total.

As indicated earlier, the beginning of the period can be characterized by excess demand for food in general. Excess demand in most products was enforced institutionally, as food rationing and price control were the rule. The easing of price control and rationing began on a small scale in 1952 and was extended around 1954. The extensive settlement program and the policies directed toward fostering production resulted in a considerable expansion, as we have already seen. But the rate of expansion was not uniform in the various branches. In part it was determined by the length of the production period. For example, it takes a few years before fruit production can be expanded. When the lag due to length of production is taken into account, expansion then depends on the prices of the products, of the alternatives, and of factors of production, and also on productivity and certainty conditions. One way to examine the role of prices in the expansion of production is to estimate the supply function. For the reasons discussed in Chapter 3, this could be done only for vegetables and poultry products. However, some general observations can be made from the available data without estimates of the supply functions for all products. In this discussion we disregard factor prices and emphasize mainly product prices and productivity.

To facilitate the discussion, information on some of the essential variables is summarized in Table 26. The period is divided into two parts: 1949–54 and 1954–60. Not only is 1954 roughly the middle year of the period but it also marks the major transition away from price restrictions and other controls.

In the first few years, expansion in production was restricted mainly to branches with short production periods. However, there were additional restrictions. Owing to a foreign exchange shortage, the poultry branch — in which the feed component, purchased abroad, accounts for a large part of total input — was subject to production control. It is seen that the largest expansion in production took place in field crops and vegetables, whose 1954 production indexes (1949 = 100) are 323 and 268, respectively, as compared with 220 for total agricultural production and with a level of about 200 for most other products. At the same time, population grew by 62 per cent. Thus, per capita production, which for most perishable products is about the same as per capita consumption, also rose. Aside from field crops, which at that time were largely intermediate products, the greatest increase in per capita production (65 per cent) was observed in vegetables; this resulted in some decline in (relative) vegetable prices. Only the price indexes of eggs and beef (1949 = 100) were in 1954 below vegetables, but the former were subject to stricter and more comprehensive price controls.

TABLE 26. *Farm Prices, Production, and Related Data: 1949, 1954, and 1960*

	Field crops	*Vege-tables*	*Fruit*		*Milk*	*Eggs*	*Meat*			*All products*
			Citrus	*Other*			*Poultry*	*Beef*	*All meat*	
1. Production cycle	short	short	long	long	inter-mediate	short	short	inter-mediate		
2. Change in productivity	low/in-termediate	inter-mediate	inter-mediate	inter-mediate	high	high	high	high		
3. Income elasticity	[a]	0–0.2	[b]	0.7–0.9	0.5–0.6	0.4–0.7	0.3	1–1.3	0.5–0.8	
4. Price elasticity	very high	high	[b]	high	low	inter-mediate	high	high	high	
5. 1954: Index (1949 = 100)										
a. Price	373	274	525	384	281	234	319	261	334	339
b. Quantity	323	268	185	210	203	171	185	199	190	220
6. 1960: Index (1954 = 100)										
a. Price	100	114	121	142	116	127	80	307	117	113
b. Quantity	154	136	136	211	177	276	491	628	520	199
7. Index of per capita production										
a. 1954 (1949 = 100)		165		130	125	106	114	123	117	136
b. 1960 (1954 = 100)		109		169	142	221	393	502	416	159
8. Subsidies as per cent of production										
a. 1954		5.6			10.1					
b. 1960		8.4			17.3	20.7	2.6	2.0		

[a] Not reported here, as production accounts for only a fraction of domestic consumption.

[b] Not reported here, as production is mainly for export.

SOURCE: Line 2: See section 5. Lines 3 and 4: Range extracted from Table 37.
Lines 5a. and 6a.: Table 22. Lines 5b. and 6b.: Table 7.
Lines 7a. and 7b.: Obtained by dividing the production indexes by the corresponding indexes of population growth, which were: 1954 — 162 (1949 = 100), and 1960 — 125 (1954 = 100).
Lines 8a. and 8b.: Subsidies divided by the value of production (Table 5) of the corresponding branches.

So, too, were some of the other products, but their prices apparently reflected to a greater extent the excess demand then in existence.

By 1954, increased production had already made it necessary to subsidize vegetables and milk in order to maintain their prices at a level above that of the free market. Such subsidies came to 5.6 per cent and 10.1 per cent of the value of vegetable and milk production, respectively. Without the subsidy, the price of vegetables would have declined somewhat (but by less than 5.6 per cent). The situation in milk is somewhat different, as considerable amounts of milk powder were mixed with fresh milk and were used in processing. A decline in prices then — in the absence of subsidies — would not have reflected consumers' demand for fresh milk, as no choice was given between fresh and mixed milk.

From 1949 to 1954 there was a sharp rise in the prices of field crops which, aside from forage, consisted mainly of small grains, whose prices reflected the restrictions on import. For instance, the 1954 price indexes (1949 = 100) for wheat, barley, and corn were 409, 461, and 536, respectively[23]. It should be noted that the expansion in field crop production was to a large extent made possible by the expansion in cultivated area. But this, of course, was done under relatively favorable price conditions.

The further relaxation of price control in 1954 and the increase in feed imports made it possible to adjust production with fewer restrictions to consumers' demand. However, demand did not remain constant; it rose as a result of the increase in real disposable income. Although a more detailed discussion on consumption follows later, we quote in Table 26 the income elasticities as estimated from the consumers' budget survey to give an indication of the relative increase in demand due to the rise in income[24]. It is seen that the income elasticity of vegetables is relatively low and that of fresh beef relatively high, the elasticities of other products falling between the two. We do not show the income elasticities for field crops, as they are not consumed directly, or for citrus, which is mainly an export commodity.

In the period 1955–60 production reflected in part, and more than in the first period, the change in demand which resulted from the change in income. Thus, per capita production of vegetables remained roughly constant, whereas that of beef was more than five times as high. However, producers react, not to consumers' income as such, but to prices. The price of vegetables rose at about the same rate as that of all agricultural

[23] *Report of the Public Committee for the Investigation of the State of Agriculture in Israel*, p. 202. (Hebrew).

[24] For details, see sections 8 and 9 of this Chapter.

products but could be maintained at this level only by raising subsidies. These subsidies were mainly used to purchase surpluses when it was necessary to maintain a predetermined price level.

In the discussion thus far, all meats have been considered together. In order to understand the development in production and prices of meats, Table 26 gives separate data on the two major components, poultry and beef. Production of poultry meat was throughout roughly double the production of beef. This was not much affected by the fact that the rate of expansion in beef production was faster, as the base year production was relatively low. It is interesting to note that the prices of the two meats behave completely differently; the nominal price of poultry dropped, whereas the nominal price of beef rose by far more than did the price of any other product. The decrease in the price of poultry meat reflects the considerable expansion in production and accounts for the rise in consumption. The income elasticity of poultry meat was relatively low, and therefore there was only a moderate change in demand owing to the change in income. But, if we consider the fact that per capita production in 1960 was at the level of 393 (1954 = 100), then it is surprising that prices declined so little. This may be explained by the fact that poultry has a relatively high price elasticity, so that large quantities were consumed with only a moderate decline in price. It probably also reflects high cross elasticities with other meats, so that when the price of poultry meat decreased, there was substitution in favor of poultry consumption. The interesting feature is that producers raised their production in spite of the nominal, and *a fortiori* the real, decline in price. This is explained in terms of the marked increase in productivity. Hochman's study of the production side was restricted to the current situation, and for that reason quantitative estimates of productivity trends could not be obtained. However, it can be said in a general way that, due to the introduction of special table breeds and other advances, the feed-output ratio and mandays per unit of output have declined considerably and made it possible to increase production in spite of the decline in prices.

The development of beef was different. The increase in demand due to income was high. But the additional production was not altogether diverted to expanded consumption, as in later years beef imports were reduced[25]. As Blumenthal shows in his study on meat (see Part II), the composition of beef consumption changed, with domestic production increasing its share. Thus, domestic supply increased less than total production; and,

[25] See Table 38.

with demand constantly increasing, prices rose accordingly. The reduction in imports of the more recent years was made under pressure from producers, who, as the data show, were successful in obtaining a considerable increase in prices which explains the increase in beef production.

After meat, the greatest expansion was in egg production. As seen in Table 7, this expansion began in 1957, and gained impetus in the following year. As pointed out by Hochman, and on the basis of other studies, the trend in production is attributable to the introduction of price-guarantees late in 1957[26]. This program eliminated price uncertainty from egg production, which was in any case rising owing to the relaxation of feed controls. But the growth of demand was not sufficient to absorb all the additional production without a decline in prices. The adjustment in prices that would have been required to absorb the whole increment would probably have been considerable in view of the relatively low or moderate price elasticity. Thus, in order to maintain prices at the guaranteed level, production was diverted from the domestic market into exports[27]. This was done at a loss and required a substantial subsidy, which in 1960 accounted for 20.7 per cent of the total value of egg production. That egg prices were maintained at a relatively high level in spite of the considerable increase in production is due only to this policy.

A stronger demand influence on production is seen for milk. Per capita production in 1960 was 42 per cent over 1954. However, as shown by Blumenthal, consumption of milk and milk products did not rise to the same extent. The bulk of the expanded per capita production was used to replace milk powder in drinking milk and in the production of milk products. The income elasticity of milk and milk products together is moderate, and thus the demand function rose much less than production; price elasticities for milk and most milk products are relatively low, so that if all the additional production had gone into raising consumption, prices would have declined considerably. As it was, to maintain the prices at their 1960 level. required subsidization to the extent of 17.2 per cent of the total value of production. The additional production reflects in part the marked improvement in productivity, as shown by Kislev, and in part the favorable prices for beef which accounts for a large share of the total value of production of the branch.

After beef, the steepest price increase in the period 1954–60 was for fruit other than citrus. Although the prices did not rise at a rate very different from that of certain other products, it should be noted that the

[26] Mundlak, *op. cit.*

[27] See Table 39.

price of non-citrus fruit was already relatively high in 1954. At the same time, per capita production rose by 69 per cent. The income elasticity for fruit was somewhat higher than that of most products, and this, together with the high price elasticities, made it possible to absorb the additional production with no depressing effect on prices. One outcome of the increased production was the spreading of the marketing seasons, so that the extra fruit was not all consumed in the same seasons as in 1954. The favorable prices led to the extension of planted orchard area, the full impact of which has not yet been felt.

The price of citrus remained at a high level, although the relative increase between 1954 and 1960 was only moderate. As citrus is chiefly an export commodity, the price reflects mainly the demand in the European market. From the discussion on the allocation of irrigated area and from Levhari's analysis it is clear that the high prices brought about a considerable expansion in planted area, whose output will be forthcoming in a few years' time.

Production of field crops continued to increase rapidly in the second period, although less so than in the first. In the second period most of the addition came from irrigated land and reflects the introduction of the industrial crops. Prices remained at the 1954 level. As indicated by Yaron, nominal prices of grains even decreased in the later years, whereas those of industrial crops fluctuated with a slight tendency to rise. As the expanded production replaced imports of the products in question, the price level was determined mainly by the international market and by the effective exchange rate in force for these products.

To conclude this Section, it is seen that the major variables affecting supply and demand can be used in a general explanation of the development of agriculture in Israel. It should be emphasized that this discussion is only intended to give a brief view of the more detailed analyses found in the individual commodity studies (see Part II), and not to go into details. The general and broad approach used in our discussion allows us to account for the major past and current developments. However, for making projections much more detailed analyses are needed, and we shall come to these later.

8. *Trends in Food Consumption and Prices*

We begin our review of developments in demand with a discussion on the consumption of food, which accounts for the bulk of agricultural production. It should be noted that we do not here deal with products such as cotton or export products and that not all food products which are here discussed are produced domestically. In order to complete the description

TABLE 27. *Consumption of Food, Beverages, and Tobacco at Current Prices: 1950–61*[a]

(*IL millions*)

	1950	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Total food	*108.2*	*138.4*	*284.6*	*380.6*	*461.6*	*545.2*	*647.8*	*730.5*	*834.1*	*919.6*	*1,013.5*	*1,160.5*
Flour and cereals			38.8	58.2	77.3	96.4	108.9	123.4	128.0	132.8	140.7	156.1
Meat and meat products			29.3	32.0	46.3	79.5	115.9	129.9	154.1	185.0	203.5	241.8
Fish			15.5	19.6	22.1	22.1	22.1	27.4	33.2	38.1	43.0	49.6
Milk and dairy products			31.1	47.1	59.3	64.8	74.3	81.8	96.4	104.7	111.2	124.5
Eggs			19.8	29.4	33.8	39.3	44.6	60.3	68.8	69.6	66.7	63.5
Edible oils			8.2	17.4	16.6	26.1	31.0	44.5	45.1	37.2	44.3	47.2
Fresh fruit			34.2	40.8	46.9	59.1	78.9	84.3	101.7	103.1	138.5	167.6
Fresh vegetables			49.0	56.8	55.7	68.0	81.9	81.5	85.5	91.3	105.0	123.5
Processed fruit and vegetables			8.1	10.9	9.9	9.1	13.9	15.7	21.6	23.2	19.2	26.5
Sugar, jam, and honey			12.6	21.7	28.7	39.6	46.5	49.5	59.5	74.7	76.1	88.7
Tea, coffee, and cocoa			3.1	6.7	6.5	14.3	14.4	14.5	20.2	27.4	33.3	38.0
Miscellaneous			34.9	40.0	58.5	26.9	16.2	17.7	20.0	32.2	32.0	33.5
Beverages	*10.4*	*16.2*	*20.5*	*22.2*	*30.0*	*39.2*	*43.3*	*50.3*	*59.5*	*65.8*	*76.8*	*90.7*
Soft drinks			4.9	5.3	9.0	16.3	16.0	16.6	19.6	21.2	25.0	30.8
Alcoholic drinks			15.6	16.9	21.0	22.9	27.3	33.7	39.9	44.6	51.8	59.9
Tobacco (including cigarettes)	*10.9*	*16.4*	*18.3*	*23.2*	*28.8*	*33.0*	*39.7*	*48.6*	*53.3*	*57.4*	*67.1*	*75.6*
TOTAL FOOD, BEVERAGES AND TOBACCO	**129.5**	**171.0**	**323.4**	**426.0**	**520.4**	**617.4**	**730.8**	**829.4**	**946.9**	**1,042.8**	**1,157.4**	**1,326.8**

[a] Calendar years. Figures may not add owing to rounding.

SOURCE: CBS (unpublished data).

TABLE 28. *Consumption of Food, Beverages, and Tobacco at Constant Prices: 1950–61*[a]

(*Millions of 1955 IL*)

	1950	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Total food	*293.6*	*352.8*	*457.9*	*474.0*	*520.2*	*545.2*	*607.7*	*632.6*	*711.9*	*777.5*	*838.7*	*910.1*
Flour and cereals			88.4	89.0	88.3	96.4	102.6	104.1	107.8	107.4	110.1	115.7
Meat and meat products			37.7	39.2	47.3	79.5	105.9	103.6	138.1	178.9	203.0	225.7
Fish			22.2	19.6	20.3	22.1	19.7	21.5	23.8	26.0	27.8	31.0
Milk and dairy products			44.1	49.6	65.8	64.8	74.2	75.4	81.1	91.2	90.0	94.2
Eggs			30.8	35.8	38.9	39.3	44.3	50.9	59.8	59.8	62.8	67.5
Edible oils			23.3	24.9	19.6	26.1	28.2	33.7	35.4	28.9	34.5	36.4
Fresh fruit			47.0	48.3	56.9	59.1	77.7	84.8	100.1	108.4	136.7	159.9
Fresh vegetables			61.6	65.9	66.9	68.0	72.8	75.8	74.9	69.2	72.5	74.1
Processed fruit and vegetables			9.9	8.6	8.6	9.1	11.4	12.1	14.4	16.0	13.3	15.6
Sugar, jam, and honey			29.1	34.2	33.4	39.6	43.8	42.9	46.0	51.8	51.5	54.5
Tea, coffee, and cocoa			7.4	9.5	8.0	14.3	11.6	11.7	13.2	15.5	19.1	22.1
Miscellaneous			56.4	49.4	66.2	26.9	15.5	16.2	15.8	23.4	22.6	22.5
Beverages	*29.6*	*34.3*	*31.7*	*28.3*	*36.3*	*39.2*	*34.8*	*37.5*	*44.4*	*47.3*	*53.9*	*60.0*
Soft drinks			10.3	8.6	13.2	16.3	13.0	12.1	14.4	15.5	18.6	21.7
Alcoholic drinks			21.4	19.7	23.1	22.9	21.8	25.4	29.9	31.8	35.3	38.3
Tobacco (including cigarettes)	*24.9*	*32.6*	*33.0*	*32.6*	*32.4*	*33.0*	*33.1*	*35.6*	*35.5*	*35.7*	*38.8*	*40.7*
TOTAL FOOD, BEVERAGES AND TOBACCO	**348.1**	**419.7**	**522.6**	**534.9**	**588.9**	**617.4**	**675.6**	**705.7**	**791.8**	**860.5**	**931.4**	**1,010.8**

NOTE and SOURCE: See Table 27.

TABLE 29. *Per Capita Consumption of Food, Beverages, and Tobacco at Constant Prices: 1950–61*[a]

(1955 IL)

	1950	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Total food	*231.8*	*236.1*	*285.1*	*287.2*	*307.9*	*311.5*	*332.4*	*327.7*	*355.9*	*377.0*	*396.2*	*416.0*
Flour and cereals			55.0	53.9	52.3	55.1	56.1	53.9	53.9	52.1	52.0	52.9
Meat and meat products			23.5	23.8	28.0	45.4	57.9	53.7	69.0	86.8	95.9	103.2
Fish			13.8	11.9	12.0	12.6	10.8	11.1	11.9	12.6	13.1	14.2
Milk and dairy products			27.5	30.1	38.9	37.0	40.6	39.1	40.5	44.2	42.5	43.1
Eggs			19.2	21.7	23.0	22.5	24.2	26.4	29.9	29.0	29.7	30.9
Edible oils			14.5	15.1	11.6	14.9	15.4	17.5	17.7	14.0	16.3	16.6
Fresh fruit			29.3	29.3	33.7	33.8	42.5	43.9	50.0	52.6	64.6	73.1
Fresh vegetables			38.4	39.9	39.6	38.8	39.8	39.3	37.4	33.6	34.2	33.9
Processed fruit and vegetables			6.2	5.2	5.1	5.2	6.2	6.3	7.2	7.8	6.3	7.1
Sugar, jam, and honey			18.1	20.7	19.8	22.6	24.0	22.2	23.0	25.1	24.3	24.9
Tea, coffee, and cocoa			4.6	5.8	4.7	8.2	6.3	6.1	6.6	7.5	9.0	10.1
Miscellaneous			35.1	29.9	39.2	15.4	8.5	8.4	7.9	11.3	10.7	10.3
Beverages	*23.4*	*23.0*	*19.7*	*17.1*	*21.5*	*22.4*	*19.0*	*19.4*	*22.2*	*22.9*	*25.5*	*27.4*
Soft drinks			6.4	5.2	7.8	9.3	7.1	6.3	7.2	7.5	8.8	9.9
Alcoholic drinks			13.3	11.9	13.7	13.1	11.9	13.2	14.9	15.4	16.6	17.6
Tobacco (including cigarettes)	*19.7*	*21.8*	*20.5*	*19.8*	*19.2*	*18.9*	*18.1*	*18.4*	*17.7*	*17.3*	*18.3*	*18.6*
TOTAL FOOD, BEVERAGES AND TOBACCO	**274.8**	**280.9**	**325.4**	**324.1**	**348.6**	**352.7**	**369.5**	**365.6**	**395.9**	**417.3**	**440.0**	**462.0**

[a] See Table 27.

SOURCE: Table 28 *divided by* average population.

TABLE 30. *Per Capita Consumption of Food, Beverages, and Tobacco at 1955 Prices: 1950–61*[a]

(Index: 1954 = 100)

	1950	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Total food	75	77	93	93	100	101	108	106	116	122	129	135
Flour and cereals			105	103	100	105	107	103	103	100	99	101
Meat and meat products			84	85	100	162	207	192	246	310	342	369
Fish			115	99	100	105	90	92	99	105	109	118
Milk and dairy products			71	77	100	95	104	101	104	114	109	111
Eggs			83	94	100	98	105	115	130	126	129	134
Edible oils			125	130	100	128	133	151	153	121	141	143
Fresh fruit			87	87	100	100	126	130	148	156	192	217
Fresh vegetables			97	101	100	98	101	99	94	85	86	86
Processed fruit and vegetables			122	102	100	102	122	124	141	153	124	139
Sugar, jam, and honey			91	105	100	114	121	112	116	127	123	126
Tea, coffee and cocoa			98	123	100	174	134	130	140	160	191	215
Miscellaneous			90	76	100	39	22	21	20	29	27	26
Beverages	109	107	92	80	100	104	88	90	103	107	119	127
Soft drinks			82	67	100	119	91	81	92	96	113	127
Alcoholic drinks			97	87	100	96	87	96	109	112	121	128
Tobacco (including cigarettes)	103	114	107	103	100	98	94	96	92	90	95	97
TOTAL FOOD, BEVERAGES AND TOBACCO	79	81	93	93	100	101	106	105	114	120	126	133

[a] Calendar years.

SOURCE: Table 29.

of the disposition of agricultural production, on the one hand, and on the sources of food products, on the other hand, it will later on be necessary to deal with the role of agriculture in foreign trade.

The data on food consumption by major commodities appear in Table 27, at current retail prices, and in Table 28 at 1955 retail prices[28]. From these two tables, the implicit price indexes for each group were computed, and they are presented in Table 31.

The consumption of all items rose, a reflection of changes in prices, population, and per capita consumption. Since we are here mainly interested in quantity consumed per capita, we turn to Tables 29 and 30. Table 29 gives per capita expenditure at 1955 retail prices, and Table 30 expresses the same data as a quantity index. In assessing the data, it should be recalled that in the first few years price control and food rationing were the rule for most products and that these were relaxed gradually from 1952 on but mainly after 1954.

Per capita consumption of food (at 1955 prices) rose from IL 231.8 in 1950 to IL 416.0 in 1961, or by about 80 per cent. The increase was not steady over the years; there was a considerable rise in 1952, a more moderate one in 1954 and 1956, and only from 1958 did the rise become somewhat steadier, with an average annual rate of 6.2 per cent. The major determinants of per capita food consumption are disposable income and food prices, and the data appear in Table 32. In Figure 2 per capita consumption is plotted against real per capita disposable income. There is a close relationship between the two variables; that is, income explains most of the increase in food consumption. It is interesting to note that during the period there were only minor changes in the real price of food. The real price of food is measured here in two ways: first, by the implicit index which appears in Table 31, and second, by the index of the food component of the consumer price index, each deflated by the Consumer Price Index. The two indexes differ somewhat in coverage of both consumers and commodities. The first represents the consumption of the whole population and of all food commodities. The second represents a given basket of food consumed by urban wage earners. The differences are small, and both indexes show that real food prices were relatively stable.

In order to quantify the effects of income and prices on total food consumption, a demand function was estimated for the period 1952–61. Whether, in view of the rationing, the first two or three years should have been in-

[28] The data in Tables 27 and 28 are revised and were obtained from the Central Bureau of Statistics in June, 1962. In some of the individual reports, earlier data were used, so that there may be discrepancies.

TABLE 31. *Consumption of Food, Beverages, and Tobacco — Implicit Price Indexes: 1950–61*[a]

(*1955 = 100*)

	1950	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Total food	36.9	39.2	62.2	80.3	88.7	100.0	106.6	115.5	117.2	118.3	120.8	127.5
Flour and cereals			43.9	65.4	87.5	100.0	106.1	118.5	118.7	123.6	127.8	134.9
Meat and meat products			77.7	81.6	97.9	100.0	109.4	125.4	111.6	103.4	100.2	107.1
Fish			69.8	100.0	108.9	100.0	112.2	127.4	139.5	146.5	154.7	160.0
Milk and dairy products			70.5	95.0	90.1	100.0	100.1	108.5	118.9	114.8	123.6	132.2
Eggs			64.3	82.1	86.9	100.0	100.7	118.5	115.1	116.4	106.2	94.1
Edible oils			35.2	69.9	84.7	100.0	109.9	132.0	127.4	128.7	128.4	129.7
Fresh fruit			72.8	84.5	82.4	100.0	101.5	99.4	101.6	95.1	101.3	104.8
Fresh vegetables			79.5	86.2	83.3	100.0	112.5	107.5	114.2	131.9	144.8	166.7
Processed fruit and vegetables			81.8	126.7	115.1	100.0	121.9	129.8	150.0	145.0	144.4	169.9
Sugar, jam, and honey			43.3	63.5	85.9	100.0	106.2	115.4	129.3	144.2	147.8	162.8
Tea, coffee, and cocoa			41.9	70.5	81.2	100.0	124.1	123.9	153.0	176.8	174.3	171.9
Miscellaneous			61.9	81.0	88.4	100.0	104.5	109.3	126.6	137.6	141.6	148.9
Beverages	35.1	47.2	64.7	78.4	82.6	100.0	124.4	134.1	134.0	139.1	142.5	151.2
Soft drinks			47.6	61.6	68.2	100.0	123.1	137.2	136.1	136.8	134.4	141.9
Alcoholic drinks			72.9	85.8	90.9	100.0	125.2	132.7	133.4	140.3	146.7	156.4
Tobacco (including cigarettes)	43.8	50.3	55.5	71.2	88.9	100.0	119.9	136.5	150.1	160.8	172.9	185.7
TOTAL FOOD, BEVERAGES AND TOBACCO	37.2	40.7	61.9	79.6	88.4	100.0	108.2	117.5	119.6	121.2	124.3	131.3

[a] Calendar years.

SOURCE: Table 27 *divided by* Table 28.

TABLE 32. *Disposable Income, Consumption of Food, and Consumer Prices: 1952–61*[a]

(IL and Index: 1955 = 100)

	1952	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
1. Per capita disposable income										
a. Current IL	497	650	836	928	1,057	1,202	1,341	1,482	1,615	1,840
b. 1955 IL (1a÷3)	756	773	886	928	993	1,061	1,144	1,246	1,328	1,419
c. Quantity index (1b)	81.5	83.3	95.5	100.0	107.0	114.3	123.3	134.3	143.1	152.9
2. Per capita consumption of food — quantity index	92	92	99	100	107	105	114	121	127	134
3. Consumers' Price Index	65.7	84.1	94.4	100.0	106.4	113.3	117.2	118.9	121.6	129.7
4. Real price of food										
a. Implicit index for food consumption	94.7	95.5	94.0	100.0	100.2	101.9	100.0	99.5	99.3	98.3
b. Food component of Consumers' Price Index	96.3	101.2	102.3	100.0	100.9	99.2	98.5	97.1	94.1	91.8

[a] Calendar years.

SOURCE: Line 1a: 1952–54: Daniel Creamer, *Israel's National Income 1950–1954*, FP, p. 20.
1958–61: Bank of Israel, *Annual Report 1961*, p. 23.
1955–57: Bank of Israel, *Annual Report 1958*, p. 4.
The annual changes in this source were used to extrapolate backwards from the 1958 figure. The resulting series was divided by mean population.

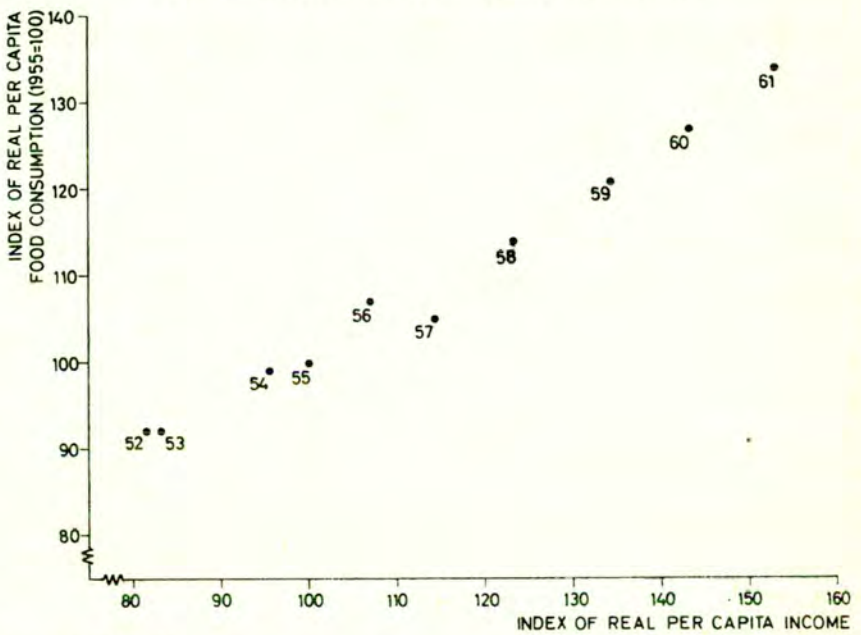
Line 2: From Table 29, Total food line.

Line 3: *SAI, No. 13*, p. 368, converted to the 1955 base.

Line 4: Food price index variants, each *divided by* total Consumer's Price Index (line 3):
a. Implicit index of food consumption, Table 31, Total food line.
b. Food component of Consumers' Price Index —
1952–58: *SAI, No. 10*, p. 285 (September 1951 = 100).
1959–61: *SAI, No. 13*, p. 369 (January 1959 = 100).
The two series were linked on January 1959 (obtained on September 1951 base from *SBI, Part B*, March 1959), and converted to the base 1955 = 100.

cluded is a moot point. We have decided to include them for two reasons: first, it is apparent from the figure that there is no deviation from the pattern observed in the later period; second, we deal with all food, not with single commodities. When rationing is not comprehensive, there is likely to be substitution in favor of the unrationed commodities.

FIGURE 2. *Disposable Income and Consumption*



SOURCE: Table 32.

This affects the composition of the basket and only to a smaller extent the total expenditure on food, and perhaps accounts for the fact that the observations in the first few years do not deviate from the overall pattern.

Since for most products the prices were predetermined, the appropriate procedure is to use quantity as the dependent variable and income and prices as independent variables. The variables used are:

Q: Per capita consumption in 1955 prices (Table 29, line A).

Y: Per capita disposable real income (in 1955 prices Table 32, line 1b).

P: Index of real retail prices of food (Table 32, line 4a).

The regression was calculated in logarithmic form so that the regression coefficients are the demand elasticities[29]. The results are as follows:

[29] The form of demand equation is $Q = A_0 \, Y^{A_1} \, P^{A_2}$, where A_0 is the constant term and A_1 and A_2 are the income and price elasticities, respectively.

Demand for Food: 1952–61 Elasticities and Auxiliary Coefficients[a]

Equation	Elasticities		R^2	Constant term
	Income	Price		
(1)	0.596		0.978	5.221
	(18.7)			
(2)	0.643	–0.625	0.989	68.300
	(21.5)	(2.645)		

[a] Values in parentheses are *t*-ratios.

In equation (1) the only explanatory variable of the change in consumption is income, whereas in (2) food prices are also included. It is interesting to note that in spite of the large degree of explanation due to income (as indicated by $R^2 = 0.978$ in the first equation), the price variable, which shows little variation by itself, improves the explanation. Also, the value of the price coefficient is plausible, with a small standard error in spite of the small number of observations (as indicated by the *t*-ratio). The introduction of a time trend into either of the two equations had no effect on the regression coefficients of income and prices, and the trend itself was highly insignificant.

We can conclude that the variations in per capita consumption of food in the years 1952–61 are explained by changes in income and prices. A 1 per cent increase in income was associated, on the average, with a 0.643 per cent increase in consumption, whereas a 1 per cent increase in the price of food, relative to all consumer prices, decreased the consumption of food by 0.625 per cent.

While there was an overall increase in per capita total food consumption and the prices of all food items were relatively stable, the trends in both variables differed for the various foods. Table 30 shows that flour and cereals remained more or less stable, with a slight decline since 1957. This was accompanied by a marked price-rise, relative to prices of all foods, up to 1954; relative stability in 1954–58; and a slight increase thereafter (Table 33). Per capita consumption of vegetables and potatoes was also fairly steady until 1957, with a moderate decline thereafter. The decline in consumption in the last four years is associated with rising prices, especially in the last three. The developments of the last three years probably reflect the production controls and disposal of so-called surpluses aimed at increasing returns to farmers. But Table 22 shows that farm vegetable

TABLE 33. *Relative Prices of Selected Food Items: 1952–61*[a]

(*Price index of total food = 100*)

	1952	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*
Flour and cereals	70.6	81.4	98.6	100.0	99.5	102.6	101.3	104.5	105.8	105.8
Meat and meat products	124.9	101.6	110.4	100.0	102.6	108.6	95.2	87.4	82.9	84.0
Fish	112.2	124.5	122.8	100.0	105.3	110.3	119.0	123.8	128.1	125.5
Milk and dairy products	113.3	118.3	110.6	100.0	93.9	93.9	101.5	97.0	102.3	103.7
Eggs	103.4	102.2	98.0	100.0	94.5	102.6	98.2	98.4	87.9	73.8
Edible oils	56.6	87.0	95.5	100.0	103.1	114.3	108.7	108.8	106.3	101.7
Fresh fruit	117.0	105.2	92.9	100.0	95.2	86.1	86.7	80.4	83.9	82.2
Fresh vegetables	127.8	107.3	93.9	100.0	105.5	93.1	97.4	111.5	119.9	130.7
Processed fruit and vegetables	131.5	157.8	129.8	100.0	114.4	112.4	128.0	122.6	119.5	133.3
Sugar, jam, and honey	69.6	79.1	96.8	100.0	99.6	99.9	110.3	121.9	122.4	127.7
Tea, coffee and cocoa	67.4	87.8	91.5	100.0	116.4	107.3	130.5	149.5	144.3	134.8
Miscellaneous	99.5	100.9	99.7	100.0	98.0	94.6	108.0	116.3	117.2	116.8

[a] Calendar years.

SOURCE: Table 31. Price index for each item *divided by* price index for total food.

prices in 1958 were about the same as in 1957; they declined by 10 per cent in 1959 and further in 1960. Thus, it is very likely that the main contribution of the price support program in vegetables was to raise the share of the consumer's price absorbed by the marketing agencies and at the same time to reduce consumption.

No distinct trend is observed in fish consumption, which fluctuated more than vegetables or cereals.

The main increase in the consumption of milk products took place in 1954, and it probably reflects, in part, the elimination of cheese and butter rationing, and in part, the favorable prices in that year. Another, much more moderate, increase occurred in 1959.

The consumption of edible oils was for some reason at a low level in 1954 but by 1957–61 had risen to a somewhat higher level As Blumenthal pointed out, some of the variations in the consumption of edible oils are explained by variations in the available supply of imported butter, which was sold at a relatively low price and was substituted for margarine.

The consumption of other foods dealt with in this study rose considerably. The 1961 consumption of eggs was 34 per cent above 1954, and their prices tended to decline, especially in the years 1960 and 1961. A similar increase is observed in the consumption of processed fruits and vegetables in spite of a rise in their prices.

A marked increase in consumption is observed in fresh fruits, the per capita consumption of which more than doubled in the period 1954–61. This was associated with a decline in their relative prices. The steepest increase is in the per capita consumption of meat which in 1961 was 3.7 times the 1954 figure. The relative price of all meat dropped over the period, a reflection mainly of the decline in the price of poultry meat. The price of beef rose considerably in 1955–57, as the composition of supply changed toward a larger proportion of fresh beef, mainly domestically produced, and a lower proportion of imported frozen beef.

Other food products and beverages, which are not dealt with in our study, also rose considerably during the period. The increase was moderate for sugar products and beverages, and very marked in tea, coffee, and cocoa. The supply of these products was rationed for most of the period, but in 1956 controls were relaxed and consumers could buy amounts in excess of the ration at considerably higher prices. The increase in retail prices does not therefore reflect the marginal price that consumers had to pay for additional quantities.

As tobacco is part of our study, it is discussed here. It is seen that there was a declining trend in consumption until 1959, which was reversed only

in 1960. As Wilsker has pointed out, the trends in consumption reflect to a great extent changes in the relative prices of the various kinds of cigarettes. The nature of this effect will become clear in the course of our discussion of the limitations of the data reviewed.

The purpose of this review of consumption patterns is to present in a general way the trends in the various food groups. For this reason we have dealt only with aggregated commodities. But this can be done only at some sacrifice in precision, and the conclusions reached are subject to reservations. The main problem is that the quantity index reflects not only physical quantities but also changes in the quality of the basket consumed. Likewise, the price index reflects not only changes in the prices of the component items but also the change in the composition of the basket. This problem was encountered in some of the individual studies. We shall therefore comment briefly here on the nature of the problem so that the discussion in this section can be viewed in the right perspective.

The index of per capita consumption which was interpreted as a quantity index, is a Laspeyre index, weighted by 1955 prices. This can be written as:

$$Q_L = \frac{\Sigma P_o X_t}{\Sigma P_o X_o}.$$

In order to demonstrate the nature of the problems involved, let us now assume that (1) there are only two commodities in the group and that they are measured in the same physical units; (2) in the base period the price of the first commodity is double the price of the second; (3) the same quantity of each is consumed in the first period, and in the second period none of the first commodity is consumed while the amount of the second is doubled. In this instance, there is no change in physical consumption, but the quantity index will decline owing to the shift to the cheaper product. This, in fact, occurred with cigarettes in some years; the number of cigarettes consumed remained unchanged, but the quantity index shows a decline owing to a change in their composition.

What induced the shift in consumption? There is no single answer to this question. In some years and for some commodities the shift reflects a change in supply. For instance, in fruit the composition of supply in a given year was determined by the production of the different fruits, and if consumption equals production the shift does not reflect response to relative prices but is entirely exogenous from the consumer's point of view. This is also reflected in the price index. The index used in our discussion here is a Paasche index, that is:

$$P_P = \frac{\Sigma P_t X_t}{\Sigma P_o X_t}.$$

Thus, in terms of our example, if there is no supply of the first commodity in the second period, it will not appear in the numerator. The price of the second commodity will probably be lower in the second period than its price in the first. Since the price of the second commodity was already lower than that of the first in the base period, then the final outcome will be a decline in the price index. Thus, we see from this example that it is possible to have a situation where the quantity index will show a decline in quantity consumed and the price index will show a decline in prices, a situation which leads to erroneous conclusions about the slope of the demand curve.

The supply does not always determine the composition of a particular composite good. For instance, the composition of cigarettes was determined only by the consumers. This, however, does not necessarily affect the movement of the price and quantity indexes used. Increasing the price differentials among various kinds may lead to substitution of cheaper for more expensive kinds, which will be reflected by a decline in both the price and quantity indexes. To overcome this problem in the empirical analysis, a quality index was used to account for change in composition[30].

It may be argued that the main concern should be to measure expenditure rather than physical quantities and that for this reason some of the problems mentioned above disappear. The validity of this argument depends on the use made of the findings. We are mainly concerned here in assessing the demand for agricultural products. In this case, the argument will only be valid when the more expensive components of the composite good require more resources in the agricultural sector for their production than do the less expensive ones. Since the income elasticities for, let us say, higher grades are greater than for lower grades, and since the production of higher grades draws more on resources, then a shift to higher grades due to income is measured correctly by the quantity index, which is actually an index of expenditure. Although this argument holds true in some cases, it is not complete in coverage as far as our study is concerned. Some of the additional resources required are drawn not from agriculture but rather from the marketing stage, or industry, or imports. Thus, it is still desirable to view the data presented in the tables above with some reservation.

It is clear that this qualification, though valid on its own merits, may

[30] See Blumenthal, *Milk*, Appendix D.

put in question whatever conclusions have been drawn. This, however, is not so serious in our case, for two reasons. First, we now supplement the information presented above with more detailed data on the more important commodities for our study. This will allow us a better insight into the nature of the changes that took place. Second, the empirical demand analyses were mostly conducted at a much lower level of aggregation, and the evidence gained there will make it possible to give less ambiguous conclusions, at least from the point of view of the problems raised above. When the demand analyses were done on aggregated products, the change in composition was accounted for. It is the empirical analyses that we finally draw on in our forecasts, so that potential biases due to aggregation are minimized.

Table 34 presents data on per capita consumption for some of the items which are more important for our study. A comparison of the relative variations in quantities consumed with the variations in expenditure will reveal the importance of the change in composition of the commodities in question.

It is seen that the quantity of flour and cereals declined much more than expenditure (evaluated at fixed prices) on those items in the years 1956–60. This indicates a shift toward higher priced products, which is also reflected in the increase in the price index for this group (Table 31). The nature of the change is discussed in detail by Blumenthal. From his discussion it appears that, by and large, the additional resources required for the production of the higher priced products do not come from agriculture but rather from the food industry.

The trends in the quantity consumed of, and expenditure on, meats are somewhat similar, except for 1959 and 1960, when expenditure rose more than quantity consumed. It is in these two years that the consumption of fresh beef, which is the higher priced component of the group, jumped considerably. Poultry was the major component of meat in recent years. It rose faster than fresh beef, except in 1959 and 1960, and the decline of poultry prices contributed to maintaining the price index for all meats at a moderate level.

The quantity of fish consumed declined until 1956 and remained at a level of 10.2–10.8 kilograms thereafter. The higher consumption of the earlier years reflects the limited supply of meat. At the same time, the supply of fish, frozen and fresh, was relatively greater, both in the rationed and in the unrationed markets. The increase in prices of the later years reflects the shift into higher priced fish, mainly pond fish, at the expense of imported fish.

The changes in the consumption of milk products are discussed in great

TABLE 34. *Per Capita Consumption of Selected Food Items: 1952–60*[a]

	1952	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*
A. Kilograms									
Flour and cereals	168.7	166.3	165.8	169.1	161.2	151.8	149.9	146.9	138.0
Meat and meat products	9.3	8.6	9.5	16.2	20.8	18.2	23.3	26.1	27.8
Beef	*0.8*	*0.9*	*1.3*	*1.4*	*1.8*	*1.9*	*2.1*	*4.0*	*4.9*
Poultry	*4.7*	*4.6*	*5.7*	*8.4*	*10.2*	*9.2*	*13.9*	*15.1*	*17.0*
Other meat and meat products	*3.8*	*3.1*	*2.5*	*6.4*	*8.8*	*7.1*	*7.3*	*7.0*	*5.9*
Fish	15.3	14.4	11.9	12.3	10.4	10.2	10.8	10.3	10.4
All fresh fruit[b]	101.8	101.8	95.0	97.0	113.7	115.4	117.6	122.4	123.0
Deciduous fruit	*4.3*	*3.5*	*6.5*	*4.1*	*6.3*	*8.8*	*9.4*	*13.4*	*16.2*
Potatoes	36.9	37.5	40.4	45.5	46.2	43.3	41.9	34.6	35.9
Other fresh vegetables	109.3	114.4	111.9	109.9	111.9	110.9	109.2	100.0	100.8
Drinking milk[c]	82.4	84.7	95.6	85.4	83.0	85.0	81.6	77.6	78.0
B. Index (1954 = 100)									
Flour and cereals	102	100	100	102	97	92	90	89	83
Meat and meat products	98	91	100	171	219	192	245	275	293
Beef	62	69	100	108	138	146	162	308	377
Poultry	82	81	100	147	179	161	244	265	298
Other meat and meat products	152	124	100	256	352	284	292	280	236
Fish	129	121	100	103	87	86	91	87	87
All fresh fruit[b]	107	107	100	102	120	121	124	129	129
Deciduous fruit	66	54	100	63	97	135	145	206	249
Potatoes	91	93	100	113	114	107	104	86	89
Other vegetables	98	102	100	98	100	99	98	89	90
Drinking milk	86	89	100	89	87	89	85	81	82

[a] Calendar years. [b] Including melons. [c] Liters.

SOURCE: CBS (unpublished data).

detail by Blumenthal, and we only mention some of the more important points. It is seen that per capita consumption of drinking milk was at its peak in 1954 and declined thereafter, so that in 1960 per capita consumption was 18 per cent below 1954[31]. During the same period there were considerable changes in the consumption of milk products[32]: a decline in consumption of imported hard cheeses and butter which were relatively inexpensive, and an increase in the consumption of domestically produced hard cheeses and butter which were relatively expensive. The consumption of 'other dairy products' also increased during the period, while that of soft cheeses declined slightly. This change in composition accounts for the increase in the price index of all milk and milk products from 90 (1955 = 100) in 1954 to 123.6 in 1960 (Table 31). At the same time, the real price of each of the component products declined. In this case, the increase in expenditure reflects more truly the demand for milk from the point of view of agricultural production, as the higher priced products contain more milk.

Eggs are a relatively homogeneous product, and therefore the figures in Tables 29 and 30 reflect the change in actual quantities consumed.

The figures on quantity consumed of fresh fruit show a much smaller increase than those of expenditure. A major change that took place during the period was the high relative increase in consumption of deciduous fruits; these are the more expensive component of the fruit basket. This accounts, to a large extent, for the increase in expenditure. It is not reflected in the price index for all fruits, as the prices of most fruits declined somewhat and this decline compensated for the change in composition.

Per capita consumption of vegetables and potatoes declined slightly less than expenditure, and this decline again is accounted for by the change in composition.

The foregoing discussion indicated that, with the exception of flour and cereals and fresh fruits, the trend in expenditures does not deviate markedly from that in quantity consumed. Small or moderate deviations exist in most cases, and they are accounted for by changes in composition. The shift into higher priced products in some cases reflects greater demand for agricultural resources (as in milk and perhaps in meat) and in some cases higher demand for resources outside agriculture (as in flour and cereals, and very likely in vegetables). This conclusion gives only a general indication, as in most cases the demand for marketing services increases

31 In this connection it should be pointed out that the per capita figures given by Blumenthal are only for organized marketing, and therefore differ from the figures presented above.

32 See the discussion by Blumenthal.

TABLE 35. *Selected Results from Family Expenditure Surveys: 1956/57 and 1959/60*

	Per capita consumption				*Implicit price*			*Per cent change from 1956/57 to 1959/60*			
					1956/57	*1959/60*					
								Deflated price	*Quantity*	*Expenditure*	
	1956/57	*1959/60*	*1956/57*	*1959/60*		*Current*	*Deflated*			*Current prices*	*Deflated*
					(3) ÷ (1)	(4) ÷ (2)	(6) × 0.9046[a]	$\frac{(7)}{(5)} - 100$	$\frac{(2)}{(1)} - 100$	$\frac{(4)}{(3)} - 100$	(10) × 0.9046
	Kilograms		*IL*		*IL per kilogram*			*Per cent*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Flour, bread, and cereals	141.0	130.4	50.2	55.6	0.36	0.43	0.39	8	–8	11	0
Meat and meat products	23.5	32.9	82.5	108.6	3.51	3.30	2.99	–15	40	32	19
Poultry	*15.4*	*22.7*	*43.1*	*56.5*	2.80	2.49	2.55	–20	47	31	18
Other	*8.1*	*10.2*	*39.4*	*52.1*	4.86	5.11	4.62	–5	26	32	19
Fish	10.6	10.5	15.7	20.2	1.48	1.92	1.74	18	–1	29	17
Milk and milk products			40.0	50.2						26	14
Milk	*75.1*	*61.1*	*20.6*	*24.6*	0.27	0.40	0.36	33	–19	19	8
Butter	*2.6*	*1.9*	*4.6*	*5.4*	1.77	2.84	2.57	45	–27	17	6
Cheese	*7.3*	*6.2*	*7.7*	*11.7*	1.05	1.89	1.71	63	–15	52	37
Other	*12.1*	*9.2*	*7.1*	*8.5*	0.59	0.92	0.83	41	–24	20	8
Eggs	320[b]	347[b]	31.4	36.6	0.098[c]	0.105[c]	0.095[c]	–3	8	17	6
Edible oils			14.1	16.1						14	3
Oil	*6.6*	*7.7*	*8.3*	*8.8*	1.26	1.14	1.03	–18	17	6	–4
Margarine	*5.1*	*3.3*	*5.2*	*6.0*	1.02	1.82	1.65	62	–35	15	4
Other			*0.6*	*1.3*						117	96
Fresh fruit	94.8	98.5	34.8	50.2	0.37	0.51	0.46	24	4	44	30
Citrus	*37.7*	*42.2*	*8.3*	*12.6*	0.22	0.30	0.27	23	12	52	37
Melons	*28.2*	*19.8*	*5.2*	*4.1*	0.18	0.21	0.19	6	–30	–21	–29
Other	*28.9*	*36.5*	*21.3*	*33.5*	0.74	0.92	0.83	12	26	57	42

Fresh vegetables and potatoes	128.5	106.6	37.2	41.4	0.29	0.39	0.35	21	−17	11	0
Potatoes and sweet potatoes	*38.1*	*28.2*	*7.7*	*7.6*	0.20	0.27	0.24	20	−26	−1	−10
Fresh vegetables	*90.4*	*78.4*	*29.5*	*33.8*	0.33	0.43	0.39	18	−13	15	4
Processed fruit and vegetables			8.0	12.0						50	36
Sugar, jam, honey, and sweets			17.2	24.6						43	29
Tea, coffee, and cocoa			7.7	13.0						69	53
Miscellaneous[d]			23.1	34.8						51	37
Subtotal food			**361.9**	**463.3**						28	16
Beverages			12.0	17.0						42	28
Soft			*2.5*	*4.1*						64	48
Alcoholic			*9.5*	*12.9*						36	23
Subtotal food and beverages			**373.9**	**480.3**						28	16
Tobacco and cigarettes			16.6	21.5						30	18
TOTAL FOOD, BEVERAGES, AND TOBACCO			**390.5**	**501.8**						29	17
TOTAL EXPENDITURES[e]			**1,029.6**	**1,408.5**						37	24

[a] Deflation by general Consumers' Price Index as follows: $\frac{\textit{Average May 1956—April 1957}}{\textit{Average October 1959—September 1960}} = 0.9046.$

[b] Units.

[c] IL per egg.

[d] Includes pulses and nuts.

[e] Includes some non-consumption expenditure (11.5 per cent of total in both Surveys).

SOURCE: CBS, *Family Expenditure Survey (1959/60)*, Special Series No. 123, March 1962 (Hebrew): Food and beverages — p. 7, Table 5; tobacco and cigarettes — p. 15, Table 6; and total expenditures — p. 5, Table 3.
The Surveys cover all cities with a population of over 10,000 at the time of the Survey. The population sampled included all urban families, but the results published in the source cover only families of Jewish employees.
Periods covered: May 1956 to April 1957 and October 1959 to September 1960.
Size of sample: 1956/57 — 6,614 families; 1959/60 — 1,112 families.
Average size of family: 1956/57 — 3.9; 1959/60 — 3.8. In the source the data are shown in terms of average per family per month and are here converted to average per capita per annum.

over time. If more services are associated with, or lead to, higher priced products, then not all of the change in composition will be reflected in the demand for agricultural resources.

Another source of information on consumption, which has not yet been utilized in our discussion, is the data obtained from the family budget surveys. We turn now to a brief examination of these data. This is done for two reasons. First, in view of the importance of the consumption data it is desirable to consider all available independent sources. Second, the survey data were used for deriving income elasticities which are used in our projections, and it is therefore desirable to indicate how they compare with the corresponding measures derived from the time series data.

The comparison is subject to at least one serious limitation, that of coverage. The family budget data were taken from the population of urban wage earners, whereas the time series data cover the total population. Thus, some differences may be due to this factor. Other possible sources of divergence will be mentioned below. The data for the family budget surveys of 1956/57 and 1959/60 are summarized in Table 35[33]. Before examining the survey data, it is desirable to explore the coverage of the two sources. The total per capita expenditure in the 1956/57 survey was IL 1,029.6. This was deflated by the consumer price index, based on 1955[34], giving IL 945.4 (1955 IL). The per capita real disposable income in the population as a whole for the same period is IL 1,015.4[35]. Thus, the expenditure in the 1956/57 survey is 93.1 per cent of real disposable income. Even if the coverage were identical, the two values should not be the same, the difference being saving. The ratio between private consumption and disposable income in 1958 was 94.7 per cent and 93.3 per cent in 1959[36]. Thus we see that from the point of view of average income in 1956/57 the two populations are similar.

The real per capita expenditure in the 1959/60 survey was 24 per cent above that in the 1956/57 survey. In the same period average real disposable

33 It should be noted that the survey data are reported in the sources as preliminary.

34 Since the survey was conducted in the months May, 1956 to April, 1957, the average index for these twelve months was calculated and divided by the 1955 index, to give 108.9 (1955 = 100).

35 This was obtained by averaging the 1956 and 1957 values from Table 32, line 2, using weights of 0.67 and 0.33 respectively, to adjust to the Survey period of May 1956 to April 1957.

36 Based on data in Bank of Israel, *Annual Report: 1961*, p. 23. It is likely that the ratio was somewhat higher in 1956/57, but not to the extent that our conclusions will be seriously affected.

income rose by 29 per cent[37]. Taking into account that personal saving may have risen between the two dates, the difference is not excessive. It can then be concluded that from the point of view of average income the family budget survey is also representative of the population in the second period.

The surveys cover only part of the population: urban wage earners. This group is likely to be more homogeneous as regards income distribution than the population as a whole. Therefore we should not expect per capita consumption to be exactly the same as in the time series data[38]. Since in most foods the marginal consumption with respect to income decreases as income increases, a wider spread in incomes, average income remaining the same, would tend to lower per capita consumption. On this ground alone we should expect the survey data to show slightly higher per capita consumption than that which was observed in the time series data. This is not the only source of difference between the two sets of data. There are factors operating in the other direction whose magnitude is likely to be dominant. The time series data include food consumption in restaurants and hotels and thus reflect meals out of the home and the consumption of tourists.

The surveys and the time series data, adjusted for the periods of the survey, are compared in Table 36[39]. An interesting feature is the similarity in per capita expenditure in the two sets in each of the periods. However, differences exist in the component items; these were mostly of the same order of magnitude in both periods, which indicates that the movement over time is reflected similarly in the two sources. The differences in each period can be accounted for, in a general way, in terms of the arguments given above. It is likely that the consumption by the rural population of fruit, vegetables, and milk is higher than that of urban families. This may also be true of flour products, where the higher per capita consumption of the Arab sector is reflected in the figures. The explanation of other differences requires further information which is not available at the present. For example, it is difficult to account for the fact that poultry consumption is considerably higher in the survey than in the population as a whole and

37 The average per capita real disposable income for October 1959 to September, 1960 was obtained by averaging the values for 1959 and 1960 from Table 32, line 2, weighted according to the months of coverage.

38 The available evidence indicates that income distribution of urban wage earners is more equal than that in the total urban population. See Giora Hanoch, "Income Differentials in Israel", FP, *Fifth Report: 1959 and 1960*, Jerusalem, August, 1961, Table 3. It is likely that the inclusion of the rural population and the population in small cities (not included in the surveys) would have increased the spread.

39 See footnote to Table 36 for a description of the adjustments and sources.

TABLE 36. *Per Capita Consumption: Comparison of Time Series and Survey Data*[a]*: 1956/57 and 1959/60*

	1956/57						*1959/60*					
	Expenditure: current prices			*Quantity*			*Expenditure: current prices*			*Quantity*		
	S	*T*	*T as per cent of S*	*S*	*T*	*T as per cent of S*	*S*	*T*	*T as per cent of S*	*S*	*T*	*T as per cent of S*
	IL			*Kg*			*IL*			*Kg*		
TOTAL FOOD[b]	**361.9**	**362.5**	100				**463.3**	**470.5**	102			
Flour, bread, and cereals	50.2	61.0	122	141.0	158.1	112	55.6	66.0	119	130.4	140.2	108
Meat and meat products	82.5	64.7	78	23.5	19.9	85	108.6	94.5	87	32.9	27.4	83
Pouitry				*15.4*	*9.9*	64				*22.7*	*16.5*	*73*
Fish	15.7	12.8	82	10.6	10.3	97	20.2	19.8	98	10.5	10.4	99
Milk and milk products	40.0	41.2	103				50.2	52.1	104			
Drinking milk				75.1	83.7[c]	111				61.1	77.9[c]	127
Butter				2.6	2.6	100				1.9	1.8	95
Eggs	31.4	26.6	85	320[d]	288[d]	90	36.6	32.1	88	347[d]	343[d]	99
Edible oils	14.1	18.9	134				16.1	20.2	125			
Fresh fruit	34.8	43.3	124	94.8	114.3	121	50.2	61.6	123	98.5	122.8	125
Fresh vegetables and potatoes	37.2	43.9	118	128.5	156.8	122	41.4	48.3	117	106.6	136.2	128
Processed fruit and vegetables	8.0	7.8	98				12.0	9.6	80			
Sugar products	17.2	25.5	148				24.6	36.0	146			
Tea, coffee, and cocoa	7.7	7.8	101				13.0	15.1	116			
TOBACCO AND CIGARETTES	**16.6**	**22.9**	138				**21.5**	**30.7**	143			

[a] Time series is designated by T; survey, by S.

[b] Including 'miscellaneous'.

[c] Liters. [d] Units.

SOURCE: Survey: Table 35.

Time series: Expenditure — Table 27 *divided by* mean population.

Quantity — Table 34, except for eggs and butter, taken from Hochman's and Blumenthal's studies respectively.

The time series figures were adjusted to the period covered by the Surveys as follows:

1956 and 1957 weighted 0.67 and 0.33 respectively, to give May 1956 to April 1957.

1959 and 1960 weighted 0.25 and 0.75 respectively, to give October 1959 to September 1960.

that the consumption of sugar products and tobacco is much higher in the population than in the survey.

It is always possible to attribute some of the differences between the two sources to error. But, as we have no reason to do so, we must conclude by indicating that at least the order of magnitude of the divergences is similar for both periods, and we hope that further research will provide explanations for them.

Let us now turn to a brief explanation of the relationships between consumption, prices, and income in the survey data. Columns (8) to (11) in Table 35 reveal that in many cases a price-rise led to a decline in consumption in spite of the increase in income between the two periods. This is the case with flour and cereals, milk and various dairy products, margarine, and melons, vegetables, and potatoes. The increase in consumption of products whose prices decreased reflected both the effect of the price decline and the rise in income. This is the case with meat, including poultry, and eggs. In fresh fruit, an increase in price was associated with an increase in consumption, and thus it reflects a stronger income than price effect.

It is interesting to note that in all cases where prices declined expenditure rose. This should not, however, be taken as an indication of elastic demand for these products. The relationship between elasticity and expenditure refers to a given demand function, whereas here we have a situation where the demand curve shifts because of changes in income.

It is clear that income and the price of a particular commodity are important in determining the consumption of that commodity, but these are not the only determinants. Prices of related commodities and changes in quality are also to be considered. In order to quantify the relationships between consumption and its determinants, we have to estimate the demand functions. The results of the empirical demand analyses are presented in the following section.

9. *Demand for Various Food and Agricultural Products — Empirical Results*

The problems involved in estimating the demand for various products are discussed elsewhere, and this section is devoted to a summary presentation of the separate studies. The main sources of data used are the time series and the 1956/57 and 1959/60 family budget surveys. The results are summarized in Table 37.

The income elasticity for total food is in the range of 0.52 to 0.64. The agreement between the sources is as close as can be expected in such studies. The price elasticity is relatively high. We have already indicated that price and income explain most of the variations in expenditure on food.

TABLE 37. *Summary of Empirical Demand Analyses*

	Family Expenditure Surveys: income elasticity[a]				*Time series*[b]					
	1956/57		*1959/60*		*Income elasticity*	*Price elasticity*	*Combined cross elasticity*	R^2	*Competing products and other variables considered*[c]	*Period*
	Quantity	*Expenditure*	*Quantity*	*Expenditure*						
Total food		0.516			0.643	–0.625		0.989	C	1952–61
Flour and cereals										
Total		–0.043								
Bread		–0.220		–0.255						
Other		0.285		0.307						
Meat and fish										
Total	0.448	0.738		0.663						
Fish	0.326	0.418		0.324						
All meat	0.481	0.778								
All beef	0.593	0.915		1.277						
Fresh beef	1.271	1.416		1.301						
Poultry (i)	0.296	0.436	0.167	0.375	1.97	–2.13	1.36	0.85	P_1, P_2	Nov.1956
(ii)[d]					0.296	–3.26	1.524	0.78		–Aug.1960
Milk and milk products										
Total		0.528		0.588						
Drinking milk (i)		0.342		0.397	0.54[e]	–0.266		0.57		1951–59
(ii)[f]					–0.02[e]	–0.324	0.637	0.72	P_3, I	1954–59
'Other' products[f]		0.475		0.863	0.273[e]	–0.031[e]	0.206[e]	0.91	P_4, I	
Soft cheese[f]					0.904	–0.129[e]	–0.281[e]	0.61	P_5, I	1954–60
Local hard cheese[f]					1.74	–0.172[e]	–0.053	0.78	Q_1, I	
All cheese		0.758		1.067						
Local butter[f]		1.902		1.04	3.92	–1.334	0.094[e]	0.83	Q_2, Q_3	1954–60
Imported butter				0.758						
All butter	0.407	0.902								

Eggs										
(i)[g]	0.660	0.752	0.332	0.424	3.276	–0.706	–0.387	0.83	P_2, P_4	July 1956–
(ii)[d g]					0.660	–0.799	–0.436	0.76		June 1960
Edible oils										
Total				–0.109						
Oils		–0.055		–0.357						
Margarine	0.090	0.134		–0.119[e]						
Fresh Fruit										
Total		0.713		0.772						
Total summer fruit					0.907	–1.8	0.294[e]	0.758	P_7, T	1954–59
Bananas[d]	0.812	0.875		0.592	0.700	–5.0	0.08[e]	0.514	Q_4	
Apples[d]	1.79	2.01		1.45	1.79	–6.1	–0.768	0.718	Q_5	
Pears[f]					2.6	–7.2	0.677	0.704	Q_4, T	
Plums	0.798	0.895			9.0[e]	–9.8	–1.2	0.611	Q_4, Q_5, Q_6, T	
Grapes[d]	0.548	0.718			0.548	–5.3		0.628	Q_7, T	
Melons	0.125	0.272								
Citrus	0.725	0.807		0.543						
Fresh Vegetables										
Total[f]	–0.073	0.169		0.261	–0.075[e]	–1.10		0.712	T, S, I	1954–59
Tomatoes[f]	–0.090	0.170	0	0.126[e]	–0.694[e]	–2.88	1.36	0.889	P_6, T, S	
Cucumbers	–0.327	0.135			2.830	–3.61	2.06	0.846		
Cabbage[f]	0.212	0.484			–0.329[e]	–4.27	0.935[e]	0.831		
Cauliflowers	0.716	0.942			–0.361[e]	–5.55	2.82	0.609		
Aubergines	–0.484	0.302			0.327[e]	–2.82	0.234[e]	0.896		
Peppers	–0.117	0.109			3.23	–3.721	1.16	0.939		
Carrots	0.879	0.798	0.245[e]	0.502	2.37	–0.240				
Potatoes	0.042	0.085		0.176[e]	0	–0.754		0.914		
Processed fruit				0.898						
Processed vegetables				0.529						
Cigarettes										
Group 1					–4.89	–0.490	1.986	0.77	P_8, t	1952–60
Group 2					–2.00[e]	–0.054[e]	0.294[e]	0.72		
Group 3					0.356[e]	–0.867	–0.063[e]	0.63	P_8	
Group 4					2.38	–5.205	2.839	0.86		
Cotton					0.69[e]	–0.948[e]				1953–58
Clothing and footwear		1.103								

NOTES AND SOURCE: See overleaf.

[a] Either quantity or expenditure were related to income. In each case, family size was allowed for.

[b] Unless otherwise stated, equations were in logarithmic form. Total food, drinking milk (i), carrots, potatoes and cotton — based on annual data. All other equations — based on monthly data.

[c] C — Total private consumption; other symbols as follows:

Prices of competing products

P_1 — eggs
P_2 — beef
P_3 — 'other' dairy products
P_4 — milk
P_5 — hard cheese
P_6 — all vegetables not in given equation
P_7 — all vegetables
P_8 — adjacent groups of cigarettes

Quantities of competing products

Q_1 — imported cheese
Q_2 — margarine
Q_3 — imported butter
Q_4 — apples
Q_5 — bananas
Q_6 — grapes
Q_7 — plums

Other variables: T — temperature
S — surpluses
I — quality index
t — time trend.

[d] Income elasticity obtained from Survey imposed on this equation.

[e] Not significantly different from zero at the 5 per cent level.

[f] Month effect allowed for.

[g] Month and year effects allowed for.

SOURCE: Time series — individual studies in Part II.
Family Expenditure Surveys — Nissan Liviatan, *Consumption Patterns in Israel*, FP, February 1964.
Results which do not appear in this source were computed from data provided by Liviatan.

The separate groups may be ranked by income elasticity, and in discussing them, we in general follow this order. Negative income elasticities are observed for edible oils and flour products. A breakdown of the group of edible oils indicates that the elasticity of oils is lower than that of margarine, the latter being positive in the first survey and not significantly different from zero in the second one. Thus the differences between two surveys in the consumption of oils and margarine can now be accounted for. The increase in quantity of oils consumed can be attributed to the decline in prices. The increase in income was not sufficient to offset the effect of the increase in the price of margarine, and so its consumption decreased.

The income elasticity of flour products is not far from zero. The breakdown shows a negative income elasticity for bread and a positive elasticity for other flour products, which are the more expensive products. This coincides with our previous observation that the trend in recent years was that of a declining per capita quantity consumed and an increase in expenditure.

A low income elasticity is observed for vegetables. In fact, when quantity consumed is related to income, the elasticity is negative. When expenditure is related to income, the elasticity is in the range of 0.17 to 0.27. Thus, there was only a small increase in expenditures on vegetables owing to the rise in income. This is not seen from the data, owing to an opposite price effect. The price elasticity of vegetables is –1.1; thus, there was a response to price. It is interesting to note that a 21 per cent increase in price between the periods of the two surveys caused a decline of 17 per cent in quantity consumed. This gives an implicit price elasticity of –0.81 when income elasticity is considered to be zero. Again, this can be considered to be in close agreement with our result.

The price elasticities of the vegetables are in most cases in the range of –2.8 to –5.5. However, for each vegetable a measure of substitutability is included, which is represented by a price index of all other vegetables. Elasticity with respect to this variable is roughly one half of the elasticity with respect to own price. In view of the relationships that exist between price movements in the market, the conceptual experiment that we should refer to is the effect on consumption of single vegetables when there is an equal proportionate change in the price of all vegetables. Thus, the increase in consumption when the price of vegetables declines would be lower than that indicated by the elasticity with respect to own price. The price elasticities of carrots and potatoes are lower than those of the other vegetables, and this may to some extent reflect the different method used for their estimation.

There are considerable differences in income elasticities both between vegetables and between the time series and the survey results. Further work on this point would shed light on the sources of these differences.

The income elasticities of animal products range from about 0.2 to 1.4. It seems that, on the whole, the rise in the price of fish roughly offset the effect of income, and consumption in the two survey periods therefore remained constant. The income elasticity of all meat was about 0.5 when quantity was related to income and 0.8 when expenditure was related to income. The greater relative increase in expenditure reflects higher elasticities for the more expensive meat products than for the cheaper ones. This difference can be seen from the results for each item. The income elasticity of poultry, which is the cheapest meat available in the country and is therefore consumed in relatively large quantities, is in the neighborhood of 0.2 to 0.4. It declined somewhat in the second survey, and this may reflect the marked increase in consumption over the first period. The elasticity for all beef was about 0.6 for quantity and 0.9 for expenditure in the 1956/57 survey and 1.28 for expenditure in the 1959/60 survey. The high value for the latter reflects a change in the composition of supply, fresh beef becoming the major component of the basket. The corresponding elasticities for fresh beef are 1.27, 1.42, and 1.30. It is thus seen that the income elasticity for fresh beef is very high as compared with other food items. For poultry meat, there are also estimates of the price elasticities from the time series. The values are –2.13 to –3.26. The first was obtained from an equation which yielded an income elasticity of about 2.0. This value was thought to be rather high for use in forecasting in view of the already high per capita consumption. The same equation was therefore estimated again, with the value obtained from the cross section imposed on the equation. The cross elasticities with respect to prices of related commodities are again about one half of the elasticity with respect to own price. The meaning of this is the same as given in the case of vegetables. Again, these values allow us to account fairly well for the changes which occurred over time in the consumption of poultry products.

For the reasons given by Blumenthal, it was impossible to estimate the demand for beef, but some indication can be obtained by comparing the results of the survey data. Let us assume that the income elasticity as related to the quantity of all beef is equal to that of all meats other than poultry. Thus, if we apply this value (0.59) to the 24 per cent increase in total real consumption expenditure in 1959/60 as compared to 1956/57, we find that there should have been a 14 per cent increase in quantity consumed due to income, prices remaining unchanged. The actual increase was 26 per

cent; thus, about 10.5 per cent (1.26/1.14) is attributable to the 5 per cent decline in real prices. This gives an implicit price elasticity of about –2. Such a calculation is admittedly very crude, and in fact gives only a lower limit. In the same period the price of poultry meat dropped by 20 per cent. It seems reasonable to assume that the cross elasticity of other meat with respect to the price of poultry meat is positive. This means that the decline in poultry meat prices led to a lower increase in the consumption of beef than would have taken place had the poultry price remained unchanged. For example, if we assume the cross elasticity with respect to the price of poultry meat to be 1, the implicit price elasticity for other meats would be –6.

The income elasticity of eggs was higher in the first than the second survey. A comparison of consumption after adjustment for the decline in price leads to an even lower value. However, here we have results of a time series analysis which yield rather high income elasticity (over 3). As with poultry meat, this value was judged to be too high to be used for forecasting, and the demand equation was also estimated using the income elasticity from the survey as extraneous information. The price elasticities obtained in the two cases are –0.7 and –0.8, respectively. In these equations, the combined effect of the cross elasticities has a negative value, the opposite of what was expected.

The income elasticity for all dairy products is in the range of 0.53 to 0.58. Here there is no estimate for all dairy products from the time series, but it can be obtained by aggregating the income elasticities obtained for each item, weighted by the share in expenditure of each product. For illustration, we take the 1960 weights[40]. We also assume that the income elasticity for all butter (local and imported) has half the value for local[41]. The result thus obtained is 0.54, which is in full agreement with that obtained from the survey data. The two analyses differ with respect to individual commodities. This can be partly attributed to the allowance for quality changes made in the time series analysis. However, the same ranking is preserved. The survey data yield the lowest elasticity for drinking milk and then, in ascending order, other milk products (mainly sour milk products and cream), cheese, and butter. The price elasticities, except for butter, are relatively low. Furthermore, whenever the cross elasticities have the right (positive, for price) sign, they are higher than the elasticities with respect to own prices. On this ground, therefore, it would seem that there should be only small response to prices. The comparison of the consumption level in the two surveys indicates somewhat more response than that obtained

40 Blumenthal *Milk*, p. 21, Table 13.

41 The time series analysis was made for local butter.

in the time series. An implicit price elasticity can be calculated for all milk products. Real expenditure in the second period was 14 per cent higher than in the first. At the same time, the price index for all dairy products increased by 6.6 per cent more than that of the consumer price index[42]. So, the change in quantity was 6.9 per cent (114/106.6). Taking an income elasticity of 0.5 and applying it to a 24 per cent increase in total expenditures indicates that the rise in consumption due to the rise in income should have been 12 per cent. If the difference between actual and expected consumption — 4.8 per cent — is attributed to the price-rise, we get an implicit elasticity of –0.727. In this case, the value can be considered as an upper limit (in absolute value) since there were considerable improvements in quality which were not allowed for in this calculation. Furthermore, the available per capita supplies of imported cheese and butter were considerably lower in the second period than in the first[43]. Since these were cheaper than the domestically produced products, this development tended to raise consumption in the first period as compared to the second. Therefore, not all of the actual decline in consumption should be attributed to price. From all this, it turns out that the price elasticity for milk products is not high, although it might be slightly higher than is suggested by the time series data.

The income elasticity for all fresh fruit, as obtained from the surveys, is in the range of 0.71 to 0.77. The value obtained for summer fruit from the time series is 0.907. The highest elasticity in the survey is for apples, in the range of 1.5 to 2.0. The value for pears in the time series analysis is 2.6. The income elasticities obtained from the time series analyses for the other fruits are questionable. Therefore, the analysis was in some cases done by imposing the corresponding survey values on the demand equation. The price elasticity for all summer fruit is –1.8, whereas the values for individual fruits are much higher. The effect of the related commodities is not always in the expected direction or of a reasonable order of magnitude.

The income elasticity of processed fruit is about 0.9 and that of processed vegetables is 0.53. Thus, both are higher than the corresponding values for the fresh products.

As the price differentials between various kinds of cigarette are relatively high in Israel, the cigarettes were put into four groups and the analysis was carried out separately for each group. The groups are numbered in the order of their prices, groups 3 and 4 being the most expensive and differing mainly in composition of tobacco and only slightly in price.

It is seen that the income elasticities are negative for the less expensive

[42] Calculated on the basis of Blumenthal, *Milk*, p. 12 Table 8.

[43] *Ibid.*, pp. 34, 36. Tables 17 and 18.

and positive for the more expensive groups. The ranking of the actual values is well correlated with the group number. The price elasticities have the right (negative) sign, and the cross elasticities, with one exception, also have the right (positive) sign. However, in some cases the magnitude of the elasticities is questionable.

The income elasticity for expenditure on clothing and footwear obtained from the 1956/57 survey is 1.1. A time series analysis of the demand for raw cotton shows an income elasticity of about 0.7. This analysis was based on a small number of observations but nevertheless yields a value which agrees with the clothing figure obtained from the survey. In such a comparison we take into account the fact that the elasticity from the survey is for expenditure and that the increased expenditure that comes with higher income reflects to a large extent an improvement in quality.

In the foregoing discussion we presented the results of the various empirical analyses which will serve as a basis for our forecasts. In some cases it was shown, in a general way, that the results make it possible to explain the past developments in consumption. Of course, in the case of the time series analysis this can be done more directly by observing the value of the coefficient of determination (R^2). This coefficient indicates the proportion of the total variations in the dependent variable which is explained by the particular equation. In most cases the value of R^2 is above 0.7 and in some cases is much higher. This shows that in general the equations fit the data fairly well.

In dairy products, vegetables, summer fruit, and tobacco, analysis was done not only for the aggregate group but also for separate commodities. It seems that the results for the separate commodities do not always appear conclusive from the point of view of the actual results obtained for relevant economic parameters. However, the results for the group as a whole seem much more reasonable and it is therefore possible to get a better basis for the appropriate interpretation and use of the individual equations. This will be discussed in further detail in connection with the projections.

10. *Foreign Trade in Agricultural and Food Products*

As pointed out in Section 8, a complete view of the outlets for the expanding agricultural production, on the one hand, and the sources for the expanded food consumption, on the other hand, requires examination of the foreign trade in these products. We turn now to a brief review of this subject.

The figures on imports of food and other agricultural commodities are presented in Table 38. It is seen that except for 1954 and 1958 the value of food imports was relatively stable. However, there were changes in com-

TABLE 38. *Imports of Food and Agricultural Products: 1952–60*[a]

(*IL millions*)[b]

	1952	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*
1. Grain and flour	57.3	61.6	49.4	65.7	69.5	72.6	73.1	79.3	87.9
2. Feedingstuffs for animals[c]	5.6	5.6	7.4	9.5	9.2	8.8	10.4	10.9	7.5
3. Meat and meat products[d]	6.6	8.1	8.6	10.1	17.3	14.6	10.7	3.6	4.7
4. Eggs and dairy produce	9.3	12.4	16.6	8.5	9.7	6.3	23.7	4.3	0.7
5. Fresh fruit, nuts and vegetables	2.4	1.4	1.1	0.8	0.4	0.4	0.1	0.2	0.2
6. Other foodstuffs	47.7	45.6	35.0	39.6	33.4	34.1	34.0	35.3	33.8
7. *Subtotal (1 through 6)*	*128.9*	*134.7*	*118.1*	*134.2*	*139.5*	*136.8*	*152.0*	*133.6*	*134.8*
8. Tobacco and beverages	1.9	1.4	1.5	1.8	1.6	2.4	3.5	2.7	3.0
9. Seeds for edible oil extraction	12.0	13.0	13.4	18.0	15.8	22.7	23.4	27.9	34.9
10. *Subtotal (7 through 9)*	*142.8*	*149.1*	*133.0*	*154.0*	*156.9*	*161.9*	*178.9*	*164.2*	*172.7*
11. Raw cotton	6.4	6.2	7.9	10.1	6.8	4.2	9.1	7.5	5.6
12. TOTAL FOOD AND AGRICULTURAL PRODUCTS (*10 plus 11*)	**149.2**	**155.3**	**140.9**	**164.1**	**163.7**	**166.1**	**188.0**	**171.7**	**178.3**
13. Total merchandise imports[e]	583	508	523	606	681	784	762	774	905

[a] Calendar years. [b] At IL 1.80 per current dollar. [c] Other than whole grains included in line 1.
[d] Including animals, live, for food.
[e] 'Imports of foreign goods'; see *SAI, No. 12*, p. 310, Table 1, column (3).

SOURCE: Food, beverages and tobacco:
1953: *SAI, No. 10.*
1952, 1954–59: *SAI, No. 12*, p. 314.
1960: *SAI, No. 13.*
Seeds for oil extraction and cotton:
1952: CBS, *Israel's Foreign Trade (1952–1953)*, Special Series No. 23.
1953–60: *SAI, Nos. 6–12.*
Total imports:
1952–55: *SAI, No. 12*, pp. 314 (1953 — p. 313).
1956–60: *SAI, No. 13*, p. 336.
The source data are classified according to the Customs Tariff in force up to October 1958.

TABLE 39. *Exports of Food and Agricultural Products*[a]*: 1949–60*[b]

(IL millions)[c]

	1949	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*
1. Citrus	32.5	30.5	28.9	30.0	39.2	60.5	57.2	72.6	87.6	87.6	82.7	84.1
2. Fresh fruit and vegetables	—	0.0	0.0	0.0	0.2	0.5	0.4	0.4	0.3	1.0	1.5	2.0
3. Livestock and poultry products	0.0	—	—	—	0.0	0.3	0.4	1.4	1.4	9.3	12.8	21.0
4. Groundnuts	—	—	—	—	0.0	2.4	1.8	2.6	2.4	3.3	2.9	3.7
5. Hard wheat and feeding stuffs	—	—	—	—	—	—	—	0.5	4.5	0.0	3.4	1.4
6. *subtotal* Unprocessed products (*1 through 5*)	*32.5*	*30.5*	*28.9*	*30.0*	*39.4*	*63.7*	*59.8*	*77.5*	*96.2*	*101.2*	*103.3*	*112.2*
7. Processed fruit and vegetables	4.4	3.0	7.0	6.0	4.1	5.6	3.7	7.4	7.2	10.4	13.1	13.3
8. Edible oils	0.0	0.1	0.1	0.0	0.2	0.2	0.1	0.9	2.8	1.5	5.2	6.4
9. Sweets, cocoa, and instant coffee	0.2	1.2	0.7	0.6	0.9	0.7	1.0	1.4	2.0	1.3	2.1	2.1
10. Spirits	0.4	0.3	0.5	0.4	0.2	0.5	0.5	0.5	0.7	0.8	0.7	0.8
11. *subtotal* Processed products (*7 through 10*)	*5.0*	*4.6*	*8.3*	*7.0*	*5.4*	*7.0*	*5.3*	*10.2*	*12.7*	*14.0*	*21.1*	*22.6*
12. Miscellaneous	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.3*	*0.3*	*0.3*	*0.4*	*0.5*	*2.9*	*3.9*
13. TOTAL (*6 plus 11 plus 12*)	**37.6**	**35.2**	**37.3**	**37.1**	**45.0**	**71.0**	**65.4**	**88.0**	**109.3**	**115.7**	**127.3**	**138.7**
14. Total merchandise exports[d]	51.3	63.3	80.6	76.6	103.5	153.0	158.1	187.3	254.3	253.1	321.8	389.9

[a] This table does not include exports of cotton or cotton products. For evaluation of the trade in cotton see Part II, Braude, p. 4, Table 2.

[b] Calendar years.

[c] At IL 1.80 per current dollar.

[d] 'Exports of Israel goods', as shown in Table 1 of the Foreign Trade Section of the *Statistical Abstracts*. For an explanation of the changes in definition introduced in later volumes, see *SAI, No. 12*, Introduction to Tables, p. xxxv. The series shown here uses the 'old' definition for 1949–56 and the 'new' for 1957–60.

SOURCE: Food and agricultural products:

1946–56: *SAI, No. 9*, pp. 266–67.

1957–60: *SAI, Nos. 10–13*.

Total exports:

1949–56: *SAI, No. 11*, p. 268. 1957–60: *SAI, No. 13*, p. 332.

For 1949–58 the source data are classified according to the Customs Tariff in force until October 1958; for 1959 and 1960 the SITC was used. There is not, however, much difference between the two classifications as applied to 1959.

position. Imports of meat rose up to 1956 and dropped sharply thereafter and in 1959 and 1960 were below the 1952 level. The fluctuations in imports of 'eggs and dairy products' reflect variations in the imports of dairy products from United States surpluses. On the whole, this group has tended to decline and in 1960 reached a very low level. Imports of fresh fruit and vegetables, at no time considerable, became negligible in the later years. Imports of other foodstuffs declined from 1952 to 1954 and remained fairly stable thereafter.

Imports of grains and feeds for animals rose. This upward trend to a large extent reflects the increase in animal products and is indicative of the nature of agriculture in Israel. Because of the limited cultivated area, domestic production of grains falls short of the direct consumption of wheat and grains required for animal products. Consumption of these products rose faster than production. The item 'feeding stuffs for animals' includes products such as fish meals, which are not produced in Israel at all. In some years it also included a considerable amount of oilcake, but this decreased with the expanded domestic production of edible oils and, in fact, the major problem of the edible oil industry at the present is that of finding outlets for domestically produced oilcake. The development of this industry is well reflected in the imports of seeds for edible oil extraction, which rose continuously. The situation here is similar to that of wheat. The limited resources of agriculture bring higher returns when used in the production of other products.

Imports of tobacco and beverages rose in the period under consideration. Cotton imports fluctuated, but showed a down-trend in 1959 and 1960. The imported cotton is used for textile manufacture for domestic consumption and for export. Thus, imports for domestic consumption are somewhat less than total cotton imports[44]. The decline in imports in 1959 and 1960 is attributed to the increase in domestic production, and it is very likely that the inclusion of one or two more years in the table would show a much lower level of imports.

On the whole, imports of food and other agricultural products rose more slowly than total imports, much less than the domestic consumption of these products. Before commenting further on this point, we turn to a review of the export figures. The data on exports appear in Table 39.

Exports of unprocessed products before 1954 consisted mainly of citrus, but in that year exports of other items began to become more important. Total exports of unprocessed products were fairly stable until 1953 and in-

[44] See Braude, p. 4, Table 2.

creased rapidly thereafter. The fluctuations around the rising trend in citrus exports reflect fluctuations in yields and in prices received in the foreign markets. The value of this export in the later years was about twice that of 1953 and even higher compared to earlier years.

The recent attempts to increase exports of agricultural products led to exports of vegetables and fruit (other than citrus), eggs and poultry meat, groundnuts, and hard wheat. However, the large-scale export of poultry products began not so much as a planned activity, but rather as a means of disposing of surpluses which could not be sold locally at the supported market prices, and which had resulted from the price support program initiated late in 1957. The sharp jump in exports of this group occurred in 1958, so that it did not take long before surpluses formed.

The item which accounts for the bulk of processed product exports is fruit and vegetables, of which citrus products is the major component. The considerable increase in exports of edible oils reflects the development of this industry (already noted above). Exports of edible oils and sweets do not represent a contribution of the agricultural sector. However, these items were included in the import figures, and it is therefore desirable to indicate to what extent the imports were processed for export.

On the whole, exports of all items considered in the table rose relatively less than total exports. The picture obtained from our discussion is that there was a slight increase in the imports of food and agricultural products but a greater expansion in exports of this group. Thus the excess of imports over exports (Table 40) declined. To relate this to the trend in consumption, we recall that from 1952 to 1960 total consumption of food, beverages, and tobacco (at 1955 prices) rose from IL 523 million to IL 931 million, or by 78 per cent. This means that the increased agricultural production made it possible both to raise food consumption to the extent indicated above, and, at the same time, to reduce the excess of imports over exports of agricultural products.

Some other related measures of the role of agricultural production in foreign trade are given in Table 40. While there was a rising trend in total imports per capita, there was a downward trend in per capita imports of food and agricultural products. There is a sharp decline in the per capita excess of imports over exports of food and agricultural products, which dropped from IL 51 in 1955 to IL 16 in 1960.

The share of imports of food and agricultural products in total imports declined from 31 per cent in 1952 to 20 per cent in 1960. At the same time, there was a drop in the share of agricultural exports in total exports, from 43 per cent in 1952 to 36 per cent in 1960. However, the share of the excess

TABLE 40. *Summary of Foreign Trade in Agriculture: 1953–60*[a]

	1953	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*
A. Balance of trade[b] (IL million)[c]								
FA[d]	104	62	89	69	53	63	37	34
Total trade	400	364	444	488	527	507	452	512
B. Per capita (IL)[c]								
Total imports	308	309	346	373	406	381	375	427
FAc imports	94	83	94	90	86	94	83	84
Balance of trade[b] in FA	63	37	51	38	27	32	18	16
C. Index 1954 = 100								
FAc imports	110	100	116	116	118	133	122	127
FA exports	63	100	92	124	154	163	179	195
Balance of trade[b] in FA	168	100	143	111	85	102	60	55
Per capita FAc imports	113	100	113	108	104	113	100	101
Per capita balance of trade[b] in FA	170	100	138	103	73	86	49	43

D. FA as per cent of total								
Imports (FAc)	31	27	27	24	21	25	22	20
Exports (FA)	43	46	41	47	43	46	40	36
Balance of trade[b] (FA)	26	17	20	14	10	12	8	7

[a] Calendar years

[b] Excess of imports over exports

[c] At IL 1.80 per current dollar

[d] FA — food and agricultural products excluding cotton and its products

FAc — food and agricultural products including raw cotton

SOURCE: Imports — Table 38: FA — line 10
FAc — line 12
Total — line 13

Exports — Table 39: FA — line 13
Total — line 14

Balance of trade: FA — calculated from Tables 38 and 39
Total — 1953–56, calculated from *SAI No. 11*, p. 268.
1957–60, *SAI No. 13*, p. 332.

For change in definition between the two sources see *SAI, No. 12*, Introduction to Tables, p. xxxv.

Per capita figures were computed on basis of mean population (*SAI, No. 13*, p. 31).

of imports over exports of the same products in the total balance of trade decreased from 26 per cent to 7 per cent.

In concluding this discussion it should be noted that the data quoted above do not reveal the net contribution of agricultural production to foreign trade, as not all imported raw materials were included. However, a glance at Table 19 indicates that in the later years purchased feeds account for about 40 to 50 per cent of all purchases of agriculture from other sectors, and for that reason the drawbacks of using somewhat gross data are not as serious as might be thought. A more detailed analysis of this point would have required the computation of the import component in the other inputs and would probably indicate larger figures for the excess imports over exports, but the observed trend would probably be unchanged.

Appendix to Chapter 2

Types of Farms in Israel

For the benefit of readers who are not familiar with types of farm organization in Israel, we shall briefly describe their main characteristics.

(1) A *moshav* (plural: *moshavim*) is a village of family farms which cooperate in some of the village operations, mainly in marketing their products and in purchasing raw materials and equipment. The cooperative acts on behalf of the farmers in matters of water supply, and is also their main credit agency. It also "enters into municipal functions and sometimes even into certain fields of production such as tractor and machine stations, cooperative incubators, grain crop production, and orchards."[1]

A *moshav shitufi* is a *moshav* in which production is collective but members maintain separate households. (In Table 4 it is referred to as a *cooperative moshav*.)

(2) A *Kibbutz* (plural: *kibbutzim*) is a collective enterprise based upon common ownership of resources and pooling of labor income and expenditure. No wages are paid, but every member is expected to work to the best of his ability and is supplied with all the goods and services that he needs, and all members have equal rights. The farm is planned, equipped, and managed as a single large-scale enterprise.

Most of the moshavim and kibbutzim are settled on public land administered by the Jewish National Fund and operate under long-term tenure. The main restriction is on the transfer of rights. Aside from this restriction, farmers may operate as if they were the owners.

(3) *Private farming*, which is the oldest type of settlement in Jewish farming in Israel, is mostly found on privately owned land not leased from the Jewish National Fund. The production of this sector as a whole is diversified and involves all products, citrus being the major crop.

1 Ministry of Agriculture and Bank of Israel, *The Economy and Agriculture of Israel*, a report prepared for the Mediterranean Development Project of the United Nations Food and Agriculture Organization, 1959, p. 95.

CHAPTER 3

CONCEPTUAL FRAMEWORK AND TECHNICAL NOTES

1. *General Approach*

The first section of this Chapter is devoted to outlining the approach and the assumptions used in the study. Later sections take up the various statistical problems involved.

The ultimate objective of our study is to secure equilibrium projections, that is, to project quantities and prices that will secure the equality:[1]

supply = demand.

This is a rather general statement. We now turn to a more detailed consideration of the formulation. The supply and demand equations (at any level of product aggregation) are divided into major components.

Demand = domestic demand (fresh and processed) + investment on farms[2] *+ foreign demand (exports).*

Supply = domestic supply + foreign supply (imports).

The equality of supply and demand implies that:

Domestic consumption + investment on farms — domestic production = imports — exports.

This equality is reached by appropriate variations in prices, constrained by some institutional impositions. The projection of the point of equilibrium to a future date requires knowledge of the shape and level of the various functions. The analyses which provide such information constituted one of the more important aspects of this study.

The approach used in projecting each one of the components, and consequently the amount of analysis necessary for such projection, varied with the relative importance of the components, the nature of their determinants, and the data available. The order of magnitude of the various supply and demand components in the past was discussed in some detail in Chapter 2. It was seen that domestic demand and supply are the more important components and they were therefore subjected to a more detailed treatment. Comprehensive analysis was also conducted on the demand for exported

[1] In an ex-ante sense.

[2] Such as orchards and livestock.

citrus. As seen from Table 39, citrus has been by far the most important constituent of agricultural export. The treatment of other export products was based mainly on certain assumptions which were regarded as reasonable. The supply of import products was not analyzed at all, and it was assumed that such supply functions are perfectly elastic, an assumption justified by the fact that Israel is a small buyer of these products and exerts no significant influence on their prices. Rather than study the nature of the import supply functions of these products, which would have taken us beyond the scope of this work, it has been assumed that their level will not change in the future. This means that they may be purchased in the future at the same international prices as in the past. The domestic price will be determined by the effective exchange rate. It is assumed that the exchange rate will move up proportionately to other prices in the economy, so that the real price of imported products will remain relatively stable.

Finally, it has been assumed that investment demand is proportional to total future production, and therefore no special analysis was required for this component.

The purpose of the study was to obtain results for specific products rather than for the aggregate of all agricultural products. Thus, a demand function for each product was analyzed. This can be written as:

$$(1) \qquad Q_j^d = f(P_j, P_i, Y, T, N)$$

where Q_j^d is the total quantity demanded per time unit for product j, P_j is the real price of this product, P_i is the real price of related products, Y is average per capita real disposable income per time unit, T stands for various factors which affect the demand over time, and N is the size of the population[3].

If the demand function is known, than the quantity demanded can be obtained for each set of values of the variables in the parentheses in equation (1). Of course, the function was not known and had to be estimated. This problem is discussed in the next section, but at present we can abstract from problems of estimation and assume that the function is known.

The determinants of the quantity demanded are classified as endogenous or exogenous to the market for the commodity for which the projections are made. That is, if a point of equilibrium is sought, then some prices will be determined simultaneously with the quantities. On the other hand, income, population, and the variables associated with time can be assumed to be independent of the developments in the markets of the agricultural products[4] and can be projected independently. This, in fact, was our pro-

[3] Both P^j and T can be either indexes or vectors. For the present discussion, there is no need to specify the actual measures used.

[4] Obviously, this is a somewhat arbitrary classification, as no such dichotomy actually

cedure. Population and income were projected on the basis of developments in the economy as a whole[5].

In order to clarify the difference between the role of the exogenous and endogenous variables, let us express (1) only in terms of the endogenous variables. This is done by substituting for the endogenous variables their projected values. The result is:

$$Q_j^d = f'(P_j, P_i) \tag{2}$$

where f' was obtained by substituting the projected values for the variables. It is this form of the demand function that must be considered with the appropriate supply function in order to find the equilibrium point.

But equation (2) has other uses in our study. In addition to deriving equilibrium projections, we also derive demand projections, that is, projections of quantity to be demanded at a future date under the assumption of some predetermined price. For the 1965 projections, 1960 real prices were used. For the 1975 projections, we mostly used the projected 1965 equilibrium prices.

Such demand projections can be considered as equilibrium projections under the assumption of a perfectly elastic supply function at the level of the predetermined prices. Thus, for products which are imported and whose import price largely determines the domestic price, this projection was also considered as the equilibrium projection.

It was indicated above that the demand equations vary over time along with variations in the exogenous variables. Such variations in demand are of prime importance for agriculture, and it is therefore desirable to dwell longer on this point.

By differentiating equation (1) we get:[6]

$$R_Q d = E_{Q/P_j} R_{P_j} + E_{Q/P_i} R_{P_i} + E_{Q/Y} R_Y + E_{Q/N} R_N + E_{Q/T} R_T, \tag{3}$$

where R_x is the percentage change in variable x and $E_{Q/x}$ is the elasticity of Q with respect to x.

From (3) it appears that the relative increase in the consumption of a

exists. Nevertheless, it is satisfactory from an operational point of view, as it reflects well the strength of dependence between the various variables.

5 For details, see N. Halevi's essay in this volume.

6 The total differential of (1) is:

$$dQ = f_{P_i} dP_i + \ldots + f_N dN, \text{ where } f_{P_i} = \frac{\partial Q}{\partial P_i} \text{ etc.}$$

$$\frac{dQ}{Q} = f_{P_i} \frac{P_i}{Q} \frac{dP_i}{P_i} + \ldots + f_N \frac{N}{Q} \frac{dN}{N}$$

which is the same as (3).

particular product (say j) is, approximately, a linear combination of the relative increase in all the determinants of the consumption, with elasticities being the coefficients of the combination.

It should be noted that for the demand projections mentioned above it is assumed that $R_P = 0$ for all prices, meaning that the quantity demanded is projected for given prices. Hence, in order to obtain the percentage increase in consumption at given prices, the last three terms of (3) must be evaluated. As indicated above, the relative increases in per capita income and in the population were projected separately. The elasticity of consumption with respect to population was considered to be unitary; that is, a 1 per cent increase in population was considered to increase consumption by 1 per cent. The two components of the last term in (3) were considered together; that is, trend effect on demand was evaluated in some cases.

Equation (3) assumes no particular form for the demand function. Thus, knowing the income elasticities and the present per capita consumption, it is easy to evaluate the changes in consumption which correspond to any change in income and population. As the reader will note, this relation was used extensively in our work.

The supply functions of domestically grown products cannot, of course, all be perfectly elastic. Limitations of land and water impose restrictions on the increase in total agricultural production. The considerations with respect to supply can be illustrated by making reference to the following formulation of the supply function:[7]

$$Q_j^s = h_j(P_j, P_i, V, C, K) \tag{4}$$

where Q_j^s = the quantity supplied of product j.

P_j = the real price of product j.

P_i = the vector of real prices of alternative products that could be produced with the same resources as are used for production of j. For simplicity, we assume at this stage that producers' prices are equal to consumers' prices.

V = the vector of input prices.

C = the vector of values of the capacity of fixed inputs used in the production of j.[8] For example, the area of fruit-bearing orchards will appear in the supply function of fruits.

K = the level of productivity in any given year.

[7] This formulation is based on known theoretical considerations which will not be discussed here.

[8] By 'fixed input' is meant that the supply function faced by the growers is perfectly inelastic. In most cases of concern here, such inputs are divisible, so that less than the maximum capacity could be used.

It is again assumed that the functions are actually known, the statistical problems thus being avoided at this stage. The prices of those products mainly produced domestically and the quantity supplied are their endogenous variables in our projection, whereas the others are considered exogenous. As was the case with the demand equation, by projecting the values of the exogenous variables, the supply function can be simplified and written as:

(5) $$Q_j^s = h_j'(P_j, P_i).$$

As in the case of demand, this function is used for obtaining supply projections under the assumption that prices will remain at their 1960 level.

The question is how to project the values of the exogenous variables. The following considerations are relevant in answering this question.

Factors of production are classified into these which are fixed in the period under consideration and those which are not. For agriculture as a whole, land and water can be considered as fixed at a level which can be easily projected. For individual commodities, there may exist some specific fixed factors. The best illustration is the case of fruit, in which the existing planted area constitutes a fixed factor. In fact, the role of this particular variable is so important that for 1965 the production of fruit has been assumed to be predetermined by the present planted area, as new planting will not result in any significant additional production before 1965. In other products, except for field crops, fixed variables are reflected only implicitly in the supply function, as will become clear in a later discussion.

Inputs which are not fixed are represented in the supply function by their prices[9]. It is assumed that the supply function for variable inputs faced by agriculture is perfectly elastic. That is, quantities of these factors purchased by agriculture have no influence on factor prices. A large proportion of the raw materials and capital services are imported, and thus this assumption is only a consequence of the assumption made earlier with respect to imports. In fact, the assumption with respect to imports is even stronger, as it also assumes no shift in the level of the import supply. With respect to wage rates, it is assumed only that the supply function of labor to agriculture is perfectly elastic, but at a level which shifts up over time. It is assumed that real wages of agricultural labor change proportionately to real wages in the rest of the economy, and the latter are projected to increase. An increase in real wages, other things being equal, will result in a shift of the supply function to the left. Such a shift will, however, be compensated for by an increase in productivity.

Before commenting on the effect of changes in productivity, let us sum-

[9] 'Not fixed' not only to the particular branch but also to agriculture as a whole.

marize the discussion thus far by expressing the total relative change in output as:

$$(6) \qquad R_{Q^S} = R_{P_i} E_{Q/P_i} + R_{P_j} E_{Q/P_j} + R_{V_1} E_{Q/V_1} + R_K E_{Q/K},$$

where, as in (3), R_x indicates the relative change in x and $E_{Q/x}$ indicates the elasticity of Q with respect to x. Note that no changes in C are considered, as C is assumed to be fixed, and that the only change in factor prices considered is that in wages (denoted by V_1).

Let us for the moment assume that product prices remain fixed. The question is then asked: under what conditions will the supply function remain unchanged? The answer is, clearly ,when:

$$(7) \qquad R_{V_1} E_{Q/V_1} = R_K E_{Q/K},$$

that is, when increase in productivity balances the effect of increase in wages.

Some speculations can be offered with respect to this condition. If we assume (1) that wage rates in the economy increase at the same rate as productivity and (2) that productivity in agriculture increases at the same rate as in the whole economy, then it emerges that R_{V_1} is approximately equal to R_K. Hence, (7) implies the equality of the two elasticities. An argument might be outlined that would indicate that it is rather unlikely that such equality exists and that it is more likely that $E_{Q/K} > E_{Q/V_1}$[10]. Hence, since $E_{Q/K} > 0$, it emerges that our underlying assumptions imply a supply function which shifts to the right over time. We have seen in Chapter 2 that the empirical findings do, in fact, support such an assumption. This is certainly the case with respect to total agricultural production, which rose considerably in spite of the decline of real prices in later years. This is

10 For the sake of brevity, let us consider a case in which prices of related products do not enter into the supply equation. This is a rather more general case than might appear at first sight as it accommodates the case in which all agricultural products are treated as a composite good. It is assumed that the industry is competitive, with no external effects. The first-order conditions for profit maximization are homogeneous of zero degree at all prices, and therefore the supply function must be so. From this property we can derive:

$$E_{Q/P} = (E_{Q/V_1} + \ldots + E_{Q/V_n}),$$

where on the right we have the elasticities with respect to all factor prices. From this it is clear that $E_{Q/P} > E_{Q/V_1}$ if there is more than one factor.

For simplicity, let us assume that productivity is 'neutral'. That is, an increase of 1 per cent in productivity implies that, with a fixed bundle of resources, production increases by 1 per cent. In this case, an increase of 1 per cent in productivity has the same effect on the first-order conditions as an increase of 1 per cent in price. Therefore, in this case we have:

$$E_{Q/K} = E_{Q/P}$$

and this, together with the inequality above, verifies the proposition.

also the case with single products whose production increased while their prices dropped. The opposite case, where a rise in production was associated with rising prices, does not contradict the assumption.

The foregoing discussion indicates that the main shifters of the supply functions over time are productivity and wage rates. It is suggested that the net effect of these two forces has been an increase in supply. The problem of projecting the increase in productivity is postponed to a later section.

We can now summarize the discussion by presenting the various equations and making use of the various assumptions made above. The equations include all the endogenous variables and the prices of imported products which are either consumed directly or used by agriculture. All other exogenous variables are fixed at their projected levels. For simplification, the time index of the various functions is omitted from the notation.

Demand equations

(A) Domestic demand:

$$Q_j^A = f_j^A(P_j, P_i) \qquad j = 1, \ldots, J_A.$$

The superscript A indicates that we deal with an equation which belongs to group (A). That is, Q_j^A is the quantity demanded of product j in A, which means that this is domestic demand.

(B) Foreign demand — negatively sloped demand functions for Israel exports. This group includes citrus and some other products. The demand functions are written as:

$$Q_j^B = f_j^B(P_j^B) \qquad j = J_A + 1, \ldots, J_B.$$

Q_j^B is the quantity of j demanded by foreign markets; P_j^B is the foreign price. Note that here prices of related products were taken as exogenous in the projection.

(C) Foreign demand — perfectly elastic demand functions for Israel export. For this group the price is fixed at the level:

$$P_j^C = C_j \qquad j = J_B + 1, \ldots, J_C.$$

Supply equations

(D) Domestic supply — supply not predetermined.

$$Q_m^D = h_m^D(P_m, P_i) \qquad m = 1, \ldots, M_D.$$

(E) Domestic supply — supply predetermined. This group includes most of the fruits. The supply is determined at the level:

$$Q_m^E = E_m \qquad m = M_D + 1, \ldots, M_E.$$

(F) Foreign supply. Here it is assumed that Israel has no influence on

foreign prices. The foreign prices are fixed at the level F_m:

$$P_m^F = F_m \qquad m = M_E + 1, \ldots, M_F.$$

Factor supply

(G) — total for agriculture. Land and water are fixed at a projected level.
(H) — fruit. For 1965, the bearing area, determined by the planted area in 1960, was considered in (E).
(I) — other factors. The supply function is considered to be perfectly elastic and this was incorporated in deriving the equation in (D).

These relationships are here expressed in somewhat more detail than was actually followed in the study. The purpose of doing so is not only to indicate what was done but also to make explicit what was not done. The reader can thus evaluate the consequences of various assumptions introduced in the solution. The main simplifications made in the study are: (1) the effect of prices of related products has in some cases been disregarded, and (2) some further assumptions with respect to the supply functions of some of the domestically produced products have been introduced. The nature of these simplifications will become clear from subsequent discussion.

As indicated above, domestic demand and supply projections were obtained under the assumption that 1960 relative prices will prevail in 1965. These projections were compared, and when excess demand (positive or negative) existed the equilibrium solution was derived. The actual details of the procedure are summarized in Chapter 4. At this stage, we shall only indicate in a general way the nature of the solutions. This is done by comparing the various combinations of supply and demand equations that were solved in order to reach the equilibrium solution. In so doing, a new subscript is used for indicating the range of commodities considered in each case. The groups are arranged and indexed according to their supply and demand attributes as discussed above.

(1) $(A+B)$, D: Products whose domestic consumption is supplied by domestic production. Supply is not predetermined, and, at existing prices, some export is projected. First, the export is projected, by judgment, at the level Q_n^{BD}. This is added to domestic demand, and equilibrium prices are obtained by equating:

$$Q_n^A + Q_n^{BD} = Q_n^D.$$

This group includes eggs, poultry meat, meat other than poultry and beef, milk, vegetables, potatoes, bananas, and melons. The main feature of the group is that the demand is downward sloping; the supply is not predetermined; and, from inertia or through the institutional mechanism, there

are no imports, so that the prices are determined by domestic demand and supply.

In the case of vegetables, eggs, and poultry meat, the solution was obtained by the intersection of the corresponding supply and demand equations. In some cases, prices of related products were determined simultaneously within this system. In other cases, prices of related products were set at their 1960 level. The result is therefore only a first approximation. Since, however, no major deviations from the assumed level were detected, no further iteration was made.

For other products of this group, it was assumed that supply would shift enough to fill the projected demand at 1960 prices. In the case of milk, the supply function is projected to increase by more than the demand, but additional considerations led to accepting the same solution.

(2) $A, (D+F)$: Products whose supply consists of domestic and foreign, or exclusively foreign, components. For this group, import price determines the price level. This price is inserted in the corresponding demand and domestic supply equations, and consumption, domestic production, and imports are projected. That is:

$$Q_n^A = f_n^A(F_n)$$
$$Q_n^D = h_n^D(F_n).$$
$$Imports = Q_n^A - Q_n^D.$$

This group includes wheat, other edible cereals, small grains, beef, fish, oil seeds, tobacco, some foods not produced domestically and treated as a group, and industrial crops. The production aspects of the field crops listed in this group are further discussed below.

It ought to be noted that the domestic price level of these groups is determined by the effective exchange rate. Usually this results in a uniform price level for domestically produced and imported products. However, there are some exceptions, such as in meat and fish, where price differentials sometimes exist. The assumption is that these price differentials are proportional to the foreign price. Consequently, the assumption of constant foreign prices leads to assumption of constant domestic prices.

(3) BE: This group consists of citrus products for 1965. The projected demand equation takes into consideration the projected supply from competitive countries. The solution was obtained by substituting the projected export in the demand equation; that is:

$$P_n^B = (f_n^B)^{-1}(E_n^B),$$

where P_n^B is the projected price.

(4) AE: This group consists of the various fruits for 1965. The result is obtained by a procedure similar to that used in (3) except that effects of

related fruits were also considered. The solution is therefore:

$$P_n^A = (f_n^A)^{-1}(E_n)$$

where E_n is here a vector of the quantities of various fruits which are included in the f_n^A.

At this stage, the limitations of land and water on agriculture as a whole (assumption (G)) are introduced. The land and water requirements of the products in groups E and D — excluding field crops for which there are perfectly elastic demand functions (by assumptions (C) and (F))[11] — are calculated. The results are the projected equilibrium quantities to be allocated to these products. These requirements are subtracted from the total projected values. The residual was considered as the projected quantity to be available for the sub-group of field crops listed above. Under this assumption, the next solution is considered.

(5) CD: Field crops traded internationally. Their prices are given in C, and the solution is:

$$Q_n^D = f_n^D(C_n, \textit{available land and water})$$

where C_n is a vector of prices. The supply function of this group is evaluated differently from those of the other products. This subject is discussed in a subsequent section.

From this discussion it should become clear that, by and large, the system used for projection is one of partial equilibrium. This stems from the fact that it was impossible to treat the cross effects so that that the various solutions would be obtained simultaneously. As a consequence, it was desirable to first submit the result to some tests.

On the demand side, it is possible to compare the total projected consumption with the other information available concerning the behavior of consumption. This test is discussed in Chapter 4. A similar procedure on the supply side would imply a comparison of projected growth rate with past performance. Such a comparison should, however, take account of the changes in land and water which are held fixed in the projection, as well as limitations which may develop owing to the fact that a considerable proportion of total production is sold in markets with negatively sloped demand functions. This comparison is discussed in Chapters 1 and 4.

The foregoing formulation of the equilibrium solutions makes clear the dependence of agricultural production on foreign prices. In the long run, only solutions (1), (2), and (3) exist, and these all depend on foreign prices. Solutions (4) and (5) do not exist in the long run since the bearing area of fruit cannot be considered as predetermined. Thus, (4) and (5) will be

11 This subgroup of field crops also includes groundnuts. For the justification see Yaron.

absorbed in an obvious way in (1). From this it is clear that a change in foreign prices, relative to wages of domestically owned factors, may have a considerable impact on agricultural production. Some use of this point is made in the discussion in Chapter 1.

In the formulation thus far, it has been assumed that producer and consumer prices are the same. This was done to simplify the exposition. In the analysis, the price differentials were considered, but only in a simple way. A more sophisticated approach would call for formulating supply and demand functions for marketing services, which account for the price differentials. The final equilibrium solution would then have to be obtained by bringing this market into equilibrium simultaneously with the other markets considered. Although this is an interesting approach, as well as an important one from the point of view of agriculture, it was not contemplated here since adequate treatment would have required a considerable extension of our work. The assumptions made reflect past experience and thus can be considered as reduced-form projections. As such, they may serve the immediate needs, should there be no important structural changes.

Another point which obtained only partial and insufficient treatment is the demand by the food processing industry. Where the industry buys its products on the wholesale market, its demand was combined with that of the demand for fresh products. In other cases, it was assumed that the relative differences between production and direct consumption will persist in the future. Here again, given time and more differentiable data, further refinement could prove of value.

2. *The Estimation and Use of the Demand Functions — Some Problems*

In this section we summarize the more important aspects of the procedure used in estimating the empirical demand equations. Most of the discussion here, and in the remainder of this section, is directed towards the reader who is interested in or familiar with the problems and techniques of estimating demand and supply equations. The main purpose of the discussion is to point out the particular problems encountered in this study and how they were handled.

Quantities consumed and income were measured on a per capita basis so that the size of the population was not included in the equation. The principal efforts were directed at estimating the effect of income and prices on consumption. In view of the rationing and the insufficient data of the earlier years, the period of analysis started in most cases in 1954 or later. Thus, data for only five or six years could be analyzed. It is well known that for purposes of statistical analysis, it is desirable to have wide variations

in the independent variable. Otherwise, if the observations cluster around some pcint with only small variations, no meaningful empirical relationships between the variables in question can be established. Fortunately, for perishable commodities, monthly data on organized marketing were available. In view of the seasonality in agricultural production, the monthly data contained considerable variability in quantity and price. They could, therefore, be used for estimating the price-quantity relationships.

Since, however, the intra-year variations constitute a major source of variations in the monthly data, it is obvious that such analysis is not very adequate for measuring the effect of income variations on demand. First there are hardly any monthly variations in income, as the major change in income occurs over time. Second, even if there had been monthly variations in income, it is questionable whether they would have been reflected in the data. Consumption in general and of food items in particular is likely to reflect the average level of income and not variations of short duration in income[12]. The most outstanding feature of income in the period under consideration here is its continuous upward trend. From Table 32, it can be seen that per capita disposable income, at 1955 prices, increased continuously from IL 886 in 1954 to IL 1,328 in 1960. Such a change is likely to be reflected better in data which show strong year-to-year, rather than within-year, variations. But, in this case, another problem may exist — that of separating the effect of time trend from that of income. Since income is strongly correlated with time trend, it is difficult to separate statistically the two effects in data which cover four to six years. If, however, trend is excluded from the analysis, then the income coefficient represents not only income, but also trend, effect[13]. When trend effect is positive (negative), the coefficient of income in the empirical equation will be biased upward (downward). This is particularly true for equations of single products, the demand for which is more likely to be affected by trend. It stands to reason that the trend effect is much weaker in the demand for food as a whole than in the demand for a particular product. Thus, it is very likely that the income coefficient for aggregate products is affected less than that for single products. Further comments on this point appear below.

To overcome the difficulties mentioned above, use was made of the data obtained from the Family Expenditure Surveys of 1956/57 and 1959/60, which were briefly discussed in Chapter 2. The main advantage of these

12 M. Friedman, *A Theory of the Consumption Function*, Princeton University Press, 1957, p. 243.

13 H. Theil, 'Specification Errors and the Estimation of Economic Relationships,' *Revue de l'Institut International de Statistique*, XXV, 1957, pp. 41–51.

data, for our needs, is that they reflect wide variations in income, and make it possible to measure with considerable reliability the effect of income on consumption. The data were analyzed in detail by N. Liviatan, and wide use of his results was made in our study[14]. Before continuing with the general discussion, it may be of some interest to see what the empirical findings suggest with respect to our discussion of the measurement of the income effect on consumption. Table 37 shows that when income elasticities were measured from the two sources of data (time series and survey) better agreement was found for aggregate than for single products. The figures for the former are shown in Table 41.

TABLE 41. *Selected Income Elasticities*

	Time series[a]	*Survey*[b] *1956/57*	*1959/60*
Total food	0.643	0.516	
Summer fruit[c]	0.907		
All fruit[c]		0.713	0.772
All vegetables	–0.075	–0.073	
Milk products	0.700[d]	0.528	0.588

[a] Quantity related to income except for total food and milk products.

[b] Expenditure related to income except for vegetables.

[c] Summer fruit includes fruit with higher income elasticities than winter fruit. This explains some of the differences between the two sources.

[d] See discussion on demand projections of milk in Chapter 4, p. 133 for derivation of this coefficient. It should be noted that this coefficient is derived under the assumption of no import of dairy products. The income elasticities for imported products are lower than those for the same products domestically produced. Since there was consumption of imported products by the survey families, it may account for some of the differences. These differences may also reflect the assumption that all milk will be marketed in bottles. See discussion by Blumenthal on this point.

Thus, there is in general close agreement between the results obtained from the two sources. However, such close agreement does not exist for some of the single products. In view of the considerations mentioned, it was in most cases decided to accept for our analysis the income elasticities obtained from the survey.

[14] N. Liviatan, *Consumption Patterns in Israel*, FP, 1964.

The survey income elasticities were used not only for the projection but also for estimating the net price-quantity relationships. The reason lies in the assumption that these coefficients are close to the 'true' coefficients and therefore measure correctly the effect of income on consumption. The discussion of the actual treatment of such a procedure is available in the literature[15].

The use of monthly data for estimating the demand function introduces some problems which are not encountered when annual data are used. There may be some variables which are associated with the particular month of the year and which may affect the observed price and quantities. The most obvious one is the temperature. For instance, the demand for fruit or beverages may rise with temperature. Temperature is an observed variable, and it is also easily measurable. However, there may be other variables which are not observed and as such cannot be included in the analysis. If these omitted variables are correlated with the independent variables which appear in the equation, the estimates are biased[16]. To account for such possible effects, a new variable is introduced and is called the month effect. Let us write equation (1) in linear form (or linear in logarithms) as:

$$Q_j = A_o + A_m + A_1 P_j + A_2 P_i + A_3 Y + A_4 T + U,$$

where A_m is the coefficient which represents the level of the function which is associated with the m^{th} month. To account for such an effect in the estimation, a covariance analysis was used. In fact, this procedure was extended also to include a year effect, that is, to allow for a systematic change (equal for all months of the year) in the level of the function. The difference between this procedure and the inclusion of a simple time trend in the equation is that the former does not restrict the trend to continuous and smooth effect.

The difficulty with covariance analysis is that it excludes some of the variations that exist in the data and therefore reduces the efficiency of the estimates. The procedure that was generally followed in this study was to test whether the effects of the month (A_m) or the year (A_t) are statistically different from zero. If they did not differ from zero, the regular regression was used. If they were statistically different from zero, we used another test of a qualitative nature. The requirement is that the estimated coefficients will conform to *a priori* knowledge derived from economic theory. That is, if the allowance for month or year effects eliminated most of the variations in the data, and the price-quantity coefficient therefore became insignific-

[15] The method was used by J. Tobin, 'A Statistical Demand Function for Food in the USA,' *Journal of the Royal Statistical Society, Series A*, Vol. CXIII, Part II, 1950, pp. 113–41.

[16] Theil, *op. cit.*

antly different from zero, the result was rejected and again the regular regression was accepted for further analysis. For the year effect, further considerations were taken into account. If there was no particular trend in the year effects, they were ignored, since there is no adequate basis for using the estimated year effects for the purpose of projection. When year or month effects were ignored for the reasons indicated above, we still considered trend and temperature variables in the regression. Their inclusion in the final form depended on conventional statistical considerations.

The next problem to be mentioned briefly is that of the method of estimation. In general, least squares estimates of a single equation were used. Argument for this procedure in estimating the demand for agricultural products was given by Fox[17]. Basically, it is founded on the observation that in the market period supply is predetermined. Consequently, quantity can be considered an exogenous variable. This also implies that price should be used as the dependent variable in the analysis. There are some limitations to this procedure which are not discussed here. It should only be noted that the procedure also requires related products to be represented in the demand equation in terms of their quantities rather than in terms of their prices. In the market, prices of related products are determined simultaneously. Therefore, when possible and when prices were not predetermined by the government, quantities of related products were used in the regression.

In view of the fact that least squares estimates may be biased, in some cases a simultaneous equation approach was also attempted. Simultaneous equation findings obtained for vegetables were compared with least squares results and no substantial differences were obtained[18].

In some cases, prices were fixed by the government and can therefore be considered exogenous. In such cases, the dependent variables of the analysis were quantities rather than prices.

The empirical results of the demand analyses are summarized in Table 37 and were discussed in Chapter 2. For purposes of projection, it was desirable to submit the equations to some empirical test which would give some indication of their performance. This was done by predicting the prices (or quantities whenever quantity is the dependent variable) for data which were not used in the analysis. While the analyses were in process, data for 1960 became available. In most cases, the results were satisfactory in the sense that the relative error of the projection was less than 10 per cent. Only in a few cases were greater errors obtained. It should be clear that

[17] K. Fox, *The Analysis of Demand for Farm Products*, US Department of Agriculture Technical Bulletin 1081, 1953.

[18] See Ben-David.

such analysis cannot predict the variables in question without error; this error can be divided into two components: (1) sampling error and (2) pure projection error. Thus, even if the various coefficients were estimated without error (that is, no sampling error), there would still exist the projection error. This component indicates that demand is affected by some other variables that were not included in the analysis. Therefore, even if the 'true' coefficients were known, this source of error would exist. To put it differently, the projection is only of the systematic component of the particular variable and takes no account of random variations around the systematic value.

The projections were made largely on the basis of the empirical equations. Nevertheless, judgment had to be introduced with respect to two parameters: (1) trend and (2) income elasticities. The use of trend in statistical demand equations, though widely accepted, creates difficulties when these equations are used for long-range projections. The question that immediately comes to mind is whether the trend will continue and if so, will it continue at the same rate as in the past? For intance, a strong downward trend was found in the consumption of wheat products. It is clear that such a trend cannot continue for ever, as there will always be some consumption of these products. Furthermore, is there any reason to assume that products whose consumption was not subject to trend in the past will not be effected by trend in the future? Obviously, no objective procedure can be used in reaching such decisions. Consequently, judgment was used in the matter.

A similar problem exists with respect to income elasticities. In most cases, logarithmic equations were used for the projections. The question is whether it is reasonable to assume that income elasticities will remain constant as consumption increases. Liviatan examined this problem from two aspects[19]. Using the data of the 1956/57 survey, he reports income elasticities for five income levels, calculated from a semi-logarithmic curve. The results are shown in Table 42.

The table shows that for some of the products there is a mild declining tendency of the income elasticities associated with increase in income. The average income of this group of families was somewhat above IL 287. To apply these results to our needs, we note that the relative change in the projected per capita income for 1965 as compared with the 1960 level is close to the relative change between the IL 350 and IL 300 groups. If we compare these two columns, we detect only small changes in the various elasticities.

[19] Liviatan, *op. cit.*, Chapter 2.

TABLE 42. *Income Elasticities of Food Items at Five Income Levels*[a]

	Level of income (C) in IL				
	200	*250*	*300*	*350*	*400*
Bread and cereals	–0.043	–0.044	–0.044	–0.044	–0.045
Fats	0.216	0.206	0.199	0.193	0.188
Vegetables	0.172	0.166	0.161	0.157	0.154
Fruit	0.750	0.643	0.575	0.528	0.494
Fish	0.473	0.428	0.397	0.374	0.356
Meat	0.917	0.761	0.668	0.606	0.561
Eggs	0.747	0.640	0.573	0.527	0.492
Milk	0.584	0.516	0.472	0.440	0.416
Total food	0.563	0.500	0.458	0.428	0.405

[a] The mean values of C and S (size) for the families on which this analysis is based are C = IL 287, S = 3.98.

SOURCE: Liviatan, *op. cit.*, Table 14, (Hebrew).

Another view of the changes in income elasticities that correspond to a change of 24 per cent in real income can be obtained by comparing the elasticities obtained in the two surveys. Table 37 shows that in most cases the elasticities obtained from the 1959/60 survey are close to those obtained from the 1956/57 survey. In fact, in some cases, an increase in values is observed. This of course can be attributed to sampling errors which can also explain some of the deviations in the other direction[20].

On the basis of these considerations, it seemed plausible to use the estimated elasticities, without adjustment, for the 1965 projections. When there was some decline between the two surveys, such as in eggs, the more recent estimate was employed.

The second aspect that was considered by Liviatan and which is more important for the 1975 projections, deals with the problem of saturation. The concept of saturation is generally not well defined. Liviatan uses the terms as synonymous with that point of income-consumption where the income elasticity is nil. That is, he finds the point at which a further increase in income will have no further effect on consumption. This is done by fitting a log normal curve to the income-consumption data. He obtains the following results:

[20] Another source for the differences is the change in quality of the products which reflects the supply conditions.

TABLE 43. *Average Per Capita Expenditure on Various Food Items Compared with the Estimated Saturation Level*

	Average monthly per capita expenditure (IL) (*1*)	*Estimated saturation level* (*2*)	(*1*) ÷ (*2*) (*3*)
All food	35.1	80.0	0.44
Eggs	3.2	4.4	0.73
Milk	3.2	4.5	0.71
Meat	8.5	20.0	0.43
Fruit	3.4	7.5	0.45
Vegetables	3.5	6.0	0.59

SOURCE: Liviatan, *op. cit.*, Table 12.

These results suggest that the consumption of milk products and eggs is close to the saturation level, whereas the consumption of the other products considered is about half way to this point. These results are certainly suggestive but should be viewed with reference to the limitations to which they are subject.

(1) The fit of cumulative curves is very sensitive to extreme observations; and, in this particular case, the number of extreme observations at 'high' income is relatively small as can be seen from the charts in the source.

(2) The saturation point is a function of the relative prices. That is, at the point of zero response of consumption to income, a substitution effect still exists. Thus, care should be taken not to associate the term with a notion of physical saturation.

Nevertheless, the results quoted in Tables 42 and 43 suggest that some adjustments should be made in the elasticities to be used for the 1975 projections. This was actually done as the reader will learn from the discussion of Chapter 5. In fact, in most cases, the adjustment was somewhat stronger than suggested by the data quoted. Two possible explanations for this are that:

(1) the elasticities were applied to the relative increase in income in the period 1965–75 and not to that of 1960–65.

(2) we have used quantity and not expenditure elasticities. It is assumed that as income increases, the major change in the rate of expenditure is in quantity consumed whereas the quality of the food basket continues to rise with only small changes in the rate of improvement.

3. *The Estimation and Use of Supply Functions — Some Problems*

For the reasons noted in Section 1 of this chapter, the procedure for supply projection can be divided into: (1) projecting the changes in the exogenous

variables; (2) estimating the effect of changes in the exogenous variables on the supply function; and (3) estimating the net price-quantity relationships. The first two elements are concerned with changes in the function itself, whereas the third one is concerned with movements along the function.

An important exogenous variable that we have to deal with is productivity. Unfortunately there is no reliable basis for predicting future changes in productivity. Very often, simple projections of trend are used. The difficulty with this approach is that there is no assurance that the same trend will continue or that, where there have been no changes in productivity, such changes will not start at a future date. From this, it is clear that at least some judgment has to be injected in projecting changes in productivity. In most cases it has been assumed that yields will continue to increase in the future. The rates of increase that were assumed varied somewhat in accordance with the judgment in each case.

The effect of changes in productivity on the position of the supply function was considered in Section 1. There it was indicated that productivity also rises in other sectors and that this is reflected in an increase of wage rates in general and of agricultural labor in particular. Therefore, what has to be taken into account is the net effect of productivity on supply after allowing for changes in wage rates. The quantification of each of these effects requires knowledge of the underlying production function or of the supply function.

As a first approximation, it has been assumed that the net effect of changes in productivity on the supply is unitary; that is, a 1 per cent increase in both productivity and wages will increase supply by 1 per cent. We deal here with changes in the supply function itself; and therefore, such changes trace horizontal price-quantity relationships over time where prices remain constant. Another reason for finding such price-quantity relationships is related to the existence of markets with highly elastic demand functions, such as the foreign markets. If farmers respond to prices, then a sharp decline in prices of some products will lead to a shift of resources to production of products whose prices remain unchanged. This means that, except for short-run variation, the price-production points should trace, over time, a horizontal line. It is in this sense that one should interpret the term 'nearly horizontal supply function', which appears in some of the discussions of the individual studies[21].

[21] The reference is to changes over time which represent not only changes along the function but also changes in the function itself. It is therefore an imprecise use of the term. However, this remark makes it clear in which sense the term is used and should prevent possible misinterpretation.

This argument, as well as the construction of the equilibrium projections, hinges on the fact that supply response by farmers exists. The estimation of the supply functions was subject to serious difficulties stemming from the fact that the period that can be analyzed is very short. In the case of the demand analysis, this difficulty was overcome by working with monthly data. In the case of supply, most products are produced on a seasonal basis; use of monthly data was therefore not always feasible. The exceptions are poultry products and vegetables for which the production cycle is relatively short and sufficient data could thus be acquired. The importance of the supply analyses for products where data were available extends beyond the frame of the particular products. It should be noted that farms in general are diversified; therefore, decisions on the supply of vegetables and poultry products are made by the same producers who make decisions on the supply of other products. If there is a supply response in one case, it very likely exists in other products.

The starting point for formulating the function to be estimated is equation (4) in Section 1. At a given point of time, production is obtained from a fixed capacity of various factors. For instance, the production of poultry products in a given year depends on the capacity of poultry barns. The effect of the fixed factors is represented by C in (4). The length of the run of the analysis is determined by the variables which are held fixed and which are therefore represented by C. For purposes of projection, we are interested in long-run situations where C represents factors which are fixed to agriculture in the period of the projection. For the purpose of statistical analysis, C represents the variables whose capacity was fixed during the year. In this sense, the empirical version of (4) represents a short-run supply function and its application to a long-run situation should take into consideration possible changes in C and their effect on the supply. It is in this sense that the comments on length of run that appear below should be interpreted.

The major difficulty in estimating (4) is not so much in the definition of the run as in the fact that no measurements exist of C, nor of productivity (K) which also appears in (4). This means that the best that can be done is to estimate (5). However, it is clear that (5) changes over time and therefore its estimation from time series data results in statistical bias[22]. To some extent, this problem can be overcome by using covariance analysis where year effect is allowed for[23]. This, of course, requires monthly data, for

[22] Theil, *op. cit.*

[23] Yair Mundlak, 'Estimation of Production and Behavioral Functions from a Combination of Cross-Section and Time-Series Data', *Measurement in Economics: Studies in Mathematical Economics and Econometrics in Memory of Yehuda Grunfeld*, Stan-

otherwise it is impossible to separate the year effect from the error term. It should be noted that the year effect represents changes in several variables: the various factors which are fixed within a period of a year, and productivity. In addition, it represents changes in conditions of uncertainty[24]. Such changes can, of course, be dominant and lead to erroneous conclusions with respect to the supply function. It is, for instance, the existence of the effect of such changes that made it impossible to arrive at meaningful results in the supply analysis for dairy milk, where monthly data could not be used[25].

The estimation of the short-run supply function with the allowance for year effect may give some indication of the price-quantity relationships. However, its application for projecting long-run situations requires projection of the year effect, which is, of course, not a simple matter. We therefore chose a different procedure in obtaining such projections, as mentioned below.

To summarize this part of the discussion, we indicate that the empirical analysis was aimed at the estimation of the short-run supply functions. The results indicate that there is a response to price in the short run; therefore, on the basis of theoretical considerations, it can be inferred that such a response, of stronger magnitude, also exists in the long run where more time is allowed for adjustment.

For a better approximation the long-run supply function, the empirical results were supplemented. In the case of poultry, where entry is relatively simple and production does not draw on the scarce resources (water and land), it was assumed that, in the long run, the supply function is highly elastic. The level of the supply function was determined on the basis of empirical study of the cost of production on a sample of farms.

In the case of vegetables, the alternative approach was used; vegetables were included in the projection of field crops. The supply of field crops was obtained by programming in which the basic idea was to attempt to simulate the actual response by farmers through the use of a normative model. An important assumption underlying the programming model is that the supply function of each of the crops considered is upward sloping only as a result of increasing alternative costs which arise from the land and water limitations. As the major purpose of the programming analysis was

ford University Press, 1963, and references listed there. This article has been reissued as FP Research Paper 12.

[24] *Ibid.*, and Mundlak, *Economic Analysis of Established Family Farms*, FP, 1964, Chapter 5.

[25] See Kislev, Appendix 2.

to secure final equilibrium projections, no attempt was made to trace the supply schedule for any particular product of the vegetable and the field crop group.

Some further comments on the problem of estimation appear in the discussion in the individual studies and will not be repeated here. We can now summarize the essential aspects of the preceding comments as follows: (1) for each of the products, we considered the shift in the supply function due to changes in the exogenous variables; (2) the existence of producer response to prices is clearly detected by the empirical analysis for vegetables and poultry products; and (3) it was assumed that a response to prices also exists in other products, including field crops whose projection was based on a somewhat different analytical framework.

The assumption of existence of supply response to prices is of the utmost importance for our projections. In the absence of such a response, the whole approach to the equilibrium projection as outlined in the first section of the Chapter would require modification. But the acceptance of the assumption of supply-price response does not solve all our problems. There still remains the question of the strength of the response and its speed. It is to this question that only partial answers were given. In general, we were not concerned with the speed of the response because the period under consideration is long enough to allow major changes. Furthermore, we have generally avoided the problem of random deviations from the course of convergence to equilibrium point. Thus, we are mainly interested in finding the equilibrium point and assume that market forces will converge to this point.

CHAPTER 4

SUPPLY AND DEMAND PROJECTIONS FOR 1965

1. *Introduction*

In this Chapter we summarize the projections made in the various commodity studies. We consider first the demand and later the supply projections, both under the assumption that 1960 prices will prevail in 1965. Demand and supply projections are then compared, and final equilibrium projections are derived. Finally these are related to the utilization of the major agricultural resources, mainly land and water.

The approach throughout in the individual studies was that of partial analysis; that is, each group of commodities was handled without considering the development of the aggregate. It is now our task, in aggregating the projections, to evaluate their plausibility. This is done in two ways. First, we check whether the projected total food basket accords with our knowledge of the income elasticity for food as a whole. Second, we ascertain that the projected requirements of agricultural resources do not exceed their available amounts.

2. *Demand Projections*

The available empirical information suggests that the income elasticity for food as a whole is in the range of 0.5 to 0.6. Thus, assuming that the 1965 per capita real income will be about 20 per cent over the 1960 figure, this implies that real per capita expenditure on food will be 10 to 12 per cent higher in 1965 than in 1960.

The aggregation of the separate demand projections is not a straightforward procedure. The following points have to be considered:

(a) The studies did not cover all food items or all food groups, although most foods were covered; we must therefore, consider all food groups. Furthermore, where all items in any group were not covered, we must complete the projection for that group,

(b) The aggregation requires use of data which are complete in coverage and which can be projected to 1965. The most appropriate data for the purpose are those compiled by the National Accounts Unit of the Central

Bureau of Statistics, as reported in Tables 27, 28, and 34[1], and referred to below as NAUS. But these were not the data used in most of the individual commodity studies, as they became available only at a late stage of our study. Moreover, they were not appropriate for most of the empirical analyses, which were based on monthly data, whereas we will now use annual figures. Furthermore, in most cases the data used in the empirical analyses were of sales through organized marketing only; these were the only figures available at the time, but in any event they would have been the most accurate ones. The estimates of unorganized marketing and home consumption by farmers are judged to be less reliable than those of organized marketing, even on an annual basis. Thus, the breakdown of annual estimates of home consumption and unorganized marketing into months would have been subject to large errors.

The procedure followed below is to apply the projected relative increase in consumption given in the individual studies to the consumption series on which our calculations are based. Any additional information available on the missing components is taken into account. This is done for each group separately. The projections used are those obtained under the assumption that 1960 real prices will prevail in 1965. Thus the projections reflect trend and changes in income only.

a. *Flour and cereals*

This group consists mainly of wheat products. Blumenthal's projections refer to wheat flour. The per capita consumption of wheat flour in 1959/60 was 114.5 kilograms[2]. In the same year the per capita consumption of other products in this group was 6.0 kilograms[3]. Thus, total per capita consumption was 120.5. The total per capita consumption of final products in the NAUS is 138.0. The difference reflects mainly differences in the weighting of final products and flour and, perhaps, wastage.

The projection is of an annual decline of 3 per cent in flour consumption. It is a trend projection and reflects the increase in the real price of wheat products. It is difficult to decompose it into price and income effects. Since

1 A series of physical consumption could also be constructed from the annual Food Balance Sheet which is reported in the *SAI*. This was in fact done by Blumenthal in some of his studies. The decision to use the series mentioned above was influenced to a large extent by the fact that the series contains physical quantities as well as expenditures, and hence prices, and therefore is complete from the point of view of our needs. Furthermore, it was revised recently and thus can be considered as most appropriate.

2 Blumenthal, *Wheat*, Table 4 (based on Food Balance Sheet).

3 *SAI* No. 12, p. 155, Food Balance Sheet, 1961.

there is reason to believe that the price elasticity of this group is low, we will accept the projection as it stands in this calculation. Thus, the projected per capita consumption for 1965 is 98.5 kilograms of wheat flour. We assume no change in the consumption of the other products in this group, and the projection for the group as a whole is therefore 104.5 kilograms, or 86.7 per cent of the 1960 level. Applying this percentage to the NAUS figure of 138.0, we obtain a per capita consumption of final products of 119.6 kilograms.

The change in expenditure is expected to follow a somewhat different pattern, as there has been a shift to more expensive products within the group. On the basis of Table 30 we assume a decline of about 1 per cent in expenditure per year, or approximately 5.5 per cent for the period as a whole. This agrees with the income elasticity for the group obtained in the 1956/57 survey. The per capita expenditure in 1960 was IL 66.5. Thus, the projected figure for 1965 is IL 62.84.

b. *Meat*

The projections of poultry meat and meat other than poultry were calculated separately.

There are several estimates for per capita consumption of poultry meat in 1960. Hochman used the NAUS figure of 17.0 kilograms as a basis for comparison. The projection, based on trend and an income elasticity obtained from the survey, is 20.5 kilograms, an increase of 20.6 per cent over 1960. It is conceivable that, in view of the already high per capita consumption, the income elasticity in the period 1960–65 will be somewhat lower than the one obtained in the survey. It is, however, difficult to decide on any adjustment at this stage, as the estimates obtained from the time series analysis suggest a much higher value. Some account of the high level of consumption has already been taken by using the survey elasticity, which is relatively low (0.167 for the increase in income between 1960 and 1965).

The per capita expenditure in 1960 was IL 42.17. Applying the 20.6 per cent increase in consumption, the projected per capita expenditure for 1965 is IL 50.9.

For 1960 Blumenthal used a figure of 10.7 kilograms for per capita consumption of meat other than poultry. This was taken from the NAUS. Blumenthal's projection is an annual increase of 5.9 per cent in consumption. It is derived from trends of the last few years and reflects also the decrease in the real price of meat in this period. Since the price elasticity for meat is believed to be relatively high, it is likely that the effect of such a decline in prices was significant and would warrant being allowed for in our cal-

culations. We therefore assume that 4 per cent of the increase is due to income and trend and 1.9 per cent is the effect of decline in price. It should be recalled that the income elasticity for meat is in the neighborhood of 1, which would tend to confirm our assumption. This carries no implications as to the effect of price on future consumption, which is considered later. We thus obtain a projected increase in meat consumption of 21.5 per cent between 1960 and 1965. Applying this to a per capita consumption of 10.7 kilograms in 1960, the projected per capita consumption for 1965 is 13 kilograms.

In 1960 per capita expenditure was IL 96.1 for all meat and IL 42.2 for poultry meat; this comes to IL 53.9 for other meat. Applying the 21.5 per cent increase, and assuming that the composition of the group does not change, we obtain a projected expenditure of IL 65.53 for meat other than poultry. The projected expenditure for both meat groups together is therefore IL 116.4.

c. *Fish*

No detailed analysis of the demand for fish was made. On the basis of the income elasticities obtained from the survey data, we assume an income elasticity of 0.25 for quantity and 0.3 for expenditure. Per capita consumption in 1960 was 10.4 kilograms, valued at IL 20.3. The projections for 1965 are 10.9 kilograms and IL 21.5 respectively.

d. *Milk and dairy products*

The calculations for milk products are somewhat more complicated. Blumenthal's data on per capita consumption of dairy products serve as the basis for our computations. These data were assembled largely from the dairies' reports to the Ministry of Commerce and Industry and were judged to be reliable[4]. Comparisons with the survey data and with the CBS data showed only minor discrepancies. Since it would have required a considerable amount of work to arrange the CBS data according to Blumenthal's groups, and since there was little to be gained by doing so, it was decided to conduct the comparison here in a somewhat different way from that followed with respect to the other products.

The relevant calculations are summarized in Table 44. Per capita expenditure on dairy products will increase from IL 52.1 in 1960 to IL 59.4 in 1965, or by 14 per cent. This implies an income elasticity of 0.7, which is somewhat higher than that obtained from the survey data (0.53 to 0.59).

[4] See Blumenthal, *Milk*, Appendix A.

TABLE 44. *Per Capita Consumption of Dairy Products: 1960 and 1965 Projection*

	Consumption (kilograms)		*Per cent change from 1960 to 1965*	*1960. (per cent)*	*Expenditure (1960 IL)*	
	1960 (1)	*1965* (2)	(3)	(4)	*1960* (5)	*1965* (6)
TOTAL				**100.0**	**52.1**	**59.4**
Milk[a]	82.7[b]	82.7[b]	0	49.9	26.0	26.0
'Other dairy products'	9.8	10.4	6	18.1	9.4	10.0
Soft cheese	5.2	6.1	18	11.1	5.8	6.8
Hard cheese	2.1	2.8	34	12.4	6.5	8.7
Butter	1.1	2.0	80	8.5	4.4	7.9

[a] Includes goats' and sheep's milk and is adjusted for home consumption. See text for explanation.
[b] Liters.

SOURCE: Columns (1) to (3) — Blumenthal *Milk*, Table 20, except for milk (see note a).
Column (4) — *Ibid.*, Table 13.
Column (5) — Total expenditure from Table 36, broken down by weights in column (4).
Column (6) — Per cent change in column (3) applied to column (5) figures.

Since the income elasticities used in the calculations were obtained from the time series analysis, it is possible that they also reflect some trend. In any case, the divergence is not large for the group, the main differences being found for individual commodities. The survey elasticities are higher for drinking milk and 'other products' and lower for cheese and butter. However, the difference between the two alternatives of demand for milk for all uses is rather small.

A word of explanation is required on the consumption of drinking milk. The figure of 56.0 liters, used by Blumenthal, is per capita consumption of cows' milk purchased through organized marketing by the milk-purchasing population, which accounts for 83 per cent of the total population. In order to get the average per capita consumption of all milk (including goats) of the total population, we have to add: (1) consumption of goats' milk; (2) an estimate of the per capita consumption of the remaining 17 per cent, which implies estimation of home consumption.

Blumenthal quotes the following figures for total consumption of drinking milk in 1959/60: cows' milk — 149.3 million liters; goats' milk — 24.8 million liters[5]. If we divide these figures by the average 1959/60 population of 2,103,000, we obtain a per capita consumption of 70.9 liters of cows' milk and 11.8 liters of goats' milk. The total average per capita consumption of drinking milk was therefore 82.7 liters.

To accept this figure as the projected value would imply more than assuming that per capita consumption of milk remains constant. Since there is a considerable variation in per capita consumption between the 'milk-purchasing population' and the 'non-purchasing population', the projected figure depends on the weight of the two groups. Our assumption implies that the weights will remain constant. An alternative approach is to assume that population growth will contribute mainly to the 'milk-purchasing population'. Under this assumption, the projected per capita consumption of cows' milk will be 67.6 liters. If we also assume that most of the goats' milk does not reach the milk-purchasing population, we arrive at a projected per capita consumption of 10 liters of goats' milk.

We thus arrive at two alternate projections, the first being the higher one, as shown in Table 45.

The choice between the two projections is rather difficult, as it depends on factors which were not investigated here and which are related to the accuracy and definitions of the estimates of the consumption of the non-

[5] In the CBS publication, goats' and sheep's milk are reported in one category, Goats' milk is used mainly for drinking, whereas sheep's milk is used mainly for processing.

TABLE 45. *Consumption of Drinking Milk: 1965 Projection*

Projection[a]	*Per capita (liters)*			*Total (million liters)*		
	Cows	*Goats*	*Total*	*Cows*	*Goats*	*Total*
A	70.9	11.8	**82.7**	179.2	29.8	**209.0**
B	67.6	10.0	**77.6**	170.9	25.3	**196.2**

[a] A is obtained under the assumption that the proportion of the 'milk-purchasing population' will remain at 83 per cent. B is obtained under the assumption that the proportion of the 'milk-purchasing population' will increase to 85.7 per cent.

purchasing population. For further computations we will resort mainly to the higher estimates.

To arrive at the demand for milk in the various uses, the projected consumption of milk products is reported in terms of milk equivalent. From Blumenthal's computation it emerges that 195.2 million liters of cows' milk will be required for processing in 1965. This was obtained under the assumption that 31.4 per cent of the hard cheeses will be produced from sheep's milk, as was the case in the past. If this ratio is to prevail in the future, sheep's milk used for processing will have to increase in proportion to the projected increase in hard cheese consumption, that is, by 60 per cent. Blumenthal reports a value of 7.8 million liters for this item in 1960. The projected value is 11 million liters. Hence, the total projected amount of milk required for processing is about 206 million liters, or 81.5 liters per capita.

To conclude, the total per capita consumption of all milk was 145.8 in 1959/60 (82.7 + 63.1). The 1965 projection is 164.2 (82.7 + 81.5), an increase of 12.6 per cent.

To arrive at the total demand for production of milk cows, a few more calculations are needed, and they will be carried out in our consideration of the equilibrium forecasts.

e. *Eggs*

Hochman's projection is for a per capita consumption of 377 eggs in 1965, a projected increase of 9.3 per cent over the 1960 level.

The per capita expenditure on eggs according to the NAUS was IL 31.5 in 1960. Applying the 9.3 per cent increase, the 1965 projected value is IL 34.4.

f. *Edible oils*

According to Blumenthal, per capita consumption of edible oils in 1960 was: oils — 8.8 kilograms; oil products — 0.76 kilograms; margarine — 6.5 kilograms[6]. Blumenthal's projections for per capita consumption in 1965 are: oils and their products — 9 kilograms; margarine — 6.7 kilograms. These amount to about a 2.2 per cent decrease in the consumption of edible oils as compared with the 1960 level. The per capita expenditure in 1960 was IL 20.9. Applying the 2.2 per cent decrease, we obtain a projected value of IL 20.4 for 1965.

g. *Fresh fruit*

Goldenberg covered only summer fruit. The major omission is citrus, consumed mainly in the winter months. We have therefore to incorporate in our calculations the fruits and months not covered by Goldenberg's study. Furthermore, his analysis was mainly an equilibrium analysis. That is, demand equations were estimated and the projected supply was used to project the decline in prices of summer fruit. The reason for this procedure is clear: the 1965 supply is determined to a large extent by the planted area in 1960, as it takes several years before an orchard bears fruit.

At this stage we are primarily concerned with projecting demand under the assumption that real prices will not change. Thus we must deviate from Goldenberg's procedure and follow instead the approach used for the other commodities. In so doing, we use the NAUS data throughout. Discrepancies between the data used here and those used by Goldenberg are primarily due to the fact that the latter consist mainly of organized marketing, some of whose fruit was used for processing. The NAUS reports total direct consumption (including unorganized marketing and home consumption) of fresh fruit. The projections made by Goldenberg will be discussed in the section dealing with the equilibrium projections.

The calculations are summarized in Table 46. The elasticities used are based on the estimates obtained from the survey data shown in Table 37. For citrus and bananas, the estimates from the 1959/60 survey are lower than the 1956/57 survey figures. These were further adjusted downward, to reflect higher per capita consumption. Similar adjustment was made for the other items. The extent of the adjustment was dictated by the income elasticity for all fruit, as the weighted average of the elasticities for the separate items should be equal to this. The weights used were the expendi-

[6] These figures were obtained from the NAUS and therefore no adjustment is needed.

TABLE 46. *Per Capita Consumption of Fresh Fruit: 1960 and 1965 Projection*

	1960		*Income elasticity*	*1965 Projection*	
	Kilograms (1)	*IL* (2)	(3)	*Kilograms* (4)	*IL* (5)
TOTAL	**123.0**	**65.40**	0.775	**136.62**	**75.55**
Citrus	55.7	14.75	0.500	61.27	16.23
Melons	19.7	5.65	0.150	20.29	5.82
Bananas	13.8	10.21	0.500	15.18	11.23
Grapes	12.0	8.35	0.500	13.20	9.19
Deciduous	16.2	22.95	1.400	20.74	29.38
Miscellaneous	5.6	3.49	0.300	5.94	3.70

SOURCE: Column (1) — NAUS (unpublished).
Column (2) — The expenditure on total fruit is derived from Table 27. The commodity breakdown is according to the proportion spent on each group in 1960, using the NAUS.
Column (3) — Adjusted elasticities (see text for explanation). Figure for total is the implicit elasticity.
Columns (4) and (5) — Obtained by applying the elasticities in Column (3).

ture on each fruit group in 1960. The value thus obtained is 0.775, which is similar to that obtained from the 1959/60 survey and a little lower than the value obtained for all summer fruit in the time series study (0.907).

The same elasticities were used for projecting both quantity and expenditure. As we deal with either single commodities or with a low degree of aggregation, the differences between quantity and expenditure elasticities should not be large. It is interesting to note that in the 1956/57 survey this was the case for most fruits.

It appears that with no change in prices, per capita expenditure on fresh fruit will increase from IL 65.4 in 1960 to IL 75.5 in 1965, or by 15.5 per cent.

h. *Vegetables and potatoes*

We shall deal here with only two groups: all fresh vegetables and potatoes. Separate projections of the more important vegetables were obtained by Ben-David and are reported in his study.

Ben-David's analysis was based on organized marketing data. In the period 1955–60 this accounted, on the average, for 73 per cent of total production. The difference between organized marketing and production consisted of unorganized marketing, home consumption, surpluses, and purchase by industry. Per capita consumption through organized marketing in 1960 was 87.3 kilograms of fresh vegetables and 28.0 kilograms of potatoes. The corresponding NAUS figures are 100.8 kilograms and 35.9 kilograms.

The projected per capita consumption (organized marketing) of fresh vegetables is 85.9 kilograms, This is a decline of 1.6 per cent from the 1960 level and reflects a low negative income elasticity. The projected per capita consumption (organized marketing) of potatoes is 28.0 kilograms, that is, no change from the 1960 level. Applying the relative change between the above projection and the 1960 level to the NAUS, we obtained 99.2 kilograms and 35.9 kilograms for fresh vegetables and for potatoes, respectively, or a total of 135.1 kilograms for the two combined.

Per capita expenditure in 1960 was IL 40.5 for fresh vegetables and IL 9.1 for potatoes. In view of the differences between quantity and expenditure elasticities, we shall assume no change in expenditure in 1965 as compared with 1960.

i. *Processed fruit and vegetables*

The demand for this group was not studied in detail and for the purpose of projection we use here the income elasticities derived from the 1959/60 survey. These are 0.898 for fruit and 0.529 for vegetables. We use an elasti-

city of 0.65 for the group as a whole. The per capita expenditure in 1960 on this group was IL 9.1. The projected value for 1965 is IL 10.3.

j. *Summary and evaluation of food projections*

Table 47 summarizes the adjusted projections described above. The 1960 data are those of the NAUS, on which the projections are based.

Total per capita expenditure on food in 1960 was IL 478.7. The empirical studies suggest an income elasticity of 0.5 to 0.6 for food and no significant trend. In view of the rising per capita consumption of food, we use the lower value of the range, that is, 0.5. Accordingly, the projected per capita expenditure for 1965 on food as a whole is IL 526.6.

No projection was made of the expenditure of three food groups: sugar and sugar products; tea, coffee, and cocoa; and miscellaneous items. The expenditure on these three groups amounted to IL 67.2 in 1960 or to 13.9 per cent of total expenditure on food. Instead of projecting the expenditure of this combined group directly, we shall examine what our projections of the other products imply with respect to this group.

The projected expenditure on food (except 'other food') is IL 450.4, compared with IL 411.5 in 1960. The difference between the 1965 projected expenditure for food as a whole and for the items considered in detail is IL 76.2, as compared with IL 67.2 in 1960, or an increase of 13.4 per cent. If we use this residual as our projection for the combined missing groups, this would imply an income elasticity of 0.67. This group thus falls among products, such as meat and fresh fruit, with a high income elasticity.

Examination of recent trends as reflected in Table 29 indicates a rather rapid increase in the consumption of tea, coffee, and cocoa; a moderate rise in the consumption of sugar products; and a slight decline in the miscellaneous group. Expenditure on the combined group (at 1955 prices) rose from IL 38.8 in 1956 to IL 45.3 in 1961, or by about 17 per cent. At the same time, real per capita income rose by 43 per cent (Table 32). Thus, on the basis of the comparison above, it seems that the income elasticity for the combined group is lower than 0.67. However, examination of Table 33 shows that the prices of these products increased more than prices of all foods, especially until 1959. The price-rise had an opposite effect to the increase in income and accounts in part for the observed consumption trend. Taking this price effect into consideration, it would mean that our implicit projection is consistent with the recent trend. It is very likely that the rate of change will be different for the various components of the group. But as we are not interested in this group as such, no attempt is made to evaluate the possible differential changes.

TABLE 47. *Demand Projections for 1965*[a]

	Per capita quantity			*Per capita expenditure*		
	1960	*1965*	*1965 as per cent of 1960*[b]	*1960*	*1965*	*1965 as per cent of 1960*[b]
	Kilograms			*1960 IL*		
1. TOTAL FOOD (2. *through* 11.)				**478.7**	**526.6**	110.0
2. Flour and cereals	138.0	119.6	86.7	66.5	62.8	94.4
3. Meat	27.7	33.5	120.9	96.1	116.4	121.1
a. Other than poultry	*10.7*	*13.0*	121.5	*53.9*	*65.5*	121.5
b. Poultry	*17.0*	*20.5*	120.6	*42.2*	*50.9*	120.6
4. Fish	10.4	10.9	105.0	20.3	21.5	106.0
5. Milk and dairy products[c]	145.8[d]	164.2[d]	112.6	52.1	59.4	114.0
6. Eggs	345[e]	377[e]	109.3	31.5	34.4	109.3
7. Oils	16.0	15.7	97.8	20.9	20.4	97.8
8. Fresh fruit	123.0	136.6	111.1	65.4	75.6	115.5
9. Vegetables and potatoes	136.7	135.1	98.8	49.6	49.6	100.0
10. Processed fruit and vegetables				9.1	10.3	113.0
SUBTOTAL (2. *through* 10.)				**411.5**	**450.4**	109.5
11. Other foods[f]				67.2	76.2	113.4
12. Cigarettes	1,249	1,200	96.1	30.3	35.1	115.6
13. Cotton fiber	4.8[g]	6.1	127.1[g]			

[a] These projections reflect trend and income changes and were obtained under the assumption that 1960 real prices will prevail in 1965. All the 1960 data are those of the NAUS. See the text for details of derivation.

[b] Calculated before rounding.

[c] The quantity for this item is in terms of milk equivalent of all products and includes sheep's and goats' milk. See Table 44 and the text for details.

[d] Liters.

[e] Units.

[f] Sugar, sugar products; tea, coffee, cocoa; and miscellaneous.

[g] This figure is for 1958 and not for 1960, and 127.1 is the projected quantity as per cent of 1958.

To summarize, the demand projections for the separate food items agree with a food basket the expenditure on which is consistent with our knowledge of consumer response to changes of income.

We now turn to a summary of the demand projections for non-food items — cotton and tobacco.

k. *Cotton*

The projection of the demand for cotton is based on an income elasticity of 0.7 for raw cotton as compared with 0.75 for all fibers. Braude's work was completed earlier than the other projects, and his base year for calculation is 1958. The increase in real per capita disposable income between 1958 and the projected 1965 value is 39 per cent. Per capita consumption of raw cotton in 1958 was 4.8 kilograms, and the projected value for 1965 is 6.1 kilograms.

l. *Tobacco and cigarettes*

The main item of this group is cigarettes[7]. Per capita consumption of cigarettes was relatively stable in recent years and fluctuated around an annual value of 1,200 cigarettes. The major changes were in the quality of the cigarettes consumed, and were accounted for by Wilsker in terms of (1) income, (2) trend, and (3) differential prices.

Wilsker's projections are for the composition of the cigarette group, which is divided into four sub-groups, ranging from the cheapest to the most expensive. The projection was made under the assumptions that total consumption will continue to be at the level of 1,200 cigarettes and that the 1961 price ratios will prevail in 1965. The latter assumption was somewhat modified to allow for an increase of two agorot per pack on all brands, contemplated by the Ministry of Finance for 1961. Two assumptions were also made with respect to the extrapolation of trend. Altogether four projections were computed; the first and second assumed no trend, while the third and fourth reflect some trend effect; the first and the third projections assume that July 1961 real prices will prevail in 1965, while the second and the fourth assume the price-rise described above.

The four projections reflect an increase in per capita expenditure of 13 to 17 per cent over 1960. It may be noted that according to the NAUS there was a slight decline in per capita expenditure in recent years (Table 30). According to Wilsker, this reflects the changes in tax policy which resulted in higher consumption of the cheaper types and lower consumption of

[7] Tobacco in other uses is mainly of a different kind and was not considered in this study.

TABLE 48. *Per Capita Consumption of Cigarettes: 1960 and 1965 Projection*

	Cigarettes by price group					*Expenditure*	
	1	*2*	*3*	*4*	*Total*	*IL*	*1965 as per cent of 1960*
			(*thousands*)				
1960							
1. Actual	0.496	0.314	0.389	0.050	1.249		
2. Adjusted	0.476	0.302	0.374	0.048	1.200	30.35	
Alternative 1965 projections							
3. *a*	0.240	0.260	0.598	0.102	1.200	35.43	117
4. *b*	0.294	0.240	0.584	0.082	1.200	34.60	114
5. *c*	0.255	0.264	0.584	0.097	1.200	35.09	116
6. *d*	0.312	0.242	0.568	0.078	1.200	34.22	113
7. *1960 prices* (*IL per thousand*)	17.05	23.36	35.50	39.58			

SOURCE: Line 1: Wilsker, p. 9, Table 6.

Line 2: Adjusted so that total consumption will be 1,200.

Lines 3 — 6: Wilsker, p. 45, Table 18. The projections are described as follows:

a assumes no trend and the existence of July 1961 prices.

b assumes some trend and the existence of July 1961 prices.

c assumes no trend and modified prices (see text).

d assumes some trend and modified prices (see text).

Expenditure in IL is calculated by applying the prices in Line 7 to the figures in the first four columns

Line 7: Wilsker, p. 11, Table 8, last line. Prices in the source are reported for packs in terms of 1951 prices. The consumer price index in 1960 (1951 = 100) was 292.2. A pack contains 20 cigarettes. The prices shown here were obtained by multiplying the prices in the source by 146.1 ($=2.922 \times 50$).

the more expensive types. With such a response, it seems doubtful whether price differentials will in future be manipulated to the same extent as in the past. If this assumption should prove correct, it seems that the tendency will be to restore the consumption of high-priced cigarettes and thus to increase per capita expenditure as well as tax revenue.

3. *Supply Projections*

The nature of the assumptions and analyses of the supply of the various products was discussed in Chapter 3. By way of summary, it is recalled that the products are divided into the following groups:

(a) Products whose import constitutes a considerable proportion of

total supply. These are wheat and other cereals, oil-seeds, sugar, tea, coffee, and cocoa. It is assumed that the supply of foods of which these products are a major constituent is perfectly elastic in the neighborhood of the projected consumption. Furthermore, in so far as these products are produced domestically (small grains), it is assumed that the demand for them is also perfectly elastic.

(B) Products whose domestic production satisfies most or all of the domestic demand — and the supply of which in 1965 will be determined by market prices and government policy between now and 1965. This group includes vegetables, milk, beef, poultry, other meat, eggs, and some other less important products.

It should be noted that the supply of the products of group (A) which are domestically produced also depends on the prevailing farm prices in Israel. The distinction is here made according to the demand facing the growers. In the case of the imported products of group (A) the demand is assumed to be perfectly elastic, whereas here it is negatively sloped.

(C) Fruit, whose supply in 1965 is largely determined by the 1960 planted area.

This section deals with the products of the last two groups, (B) and (C), whereas the discussion on the equilibrium projections which follows in the next section will include all products.

The purpose of this section is to summarize the separate supply projections; that is, under the assumption that 1960 farm prices will prevail in 1965. Such projections serve as an introduction to the next section in the sense that they make it possible to determine whether 1960 prices imply excess supply or excess demand.

Following the procedure used in our demand projections, it is desirable to relate the projections to a published series of data and thereby secure consistency as well as the possibility of comparison with past performance. The data selected for this purpose are those of physical production as reported in the SAI and will be referred to as SAIS (SAI Series).

a. *Milk*

The empirical estimation of the supply function of cows' milk did not give conclusive results, and for that reason, Kislev chose to project production on the basis of past trends. This was based on the observation that there was rapid expansion in the past in spite of the decline in the real price of milk. The expansion was accounted for by the favorable prices of beef, which is produced jointly with milk, as well as by the increase in yield per

cow and per manday. Should prices remain at their 1960 level, it is likely that these factors will continue to lead to higher production.

In the period 1956–60, production rose by about 62 per cent. If another 62 per cent is added, the production level in 1965 will be 449 million liters as compared with 277 million liters in 1960.

In order to project all milk, we have to add a projected value for production of sheep's and goats' milk. The latter fluctuated in the period 1956–60 from 38.1 to 41.5 million liters, with the highest output in 1958. In 1960 production was 39.3 million liters. Thus, it seems that there is no trend in production, and on the basis of these data we assume a production of 42 million liters for 1965.

If, therefore, the recent trend of expansion in production continues, the 1965 production of all milk will reach a level of 491 million liters compared with 316.6 million liters in 1960. This is an increase of 55.0 per cent.

Examination of the past rise in yield per cow led Kislev to accept an annual rate of increase of 2.4 per cent. Accordingly, the projected yield for 1965 is 4,780 liters as compared with 4,250 liters in 1960. This projection is used later for projecting the size of the dairy herd and for other corollary projections which are discussed in the next section.

b. *Meat other than poultry*

In our projections of meat production it is convenient to distinguish between (1) mutton, (2) other meat, and (3) beef. The sources of beef production are subdivided into: (a) dairy herds, (b) beef herds (both mainly in Jewish farming), and (c) herds in Arab farming.

The major component of meat production is that from dairy herds. The level of this production depends on the size of the herd. At this stage there is, however, no point in calculating projected milk production in order to obtain the projected production of beef in the dairy herd. As we shall see, the equilibrium production of milk is lower than that suggested by the supply projection. It is, therefore, desirable to postpone this calculation to the next section.

The beef herd — a relatively new activity in Israel — showed marked expansion in the past. It is assumed that the branch will continue to expand but at a somewhat different rate. In constructing the projection, Kislev consulted expert opinion on the carrying capacity of the natural pasture and on the current cost situation in the beef herd. On this basis, he arrives at a projected meat production of 5,822 tons (live weight)[8].

[8] There was no readily available value for the 1960 production of this source. However, to give some idea of the relative order of magnitude of the increase — the 1965 pro-

The projections of the other sources are based on past trend alone and are (live weight): mutton, 6,000 as compared with 4,900 in 1960; other meat (mainly pork), 7,000 as compared with 5,700; and beef in Arab herds, 3,500 as compared with 2,600 in 1960.

c. *Eggs and poultry meat*

Two supply functions are considered by Hochman in projecting the production of poultry products: long-run and intermediate-run. The difference between the two is mainly that the second assumes that the capacity of poultry structures will remain fixed at the 1960 level. The justification for considering the intermediate-run supply function for poultry lies in the fact that existing capacity could sustain the production necessary to meet the projected domestic demand in 1965.

The intermediate-run supply functions were estimated empirically. The long-run function was assumed to be horizontal in the relevant range of quantities. Its level was determined on the basis of data collected from a survey of poultry farms.

Under the assumption that the 1960 prices will continue to prevail in 1965, Hochman obtains the following projections of organized marketing from the empirical intermediate-run supply functions: eggs, 914 millions; poultry meat, 61,300 tons live weight. The corresponding values for 1960 are reported by Hochman as 937.7 million eggs and 40,300 tons (live weight) of poultry meat[9]. The increase in the projected production of poultry meat over the 1960 value reflects the strong upward trend in the supply function, which Hochman attributes to the constant increase in productivity. The long-run function was used only in the equilibrium projection and will be discussed later.

d. *Fruit*

The composition of fruit production in 1960 is summarized in Table 49. Detailed studies were conducted on citrus, table grapes, deciduous fruits, and some other fruits. However, as far as production is concerned, the 1965 projections were based on the 1960 planted area, as any subsequent planting will have little effect on the supply in 1965: the projections to be described below are actually projections of the bearing capacity of the 1960 fruit area.

Levhari quotes a projected citrus production of 820,000 tons for the

jection is for a herd of 20,000 beef cows as compared with 12,800 in 1961, an increase of 56 per cent.

9 See Hochman, p. 9, Table 5.

TABLE 49. *Fruit Production*[a]: *1960 and 1965 Projection*

(*Thousand tons*)

	1960				*1965 production*	*1965 as per cent of 1960* (5)÷(1)
	Production	*Exports*	*Organized marketing*			
	(1)	(2)	(3)	(4)	(5)	(6)
Citrus	609.6				830.0	136
Olives	6.8				12.6	185
Wine grapes	24.3		24.2		35.0	144
Deciduous fruit	37.5		21.5	27.6	109.5	292
Table grapes	28.4	0.6	21.9	20.9	41.2	145
Bananas	34.3	4.1	32.8	31.0	[b]	
Melons	50.5	3.7	20.4		[b]	
Subtropical and other	14.1	0.1	7.1		22.6	160

[a] Blanks indicate information either not available or not utilized in discussion.

[b] See Table 51.

SOURCE: Columns (1) and (3) — *SAI No. 12*, pp. 189 and 205.
Column (2) — *Report on Agriculture*, submitted to the Knesset by the Minister of Agriculture, February 1962, p. 37.
Column (4) — Goldenberg, p. 24, Table 4.
Column (5) — Citrus, Levhari; deciduous and table grapes, Goldenberg, Appendix 2, and the discussion in the text.

1964/65 season and 880,000 tons for the following season. These amount, respectively, to increases of 35 per cent and 44 per cent over the 1960 figure. In our projection we use a value of 830,000 tons.

Goldenberg's analyses of deciduous fruit and grapes were conducted in terms of organized marketing rather than in terms of total production. From Table 49 we see that for some fruit the differences between organized marketing and production are quite large. There are also some differences between the data used by Goldenberg, which are based on monthly publications of the CBS, and the SAIS data. If we take Goldenberg's data as a starting point, the projected 1965 marketing of deciduous fruit and table grapes will be 2.92 and 1.45 times that of 1960, respectively. These rates of increase are applied to the 1960 production figures to yield production projections; the major increase will thus be in deciduous fruit. The breakdown of deciduous fruits appears in the study on summer fruit.

Goldenberg's projections were obtained under the assumption of no

increase in yields in 1965 as compared with 1960. This point is rather difficult to evaluate. There are no adequate data on yields for the country as a whole which could be extrapolated. There is a constant change in the regional distribution of orchards. Some of the new plantings were in the high-yield areas, such as the Hula, and some in low-yield areas, such as the hill regions. It seems, therefore, that the final result is somewhat more questionable than is the case for some of the other products.

The analysis and discussion of fruit did not cover olives, wine grapes, or miscellaneous fruits. We shall therefore give some indication of the order of magnitude of the production of these fruits and make a rough statement on their possible development in the next few years.

The olive area was around 130,000 dunams in the period 1955–59. It declined to 123,000 in 1960. The yield of olives is subject to wide variations. For instance, production in 1956 was 25,000 tons, and in 1957 it was 7,000 tons. Thus, it would only be meaningful to project production for what may be called a normal year. The average production in the period 1956–60 was 12,940 tons. If allowance is made for a decrease in acreage, we may suggest a production of 12,600 tons in 1965. In doing so we assume that there would be no further decline in area and that the decline in 1960 was of marginal orchards.

The area of wine grapes was 31,153 dunams in 1954 and increased gradually to 43,404 in 1962. Production was 25,600 tons in 1958, 32,100 tons in 1959, and 24,300 tons in 1960. On the basis of these data, the projected production for 1965 is 35,000 tons.

The area of subtropical fruit, figs, pomegranates, dates, and pecans was 13,635 in 1954 and increased gradually to 23,120 dunams in 1960; the major increase was in subtropical fruits. On the basis of this development, it may be suggested that the production of this group in 1965 will be about 60 per cent above 1960. Since subtropical fruit is being successfully exported, the increase in domestic consumption is likely to be much smaller. Production of subtropical fruit and others was 14,100 tons in 1960. Thus, the projected production is about 22,600 tons.

Melons and bananas differ from other fruits in that their production could be considerably expanded in a short period. As the supply side of these two products was not studied in detail, we reserve the projection to the next section.

e. *Vegetables*

Two approaches were used in deriving supply projections for vegetables: The first, used by Ben-David, involves the statistical estimation of a supply

response equation. The second, used by Yaron, is a simultaneous normative solution for vegetables and the field crops branch as a whole; it is an equilibrium solution and will, therefore, be discussed in the next section.

The empirical supply analysis was conducted for the area, rather than for the production, of the five major vegetables which, in the period 1955–60, constituted 65.8 per cent of total production of all vegetables. The relative change of projected acreage from the 1960 level that was obtained for these crops was then applied to total area of all vegetables. This gave the projected value for vegetables as a whole. The value thus obtained is 148,373 dunams as compared with 175,000 dunams in 1960.

The projected production was obtained by multiplying projected area by projected yields. The latter were obtained in two ways: first, by trend extrapolation, and second, by adopting the normative values used by the Planning Center. The first projection is 1.95 tons per dunam and the second is 2.25 tons per dunam. The 1960 value is 1.78 tons per dunam. Thus, the two projections imply an increase in yield of 10 and 26 per cent, respectively.

The projected production of all vegetables is, then, 289,327 tons under the first yield assumption and 333,839 tons under the second. Ben-David quotes a production figure of 301,347 for 1960. The corresponding figure in the SAIS is 296,200. Thus the projected supply in 1961, under the assumption of 1960 prices, is close to the 1960 level.

There was no estimation of the supply function of potatoes and the final projection is therefore considered in the next section.

f. *Tobacco*

The production of tobacco has been subject to relatively wide annual variations in the past. This reflected variations in both area planted and in yield. As Wilsker points out, the present tobacco prices result in low profitability of this enterprise whose main input is labor. Since, however, tobacco is grown in districts where the opportunity cost of labor is low, there is reason to believe that all the land classified as tobacco land will be utilized for that purpose. As a consequence, he arrives at the following projections: total area, 44,500 dunams; yield, 55 kilograms per dunam; and production, 2,447 tons. The yield projection is about 4.0 per cent higher than the average observed in the period 1956–60. The projected production is about equal to the 1959 production, and 40 per cent above 1960, when both area and yield were at a relatively low level.

g. *Other products*

The last major group of products which has so far not been mentioned here is that of field crops. The projection of this group is basically an equilibrium projection, as will become clear, and it will therefore also be discussed in the next section.

h. *Summary*

In view of the fragmentary nature of the foregoing discussion on the supply projection, it would be desirable to reserve the concluding statements to the end of the section on equilibrium projections. However, it should be noted here that where it was possible to conduct an empirical analysis of the supply side (vegetables, poultry meat, eggs), it was found rather conclusively that a supply response to prices does exist. This, of course, has far-reaching implications for our subsequent analysis and discussion. Since it is more difficult to summarize such findings in a simple form than was the case with demand, no such undertaking is contemplated here. Instead, we resort to a somewhat different method of summarizing the findings by indicating the general order of magnitude of deviation from the 1960 level of production for the more important products considered above.

It is suggested that the persistence of present prices will not lead to any significant change in the production of vegetables. It is expected to lead to a moderate increase in the production of some meats and to a greater increase in the production of milk, and of beef produced both from dairy and beef herds. A considerable rise in production is expected in some, mainly deciduous, summer fruits.

The extent to which these anticipated developments accord with those of demand is examined in the next section. Only after conducting such a comparison and deciding on what seem to be equilibrium projections can a meaningful comparison also be made between projected production and past performance.

4. *Equilibrium Projections*

This Section is devoted to the construction of the final projections for 1965. In it, we compare the demand and production projections discussed above. As recalled from the discussion in the preceding sections, the production projections were not as comprehensive in coverage as the demand projections. Products which were not dealt with in detail in the previous section are therefore commented on.

It should be clear, by now, that in drawing the final conclusions some judgment has to be used to supplement the available information. This, of course, is inherent in the problem, and the only reason for raising the point is to avoid misunderstanding. Furthermore, it is felt that opinions and assumptions should be explicitly stated so that they can be evaluated on their merits, and they are included in our discussion so that the informed reader will be able to modify the results according to his understanding of the subject.

Perhaps some reservation should be made as to the term 'equilibrium projections'. Only sometimes have we succeeded in quantifying the supply function. In these cases we rely mainly on the solution obtained by the intersection of the supply and demand equations. But, clearly enough, even this could not be done without assuming values for the exogenous variables which were not studied and which may have a stronger effect than those which were carefully considered. Thus, although one is inclined to have more confidence in a more refined analysis, this does not necessarily mean that the predictive power of the construction is more soundly based. What follows should therefore be viewed as a summary of a careful examination of the data. In spite of these qualifications, it is felt that the major developments are well brought out and projected, and it is for this reason that we have undertaken to discuss the policy implications of our findings.

One final word should be said on the treatment of the yield projections which are basic to the other projections. In crops where the yields are subject to wide annual variations, we have taken the projected average yield. Thus, in this respect the projected yield can be thought of as being the average of the period 1964–66.

a. *Flour and cereal products*

The main raw material of this group is wheat. From Blumenthal's calculations it appears that the projected figure for wheat for direct consumption is 316,600 tons. Adding to this wastage, animal feeds of lower grade wheat, and seeds, the final demand projection becomes 345,000 tons.

Projected domestic production, based on Yaron's work, is about 81,000 tons. Thus, the net demand for imports of wheat is 264,000 tons. Actual imports are likely to be higher, as some domestically grown hard wheat is exported.

In our demand projection it is suggested that per capita consumption of other cereals will remain unchanged. Using a per capita figure of 6 kilograms, the projected demand is 15,168 tons. The main component of this group is rice, which is mostly imported.

As a result of the decline assumed for per capita wheat consumption, the projection calls for only a slight increase in total consumption of wheat. The projected demand for direct consumption is only 5.5 per cent above 1960.

b. *Oils*

Blumenthal's calculations show that the oil industry will have to refine 37,150 tons of oil for domestic consumption in 1965. This would require 232,187 tons of oil seeds. Most of the oil seeds are imported. The major product of domestic production is cottonseed. The projected value of cottonseed production in 1965 is 39,000 tons. Thus the remainder will have to be imported.

The total import of seeds is likely to exceed considerably the amount needed for domestic consumption. Blumenthal indicates that the present processing capacity of the industry is some 487,500 tons. If this is fully utilized, the total demand for imported oil seeds will be about 448,500 tons rather than the 193,187 needed for domestic consumption.

c. *Milk*

The projected per capita consumption of milk, in all forms, was 164.2 liters. For the whole population the figure is 415 million liters. To this we add 13 million liters for calf feeding to obtain a total demand of 428 million liters. To obtain the demand for cows' milk, we subtract the projected supply of sheep's and goats' milk, 42 million liters, the result being 386 million liters. The projected supply of milk, under the assumption that the rate of expansion in production will continue at the same rate as in recent years, is 449 million liters. Should this development actually take place, there would be an excess supply of 63 million liters, which is 16.3 per cent of total demand.

The question is how the projected excess supply may be avoided. The answer to this requires a projection of government policy with respect to this branch. As suggested by Kislev, in view of the low price elasticity for milk and some of the milk products, and in view of past policy, it is most likely that prices will not be allowed to reach their free market level. This means that production will continue to be regulated. It is therefore suggested that consumption will equal the level obtained for the demand projection.

Such a solution to the problem would require a considerably increased subsidy. Since April, 1961, the rate of subsidy has been 1.1 agorot per liter of bottled drinking milk and 7.1 agorot per liter of milk for processing.

The average subsidy in 1961 was 4.58 agorot per liter, or 15.2 per cent of the price received by farmers for milk sold through organized marketing. If this rate of subsidy is to be maintained, a considerable increase in total payments is required. It therefore seems reasonable to assume that there would be some reduction in the rate of the subsidy, and this would lead to an increase in the retail price of milk, and mainly of milk products, and to a decline in the price received by farmers. As a consequence, the excess supply would be reduced, and in fact might disappear. There are other measures which the government could take, but as there is no basis for projecting such measures we simply accept the demand projection as the equilibrium one.

For further computations, it is necessary to arrive at the size of the dairy herd on Jewish farms. After subtracting a projected production of 13 million liters on Arab farms, we obtain a projected demand of 373 million liters for milk produced on Jewish farms. Using the projected yield of 4,780 liters per cow, we get a requirement of about 78,000 dairy cows.

d. *Meat other than poultry*

The production of the various types of meat, except beef produced on dairy farms, was projected in the preceding section. According to Kislev's calculations, the meat production of a dairy herd of 78,000 cows can be expected to reach a level of 31,888 tons (live weight). When this is added to projected production of other meat, the projected production of the group as a whole is obtained: 54,318 tons live weight. The conversion from live weight to edible parts results in a value of 24,200 tons[10].

The projected demand is 13.0 kilograms per capita or a total of 32,900 tons. This also includes meat products which contain components besides meat. No attempt, however, will be made to derive the meat component of the group, as this will not differ significantly from the above value. Kislev's discussion suggests that it is most likely that the excess demand will be met by importing meat. This would imply imports of about 8,700 tons, which is lower than the figure for several past years.

It should, however, be noted that if prices of imported meat were to be set at a low level, so that the average price of all meat declined as compared with 1960, a considerable expansion in demand could be expected. There is reason to believe that the price elasticity of demand for meat is high, and declining prices would lead to a considerable expansion in consump-

[10] The conversion factors are reported by Kislev, p. 71. To this we add 6 per cent (as used by the CBS) for offal which were included in the demand projections.

tion. But since there is no way of anticipating the meat import policy, further calculations or speculation on this point have little meaning. It is merely recalled that our demand projection is strictly an income and trend projection under the assumption of constant prices. Blumenthal's original projection involved the implicit assumption that real prices of meat will continue to decline. If this assumption were accepted, there would be even greater consumption of imported meat.

e. *Poultry meat and eggs*

Two sets of projections were obtained for poultry products. The first was obtained by using the intermediate-run supply function, and the second by using the long-run supply function.

The intermediate-run supply function indicates the quantities to be produced at various prices, under the assumption that the capacity of poultry structures will remain at the 1960 level. The functions were estimated empirically from market data. The equilibrium solution was obtained simultaneously for poultry meat and for eggs. The reason for this is that the prices of one product appear in the demand and supply equations of the other product[11]. The results appear in Table 50.

TABLE 50. *Poultry Products: 1960 and 1965 Projections*

		1965 projections	
	1960	*A (intermediate-run)*	*B (long-run)*
Eggs			
Retail price (agorot per egg)	9.1	8.4	8.7
Producer's price (agorot per egg)	7.4	6.9	7.1
Per capita consumption (units)	345	396	385
Total domestic consumption (millions)	730	1,001	973
Poultry meat			
Retail price (IL per kg edible weight)	2.64	2.85	2.19
Producer's price (IL per kg live weight)	1.56	1.68	1.29
Per capita consumption (kg edible weight)	17.0	18.1	27.5
Total domestic consumption (thousand tons, live weight)	36.0	45.7	69.5

SOURCE: Hochman, p. 115, Table 44.

[11] For details, see Hochman, Chapter 5 and Appendix 3.

The results indicate that the equilibrium price of eggs is only slightly lower than the 1960 price. Furthermore, the price obtained from the long-run supply function is very similar to that obtained from the empirical intermediate-run function. This indicates that the existing capacity of structures is capable of producing the required quantity at a price level which is in line with long-run equilibrium.

To arrive at a production projection, we add 64 million eggs for hatching and 200 million eggs for export and arrive at a total figure of 1,237 million eggs. The 1960 production was 1,198 million, of which about 400 million were exported[12]. In view of the difficulties of exporting eggs, projected exports were arbitrarily set at a lower level.

The situation is somewhat different for poultry meat. Here, on the basis of a detailed study of the production aspects of the broiler branch, Hochman concludes that producers will be willing to produce at a price level of IL 1.29 per kilogram (live weight). This is equivalent to a retail price of IL 2.19 per kilogram (edible weight). This is considerably lower than the 1960 price. In view of the fact that the demand elasticity (with respect to price) of poultry meat is in the neighborhood of –2, the resulting projected per capita consumption is rather high, and it would be desirable to modify the projection. This is justifiable because demand elasticities (both price and income) may decrease as consumption rises. Considerations on the supply side may lead to similar conclusions. There are relatively wide fluctuations in poultry meat prices, which lead to price uncertainty, the existence of which is usually reflected in a decline in the amount supplied at a given price. It is likely, therefore, that the long-run supply price will be higher than the one assumed. On the basis of these considerations, the final equilibrium projection of per capita consumption is adjusted downward. It is assumed that the equilibrium price will equal the 1960 price and that per capita consumption will therefore be at a level of 20.5 kilograms (edible weight). Total domestic consumption will then be 51.8 thousand tons of edible weight or 69.0 thousand tons of live weight. To this we add estimated exports of 500 tons to obtain a total production of 52.3 thousand tons of edible weight.

f. *Fish*

The projected per capita consumption of fish for 1965 is 10.9 kilograms. The corresponding total consumption is 27,555 tons. Production was 12,350 tons in 1958; 13,200 tons in 1959; 13,900 tons in 1960; and 14,650

[12] The figure for 1960 production is the one given by Hochman. It differes from that reported by the CBS and shown in Table 56.

tons in 1961. In view of the scarcity of water, it is unlikely that there will be a significant increase in production of pond fish. Thus, unless sea fishing increases faster than in the past, an increase in imports of fish will be required to meet consumption at the 1960 price level. If we make an arbitrary projection of total production of 20,000 tons in 1965, the required import would be some 7,600 tons[13].

g. *Fruit*

Some of the problems involved in the projections of fruit have already been mentioned in the foregoing discussion. In what follows we summarize the available information and draw some conclusions as to future developments. It is needless to say that the quality of such conclusions depends on the assumptions made and particularly those which deal with the interpretation of the basic data. As there is no way to evaluate this interpretation, we simply specify the assumptions so that the projections could be modified should better information become available.

In our discussion on the supply projection we quoted various data on the 1959/60 season. To these we now add the NAUS data on total consumption (Table 46). Basically the NAUS data are obtained by subtracting from the production series an allowance for wastage, purchases by industry, and exports.

Three sets of projections are presented: production, production for domestic consumption, and consumption of fresh fruit. The production projections are in terms of the CBS data. Production will be utilized in three forms: for export, for processing, and for fresh consumption. Except for citrus, no projection of fruit exports was contemplated in this study. So far, melons and bananas have been the main export items (apart from citrus). Since the production of these two products can be adjusted annually, it is possible to project the production necessary for domestic consumption. Should the export of these products continue, the final production will be above what is called for by our projection. The only allowance that can be made for such possibilities is that of land and water, and this is done implicitly in our summary, which follows in the next section.

It is very likely that there will also be exports of other fruit in quantities which might be noticed in the domestic market. Among the fruits dealt with in detail, this is perhaps most likely to occur with grapes. Should it

[13] In making the production projection, it has been assumed that the recent attempts to raise production will bear fruit. For a description of the present situation and attempts, see Ministry of Agriculture, *Report to the Knesset by the Minister of Agriculture*, February 1962, pp. 132–35.

actually happen, the result would be to decrease domestic marketing and consequently to raise the price above what is projected.

Also, no attempt is made to project the quantities to be absorbed by the processing industry. Instead, we assume that such quantities, as well as wastage, will be proportional to the increase in production. Consequently, the NAUS data are used for projecting consumption. The difference between projected production and fresh consumption is then allotted to other uses. This procedure does not imply that the processing industry may not eventually serve as an important outlet for fruit. It is, in fact, very likely that its importance will increase in the future. But as this outlet was not studied in detail no indication can be given on this point. It is to be hoped that the subject will be studied in the future and that the results will be applied to modify the present projections.

The projections of domestic consumption and production of fresh citrus, melons, and bananas are based on the assumptions (1) that 1960 prices will prevail in 1965 and (2) that these prices are sufficiently favorable to allow the increase in production necessary to meet the increase in demand. In other words, these assumptions imply a highly elastic supply function in the neighborhood of the projected point. The per capita projections were obtained from Table 46, and multiplied by the projected population to give projected total fresh consumption. The results are presented in Table 51.

The production of deciduous fruit and grapes in 1965 is largely predetermined, and their projections have already been presented in the previous section. It was noted that production of deciduous fruit is expected to increase by 192 per cent and that of table grapes by 45 per cent. When these rates are applied to the SAIS production figures, we obtain a projected production of 109,500 tons of deciduous fruits and 41,180 tons of table grapes.

The price projections were obtained by Goldenberg by using the demand equations — which were estimated on the basis of data on organized marketing — and the projection of organized marketing in 1965. His projections indicate the following percentage changes in 1965 prices as compared with 1960 prices, for some of the major summer fruits[14]: apples, 9; pears, –3; grapes, 2; plums, –32; all summer fruits combined, –3.

The major increase in per capita marketing is expected in apples, from 9.1 kilograms in 1960 to 19.9 kilograms in 1965. In spite of such an increase, there is expected to be no decline in price, and perhaps even some increase. An increase of per capita marketing of pears from 0.8

[14] All these results are in terms of the early projections of population and income. The effect of the revision is to increase somewhat the level of the 1965 prices.

TABLE 51. *Final Projections for Fruit: 1965*

	Deciduous fruit	*Table grapes*	*Bananas*	*Melons*	*Citrus*[a]	*Subtropical and other*
1960 (THOUSAND TONS)						
1. Production	37.5	28.4	34.3	50.5	609.6	14.1
2. Exports	0	0.6	4.1	3.7		0.1
3. Production net of exports (1. *less* 2.)	37.5	27.8	30.2	46.8		14.0
4. Consumption — fresh	34.2	25.4	29.2	41.6	118.0	11.9
5. Organized marketing	27.6	20.9	31.0	20.4		7.1
1965 PROJECTION — TOTAL (THOUSAND TONS)						
6. Production for domestic consumption	109.5	40.3	39.7	57.6		22.4
7. Domestic consumption — fresh	99.9	36.8	38.4	51.3	155.0	17.7
1965 PROJECTION — PER CAPITA (KILOGRAMS)						
8. Production for domestic consumption	43.3	15.9	15.7	22.8		8.9
9. Domestic consumption — fresh	39.5	14.6	15.2	20.3	61.3	7.0
1965 AS PERCENT OF 1960						
10. Total production for domestic consumption	292	145	131	123		160
11. Per capita consumption	244	122	110	103	110	125
12. Wholesale price	90–100	62	100	100	100	95

[a] For citrus, only data for fresh consumption are given. Total fresh consumption is expected to be 31 per cent above 1960. Total production is expected to be in the range of 820,000 to 880,000 tons. For details, see Levhari's study in Part II.

SOURCE: Lines 1 and 2 — Table 49.

Line 4 — Column (1) of Table 46 *multiplied by* population.

Line 5 — Table 49: deciduous fruit, table grapes and bananas from column (4) and melons, subtropical and other from column (3).

Line 6 — Line 3. *multiplied by* line 10.

Line 7 — Deciduous and grapes: line 4. *multiplied by* line 10. Bananas and melons: Table 46, column (4) *multiplied by* population. Citrus, subtropical and other: line 9. *multiplied by* population.

Line 8 — Line 6. *divided by* population.

Line 9 — Deciduous and grapes: line 7. *divided by* population. Bananas, melons, citrus: Table 46, column (4). Subtropical and other: see text, p. 157.

Line 10 — Deciduous, grapes, subtropical and other: Table 49, column (6). Bananas, melons: line 7. *divided by* line 4., per cent.

Line 11 — Line 9. as per cent of Table 46, column (1).

Line 12 — Deciduous and grapes: actual projection (see text). Bananas and melons: arbitrary assumption.

kilograms in 1960 to 2.5 kilograms in 1965 is also expected to have only a slight depressing effect on prices. These projections reflect relatively high income and price elasticities of demand. Nevertheless, it may seem strange, at first sight, that the price should not be subject to a larger decline. The reason for this lies in the way the price change was measured. The average annual price, weighted by the monthly quantities in 1965, was compared with that of 1960. Thus, the result depends on the monthly distribution of the fruits. Goldenberg assumed a large relative increase in marketing in the off-season months, in which prices are relatively high. Thus, in spite of the price decline in these months, the weighted average gives a higher price than in 1960, when the weight of these months was small.

A large increase — from 2.4 kilograms in 1960 to 5.0 kilograms in 1965 — is also expected in the per capita marketing of plums. Here, however, the scope for spread of marketing to off-season months is more limited than in apples and pears, and as a consequence a considerable decline in price is expected. A large decline in price is expected in grapes, in spite of the smaller rise in marketing, from 9.9 kilograms in 1960 to 12.4 kilograms in 1965. In part this reflects the already high per capita consumption of grapes. In fact, the projection was obtained under the assumption that the price will not be allowed to decline below a certain level. To maintain this level, 4,000 tons of grapes would have to be removed from the market.

These results give some indication of the possible effect of the increased production on prices of the more important deciduous fruits and grapes. From this we can now go on to consider the group as a whole. There was no estimation of the demand function of deciduous fruit as such. Instead, the demand for all summer fruit was estimated. In addition to deciduous fruit, summer fruit include grapes, melons, some citrus, bananas, and some less important varieties. In order to obtain some indication of the possible decline in price for this group as a whole, we use the following procedure:

(1) We assume that the rise in marketing of deciduous fruit in the summer months is proportional to the increase in total marketing of the group. This assumption inflates somewhat the quantities of apples and pears to be marketed in the summer, as we have already indicated that the relative weight of marketing in the winter months will increase.

(2) We consider only deciduous fruit, grapes, melons, and bananas. These, of course, account for most of the summer fruit basket. For the remainder, we assume that the relative increase in marketing is the same as for the whole summer fruit group.

(3) The relative increase in the quantity of summer fruits is obtained by

taking the weighted average of the relative increase of each of the components, the weights being the quantities. For melons and bananas, we use the projected relative increase as previously obtained. The result is a 45 per cent increase in per capita marketing.

(4) Assuming an income elasticity of 0.907, as obtained in the demand equation for summer fruit, the effect of income would be to raise per capita consumption by 18 per cent without a change in price.

(5) Thus, the change in price would be due to an increase of 22.9 (=1.45/1.18) per cent in quantity[15]. Taking a price elasticity of –1.8, the expected decline in price is 12.7 per cent.

In this calculation we implicitly assume that the monthly distribution of marketing within the summer season will not change. This is an unlikely situation, and therefore the consequence of the assumption is to exaggerate the decline in prices. On the basis of this last statement and of assumption (1) above, we can accept this result as a lower limit for the 1965 price level of summer fruit.

Goldenberg used a somewhat different basket, which comes to a per capita increase of 51 per cent, and computed the expected price from the demand equation. This was done after projecting the monthly distribution of marketing and gave a price decline of only 3 per cent. In either case, we have taken no account of the fact that the actual price of the basket will increase because of the change in composition, which reflects a larger proportion of the more expensive fruits such as apples, pears, apricots, and peaches. In this sense, the price projection is of a basket whose composition is fixed.

We conclude this discussion by indicating that, in spite of the considerable relative increase of deciduous fruit and grapes, the price of summer fruit will not be drastically affected. Consideration of the more important fruits indicates that the major effect of the price decline will be in plums and grapes.

According to Goldenberg's evaluation of production costs, most varieties will continue to be profitable in spite of the possible price changes.

In this discussion, no evaluation of the demand of the processing industry or of the increase in exports of deciduous fruit and grapes was considered. Of course, an increase in marketing to these two outlets will raise the price received from sales for fresh consumption.

The foregoing projections suggest that the per capita consumption of fruit will be above that projected in Table 46. The per capita consumption

[15] The remainder is absorbed with no change in price, due to the increase in demand resulting from the increase in income.

of deciduous fruit and grapes may reach a level of 39.5 kilograms and 14.6 kilograms, respectively.

To complete our discussion we must mention the group of 'other fruits'. We previously remarked that a considerable increase in production is anticipated. However, in terms of their share in total fruit consumption, this is unlikely to have a large impact on prices. Furthermore, subtropical fruit, mainly avocados, are successfully exported. Others, such as figs, are processed, while still others, such as dates, are imported. It thus appears that the total increase in domestic marketing will exceed only by a small amount the consumption which was projected by taking into account population and income growth. To quantify this possible development, we assume that per capita consumption will rise to 7.0 kilograms (as compared with 5.6 in 1960) and that the price will decline by 5 per cent.

Wine grapes are processed and therefore do not concern us here. Olives are used either for pickling or for oil production. At present, there is no marketing problem, and with the decline in the area of olive-bearing plantations and the increase in production, pressure might be created for raising prices.

Finally, something must be said about future planting from the point of view of water and land utilization. On the basis of Levhari's analysis, and in view of the higher exchange rate which citrus producers now enjoy, it is very likely that there will be a tendency to extend the citrus area. We therefore assume that this will be at a level of 400,000 dunams in 1965 as compared with 340,000 in 1961. On the basis of Goldenberg's comparison of projected prices with production costs, it seems that there will also be a tendency to extend the area of some of the deciduous fruits. There has also been a continuous increase in area of some other fruits. We therefore assume that the irrigated area of fruit other than varieties will be 200,000 dunams as compared with 165,000 in 1960.

h. *Vegetables*

The equilibrium point was solved by Ben-David by equating the empirical supply and demand equations for these crops whose supply function was estimated. The average relative change obtained for the vegetables in question was then applied to all vegetables in order to obtain the projection for the group as a whole. The computations were made for two alternative yield projections.

The projected equilibrium point for fresh vegetables as a whole (organized marketing) varies between 86.6 kilograms and 92.9 kilograms, as compared with 87.3 kilograms in 1960. The corresponding projected total

production varies between 300,000 tons and 321,500 tons, as compared with about 300,000 tons in 1960.

There was no empirical supply equation for potatoes, which made it mpossible to repeat the procedure for this crop. The projection was then obtained under the assumption that there would be no change in per capita production and prices. Total production of potatoes will therefore be 97,000 tons.

The projections obtained by Yaron were 290,000 tons of fresh vegetables and 72,000 tons of potatoes, or a total of 362,000 tons. To this he adds 23,000 tons produced on Arab farms to arrive at a total of 385,000 tons. This is 3 per cent less than the lower of Ben-David's projections.

The comparison of Ben-David's and Yaron's projections is rather interesting, as it is suggestive of the nature of supply behavior. It is recalled that Ben-David based his projection on an empirical supply function. The estimated elasticity of supply with respect to price was relatively low, and some explanation was offered for this result. Yaron's projection is a normative one and indicates what farmers ought to do in order to maximize their returns subject to certain restrictions, the main one being water. Had there been no restrictions, this approach would imply a perfectly elastic supply function. But as some resources are limited, an increase in the supply of one product increases the opportunity cost of the scarce resources — in this case water — so that supply becomes upward-sloping. What the result indicates is that the low elasticity with respect to price obtained in the empirical study may reflect to a large extent the opportunity cost of the resources available to the farmers in limited quantities. In spite of the relatively high price elasticity of the demand for vegetables, there would be therefore no significant change in production.

As to the actual change, the comparison with the 1960 production figure is somewhat misleading. In that year, about 12 per cent of total production of fresh vegetables was removed from the market as surplus, so that only 266,103 tons were actually consumed. Since we are concerned here with an equilibrium projection, it is assumed that no surpluses would exist. It is then clear that the projected total consumption is above actual 1960 consumption.

The projected average wholesale price of fresh vegetables ranges between IL 268 per ton and IL 251 per ton, as compared with IL 270 per ton in 1960 (all in terms of 1960 prices). Thus, there may be a price decline, the extent of which depends on the increases in yields.

The projected area for fresh vegetables ranges from 142,000 to 150,000 dunams, and that of potatoes from 44,000 to 49,000 dunams. The projected

combined area ranges between 186 and 199 thousand dunams, as compared with 219,000 dunams in 1960. Thus, a decline in total vegetable area is expected.

This is accounted for in two ways: first, yields will rise; second, according to this projection there will be no surpluses (which are not consumed but which require land and water).

There is one final comment on Ben-David's equilibrium projection. His procedure implicitly assumes no dependence of the acreage response equation on the level of yields. For theoretical considerations there is reason to reject such an assumption. However, there is also increase in yields in competing branches, and what actually should be taken into account is the increase in vegetable yields relative to that of competing crops. As the evaluation of such developments is not at all simple, it was not attempted in this work.

The projections of the major crops are summarized by Ben-David in his Table 30 and will not be reproduced here.

i. *Tobacco*

The tobacco demand projections are based on the projected demand for cigarettes. It is estimated that about 1,650 tons of local oriental tobacco, about 1,090 tons of imported oriental tobacco, and about 300 tons of Virginia tobacco will be required to meet the projected demand for cigarettes.

The projected supply (2,153 tons, after allowing 12 per cent for wastage) exceeds the demand for local tobacco. Wilsker suggests that improvement of local tobacco would make possible its substitution for imported oriental tobacco. Accordingly, imports of oriental tobacco will drop to about 600 tons.

j. *Field crops*

As explained in Chapter 3, it is assumed that the level of production of this group as a whole will be determined by the amount of the scarce agricultural resources — mainly land and water — not utilized by the other branches.

The available quantities of water are not sufficient for irrigating all the arable land, and a relatively large area is expected to remain without irrigation. Separate projections must therefore be made for irrigated and unirrigated crops. The major limiting factor for the first is water, whereas for the second it is land.

(a) *Irrigated crops.* The amount of water that will be available for field crops in 1965 was calculated by Yaron and is quoted below.

It is seen that total water consumption by agriculture in 1965 is expected to be somewhat lower than in 1960 and only slightly higher than the average consumption in 1958–61. Allowance for the other crops was based on preliminary forecasts. Some revisions were later made, but these do not change the general picture. From the table on water requirements, it appears that field crops — other than forage and those crops not considered by Yaron — will be allocated about 200 million cubic meters.

TABLE 52. *Estimate of Water Utilization in Agriculture: 1965*

(*Millions of cubic meters*)

Total for agriculture[a]	**1,016.0**
Plots and yards	50.0
Non-Jewish agriculture	10.0
Fish ponds	100.0
Irrigated fodder crops	143.0
Orchards	428.0
Field crops not included in analysis	5.1
Vegetables, potatoes, and flowers for export	8.7
Vegetables not included in analysis	16.6
Subtotal	*761.4*
Subtotal augmented by 7 per cent excess	814.7
Residual for planned field crops and vegetables	201.3

[a] As estimated by Tahal.

SOURCE: Yaron, p. 112, Appendix E.

This projection is obtained under the assumption that producers will utilize available resources so as to maximize their net income. The problem is solved by mathematical programming. In addition to water, some other possible scarce resources were considered, but it was found that they did not constitute effective limitations, as the final projection leaves an unutilized residual. There was one exception, the processing capacity of the sugar refining industry, on which we shall comment below.

The crops considered by Yaron are sugar beet, cotton, groundnuts, vegetables, potatoes, and grains. Vegetables were included in the analysis on the assumption that they constitute the closest alternative in production to the crops under consideration, and like the latter their production can be varied rather rapidly according to existing price situations. Net income was calculated under two dollar exchange rate assumptions: IL 3 and IL 3.5 per dollar. The exchange rate assumption affects both cost and revenue.

The effect on cost applies to all crops, whereas the effect on revenue applies to all crops except sugar beet, and vegetables and potatoes. The net income from vegetables and potatoes varies according to the level of production. That is, decline in price with rising production leads to decline in net income if costs are assumed to be independent of the level of production. The evaluation was made only for vegetables and potatoes, which are locally consumed. The prices of these are obtained from the demand function and are not directly affected by the assumed exchange rate. The assumption about the price of sugar beet will be discussed below.

The programming is of the land and water allocation to the various crops. Production is obtained by multiplying projected acreage by projected yield. It should, however, be noted that projected acreage is not independent of projected yields, as the latter were used in calculating net income for the various crops.

The projections for irrigated field crops were not very sensitive to varying the exchange rate from IL 3 to IL 3.5. The final results are summarized in Table 53.

TABLE 53. *Projection of Irrigated Field Crops and Vegetables on Jewish Farms: 1965*

	Area (thousand dunams)	*Yield per dunam (tons*[a]*)*	*Total production (thousand tons)*
Cotton	155	0.110	17.1
Cotton under auxiliary irrigation	35	0.055	1.9
Groundnuts	40	0.350	14.0
Sugar beet	60	0.668	40
Sorghum	15	0.400	6
Vegetables	126.4	2.290	290
Potatoes	36	2.000	72

[a] Yield and production refer to fiber in cotton, sugar content of sugar beet and groundnuts in shell.

SOURCE: Yaron, p. 98, Table 24, and p. 102, Table 27.

To the crops listed in the table Yaron adds 20,000 dunams of vegetables, flowers, and bulbs for export and 18,000 dunams of miscellaneous field crops. To this we must also add the irrigated area for forage production, the revised projection of which is 285,000 dunams. The earlier projection was 275,000, and this was used by Yaron. Nevertheless, the projections

quoted above are not revised, and it is assumed that the water required for the additional acreage (5 million cubic meters) will be found through some decline in irrigation rates and from the reserve for excess utilization.

It is interesting to note that Yaron's projection establishes the fact that industrial crops compete more favorably for the limited water than do summer grains. In this sense, we can say that the trend which has been observed in recent years will continue. The area of irrigated summer grains was at its peak in 1957, when it reached 82,000 dunams, whereas industrial crops in that year were only 116,000 dunams. In 1960 irrigated summer grains occupied only 17,000 dunams, whereas industrial crops occupied 187,000 dunams.

A word of caution should be said against misinterpreting the implications of the projected composition of industrial crops. The price for sugar beet used in the calculation makes it the most profitable crop, and the area of 60,000 dunams was determined by the sugar refining capacity available to-day. The result reflects the assumption with respect to the price of sugar beet. The procedure for pricing sugar beet differs from that for the other industrial crops. For the latter, actual international prices were used. If this had been done for sugar beet, it would have required calculation of a derived price — taking the price of sugar, deducting from it the cost of refining, and attributing the residual to sugar beet. This was not done here for the simple reason that this procedure is not followed in Israel. Since our main purpose is to reach projections, the assumption to be made should approximate the actual pricing. The price assumed by Yaron for sugar beets was $16 per ton. Since it takes 7.5 tons of sugar beet to produce one ton of sugar, the cost of the beet alone exceeds the price of the refined sugar, which is usually below $100 per ton[16]. It is quite clear that, with the present scarcity of water, sugar beet priced correctly (in an economic sense) would not be in a position to compete with other industrial crops, and it is very possible that its continued production entails a real economic loss.

It is sometimes argued that with a somewhat higher exchange rate sugar production would be profitable even without subsidy. From an accounting point of view, it is true that if there is any value added in sugar production then there exists some exchange rate at which it could be produced profitably without differential treatment. This view is however completely misleading, as it overlooks the fact that under such circumstances the other

[16] As shown by Yaron, there are by-products of sugar production which substitute for imports and can thus be evaluated in terms of dollars. However, this does not materially change the argument.

alternatives will be even more profitable. The implication of this discussion is rather suggestive. It would be desirable to investigate whether sugar beet production should not be discontinued. This is not merely a long-run problem to be considered only after the existing refineries are physically depreciated. It is very possible that in spite of the existence of the refineries there would be a real gain in using the limited water for producing other crops.

Although there is reason to believe that such a review of sugar production is desirable, its outcome should not affect the 1965 projections. It is rather unlikely that any major change in sugar beet pricing policy will take place before 1965. In fact, from this point of view the pricing of sugar beet in the programming is of secondary importance, since it is very likely that by an iteration process a price will be determined at such a level that the present capacity would be fully utilized.

The projected area for irrigated crops on Arab farms is (in thousands of dunams): vegetables and potatoes, 23; cotton, 4; sugar beet, 2; groundnuts, 2. To this we add 8,000 dunams of irrigated forage. In evaluating these projections, it should be kept in mind that the ratio of water to land in Arab farming is lower than for Jewish farming.

(b) *Unirrigated crops.* The choice of crops on unirrigated fields is quite limited. This is well reflected by the fact that the composition of land allocation of this group has been relatively stable in the past. On the basis of this observation, Yaron assumes that the 1965 composition will be similar to what was found in the past. After taking into account possible changes in land utilization which will affect the future area available to this group, he obtains a value of 1,940 thousand dunams for unirrigated field crops. To this he adds 220,000 dunams for unirrigated crops to be grown (without irrigation) on irrigated fields as part of the crop rotation system.

His projection for land utilization is (in thousands of dunams): winter grains, 970 (150 of which on irrigated fields); summer grains, 175; cotton, 75; forage, 495 (45 of which on irrigated fields); green manure and summer fallow, 200; and other, 245.

Unless there is a greater increase in yields than was assumed by Kislev, the area allocated to forage production will not meet the demand for it. According to Kislev's computation, some 520,000 dunams will be required in order to supply the forage necessary to supplement the concentrates and the forage produced on irrigated land. This may create pressure to increase the forage area, which is likely to take the place in green manure and the miscellaneous group, and which may lead to a decline in

TABLE 54. *Land Utilization — Unirrigated: 1959, 1960 and 1965 Projection*
(Thousands of dunams)

Crop	*1959*	*1960*	*1965*
TOTAL	**2,870**	**2,770**	**2,540**
Orchards	237	229	230
Forage	465	405	500
Vegetables	17	22	15
Melons and pumpkins	70	44	50
Winter grains	1,206	1,200	970
Summer grains	229	63	175
Cotton	6	7	75
Tobacco	45	38	45
Other industrial crops	61	79	180
Pulses	111	98	
Fallow and green manure	300	481	200
Miscellaneous[a]	123	104	100

[a] Includes land in preparation, auxiliary farms, miscellaneous, and discrepancy.
SOURCE: 1959 and 1960 — *SAI Nos. 12* and *13*.

grain area. But should this be the case, it is very likely that another development will take place: an increase in the share of concentrate feeds and a decrease in that of forage. In Table 54, we have assumed an area of 500,000 dunams for forage. The internal composition as shown in this table might change, but in any case it is likely that forage area will be larger than in the past. The projected production of these crops appears in Table 56.

5. *Summary of Production Projections*

We now turn to a summary of the various projections and to their comparison with the performance in the last year or two (1959, 1960) for which revised data were available. The projection for unirrigated land appears in Table 54, and that for irrigated land in Table 55. Since 1960 was a drought year and thus affected the cultivated area of some unirrigated crops, Table 54 also shows the 1959 data.

The major changes in land utilization have already been discussed. Owing to a shift of land to irrigation and nonagricultural uses, and to a possible withdrawal of land in the low-rainfall regions, total cultivated unirrigated area will be somewhat smaller than in the past. The principal changes

TABLE 55. *Land Utilization — Irrigated: 1960 and 1965 Projection*

(Thousands of dunams)

	1960	*1965*
TOTAL	**1,305**	**1,469**
Orchards	493	600
Citrus	*328*	*400*
Other	*165*	*200*
Forage	266	293
Vegetables and potatoes	198	180[a]
Sugar beet	38	60[b]
Cotton	98	159[c]
Groundnuts	51	42
Sorghum and corn	17	15
Miscellaneous[d]	144	120

[a] The projected figure was 186. The figure in the table reflects the projected production of unirrigated fields.

[b] Includes 2,000 dunams of Arab farming.

[c] In addition there will be 35,000 dunams of cotton with supplementary irrigation.

[d] Includes fish ponds, auxiliary farms, flowers, nurseries etc.

SOURCE: 1960 — *SAI No. 13.*

in composition of the unirrigated land consist of an increase in forage and cotton acreage and of a compensating decline in the area of other crops.

The principal changes anticipated in the utilization of irrigated land (Table 55) consist of an increase in orchards (mainly citrus), forage, cotton, and sugar beet and of some decline in groundnuts. The concentration in the production of the three industrial crops, is of major significance in the projected composition of field crops. It should be recalled that the 1965 projections allow for land and water for export crops. The significance of this will become clear later.

We now turn to the summary of the final production projections as they appear in Table 56. The projections of physical production appear in column 3. They are compared with performance in the two agricultural years 1959 and 1960. In order to obtain a measure of the overall anticipated increase in production as well as that of the major branches, the projections are converted to value units (at 1959 prices), by multiplying the value of the production in the base periods (1959 and 1960) by the projected per cent increase in physical production. No projection was made for a few minor items, and in order to complete the table we have made some assump-

TABLE 56. *Production: 1959, 1960, and 1965 Projection*[a]

	Thousands of tons			*1965 as per cent of*		*Value of production (thousands of 1959 IL)*			
								1965 based on	
	1959 (1)	*1960* (2)	*1965* (3)	*1959* (4)	*1960* (5)	*1959* (6)	*1960* (7)	*1959* (8)	*1960* (9)
TOTAL						**713,012**	**750,530**	**1,083,088**	**1,111,182**
Field crops						**138,365**	**122,389**	**193,052**	**193,504**
Grains and pulses						*40,200*	*19,513*	*41,359*	*41,300*
Wheat	73.7	41.3	81.2	110	197	16,012	8,947	17,613	17,626
Barley	65.0	26.6	71.2	110	268	11,255	4,571	12,381	12,250
Corn and sorghum	55.4	23.9	45.0	81	188	9,093	3,949	7,365	7,424
Others						3,840	2,046	4,000	4,000
Forage	197.4[b]	187.6[b]	226.0[b]	114	120	*41,811*	*39,762*	*47,665*	*47,714*
Industrial crops						*41,674*	*53,576*	*91,682*	*91,822*
Groundnuts	15.3	17.0	14.7	96	86	8,865	9,842	8,510	8,464
Cotton, lint	7.3	10.6	22.8	312	215	17,903	26,037	55,857	55,980
Cotton seed	12.2	16.9	39.0	320	231	1,880	2,597	6,016	5,999
Sugar beet	122.1	169.0	282.0	231	167	5,930	8,213	13,698	13,716
Tobacco	2.4	1.7	2.4	100	141	3,601	2,598	3,601	3,663
Others						3,495	4,289	4,000	4,000
Melons and pumpkins	83.3	52.0	58.0	70	112	*8,351*	*5,507*	*5,846*	*6,168*
Miscellaneous						*6,329*	*4,031*	*6,500*	*6,500*
Vegetables and potatoes	358.5	378.0	405	113	107	**58,730**	**62,316**	**66,365**	**66,678**
Citrus	587.6	609.6	830.0	141	136	**106,166**	**113,676**	**149,694**	**154,599**

Other fruit						**58,688**	**71,912**	**134,791**	**155,611**
Table grapes	25.7	28.4	41.2	160	145	8,229	8,972	13,166	13,009
Wine grapes	32.1	24.3	35.0	109	144	7,382	5,636	8,046	8,116
Olives	8.0	6.8	12.6	158	185	3,589	2,844	5,671	5,261
Bananas	31.6	34.3	39.6	125	115	12,173	13,330	15,216	15,330
Deciduous	30.0	37.5	109.5	365	292	23,356	36,429	85,249	106,373
Subtropical and other	12.0	14.1	22.6	188	160	3,959	4,701	7,443	7,522
Milk	300.8[c]	316.6[c]	428.0[c]	142	135	**78,584**	**83,108**	**112,026**	**112,137**
Cows[d]	*259.5*	*277.3*	*386.0*	149	139	67,808	72,536	101,034	100,825
Sheep and goats	*41.3*	*39.3*	*42.0*	102	107	10,776	10,572	10,992	11,312
Eggs	1,027.0[e]	1,114.0[e]	1,237.0[e]	120	111	**85,176**	**93,234**	**102,211**	**103,490**
Meat (live weight)	70.0	81.4	123.3	176	151	**130,807**	**153,339**	**233,623**	**233,409**
Beef	*18.9*	*25.1*	*41.3*	219	165	43,103	57,107	94,396	94,227
Mutton	*4.9*	*4.9*	*6.0*	122	122	8,716	8,656	10,634	10,560
Poultry[f]	*40.6*	*45.7*	*69.0*	170	151	66,352	74,655	112,798	112,729
Other	*5.6*	*5.7*	*7.0*	125	123	12,636	12,921	15,795	15,893
Fish	13.2	13.9	20.0	152	144	**17,320**	**18,579**	**26,326**	**26,754**
Miscellaneous[g]						**39,176**	**31,977**	**45,000**	**45,000**
Exports not included above								**20,000**	**20,000**

[a] In going from the consumption to the production projections account was taken of uses other than direct local consumption — in the main, industry and export.

[b] Millions of feed units.

[c] Millions of liters.

[d] On the assumption that 13 million liters will be supplied by the Arab sector and that average yield per cow will be 4,780 liters, the milking herd in the Jewish sector will amount to 78,000 cows.

[e] Millions.

[f] The 1965 figures do not include production for export. The value of projected exports is shown in the last line of the table.

[g] Includes honey, changes in livestock inventory and miscellaneous.

SOURCE: For 1959 and 1960 — *SAI, No. 12*, pp. 188–89, 200–01.

tions which seem to be suggested by past data and by the amount of resources allotted to these products. The items in question are unspecified grains, pulses and industrial crops, miscellaneous field crops, and miscellaneous agricultural products not elsewhere specified. To this we add, at the end, an estimate for exports which covers items which are not included in our production projections. The major items are bananas, melons, chicks, hatching eggs, and poultry meat. The export value of this group was $2.222 million in 1960 and $3.908 million in 1961[17]. Assuming an effective exchange rate of IL 2.5 per dollar (in terms of 1959 prices) and a projected value of $8 million in 1965, we obtain the projections shown in Table 56. The production of these items in 1959 and 1960 appears in the relevant production figures. However, the 1965 projection of these items was net of exports. Further comments on exports follow.

The projected overall agricultural production for 1965 is IL1,083.1 million when 1959 weights are used and IL1,111.2 million when 1960 weights are used[18]. This indicates an increase of 52 per cent over the 1959 level and 48 per cent over the 1960 level, or average annual rates of growth of 7.2 and 8.1 per cent, respectively. These rates of increase are significantly lower than those observed in the past. Before commenting on this point we turn to a review of anticipated developments in the major branches, as summarized in Table 57.

The greatest increase is expected in the production of fruit other than citrus. This projection, as recalled, reflects the projected 1965 fruit bearing area. The projected rates of increase for other products are much more moderate. The figure for field crops reflects the land and water limitation. The citrus projection reflects the bearing capacity of the area which has already been planted. The projected production of vegetables reflects the limitation imposed by domestic demand as well as the assumption that government policy will not, as in the past, lead to surpluses. That is, consumption is projected to increase relatively more than production. It is anticipated that with the increasing demand for land and water there will be no wasted production. The increase in milk production is also limited by domestic consumption. It should be recalled that the projections were obtained under the assumption that there will be no import of dairy products and that processing will consist mainly of fresh milk. Should these two assumptions be violated, the increase in milk production will be somewhat lower. All this, of course, is also dictated by the assumption that

[17] Quoted in the Ministry of Agriculture's *Report* (see footnote 13).

[18] The difference reflects the difference in the average prices of groups due to aggregation within groups.

TABLE 57. *Production: 1959, 1960 and 1965 Projection — Summary*

(Thousands of 1959 IL)

	1959	1960	1965		1965 as per cent of	
			1959 weights	1960 weights	1959	1960
Field crops	138,365	122,389	193,052	193,504	140	158
Vegetables and potatoes	58,730	62,316	66,365	66,678	113	107
Citrus	106,166	113,676	149,694	154,599	141	136
Other fruit	58,688	71,912	134,791	155,611	230	216
Milk	78,584	83,108	112,026	112,137	143	135
Eggs	85,176	93,234	102,211	103,490	120	111
Meat (live weight)	130,807	153,339	233,623	233,409	179	152
Fish	17,320	18,579	26,326	26,754	152	144
Miscellaneous	39,176	31,977	45,000	45,000	115	141
Exports not included above			20,000	20,000		
TOTAL	**713,012**	**750,530**	**1,083,088**	**1,111,182**	152	148

SOURCE: Table 56.

the tendency to increase production over and above domestic consumption will be suppressed, either by direct control or by reducing subsidies.

Unless there is an expansion of egg exports — making it possible to expand egg production as in the past — egg production will also increase slowly. In our projection we assumed an export of 200 million eggs, which is lower than the level realized in the preceding few years.

The expansion of meat production reflects both supply and demand limitations. A major proportion of the consumption is poultry meat, whose production could be expanded more than the projected level. But it is anticipated that additional production could only be sold at prices which would not meet the cost of production. The increase in the production of beef is dictated to a large extent by the size of the dairy herd, and it is unlikely that it could further increase without creating an excess supply of milk. It was therefore concluded that if prices are to be maintained at their present real level beef imports will have to be relied on in order to supply the projected excess demand. One possibility which might affect this conclusion and which should be carefully examined in the future is the import of young calves for fattening. This problem is rather more complicated than it seems at first sight. The issue is whether fattening with grains purchased abroad is profitable. It should be recalled that most of the beef production comes from the fattening of calves on dairy farms. If this is a profitable activity, then it is possible that it could also be extended as suggested, provided, of course, that young stock can be purchased at appropriate prices. If it is not profitable, then one could question the merits of following the activity even in its present form. No further attempt is made here to evaluate this point. Nevertheless, it is suggested that the problem be examined in the future.

From all this, it appears that domestic demand restrains the rate of expansion in most of the major branches. However, this statement deserves qualification. Should domestic demand allow further expansion of some branches, then—in view of the limited resources—the production of others, mainly certain field crops, would have to decline. Yet such a shift would result in a net increase of value produced. For instance, a 10 per cent increase in milk production and a corresponding expansion in beef production in dairy herds would entail a much smaller decline in the production of other branches. It is needless to say that an increase in poultry or egg production, which in the past contributed a great deal to the expansion in total agr-f cultural production, would entail almost no decrease in the production io other branches.

Two final qualifications should be suggested with respect to the above

projections. First, in most cases the assumption with respect to yields calls for a very moderate increase. Past trends did not suggest that higher projections should be used. However, in view of the fact that future expansion in production of most products would have to come mainly from scarce resources and by the operation of existing farms, it is very likely that some of the yield projections would prove to be too low. No attempt is made to suggest in which branches this is likely to happen. However, the net result of an improvement in yields might be a greater increase in overall production. The limitations of domestic demand may direct most of such an increase towards the production of field crops or export products. This brings us to the second qualification, which is concerned with exports. Except for citrus, no detailed evaluation of export possibilities was made. Some allowance was made in Table 55 for an increase in some items so that a comparison of past performance could be completed. Yet the allowance of water and land for export crops makes it possible to increase their production. It is therefore possible that such exports will continue to expand as in the past. Under these circumstances the overall increase in production would therefore somewhat exceed the projection. If these two qualifications had to be quantified, we would suggest an annual rate of growth of 9 to 10 per cent.

The question is how this modification will affect the projected equilibrium production in the various branches. It seems that in view of the negatively sloped demand function for the fresh products there will be only a small increase in their production. That is, the declining prices due to additional production will result in the movement of resources to production in those branches whose prices are not affected by increased production. Consequently, in the final analysis it seems that should there be greater increases in yields than is assumed in the projections, the main effect would be to raise the production of field crops and export products.

It should be recalled that Halevi's final projections of NDP are based on assumed alternative rates of growth of 8 and 10 per cent in agricultural production. The most reasonable projection suggested by Halevi assumes the lower value (8 per cent). Thus it is consistent with our projection and there is no need for any iteration to ensure consistency.

No explicit analysis of the possible developments in the factor markets is contemplated here. However, some general observations can be made with respect to the use of the more important factors.

It is likely that the rate of investment will decline somewhat. The decline would occur mainly in irrigation systems on farms, in poultry, and perhaps also in livestock structures and fish ponds. Investment in orchards and

machinery may continue at the past level. Investment in cattle may also be slightly lower than in the past in view of the assumed lower rate of expansion and the increase in yield.

Only a small increase in the agricultural labor force is expected in spite of the projected increase of over 50 per cent in production. Except for some seasonal work such as citrus harvesting, it is expected that most of the additional production will be achieved with the labor force already engaged in agricultural production. Such a development is, in fact, consistent with recent trends in the size of the agricultural labor force as well as with the overall increase in productivity. This outcome would also allow an increase in the net income of farmers, provided that prices did not move in the opposite direction to an extent that would affect the increase in productivity. From our subsequent discussion, it appears that this is not very likely.

The demand for other raw materials will probably rise somewhat, in proportion to the increase in production. Of course, this statement requires amplification, as it applies to particular raw materials and corresponding uses in the individual branches. Thus, the use of fertilizers and insecticides will depend on the expansion of crops and orchards, whereas the use of concentrate feeds will depend on the expansion in poultry and cattle. For the latter it was assumed that there will be some substitution for forage grown on farms.

It seems that a major policy issue will emerge in the future regarding the pricing and mobility of the two scarce resources, water and land. The problem involves the establishment of a policy which will allow an efficient use of such resources. Some reflections on this problem were suggested in the first chapter.

6. *Projected Prices and Consumption*

The foregoing analysis suggested some possible developments in real prices. The following rates of decline in wholesale prices as compared with the 1960 level were suggested: vegetables, up to 7 per cent; deciduous fruit, up to 10 per cent; grapes, 38 per cent; subtropical and other fruits, 5 per cent; eggs (retail price), 10 per cent. It is also projected that the export price of citrus may decline as much as 10 per cent. The retail price of poultry meat is expected to remain at the 1960 level. The prices of other products were assumed to remain unchanged, for the various reasons offered in the discussion.

These projections should be viewed in terms of the following underlying assumptions. A basic assumption used throughout is that the prices of products traded intensively on the international market would,

except for citrus, remain unchanged. That is, the prices in this market are assumed to remain at their past level, except for annual fluctuations. The domestic prices of the commodities will depend on the effective exchange rate. In view of the recent devaluation of the Israel pound and the present tendency toward eliminating discrepancies between price ratios in the domestic market and abroad, it seems reasonable to assume that variations in the effective exchange rate in the future will not differ much among products. It is more difficult to predict the actual level of such an exchange rate, but it is very likely that it will be somewhat higher than the present official rate, perhaps at a level of IL 3.5 to IL 4 per dollar. The actual level will be reflected in the cost of production, as it would lead to an adjustment in the prices of all imported commodities.

At first sight it seems that there should be a considerable differential effect on the costs of production, and hence on the supply, of the various products, according to the import component of their aggregate input. This, however, does not appear to be the case. Products whose imported inputs have already been affected by changes in the effective exchange rate in the more recent years will probably be affected by the additional adjustment in the exchange rate in a similar way — in relative terms — to other products, where the absolute adjustment in the effective exchange rate is greater but in which the labor component is also greater. It is not suggested that there will be no differential effect, but rather that this is not likely to be of major importance. It seems that the principal effect will be in terms of the opportunity cost, that is, that a rise in the exchange rate will encourage an increase in export production and some decline in other commodities. It has already been suggested that some possible adjustments, such as decreasing the production of sugar beet, should be examined. It would however be somewhat premature to quantify the possible consequences for the purpose of adjusting our projections. As for policy aims, it seems that if domestic prices are allowed to reflect the prices of international markets the adjustment will take place as, from all that we know at present, there will be a response to changes in the price structure.

So far, statements have been made only with respect to wholesale prices. The question is how retail and farm prices will be affected. Our analysis on this point is rather insufficient for making a conclusive statement. But again we can make some general observations. It seems that marketing charges do not vary in proportion with prices. This means that farm prices will decline somewhat more and retail prices less than will wholesale prices. The consumption and production projections are not affected, as they were laregly based on wholesale price relationships.

TABLE 58. *Local Consumption of Food, Cigarettes, and Tobacco: 1960, and 1965 Projection*

	Per capita quantity (kilograms[a])			*Per capita outlay (1960 IL)*			*Total quantity (thousands of tons[b])*		
	1960	*1965 projection*		*1960*	*1965 demand projection*	*1965 as per cent of 1960*	*1965 projection[e]*		*1965 demand as per cent of 1960*
		Demand[c]	*Equilibrium[d]*				*Demand*	*Equilibrium*	
TOTAL FOOD				**478.7**	**526.6**	110.0			
Bread and cereal products	138.0	119.6	119.6	66.5	62.8	94.4	302.3	302.3	103
Meat	27.7	33.5	33.5	96.1	116.4	121.1	84.7	84.7	144
Meat other than poultry	*10.7*	*13.0*	*13.0*	*53.9*	*65.5*	121.5	*32.9*	*32.9*	145
Poultry meat (edible weight)	*17.0*	*20.5*	*20.5*	*42.2*	*50.9*	120.6	*51.8*	*51.8*	144
Fish	10.4	10.9	10.9	20.3	21.5	106.0	27.6	27.6	125
Milk and milk products[f]	145.8	164.2	164.2	52.1	59.4	114.0	415.0	415.0	134
Eggs	345	377	385	31.5	34.4	109.3	953	973	130
Oils	16.0	15.7	15.7	20.9	20.4	97.8	39.7	39.7	117
Fresh fruit	123.0	136.6	157.9	65.4	75.6	115.5	345.3	399.2	133
Fresh vegetables and potatoes	136.7	135.1	143.0	49.6	49.6	100.0	341.5	361.5	118
Other foods				76.3	86.5	113.4			
Cigarettes[g]	1,249	1,200	1,200	**30.3**	**35.1**	115.6	3.03	3.03	115
Cotton	4.8[h]	6.1	6.1				15.4	15.4	152

[a] Milk in liters, eggs and cigarettes in units.

[b] Milk in millions of liters, eggs in millions of units.

[c] Assuming that the 1960 real prices of different commodities prevail in 1965.

[d] Assuming that the prices will be determined at the intersections of the supply and demand curves.

[e] Obtained by multiplying the per capita figures by the projected population.

[f] Consumption in terms of milk for drinking and for industry. Expenditure calculated for each sub-group separately.

[g] Total consumption calculated for tobacco needed for cigarette production.

[h] The figure is for 1958.

SOURCE: Food — Table 47 and text.

Cigarettes and cotton — studies of M. Wilsker and D. Braude in Part II.

With the increasing interest in improving the efficiency of agricultural marketing, it is likely that there will be a compensating effect which will allow both farm and retail prices to vary with wholesale prices. The major problem involved in increasing marketing efficiency is related to the economic structure of the markets involved. There are far more producers and ultimate consumers than there are marketing agencies. Such a situation is rather favorable to the development of monopolistic elements in the pricing of the intermediate agencies. Thus, considerable attention should be given to the possibility of increasing competition in all phases of the marketing channels. Such a development should automatically raise physical efficiency and should also result in a reduction in marketing charges.

Taking into consideration the adjustments called for by the equilibrium projections, the final projected basket is summarized in Table 58. The adjustments, in most cases, are not significant, and have already been discussed.

Perhaps a word of explanation should be provided on the projected consumption of wheat products and oils, the major components of which are imported raw materials. The prices of these products are likely to be affected more strongly by the change in exchange rate than are those of others. Since, however, it is believed that their price elasticity is relatively low, their consumption will not be greatly affected. Furthermore, in the case of wheat some increase in price was taken into account in using the trend projection.

7. *Foreign Trade*

A comparison of the projected consumption and domestic production leads to projected imports (or exports) of the commodities in question. Such projections for the more important commodities which were imported in large quantities are given in Table 59. It should be kept in mind that the comparison with 1960 gives only a partial view, for two reasons: (1) 1960 was a drought year; (2) in most of these commodities there are inventory changes and import and domestic production do not therefore add up to consumption.

It appears that Israel will continue to depend heavily on foreign supplies of wheat, grains for animal feeding, and oil seeds. It will also have to import some meat in order to maintain the price level and satisfy the rising consumption. There would be a decline in tobacco imports, which would be limited to types not produced domestically. The production of cotton will exceed domestic consumption, and there will be relatively large exports. In view of recent developments, it is suggested that such exports will probably be mainly as textile products rather than as raw cotton.

TABLE 59. *Net Imports and Domestic Production of Selected Products: 1960, and 1965 Projection*

(Thousands of tons)

	1960	*1965*
Wheat		
Domestic production	41.3	81
Imports	282.7	264
Grains for animal feeding		
Domestic production	51.5	132[a]
Imports	379.9	289
Meat other than poultry (edible weight)		
Domestic production	14.8	24.2
Imports	3.0	8.7
Tobacco		
Domestic production	1.7	2.1
Imports	1.1	0.9
Raw cotton fiber[b]		
Domestic production	10.6	22.8
Imports	4.6	–7.4
Oilseed for domestic consumption[c]		
Domestic production		39.0
Imports		193.2

[a] The production figure includes 16,000 tons of low-grade wheat which is also included in the wheat imports figure.

[b] There was some export of cotton products in 1960. Therefore, the sum of the two figures does not indicate domestic consumption for 1960 as it does for 1965.

[c] No figure is given for 1960, as no breakdown was made into imports for domestic consumption and for exports. Total imports of oilseed in 1960 were 198,606 tons. Blumenthal's projection indicates that if the oil refining industry operates at full capacity, total import of oilseeds will reach a level of 448,500 tons.

Imports of other foodstuffs, as recorded in Table 38, were not projected. It would be safe to assume that they will continue at about the past level. There will be no significant imports of fruit, vegetables, eggs, or dairy products. It is likely that imports of sugar will also decline somewhat. On the other hand, imports of products such as tea, coffee, and cocoa will rise. However, the change in the value of these imports will not be great.

It seems that per capita imports of all foods will continue to decrease somewhat. Likewise, the proportion of food and agricultural imports in total imports will continue to decline.

From the previous discussion it is clear that there is little basis for projecting the exports of most agricultural products. However, Table 39 shows that the principal export product is citrus, whose exports can be projected with a fair degree of confidence. If we assume that exports will rise proportionately to production, they will be 41 per cent over the 1960 level. The expected decline in foreign prices will probably be offset by the rise in the effective exchange rate to the citrus growers. In addition, exports of processed citrus products, which constitute the major item in the group of processed fruits and vegetables, will show a more than a proportionate increase.

The export of fresh fruits and vegetables is still in the initial stages, and it is impossible to predict its future course. In addition to the inherent difficulties of establishing such exports, it is possible that the trade regulations of the European Common Market will strongly interfere with their development. Although the large-scale development of these exports may open an important outlet for high-value agricultural products and facilitate a significant increase in agricultural production, it would be premature to make any projection which would deviate much from recent performance. This may not be the best guess, but it would be symmetrical with the other projections which are based on developments in the past. Some assumptions as to future exports of certain items were made in our calculation of total agricultural production. More detailed or comprehensive statements on this subject will have little value and therefore are not contemplated here.

APPENDIX TO CHAPTER 4

THE DEMAND FOR IMPORTED FEED GRAINS

The projected imports of feed grains were obtained by taking the difference between projected equilibrium consumption and production. The equilibrium consumption of feed grains was derived from the projected equilibrium consumption of cattle, poultry, and pond fish products. The output/input coefficients used in this derivation are based on surveys conducted in dairy and poultry farms. The results of the surveys were supplemented with information on the norms at present recommended by experts and by our judgment on future technological improvements as well as on changes in the prices of roughage feeds. The details of these calculations are discussed by Kislev and by Hochman (in Part II of this study). In the case of fish, we have applied the norms used by the Ministry of Agriculture. The results appear in the table. It is seen that the projected consumption is 421,000 tons and 540,000 tons for 1965 and 1975, respectively.

The production figures for 1965 were obtained from Table 56. To repeat, the projected production of barley corn and sorghum is 116,200 tons. To this we add 16,000 tons of low quality wheat which were taken into account by Blumenthal in his projection of wheat consumption. Thus, the projected total production (or local supply) of feed grains is 132,000 tons in round figures. Consequently, the projected import requirement is 289,000 tons.

For 1975, we start with our projection that the area of the unirrigated field crops will be at 80 to 86 per cent of the 1965 level. We assume that the increase in yields will offset the decline in area under cultivation so that final production will be the same as in 1965. Since the projected consumption of wheat in 1975 is not much different from that of 1965, we use again a figure of 16,000 tons of low quality wheat to be used as feeds. To summarize, the 1975 projections are: consumption, 540,000 tons; production, 132,000 tons; and import, 408,000 tons.

APPENDIX TO CHAPTER 4: *Projected Consumption of Mixed Feed Components, by Farm Branch: 1965 and 1975*

(*Thousands of tons*)

	Total mixed feed	*Small grains*	*Seedcake*	*Fishmeal*	*Bran*	*Others*
1965						
TOTAL	**720.3**	**421.1**	**168.1**	**9.1**	**66.0**	**56.0**
Poultry[a]	450.3	287.9	97.3	9.1	—	56.0
Dairy[b]	240.0	103.2	70.8	—	66.0	—
Fish[c]	30.0	30.0	—	—	—	—
1975						
TOTAL	**913.9**	**539.7**	**213.1**	**12.7**	**72.9**	**75.5**
Poultry[a]	616.4	393.3	134.9	12.7	—	75.5
Dairy[b]	265.0	113.9	78.2	—	72.9	—
Fish[c]	32.5	32.5	—	—	—	—

[a] According to Hochman, Chapter 5, Appendix 4.

[b] Total mixed feed according to Kislev, Chapter 3.

Calculated according to production projections for fish for 1965 and 1975.

The concentrate feed consists of small grains. The conversion coefficient is 2.5 kilograms of small grains per kilogram of pond fish (according to the Joint Planning Center).

CHAPTER 5

SUPPLY AND DEMAND PROJECTIONS FOR 1975

1. *Demand Projections*

The length of the period for which the projections are derived has very important bearings on our approach. It would certainly seem unjustifiable to try simply to extrapolate the empirical results which were obtained from analysis of the data in the period 1954–59. Such a procedure would take no account of some of the more important changes which are likely to occur. Thus, it may be expected that with an increase in the consumption of food items the income and price elasticities will tend to decrease. Furthermore, basic changes in consumption habits may take place. Such changes in tastes, of course, cannot be anticipated by any procedure, and any estimate may be arbitrary, with one exception: it seems safe to assume that such changes may affect the demand for individual products more strongly than the demand for food as a whole. Hence, aggregates may show greater stability and their projections may therefore be subject to smaller error.

For these reasons, and as a first approximation, we should derive consumption projections for major food groups on the basis of adjusted income elasticities. The results (again related to the NAUS) are summarized in Table 60. In the next section, we explain the relation of the results in Table 60 to both the individual commodity studies and to our discussion of the 1965 projections.

The income elasticities used in obtaining the projections of per capita consumption in 1975 are shown in column (1) of Table 60. To obtain the projections we first compute the per cent change in consumption — obtained from the product of the relative increase in income and the income elasticity — to the 1965 equilibrium projections of per capita consumption (column (2) of Table 60). In some products, the results are then modified to take account of trend or changes in price.

The weighted average of the income elasticities — the relative expenditure on the various groups being the weights — is about 0.2. This can then be considered as the assumed income elasticity for physical consumption of food as a whole. It should be noted that, since we deal only with physical

TABLE 60. *Consumption: 1965 and 1975 Projection*[a]

	Assumed income elasticities 1965–75[b]	*Per capita consumption*				*Total consumption*		
		1965	*1975*	*Per cent change from 1965 to 1975*	*1965 composition (per cent)*	*1965*	*1975*	*Per cent change from 1965 to 1975*
		(*kilograms*[c])				(*thousand tons*[d])		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ALL FOOD	0.2				**100.0**			
Bread and cereals	–0.5	119.6	98.8	–17.4	11.9	302.3	331.0	9.5
Meat		33.5	38.5	14.9	22.1	84.7	129.1	52.4
Other than poultry	0.8	*13.0*	*15.8*	21.6	*12.4*	*32.9*	*52.9*	60.8
Poultry	0.2	*20.5*	*22.7*	10.7	*9.7*	*51.8*	*76.2*	47.1
Fish	0.15	10.9	11.3	4.0	4.1	27.6	37.9	37.3
Milk and milk products	0.22	164.2	173.4	5.6	11.3	415.0	580.9	40.0
Eggs	0.2	385	401	4.1	6.5	973	1,343	38.0
Oils	–0.2	15.7	14.6	–7.0	3.9	39.7	48.9	23.2
Fresh fruit	0.3	157.9	170.7	8.1	14.4	399.2	571.8	43.2
Fresh vegetables and potatoes	0	143.0	143.0	—	9.4	361.5	479.0	32.5
Other foods[e]	0.37			10.0	16.4			
Cigarettes	0	1,200	1,200			3.0	4.0	
Cotton	0.7	6.1	7.2	18.9		15.4	24.1	56.5

[a] Equilibrium projections.

[b] The elasticities are for quantity and not for expenditure. The assumptions are discussed in the text. The following should, however, be noted: (1) The income elasticity for milk products reflects changes in the composition of the population. Underlying the final results is the assumption of elasticity of 0 for drinking milk and of 0.74 for all milk products (in terms of their milk requirement). (2) The elasticity for oils is related only to edible oils.

[c] Except for milk — in liters, and eggs and cigarettes — in units.

[d] Except for milk — in million liters, and eggs — in millions. The figures for cigarettes refer to tobacco.

[e] The projected increase in per capita consumption of other foods was arbitrarily estimated. The value is used only in order to derive the income elasticity for all food.

SOURCE: Columns (1) and (3) — see text. Column (2) — Table 58.
Column (5) — Calculated from Table 47, (demand projection, expenditure).
Columns (6) and (7) — Columns (2) and (3) multiplied by the projected population for 1965 and 1975, respectively.

measures, this elasticity takes no account of changes in the composition of the groups. Such a change in composition is considered only for total food: we first assume that income elasticity of expenditure on all foods will be at an average level of 0.42 in the period 1965–75. By using the relationship between income elasticities of expenditure and quantity, we can indicate that our assumptions imply that the quality elasticity is 0.22 (0.42 *less* 0.20). That is, changes in composition (in types, varieties and grades), as well as the increase in marketing services, will raise the value of the basket by (0.22)(27) = 5.94 per cent over its 1965 value.

The 1975 projections show a continued decrease in the consumption of bread and cereals and some decline in consumption of edible oils. Per capita consumption of vegetables and fish is forecast to remain at about the 1965 level. Egg consumption is expected to rise relatively little, and a moderate increase is forecast for milk and dairy products, and for fruit. The greatest increase, a considerable one, is expected in meat.

2. *Comments on the Consumption Projections for 1975*

We briefly indicate here the assumptions made in obtaining the 1975 projections of per capita consumption. They are related to the discussion in the previous chapter which deals with the demand projections for 1965 as well as to the projections made in the individual commodity studies.

a. *Flour and cereals*

The 1965 projection was obtained under the assumption of an annual 3 per cent decline in flour consumption. This was a trend projection which took into account some increase in the real price of wheat products. It also corresponds with a negative income elasticity for bread, which is the most important item in this group.

For 1965 we could adopt this projection without having to assume anything about the quantitative contribution of the various factors. However, granted that the income elasticity of this group is negative, a lower rate of increase in income in 1965–75 (2.4 per cent per year) as compared with that projected for 1960–65 (3.7 per cent) would imply a smaller decline in consumption as long as the income elasticity remains unchanged. It is, however, conceivable that, for some range, the income elasticity will continue to decline, but this is presumably to some extent reflected in the negative effect of trend. Furthermore, it is rather difficult to determine what should be the effect of trend itself, that is, whether it should continue to reflect a constant decline in consumption.

It is realized that any answer to these questions will be arbitrary. Yet it

seems plausible to assume that the trend of a decline in consumption will weaken[1]. In view of this assumption, and in view of the fact that income will rise more slowly, we assume that the consumption of flour products will decline at a lower rate than in the period 1960–65. We arbitrarily assume a rate of decline of 2 per cent per year and suggest that this may reflect an average income elasticity of –0.5 and an annual trend effect of –0.8 per cent[2]. This would result in a projected per capita consumption of 80.8 kilograms of wheat flour, which is 82 per cent of the 1965 level (98.5 kilograms).

We assume that the per capita consumption of the other products of this group will decline from 6 kilograms to 5.5 kilograms. Consequently, the projection for the group as a whole is 86.3 kilograms, which is 82.6 per cent of the 1965 level. Applying this percentage to the 1965 projected value of *final* products of this group (based on NAUS), 119.6 kilograms, we obtain a projected per capita consumption of 98.8 kilograms.

b. *Meat other than poultry*

It was assumed that consumption will continue to increase rapidly, though at a somewhat lower rate than was assumed for 1960–65. That is, the income elasticity was adjusted from about 1 to 0.8. As per capita income is expected to increase at an average annual rate of 2.4 per cent, per capita demand can be expected to increase at about an average annual rate of 1.92 per cent. This amounts to about one half of the rate assumed for the period 1960–65. The difference reflects not only lower income elasticity but also a lower rate of increase in per capita income. Our adjustment brings the projections in line with our forecast of declining elasticities.

Blumenthal's projection is higher for the following reasons: (a) it implicitly assumes a decrease in the relative price of meat, whereas here it is taken as constant[3]; (b) it assumes a constant annual rate of increase in consumption, but, since income will rise more slowly than in 1960–65, it implicitly assumes a higher income elasticity.

c. *Milk and dairy products*

The problems involved in arriving at a projection of drinking milk were discussed in connection with the 1965 projections. The following assumptions are made for 1975:

1 Because consumers buy wheat and cereal products even at high incomes.

2 Note that –0.5 is the elasticity of quantity consumed with respect to income. The expenditure elasticity will be higher, say –0.2.

3 See the discussion in Chapter 4.

(1) The 'nonpurchasing population' will not increase. This means that the additional population will have the consumption level of the 'purchasing population' (56 liters per capita).

(2) We accept the projected per capita consumption of drinking milk of 82.7 liters in 1965 as a basis of our computation.

(3) Multiplying the difference in the projected population between 1965 and 1975 by 56 liters, the derived consumption of drinking milk, with relative prices remaining constant, will increase by 46 million liters. The total consumption is thus projected to be at a level of 255 million liters. Accordingly, the average per capita consumption is projected at 76 liters. The decline from the 1965 level reflects the assumed change in composition in the population. Basically, this assumption implies that in the period 1965–75 there will be no increase in the number of milk producers whose consumption is higher than that of the rest of the population.

The demand for dairy products is projected by Blumenthal under the assumption that the income elasticities will remain the same as in the past. Accordingly, he projects milk requirements for processing to be 374.5 million liters, or 111.8 liters per capita. This amounts to a 45 per cent increase over the projected 1965 level. For the same period, per capita personal income is projected to increase by 27 per cent. Consequently, his projection implies an income elasticity of 1.67 for dairy products. This is considered to overestimate the actual income effect on consumption. With the rise in consumption of foods in general and of dairy products in particular, it is likely that income elasticities will be considerably lower. We therefore inject the assumption that per capita demand of milk for processing will increase by only 20 per cent and will be at a level of about 92 liters. This amounts to a total demand of 308 million liters for processing.

To this we add the requirement of 18 million liters of sheep's milk for the production of hard cheese to obtain a total demand for processing of 326 million liters. Thus, the projected total demand for milk from all sources and for all consumption outlets comes to 581 million liters, or 173.4 liters per capita, compared to 164.2 in 1965.

If we assume that the production of sheep's milk will increase by 7 million liters to supply the increased demand for processing, we shall obtain a projected production of 49 million liters of sheep's and goats' milk. Consequently, the demand for cows' milk will be 532 million liters. If we further assume that production on Arab farms will be at the level of milk used for calf feeding, as was approximately the case in the past, then the above figure is accepted as the demand for cows' milk to be supplied by the Jewish sector.

d. *Eggs and poultry meat*

Since the present consumption of eggs and poultry meat is among the highest in the world, we assumed a decrease in income elasticities and applied the elasticities of the 1959/60 family survey to the projected increase in income between 1960 and 1975[4]. Income elasticities are 0.332 for eggs and 0.167 for poultry meat.

The consumer price of poultry meat was arbitrarily fixed at IL 2.50 per kilogram of edible meat, that is, 5.3 per cent below the 1965 level, whereas the price of eggs was assumed to remain at the 1965 level. The final per capita projection for 1975 was 401 eggs and 22.7 kilograms of edible meat. These are equilibrium projections and reflect the effect of the assumed decline in the price of poultry meat.

e. *Edible oils*

The projected consumption of edible oils (margarine excluded) made by Blumenthal is 9.0 kilograms, the same as for 1965. In this, Blumenthal assumed no income effect. The empirical analysis suggests that there is a negative effect. If we take an income elasticity of –0.2 ,we arrive at a projected per capita consumption of 8.5 kilograms.

Blumenthal projected a per capita consumption of butter and margarine of 9.1 kilograms. The projected per capita consumption of butter is 3.4 kilograms. In view of our adjustments of the projection of dairy products, this value has to be changed accordingly. We assume the average income elasticity of butter for the period 1965–75 to be 2, and thus obtain a projected per capita consumption of butter of 3.0 kilograms. Accordingly, the per capita consumption of margarine will be 6.1 kilograms.

f. *Fruit*

The projected per capita consumption of fresh fruits for 1965 is 157.9 kilograms. This seems to be a relatively high level of consumption, and any further expansion in consumption is likely to be rather small. That is, in view of the high level of the projected 1965 consumption, it seems that the average income elasticity in the period 1965–75 will be relatively low.

If we assume an income elasticity of 0.3 for the period 1965–75, we would get a projected increase in per capita consumption of 8.1 per cent over the 1965 level. That is, the projected per capita consumption for 1975 under this assumption would be 170.7 kilograms. The rate of increase will not

[4] A similar procedure was followed in the 1965 projection. For details see Hochman.

be the same for all fruits. It is very likely that the present ranking of the income elasticities will prevail in the future, that is, higher income elasticities for apples and pears, and lower elasticities for plums, grapes, citrus, bananas, and melons. We shall not attempt, however, to break down the projection by major fruits, as this would serve no purpose at this stage.

g. *Vegetables*

The per capita consumption of vegetables is expected to remain at the 1965 level. It is recalled that the 1965 level is about the same as that of the 1960. Thus it is assumed that the income elasticity will continue to be zero.

3. *Implications for Production in 1975*

We turn now to the implications of the 1975 demand projections for the 1975 projections of production and land and water utilization.

We again assume that real prices of raw materials will remain at their 1960 level. This is, of course, only a working hypothesis. In our study no analysis was made of the factor markets, and hence there is no good basis for making any other specific assumption. The rationale of this hypothesis lies in the fact that most raw materials are imported. If we assume that the international prices of these goods are relatively stable, then their domestic prices will tend to vary with the general price level in Israel. In this connection, it should be noted that the proportion of expenditure on raw materials accounted in 1961 for 37 per cent of total agricultural output[5]. Thus, small deviations from this assumption will not have a significant effect on our conclusions.

It is further assumed that the cost of farm labor will increase proportionately to the average wage rate of urban employees. This means that there will be a constant increase in the real cost (opportunity or direct) of farm labor, tending to reduce the quantity supplied at any given price. The effect will be stronger in labor intensive products.

An opposite effect on the supply function for farm products will result from the increase in productivity. From the discussion in Chapter 3, it appears that the increase in supply resulting from a 1 per cent increase in productivity will more than offset the reduction in supply due to a 1 per cent rise in the real wage of labor. Thus, the actual change in the position of the supply function will depend on the relative increase in productivity and wage rates. As a first approximation, it is assumed that the supply functions will shift at the same relative rate as that of the increase in pro-

[5] See Table 8.

ductivity. To determine the drain on particular resources (mainly land and water), output is divided by the projected yields.

The yield assumptions are clearly arbitrary. We have commented on this point in Chapter 3 and indicated that extrapolation of past trends may be misleading. Thus, at best, our calculations would allow us to explore the projected pattern of resource utilization in agriculture under one set of yield projections.

We turn now to considerations of the future development of each branch. The order of presentation will differ from that of Chapter 4. We start with products which are produced and consumed domestically and then arrive at resources available for field crops.

a. *Dairy products*

On the basis of a detailed examination of yield variations, Kislev projects the yield per cow to be 6,000 liters in 1975, as compared with 4,780 liters in 1965. This amounts to an increase of 25.5 per cent in the period considered. With a projected production of 532 million liters in 1975, the dairy herd will consist of 88,700 milking cows. This is an increase of 13.7 per cent over the projected number of cows in 1965.

Kislev arrived at the projection of the area necessary to supply the forage requirements by assuming (1) an increase in the proportion of concentrates in the total ration; (2) that with the increase in the demand for water, supply remaining almost unchanged, greater efforts will be directed at raising forage yields per unit of water. This would be done partly by reducing the amount of water per irrigated dunam of forage (also through a change in composition in favor of crops with higher average productivity per unit of water) and partly by increasing the yield level in general. It is arbitrarily assumed that water conservation will lead to a saving of 10 per cent and the second factor will increase yield per dunam by 20 per cent. Consequently, the irrigated land necessary to provide a given quantity of feeds will decrease by 20 per cent, and the quantity of water necessary to produce the same quantity of feeds will decrease by 25 per cent.

For forage production on dry land, it is assumed that the yield will increase by 10 per cent. Consequently, the projected forage area is 350,000 dunams on irrigated land and 600,000 dunams on dry land.

b. *Meat other than poultry*

The projected demand is of 52,900 tons of meats other than poultry (edible weight). The projected supply is of 32,540 tons[6]. Thus, in order to

[6] See Kislev, Chapter 3, p. 77.

maintain the real prices of meat at the 1960 level, 20,360 tons will have to be imported. The limiting factor to the expansion of beef production is the supply of young stock for fattening. This problem was commented on in Chapter 4. However, should it be found that fattening imported stock is a profitable activity, meat imports will be reduced.

c. *Poultry meat*

The projected domestic consumption of poultry meat is 76,200 tons edible weight, equivalent to 101,597 tons live weight. With the addition of 500 tons for exports, production will be 76,700 tons of edible meat.

d. *Fish*

The projected consumption is 37,900 tons. Assuming — as for the 1965 projection — that attempts to develop sea fishing will be successful, we arbitrarily set the projected production at a level of 25,000 tons. Thus, imports of 12,900 tons will be required.

e. *Citrus*

On the basis of Levhari's analysis and on the basis of the present tendency to increase the citrus area, it is assumed that the total citrus area will rise to 500,000 dunams. Such expansion will result in planting lower-yield districts or land. Consequently, any increase in the general level of yields will probably be offset by the lower yield of the new orchards. We therefore assume no change in average yield[7].

f. *Fruits other than citrus*

The projected domestic consumption indicates an expansion of 43.2 per cent in the period 1965–75. If we assume that yields will increase by 20 per cent, then the fruit area will have to increase by some 20 per cent in order to supply domestic consumption.

g. *Vegetables*

An increase of 20 per cent in yield per dunam is also asssumed for vegetables and potatoes. As a result, the area of vegetables and potatoes will have to increase by 10.4 per cent over the 1965 level in order to supply the domestic demand.

[7] It is also assumed that most planting will take place early in the period so that by 1975 the yields will be close to normal.

4. *Water, Land Utilization and Field Crops*

The projected production of field crops depends on the water and land that will be available for this branch. For 1975, no detailed projection by crops will be made. Instead, an attempt is made to construct projections of the value of production for the following three groups: irrigated field crops other than forage, unirrigated field crops other than forage, and forage. The projected value of these three groups for 1965 is (in millions of 1959 IL)[8]:

Irrigated crops	75.5
Unirrigated crops	70.3
Forage	47.7
Total	*193.5*

The water requirements of the products, other than field crops, whose production is projected above are summarized in Table 61, where 1975 requirements are compared with those estimated for 1965. In this comparison, allowance is made for other uses which are not discussed in this Chapter (first two lines of Table 61). It emerges that water consumption by agriculture, excluding field crops, will be 945 million cubic meters in 1975 as compared with 808 million cubic meters in 1965. The latter figure was augmented by 7 per cent to allow for excess use[9]. This can be interpreted as saying that actual requirements are 7 per cent above the norms used.

In order to arrive at the projected quantity of water available for field crops in 1975, another factor has to be considered. It stands to reason that the relative scarcity of water will lead to more efficient methods of utilization which can take various forms such as (1) decrease in the rates of water application per unit of land, so that a given quantity is used to irrigate a larger area; (2) a change in crop composition in favor of crops consuming less water; and (3) the development and adaptation of new crops or varieties which produce larger yields per unit of water. We assume that such improvements will result in a total saving of 15 per cent. As a consequence, the subtotal is adjusted downward from 945 million to roughly 875 million cubic meters[10].

The final step of this calculation depends on the projected total quantity of water to be available for agricultural production. Yaron quotes a projected quantity of 1,100 million cubic meters for 1970. No projection is

[8] Based on last column of Table 56.

[9] See Yaron, Appendix E.

[10] Obtained by first augmenting the subtotal by 7 per cent and then taking into account the 15 per cent saving.

TABLE 61. *Water Utilization: 1965 and 1975[a] Projections*

(Millions of cubic meters)

	1965[b]	*1975*
Plots, yards, and non-Jewish agriculture	60	70
Fish ponds	100	100
Irrigated forage crops	143	176
Orchards	428	513
Citrus	*300*	*360*
Others	*128*	*153*
Vegetables	77	86
Subtotal	**808**	**945**
Subtotal adjusted for increase in efficiency in 1965–75[c]		875
Residual for field crops and export crops[d]	208	225–325
TOTAL FOR AGRICULTURE	**1,016**	**1,100–1,200**

[a] The following rates of water application (not adjusted for increased efficiency of application) are assumed (cubic meters per dunam): forage, 502; vegetables, 430; citrus, 720; other fruits, 637. The projected utilization of irrigated land appears in Table 62.

[b] Based on Table 52. The figure for vegetables was obtained by multiplying 180,000 dunams (Table 55) by the rate of 430 cubic meters (note a).

[c] See text.

[d] The figure 208 is a 'gross' figure from which allowance for excess use must be deducted. See text.

available for a later date. The pertinent developments that may take place in the period 1970–75 are that (1) population growth and industrial expansion may increase the non-agricultural uses of water and reduce the quantity available to agriculture, and (2) further development of marginal sources may have an opposite effect. Of course, no consideration is given here to the possibility of a major development of cheap energy sources or methods of desalination, either of which may result in a fundamental change in the water limitation. There is no basis for discussing this projection in greater detail, so it is assumed that the total quantity available to agriculture will be in the range of 1,100 to 1,200 million cubic meters.

A consequence of this assumption is that some 225 to 325 million cubic meters will be available for field and export crops. This serves as a basis for projecting the production of these crops. The production projection for the whole group is obtained by assuming: (1) that with no increase in yields,

the value of production will change proportionately to the amount of water available for the group; and (2) that the result obtained in (1) is inflated by a projected increase in yields.

The assumed quantity of water to be used in 1965 by field and export crops is 146 million cubic meters. Consequently, the corresponding projection for 1975 is 54 to 123 per cent higher (depending on the projected total). The projected value of production of the irrigated field crops was quoted above as IL 75.5 million (1959 prices). The water consumption of this group accounts for 94.5 per cent of the 146 million cubic meters. Taking this into account, the projected production for 1975, under the assumption of no changes in yields and composition, is IL 123 to 178 million (1959 prices). It is assumed that increase in yields and change in composition (in favor of higher-value crops) will raise the value of production by 25 per cent[11]. Consequently, the projected production of the groups is IL 154 to 223 million (1959 prices).

The next step is the calculation of the projected production of unirrigated crops. The procedure is similar to that followed above except that the determining factor will be the quantity of land available for this group. The projected utilization of irrigated crops appears in Table 62.[12] The

TABLE 62. *Utilization of Irrigated Land: 1965 and 1975 Projections*

(Thousands of dunams)

	1965[a]	*1975*[b]
Orchards	600	740
Citrus	*400*	*500*
Others	*200*	*240*
Forage	293	352
Vegetables	180	200
Other crops[c]	396	530–710
TOTAL	**1,469**	**1,822–2,002**
TOTAL adjusted for saving in water application (TOTAL *plus* 10 per cent)		2,000–2,200

[a] Based on Table 55. [b] See text for explanation.

[c] The figure for 1975 was obtained under the assumption that the average rate of irrigation for field crops will be 550 cubic meters per dunam and by adding 120,000 dunams of miscellaneous crops (see Table 55).

11 Note that this also reflects the assumption of a reduction in irrigation rates.

12 It has been assumed that land allocated to irrigated field crops will increase in the same proportion as the water available for the group.

total was then inflated by 10 per cent to allow for the assumed reduction in irrigation rates. The result is a projected value of irrigated land of 2.0 to 2.2 million dunams, or an increase of 530 to 730 thousand dunams over the total projected for 1965. The projected total of cultivated unirrigated land for 1965 was 2,440 thousand dunams. This figure is accepted as a basis for further calculations, the results of which are summarized in Table 63. From these calculations it emerges that unirrigated field crops in 1975 will be at a level of 80 to 85 per cent of that projected for 1965. It is assumed that in this group the value of production per unit of land will rise by 25 per cent in the period 1965–75. This takes into account an increase in yield and a change in composition in favor of higher-valued crops (more labor or capital intensive). As a consequence, the projected production of this group is IL 70 to 75 million (1959 prices).

TABLE 63. *Land for Unirrigated Crops: 1975 Projection*

(Thousands of dunams)

		Available water hypothesis	
		Low	*High*
Dry land in 1965		2,440	2,440
less Land shifted to irrigation		530	730
Dry land in 1975		*1,910*	*1,710*
less Orchards		250	250
less Forage		600	600
Dry land for field crops other than forage or miscellaneous		*1,060*	*860*
plus Unirrigated crops on irrigated land		400	500
Total unirrigated crops other than forage	1975	**1,460**	**1,360**
	1965	1,710	1,710
1975 as per cent of 1965		85	80

Finally, Kislev suggests that a total of 573 million feed units will be required in 1975; it is assumed that of this 308 million will be supplied by domestically grown roughages. This amounts to a 36.3 per cent increase over the projected 1965 level. Consequently, the value of production is projected as IL 65 million (1959 prices). The figures are summarized in Table 64.

TABLE 64. *Production of Field Crops: 1975 Projection*
(Millions of 1959 IL)

	Water assumption	
	Low	*High*
Irrigated field crops other than forage	154	223
Unirrigated field crops other than forage	75	70
Forage	65	65
TOTAL	**294**	**358**

Perhaps a general remark may be made with respect to the composition of this group. Basically, if no major structural changes take place, then Yaron's analysis could be extended to 1975. This implies a pattern of production similar to that projected for 1965, with cotton being a major crop. The role of sugar beet will depend on future policy with respect to the existing differential treatment. In addition, it is likely that there will be an expansion in crops whose export will prove feasible and profitable. The pattern of utilization of unirrigated crops is likely to be similar to that which existed in the past unless new crops are introduced. More specifically, it is expected that tobacco area will decline somewhat and that melon, cotton, and perhaps vegetable area will increase somewhat, with small grains and pulses taking up the slack.

5. *Production Projections — Summary and Evaluation*

The production projections are summarized in Table 65. Total agricultural production is expected to increase from IL 1,111 million in 1965 to between IL 1,672 and 1,736 million in 1975 (1959 prices). This is an overall increase of 50.5 to 56.3 per cent, or 4.2 to 4.6 per cent per year. This is considerably less than the rates projected for the period 1960–65. The decline in the rate of growth is again explained by limitations from the demand side and by the limitations on land and water. It should be noted that the demand limitations are expected to be more restrictive than in the period 1960–65. This stems from the fact that per capita income will rise more slowly, and that income elasticities are expected to decline as income and consumption increase. Thus, the projected increase in the production of those perishable products which are mostly consumed domestically varies in the range of 32 to 43 per cent. The production of beef is

TABLE 65. *Production: 1965 and 1975[a] Projection*

	Physical production (thousand tons)		*Per cent change from 1965 to 1975*	*Value of production (millions of 1959 IL)*	
	1965 (1)	*1975* (2)	(3)	*1965* (4)	*1975* (5)
Forage	226[b]	308[b]	36.3	47.7	65.0
Other field crops[c]				145.8	229–293
Vegetables and potatoes	405	537	32.5	66.7	88.4
Citrus	830	1,800	116.9	154.6	335.3
Other fruit			43.2	155.6	222.8
Milk	428[d]	600[d]	40.2	112.1	157.0
Cows	*386*	*550*	42.5	*100.8*	*143.6*
Sheep and goats	*42*	*50*	19.0	*11.3*	*13.4*
Eggs	1,237[e]	1,607[e]	29.9	103.5	134.4
Meat (live weight)	123.3	174.6	41.6	233.4	326.9
Beef	*41.3*	*51.3*	24.2	*94.2*	*117.0*
Mutton and other	*13.0*	*21.0*	61.5	*26.5*	*42.8*
Poultry	*69.0*	*102.3*	48.3	*112.7*	*167.1*
Fish	20.0	25.0	25.0	26.8	33.5
Miscellaneous[c]				45.0	60.0
Exports not included above[c]				20.0	20.0[f]
TOTAL				**1,111.2**	**1,672.3–1,736.3**

[a] First approximation.
[b] Million feed units.
[c] No projection of physical production was made.
[d] Million liters.
[e] Millions.
[f] For further possible expansion in exports see discussion in the text.

SOURCE: Columns (1) and (4) — Table 56, columns (3) and (9), respectively.
Columns (2) and (3) — See text for details.
Columns (5) — the per cent change in column (3) applied to column (4).

also affected by demand limitations in that the rate of expansion of the dairy herd determines the production of beef on dairy farms. The second source of beef production is the specialized beef herds. The contribution of this source is limited by the present estimate of the carrying capacity of natural pasture.

The major increase in production is expected in citrus which is mainly exported. This projection reflects, of course, our assumption of a further increase in citrus area.

As explained in the previous section, the production of field crops is mainly determined (apart from the yield assumption) by the available quantities of water and land. Thus, these limitations affect the projected increase in production of this group.

The question then arises whether it is inevitable that the rate of growth will decline considerably in the future. There are apparently two principal developments which may change the results: (1) development of exports, and (2) a further increase in productivity. This subject is discussed elsewhere in the report and therefore only a few comments are made here. Except for citrus, the 1975 projections envisage no substantial increase in exports over the 1965 projections. This is mainly due to the lack of any sound basis for an explicit statement of future agricultural exports. However, some idea of the possible contribution of exports to total agricultural production can be obtained in the following way.

Let us ask what should be the net contribution of additional exports (over and above the values implicit in our projections) to production if total production is to expand at annual rates of 4.7 to 5.1 per cent rather than from 4.2 to 4.6 per cent. Under this assumption, total production will be at a level of IL 1,758 to 1,825 million (1959 prices), or an increase of IL 86 to 89 million over the original projection. Of course, these figures represent the *net* contribution of export. That is, production is equal to the additional export less the production foregone as a result of shifting land and water to those crops. Although these figures seem to be somewhat high, we accept them as an alternative which will be denoted as 'projected production with development in exports'.

While development of exports may reduce the limitations from the demand side, a faster increase in yields may overcome some of the resource limitations. The original projections were obtained largely under the assumption that in the period 1965–75 the increase of yields will be in the order of 20 to 25 per cent. We can now explore the possible consequences of a faster increase in yields. The calculations are similar to those made above with respect to exports and are summarized in Table 66.

TABLE 66. *Alternative Projections of Total Agricultural Production: 1975*

Adjustments	*Increase in rate of growth (per cent per annum) due to adjustment*[a] *in*		*Resulting rate of growth (per cent per annum): water assumption*		*Per cent change from 1965 to 1975: water assumption*		*1975 production (millions of 1959 IL): water assumption*	
	Exports	*Yield*	*Low*	*High*	*Low*	*High*	*Low*	*High*
1. None			4.17	4.57	50.5	56.3	1,672	1,736
2. Exports	0.5		4.69	5.09	58.3	64.3	1,758	1,825
3. Yield—a		1.0	5.21	5.62	66.2	72.7	1,846	1,919
4. Yield—b		2.0	6.25	6.66	83.3	90.6	2,036	2,118
5. Exports and yield—a	0.5	1.0	5.73	6.14	74.6	81.4	1,940	2,015
6. Exports and yield—b	0.5	2.0	6.77	7.18	92.5	100.0	2,139	2,222

[a] Blanks indicate that no adjustment was made.

It emerges that under the assumptions considered above, the rate of growth may vary in the range of 4.2 to 6.8 per cent per year for the low water assumption and in the range of 4.6 to 7.2 for the high water assumption. Obviously the different assumptions imply considerably different production projections. The question can then be raised, how should the increased production due to increase in yields be absorbed if domestic demand is considered a limiting factor? No unique answer can be given to this question as it depends on the differential increase in the various branches, a subject which is not considered at all here. Generally speaking, the following adjustments in production composition are likely to take place:

(1) Prices of products whose yield will rise relatively faster and which are domestically consumed will have to decline somewhat, and consequently consumption will increase accordingly.

(2) The increase in yields is likely to improve the competitive position in foreign markets, and consequently higher exports are likely to be realized. This means that the export assumption is not completely independent of the yield assumption.

(3) The slack which is not taken care of by (1) and (2) will be absorbed by the increase in the production of field crops on which no demand limitations exist.

Finally, one may have doubts whether such a range in production projection has any value. After all, we deal with variations of the order of magnitude of 30 per cent, and it makes a considerable difference which one will materialize. There are two pertinent points here: (1) it is difficult to predict the variables that determine the variations, and the limitations of our knowledge should be taken into consideration in evaluating the projections; (2) there is, however, a normative value which is derived from the variations in the magnitude of the final projections. The activity of increasing yields is not at all exogenous to the economy. Therefore, the different total production aggregates obtained give some dimension to possible future gains from speeding up the increase in yields.

PROJECTIONS OF POPULATION AND INCOME FOR 1965 AND 1975

by NADAV HALEVI

1. *Introduction*

The purpose of these projections is to present some of the macro-economic data necessary for estimating the demand and supply of agricultural commodities. The main data needed on the demand side are population and disposable income per capita.

All the aggregates about which assumptions have to be made (such as immigration, employment and productivity) may be subject to considerable changes, even over a short period. Indeed, several of the following tables showing Israel's experience to date bring out the fact that extremely large changes have been quite common, and that therefore there is considerable danger in the blind projection of past trends. However, it is not the purpose of these projections to catalogue *all* possible developments in the Israel economy, but rather those that appear to be the more likely ones. Consequently, the projections for 1965 are based on what appear to be 'reasonable' assumptions, allowing for some, but not major, variations in the basic elements — except immigration, which is allowed a wider range of variability. A compromise has been made between the desire to allow for as much 'reasonable' variation as possible and the need to reduce the variety of results to manageable proportions.

Whereas projections for 1965 can be presented with some confidence that they will probably approximate actual developments, the projections for 1975 are no more than a presentation of what now appears plausible. In a longer period, it is very likely that at least one or more major developments — cheap desalination of sea water, war, final peace with the Arabs, cheap atomic power, Israel membership in a regional economic scheme (most likely Europe) — will take place. Any one of these can change the basic assumptions from which the projections stem. Consequently, the projections are not a prediction of what will happen, but of what is likely to happen if no major changes occur. For this reason, fewer possibilities are discussed than for 1965.

Because the studies carried out in this research project are quite time-

consuming, two sets of projections have been prepared: one based on 1959 and incomplete 1960 data and a later set based primarily on 1961 data. The first set was the basis for the preliminary estimates of demand and supply of agricultural commodities. The second set was used to adjust the preliminary estimates, where necessary. In the following pages, both sets of estimates are presented.

2. *Projections to 1965*

a. *Population*

The tremendous increase in population has been the most distinctive feature of the Israel economy[1]. Tables 1 to 3 summarize the main features of the growth in population. The primary factor accounting for the increase in population has been Jewish immigration, particularly from May 1948

TABLE 1. *Average Population: 1949–61*

(Thousands)

	Jews	*Others*	*Total*	*Per cent growth in total over preceding year*
1949	901.1	145.0	1,046.1	..
1950	1,103.0	163.7	1,266.8	21.1
1951	1,324.0	170.3	1,494.3	18.0
1952	1,429.8	176.4	1,606.2	7.5
1953	1,467.7	182.6	1,650.2	2.7
1954	1,500.6	188.8	1,689.5	2.4
1955	1,555.3	195.1	1,750.4	3.6
1956	1,626.3	202.0	1,828.4	4.5
1957	1,721.2	209.3	1,930.5	5.6
1958	1,782.7	217.4	2,000.1	3.6
1959	1,836.2	225.9	2,062.1	3.1
1960	1,882.6	234.4	2,117.0	2.7
1961	1,943.8	243.6	2,187.4	3.3

SOURCE: *SBI*, Part A, February 1962, p. 49 (Hebrew).

1 For a summary of the impact of population growth, see Don Patinkin, *The Israel Economy: The First Decade*, FP, 1960, Chapter 1.

TABLE 2. *Jewish Immigration: 1948–61*

(*Thousands*)

	Immigrants[a]	*Emigrants*	*Net Immigration*
1948 (May–December)	101.8	1.0	100.8
1949	239.6	7.2	232.4
1950	170.2	9.5	160.7
1951	175.1	10.1	165.0
1952	24.4	13.0	11.4
1953	11.3	12.5	–1.2
1954	18.4	7.0	11.4
1955	37.5	6.0	31.5
1956	56.2	11.0	45.2
1957	71.2	11.0	60.2
1958	27.1	11.5	15.6
1959	23.9	9.5	14.4
1960	24.5	8.5	16.0
1961 (January–September)[b]	33.5		

[a] Including travelers settling.

[b] Latest available figures at time of writing. While this was in press, *SAI No. 14* became available and according to this source there were 47,600 immigrants and 7,300 emigrants (including non-Jews), for the whole of 1961 (pp. 109, 121). Net immigration thus came to roughly forty thousand.

SOURCE: 1948–60 — *SAI No. 12*, pp. 85, 102.
1961 — *SBI*, Part A, November 1961, pp. 489, 492 (Hebrew).

to the end of 1951[2]. Immigration[3] accounted for two-thirds of the increase in population from May 1948 to the end of 1959. However, if the comparison is restricted to the period 1952–59, i.e., after mass immigration had subsided, immigration accounts for only 37 per cent of the increase in population. Even though immigration has declined in importance in recent years, it has still been sufficiently large, together with Israel's fairly high natural increase, to make Israel's population one of the fastest growing in the world.

The importance of immigration, and the frequent fluctuations in its size, make the estimate of future immigration of paramount importance in projecting the size of population. In no five-year period since 1952 has average net immigration been less than 18,000, or more than 33,500. In the first

[2] See Moshe Sicron, *Immigration to Israel: 1948–1953*, FP and CBS, May 1959.

[3] Net of Jewish emigration, and excluding the emigration of Arabs who were resident in the territory which is now Israel and left after the creation of the State.

projection it was thought advisable, therefore, to use three alternative average net immigration assumptions: 20,000, 30,000 and 40,000.

While the number of immigrants in 1960 was only 24,500 it grew to 33,500 during the first nine months of 1961 (the latest official estimate at the time of writing) — a considerable increase, though probably not beyond the limits of our highest alternative. All indications are that 1962 was a year of greatly increased immigration, well beyond our three alternatives[4]. However, no one can predict how long this immigration will continue. Our guess — and it is no more than a guess — is that there may be a year or two of 'high' immigration, and then a considerable decline. Our new projections, therefore, starting from a mid-1961 base, assume three alternatives for annual net immigration — 30,000, 40,000 and 50,000.

TABLE 3. *Rates of Natural Increase: 1950–61*

(per 1,000 average population)

	Jews	*Others*	*Total*
1950	26.48	33.71	27.42
1951	26.26	37.75	27.23
1952	24.73	34.05	25.68
1953	23.91	38.72	25.44
1954	20.93	35.42	22.45
1955	21.45	37.35	23.12
1956	20.37	37.80	22.18
1957	19.86	37.21	21.63
1958	18.43	40.16	20.66
1959	18.51	40.51	20.78
1960	18.67	42.53	20.35
1961	17.35	41.34	18.98

SOURCE: *SBI*, Part A, February 1962, p. 52 (Hebrew).

The estimate of natural increase has been made separately for Jews and non-Jews, because of the large difference in birth rates between the two. The non-Jewish (mainly Arab) population of 1965 was projected by assuming that the average 1960 population will increase at an annual rate of 40 per thousand, i.e., 4 per cent. There is no reason at present to revise this estimate.

4 Figures published as this goes to press confirm this impression.

The natural increase of the Jewish population has been declining, though not consistently. An examination of the age distribution of the population suggests that this trend is approaching an end, and in fact some rise in the rate of natural increase may be expected in several years when the share of women of childbearing age will increase. For the 1965 projection an average rate of about 1.8 per cent was assumed. Thus, three estimates of population are presented in each set. They result from applying a 1.8 per cent rate of growth to the 1960 (1961 for the second set) average Jewish population, adding to the result three alternative immigration figures, and repeating the process till arriving at the three average 1965 Jewish population estimates, to which is added the non-Jewish population. The resulting population projections ranged from 2,450,000 to 2,560,000, in the first set, and from just under 2,500,000 to 2,590,000 in the later set.

b. *Employed labor force*

The employed civilian labor force and its branch distribution during 1950–61 is shown in Table 4. The demographic structure of the labor force is not expected to change sufficiently during the coming five years to warrant prediction of significant changes in labor force participation. Furthermore, since the assumed increase in population — except perhaps the highest — does not seem to be too large for the economy to absorb without undue stress, it is reasonable to assume that the recent, relatively low, unemployment level of slightly under 5 per cent will be maintained on the average.

Using these two simplifying assumptions, a projection of the employed civilian labor force is made by applying the percentage growth in population to the employed civilian labor force, of 1960 in the first set, and of 1961 in the second set.

The distribution of employed civilian labor force has shown unusual consistency with some shift to industry in recent years. However, even a shift of one or two percentage points from one branch to another may be significant. Four alternative assumptions of distribution in 1965, each fairly arbitrary, were used for the first set:

1. The distribution will be the same as in 1959.
2. The share of employment in the sectors other than agriculture and industry will decrease to 55 per cent, with industry taking up the difference.
3. The share of employment in agriculture will decrease to 15 per cent, with industry taking up the difference.
4. Industry will absorb a decline in the shares of both agriculture and the other sectors, i.e., 2 + 3.

TABLE 4. *Employed Civilian Labor Force, by Branch: 1950–61*

	Agriculture	*Industry*[a]	*Other*	*Total*
A. *Thousands*				
1950	64.6	95.6	238.3	398.5
1951	78.9	116.1	301.3	496.3
1952	90.9	121.9	331.3	544.1
1953	90.8	133.2	319.7	543.7
1954	94.2	138.1	331.6	563.9
1955	102.7	137.2	343.9	583.8
1956	106.5	143.0	348.9	598.4
1957	104.7	154.8	382.7	642.2
1958	115	162	378	655
1959	120	170	390	680
1960	120	179	403	702
1961	122	194	419	735
B. *Per cent of total*				
1950	16.2	24.0	59.8	100.0
1951	15.9	23.4	60.7	100.0
1952	16.7	22.4	60.9	100.0
1953	16.7	24.5	58.8	100.0
1954	16.7	24.5	58.8	100.0
1955	17.6	23.5	58.9	100.0
1956	17.8	23.9	58.3	100.0
1957	16.3	24.1	59.6	100.0
1958	17.6	24.7	57.7	100.0
1959	17.6	25.0	57.4	100.0
1960	17.1	25.5	57.4	100.0
1961	16.6	26.4	57.0	100.0

[a] Including public utilities.

SOURCES: 1950–57: A.L. Gaathon, *Capital Stock, Employment and Output in Israel: 1950–59*, Bank of Israel Research Department, Special Studies No. 1, Jerusalem 1961, Appendix Table C–1.
1958–61: Bank of Israel, *Annual Report: 1961*, p. 134.

A relative decrease in agriculture seems reasonable in view of the limitations imposed on the expansion of agricultural settlement by the shortage of water. Such a shift can be brought about by a change in the settlement policy of the Government in conjunction with efforts to expand industry, or as the result of market forces: i.e., a continuation of the trend of relative decline in agricultural prices and earnings.

A shift from services to industry is desirable in order to improve the balance of payments situation. It too can be brought about by changes in relative

earnings, particularly as a result of government efforts toward relative expansion of investment in industry.

Recent events have strengthened our conviction that there will probably be a relative decline in agriculture. Consequently, assumptions 1 and 2 were dropped in the second set, which of course is based on 1961 data[5].

c. *Methods of estimating national product*

National product may be projected with various levels of refinement. The simplest method is to assume an average annual rate of growth, taking into consideration that the rate of growth in recent years has been close to 9 per cent[6].

A second method is to assume some rate of change in the capital-output ratio and to estimate growth in utilized capital, or assume some rate of growth in output per worker and estimate the size of employed labor force. The essential difference between this and the first method is that here the growth in output is divided into two parts: one part resulting from increased inputs of a major factor of production (either labor or capital) and the second part resulting from increases in output per unit of the input, regardless of whether such increased output is a reflection of increased 'productivity' or of increased inputs of other factors. A more sophisticated method is to employ one of the above variants within a multi-equation model designed to make explicit assumptions usually left implicit, and to test the compatibility of the various assumptions, particularly those relating to government policy. Extremely interesting work of this type, both in aggregate models and disaggregated input-output models, is being done at the Bank of Israel[7].

The more complex model has not been chosen for our forecasts because the relatively few macro-economic magnitudes we require can be estimated on the basis of much simpler assumptions, leading to results virtually the same as those given by the Bank of Israel's intricate model.

A variation of the second method mentioned has been adopted, not

[5] These assumptions (1 and 2) were included in the original calculations, but as they were not applicable to the 'more likely' tables of the first set, they are not shown in the alternative tables.

[6] This is the procedure used, for example, by the United States Operations Mission in Israel.

[7] The method of their work is summarized in Hollis B. Chenery and Michael Bruno, *Development Alternatives in an Open Economy: The Case of Israel*, (forthcoming). An article based on this research has appeared: Z. Zussman, "The Limitations of Economic Planning in Israel", *The Economic Quarterly*, Vol. 7, No. 28, October 1960, (Hebrew).

because it is much more exact than a simple assumption as to the rate of growth of national product, but because it makes explicit some of the assumptions on which the first method rests.

The method here used is as follows: alternative assumptions are made concerning the increase in output per worker in industry and the 'others' sector. These are based mainly on recent experience. The alternative outputs per worker, based on rates of growth applied to the product per worker in the base year, multiplied by the alternative number of workers, give numerous outputs. To narrow the variety of outputs to manageable proportions, only 'more reasonable' combinations of assumptions are used in the final computations. This procedure is adopted because an alternative, using capital-output ratios, seems inappropriate for an economy where more than half of the product originates in services (defined to include everything other than agriculture and industry).

For agriculture, assumptions are made as to rates of growth of output, rather than output per worker. This is done because the number of workers is of much less significance in determining output than in the other branches.

d. *Forecasts of national product*

Table 5 summarizes the rates of growth in output per worker during 1950–59 and sub-periods. There are glaring discrepancies in industry between growth in output per worker and growth in net domestic product

TABLE 5. *Average Annual Rates of Growth of Output and Product per Worker*

(*Per cent*)

	1950–59	*1950–52*	*1952–55*	*1955–59*
Output per worker				
Agriculture	7.3	–1.9	9.0	10.8
Industry	2.8	–10.8	8.0	6.3
Net domestic product per worker	4.7	–0.3	8.2	4.7
Agriculture	8.0	1.0	4.4	14.4
Industry	–1.1	–10.5	4.3	–0.1
Transportation	8.6	13.5	8.8	6.2
Other branches	6.9	5.8	11.2	4.4

SOURCE: A.L. Gaathon, *op. cit.*, Appendix Table D–4.

per worker[8]. One reason may be that the method of deflating NDP in industry understates its growth. On the other hand, there is evidence that the ratio of total output to added value in industry is increasing[9]. Consequently, the 'true' average rate of growth of NDP per worker in industry in the 1955–59 period is somewhere between 0 (the rate of growth in *product* per worker) and 6 per cent (the *output* per worker). For this reason, four alternatives have been chosen: 2 per cent, 3 per cent, 4 per cent, and 5 per cent.

Product per worker in the 'others' sector (excluding rent) has grown at close to 5 per cent during the 1955–59 period, although the concept of productivity for many of the components of this catch-all item is highly ambiguous. Three alternative assumptions are used: 3 per cent, 4 per cent and 5 per cent.

NDP in agriculture has grown extremely rapidly in recent years,[10] with annual increases ranging from 12 to 24 per cent. After discussion with the agricultural economists working on the agricultural side of this study, it has been decided to assume alternative rates of growth of 8 per cent, 10 per cent and 12 per cent.

The combination of working hypotheses was made with the following implicit assumptions in mind: agricultural production will be affected mainly by size of population, and only partly by the number of workers in agriculture; investments in industry will vary in a limited range, and thus permit high rates of growth in product per worker if the additional manpower is not large, but these rates will be lower the greater the absolute increase in industrial workers; increases in product per worker in services will probably be somewhat lower than in recent years, particularly if the increase in workers is relatively large.

On the basis of these assumptions, eight product figures were derived in the first set, and seven in the second set. Two adjustments must be made to arrive at net domestic product. First, net rent must be added. The ratio of net rent to net domestic product excluding rent was applied to our 1965 figures to arrive at a projection of net rent. A second adjustment is to reduce NDP by the difference between estimated actual depreciation and the profit-and-loss statement depreciation usually used in the branch breakdown of NDP[11]. Here too the average ratio of recent years was used.

[8] Output refers to total gross production, whereas product here refers to net value added only, i.e., intermediate products and depreciation are excluded.

[9] This is pointed out by Gaathon, *op. cit.*

[10] 1960 was an unusually bad year, mainly because of drought conditions.

[11] This is the procedure used by the CBS.

The implicit average annual rates of growth of NNP in the projections varies from 7.3 per cent to 8.5 per cent in the first set, and 7.5 to 8.5 in the second set, which is similar to the range usually taken when a direct assumption is made of growth in NNP or GNP, or that arrived at by the Bank of Israel models. However, even the highest rate is slightly lower than the average for recent years.

e. *Disposable income*

Disposable income is, by definition, equal to national income *less* direct taxes *plus* transfer payments to the private sector *less* transfer payments from the private sector *plus* net transfers from abroad *less* undistributed profits. Each of these items is hard to predict. The most significant single item is direct taxes. In recent years there has been a tendency for the share of direct taxes in total government revenue to rise only slightly, with relatively larger sums being collected through indirect taxation. Thus, whereas total tax revenue rose from about 29.5 per cent of national income in 1958 to 35.3 per cent of national income in 1961, direct taxes as a percentage of national product rose somewhat less (from 11.5 per cent to 12.4 per cent) during the same period[12]. It is expected that the share of direct taxes in total revenue, and consequently as a percentage of national income, will rise further during the coming years. Therefore, in forecasting direct taxes for 1965, the first set assumed that they will be 13 per cent of national income; the second set raised the percentage to 14, in view of a recently announced forced savings 'loan'.

Net transfers on current account from government to the private sector have been growing from year to year. The first set figure for 1965, IL 250 million, is a guess based on recent growth. A lower figure, IL 200 million, was used in the second set.

Net transfers from abroad are difficult to predict because of two major factors:

(1) The largest single item, restitution payments from Germany, which in 1960 and 1961 reached and exceeded the sum of $100 million, are expected to decline drastically in several years. But the exact year of the sharp decrease, and the pace of decline, cannot now be determined. (2) Both restitution payments and institutional transfers are of two kinds: on current account and on capital account. Only the former should be included for estimates of disposable income. The separation of such transfers for this purpose must at present be highly arbitrary.

[12] The ratio of total taxes to product is that shown in Bank of Israel, *Annual Report 1961*, Table VII–2; ratio of direct taxes to product computed from *ibid.*, Table II–12.

For our 1965 forecast private transfers (all on current account) were estimated at $40 million ($30 million in the first set); restitutions on current account (pensions) at $20 million, and transfers to charitable institutions (excluding the Jewish Agency) at $20 million. The second set converted these sums at the official rate of IL 3.00 per dollar.

Undistributed profits have been ignored in the past, for lack of data. Their inclusion in the forecast, even by an arbitrary estimate, is to emphasize that they should not be ignored. An arbitrary figure of 15 per cent of returns to capital was chosen, which gives a figure equal to some 4 per cent of industrial product, or IL 50 million in the first set and IL 60 million in the second[13].

f. *Product per worker and relative earnings*

The projections of the first set were in terms of 1959 prices, and those of the second set in 1961 prices. A change in the general price level should not alter the conclusions reached; however, if relative prices change, this will undoubtedly alter the projections.

Very little is known about how the distribution of the labor force in Israel is affected by changes in relative earning. In the projections, an assumption has been accepted that agricultural prices will decline relative to other prices, thus leading to a similar decline in relative earnings and a less than proportional increase in employment in agriculture. But the various assumptions as to product per worker in the different sectors, if borne out, would lead perhaps to further shifts in the distribution of labor. Among the factors affecting such shifts are the relation between product per worker and earnings per worker in each sector, and the demand conditions which, together with the supply conditions, determine relative prices.

Thus, not much can be said about the compatibility of the productivity assumptions and the labor distribution assumptions, particularly as between industry and services. However, some insight may be derived, by assuming that industrial workers will receive, on the average, two-thirds of the value of their product.

g. *Summary of projections*

Appendix Tables 1 to 4 present both sets of all alternative projections of national product and disposable income. The differences between the several alternatives are small. Table 6 summarizes three representative alternatives

[13] Returns to capital as per cent of industrial product was for 1958 estimated at 26 per cent. See M. Bruno, *Interdependence, Resource Use and Structural Change in Israel*, Bank of Israel Research Department, Special Studies No. 2, Jerusalem 1962, p. 53.

TABLE 6. *Early Projections for 1965*

(Set I)

		I	*II*	*III*
1.	Average population — thousands	2,454	2,506	2,558
	of which: Jews	2,168	2,220	2,272
2.	Employed civilian labor force — thousands	814	831	848
	Agriculture	*122*	*125*	*127*
	Industry	*244*	*229*	*234*
	Other branches	*448*	*477*	*487*
3.	Product per worker — 1959 IL			
	Industry	5,331	5,650	5,842
	Other branches	5,845	5,515	5,390
4.	Net domestic product — millions of 1959 IL	4,837	4,926	5,090
5.	Net national product			
	Millions of 1959 IL	4,737	4,826	4,990
	Average annual rate of growth per cent	7.6	8.0	8.5
6.	Disposable income			
	Total — millions of 1959 IL	4,470	4,550	4,690
	Per capita — 1959 IL	1,820	1,820	1,830
	— per cent change (1965/1959)	25.0	25.0	25.7

of the first set. The first two projections appeared most reasonable at the time, and were used for the first detailed studies.

Table 7 summarizes the more probable second set projections, with the third column probably least likely. The very slight difference in national product between the high and moderate population estimates stems from the assumption that several consecutive years of high immigration will pose either an unemployment problem or, the alternative we have used, lead to a lower output per worker, particularly in 'other branches'.

The later projections differ from the earlier ones in several respects. Although developments in 1960 and 1961 were very much in accord with the 'more probable' projections, the switch to a later base and the consequent loss of possible variation in two years could not but prove wrong at least some of the alternative assumptions. A major development which affected the basic assumptions was the upsurge in immigration in 1962. In addition, minor changes were made whenever they seemed appropriate: the aim was to make the later set of projections as good as possible regardless of the difference between them and the earlier projections.

TABLE 7. *Later Projections for 1965*

(Set II)

	I	*II*	*III*
1. Average population — thousands	2,497	2,528	2,589
of which: Jews	2,212	2,243	2,304
2. Employed civilian labor force — thousands	839	849	870
Agriculture	*126*	*127*	*130*
Industry	*252*	*255*	*244*
Other branches	*461*	*467*	*496*
3. Product per worker — 1961 IL			
Industry	6,132	6,132	6,374
Other branches	7,113	7,113	6,586
4. Net domestic product — millions of 1961 IL	5,734	5,850	5,838
5. Net national product			
Millions of 1961 IL	5,534	5,630	5,638
Average annual rate of growth per cent	8.0	8.4	8.5
6. Disposable income			
Total — millions of 1961 IL	5,140	5,220	5,230
Per capita — 1961 IL	2,058	2,065	2,020
— per cent change (1965/1961)	11.8	12.2	9.8
— per cent change (1965/1959)[a]	27.2	27.7	25.0

[a] The 1959 estimate of per capita disposable income (calculated from Bank of Israel, *Annual Report 1961*) is higher than that used for set I projections. The current price figure in the source was converted to 1961 prices by means of the Consumer Price Index.

3. *Projections to 1975*

a. *Population*

Assuming that the Jewish population in 1965 will be about 2,240,000, that the natural increase from 1965 to 1975 of the Jewish population will be at a rate of 2 per cent per annum, that the rate for the non-Jewish population will gradually decline and average 3.5 per cent, and that net immigration will be 10,000, 20,000 or 30,000 per year, we arrive at 1975 population estimates ranging from 3,240,000 to 3,460,000. We adopted a mid-figure of 3,350,000. The earlier projection used a figure of 3,300,000.

b. *Rates of growth of national product*

Our 'most reasonable' assumptions for 1965 were that national product would increase at an average annual rate of around 8 per cent from 1959

to 1965. Can we assume that this high rate will be maintained until 1975? In other words, can income per capita rise at close to 5 per cent per year? The answer depends on the assumptions regarding the effective limits to growth.

The Israel economy has each year financed its consumption and investment out of its national product *plus* a large annual import surplus. Exactly when the import surplus will have to be eliminated is a subject of controversy, but most Israel economists agree that by 1975 the import surplus, if any, cannot be counted upon as a substantial addition to local resources. Thus, our first hypothesis is that by 1975 consumption *plus* investment cannot exceed gross national product.

What must be the rate of growth in investments to maintain an 8 per cent growth in GNP? Professor Patinkin has suggested[14] that in view of the fact that future investment will probably go less to basic overhead investment (infrastructure), and can be expected to be less wasteful and more productive, the intensity of Israel's investment effort can be reduced somewhat without impeding growth. On the other hand, closing the balance of payments gap will require large changes in the relative importance of economic sectors: specifically, a shift from a low capital-output sector, services, to a capital intensive sector, industry. This may more than offset any tendency for capital-output ratios to decline. Nonetheless, we may take as a working hypothesis that the average capital-output ratio will remain constant, consequently an 8 per cent increase in GNP will require an 8 per cent increase in gross investment. However, we should refine our concept of investment and include only nondwelling fixed reproducible capital, and relegate housing to consumption[15].

As a rough example, purely for illustrative purposes, we can project the 1959 GNP and nondwelling investment at 8 per cent per year to 1975, and arrive at a GNP of some IL 13.6 billion and gross investment of IL 2.3 billion in 1959 market prices. The residual can allow a 3 per cent per annum increase in per capita government consumption and housing, and about 4 per cent per capita increase in private consumption, to equate 1975 GNP with total uses of resources. In other words, an 8 per cent growth in GNP, on our assumptions, seems possible without any significant reduction in the rate of rise of the standard of living.

Unfortunately, the above illustrative example ignores several fundamental difficulties. First, will domestic saving be sufficient to finance the required

[14] *Op. cit.*, Chapter 5.

[15] The ratio of nondwelling capital stock to NDP has been fairly constant during 1955–59, according to Gaathon's figures.

investment? Personal saving has been estimated at about 5 per cent of disposable income[16]. Assuming that personal saving will be 5 per cent of GNP in 1975, it will provide only some 20 to 30 per cent of the required investment. However, if by then Israel business follows the pattern of financing expansion primarily out of profits, the bulk of which are thus not distributed, most of the required non-dwelling investment be will provided for. Nonetheless, personal saving will have to be raised, either voluntarily, or through a higher tax burden, to provide for total investment including housing.

Secondly, we have ignored the major shifts which would be necessary to expand exports in order to pay for imports. If we assume — again, purely for illustrative purposes — that the import component of production can be decreased somewhat to, say, 13 per cent for private consumption, 22 per cent for government consumption, 30 per cent for investment, and 38 per cent for exports[17], then exports will have to be more than IL 4 billion (in 1959 prices) in 1975 to finance required imports. It is quite likely that the economy will have great difficulty in shifting its resources to achieve this object.

Thirdly, we have assumed that the economy will not need to eliminate the import surplus until 1975. Even if this is so, the rate of decrease in the import surplus during the 1960–1975 period may be such as to diminish the growth of the economy. In our 1965 projection we have not considered this possibility a serious obstacle: although foreign capital inflow may diminish somewhat by 1965, the timing of this decline need not reduce investment and development by 1965. However, between 1965 and 1975, and particularly during the 1970–75 period, the rate of increase in domestic savings and in exports may not be sufficient to offset the reduction in capital inflow.

Because of these three factors, we believe that an 8 per cent rate of growth in GNP between 1965–1975 must be considered as an optimistic upper limit, and that a more reasonable assumption is that the average rate of growth will be somewhat lower — 7 per cent or even 6 per cent.

c. *National income and disposable income*

Table 8 presents four first set and two second set projections for 1975. The first set projections of national product were derived by applying alternative rates of growth of 6 per cent and 7 per cent to each of the first

[16] See *Survey of Family Savings 1957/58 and 1958/59*, FP Research Paper 8, September 1960.

[17] These illustrative figures are based on some Bank of Israel projections for 1964.

two projections of 1965 NNP in Table 6. The second set projections app- these alternative rates of growth to a figure midway between the first two projections of NNP for 1965 in Table 7.

The difference between national income and disposable income will probably increase over time, both direct taxes and undistributed profits becoming a larger fraction of national income. This divergence should increase as the the rate of growth increases. Therefore, in both sets an arbitrary deduction of 15 per cent from national product is used to arrive at disposable income when the growth in national income is assumed to be 6 per cent. A deduction of 20 per cent is used when the rate of growth is assumed to be 7 per cent.

TABLE 8. *Projection for 1975*

	Early projections (set I)				*Late projections (set II)*	
	I	*II*	*III*	*IV*	*I*	*II*
1. Average population — thousands	3,300	3,300	3,300	3,300	3,350	3,350
2. Net national product — millions of IL[a]	8,480	9,320	8,640	9,490	9,990	10,980
3. Disposable income						
Total — millions of IL[a]	7,210	7,460	7,340	7,590	8,490	8,780
Per capita — 1959 IL	2,180	2,260	2,220	2,300	2,320	2,400
— 1961 IL					2,530	2.620
— per cent change from 1965 to 1975	19.8	24.2	22.0	26.4	22.9	26.9
— per cent change from 1959 to 1975	49.8	55.3	52.5	58.0	56.2[b]	62.0[b]

[a] Rounded to nearest ten million. Early projections are in 1959 prices, and the later projections in 1961 prices.
[b] See footnote to Table 7.

TABLE 9. *Alternative Projections of Net National Product at Factor Cost for 1965: Set I*
(Millions of 1959 IL)

	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*
Agriculture	778	778	698	698	778	778	866	866
Industry	1,245	1,283	1,271	1,302	1,294	1,327	1,367	1,272
Other branches	2,576	2,619	2,575	2,618	2,630	2,672	2,625	2,565
SUBTOTAL	*4,599*	*4,680*	*4,544*	*4,618*	*4,702*	*4,777*	*4,858*	*4,703*
plus Rent[a]	368	374	364	369	376	382	389	376
less Depreciation adjustment[b]	–149	–151	–148	–150	–152	–155	–157	–152
Net domestic product	*4,818*	*4,903*	*4,760*	*4,837*	*4,926*	*5,004*	*5,090*	*4,927*
less Net factor payments abroad[c]	–100	–100	–100	–100	–100	–100	–100	–100
Net national product	**4,718**	**4,803**	**4,660**	**4,737**	**4,826**	**4,904**	**4,990**	**4,827**

[a] 8 per cent of subtotal.
[b] 3 per cent of unadjusted NDP (subtotal *plus* rent).
[c] Guess based mainly on forecasts of balance of payments items 'investment income' and 'insurance'.

TABLE 10. *Alternative Projections of Disposable Income for 1965: Set I*
(*Millions of 1959 IL*)

	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*
Net National Product	4,718	4,803	4,660	4,737	4,826	4,904	4,990	4,827
less Direct taxes[a]	–613	–624	–606	–616	–627	–638	–649	–628
plus Net transfers from government[b]	250	250	250	250	250	250	250	250
plus Transfers from abroad on current account[c]	150	150	150	150	150	150	150	150
less Undistributed profits[d]	–50	–50	–50	–50	–50	–50	–50	–50
Disposable income (rounded to nearest 10 million)	**4,460**	**4,530**	**4,400**	**4,470**	**4,550**	**4,620**	**4,690**	**4,550**

[a] 13 per cent of NNP.
[b] Guess, based on recent trends.
[c] Based, roughly, on following assumptions: $30 million private transfers *plus* $20 million restitutions *plus* $20 million institutional transfers converted at rates prevailing in 1959.
[d] Roughly 4 per cent of NDP originating in industry (see p. 212, footnote 13).

TABLE 11. *Alternative Projections of Net National Product at Factor Cost for 1965: Set II*

(Millions of 1961 IL)

	I	*II*	*III*	*IV*	*V*	*VI*	*VII*
Agriculture	698	649	649	698	698	751	751
Industry	1,415	1,498	1,545	1,517	1,564	1,555	1,539
Other branches	3,272	3,272	3,279	3,313	3,322	3,267	3,279
SUBTOTAL	*5,385*	*5,419*	*5,473*	*5,528*	*5,584*	*5,573*	*5,569*
plus Net rent[a]	431	434	438	442	447	446	446
less Depreciation adjustment[a]	–175	–176	–177	–179	–181	–181	–180
Net domestic product	*5,641*	*5,677*	*5,734*	*5,791*	*5,850*	*5,838*	*5,835*
less Net factor payments abroad[a]	–200	–200	–200	–200	–200	–200	–200
Net national product	**5,441**	**5,477**	**5,534**	**5,591**	**5,630**	**5,638**	**5,635**

[a] See footnotes to Table 9.

TABLE 12. *Alternative Projections of Disposable Income for 1965: Set II*
(Millions of 1961 IL)

	I	*II*	*III*	*IV*	*V*	*VI*	*VII*
Net national product	5,441	5,477	5,534	5,591	5,630	5,638	5,635
less Direct taxes[a]	–762	–767	–775	–783	–788	–789	–789
plus Net transfers from government	200	200	200	200	200	200	200
plus Transfers from abroad on current account[b]	240	240	240	240	240	240	240
less Undistributed profits[c]	–60	–60	–60	–60	–60	–60	–60
Disposable income (rounded to nearest 10 million)	**5,060**	**5,090**	**5,140**	**5,190**	**5,220**	**5,230**	**5,230**

[a] 14 per cent of NNP.
[b] Based, roughly, on following assumptions: $40 million private transfers *plus* $20 million restitutions *plus* $20 million institutional transfers, converted at IL 3.00 = $1.
[c] See footnote d to Appendix Table ■ 10.

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agriculture can be largely dispensed with, not only on the basis of general principles but also because this is feasible in practice.

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