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SUMMARY STATEMENT

Supply and demand projections for food grains are needed for effective planning and development of grain storage and marketing programs and facilities and are usually lacking in developing countries. The study reported here is concerned with developing reliable projections of supply and demand for food grains (including pulses and oilseeds) in 1980 and the finding of future relationships between supply and demand in Ethiopia. In addition to a specific application to grain marketing programs and facilities planning, the results of this study can be used to improve the quality of future national and regional agricultural as well as over-all economic development planning of the country. Methods used in this study will also provide basic tools for future studies.

This study specifically deals with projections of production (supply) and demand for barley, corn, sorghum, teff, wheat, pulses and edible oil-seeds from 1970 to 1980 based on the historical data during 1961 to 1970. Due to inadequate statistical data, particularly in disaggregation of production and population by provinces and sectors, several estimations have been employed throughout the study, so that the results are susceptible to some margin of error.

Under the assumption that the crop production during the 1970's will follow the production trends during the 1960's, the historical data for area, yield and production of each crop were fitted with exponential models by varying the exponents to obtain alternative projections. Final results were selected mainly on the basis of the highest coefficients of determination.

In general, it was found that much of the increases in production will be effected through area expansion rather than increases in yield--a finding closely compatible with the actual existing situation. In the decade to 1980, the highest rates of increase in production are indicated for sorghum and oilseeds; production of the other crops will increase at relatively lower rates. Projected rates of increase are equivalent to the average rates in the sixties but lower than the rates proposed by the government during 1968 to 1973.

Review of determinants of demand indicate that growth in demand for food during economic development is determined by growth in population and income, and by the income elasticity of demand for food. In order to determine the population effect on demand, historical data by segments during 1961 to 1970 were projected to 1980 with a logarithmic model. Results indicate low annual growth rates in the rural segments (1.4 perce and a dramatic annual rate of urban population growth (about 9.9 percent) These results reflect the wide socio-economic gaps between rural and urba areas, typical of early stages of of economic development. Similarly, results of projections of per capita demand demonstrate large disparity between rural and urban areas as a consequence of strong income effects in the urban areas. Per capita demand varies among the provinces mainly because of differences in production and food habit patterns.

Aggregate demand for each commodity was derived by multiplying the per capita demand by the total population. Analysis of the projections reveals a rapidly increasing total demand in the urban sector, a reflecti of the high rates of population and income growth. The results indicate need for improving the movement of products from rural to urban areas within a province as well as among provinces.

Comparison of the projected supply (production less estimated seed and wastage) and projected demand indicates that Ethiopia will be in seve shortage of supply of most cereals and pulses. Indicated deficits by 198 range from 7 percent for barley to 45 percent of total demand for wheat. Provincially, Shoa, Eritrea, Harar (except sorghum) and Tigre are project to experience substantial shortages. Gojam, Begemder, Wollega, Arussi, and Bale will have surpluses in most commodities. Other provinces will have deficits in most crops but surpluses in two or three crops.

Based on the results, it is concluded that increases in domestic supply will not keep in pace with increases in demand originating from high rates of population and income growth, particularly in urban areas. If domestic supply does not increase at a higher rate than projected and if grain imports continue to be restricted by import policy and bottlenec in balance of payments, then "demand pull price inflation" will be a threat to the Ethiopian economy. Although not an easy task, domestic supply could be increased by mobilizing the undeveloped and under-employe available resources, increasing productivity and provision of market incentives.

SUPPLY AND DEMAND PROJECTIONS FOR FOOD GRAINS IN ETHIOPIA, 1970-1980

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PREFACE

Planners in the developing countries must anticipate the need for handling, storage, processing, transport and distribution facilities. Usually facilities of the proper type and size must be planned for the right locations several years before they are needed in order to provide time to arrange financing, let the contracts, complete construction and machinery installation, and start up the facilities.

Accurate anticipation of facility needs is a difficult task in the development setting. Changes accompanying the "green revolution," rapid urbanization and other elements of development make it difficult to make accurate projections of future food production and consumption. The problem is aggravated by the lack of base data for projections in most developing countries. It is not surprising that one frequently finds either (1) inappropriate and under-utilized "white elephant" facilities, or (2) depressed prices, product losses, monopoly profits and other indicators of inadequate facilities.

Realistic projections of domestic patterns of production and consumption represent an essential ingredient in the "recipe" for development of appropriate marketing facilities. The computerized "master projection model" developed at Kansas State University is a working tool for building the best possible projections of food product production and consumption for several years into the future. It is designed to make maximum use of limited base data and to permit estimation where necessary to supplement available data. It is designed to create a file of actual plus estimated data which can be improved and up-dated as basis for more accurate projections as additional data become available. In the process of use for making projections, the model helps to specify additional data needs and serves as an aid for establishing priorities for studies to produce needed base data.

The logic of the "master projection" model is based on recognition of development as an <u>evolutionary</u> process, not a <u>revolutionary</u> one. Future production and consumption patterns are recognized as reflections of past trends in the specific country or area of concern. It is recognized that past trends may accelerate or decelerate, and even may change direction, but that they will continue as trends rather than jump up or down irratically. Seasonal or cyclic sometimes found in agricultural production and consumption figures can be reflected in the model to develop "net" trends for the projections. The logic of the model is implemented through what is sometimes called "time series analysis"--analysis of past data for a period of years in order to determine the nature and magnitude of changes which can be expected in future years.

The "master projection" model is somewhat complex because of its versatility. For example, the alternative statistical models for fitting trends include linear, logarthmic, exponential and specified rate, and these alternatives may be specified for both the "master" projection and for the component parts (e.g., provinces or sub-products) which are pro-rated from the "master" projection. Still, it is believed that economists or statisticians with a minimum of computer training can learn to use the model effectively in a few weeks of applied training. With the tool, specialists from the developing countries often can make more accurate projections of domestic production and consumption than can be developed by foreign experts, because of their greater knowledge of local conditions affecting the trends.

In this study, Mr. Fekadu Ebba has made effective use of the "master projection" model to develop projections of production net supplies, volume of demand and movement patterns for a number of food grains, pulses and oilseeds by province in Ethiopia. In doing so, he has worked around limitations of historical data which are more serious than would be true in many other developing countries of the world. His findings are of immediate significance to planners in his country. In addition, he has developed a methodology and created a data file upon which to build. As studies are completed to provide data for replacing estimates which he has had to make, the data file can be up-dated and the methodology used to produce increasingly accurate projections in the months ahead.

Food and Feed Grain Institute staff members at Kansas State University are in the process of preparing a complete users manual for the "master projection" model including a number of example problems, input formulations and output solutions. In the meantime, it is hoped that those concerned with similar problems in other developing countries will find Mr. Ebba's study for Ethiopia to be a helpful reference. The complete computer source program for the "master projection" model is included in Appendix D of the report.

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INTRODUCTION

Although cereals, pulses and oilseeds compose the major farm products and constitute the larger percentage of daily calorie intake of Ethiopians, little attention and resources have been devoted to identifying and analyzing the past, present and future supply and demand for food grains or for agricultural products as a whole. For a smooth working economic system and for balanced economic development the supply and demand for various products must be kept in balance. However, because of the physical, social and economic variables that influence production, distribution and consumption, imbalances between supply and demand for food grains are inevitable. As economic development occurs, supply-demand imbalances often occur among income groups within the country as a whole and between countries in the developing areas of the world. This is the crucial problem facing the whole world, in particular the less developing countries today. Knowledge of the relationship between supply and demand is very essential in order to devise corrective measures affecting domestic production and distribution as well as imports and exports of the major food grains. In this context, the significance of careful analysis of the past and future trends of supply and demand for food grains is apparent. The objectives of this study are to identify and analyze the past trends and inter-regional balances of supply and demand for major food grains and edible oilseeds in Ethiopia, and to project these trends to 1980. This study is directed to the individual

provinces as well as to the national level.

The importance of long-term projections of the food grain situation, together with identification of the accompanying impacts on agricultural development, and the total Ethiopian economy in the framework planned development cannot be over-emphasized. A realistic appraisal of the direction of long-term demand for the various grain products is needed to provide guidelines for the economic planners and farm producers. Allocation of scarce resources among competing ends is difficult in the development setting and accurate projections play an important role in this process. Realistic assessment of supply possiblities is needed to point out the extent and direction of imbalances which are likely to arise in different sectors and regions. It is the hope of the author that the procedures used and the results of this study will contribute materially to the future development and improvement of the grain marketing system in Ethiopia.

The specific objectives of this study are:

(1) To estimate aggregate domestic demand for the major cereals, pulses and oilseeds over the projection period.

(2) To estimate domestic supply of these food grains over the projection period.

(3) To determine supply-demand balances by provinces on the basis of the projections of supply and demand.

(4) To assess the implications of the projected supply-demand balances on the future inter-provincial grain trade.

Several explicit and implicit assumptions have been necessary in order to develop the projections; the results and implications must be interpreted accordingly. Severe limitations in available historical data

and demand coefficients have created several methodological and analytical problems for the study. Nevertheless, it is believed that the results provide a broad picture of the future grain situation in Ethiopia and provide important implications for grain marketing development at the national and provincial levels. It is hoped that the methodology and models used in study can be applied for more precise results as more complete data are developed.

CHAPTER I

REVIEW OF DETERMINANTS OF FOOD SUPPLY AND DEMAND, AND ECONOMIC GROWTH

The economic history of the major advanced countries reveals the strong interdependent and complementary relationships between agriculture and non-agriculture industries.[1] In these countries the rich and developing agriculture formed the basis for the expansion of manufacturing industries. It provided sufficient food supplies to the growing urban population. Agricultural surpluses were mobilized for capital formation in both agricultural and non-agricultural sectors. The increasing real per capita incomes in the rural areas created effective and rising demand for the industrial goods and services. Increased productivity in agriculture resulted in exportable surplus food and raw products to finance the import of capital goods for expansion of industries. These are some of the major roles and contributions of agricultural development in the over-all economic growth of a nation. Hence, it is imperative to realize the importance of increased production of cereals, pulses, oilseeds and other agricultural products in the total economic development process in Ethiopia.

People need a sufficient quantity of food that provides the right

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[1]Bruce R. Morris, Economic Growth and Development, (New York: Pitman Publishing Corporation, 1967), pp. 111-117.

type of nutrients to survive and to be productive. A recent study revealed that the average nutritional level of Ethiopians was about 1920 calories per day in 1966[2] which obviously is below the requirement of 2160 calories per day estimated for 1961-1963.[3] Improvement of the nutritional level will undoubtedly help the acceleration of economic development which Ethiopia is determined to attain. Mellor enumerates the direct and indirect effects of human nutrition in reference to economic development:

> Per capita food intake is of special importance because of (a) its direct effect on human welfare and happiness, (b) its indirect effect on output through influence on the capability of man to perform work and the attitude of man toward work and (c) its indirect effect on per capita income through influence on death rates and hence on population growth.[4]

Considering the insufficiency of nutritional intake of Ethiopians at present, improvement on both quantity and quality of food can be expected to enhance productivity of the labor force in all sectors of the economy.

Besides supplying enough cereals, pulses and oilseeds to the domestic market, increased production will earn foreign exchange to purchase capital goods required in both agriculture and other industries. Presently pulses and oilseeds are among the leading export agricultural products, and past trends indicate exports of these crops are increasing, but at a low rate. Past trends indicate decreasing exports of cereals

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[2]Willis G. Eichberger, Food Production and Utilization in Ethiopia, E.C. 1958. Mimeographed report (Addis Ababa: USAID/Ethiopia, 1968), p. 18.

[3]United Nations Economic Commission for Africa, Economic Bulletin for Africa, Vol. X, No. 1 (New York: United Nations, June 1, 1970), p. 29.

[4]John W. Mellor, The Economics of Agricultural Development (Ithaca, New York: Cornell University Press, 1966), p. 37.

(see Table 1.1), but it should be possible to reverse these trends over time through effective development of the production and marketing systems. In summary, Ethiopia's economic destiny lies fundamentally in increased productivity and structural transformation in the agricultural sector.

Understanding the factors behind production and demand for agricultural products promotes and facilitates realistic planning to meet wisely prospective problems arising in the Nation's economy. A brief discussion of the determinants of supply and demand for cereals, pulses and oilseeds in Ethiopia is presented in the next sections.

Supply of Food Grains

"In fact, unless a very major and concentrated effort is made to increase supplies, Ethiopia will become even more dependent on grain imports to meet its domestic needs."[5] Statistical evidence indicates that Ethiopia was a net grain exporter prior to the mid 1950's but since then has become a net grain importer because domestic production has not kept pace with population and income growth.[6] Although the low growth rate of production is considered the major drawback, the restricted movement and distribution of the available supply from surplus areas to deficit areas is another inherent problem. Deficiencies in grain market organization and performance in the transportation system and in storage facilities are the main factors restricting inter-regional movement of farm products in Ethiopia.

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[5]Thodey, Marketing of Grains and Pulses in Ethiopia, p. 5.

[6]Omero Sabatini and Louise N. Samuel, A Survey of Agriculture in Ethiopia (Washington, D.C.: U.S. Department of Agriculture, Economic Research Service, 1969), p. 22.

TABLE 1.1. ETHIOPIA EXPORTS OF GRAINS, PULSES AND WHEAT FLOUR--1948-1966
(Unit: 1000 Metric Tons)

Year	Grains*	Pulses+	Wheat Flour
1948	53.4	37.0	4.4
1949	32.3	22.6	4.4
1950	19.7	33.2	1.0
1951	50.5	34.4	0.6
1952	30.8	64.0	2.2
1953	30.4	68.7	0.1
1954	18.9	60.5	0.1
1955	14.3	55.4	0.6
1956	6.3	43.1	
1957	5.2	54.8	
1958	2.3	33.3	
1959	0.5	46.4	
1960	1.5	66.6	
1961	2.5	80.2	
1962	3.6	69.0	
1963	5.8	69.8	
1964	2.3	68.0	
1965	4.3	116.4	
1966	0.1	69.3	

*Average composition 1948-61: 40% sorghum (durrah), 25% maize, 25% wheat, 10% other cereals.

+Average composition 1948-61: 36% horse beans, 33% lentils, 13% haricot beans, 13% chickpeas, 5% other pulses.

Source: Alan R. Thodey, Marketing of Grains and Pulses in Ethiopia, Report No. 16 (Menlo Park, California, Stanford Research Institute, 1969), p. 41.

To meet the ever expanding domestic demand and the growing need for foreign exchange, Ethiopia urgently requires an increase in available supply of grains through both increased production and improved marketing. The two main methods of increasing production are through bringing more land under cultivation and increase productivity (yields) per unit of area cultivated. Neither is as easy as it may sound. There are limits to both area expansion and yield increases. Both methods require large capital investment, changes in social and economic structures and changes in psychology and attitudes of the people engaged in agriculture.

The problem with expansion of the area under cultivation was summarized by Miller et. al.:

> While there yet remains some possibility for bringing new lands into cultivation in Ethiopia by clearing forests, plowing grasslands, irrigating dry lands or deserts, and removing health and erosion hazards, lack of the necessary infrastructures and economic considerations will undoubtedly restrict any large scale immediate expansion of the land area.[7]

With respect to the same problem, the Steering Committee of the Ethiopian Planning Commission commented that "it is probably a fallacy that there is virtually unlimited room for expansion of cultivation in most of the areas where most of the people live."[8] A casual observation of Ethiopian highlands can tell the slim chance for major expansion of grain production; the above statement seems justified. However, in the present Ethiopian Third Five Year Development plan, it was stated that "a large

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[7]Clarence J. Miller, et. al. Production of Grains and Pulses in Ethiopia, Report No. 10 (Menlo Park, California: Stanford Research Institute, 1969), p. 51.

[8]Imperial Ethiopia Government Ministry of Planning and Development, Regional Aspects of National Planning in Ethiopia, Part I (Addis Ababa: Ministry of Planning and Development, 1959 E.C.), p. 36.

amount of arable land still available for crop planting and the supply of land itself is not a current or foreseeable constraint on increased production."[9] Thus, it is possible to draw a logical conclusion that Ethiopia can increase her food grain production in the long run through expansion of land cultivated in new or thinly settled areas through substantial overhead capital investments in infrastructures such as highways, feeder roads and irrigation facilities.

In view of the above problems of expanding cultivated areas, improvement of crop yields appears economically more feasible. However, teaching and persuading the numerous small subsistence farmers to accept the techniques and methods of increasing yields represent complex and hard undertakings. Subsistence farmers are understandably wary of assuming new risks and uncertainties, not because they lack some degree of entrepreneurship, but because they are so near to the margin of survival. Studies of peasant farmers responses to new methods of farming have demonstrated that they are willing to assume risks provided the new method is proven to be profitable.[10] Hagen believes that:

> . . . even if the peasant were vigorously innovational, because of the small size of his operations, it would not pay him to spend his resources to seek out technical advances. The cost of finding improved varieties and practices, even if there were not cost of adaptation, would almost invariably be much greater than his small benefit. The cost of adaptation compounds the impossibility.[11]

The increased capital investment and expenditure required are far more

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[9]Imperial Ethiopian Government, Third Five Year Development Plan 1968-1973, (Addis Ababa: Berhanena Selam H.S.I. Printing Press 1968), p. 183.

[10]Everett E. Hagen, The Economics of Development (Homewood, Illinois: Richard D. Irwin, Inc., 1968), p. 73.

[11]Ibid., p. 72.

than the majority of Ethiopian peasant farmers can afford in absence of farm credit services. Moreover, "very little progress in agrarian reconstruction and development, particularly in peasant agriculture, can be made under the existing conditions of tenure and farm size."[12]

Thus, if the farmers are to invest in the modern inputs of improved seeds, fertilizers, pesticides and better farm tools which are essential to increase the output of their holdings and labor, these resources must be made easily available to them. A system of farm credit must be established so that they can afford to purchase. They must be instructed and convinced in the proper and economic utilization of these inputs. They must be reassured that they will be compensated for possible losses incurred in the process of adaptation. Above all, they must be shown that the potential gain is worth the risk. Land tenure policies should not be such that landlords will profit and the tenants not.

In addition to all of these things, the marketing system and price policies should be developed to provide incentives to the farmers. Some recent studies of peasant response to price changes in LDC's show that farmers increase production when sustained increases in prices of agricultural products occur.[13] Also, a study in Keyna has established peasant farmers' response to price changes, at least with respect to the acreage devoted to cash crops and of subsistence crops in regions that are already market oriented.[14] No such study is available in Ethiopia at

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[12]Imperial Ethiopian Government, Third Five Year Development Plan, p. 195.

[13]Hagen, The Economics of Development, p. 75.

[14]Eric Clayton, Economic Planning in Peasant Agriculture (London: Headley Brothers, LTD., 1963), pp. 55-59.

present, but these experiences in similar countries can be a good reason to assume Ethiopians also do respond to price changes. In analyzing the marketing system in Ethiopia, Thodey stated that:

> With improved efficiency, the marketing system can itself provide an incentive for greater production of grains and pulses by reflecting a higher proportion of the price paid by consumers back into that received by producers and thus encouraging producers to increase the production and sale of those crops with higher prices.[15]

Thus, the long run level of supply of cereals, pulses and oilseeds in Ethiopia primarily depends on the Government activities in planning and implementing agricultural development programs. Proper adaptation of new farming techniques and farm inputs has brought about a "Green Revolution" in several developing countries, enabling them to be self-sufficient in food grain supplies. In fact, Ethiopia's situation appears more favorable in terms of the available vast undeveloped agricultural resource per person; however, the scarcity of capital investment remains the major bottleneck. The recent emphasis on policies of "Package Programme" and commercialization of agriculture, as stated in the Third Five Years Development Plan, are expected to increase output of certain export and subsistence crops. On the other hand, the productivity in the overwhelming portion of the agricultural sector will remain unaffected for some time to come even if the development programs are implemented effectively. Economic development is a gradual process and the gestation period usually is long, particularly in agriculture. Analysis of the recent past trends indicates that "production of food grains in Ethiopia may not be keeping pace with increases in population."[16] This is the

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[15]Thodey, Marketing of Grains and Pulses in Ethiopia, p. 149.

[16]Miller, et. al. Production of Grains and Pulses in Ethiopia, p. 52.

kind of hypothesis which this study is intended to test by trend projections into the future.

Demand for Food Grains

Factors exogenous and endogenous to agriculture affect the demand for cereals, pulses, and oilseeds in Ethiopia. The exogenous factors, arising from the economic development process and affecting the level of demand over time include population, income, tastes and preferences. The endogenous factors which are jointly determined within the agricultural economy include prices and price relationships among substitute and complementary products. These price relationships influence the distribution and relative importance of products in consumption over both the short run and the long run. In general, relative prices affect the composition of consumption at all stages of economic development and thus influence the aggregate demand for the products.

The impacts of growth in population and per capita income on demand for grains have been appraised:

> Ethiopia's market dependent population is at present growing in excess of 3.5 per cent per year and is projected to be 6.8 million by 1980 or 65 per cent greater than it was in 1966. This means the estimated 1966 demand for grains of about 0.6 million metric tons will have increased to at least 1.0 million tons by 1980. However, the actual growth in demand will likely be much higher because per capita demand will increase as a result of higher per capita incomes. Higher incomes will also result in a shift in grain consumption from teff to other grains, especially wheat.[17]

This case is obviously compatable with the theory that growth in population and growth in demand for food have positive and proportional relationships, i.e., a one percent change in population entails a one

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[17]Thodey, Marketing of Grains and Pulses in Ethiopia, p. 5.

percent change in the quantity of food demanded, other things held constant.[18] This relationship makes it clear that population increase alone can diminish the nutritional level of the Nation substantially if production does not keep in pace. "Population expansion by itself normally provides for a symmetrical expansion of demand for agricultural commodities in the sense that the demand for each agricultural commodity will expand by the same percentage as all others."[19] This statement implies that to maintain the existing per capita consumption of a product, production must increase by the same percentage as the increase in population.

Change in per capita incomes has another bearing and relationship with per capita food consumption, and consequently on the aggregate demand for food grains. It is natural that the per capita income of a nation rises with economic growth. An increase in per capita income means an increase in the purchasing power of consumers, other things unchanged. And as it was theorized by Keynes, a prominent British economist, ". . . from our knowledge of human nature and from detailed facts of experience," it follows "that men are disposed as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income."[20] Keynes' theory is no different from Engel's law, 1895, which implies that as the per capita income increases, a smaller and smaller proportion of the increase will

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[18]Geoffery S. Shepherd, Agricultural Price Analysis, 6th ed., (Ames, Iowa: Iowa State University Press, 1963), p. 11-12.

[19]Mellor, The Economics of Agricultural Development, p. 65.

[20]John Maynard Keynes, The General Theory of Employment, Interest and Money (New York: Harcourt Brace & World, Inc., 1964) p. 96.

be spent on food, but the absolute expenditure on food increases.[21] This theory was based on experience in the Western world, but studies in developing countries of Africa and Asia show the same tendency.

This relationship between per capita income and demand for food products, known as income elasticity of demand, measures the percentage change in demand or consumption with a one percentage change in per capita income. The income elasticity of demand for a product varies among different groups in a society, e.g., urban and rural, high and low income groups, and moreover it varies among the various food products.[22] Generally, the higher the income the lower the elasticity and the higher quality the product, the higher the income elasticity.

The result of a case study of income elasticity in Ethiopia follows this general theory of consumers' behavior, at least within the higher income groups (see Table 1.2). The study was subject to some statistical and methodological discrepancies, which may explain why in some cases it deviated from what the theory explains. Thodey concluded from the study as follows:

> . . . the overwhelming proportion of Ethiopians are still at an economic stage where they increase their food expenditure when their income rises. The higher the level of income generally the lower the proportion of any increase that is spent on foodstuffs, although the relationship is still positive--that is the income elasticity of demand is positive but declines as income rises.[23]

The subsistence nature of Ethiopian economy does not permit accurate measurement of the income elasticity of demand for agricultural

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[21]Shepherd, Agricultural Prices Analysis, p. 15.

[22]Mellor, The Economics of Agricultural Development, p. 61.

[23]Thodey, Marketing of Grains and Pulses in Ethiopia, p. 35.

TABLE 1.2. ESTIMATED INCOME ELASTICITIES OF DEMAND FOR ALL FOOD--RURAL SHOA PROVINCE

Family Income Range Eth$	Income Elasticities
50 to 150	0.98
150 to 250	1.26
250 to 350	1.55
350 to 450	0.86
450 to 550	0.54
550 to 650	1.28
650 to 750	0.75
850 and over	

Source: Alan R. Thodey, Marketing of Grains and Pulses in Ethiopia, p. 37.

products because more than 80 per cent is consumed on farms where the products are produced. However, economic analysis of this relationship promotes knowledge of prospective demand for agricultural products and aids in proper allocation of available resources among the various products and markets. It can contribute something to selecting and planning of agricultural development projects in Ethiopia. "A principal reason for developing data concerning income elasticities of demand is to make projections and then use those projections as a base for planning agricultural development."[24]

So far attention has been concentrated on the impact of changes in population and per capita incomes on demand for food grains. Another factor, no less important, is the relative price--the price of a product in relation to the prices of competing products. The theory of demand has long emphasized the complex relationship between prices of agricultural products and their consumption. Ordinarily, a reduction in the price of a product results in increase of quantity demanded, the extent of increase in quantity depending on the price elasticity for the product. Also, a reduction in price of a product could cause a decrease in quantity demanded of a competing product, the extent of decrease being a function of the cross elasticity of demand between the two products.

Little is known about relations between food grain prices and demand in Ethiopia. Analysis of price elasticity is more complex and tedious than income elasticity in any economy and particularly difficult in a developing economy. This problem has been long realized by economists. For example, Mellor observed:

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[24]Mellor, The Economics of Agricultural Development, p. 68.

> All the usual difficult problems of emperical derivations of price elasticities are compounded in the case of low income countries by the necessity of working with short-time series, with prices of imprecisely defined commodities, and with a paucity of data concerning the operation of other variables.[25]

In absence of statistically derived elasticity coefficients, it seems reasonable to expect that price elasticities for food grains in Ethiopia may tend to have similar absolute values as the income elasticities. Alan R. Thodey in study of grain market in Ethiopia expressed his opinion as follows:

> It should be noted that consumers tend to purchase cheaper varieties of grains when their prices rise and more expensive varieties when prices are low--that is, a cross-elasticity of demand between grain varieties and types exist in Ethiopia. For example, when teff prices rise, consumers tend to purchase more of the cheaper brown varieties and less of the higher priced white varieties; in addition, some consumers substitute other lower priced, less preferred grains for teff in their injera. The same also appears to be the case for pulses.[26]

Several reasons appear to cause price changes in Ethiopia mainly due to some imperfection in market organization and performance. It has been noted that both seasonal and trend price fluctuations exist in the food grain markets. A price analysis of cereals, pulses, and oilseeds revealed high seasonal price fluctuations, probably caused by "the relatively uncoordinated nature of storage, the lack of a high degree of intermarket integration, the fact that most farmers' sales are crowded into a short post-harvest period, and the general lack of capital available for investment in storage and marketing activities by private merchants."[27] The long-run price changes are more the result of exogenous factors to the marketing system. For example, the fact that production

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[25] Ibid., p. 71.

[26] Thodey, Marketing of Grains and Pulses in Ethiopia, p. 39.

[27] Thodey, op. cit., p. 129.

does not grow in pace with the growing demand arising from increases in population and per capita incomes might cause an upward price trend, consequently food price inflation. The solution to trend price changes may be to attempt adjusting production to cope with changes in demand. Based on his price trend analysis, Thodey concluded that the "trends reflect a growing basic imbalance between supply and demand in Ethiopia; there is relatively little that the marketing system can do directly to reverse the situation."[28]

Previous Supply and Demand Projections

Supply Projections

The Ethiopian Government has made a series of crop production projections since 1958 when the First Five Year Development Plan was launched. The projections for the First and Second Five-year plan were rather crude and unsatisfactory because of the time series employed which was not backed with reasonable statistical evidences or observations. The projections for the present plan period, that is the Third Five Year Plan, however, were founded on findings from sample surveys and crop cutting in several provinces of the country which gives the projection higher quality and reliability. This does not mean the projections are ideal but at least the projections were based on satisfactory amount of statistical data, past projection experiences and better insight of technological impacts.

The results of these projections which are only on national level, are given in Table 1.3. Crop production was projected at a specified annual growth as indicated in the table. In view of the previous

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[28] *Ibid.*, p. 131.

experiences the Government intended to achieve a very high annual rate of growth of 7 percent in oilseeds, 3.6 percent in pulses, 4 percent in wheat and 3 percent or less in other cereals.

TABLE 1.3. PROJECTED GROSS OUTPUT OF CEREALS, PULSES AND OILSEEDS IN ETHIOPIA
(Unit: 1000 metric tons)

Crop	1965	1967	1973	Percent Increase 1973/68	Rate of Growth 1968-73
Cereals	5,207.6	5,486.8	6,226.2	13.5	2.6
Teff	1,267.0	1,304.3	1,402.3	7.5	1.5
Wheat	721.7	760.0	922.5	21.4	4.0
Others	3,218.9	3,422.5	3,901.4	14.0	2.7
Oilseeds	391.7	437.4	607.6	38.9	6.8
Pulses	576.1	599.6	713.6	19.0	3.6

Source: Imperial Ethiopian Government, The Third Five Year Development Plan 1961-1965 E.C. (1968-1973).

Note: 1965 is actual, 1967 is estimated and 1973 is planned.

The Government realizes that the specified rates of increases might be unattainable, but still believes that these rates "are considered feasible in terms of known and potential resources and capabilities."

Other supply projections include those of the Food and Agriculture Organization of the United Nations, and Willis Eichberger, a member of USAID mission in Ethiopia. FAO projections of supply were aggregate on world regional basis of that except for wheat Ethiopia's crops are not

identified separately. Results of the projections of wheat are given in Table 1.4. The expected rate of increase is slightly less than that which the Ethiopian Government used in its projections of wheat production.

Eichberger's projections are similar to and at the same time different from the Government projections. The difference is that Eichberger did make separate projections for each of the fourteen provinces. Table 1.5 gives the projected levels of area, yields and production of cereals, pulses and oilseeds. Eichberger assumed that the rates of increase in production depend upon estimated foreseeable changes in area and yields from increased use of improved seeds and commercial fertilizers. Comparison of the three different projections reveals some differences in the base year data as well as in the projected levels of supply.

Demand Projections

Demand projections are more complicated and require more statistical data than supply projections. Statistical coefficients of demand determinants such as population growth by components, income growth by economic classes, elasticities of income and prices are missing or incomplete in Ethiopia. For this reason no detailed demand projections for the agricultural products ever have been made to the authors knowledge. However, Eichberger did calculate the quantity consumed in his projection of 1973 which in a sense is the amount available for human consumption. The per capita consumption and apparent consumption for 1973 are shown in Tables 1.6 and 1.7.

Demand for cereals, pulses, oilseeds and other agricultural prod-

TABLE 1.4. HISTORICAL AND PROJECTED AREA, YIELD AND PRODUCTION OF WHEAT IN ETHIOPIA

	Base Year 1964-66 Average	1970		1980		Compound Rates	
		Extrapolated	Estimated	Extrapolated	Projected	Past 1955-70	Projected 1970-80
Area (1000 Ha.)	957	1046	1060	1198	1260	1.6	1.8
Yield (100 Kg/Ha)	7.2	7.5	7.4	8.3	8.5	1.1	1.4
Production (1000 tons)	689	784	780	994	1071	2.7	3.2

Source: Food and Agriculture Organization of the United Nations, Agricultural Commodity Projections, 1970-80. Vol. II (Rome: FAO of the UN, 1971), p. 39.

TABLE 1.5. ESTIMATED AND PROJECTED AREA, YIELD AND PRODUCTION OF CEREALS, PULSES AND OILSEEDS IN ETHIOPIA

	1966 Base Year			1973 Projected		
	Area (1000 Ha)	Yield (100 Kg/Ha)	Production (1000 tons)	Area	Yield	Production
Barley	1480.8	8.97	1328.9	1582.1	9.03	1429.7
Corn	1119.3	9.82	1099.3	1208.4	11.64	1406.4
Sorghum	1620.1	8.39	1360.0	1779.6	9.05	1610.4
Teff	2008.7	5.72	1149.2	2101.9	7.0	1471.8
Wheat	660.1	7.26	478.9	806.3	7.65	616.9
Pulses	946.8	7.28	689.5	1022.2	7.16	731.6
Oilseeds	475.2	5.58	265.3	516.6	5.86	309.0

Source: Willis G. Eichberger, Food Production and Utilization in Ethiopia E.C. 1958, pp. 19, 42.

TABLE 1.6. INCOME ELASTICITIES, BASE YEAR, AND PROJECTED PER CAPITA DEMAND FOR CEREALS, PULSES AND OILSEEDS IN ETHIOPIA
(Unit: Kilograms/Year)

Crop	Elasticities	Per Capita Demand						
		1965	1970	1973*	1975T	1980T	1975H	1980H
Cereals	0.44	160.8	163.4	150.7	167.4	170.1	171.7	175.0
Wheat	0.70	23.6	23.7	12.0	24.8	25.8	26.5	28.9
Corn	0.40	25.0	25.1	35.5	25.6	25.9	26.1	26.3
Sorghum	0.40	29.1	29.2	40.9	29.9	30.2	30.4	30.6
Other cereals	0.40	82.9	85.1	62.2	86.9	88.0	88.5	89.1
Pulses	0.50	19.6	19.7	25.76	20.3	20.8	21.2	22.2
Oilseeds	0.60	2.8	2.8	3.2	2.9	3.0	3.1	3.3

Source: Food and Agriculture Organization of the United Nations, Agricultural Commodity Projections, 1970-1980, p. 194.

* Willis G. Eichberger, Food Production and Utilization in Ethiopia, E.C. 1958, p. 42.

Note: Assumptions on population (1000):

1965	1970	1975	1980
22,699	25,277	28,183	31,731

Assumptions on per capita expenditures: (Index 1965=100)

1970	1975T	1975H	1980T	1980H
101.1	107.7	117.9	113.6	133.7

TABLE 1.7. PROJECTED TOTAL DEMAND FOR CEREALS, PULSES AND OILSEEDS IN ETHIOPIA
(Unit: 1000 Metric Tons)

Product	1965	1970	1973*	1975T	1980T	1975H	1980H
Cereal	3649	4130	3981	4717	5398	4839	5554
Wheat	535	600	318	700	818	746	917
Corn	567	634	939	722	823	735	833
Sorghum	661	739	1081	841	959	857	971
Other cereals	1882	2151	1644	2449	2792	2495	2826
Pulses	508	569	681	655	756	684	816
Oilseeds	79	89	84	104	122	112	139

Source: Food and Agriculture Organization, Agricultural Commodity Projections, 1970-80, pp. 372-402.

*Willis G. Eichberger, Food Production and Utilization, pp. 19, 42.

ucts have been projected to 1980 by FAO. This projection was based on assumptions of constant 1980 retail prices as well as the assumption that change in demand would be determined by changes in population and per capita private consumption expenditure. The projections were run with two alternatives--trend projection (t) and a high target projections (H). (See Table 1.6.)

The total demand was derived simply by multiplying the per capita demand by the projected population. Results are shown in Table 1.7 which includes Eichberger's projections for 1973. There are large differences between the two projections, and the reader is cautioned to compare these projections with those of this study as presented in the following chapters.

CHAPTER II

GENERAL METHODOLOGY OF THE ANALYSIS

Product Coverage

There are many different agricultural products in Ethiopia which need to be analyzed with respect to potential roles and impacts for meeting domestic food demand and export requirements. However, it is practically impossible to consider all of the agricultural products with the limitations of time, data, and expenditure for this study. Selection of the products for study is based in part on their importance in domestic production and consumption, and in part on the relative availability of documented statistical data. The three major groups of products considered are:

(1) Cereals - barley, corn, sorghum (including millet), 'teff'[29] and wheat.

(2) Pulses - broadbeans, chickpeas, field peas, haricot (dry) beans, and lentils (considered in aggregate under pulses).

(3) Edible oilseeds - groundnuts, linseed, nigerseed (Noug), rape seed, sesame and safflower (considered in aggregate).

Although there is much variation in the importance of the individual products grouped under pulses and oilseeds, the inadequacy of data on

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[29]'Teff' is a native foodgrain grown and used more than any other crop in Ethiopia.

individual products makes separate analysis impossible.

Sources of Data

The quality of any type of projection depends primarily upon the quantity and quality of statistical data and information obtainable. Yet, no other criticism has done as much damage to Ethiopia in discouraging the economic researchers as the stereotyped repetition of complaints about the lack of statistics and information on the National economy. It is a common practice with researchers, in any country, to obtain few facts from the available statistics and produce the rest themselves depending upon their abilities and research facilities. No doubt, Ethiopia, like any other developing country, lacks adequate, reliable, and scientifically collected and analyzed statistics. National figures on agricultural production, area cultivated and yields are estimated from sample surveys conducted in several of the fourteen provinces. Statistical data on population also are derived from sample surveys, but the estimation is more objective than for production. Even if the national statistical data are good estimates for the country as a whole, serious problems can arise when disaggregation of the totals by sector or provinces is desired. Except for population data, information on social and economic indicators at the provincial level is very scant, and the reliability of the data available is questionable.

The Ethiopia Statistical Abstract, an annual publication by the Ethiopian Government Statistical Office, has been the main source for population and crop production data. The United Nations' Production, Area and Yield Yearbook and Demographic Yearbook were used to provide supplementary and check data to the above source.

A mimeographed report, "Food Production and Utilization in Ethiopia" by W. Eichberger was the principle source of data on crop production, area and yields, and for most of the basic data for determining the base year per capita consumption for the provinces. The fourth source included two reports prepared for the Ethiopian Government by Stanford Reserach Institute, "Production of Grains and Pulses in Ethiopia" and "Marketing of Grains and Pulses in Ethiopia". References have been made to several sources from other countries on various topics.

Base and Projection Period

The base year, 1966, was selected for two reasons. First, it is the latest year for which all information needed in the projections is available, and second, other projections with this base year are available so that the projected results can be cross checked. Selection of the latest year in the series as base might have improved the results by reflecting more recent changes in supply and demand but would have created serious data limitations.

The projection period extends over ten years from 1971 to 1980 based on ten years of historical data, 1961 to 1970. All statistical figures, including the historical data and projections by year are retained and presented in tables to provide full information to the reader.

Assumptions

The finding of orderly patterns in the past and the assumption of a predictable relation between the past and future raises difficulties in economic projections, especially those expressed in quantities. Accurate projections of past trends and relationships require that

reasonable, explicit assumptions be made to support the faith that the relationship patterns will hold in the future.

The types of assumption needed in projections depend on the object to be projected but there are some general assumptions which are required in economic projections. Simon Kuznets identifies three basic assumptions usually made in projections:[30] (1) assumptions concerning "continuity of physical nature" which are usually assumed implicity or continuity is taken for granted. (2) assumptions concerning "social continuity" include assumptions about political, administrative and economic policies which are susceptible to changes over a short time period. (3) assumption on "specifying conditions" which help in projecting an object at a selected rate to arrive at a pre-planned goal based on the past experience. Assumptions of the third type employed commonly in economic projections where a new change different from the past change is anticipated in the future. If no significant new change is expected, Kuznets indicates not much need to make such assumptions:

> . . . If future government programs are known and are close to those observed in the past, their inclusion in a specifying assumption can only help in making a projection since concrete values are provided for some components, without disturbing the persistent relations within the system of components that prevailed in the past and that can be extrapolated into the future.[31]

The basic assumptions of this study incorporate the physical, social and economic factors that are expected to regulate the future supply and demand for cereals, pulses, and oilseeds in Ethiopia. The

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[30]Simon Kuznets, "Concepts and Assumptions in Long-Term Projections of National Products." Long Range Economic Projections, Studies in Income and Wealth. Vol. 16 (Princeton: Princeton University Press, 1954), pp. 17-22.

[31]Kuznets, op. cit., pp. 20-21.

physical and social factors are assumed to remain constant, even though such assumptions especially on social activities, are highly precarious because of the drastic political and social changes common in a developing economy. The facts cited in the previous chapter indicate that the future total food grains production in Ethiopia will not exceed the past trends by a notable amount. Other evidences indicate that production of certain exportable crops such as pulses and oilseeds may increase at higher rates if the intentions of the Ethiopia Government are realized through implementation of the proposed plans. But the existing conspicuous social and economic factors may not allow the expected high rate of growth in the over-all agricultural sector. Based on these suggestive indications, it is assumed that rate of increases in area cultivated, yields and production will follow the past trends. The complementary assumption is that the historical data are good estimates of recent past trends.

Changes in population, per capita income, prices, tastes, preferences, etc., are the major determinants of changes in demand. Though tastes and preferences may change slightly with economic development and increased urbanization, they were assumed to remain constant. Because of the low price elasticities of both supply and demand for agricultural products and the unavailability of price elasticity coefficients, the projections are based on the assumption that relative prices will remain constant at 1966 levels.

The assumptions regarding population and per capita income growth need further explanation. Unlike many developing countries where rates of population growth are fairly high, Ethiopia has a relatively low rate of about 2.0 percent per annum. This rate has been estimated from representative sample surveys and is believed to be reasonably accurate.

Health facilities, which usually are cited as the major cause for increased population growth in developing countries, still remain unavailable to the majority of Ethiopians, even though they have been expanded in recent years. With these factors in mind, the population was projected at the same rate over the next ten years.

Because of limited quantities of agricultural products and servic that enter the market system, assessment of national production in a subsistence economy is vulnerable to more errors and distortions than in a monetized economy. Serious problem arises when the origin and the beneficiaries of increased output or income are assigned. In economic analysis involving product demands affected by income, the breakdown of the per capita income by region, by urban and rural populations and by income group is essential. The big disparity of per capita income between urban and rural populations in Ethiopia further emphasized the need for separate analysis of the two sectors. The disparity applies not only to the level but also to the rate of growth in per capita income. Allan Thodey precisely puts the situation as follows:

> Several salient facts should be noted about per capita incomes in Ethiopia. First, urban per capita income averaged an estimated Eth $415 in 1967 while rural income averaged only an estimated Eth $107. Second, urban per capita incomes are rising substantially faster than rural ones--5.4 percent annually between 1962-67 compared with 0.5 percent. Third, urban incomes are mostly monetized while rural incomes are mostly imputed values of subsistence consumption. And finally, in both urban and rural areas, income distribution is exceedingly unequal.[32]

The time-series of Gross Domestic Product over the last few years is available but does not indicate the distribution between urban and rural populations. Consequently, the per capita income growth rates,

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[32]Allan R. Thodey, Marketing of Grains and Pulses in Ethiopia, p. 35.

5.4 percent for urban, 1.0 percent for rural non-farm and 0.5 percent for rural farm were assumed in the projections of per capita demand.

Projection Methods

"All statements about the future must necessarily employ data on past events."[33] No realistic projections can be done without using the experience gained over the past several years. The most practical and accurate method of knowing about the future, then, is the analysis of a time-series data which are a collection of past observations belonging to different time periods. The reliability, adequacy and consistency in method of data collection of the time-series are indispensable for acceptable projections.

Production

Projections of supply of grains, pulses and oilseeds were based on historical data of area, yields and production of the individual product over ten years, 1961 to 1970. This time is not long enough to establish a sound long-term secular trend, but the unavailability of the time-series prior to 1961 was the limitation. It was impossible to get all the historical data from the same source, some adjustments were necessary to remove variations due to differences in methods of estimation and analysis among the different sources. This is true especially for some crops (e.g. wheat, corn) for the years prior to 1965 when the sample size used for the estimation was not sufficient to upgrade and modify the previous estimates.

As already stated in the introduction, the primary objectives of

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[33]Simon Kuznets, Concepts and Assumptions in Long-Term Projections, p. 9.

this study are to project and analyze the supply and demand for the product under consideration at the provincial level as well as for the Nation as a whole. Information on factors involved in projections of supply and demand is very meager in all fourteen provinces. The only source that could be found was W. Eichberger's report in 1968 for the crop production year of 1966. Eichberger founded his estimations on the 1965-1966 provincial surveys in seven provinces and the crop cutting surveys in Arussi and Shoa Provinces carried out by the Central Statistical Office and the Ministry of Agriculture. The fact that his study was based on results of the surveys as well as on wide personal experience gives some degree of reliability to the information found in his report.

The existing large diversity in weather, topography, soil fertility, culture, food habits, land tenure system and stage of agricultural development makes the disaggregation of the total crop production into provinces more complex. None of the above factors should be ignored in estimating crop production and consumption by the provinces. In using the 1966 estimates in this study, it was assumed that most of these factors were considered in the process of original estimation; therefore, no further consideration was given to them. Change in weather (e.g. rainfall) from year to year, and change in state of development were given much emphasis.

Ethiopian agri ultural development programs are based on priorities of return and other National goals which tend to result in regional unbalanced development. Such tendency was observed and was warned against not to create social and political criticisms.[34] It is the unbalanced

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[34]Planning Unit, Agriculture, 2nd ed. (Addis Ababa: Ministry of Agriculture, 1970), p. 36.

development program implementation which is assumed to change the production relationships among the provinces which was roughly established by Eichberger's Study. The question is whether these relationships (share to each province in National output) were the same prior to and after 1966. The answer undoubtedly is no, because of the dynamic development in a few provinces (e.c., Shoa, Arussi, Begemdir and Eritrea), and the somewhat static growth in the rest of the provinces. It is the quantitative estimation of these unbalanced changes which pose serious problems in absence of statistically tested evidences. In spite of this inherent problem, rough estimates can be derived if founded on available quantitative and non-quantitative indicators, experience and good judgement.

In order to develop annual historical estimates of grain production by province, the 1966 provincial data on production and area planted first were expressed as percentages of the National total production and area, respectively, for the individual crop. This relative role of each province in the National production provided the major and minor producing regions of each food grain. Using the obtainable quantitative and qualitative information, and personal knowledge of the progressive regions within each province where the impact of new farming methods is apparent, the relative position of each province was determined. Examples of progressive regions include Chilalo Awarajo in Arussi for wheat and barley, Awash Valley and the Shashame area in Shoa for corn, Setit Humera in Begemider and Eritrea for sorghum and oilseeds production. Then allowing for the fluctuations in annual rainfall, the percentage changes in production for each province and crop were computed subjectively. The impacts of new inputs, better fertilizer, farm chemicals,

mechanization, extension services and government programs which affect both cultivated areas and yields, were assumed to vary from province to province over time while the physical and social factors were assumed to remain constant as they were in 1966. Consequently, the final estimated historical data, 1961 to 1970, were derived as a percentage of the National production level for each year. These percentages were transformed into the absolute values by the computer program in the process of making the projections presented in tabular form in Chapter 3 and Appendix A. The knowledge of the methods employed in arriving at the provincial historical data and the projections will undoubtedly help the readers to interpret and use the results with due care and awareness.

Demand

Projections of the level of demand according to the aforementioned assumptions, involve population, per capita incomes and income elasticities of demand. Change in demand (d) is the function of change in population (p), change in per capita income (g) and income elasticities (n) which algebraically can be expressed in $d = p + gn$.[35] Thus, the determination of levels of demand during the projection period requires projections of population and per capita income.

Accurate population projections can be achieved by disaggregating the total population into age group, sex, profession, rural and urban, etc., but unfortunately the scarcity of information did not permit such refinement in this study. The total population was divided into four

[35]Robert D. Stevens, Elasticity of Food Consumption Associated with Changes in Income in Developing Countries. Foreign Agriculture Economic Report No. 23 (Washington D.C. Government Printing Office, 1965).

segments and projected separately. The segments are rural farm, rural non-farm, urban places with less than 5,000 persons and urban places with 5,000 persons and above.[36] One initial objective of projecting the population by the farm segments was to determine the level of demand for each group, but unavailability of differentiated coefficients of demand forced the objective to be dropped, particularly for the separate urban population segments.

Per capita consumption of each product by province and population segment have been estimated by Eichberger in his study of 1966. The estimates were derived from the 1966 provincial total production after allowances were made for seeds, non-food uses and storage losses. He subtracted or added the net export or import balance to find the final supply figure which was divided by total population in order to get the per capita consumption (grain equivalent) for each province. Applying estimated extraction factors (Table 2.1) he determined the per capita consumption figures. The per capita consumption of population segments were determined by the same procedure on the assumptions that the rural farm, rural non-farm and urban population consume 88%, 3%, and 9% of the supply available, respectively. The corresponding estimated percentage of available supply distribution among the three population sectors by province in 1966 are shown in Table 2.2.

Because of differences in total production of 1966 used by Eichberger and in this study, his estimated per capita consumption of all cereals, pulses and oilseeds were not used in the final demand projections. Instead, completely different per capita consumption rates for the

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[36] Willis G. Eichberger, Food Production and Utilization in Ethiopia, EC 1958. Mimeographed report (Addis Ababa: May 1968), p. 12.

TABLE 2.1. ESTIMATED COEFFICIENTS OF SEEDING RATE, LOSSES, NON-FOOD USES AND EXTRACTION FACTOR

Crop	Seeding Rate(Kg)	Loss (%)	Non-food Uses(%)	Extraction Factor(%)
Barley*	135	15	9.3(0)	65
Corn*	50	10	8.4(0)	85
Sorghum*	60	10	8.4(0)	88
Teff*	20(50)	20		93
Wheat	125	15		75
Pulses*	73	0(5)		100(85)
Oilseeds	23	5		30

Source: Willis G. Eichberger, Food Production and Utilization in Ethiopia E.C. 1958, pp. 9-10.

*Those factors indicated in brackets were used in this study.

TABLE 2.2 ASSUMPTIONS ON DISTRIBUTION OF AVAILABLE SUPPLY OF CEREALS, PULSES AND OILSEEDS AMONG POPULATION SECTORS WITHIN PROVINCES IN ETHIOPIA, 1966
(UNIT: PERCENT)

PROVINCE	BARLEY			CORN			SORGHUM			TEFF			WHEAT			PULSES			OILSEEDS		
	FARM	NON-FARM	URBAN	FARM	NON-FARM	URBAN	FARM	NON-FARM	URBAN	FARM	NON-FARM	URBAN	FARM	NON-FARM	URBAN	FARM	NON-FARM	URBAN	FARM	NON-FARM	URBAN
ARUSSI	91.0	3.0	6.0	91.0	3.0	6.0	91.0	3.0	6.0	90.8	3.1	6.1	91.0	3.0	6.0	92.0	3.5	4.5	91.5	3.2	5.3
BALE	82.0	3.0	15.0	82.0	3.0	15.0	82.0	3.0	15.0	92.0	2.7	15.3	82.0	3.0	15.0	82.9	2.8	14.3	82.9	2.7	14.4
CHERCHER	90.0	3.0	7.0	90.2	3.0	6.8	90.5	3.0	6.5	89.0	3.0	8.0	89.0	3.0	8.0	90.3	3.4	6.3	89.9	3.1	7.0
ERITREA	79.0	3.0	18.0	79.5	3.0	17.5	80.0	2.8	17.2	79.0	3.0	18.0	79.5	3.0	18.5	80.3	2.4	17.2	79.0	2.8	18.2
GEMU GOFA	92.0	3.4	4.6	92.3	3.5	4.2	92.3	3.5	4.2	91.8	3.2	5.0	91.8	3.2	5.0	93.0	3.5	3.5	92.1	3.3	4.6
GOJAM	91.0	3.2	5.8	91.3	3.3	5.5	91.3	3.3	5.5	90.6	3.4	6.0	90.6	3.4	6.0	91.3	3.3	5.4	90.8	3.3	5.9
HARAR	91.0	3.3	6.7	91.5	3.5	6.0	92.0	3.3	5.7	90.0	3.5	6.5	88.0	3.5	8.5	91.5	3.4	6.1	91.3	3.3	6.4
ILLUBABOR	91.4	3.3	5.3	91.7	3.5	4.8	91.7	3.5	4.8	91.2	3.3	5.5	90.0	3.3	6.7	91.4	3.3	5.3	91.4	3.3	5.3
KAFFA	87.0	3.0	10.0	88.7	3.3	8.0	88.7	3.3	8.0	86.7	3.0	10.3	85.0	3.0	11.0	87.5	3.1	9.4	87.5	3.1	9.4
SHOA	76.0	2.5	21.5	76.0	2.8	21.1	76.0	2.8	21.1	75.4	2.6	22.0	74.0	2.6	23.4	76.2	2.4	21.4	76.1	2.4	21.5
SIDAMO	88.8	3.2	8.0	88.8	3.5	7.8	88.8	3.2	8.0	88.0	3.3	8.7	86.0	3.5	10.5	88.8	3.2	8.0	88.0	3.5	8.5
TIGRE	89.7	3.3	7.0	90.0	3.5	6.5	90.0	3.5	6.5	89.0	3.5	7.5	89.0	3.4	7.6	90.0	3.3	6.7	89.6	3.5	4.8
WELLEGA	92.0	3.1	5.0	93.0	3.3	3.7	93.0	3.3	3.7	91.5	3.2	5.3	0.0	0.0	10.0	92.0	3.4	4.6	91.0	3.3	5.7
WELLO	92.0	3.3	4.7	91.8	3.5	4.7	92.0	3.3	4.7	91.5	3.3	5.2	91.2	3.3	5.5	92.2	3.4	4.2	92.0	3.4	4.4

SOURCE: BASED ON POPULATION DISTRIBUTION ESTIMATES AND WILLIS G. EICHBERGER'S ASSUMPTIONS ON FOOD SUPPLY DISTRIBUTION AMONG POPULATION SECTORS.

products by provinces and population segments were computed following the same procedures used by Eichberger. However, some of the technical conversion factors were modified or dropped totally (see Table 2.1). One of the major modifications is the non-food uses of barley, corn and sorghum. Use of these grains as animal feeds is relatively insignificant in Ethiopia at present, but expected to increase with development of modern livestock industry in the future. The major demand for these grains arises from home processing of native beverages which roughly demands about 50 percent of barley supply and 20 percent of corn and sorghum, respectively, but varies among the provinces. Since one objective of this analysis is to determine the level of aggregate demand, the exclusion of home processing demand for barley, corn and sorghum undoubtedly would understate the final result.

In order to determine the per capita demand for each product over the projection years, the estimated per capita consumption of the base year, 1966, is applied to the product of rate of growth in per capita income and income elasticity by use of a model. The computed per capita consumption multiplied by the corresponding projected population gives the aggregate demand for the particular product under consideration. Algerbraically it can be expressed as

$$C_t = C_t\text{-}1 + (C_{t-1})\ (gn)$$

$$D = \left[C_{t-1} + (C_{t-1})\ (gn)\right] P_t$$

Where C = per capita consumption

t = year

g = rate of per capita growth

n = income elasticity of demand

D = aggregate or total demand

P = population

Both g and n were kept constant over time.

Projection Models

> The first step in deciding what trend type to use should always consist of plotting the observed data on arithmetic paper and examination of the plotted data will frequently provide an adequate basis for deciding upon the type of trend to use.[37]

Selection of proper models in projections pose much problem. It involves several considerations such as the nature of the time-series, complexity of variables to be projected, the desired degree of precision and simplicity of computation. These factors dictate the type of model to be used while the model dictates the quality of the projections. Examination of the time-series by plotting on graph paper, as suggested by Croton, et. al., and knowledge of theory about the specific subject and the underlying factors provide sufficient grounds for the selection of mathematical models that can reveal the relationships among the variables. An equation "shows the relations only insofar as it is possible to do so within the limits of the particular equation used."[38]

All analyses in this study were carried out by a computerized least squares method regression projections program[39] with several options for type of projection model, mathematical operations, number of variables, insertion of override data instead of estimates, projections of components of aggregate data by forcing the sum into the aggregate total, etc. The program allows three major projection methods (1) exponential

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[37]Fredrick E. Croxton, Dudley F. Cowden, and Sidney Klein, Applied General Statistics, 3rd ed. (Englewood Cliffs: Prentice Hall, Inc., 1967), p. 282.

[38]Mordecai Ezekiel and Karl A. Fox. Methods of Correlation and Regression Analysis, 3rd ed. (New York: John Wiley & Sons, Inc. 1959), p. 102.

[39]The program was developed during the study by Dr. Richard Phillips, Professor in Department of Economics at Kansas State University.

(2) logarithmic (3) specified rate. It computes and prints values of the regression coefficients, the coefficient of determination, and the type of projection model used. It can execute all the mathematical operations--addition, subtraction, multiplication and division. The outstanding feature of the program is that it accurately proportions aggregate (National) data into its component (Provinces) at specified ratios and then projects the components separately, so that the sum equals to the projected aggregate.

After examining the nature of the time-series data for production, area cultivated and yields, and exponential equation was selected for projecting to 1980. This method allows several alternative projections with different specified exponents to facilitate selection of the best fit of the trends. The equational form is given below:

$$Y = a + bX^c + u$$

Where Y = dependent variable - production, area or yield.

X = independent variable - time

a = constant

b = regression coefficient - change in Y for a unit change in X

c = a specified constant exponent

u = a random factor or error term

The equation apparently requires transformation into logarithmic form but instead the program permits direct calculation of X^c (i.e., if the exponent C is assigned a value of 1.2, the program calculates $X^{1.2}$) before it starts the projection. In this process the exponential equation is expressed in linear form as

$$Y = a + bZ + u \quad \text{where } Z = X^c$$

Except when the exponent equals to 1.0, this equation is completely

different from the simple linear regression equation $Y = a + bX + u$, which fits the trend with a straight line or has a constant regression coefficient for all corresponding X and Y values. The exponential model allows the trend to change at a decreasing rate when exponent or $C<1.0$, constant rate when $C = 1.0$, and increasing rate when $C>1.0$. Figure 1 illustrates these three cases with oilseeds production as an example. The figure shows that the projected level of production is higher with exponent 1.6 at R^2 of 98 percent which is fairly high and statistically significant. Also, it can be noted in the figure that the trend values with exponent 1.0 is greater than those with exponent 0.6, yet the R^2 value for the latter is greater than the former. This suggests that the R^2 value is not the only criteria for choosing among the different alternative models. The analyst should add his own judgement as to which result appears to be reasonable or attainable within the context of the foreseeable circumstances. All projected production, area, and yield results presented in this paper were selected from alternative trend projections.

Another important point to notice in exponential projections in this paper is the values of the regression coefficient (b) whenever the specified exponents are less or greater than 1.0. First, exponents less than 1.0 result in increases at decreasing rate and those greater than 1.0 result in increases at increasing rate so that the changes in production, area or yields are not uniform or constant over time. Second, the computed b values correspond to Z in the transformed equation rather than to X. Under this condition the proper means of determining the change from one given year to the next is to calculate directly from the projected results.

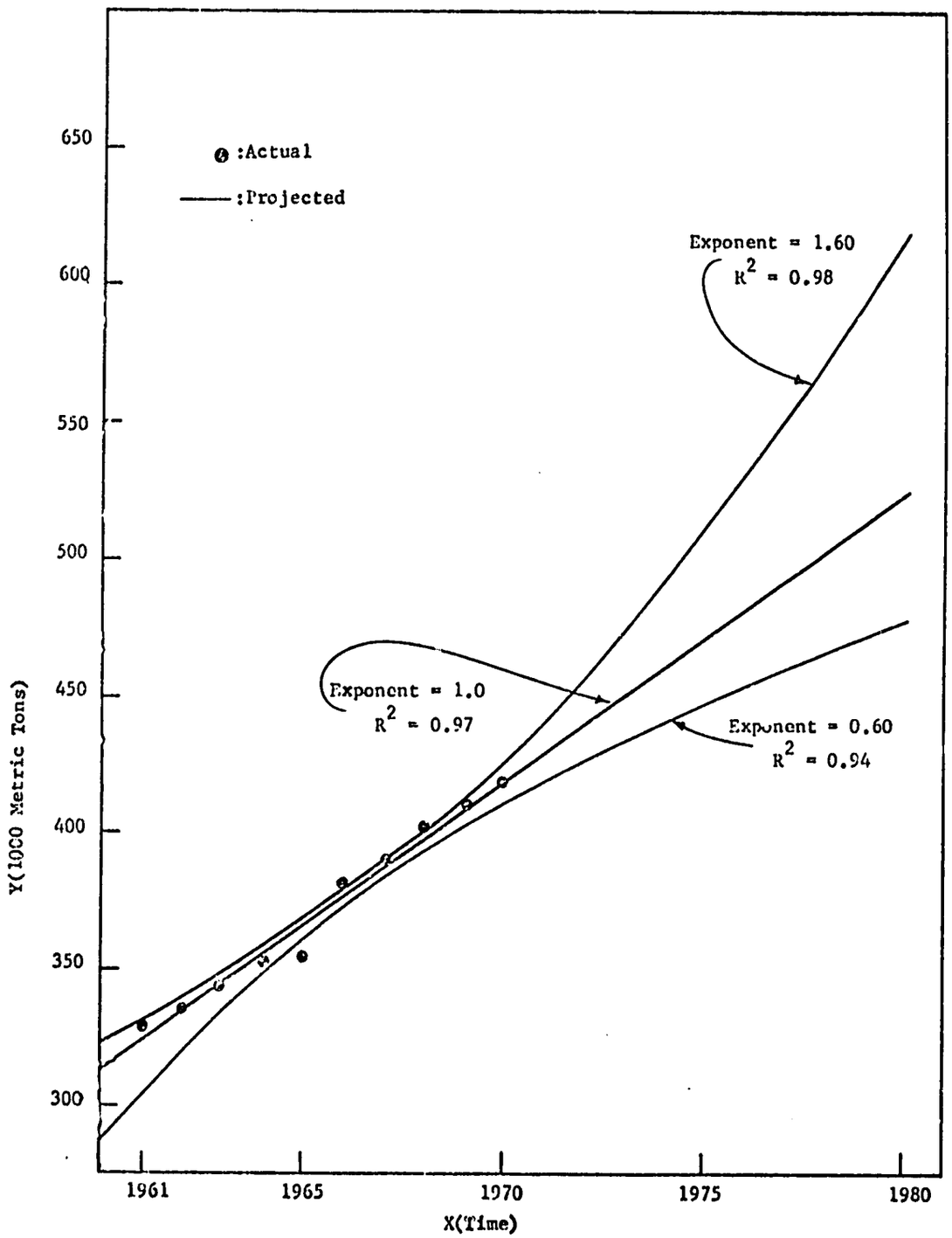

Fig. 1.1--Example of Exponential Projections with Oilseeds Production in Ethiopia.

Projections of population were needed to determine the population effect on demands for cereals, pulses and oilseeds. The historical data were fitted to a mathematical equation of a form $Y = ab^x e^u$. In logarithmic expression it is $\log Y = \log a + X \log b + u \log e$.

> Being an abstract measure, it permits comparison of trends, all described by straight line on ratio paper of series with different origin units. Series such as production of all kinds, population or national income become immediately comparable and conclusions about activities can be readily drawn. This measure, consequently provides an effective device for the study of socio-economic changes in a nation.[40]

The only shortcoming of this model, as indicated by Croxton, et. al., is that in some cases the sum of the deviations above the trend line is slightly larger than the sum of those below it.[41] The equation provides changes at a constant ratio over the projection period. The computed b value for each projection represents this constant ratio which requires transformation into growth rate. First, the ratio should be expressed in terms of percentage and 100 should be deducted from it. Then the result is the average growth rate of the trend under consideration. In this study, however, the program computes in such a way that the ratio only needs to be expressed in percentage to determine the growth rate. For example, if $b = 0.0142$, then the growth rate is 1.42 percent.

The model used for per capita demand (consumption) has been described briefly in the aforegoing section. The equation, i.e., $C_t = C_{t-1} + (C_{t-1})(gn)$ projects at a compound growth rate. To start with base year per capita consumption, per capita income growth rate and income

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[40] Ya-Lun Chou. Applied Business and Economic Statistics (New York: Holt, Rinehart and Winston, 1963), p. 509-513.

[41] Croxton, et. al., Applied General Statistics, p. 260.

elasticity of demand must be available. Then, the base year per capita consumption is multiplied by gn, and the product is added to the base year per capita consumption (C_{t-1}) to get per capita consumption for the next year. The same process is continued over the entire time series.

In summary, three projection models, exponential, logarithmic and compound rate, were used to determine the levels of supply and demand for the food grains covered in this study. The results and inferences are in the next chapters.

CHAPTER III

SUPPLY PROJECTIONS

Before getting to the presentation and analysis of the supply projections, the term "supply" as used in this thesis needs some clarification. In economics, supply involves price and quantity relationships. It refers to the various quantities that would be put on a market at different prices within a given time period. In everyday usage, however, supply refers only to the quantity offered for sale regardless of the price-quantity relationship. Supply is sometimes confused with production which is "simply the quantity produced at a specified point on the supply curve."[42] The term supply is used in this study to mean the quantity supplied each year; the quantity supplied is equal to production minus harvesting, handling and storage losses, seed and other disappearance not related to food and industrial uses. Quantity supplied is not explicitly related to price for this analysis.

As briefly explained in the foregoing chapter, supply projections were based on the historical data of production, cultivated area and yields for 1961 to 1970. The supply projections are based on past trends on the assumption that the time series are good estimates of the existing actual production, and that the past trend can best approximate prospective future production levels.

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[42]Shepherd, Agricultural Price Analysis, p. 7.

Tables showing all of the historical and projected figures for production are presented in this chapter while those on area cultivated and yields are given in Appendix A. The arrangement of the tables has no implication as to their importance; all are hoped to contribute to better understanding of the study. The products and the provinces are arranged alphabetically; the order does not imply relative importance among the products or provinces.

Tables 3.1, A-1 and A-2 are the basic tables of national total crop production, area cultivated and yields, respectively, from which tables 3.2 to 3.8, A-1.1 to A-1.7 and A-2.1 to A-2.7 were derived for the provinces.

The primary dependence on agriculture as a means of livelihood has been a characteristic feature of the Ethiopian economy; more than 85 percent of the people are engaged in agricultural production. Production of cereals, pulses and oilseeds has been carried on for centuries with traditional, less-productive methods. Production has been primarily for family consumption with little surplus for internal or external markets. Aggregate production was increasing as the result of increases in numbers of farm families. There has been some introduction of new technology, but on the average the per capita production has remained constant or declined slightly over the last two or three decades. For example, during the last decade, 1961 to 1970, production of all the products combined increased only by 22 percent while population increased by 20 percent over the same period.

The quantity of individual crops grown is highly correlated with the family subsistence need rather than with market prices as is the case with market-oriented agriculture. As shown in Table 3.1, production of

TABLE 3-1. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED PRODUCTION OF CEREALS, PULSES AND OILSEEDS IN ETHIOPIA, THROUGH 1980
(UNIT: 1000 METERIC TONS)

*Exponent

YEAR	PRODUCTION							
	BARLEY	CORN	SORGHUM	TEFF	WHEAT	PULSES	OIL SEEDS	TOTAL
1961	1248	670	1064	1213	642	518	330	5685
1962	1278	682	1081	1223	662	525	336	5787
1963	1325	714	1100	1244	684	538	344	5949
1964	1348	788	1121	1256	693	554	352	6112
1965	1372	812	1134	1267	722	566	354	6227
1966	1399	827	1165	1286	739	579	376	6371
1967	1423	839	1230	1304	745	574	389	6504
1968	1499	849	1291	1323	755	570	402	6689
1969	1517	860	1355	1343	764	575	409	6823
1970	1540	895	1395	1362	780	575	419	6966
1971	1588	914	1448	1377	791	590	433	7141
1972	1626	932	1509	1395	801	595	445	7303
1973	1666	949	1573	1413	812	600	458	7471
1974	1706	965	1640	1431	822	604	471	7639
1975	1746	981	1710	1450	831	609	484	7811
1976	1787	997	1782	1468	841	613	497	7985
1977	1829	1012	1858	1487	850	617	510	8165
1978	1871	1027	1934	1506	859	621	524	8344
1979	1913	1042	2017	1525	867	625	538	8527
1980	1956	1056	2100	1544	876	629	551	8712
A	1236.71	585.25	1041.32	1196.88	593.62	500.46	320.31	
B	19.7562	77.9818	8.7753	12.8550	46.7790	21.3127	6.3438	
RSQ	0.9851	0.9539	0.9813	0.9961	0.9897	0.8605	0.9833	

SOURCE:

"STATISTICAL ABSTRACT", CENTRAL STATISTICAL OFFICE ETHIOPIA, 1965 TO 1970.
"WORLD CROP STATISTICS AREA, PRODUCTION AND YIELD", FAO, ROME, 1966 TO 1970.

*BARLEY AND OILSEEDS AT 1.20; SORGHUM AT 1.60; TEFF AT 1.10; OTHERS AT 0.60.

oilseeds and pulses, which are more or less cash crops, are produced on a limited scale compared to the cereals group. Teff, the staple food, and barley, which is required in home brewing, are grown more than any other crop in Ethiopia; together they comprise more than 40 percent of the combined food crop production.

The projection indicates that the total production of cereals, pulses and oilseeds will reach about 8.7 million metric tons in 1980, of which 86 percent or 7.5 million metric tons will be cereals. This amounts to an increase of 36 percent over 1966 levels and to 24 percent above 1970 production levels.

Because of the differences in climate, soil fertility, food habits and tastes in Ethiopia, the quantity and type of crop production varies widely among regions, provinces, and even within provinces. Though the natural factors are dominant factors, the influences of food habits and taste patterns on the quantity and type of crop grown in each province appear to be strong. The central and northern regions have more than 70 percent of their cultivated areas under barley, teff, wheat, pulses and oilseeds, while 70 percent of the cultivated area is planted to corn and sorghum in the southwest, south and eastern regions. In general, the major portion of the marketable surplus of cereals, pulses and oilseeds is supplied from Shoa, Gojam, Arussi, Begemder and Wollo, with the other provinces being self-sufficient or importers. Separate analysis of past and future trends of individual products will help clarify the apparent situations.

Barley

The past trend reveals that barley has been the leading crop in

quantity of output and second to teff in area cultivated. In 1966, it represented 22 percent of total production and occupied 19.3 percent of area under all crops under consideration. Likewise in 1966 barley represented 26.6 percent of cereal production and occupied 23.5 percent of the area planted to cereals. Barley is expected to remain the leading crop in Ethiopia through 1980.

Production of barley is projected to reach 2.0 million tons in 1980, an increase of 0.4 million tons or 27 percent over 1970 levels, for an average growth rate of 2.4 percent per annum. The projected increase in production will come from 1.1 percent annual growth in area and 1.3 percent growth in yields (see Appendix A, Tables A-1 and A-2).

Projections by provinces show high production concentration, with 73.8 percent in Arussi, Begemder, Gojam, Shoa and Wollo. However, the indicated figure is 5 percent below the share of total production represented by these provinces in the base year (1966), implying that other provinces will increase production of barley. As indicated in Table 3-2 most of the minor barley producing provinces will increase production at a rate above the national rate (notice the positive B values). Production in Begemder, Gojam and Wollo will grow at rates well under that for the country as a whole (negative B values). The highest rate is registered by Arussi, followed by Shoa; the high rates in these two provinces arise from both area and yield expansion. The present growing usage of modern inputs in these two provinces warrant expectations of yield increases. By 1980 Arussi and Shoa can be expected to supply more than 36 percent of total production, or about 705 thousand tons. The fact that both provinces have ideal climates, soils, access to new methods and markets will induce more production if better varieties are released

TABLE 3-2. ESTIMATED ANNUAL HISTORICAL(1961 TO 1970) AND PROJECTED PRODUCTION OF BARLEY BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNITS 100 METERIC TONS)

EXPONENT IS 1.20

PRODUCTION

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1961	1959	150	1560	150	312	2471	562	225	75	2122	125	499	374	1897	12472
1962	2019	166	1598	153	319	2492	562	243	77	2173	128	511	409	1930	12773
1963	2091	172	1628	159	331	2568	596	265	93	2250	146	543	424	1986	13242
1964	2157	175	1631	162	337	2615	593	270	81	2305	148	553	445	2009	13473
1965	2195	178	1660	165	343	2648	604	288	110	2346	151	563	466	2003	13713
1966	2252	182	1693	168	350	2658	616	294	112	2406	154	588	490	2029	13981
1967	2305	213	1679	185	356	2675	626	313	142	2448	171	598	498	2021	14224
1968	2443	225	1739	195	375	2788	645	330	180	2593	180	630	540	2129	14981
1969	2488	228	1714	212	394	2791	637	319	182	2655	197	652	546	2154	15165
1970	2544	231	1727	216	401	2806	647	339	185	2698	200	663	570	2174	15392
1971	2637	250	1759	223	410	2865	665	364	214	2788	213	692	606	2194	15872
1972	2718	263	1773	233	422	2901	675	380	235	2866	225	715	634	2221	16253
1973	2803	276	1787	244	434	2939	686	397	257	2949	237	739	664	2249	16652
1974	2888	290	1799	255	446	2974	696	415	280	3033	250	764	695	2275	17054
1975	2976	304	1809	266	459	3007	705	433	304	3118	263	790	726	2300	17454
1976	3066	319	1819	278	472	3040	715	452	329	3205	277	816	759	2324	17860
1977	3158	334	1827	291	486	3072	725	472	355	3294	291	843	794	2348	18284
1978	3252	350	1834	303	499	3102	734	492	383	3385	306	871	829	2370	18702
1979	3348	367	1838	316	513	3130	743	513	412	3476	321	899	865	2390	19124
1980	3446	384	1841	330	527	3157	751	534	442	3570	337	928	903	2409	19553
A	0.1565	0.0120	0.1266	0.0114	0.0247	0.1986	0.0452	0.0187	0.0048	0.1689	0.0098	0.0398	0.0306	0.1524	
B	0.0005	0.0002	-0.0009	0.0001	0.0001	-0.0010	-0.0002	0.0002	0.0005	0.0004	0.0002	0.0002	0.0004	-0.0008	
RSQ	0.9821	0.8185	0.9572	0.7938	0.5275	0.9740	0.8016	0.7738	0.9063	0.9049	0.9221	0.9392	0.9430	0.9342	

SOURCE:

ESTIMATED FROM NATIONAL PRODUCTION BASED ON W.EICHBERGER'S STUDY, 1966, AND IMPORTANCE OF CROP, FARM TYPES ,IMPROVED PRACTICES AND GOVERNMENT PROGRAMS.

through the experiment stations.

Corn

During 1961 to 1970 the corn yield growth trend has been very low except in 1963 when it increased by ten percent. Over the projection years corn yields are indicated to grow at an average rate of 1.3 percent per year. The indicated average annual increase in area planted to corn is 1.1 percent over the 1970-1980 period.

The projections indicate that corn production will reach a level of about 1.1 million tons, slightly above half of barley production. By 1980 corn production will represent 14 percent of total cereal production and 12 percent of all products output. The percentages represented by corn are declining somewhat, primarily due to the rapid increase in sorghum.

In 1966 Wollega, Sidamo, Harar, Kaffa, Illubabor and Shoa together represented about 75 percent of total corn production and 74 percent of the total area under corn; by 1980 these shares are projected to fall to 68 percent and 65 percent, respectively (Table 3.3). Among the minor corn producing provinces, Arussi, Eritrea and Gojam are expected to increase corn production substantially, through both area increases and yield increases as indicated in Appendix A, Tables A-1.2 and A-2.2. The projected rates of increase in corn production are relatively low in most provinces and for the country as a whole. Larger increases than those indicated by the projections should be possible for example in Shoa, Arussi and Sidamo where the use of better inputs already is underway on a limited scale.

TABLE 3-3. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED PRODUCTION OF CORN BY PROVINCES IN ETHIOPIA, THROUGH 1980
(100 METERIC TONS)

EXPONENT IS 0.60

	PRODUCTION														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WELLO	TOTAL
1961	121	7	348	33	502	228	797	409	677	804	992	368	1266	127	6692
1962	136	7	353	34	532	238	821	421	692	808	1034	373	1310	122	6813
1963	143	14	380	36	509	258	860	452	731	803	1061	380	1384	129	7132
1964	173	16	426	47	552	299	930	512	804	875	1166	418	1521	142	7672
1965	178	16	422	49	568	300	965	535	844	900	1209	422	1574	138	8112
1966	182	25	422	50	563	290	993	538	861	919	1250	422	1614	141	8263
1967	185	25	428	59	562	302	1015	537	873	923	1267	428	1644	143	8382
1968	187	25	433	68	561	306	1026	552	892	918	1283	425	1666	144	8481
1969	189	26	439	77	576	310	1041	559	912	912	1299	430	1666	146	8592
1970	215	27	439	81	600	331	1092	582	949	949	1342	439	1754	152	8942
1971	217	32	459	81	593	337	1110	604	972	954	1385	445	1800	151	9133
1972	224	34	466	86	598	345	1133	619	995	963	1415	450	1839	153	9312
1973	232	37	473	91	603	352	1156	633	1017	972	1443	454	1875	154	9483
1974	239	39	479	95	607	359	1177	646	1038	979	1470	457	1910	155	9644
1975	246	41	485	100	611	366	1198	659	1058	986	1497	461	1945	157	9802
1976	253	43	491	104	615	374	1219	673	1079	993	1524	464	1980	158	9962
1977	260	46	496	109	619	380	1239	686	1099	999	1549	467	2013	159	10113
1978	266	48	502	113	622	387	1259	698	1119	1005	1575	470	2046	160	10263
1979	273	50	508	118	625	394	1278	711	1139	1010	1600	473	2079	161	10412
1980	280	52	513	122	628	400	1297	723	1157	1015	1624	475	2110	162	10555
A	0.0173	0.0002	0.0540	0.0026	0.0775	0.0345	0.1181	0.0606	0.0988	0.1235	0.1461	0.0574	0.1901	0.0192	
B	0.0015	0.0008	-0.0009	0.0015	-0.0030	0.0006	0.0008	0.0013	0.0018	0.0045	0.0013	-0.0021	0.0016	-0.0006	
RSQ	0.8157	0.8745	0.4281	0.8506	0.9275	0.2245	0.3978	0.6158	0.9412	0.9127	0.6775	0.9787	0.8546	0.7885	

SOURCE:

ESTIMATED FROM NATIONAL PRODUCTION BASED ON W.EICHBERGER'S STUDY, 1966, AND IMPORTANCE OF CROP, FARM TYPES ,IMPROVED PRACTICES AND GOVERNMENT PROGRAMS.

Sorghum*

Sorghum is the only crop projected to show a dramatic increase in production; if the increase continues, by 1980 sorghum production will exceed that of all other food grains combined. The projected trend reflects the increased production during the 1970's originating on the rapidly expanding, relatively large scale commercial farms.

The total output of sorghum is projected to reach about 2.1 million metric tons in 1980--24 percent of the production of all products and 28 percent of total cereal production (a 6 percent gain in both percentages compared to 1966). The projected 1980 production level of sorghum is about 75 percent above the level in the base year, and represents an absolute increase of 0.94 million tons. Most of the increase projected arises because of the expansion in area cultivated (about three percent per annum), rather than through substantial increases in yields. The projection indicates a low rate of growth in yield of one percent per year. This coupled with the growth in plantings means about four percent annual growth in production.

A graph showing indexes of production, area and yield of sorghum in relation to the 1961 base is given in Figure 3.1. From the graph, it is clear that area is growing more rapidly than yield, inducing production to rise at a more rapid rate.

Harar province has been the single major sorghum-producing region in Ethiopia with an average of 30 percent of national total output prior to the mid 1960's. Since then its importance has been declining gradually. Even though Harar will remain the major supplier, by 1980 its

*Includes millet.

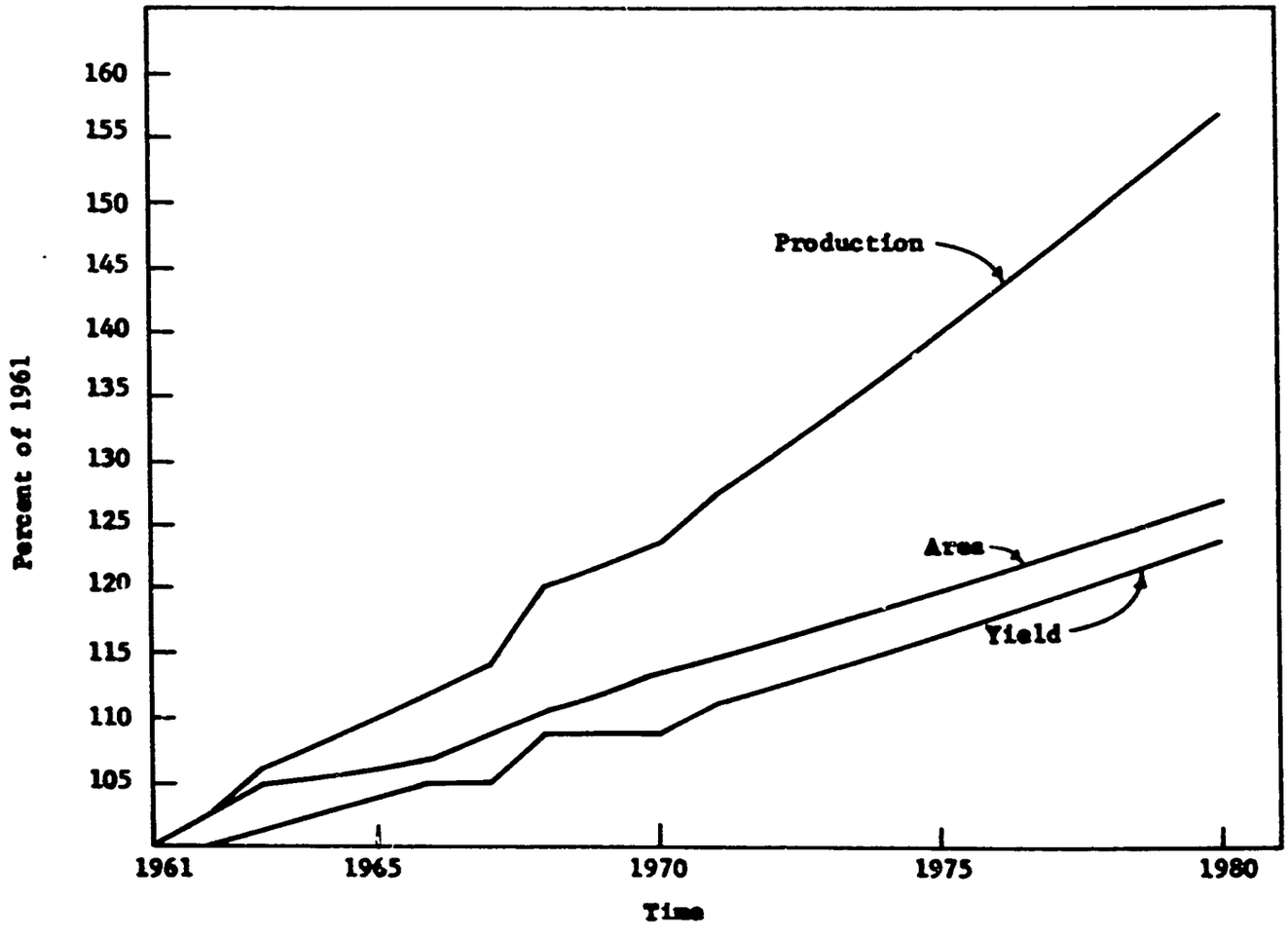

Fig. 3.1--Historical (1961 to 1970) and Projected Barley Production, Area, Yield Indices in Ethiopia, 1961 to 1980.

share will have dropped by almost 8 percent from its former position.

Harar, Begemder, Wollo, Eritrea, Wollega and Sidamo, in order of importance, will make up 75 percent of the total production in 1980 as compared to 72 percent in 1966. Among these, Begemder, Eritrea and Wollo appear to increase more rapidly than the others.

In fact, the large proportion of the realized and expected increase in sorghum supply apparently will come from Begemder and Eritrea, these two provinces together will produce 25 percent of the total in 1980 as compared to only 16 percent in the base year. It should be realized, however, that such production influx comes only from a relatively small area, Setit Humera, which extends into both provinces. In view of the progress achieved since the early 1960's and the huge overhead investment in infrastructure in this region, the rate of growth for sorghum production in Setit Humera is much more rapid than in other regions of the two provinces.

In Table 3.4, it is clear that Arussi, Sidamo, Gemu Gofa, Illubabor and Wollo are increasing production slightly above the national average rate while production in Harar and Wollega is increasing more slowly than the average rate. Gojam and Tigre show absolute decreases in production, probably due to one or two years of low production data in the series upon which the projections are based. This illustrates the difficulties with extremities of data used as basis for trend projection; they can cause apparent accelerated increases or decreases which may not be unacceptable. See the results for Gojam and Tigre in Table 3.4. Reference to Appendix Tables A-1.3 and A-2.3 may facilitate understanding of the variation of area and yield growth among the provinces.

TABLE 3-4. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED PRODUCTION OF SORGHUM BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNITS 100 METERIC TONS)

EXPONENT IS 1.60

PRODUCTION

YEAR	AFUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1961	32	11	947	585	309	947	3086	319	255	585	404	702	1053	1415	10644
1962	43	11	962	605	313	962	3113	335	249	595	411	713	1059	1449	10815
1963	44	11	968	638	341	968	3135	352	253	605	429	715	1067	1485	10997
1964	45	11	1043	650	336	986	3172	370	224	628	437	729	1076	1513	11215
1965	56	11	1105	676	349	981	3168	383	225	620	462	721	1071	1522	11344
1966	70	12	1165	699	361	979	3262	396	233	641	489	687	1095	1573	11653
1967	74	12	1255	750	394	984	3419	430	246	701	529	701	1132	1685	12305
1968	90	13	1343	826	439	1007	3524	452	258	736	568	736	1162	1769	12914
1969	108	14	1490	908	461	989	3658	474	271	759	596	745	1206	1883	13556
1970	139	14	1562	935	488	1018	3697	502	279	781	628	739	1242	1939	13957
1971	151	15	1712	1018	527	1011	3830	547	269	830	686	732	1255	2048	14622
1972	175	15	1862	1099	568	1009	3950	588	272	874	740	728	1286	2162	15324
1973	202	16	2027	1189	614	1003	4072	632	275	921	799	720	1316	2283	16064
1974	232	17	2210	1287	664	992	4197	680	277	972	863	709	1346	2415	16852
1975	266	18	2411	1395	718	975	4323	734	278	1026	934	693	1374	2556	17692
1976	304	19	2631	1514	778	951	4450	791	279	1083	1011	671	1401	2707	18584
1977	346	19	2869	1641	842	920	4571	853	277	1143	1094	643	1424	2866	19503
1978	393	20	3131	1780	913	880	4693	921	275	1208	1185	609	1446	3037	20484
1979	444	21	3414	1931	989	830	4810	994	271	1276	1282	567	1464	3217	21504
1980	500	23	3721	2093	1070	770	4921	1072	265	1347	1388	516	1477	3408	22564
A	0.0029	0.0010	0.0873	0.0551	0.0289	0.0910	0.2894	0.0311	0.0225	0.0550	0.0379	0.0670	0.0986	0.1332	
B	0.0002	0.0000	0.0006	0.0003	0.0002	-0.0005	-0.0006	0.0001	-0.0001	0.0003	0.0002	-0.0004	-0.0003	0.0001	
RSQ	0.9616	0.0000	0.9727	0.9663	0.9293	0.9613	0.9729	0.8617	0.5246	0.3761	0.9553	0.9538	0.9690	0.9041	

SOURCE:

ESTIMATED FROM NATIONAL PRODUCTION BASED ON W.EICHBERGER'S STUDY, 1966, AND IMPORTANCE OF CROP, FARM TYPES ,IMPROVED PRACTICES AND GOVERNMENT PROGRAMS.

Teff

Teff, the staple food item for the majority of Ethiopians, is grown extensively throughout the country, principally in the central highlands. Grown and only consumed by Ethiopians in the world, teff has significant role in the economy of the country, and serves as the major source of food to the people.

In terms of cultivated area, teff occupies the first place among all field crops but is second to barley in output because of its low yields. In 1966, the production was estimated at 1.3 million tons from land area of 2.1 million hectares, for an average yield of 6 quintals* per hectare (Tables 3-1, A-1 and A-2). The corresponding production in 1980, as indicated by the projections, will be 1.5 million tons from land area of 2.1 million hectares (actually 30,000 hectares less than the 1966 figure) at an average yield of 7.3 quintals per hectare. Teff is the only crop showing a decrease in area cultivated. Unless use of commercial fertilizer is expanded, decrease in teff area can be expected due to the farmers' tendency to shift to more profitable and higher yielding crops. This is particularly true in the central and northern provinces where teff yield has been decreasing with year-to-year soil fertility depletion.

The rate of decrease in area during the projection period is nearly the same as has been true during the previous decade--about 0.2 percent per year. Teff yields are projected to increase at an average rate of 1.5 percent per annum. Thus, the rise in total teff supply resulting from increases in yields at a more rapid rate than the decrease in area amounts to a net average rate of 1.3 percent per year.

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*1 quintal = 100 kilograms.

The relative growth in teff production, area and yields for the country is shown graphically in Figure 3.2. The area curve show a drastic drop in 1964, a constant rise during 1965 to 1970 and a gradual decline over the projection years. As a result of decreasing area and rising yield, the production curve lies between the two curves, and rises at a constant rate.

The trends in area and yields of teff by province are shown in Appendix Tables A-1.4 and A-2.4. Areas planted to teff in Begemder, Gojam, Tigre, Wollega and Wollo show decreasing trends at varying rates, while plantings in the other provinces are increasing but at very slow rates. Shoa, Arussi, Gojam, and Wollo exhibit an increasing trend in yields, but the rates are lower than those indicated for the minor producing provinces such as Bale and Sidamo.

It is interesting to observe the extremely high concentration of teff production in six provinces. Gojam, Shoa, Wollo, Begemder, Wollega and Tigre alone will contribute 87 percent of the expected total production of 1980, a decrease of 3 percent from their share in 1966. Large portions of this three-percent decrease are attributed to Arussi, Sidamo and Eritrea. Production in the other province, though increasing still will remain small relative to the total output for Ethiopia as a whole (see Table 3.4).

Wheat

Wheat production has been minor among the cereals, and is not widely distributed over the country. Last production estimates of wheat vary among different sources such that it has been difficult to determine which one to use in this study. For example, for 1966 the Ethiopian

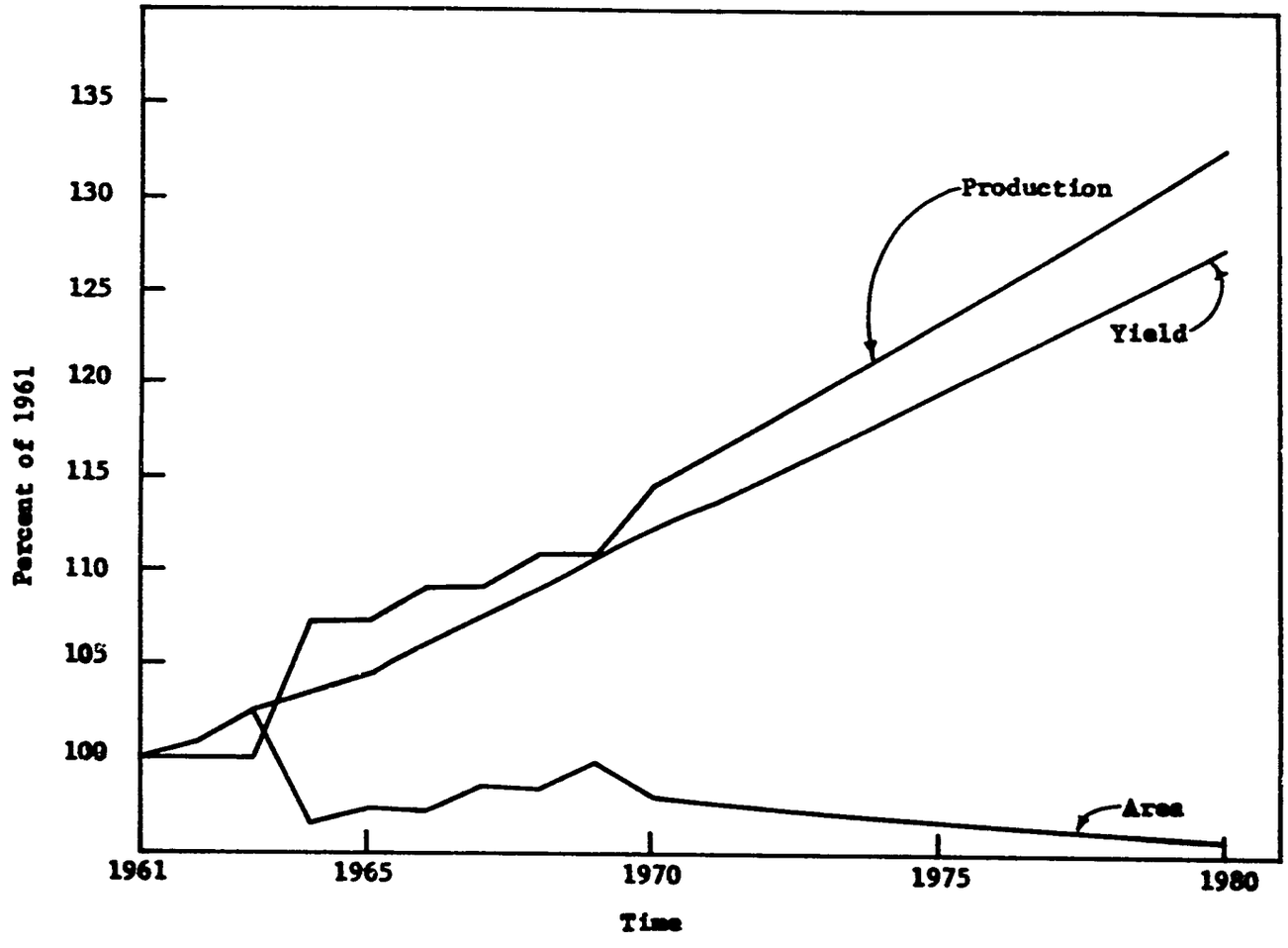

Fig. 3.2--Historical (1961 to 1970) and Projected Teff Production, Area, and Yield Indices in Ethiopia, 1961 to 1980.

TABLE 3-5. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED PRODUCTION OF TEFF BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNITS 100 METERIC TONS)

EXPONENT IS 1.10

	PRODUCTION														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WELLO	TOTAL
1961	182	61	2014	85	133	3214	218	85	73	2293	146	764	1092	1771	12121
1962	196	61	2030	98	135	3229	220	86	73	2311	147	758	1101	1786	12223
1963	199	75	2040	100	137	3284	224	87	75	2351	149	771	1120	1807	12474
1964	202	76	2056	89	139	3313	227	88	76	2381	151	756	1134	1834	12[illegible]3
1965	203	76	2071	102	140	3342	229	102	76	2402	165	762	1118	1681	12663
1966	219	90	2070	116	141	3344	231	116	77	2443	219	772	1119	1903	12853
1967	223	103	2083	116	142	3351	246	116	91	2523	233	776	1125	1915	13232
1968	225	106	2117	119	146	3387	238	119	93	2540	238	781	1125	1955	13223
1969	242	108	2115	121	135	3361	256	135	108	2654	242	795	1145	1994	13421
1970	246	109	2129	136	136	3385	259	136	123	2702	246	805	1160	2047	13614
1971	252	123	2141	138	141	3429	261	145	116	2734	277	798	1153	2061	13764
1972	260	131	2152	144	141	3446	266	153	122	2787	294	802	1158	2093	13944
1973	268	138	2163	150	142	3462	272	161	128	2841	312	806	1162	2125	14122
1974	277	146	2173	156	142	3477	277	170	135	2895	330	809	1166	2157	14303
1975	285	155	2184	163	142	3494	283	178	141	2952	349	813	1170	2191	14493
1976	294	163	2192	169	142	35[illegible]8	288	187	148	3007	368	816	1173	2224	14673
1977	303	172	2202	176	143	3522	294	196	155	3065	389	819	1177	2259	14952
1978	312	181	2211	183	143	3536	299	205	162	3124	408	822	1180	2293	15055
1979	321	190	2220	190	143	3549	305	215	169	3183	429	825	1183	2328	15242
1980	330	199	2228	198	143	3561	311	224	177	3243	450	828	1185	2363	15433
A	0.0150	0.0747	0.1676	0.0070	0.0113	0.2687	0.0177	0.0063	0.0052	0.1962	0.0104	0.0626	0.0913	0.1460	
B	0.0002	0.0003	-0.0009	0.0002	-0.0001	-0.0014	0.0001	0.0003	0.0002	0.0009	0.0007	-0.0003	-0.0005	0.0003	
RSQ	0.9011	0.9124	0.9556	0.7746	0.5274	0.8889	0.5645	0.9156	0.7394	0.8548	0.8401	0.8530	0.8456	0.5870	

SOURCE:

ESTIMATED FROM NATIONAL PRODUCTION BASED ON W.EICHBERGER'S STUDY, 1966, AND IMPORTANCE OF CROP, FARM TYPES ,IMPROVED PRACTICES AND GOVERNMENT PROGRAMS.

Government estimated wheat production at 739 thousand metric tons, Willis G. Eichberger at 479 thousand metric tons and another source at 431 thousand tons. The Government estimates were used in the final projections of production and per capita consumption. Estimates made by Food and Agriculture Organization of the United Nations are approximately the same as the Government figures. Alternative projections based on the lowest production series were made, but the results seem unreliable and are not included in this paper.

Based on the high time series used, wheat still accounts for a minor share of total food grain production in Ethiopia, amounting to 739 thousand metric tons out of the total production of 5.4 million tons of cereals and 6.4 million tons of all products in 1966. In percentage terms, the wheat conponent of total production was 13.7 and 11.6, respectively. Although by 1980 wheat production will increase to a level of 76 thousand tons or about 37 percent above the 1966 level, its relative standing among the cereals and all products will decline to 11.6 percent and 10 percent, respectively.

During 1961 to 1970 the wheat area cultivated expanded at an average rate of 1.5 percent per annum while wheat yields increased at a low rate of 0.6 percent per year over the same period. As a consequence production grew at 2.1 percent per year.

The rate of increase in area planted to wheat will average 1.3 percent over the projection period while that for wheat yield is expected to be about 0.50 percent per year. These will provide an annual rate of increase in production of 1.8 percent which is far below the Government expectation of 4 percent per year. Comparison of Table 1.2 and Table 3.1 reveals a difference of 11 thousand metric tons between wheat production

TABLE 3-6. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED PRODUCTION OF WHEAT BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNITS 100 METERIC TONS)

EXPONENT IS 0.60

	PRODUCTION														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1961	1040	257	501	96	45	578	366	64	51	2170	90	481		681	6418
1962	1079	265	516	106	46	589	377	73	53	2244	93	477		702	6619
1963	1115	274	520	123	48	595	383	75	55	2326	96	513		718	6839
1964	1130	291	527	139	55	603	381	69	55	2356	104	506		714	6929
1965	1206	303	549	144	58	628	390	72	58	2455	108	513		736	7220
1966	1249	318	554	148	59	636	384	74	67	2513	111	532		746	7390
1967	1266	320	551	149	60	633	387	74	74	2533	119	536		745	7450
1968	1291	332	551	151	60	634	393	75	75	2582	121	536		747	7552
1969	1323	344	558	153	61	627	390	76	76	2638	122	528		742	7642
1970	1349	351	562	156	70	640	390	78	78	2722	133	523		749	7798
1971	1375	359	569	170	69	647	393	78	81	2730	132	541		759	7902
1972	1400	367	572	175	70	650	393	79	84	2770	136	544		762	8004
1973	1427	375	576	180	72	654	394	79	87	2813	139	548		766	8116
1974	1452	383	580	185	74	658	395	80	89	2852	143	551		770	8214
1975	1476	390	583	190	76	661	395	80	92	2888	146	554		772	8302
1976	1500	398	586	195	78	664	395	81	94	2927	149	557		775	8404
1977	1524	406	589	200	80	667	395	81	97	2963	153	559		778	8493
1978	1547	413	592	205	81	670	395	82	99	2999	156	562		780	8583
1979	1568	420	594	210	83	672	395	82	102	3031	159	564		782	8663
1980	1591	428	597	214	85	674	395	83	104	3067	162	566		784	8754
A	0.1560	0.0373	0.0806	0.0144	0.0063	0.0929	0.0604	0.0108	0.0065	0.3341	0.0125	0.0773		0.1110	
B	0.0043	0.0019	-0.0020	0.0017	0.0006	-0.0026	-0.0025	-0.0002	0.0009	0.0027	0.0010	-0.0021		-0.0035	
RSQ	0.9151	0.9298	0.9427	0.7328	0.7622	0.9394	0.9526	0.2559	0.7699	0.6179	0.8885	0.6971		0.9590	

SOURCE:

ESTIMATED FROM NATIONAL PRODUCTION BASED ON W.ETCHBERGER'S STUDY, 1966, AND IMPORTANCE OF CROP, FARM TYPES ,IMPROVED PRACTICES AND GOVERNMENT PROGRAMS.

target projections by Ethiopian government and those of this study for 1973. Compared to an FAO projection based on a target rate of 3.2 percent per annum the difference is 195 thousand tons by 1980 (see Table 1.3).

The introduction of modern inputs to the two major wheat producing provinces, Arussi and Shoa, would definitely affect yield per hectare significantly, and more new variety seeds and fertilizers are expected to be used during the 1970's. Under such expectations, the projected wheat production figures in this study may be considerably below what can be achieved. However, targets such as the government and FAO will not be achieved without a concerted wheat production improvement program.

The trend projections indicate no major change in the relative importance of the individual provinces in wheat production. Shoa and Arussi will move slightly up from their share of 51 percent in 1966 to 53 percent of the total wheat output in 1980. Almost 83 percent of the prospective production of wheat will be in Shoa, Arussi, Wollo, Gojam, Begemder and Tigre, all in the central and northern regions. Plantings of wheat are small in the other provinces, but in most cases production could be increased over the projections if programs were developed to encourage additional plantings. From the projection results it is clear that Ethiopia's wheat supply during the 1970-80 period will depend heavily upon Arussi and Shoa Provinces.

Pulses

Several varieties of pulses crops are raised in Ethiopia, of which chickpeas, field peas, broad beans, lentils and haricot beans are the major ones. They are all aggregated in one group as pulses in this

study. The 1966 percentage composition of the total pulses production was as follows: chickpeas, 30; field peas, 21; broad beans (horse beans), 21; lentils, 17; and haricot beans, 11. They follow the same order in area cultivated. Field peas and broad beans had the highest yields per hectare, and the yields of haricot beans were next highest.

Pulses production in Ethiopia, particularly on peasant farms, has two primary purposes. First, as food products, and second, as a means of restoring soil fertility. Pulses, which are legumious crops, fix the atmospheric nitrogen in the soil to benefit the subsequent crop, hence has great importance with the farmers. In fact, the production of pulses and especially chickpeas can be expected to decline with expansion of commercial fertilizers unless prices or other incentives are provided. Generally, all of the pulses crops are grown in more or less the same regions, with the major concentration in the central and northern highlands.

The trend projections for pulses production to 1980 show an increase of 50 thousand tons over 15 years, an average absolute increase of slightly more than three thousand tons per annum for the entire country (see Table 3-1). This increase is only 9 percent above the 1966 level as compared to the 19 percent increase during the five-year period, 1968-1973, projected by the Ethiopian government. The government projection shows pulses production of 714 thousand tons by 1973. This projection is based on an annual growth of 3.6 percent, more than double the average growth rate of 1.5 percent during the 1960's. Materialization of such high growth within the five-year period seems highly improbable under the existing production practices.

Pulses production is highly concentrated in only four provinces,

TABLE 3-7. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED PRODUCTION OF PULSES BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNITS 100 METERIC TONS)

EXPONENT IS 0.60

PRODUCTION

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO	TOTAL
1961	212	26	570	36	41	699	414	67	47	1404	114	306	135	1119	5172
1962	220	26	572	37	42	703	420	68	47	1423	115	310	136	1129	5242
1963	231	27	581	38	43	721	420	70	54	1463	124	312	140	1157	5372
1964	238	28	598	39	44	737	432	73	55	1507	127	321	144	1191	5534
1965	244	34	606	40	40	742	436	79	57	1547	130	329	153	1224	5552
1966	249	35	614	41	46	753	440	87	58	1581	139	336	156	1256	5781
1967	253	34	609	40	46	746	430	86	57	1567	138	327	155	1251	5734
1968	251	40	598	40	51	735	422	85	57	1562	137	319	160	1243	5691
1969	253	40	604	40	52	736	420	86	63	1575	144	322	161	1253	5741
1970	253	40	603	40	57	735	414	86	63	1585	144	316	161	1252	5744
1971	263	42	614	41	54	750	425	92	64	1623	148	327	166	1290	5892
1972	266	44	617	42	55	753	425	94	66	1639	151	328	169	1303	5941
1973	270	45	620	42	56	756	424	96	67	1654	154	329	171	1315	5994
1974	273	47	622	42	57	758	424	97	68	1667	156	330	173	1327	6032
1975	276	48	624	43	58	760	424	99	70	1683	159	331	176	1340	6082
1976	279	49	626	43	59	762	423	101	71	1695	161	331	178	1351	6123
1977	282	51	628	43	60	764	422	103	72	1708	163	332	180	1361	6167
1978	285	52	630	43	61	766	422	104	73	1721	166	333	182	1372	6203
1979	288	53	632	44	62	768	421	106	74	1734	168	333	184	1382	6244
1980	291	54	634	44	63	770	421	108	76	1746	170	334	186	1393	6283
A	0.0406	0.0037	0.1117	0.0070	0.0069	0.1382	0.0838	0.0119	0.0084	0.2691	0.0207	0.0608	0.0247	0.2124	
B	0.0309	0.0008	-0.0018	-0.0000	0.0005	-0.0026	-0.0028	0.0009	0.0006	0.0014	0.0011	-0.0012	0.0008	0.0015	
RSQ	0.8698	0.8468	0.9727	-0.0000	0.3900	0.9582	0.9576	0.8625	0.7788	0.8047	0.9268	0.8509	0.8441	0.8535	

SOURCE:

ESTIMATED FROM NATIONAL PRODUCTION BASED ON W.EYCHBERGER'S STUDY, 1966, AND IMPORTANCE OF CROP, FARM TYPES ,IMPROVED PRACTICES AND GOVERNMENT PROGRAMS.

Shoa, Wollo, Gojam, and Begemder; these provinces make up about 73 percent of the total production in the base year and are expected to maintain the same share in 1980. Other provinces with significant quantities of pulses output are Harar, Tigre and Arussi; the three are expected to contribute 17 percent of the national output by the end of the projection period. Among the principle producing provinces, Wollo, Shoa and Arussi are projected to raise their production more rapidly than the national growth rate while Harar, Gojam and Begemder will increase production at a slower rate than the national average rate, mainly due to the low rate of area expansion (Appendix Table A-1.6). Pulses yields vary slightly among the provinces with little or no increase projected in most provinces during the 1971 to 1980 period (see Appendix Table A-2.6).

Oilseeds

The general name oilseeds in this study refers only to edible oilseeds and nuts. Oilseeds include nigerseed (neug), linseed, sesame, safflower seed, rape seed and ground nuts. Nigerseed is the leading kind of oilseed in Ethiopia with 61 percent of the total production in 1966. Linseed and sesame are the second most important oilseed crops. The rate of increase in sesame production has out paced the others since 1965, and is expected to increase quite rapidly during the 1970's.

Even though oilseeds production is minor relative to other field crops, oilseeds rank second to coffee in foreign trade. The total output is projected to reach 551 thousand tons in 1980; this represents an addition of 175 thousand tons or 47 percent over production in 1966 (see Table 3-1). During the decade 1970-80 it is expected that output of oilseeds will grow faster than in the previous decade. The trend pro-

jection shows average rates of growth of 2.2 percent in area and 0.8 percent in yield, implying a production growth rate of about 3 percent per year. This rate is somewhat higher than the 1961 to 1970 growth rate of 2.6 percent, but still it appears not to reflect much of the progress achieved in the early 1970's. The Ethiopian government expects such a rapid increase in oilseeds production in some specific regions that it used a country wide annual rate of 6.8 percent from 1968 to 1973 (Table 1.2). How much of this planned growth rate can be attained depends upon the rate of expansion in area planted and in yields.

Figure 3.3 shows oilseed production, area and yield as indexes of the 1961 base. Production started rising rapidly in 1965, with increases in area cultivated, thereafter has been increasing at a progressive rate. Yields dropped below the 1961 level during 1962 to 1966 and began rising thereafter.

Examination of the past and projected trends of oilseeds production by province reveals that among the five major producing provinces, all but Begemder and Harar, lost in importance during 1970-80. Gojam, Shoa, and Wollo alone produced 48 percent of the national output in 1966; this share is projected to decline to 44 percent by 1980. Begemder gained more than three percent during the same period, increasing from 23 percent in 1966 to 27 percent by the end of projection period. Begemder is expected to show a dramatic increase in oilseeds production, similar to that for sorghum. From Table 3.8, it can be observed that Begemder has the highest relative growth rate, followed by Harar and Eritrea. Production in Begemder is projected to rise from 88.7 thousand tons in 1966 to 146 thousand tons in 1980, an increase of 64 percent over fifteen years.

Variations in annual changes in areas and yields of oilseeds among

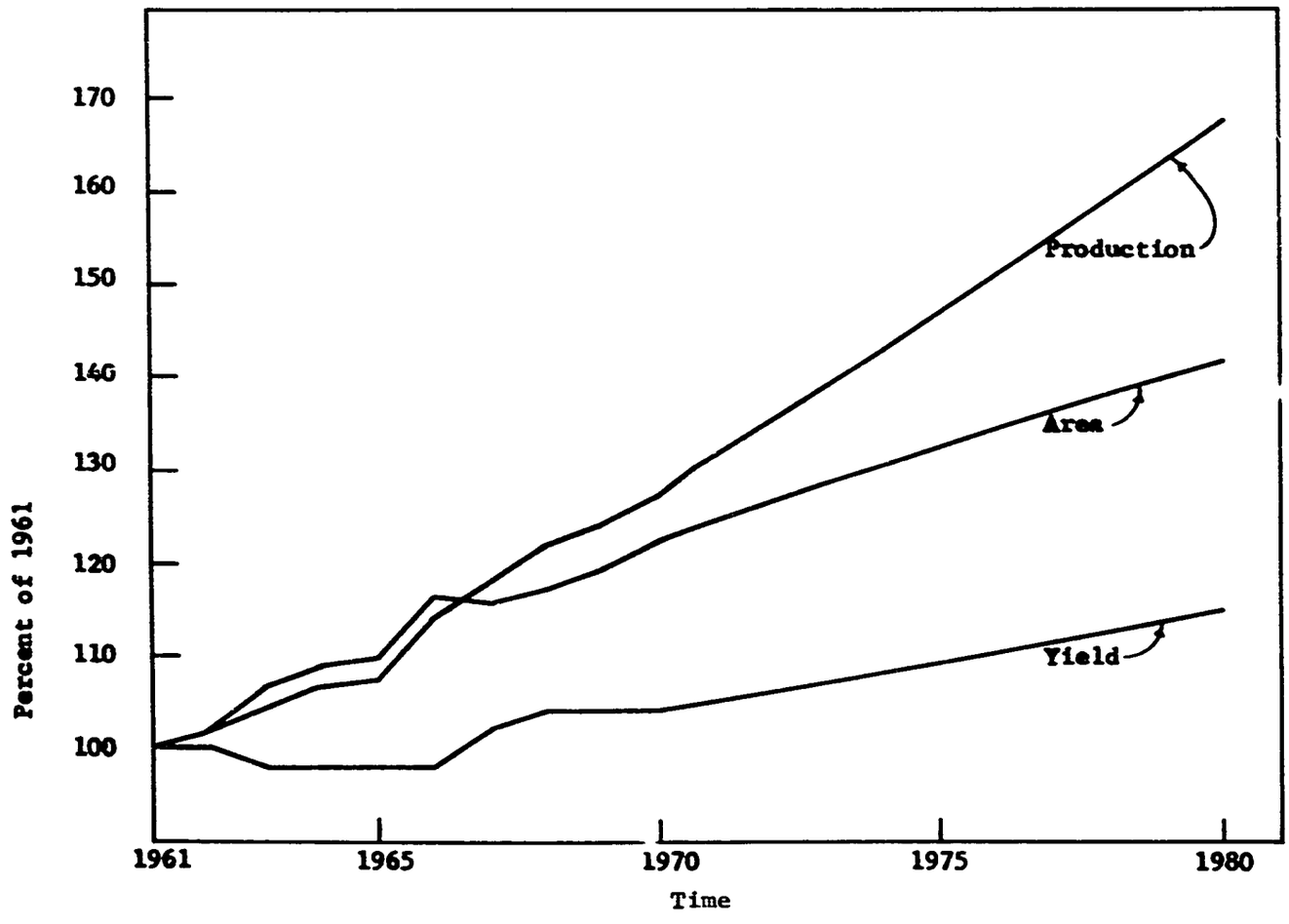

Fig. 3.3--Historical (1961 to 1970) and Projected Oilseeds Production Indices in Ethiopia, 1961 to 1980.

the provinces are clear from Appendix Tables A-1.7 and A-2.7. Area expansion is relatively significant in Begemder, Harar, Eritrea and Wollega while larger yield increases are expected in Shoa and Wollo. Yields in Bale and Illubabor are predominantly higher than in any other province, but their share in the total production will remain insignificant.

In summary, the analysis of production, area and yield trends for cereals, pulses and oilseeds discloses varying rates of increase among the different crops and large supply gaps among the different regions and provinces. The secular trend signifies relative high annual growth rates for sorghum and oilseeds (4 percent and 3 percent, respectively). Barley and corn are projected to increase at the same rate of 2.4 percent per annum while wheat and pulses show annual growth rates of 1.8 and 2.1 percent each. Teff production will grow at the low rate of 1.3 percent during the projection period.

Production distribution among the provinces will be more or less as in the previous decade, highly concentrated in the central and northern highlands. Arussi, Shoa, Gojam, Begemder and Wollo will be the major producers of all crops except corn, for which Wollega will continue to lead.

In the next chapter, results of demand projections for the products will be discussed. In the following chapter supply and demand will be related to determine the general food surplus-deficit situations in the individual provinces during the 1970's.

TABLE 3-8. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED PRODUCTION OF OILSEEDS BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNITS 100 METERIC TONS)

EXPONENT IS 1.20

PRODUCTION

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBA BOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1961	46	3	756	119	3	739	241	20	33	531	20	195	73	525	3295
1962	47	7	773	121	3	753	249	20	34	541	20	195	74	528	3355
1963	48	3	796	131	3	771	251	21	35	554	24	193	76	533	3437
1964	49	7	817	130	4	771	264	21	39	563	21	204	81	542	3518
1965	50	7	825	135	4	779	265	25	42	563	21	209	81	538	3536
1966	56	8	887	143	4	820	286	26	41	590	26	222	86	558	3756
1967	58	12	927	152	4	843	301	27	43	607	27	226	93	563	3906
1968	60	12	965	161	4	848	314	32	49	619	32	229	96	603	4019
1969	65	16	989	169	4	846	319	33	53	633	37	229	98	635	4087
1970	67	21	1027	172	4	846	327	38	54	649	38	230	113	608	4197
1971	70	21	1063	181	4	875	343	39	57	660	40	242	112	623	4322
1972	73	23	1102	189	4	886	356	41	61	674	43	247	118	633	4442
1973	77	26	1147	198	5	908	370	45	64	689	46	252	124	644	4574
1974	80	29	1186	207	5	910	384	48	68	703	49	258	130	654	4702
1975	84	32	1229	216	5	920	399	51	71	718	52	263	136	664	4832
1976	88	35	1272	225	5	929	413	54	75	731	56	269	142	674	4964
1977	92	39	1317	235	5	938	428	58	79	745	60	274	149	682	5091
1978	96	42	1365	245	5	947	444	62	84	759	64	279	156	692	5233
1979	100	46	1413	256	5	955	460	66	88	774	68	285	163	701	5372
1980	105	50	1460	266	6	960	476	70	92	786	72	290	170	708	5503
A	0.0135	0.0006	0.2272	0.0356	0.0010	0.2287	0.0726	0.0054	0.0099	0.1621	0.0054	0.0589	0.0213	0.1587	
B	0.0002	0.0002	0.0010	0.0003	0.0000	-0.0015	0.0004	0.0002	0.0002	-0.0005	0.0002	-0.0002	0.0003	-0.0008	
RSQ	0.8617	0.8537	0.9693	0.9258	0.0000	0.9270	0.9223	0.9054	0.7907	0.8925	0.7916	0.3546	0.7895	0.9621	

SOURCE:

ESTIMATED FROM NATIONAL PRODUCTION BASED ON W.ETCHSERGER'S STUDY, 1966, AND IMPORTANCE OF CROP, FARM TYPES ,IMPROVED PRACTICES AND GOVERNMENT PROGRAMS.

CHAPTER IV

DEMAND PROJECTIONS

The volume of demand for cereals, pulses and oilseeds in Ethiopia is projected under the basic assumption of 1970 constant prices to change according to the rate of increases in population, the rate of increase in per capita income and the income elasticities coefficients for each grain. So, the first step in projecting demand is the projection of population, for even if per capita income were to increase rapidly, population levels must be determined in order to multiply by per capita changes for projections of total demand. The existing low level of per capita consumption, especially in rural sectors, and the high income elasticities of demand for most of the food grains in Ethiopia would indicate a pronounced income effect on future levels of demand. However, the fact that the per capita income growth rate in the rural sector is low will mean slower demand growth than in the urban sector where the income growth rate is relatively high.

Population Projections

Table 4-1 shows the projected population by segments and for the total population of the country. The table contains separate projections so that the total columns presented are not the actual sums of the components. Simple addition reveals that from 1971 to 1980 the components do not sum up to the indicated total or grand total. For example, the

sums of total rural and total urban in 1975 and 1980 equal to 28.3 and 32.4 million each, rather than 27.8 and 30.6 million as shown in the last column. This clearly signifies the deviations between aggregate and components projections. The choice between the two results depends upon the quality of time series used in projecting the components. The individual rural segments and urban total population segment were selected as basis for the final projections of level of demand for all products in this study.

At a constant annual growth rate of about 2 percent, the total population of Ethiopia would reach 28.3 million in 1975 and 32.4 million in 1980. It is very interesting to see the variations between the growth rate of populations in different sectors. Total rural population shows a low annual rate of 1.4 percent while the total urban population is growing at a surprisingly high rate of 9.1 percent per annum. Relatively better standards of living, higher incomes, better medical facilities and services, and a high migration rate to the urban areas are some of the basic reasons for such a high rate of growth in the urban population. Similarly, the low rate of growth in rural areas can be explained by the poverty, absence of adequate medical facilities, migration to urban areas and other demographic factors.

Farm and non-farm populations are growing at almost the same rate of 1.4 percent per annum; this is understandable because of the comparable economic and social conditions in the two segments. The non-farm population is assumed to represent three percent of the total rural population as estimated by Eichberger for 1966. The non-farm population is defined as "consisting of merchants and service people in small villages and laborers who work on farms or in other pursuits." Since no

TABLE 4.1. ESTIMATED ANNUAL HISTORICAL(1961 TO 1970) AND PROJECTED RURAL AND URBAN POPULATION BY SECTOR IN ETHIOPIA,THROUGH 1980
(UNIT: 100 PERSONS)

LOGARITHM PROJECTION

	RURAL			URBAN			GRAND TOTAL
YEAR	FARM	NON FARM	TOTAL	-5000	+5000	TOTAL	
1961	194802	6035	200827	3184	7609	10793	211620
1962	197191	6099	203290	3461	8599	12060	215350
1963	199553	6172	205725	3702	9663	13365	219090
1964	202061	6249	208310	3945	10775	14720	223030
1965	204333	6303	210636	3951	11364	15315	225951
1966	206564	6387	212951	4289	12844	17133	230084
1967	210897	6523	217420	4904	14750	19254	236674
1968	214765	6644	221409	4492	15501	19993	241402
1969	217491	6728	224179	5150	17771	22927	247106
1970	221334	6856	228190	5302	19758	25060	253250
1971	223488	6916	230404	5565	21763	27195	256376
1972	226680	7016	233695	5873	24139	29786	261491
1973	229918	7117	237033	6193	26774	32622	266709
1974	233202	7220	240419	6533	29698	35729	272030
1975	236532	7324	243854	6891	32940	39132	277458
1976	239910	7429	247337	7270	36536	42859	282994
1977	243337	7536	250873	7669	40525	46940	288641
1978	246812	7645	254454	8090	44950	51411	294400
1979	250337	7755	258089	8534	49857	56307	300274
1980	253912	7867	261776	9002	55300	61670	306265
A	12.16	8.68	12.19	8.04	8.85	9.21	12.24
B	0.0142	0.0143	0.0142	0.0534	0.1036	0.0910	0.0198
RSQ	0.9438	0.9604	0.9313	0.9740	0.9959	0.9938	0.9557

SOURCE:

"STATISTICAL ABSTRACT",CENTRAL STATISTICAL OFFICE,ETHIOPIA,1965 TO 1970.
"DEMOGRAPHIC YEAR BOOK",UNITED NATIONS,1970: BREAKDOWN ESTIMAT.FOR 1965-1970

better estimate nor bases to modify this estimate could be found, this assumption was adopted for the projection to 1980. Farm and non-farm populations are projected to increase at almost the same rates, reaching 25.4 and 0.8 million, or a total rural population of 26.2 million in 1980. This represents an increase of 3.4 million or 14.7 percent over the 1970 level. The increase amounts to about 0.3 million more rural people every year during the 1970's.

Further analysis of the projections reveal an accelerating decline in the rural population relative to the urban population, a trend which usually accompanies the process of economic development. In 1961, 1965 and 1970, the percentages for the rural population were 94.9, 93.2 and 90.1. The percentage will continue to decline, reaching 86.2 in 1975 and 80.9 in 1980.

The dramatically high rate of growth of urban population may not be maintained, but indications are that it will be, at least to 1980. According to the trend projections, the total 1980 urban population in Ethiopia will reach 6.2 million, 146.1 percent above the 1970 level, slightly more than the percentage change from 1961 to 1970. Projections of the two components of urban population reveal large variations between big cities and small towns. These variations are probably explainable by the differences in economic and social variables. Populations in the small towns are growing at only about one-half the rate of growth in the cities and large towns (see Table 4.3).

In summary the total population of Ethiopia is expected to grow at a constant rate of about two percent per year over the projection period reaching about 28.3 million in 1975 and 32.4 million in 1980. The projections represent increases of 11.9 percent and 28.1 percent over

the 1970 level. The large gap between rates of growth in rural and urban sectors has important implications for the prospective demand for food grains, as is discussed below.

Despite the paucity of statistical data on population distribution by provinces, an attempt has been made to project provincial populations by prorating the projections for all-Ethiopia. Population projections by province will definitely promote knowledge of population growth rates and levels considered to be essential in determining the prospective demand for food. Regional distribution of the population is no less important than the aggregate rate of growth in affecting the demand for goods and services.

In Ethiopia, the pattern of population settlement in the various parts of the country has a long history and appears to have strong impact on the economic development of the Nation. Some provinces are densely populated while others are not. Some are rich in agricultural resources while others have scarce or poor resources due to soil depletion over the centuries. These are some of the basic factors creating imbalances in food production and consumption among the provinces.

Projected total populations for all fourteen provinces are shown in Table 4-2. It is clear from the table that Shoa has the largest population followed by Harar and Wollo. These three accounted for 44 percent of the total population during 1966 to 1970, and will account for 45 percent in 1975 and 46 percent in 1980. Among all provinces Shoa is projected to raise its share by about three percent from 1966 to 1980, a gain of about one percent every five years. In 1980, population distribution in the major provinces is projected to be:--Shoa, 19.7 percent; Harar, 13.4 percent; Wollo, 12.6 percent; Tigre, 9.3 percent;

TABLE 4.2. ESTIMATED ANNUAL HISTORICAL (1965 TO 1970) AND PROJECTED TOTAL POPULATION BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 100 PERSONS)

LOGARITHM PROJECTION

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
	PROVINCIAL TOTAL POPULATION														
1965	10695	1538	12983	15014	8092	15174	32228	6207	6577	36833	14653	22213	13705	30036	225944
1966	10885	1566	13213	15281	8236	15444	32802	6430	6693	37489	14913	22609	13949	30570	230073
1967	11108	1598	13484	15894	8405	15761	33416	6632	6884	39702	15219	23073	14299	31196	236660
1968	11320	1628	13740	16283	8565	16061	34111	6687	6961	40733	15508	23511	14505	31789	241388
1969	11537	1660	14004	16755	8730	16368	34738	6913	7122	42294	15806	23963	14817	32401	247105
1970	11783	1695	14298	17265	8914	16714	35462	7103	7278	43918	16138	24468	15135	33082	253236
1971	11881	1710	14420	17574	8990	16856	35759	7210	7346	45047	16276	24677	15271	33364	256373
1972	12072	1737	14651	18022	9135	17127	36328	7372	7470	46550	16537	25074	15523	33901	261494
1973	12265	1765	14885	18479	9282	17401	36903	7538	7595	48099	16801	25475	15778	34443	266705
1974	12461	1794	15123	18949	9431	17680	37488	7708	7723	49700	17070	25883	16038	34994	272032
1975	12659	1822	15363	19428	9581	17961	38077	7881	7852	51350	17341	26295	16300	35550	277454
1976	12860	1851	15607	19920	9733	18246	38676	8057	7983	53054	17617	26713	16566	36115	282994
1977	13064	1881	15854	20423	9888	18535	39283	8237	8116	54812	17896	27137	16836	36688	288645
1978	13271	1911	16104	20937	10045	18828	39897	8421	8251	56625	18178	27566	17109	37267	294405
1979	13479	1941	16357	21463	10203	19124	40518	8608	8387	58495	18464	28000	17386	37854	300275
1980	13691	1972	16614	22003	10364	19425	41149	8799	8526	60426	18754	28441	17667	38449	306272
A	-3.0460	-4.9853	-2.8521	-2.7189	-3.3250	-2.6962	-1.9429	-3.5901	-3.5323	-1.8313	-2.7311	-2.3151	-2.7980	-2.0134	
B	-0.0037	-0.0036	-0.0037	0.0056	-0.0036	-0.0037	-0.0038	0.0027	-0.0029	0.0132	-0.0037	-0.0036	-0.0032	-0.0037	
RSQ	1.0205	0.4042	0.8614	0.9316	0.7158	0.9581	0.9285	0.3395	0.5528	0.9544	0.9073	1.0152	0.8499	1.0950	

SOURCE:

"STATISTICAL ABSTRACT",CENTRAL STATISTICAL OFFICE,ETHIOPIA,1965 TO 1970.
PROVINCIAL DATA FOR 1961 TO 1964 ESTIMATED FROM TOTAL POPULATION SERIES.

Eritrea, 7.2 percent; Gojam, 6.3 percent; Sidamo and Wollega, 6 percent each. Others range from 0.6 percent in Bale to 5.4 percent in Begemder.

In spite of the large variation in population sizes among the provinces, rates of growth do not show large differences. Generally, all provinces except Shoa, Eritrea and Illubabor, have a lower growth rate than that indicated for the country as a whole. The values of B at the bottom of the Table 4.2 should be added or subtracted from all Ethiopia rate of growth of 1.98 percent shown in Table 4.1 to arrive at the provincial rates. For example, provincial B value of -0.0037 represents growth of 1.61 percent per year, constant over the projection period.

It is apparent from the table that population in Arussi, Bale, Begemdir, Gumu Goffa, Gojam, Harar, Sidamo, Tigre, Wollega and Wollo will be growing at about 1.6 percent per year, while Kaffa will have a rate of 1.7 percent. Shoa, Eritrea and Illubabor can be expected to increase at the rates of 3.3 percent, 2.6 percent and 2.3 percent, respectively. The growth rates of the total population in Shoa and Eritrea are strongly influenced by the rapid increase in urban populations, especially in Addis Ababa and Asmera. Reasons for the high rate in Illubabor are less obvious since it has no major cities, and actually is less urbanized than either Kaffa or Wollega, the two bordering provinces.

Population projections by sectors, rural and urban, reveal further differences among the provinces which will have an important bearing on the demand for food. The projected rural population distribution during 1970-1980 does not show much change from the distribution during 1961 to 1970. Small percentage gains of not more than 0.3 are registered for Shoa, Illubabor, Harar, Gojam and Bale, and losses of similar magnitudes are indicated in Eritrea, Sidamo and Wollega. The shares of total rural

population by province in Ethiopia are as follows: Harar, 14.8 percent; Shoa, 14.5 percent; Wollo, 13.9 percent; Tigre, 10.1 percent; Gojam, 7.1 percent; Sidamo, 6.4 percent; Wollega, 6.2 percent; Begemdir, 5.9 percent; Eritrea, 5.6 percent; Arussi, 4.9 percent; Gemu Goffa, 3.8 percent; Illubabor, 3.2 percent; Kaffa, 2.9 percent; and Bale, 0.7 percent. Table 4.3 shows the same distribution in absolute figures.

Unlike the growth in total population, the growth in rural population indicates large diversities among the provinces. Eight provinces show growth rates greater than the national average and the rest are growing at slower rates (see in Table 4.3). The lowest rate of rural growth is in Eritrea, about 0.9 percent per year compared to its overall growth rate of 2.6 percent. The highest rural growth rate is in Illubabor, about 2.2 percent per year.

Comparison of the projections in Appendix Tables B-1 and B-2, the rural farm and non-farm population reveals the existence of variation in growth rates of the two rural sectors. On the average non-farm populations are increasing at a faster rate. The difference is more magnified for Bale than for any other province.

A brief look at Table 4-4 reveals that Shoa and Eritrea together have more than half of the urban population in Ethiopia--for example, in 1966, 41 percent and 14 percent of the total, respectively. By 1980 these percentages are projected to increase to 51.3 percent for Shoa and 19.4 percent for Eritrea. The highest growth rates also are expected in these two provinces during 1970-80. The rate of urban population growth for Wollega appears to be highly exaggerated, probably due to some deficiency in the time-series used. For example, in 1975 Wollega had only one-third of Harar's urban population; by 1980 it shows a larger urban population

TABLE 4.3. ESTIMATED ANNUAL HISTORICAL (1965 TO 1970) AND PROJECTED TOTAL RURAL POPULATION BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 10 PERSONS)

LOGARITHM PROJECTION

RURAL POPULATION

YEAR	ARUSSI	BALE	BORENDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO	TOTAL
1965	103898	15488	124401	130524	78996	145044	308598	59846	61048	301132	139733	[illegible]	133359	[illegible]	[illegible]
1966	104729	13699	125147	129677	80152	147515	313423	61824	61964	[illegible]	[illegible]	[illegible]	134756	[illegible]	[illegible]
1967	106343	13790	127750	133410	81850	150530	318520	63730	63510	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1968	108770	14240	[illegible]	134920	83400	153490	[illegible]	64230	64170	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1969	110193	14450	131530	135210	84600	[illegible]	329840	66160	[illegible]	[illegible]	147060	[illegible]	141450	[illegible]	2241776
1970	112079	14730	133719	136819	86250	156989	335998	67650	66420	327756	149149	230899	143629	317419	2281892
1971	113095	14892	134843	137360	87192	160853	339493	68931	67059	331215	[illegible]	233101	144932	[illegible]	[illegible]
1972	114535	15125	136597	139508	88556	163477	344594	70590	68072	[illegible]	152278	[illegible]	[illegible]	[illegible]	[illegible]
1973	116196	15362	138372	139665	89540	166143	349771	72102	69049	[illegible]	154112	237717	[illegible]	[illegible]	[illegible]
1974	117777	15603	140171	140831	91346	168851	355023	73658	70080	[illegible]	155767	240036	153533	334777	2404183
1975	119380	15847	141992	142007	92773	171604	360354	75309	71106	351670	157344	246521	152481	[illegible]	2426534
1976	121003	16095	143836	143150	94222	174400	365761	76964	72147	[illegible]	[illegible]	249592	154456	[illegible]	2473364
1977	122649	16347	145703	144384	95693	177240	371248	[illegible]	73202	[illegible]	161663	253510	[illegible]	[illegible]	[illegible]
1978	124314	16602	147594	145587	97187	180127	376816	80365	74272	367831	163607	257077	158474	354618	2544535
1979	126003	16862	149509	146799	98703	183059	382465	82151	75358	373376	165572	260693	160522	359819	2560885
1980	127714	17125	151448	148020	100243	186038	388199	83956	76459	[illegible]	167561	264359	[illegible]	365043	2617755
A	-3.0097	-5.0513	-2.8296	-2.7789	-3.2838	-2.6760	-1.9202	-3.5611	-3.5391	-1.9454	-2.7134	-2.2898	-2.7578	-1.9743	
B	-0.0006	0.0014	-0.0012	-0.0058	0.0014	0.0020	0.0008	0.0076	0.0004	0.0008	-0.0022	-0.0002	-0.0013	0.0003	
RSQ	-0.0001	0.1373	0.5877	0.8318	0.2340	0.7795	0.6494	0.7370	0.0121	0.7936	0.7929	-0.0298	0.3809	-0.0955	

SOURCE:

HISTORICAL DATA BASED ON RURAL POPULATION SERIES FROM ETHIOPIA STATISTICAL ABSTRACT 1965 TO 1970;AND ESTIMATIONS FOR 1961 TO 1964 FROM TOTAL POPULATION

TABLE 4.4. ESTIMATED ANNUAL HISTORICAL (1968 TO 1970) AND PROJECTED TOTAL URBAN POPULATION BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 10 PERSONS)

LOGARITHM PROJECTION

URBAN POPULATION

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GAMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO	[illegible]
1965	3142	1875	5498	19134	1993	6774	13852	2268	4712	66445	6962	8865	3819	8011	153142
1966	4092	1975	6964	23229	2177	6893	14512	2459	4968	70120	8979	10551	4466	9725	171323
1967	4140	2000	7049	26547	2270	6979	15249	2530	5323	[illegible]	9009	10[illegible]	5469	[illegible]	[illegible]
1968	4230	2040	7190	27900	2290	7100	15600	[illegible]	5440	[illegible]	[illegible]	10[illegible]	[illegible]	[illegible]	[illegible]
1969	5050	2190	8460	33250	2690	7490	16760	2920	5940	[illegible]	11510	12220	6750	11390	[illegible]
1970	5442	2210	9200	37530	2740	7490	17310	2890	6090	115270	11920	12930	7520	12070	250586
1971	5909	2253	9845	41964	2859	7545	17743	2981	6312	126765	12434	13553	8429	12746	271542
1972	6452	2307	10693	47281	3022	7643	18433	3095	6582	14[illegible]	14121	14414	[illegible]	13[illegible]	297854
1973	7039	2360	11582	53227	3190	7735	19091	3210	6858	156105	15404	15250	10695	14474	326213
1974	7674	2413	12548	59875	3366	7822	19751	3326	7140	173724	16790	16133	12132	15394	357284
1975	8360	2465	13594	67302	3548	7904	20419	3445	7429	191633	[illegible]	17055	13529	[illegible]	39[illegible]
1976	9111	2517	14694	75636	3749	7981	21095	3565	7723	21[illegible]	[illegible]	18317	15173	[illegible]	42[illegible]
1977	9900	2568	15[illegible]4	84951	3974	8053	21777	3686	8024	234[illegible]	21[illegible]	19[illegible]	17[illegible]	[illegible]	47[illegible]
1978	10762	2618	17159	95177	4149	8120	22467	3809	8330	25[illegible]41	23530	20064	19141	19554	514[illegible]
1979	11692	2667	18524	106690	4351	8183	23163	3934	8643	2[illegible]8331	25558	21152	21460	20724	563[illegible]62
1980	12694	2715	19986	119502	4572	8241	23966	4060	8962	31[illegible]59	27744	22[illegible]	24545	21950	614693
A	-3.8295	-4.3444	-3.2749	-2.0885	-4.3255	-3.0588	-2.3[illegible]	-4.1590	-3.4415	-0.8794	-3.0448	-2.7962	-3.6949	-2.8860	
B	0.0007	-0.0035	-0.0056	0.0320	-0.0321	-0.0745	-0.0516	-0.0400	-0.0453	0.0172	0.0[illegible]5	-0.0293	0.0322	-0.0240	
RSQ	0.0006	0.9764	0.0507	0.9260	0.745[illegible]	0.9782	0.9845	0.9750	0.9837	0.8[illegible]57	0.[illegible]4	0.7650	0.9471	0.4202	

SOURCE:

HISTORICAL DATA BASED ON RURAL POPULATION SERIES FROM ETHIOPIA STATISTICAL ABSTRACT 1965 TO 1970; AND ESTIMATIONS FOR 1961 TO 1964 FROM TOTAL POPULATION

than Harar. This is highly improbable under the past and present pace of economic development and urbanization in Wollega.

The breakdown of the urban population into those in towns and villages with less than 5,000 people and into those in big towns and cities is provided in Appendix Tables B-3 and B-4. The results in these tables were not used in this study but simply included to show the differences in population gorwth rates between large cities and smaller towns. Such information could be used in determining population effects on demand for food products if separate information on income and income elasticities were available for the two segments.

The population projections also show the distribution between rural and urban areas within individual provinces. It has been already indicated that for the entire country urban population will move up from 7.5 percent in 1966 to 19 percent of the total population in 1980. Because of the relatively higher per capita consumption in urban areas, the increasing proportion of the population in urban areas obviously will accelerate the growth in the aggregate demand for cereals, pulses and oilseeds. Percentages of urban population (of total population) in 1966 and 1980 in each province are as follows:

	Arussi	Bale	Begemdir	Eritrea	Gemu Goffa	Gojam	Harar
1966	3.8	12.6	5.3	15.2	2.6	4.5	4.4
1980	9.0	13.7	11.7	44.7	4.4	4.2	5.8

	Illubabor	Kaffa	Shoa	Sidamo	Tigre	Wollega	Wollo
1966	3.8	7.4	18.7	6.2	4.7	3.3	3.2
1980	4.6	10.5	45.5	14.2	7.8	12.9	5.7

According to the assumptions of the trend projection then, these changes are expectable up to 1980, even though it will be difficult to achieve the large and rapid changes indicated in some provinces, e.g., Wollega, Sidamo and Begemdir. In Shoa and Eritrea, where industralization and urbanization are the highest in the country, large percentages of the total population will live in urban areas by 1980. The figures may look huge and unattainable within a short span of time, but during rapid economic development and industralization of a country, fast population growth is an inherent characteristic.

Per Capita Demand Projections

The per capita demand for cereals, pulses and oilseeds is projected in this study on the basis of the estimated rates of increase in per capita incomes and the corresponding income elasticity of demand. Both coefficients are assumed to remain constant over the period 1966 to 1980. The estimates of per capita demand were derived separately for rural farm, rural non-farm, and urban sectors, using their respective rates growth in per capita income. Due to lack of separate estimates of income elasticities, the same elasticity coefficients were applied in arriving at the projected per capita demand in rural and urban sectors. Normally, the income elasticities are lower in urban than in rural sectors as far as demand for food grains is concerned; however, in the absence of separate coefficients, it is believed that use of the same elasticity value will not cause excessive distortion of the results.

Rates of income growth for the different sectors are presented in Chapter 2. The income elasticities used in this study are the same with the ones used by the United Nations in projections of world agricultural

commodities for 1970-1980 for Ethiopia as shown in Table 1.5.

The per capita consumption in the base year as estimated from the production level of that year appears in tables of per capita demand for each province by sectors. As already mentioned in Chapter 2, per capita consumption of agricultural products in Ethiopia has been estimated by Eichberger using production estimates for 1966 which are different from those presented in this study. This necessitated estimations of completely new per capita consumption from the production of 1966--utilizing the projected seeding rates, wastages and extraction rates (see Table 2.1) and actual net trade, i.e., international and interprovincial trade. The per capita consumption of the various products in the base year and during the projection period for rural and urban areas by province are presented in Appendix Tables B-5.1 to B-7.7. Since this study is primarily concerned with gross supply and demand, the estimated net per capita consumption of each product was converted into grain equivalent by multiplying times the reciprocal of the extraction rates, as presented in Appendix Tables B-5.1.1 to B-7.7.7.

The per capita demand for base year and projection years for all Ethiopia is shown in Table 4.5. The 1966 per capita demand was calculated on basis of the same procedure used for the provinces, the results were checked for congruency with the weighted averages of the provincial per capita demands. However, the projected quantities for 1970, 1975, and 1980 were calculated from the provincial projections simply by dividing the aggregate demand into total population for each sector.

The per capita demand for all cereals can be determined by summing the individual weighted average demands for the individual cereal grains. The all cereals demand is projected to increase from 174.9 kilograms per

TABLE [illegible]: ESTIMATED TOTAL AND PER CAPITA [illegible]
[illegible]
[illegible]
(GRAMS/PERSON/YEAR)

PRODUCT	YEAR	RURAL	[illegible]	[illegible]	[illegible]	[illegible]
BARLEY	1966	83.76	85.59	85.62	81.81	81.62
	1970	81.13	[illegible]	81.53	[illegible]	[illegible]
	1975	81.61	87.70	84.80	[illegible]	[illegible]
	1980	[illegible]	90.21	[illegible]	83.16	[illegible]
CORN	1966	29.95	32.38	30.16	31.53	30.77
	1970	30.10	36.[illegible]	[illegible]	34.70	31.51
	1975	33.45	37.[illegible]	[illegible]	36.88	33.86
	1980	33.73	39.35	[illegible]	34.[illegible]	34.90
SORGHUM	1966	39.35	45.16	[illegible]	38.93	35.60
	1970	35.64	44.64	[illegible]	[illegible]	33.11
	1975	39.53	45.71	[illegible]	36.[illegible]	31.06
	1980	40.30	42.60	40.[illegible]	30.[illegible]	32.51
TEFF	1966	37.76	44.54	37.[illegible]	55.32	39.37
	1970	36.07	45.[illegible]	[illegible]	[illegible]	40.66
	1975	38.40	46.15	[illegible]	[illegible]	42.96
	1980	38.65	47.06	39.13	77.45	46.41
WHEAT	1966	21.68	25.32	21.79	45.11	23.53
	1970	21.45	26.63	22.11	58.63	[illegible]
	1975	22.39	26.94	[illegible]	71.[illegible]	24.20
	1980	22.78	27.83	[illegible]	80.15	31.85
PULSES	1966	17.98	20.64	18.06	24.54	18.58
	1970	18.17	21.03	18.26	26.10	19.23
	1975	18.42	21.59	18.51	[illegible]	20.41
	1980	18.66	22.14	18.77	30.[illegible]	21.22
OILSEEDS	1966	9.51	10.39	9.53	12.04	9.72
	1970	9.62	10.64	9.65	[illegible]	10.06
	1975	9.77	10.96	9.81	16.23	10.70
	1980	9.92	11.33	9.96	19.19	11.72

SOURCE: CALCULATED FROM PROJECTED PROVINCIAL PER CAPITA DEMAND.
NOTE: PER CAPITA DEMAND WAS ESTIMATED BY ADDING TO [illegible] 30 AND 50 OF THE AVAILABLE SUPPLIES WERE ASSUMED IN RURAL, NON-RURAL, AND URBAN SECTORS, RESPECTIVELY.

annum in 1966 to 207.7 kilograms by 1980, an increase of about 18.7 percent over a period of 15 years. Among the cereals, wheat will have greatest demand increase--about 52 percent over the 15 years from 1966 to 1980. As clearly seen in Table 4.5, much of the increase arises in urban areas where the high rate of growth in per capita income (5.4 percent per year) is combined with a high income elasticity of demand (0.70). The projected per capita demand for wheat in urban areas will reach an unprecedented level of about 80 kilograms--some 78 percent above the base year level. Such high level of demand may not be generated in reality because of the high income elasticity may not hold when per capita incomes reach the higher levels. Consumers shift from inferior to superior cereals and from food grains to non-cereal foods as a result of increase in incomes. The degree of such shifts and their influence on total food demand will depend mainly upon the relative importance of various socio-economic groups, relative income levels, and income elasticities of demand for the different types of food. Under these circumstances, materialization of the projected level of demand for wheat appears improbable, and most probably nutritionally undesirable. An important point to have in mind is that in projections, the direction and relative magnitude of changes are more useful and more meaningful than the actual numerical results.

The per capita demand for all products in urban areas is expected to be higher than in rural areas; within the rural sectors the non-farm demand appears to increase more rapidly than the farm demand. The gaps in per capita demand among the three sectors will grow larger and larger, primarily due to the differences in the base year per capita consumption levels and rates of growth in per capita incomes. The widening gap will

be more pronounced between the rural and urban areas than within the rural sectors. Careful inspection of the absolute levels given in Table 4-5 reveals the differential rates of increase in demand among the sectors.

Figure 4-1 shows graphically the projected per capita demand for all products. The absolute levels and the rates of increase can be visualized from the graph. Per capita demand for barley is highest until around 1979, but teff demand is higher from then on because of relatively higher rate of growth in teff demand arising in the urban sector. Although the base per capita demand for sorghum is high, its rate of growth is relatively gradual. Although not as sharply increasing as for wheat, per capita demand for pulses and oilseeds is indicated to increase at higher rates than shown for cereals other than wheat.

The results derived in this study are comparable to previous per capita projections, such as those made by FAO of United Nations. The results of the FAO projections are shown in Table 1.6, page 23. The indicated per capita demand for each commodity in Table 4.5 should be converted into the corresponding net consumption (by multiplying by the extraction rates given in Table 2.1) prior to any comparison. Though the two projections are on the average within the same range, the rates of growth in this study are higher. The differences arise mainly from the variation in the projection models and rate of growth in per capita consumption employed in the two studies.

Estimated per capita consumption in the base year, 1966, and projected per capita demand for cereals, pulses and oilseeds during 1970, 1975 and 1980, are shown by provinces in Table 4.6. The projections are based on the assumption of uniform per capita incomes in corresponding sectors and uniform income elasticities of demand for all provinces.

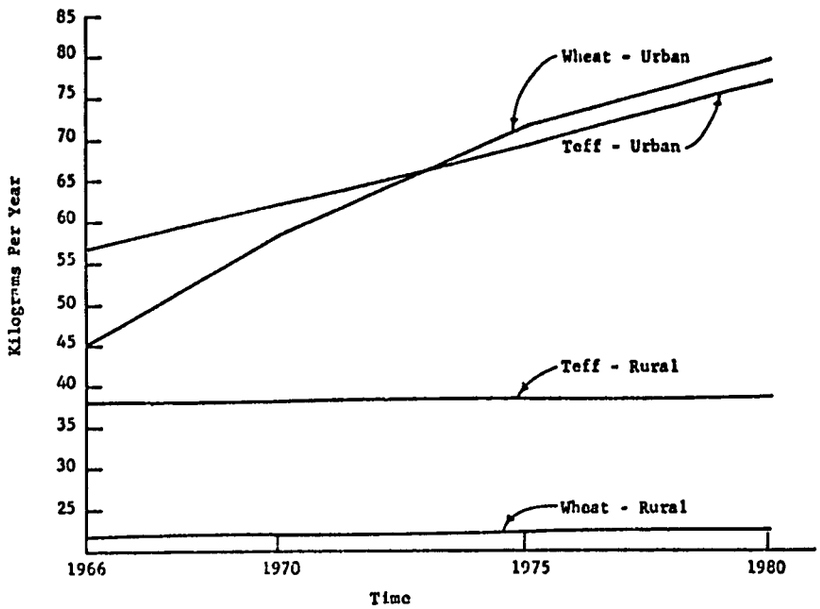

Fig. 4.1b--Per Capita Demand for Teff and Wheat in Rural and Urban Areas in Ethiopia, 1966 to 1980.

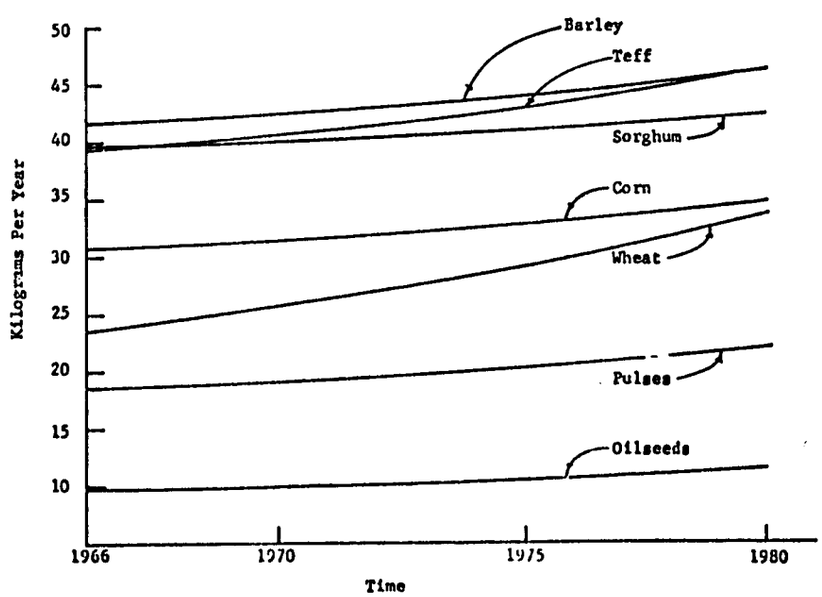

Fig. 4.1a--Estimated and Projected Per Capita Demand for Cereals, Pulses and Oilseeds in Ethiopia, 1966 to 1980.

TABLE 4-6. ESTIMATED (1966) AND PROJECTED PER CAPITA DEMAND FOR CEREALS, PULSES AND OILSEEDS BY SECTORS AND PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS/YEAR)

		PROVINCIAL													
PRODUCT	SECTOR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
BARLEY	RURAL	12681	6225	7117	1521	2716	9831	1941	2866	2569	4299	925	2112	2445	4642
		12786	6287	7176	1534	2738	9913	1957	2889	2590	4325	932	2130	2465	4681
		12918	6358	7250	1549	2767	10016	1977	2920	2618	4380	942	2152	2491	4730
		13052	6430	7325	1565	2796	10120	1998	2950	2645	4428	952	2174	2517	4779
	URBAN	18463	7610	9631	1860	4809	12951	2971	4030	3571	5131	1260	3251	3731	6971
		20113	8290	10490	2026	5241	14107	3236	4389	3890	5589	1372	3541	4031	7593
		22377	9225	11673	2254	5831	15697	3501	4885	4328	6219	1527	3940	4485	8449
		24901	10265	12990	2509	6490	17468	4007	5436	4816	6920	1699	4384	4991	9402
	TOTAL	12898	6386	7250	1571	2768	9965	1985	2908	2645	4457	945	2167	2488	4794
		13090	6549	7386	1657	2816	10063	2011	2942	2693	4702	967	2195	2537	4767
		13535	6717	7636	1777	2876	10267	2064	3009	2776	5028	1005	2269	2650	4902
		14123	6956	7986	1988	2958	10433	2114	3068	2868	5559	1060	2344	2834	5037
CORN	RURAL	2325	1316	2686	3040	5689	1579	2558	3515	4377	3058	6433	3112	3415	1631
		2344	1329	2709	3065	5736	1592	2579	3545	4414	3083	6487	3137	3444	1645
		2368	1344	2737	3096	5797	1608	2606	3582	4460	3115	6554	3170	3480	1662
		2393	1359	2765	3128	5857	1625	2634	3619	4507	3148	6623	3203	3516	1680
	URBAN	3800	1620	3520	3600	9182	1970	3480	4449	4750	3560	8480	4491	3802	2450
		4140	1765	3834	3921	10000	2147	3791	4847	5174	3878	9237	4892	4108	2669
		4606	1963	4267	4364	11127	2389	4218	5393	5759	4315	10278	5443	4571	2970
		5125	2184	4748	4856	12382	2657	4694	6002	6407	4802	11438	6057	5086	3305
	TOTAL	2379	1341	2732	3128	5780	1593	2597	3546	4408	3156	6558	3176	3427	1687
		2419	1357	2777	3284	5856	1609	2628	3576	4466	3320	6686	3221	3469	1675
		2513	1420	2873	3502	5990	1643	2692	3657	4584	3538	6944	3316	3566	1722
		2642	1462	2998	3898	6144	1668	2752	3727	4706	3900	7307	3426	3718	1771

SOURCE: CALCULATED FROM APPENDIX TABLES.
NOTE: WITHIN EACH SET FIGURES SHOWN ARE FOR 1966, 1970, 1975 AND 1980, RESPECTIVELY.

TABLE 4-6 (CONTINUED)

PRODUCT	SECTOR	PROVINCIAL													
		ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
	RURAL	521	1225	5703	5932	2920	5126	6299	2335	2827	2163	2653	3557	4118	4120
		526	1238	5750	5981	2944	5168	6351	2354	2851	2181	2675	3586	4153	4154
		531	1251	5809	6041	2975	5222	6417	2379	2881	2203	2703	3623	4196	4197
		537	1265	5869	6103	3006	5277	6484	2403	2911	2226	2731	3661	4240	4241
SORGHUM	URBAN	850	1489	5994	5406	4768	6380	7421	2656	3060	2521	3601	5050	4596	6180
		926	1624	6528	5888	5131	6949	8083	2892	3333	2745	3921	5501	4967	6732
		1030	1805	7264	6552	5710	7733	8995	3219	3710	3055	4364	6121	5528	7490
		1146	2011	8084	7291	6354	8605	10009	3584	4127	3400	4855	6811	6151	8335
	TOTAL	533	1277	5714	5857	2963	5180	6347	2348	2839	2233	2709	3627	4129	4255
		543	1298	5798	6018	3007	5229	6412	2365	2885	2348	2764	3674	4189	4232
		564	1311	5939	6206	3073	5331	6555	2413	2954	2503	2873	3786	4307	4348
		591	1361	6125	6634	3148	5420	6688	2454	3044	2759	3031	3907	4485	4469
	RURAL	3602	3341	5212	3363	3022	5090	1886	2970	3362	5269	3372	3508	3404	4402
		3632	3375	5256	3391	3046	5131	1902	2995	3390	5312	3400	3537	3432	4438
		3669	3413	5310	3425	3078	5184	1923	3026	3426	5367	3436	3573	3468	4484
		3707	3452	5365	3461	3110	5238	1944	3058	3462	5423	3472	3611	3504	4531
TEFF	URBAN	5980	5028	7121	4121	5852	7122	2880	3961	4811	6460	5009	5810	5525	7351
		6513	5480	7757	4488	6372	7757	3137	4313	5240	7037	5457	6328	5968	8007
		7248	6097	8631	4994	7091	8632	3490	4801	5830	7830	6072	7042	6642	8910
		8065	6785	9604	5558	7892	9606	3884	5342	6487	8713	6757	7836	7391	9914
	TOTAL	3693	3576	5313	3481	3096	5180	1930	3002	3466	5495	3473	3614	3470	4571
		3752	3658	5413	3661	3141	5229	1954	3041	3531	5811	3551	3674	3555	4549
		3906	3768	5599	3932	3229	5337	2006	3098	3654	6236	3707	3798	3729	4688
		4102	3931	5856	4396	3320	5425	2056	3159	3781	6919	3937	3939	4008	4833

SOURCE: CALCULATED FROM APPENDIX TABLES.
NOTE: WITHIN EACH SET FIGURES SHOWN ARE FOR 1966, 1970, 1975 AND 1980, RESPECTIVELY.

TABLE 4-6 (CONTINUED)

PRODUCT	SECTOR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
		PROVINCIAL													
	RURAL	5420	4350	2178	2326	474	2666	1689	942	1780	3860	639	2679	0	1572
		5499	4421	2209	2360	481	2705	1714	956	1806	3916	648	2716	0	1595
		5598	4506	2250	2403	490	2755	1745	973	1839	3988	660	2767	0	1624
		5700	4593	2291	2447	499	2805	1777	991	1873	4061	672	2818	0	1654
WHEAT	URBAN	8856	5322	3403	4607	1837	3641	3605	1785	2746	5599	1664	4760	2091	3053
		10272	6172	3949	5343	2131	4224	4182	2069	3184	6494	1930	5521	2406	3542
		12366	7432	4753	6433	2565	5085	5035	2491	3834	7818	2323	6647	2895	4263
		14887	8947	5723	7744	3088	6122	6061	3000	4615	9412	2797	8002	3486	5133
	TOTAL	5548	4474	2242	2675	510	2709	1773	974	1852	4188	701	2776	70	1647
		5706	4647	2320	3032	531	2763	1828	997	1915	4627	742	2857	120	1660
		6041	4900	2468	3699	566	2857	1921	1040	2028	5339	833	3018	236	1746
		6531	5189	2691	4813	612	2946	2025	1084	2161	6494	974	3221	449	1850
	RURAL	1185	1910	2349	1519	902	2349	2028	1105	902	2798	740	1786	1095	1816
		1198	1932	2373	1535	911	2373	2049	1116	911	2827	747	1805	1107	1835
		1214	1959	2404	1554	923	2404	2076	1131	923	2863	757	1828	1121	1859
		1230	1987	2435	1575	935	2435	2103	1145	935	2900	767	1852	1136	1883
PULSES	URBAN	2493	2476	2723	1946	1176	2723	2818	1545	1165	3053	1003	2120	1532	2426
		2774	2751	3028	2165	1310	3028	3135	1722	1296	3396	1117	2359	1690	2698
		3169	3144	3460	2473	1494	3460	3581	1965	1481	3880	1275	2695	1931	3083
		3621	3591	3953	2826	1708	3953	4092	2246	1692	4433	1457	3079	2206	3523
	TOTAL	1231	1980	2369	1584	911	2363	2064	1120	926	2849	758	1800	1111	1866
		1265	2065	2413	1685	920	2393	2095	1140	934	3001	775	1827	1136	1859
		1339	2130	2494	1849	945	2451	2156	1168	980	3221	812	1886	1187	1916
		1446	2218	2613	2134	973	2502	2218	1193	1018	3597	865	1947	1275	1975

SOURCE: CALCULATED FROM APPENDIX TABLES.
NOTE: WITHIN EACH SET FIGURES SHOWN ARE FOR 1966, 1970, 1975 AND 1980, RESPECTIVELY.

CALCULATED FROM APPENDIX B TABLES.

TABLE 4-6 (CONTINUED)

PRODUCT	SECTOR	PROVINCIAL													
		AKUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
	RURAL	693	890	943	1024	824	943	1021	885	924	1211	545	909	965	967
		701	902	955	1037	834	955	1034	896	935	1226	551	920	977	979
		712	918	970	1053	846	970	1050	910	950	1245	560	934	992	994
		723	932	985	1070	861	985	1066	924	965	1264	569	949	1008	1010
		1	1	1	1	1	1	1	1	1	1	1	1	1	1
OILSEEDS	URBAN	1000	1038	1166	1270	1038	1166	1167	1240	1200	1300	790	1090	1095	1167
		1136	1181	1325	1443	1182	1326	1325	1410	1363	1477	898	1238	1234	1326
		1333	1387	1555	1692	1387	1555	1554	1652	1599	1732	1053	1452	1448	1554
		1563	1624	1823	1985	1625	1823	1823	1938	1876	2031	1235	1703	1698	1823
		1	1	1	1	1	1	1	1	1	1	1	1	1	1
	TOTAL	707	894	954	1060	826	952	1027	902	941	1230	557	916	968	988
		722	944	979	1135	841	969	1043	915	962	1302	576	932	991	988
		752	983	1022	1257	872	997	1077	940	1006	1417	613	967	1030	1020
		798	1008	1085	1480	897	1019	1109	966	1065	1613	666	1008	1098	1056

SOURCE: CALCULATED FROM APPENDIX TABLES.
NOTE: WITHIN EACH SET FIGURES SHOWN ARE FOR 1966, 1970, 1975 AND 1980, RESPECTIVELY.

Since the base year per capita consumption is founded on provincial estimated production and roughly estimated interprovincial commodity import and export, the results contained herein should be considered as rough indicators rather than final figures.

Because of production disparity and differences in culture and food habits, consumption of cereals, pulses and oilseeds vary considerably among regions and provinces in Ethiopia. In a subsistence economy, especially in rural sector, people tend to consume more of products grown locally and less of those imported from other areas or provinces because of transport limitations and cultural factors. As a consequence, large differences in per capita demand for specific products exists among the provinces. This condition is expected to narrow with more monetization of the economy and better interprovincial communication as development of the country progresses.

Per capita demand for cereals other than wheat in each province is projected at annual rates of 0.2 percent for rural farm, 0.4 percent for rural non-farm and 2.2 percent for the urban sector. Wheat has the highest income elasticity (0.70), and the demand is projected to increase at the rate of 0.35 percent for rural farm, 0.70 percent for rural non-farm, and 3.78 percent for urban areas. Pulses and oilseeds with income elasticities of 0.50 and 0.60 will enjoy demand growth at higher rates than that for most cereals (see Appendix B- Tables). The average percentage increases in per capita demand from 1966 to 1980 in all provinces, both in rural and urban, is as follows:

	Barley	Corn	Sorghum	Teff	Wheat	Pulses	Oilseeds
Rural	3.4	2.7	2.7	3.0	5.3	3.9	4.5
Urban	25.6	34.0	24.2	36.3	77.4	47.9	59.4

In spite of equal rates of increases in all provinces over the projection period, the absolute level of per capita demand shows large differences among the provinces because of average per capita consumption levels for the base year, 1966. As a result, the increases in absolute terms will be much greater in those provinces for which the per capita demand is higher in the base year, so that the differences among the provinces will widen through time.

Aggregate Demand

The demand projections at the aggregate level are computed as products of the projected population and per capita demand for the individual crops. Aggregate demand in rural farm, rural non-farm and urban sectors were projected separately by provinces, and the final results were summed to obtain the provincial total demand for each crop as presented in Tables 4.7 to 4.13. The aggregate demand for all Ethiopia appears under the last column "Total," in all tables of projected total demand for the provinces.

The demand projections indicate an aggregate increase of 67 percent between 1966 and 1980 for the cereals--barley, corn, sorghum, teff and wheat. The demand for the cereals as a group will rise to 6.7 million tons in 1980 from 4 million tons in 1966. Over the same period the demand for barley will increase by 56 percent, that for corn by 60 percent, that for sorghum by 51 percent, that for teff by 66 percent and that for wheat by 100 percent. Projections of pulses and oilseeds indicate demand increases of 68 percent and 70 percent, or absolute increments of about 291 thousand tons and 146 thousand tons, grain equivalent, respectively.

Figure 4.2 illustrates visually the increasing trend in aggregate

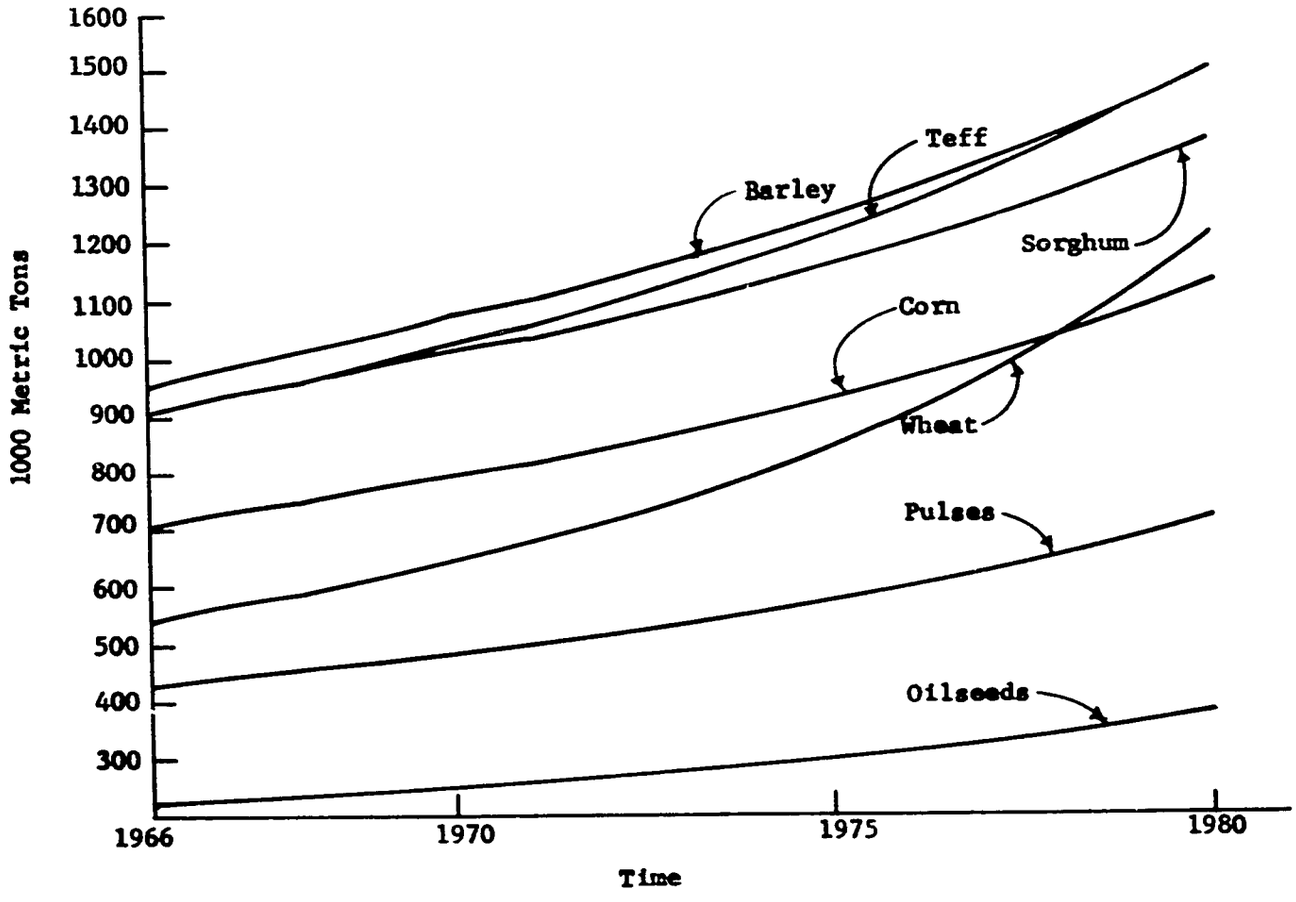

Fig. 4.2--Estimated and Projected Aggregate Demand for Cereals, Pulses and Oilseeds in Ethiopia, 1966 to 1980.

demand for each crop. Each curve rises at a rate determined by population and income growth rates, and by the income elasticity of demand for the crop. The curve representing demand for wheat shows a sharp rise due to strong income effects especially in the urban sector where 45 percent of the total demand will be generated. An important point to remember here is that population affects the demand for all products equally, and that the population effect represents the dominant variable in Ethiopia throughout the projection period.

The strength of income effect on the demand for the individual crops depends upon the corresponding income elasticity. High income elasticities, as in case of wheat, accelerate increases in demand while low elasticity result in the demand growing at a lower rate, as is true for barley, corn, sorghum and teff. Combinations of high per capita income growth rates and high income elasticities result in large increases in per capita demand. This case is illustrated by the per capita projections of wheat demand in the urban sector.

Before getting to the discussion of the findings by crop it is worthwhile to briefly explain the method of determining the population effect and the income effect in changing the aggregate demand for a product. According to our assumption, change in demand is a function of change in population and change in per capita income. Then we can express rate of change in demand as:

$$D = p + gn$$

where D = rate of change in aggregate demand

p = rate of population growth

g = rate of change in per capita income

n = income elasticity of demand

The effects of population and income are additive. Absolute change in aggregate demand can be determined by this simple equation:

$$\Delta D = PD_{t-1} + gnD_{t-1}, \text{ or}$$

$$\Delta D = D_{t-1}(P + gn)$$

When Δ = change

t = time or year, and the other variables are defined as above.

Using this equation, one can also easily calculate the share or percentage of the increase or decrease in aggregate demand for a product can be attributed to change in population and that which can be attributed to change in per capita income. The interested reader may do the calculation himself, using the revelant growth coefficients provided in the accompanying tables on population, per capita demand and total demand.

With regard to rural and urban demand, the projections show an appreciable gain for the urban sector in the share of aggregate total demand for cereals, pulses and oilseeds. From the base period share of 8 to 9 percent, the urban population by 1980 will demand 26 percent of the barley, 28 percent of the corn, 23 percent of the sorghum, 32 percent of the teff, 45 percent of the wheat, 32 percent of the pulses and 31 percent of the oilseeds in Ethiopia. The share of the total demand represented by the rural non-farm population remains almost constant at an average of 2.8 percent, a very small decline from its share in the base year. Demand in the rural farm population will decline from 88 percent of the available supply in 1966 to only 70 percent of the projected total demand in 1980.

The projected overall secular trend of aggregate demand for all commodities is dominated by the rapid growth in urban demand, basically arising from urban population growth at the rate of 9.1 percent per year

and an urban income effect ranging between 2.0 percent and 4.0 percent per year. This means that demand for the consumer products in urban areas will grow at compound annual rates of between 11 percent and 14 percent. In contrast, demand in the rural sector will grow only from 1.6 percent to 1.8 percent per year.

Barley

Total demand for barley is projected to increase at a rate of 3.6 percent per year during the projection period, 1970-1980. At this rate the level of demand will reach about 1.5 million tons, an increase of 0.5 million tons above the 1966 level (see Table 4-7). Seventy-four percent of the total demand will come from the rural population (71 percent farm, 3 percent non-farm) and the other 26 percent from the urban population (see Appendix B, Tables B-8.1, B-9.1 and B-10.1 and B-11.1).

Projections of demand for barley on the provincial level indicate large variations in the absolute quantities demanded in the fourteen provinces. The principle causes of the variation, assuming constant relative prices, uniform incomes per capita, uniform income growth rates and equal income elasticities, are (1) the differences in per capita consumption in the base year and (2) the differences in rate of population growth during the projection period.

The percentage shares of National demand for barley in each province are highly related to the indicated percentage shares of production. Shoa, Gojam, Arussi, Wollo and Begemdir together will form about 75 percent of the total barley demand in 1980 as compared to 73.6 percent in 1966. All of the five but Shoa (which will increase its share from 18 to 26 percent), will lose importance gradually over the projection

TABLE 4-7. PROJECTED TOTAL DEMAND FOR BARLEY
BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

	TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	140358	10025	95775	24045	22816	153949	65138	18707	17693	167149	14088	48952	34680	144133	957508
1967	143701	10290	98075	25227	23358	157607	66652	19360	18295	178991	14428	50122	35749	147567	989422
1968	146908	10535	100286	26013	23877	161150	68269	19585	18582	185183	14756	51243	36384	150821	1013592
1969	150523	10843	102876	27289	24504	164533	69719	20289	19085	195739	15159	52451	37423	154060	1044493
1970	154244	11093	105602	28588	25055	168164	71349	20868	19575	206503	15559	53750	38438	157746	1076534
1971	157035	11292	107510	29793	25460	170652	72454	21324	19923	216249	15870	54658	39250	160276	1101746
1972	160714	11549	110118	31325	26005	173976	73940	21888	20380	228435	16278	55869	40312	163655	1134444
1973	164576	11810	112860	33048	26566	177355	75460	22466	20849	241885	16711	57122	41459	167143	1169310
1974	168641	12077	115752	34988	27145	180792	77014	23060	21331	256753	17171	58417	42701	170745	1206587
1975	172922	12349	118799	37175	27740	184287	78604	23670	21828	273204	17661	59760	44049	174466	1246514
1976	177438	12629	122016	39642	28353	187840	80231	24296	22340	291420	18182	61149	45516	178312	1289364
1977	182210	12911	125419	42427	28983	191457	81895	24939	22867	311607	18742	62590	47119	182291	1335457
1978	187262	13201	129022	45573	29634	195132	83597	25600	23408	334000	19339	64083	48873	186407	1385131
1979	192614	13497	132839	49132	30304	198873	85338	26279	23966	358846	19977	65630	50800	190672	1438767
1980	198298	13798	136892	53155	30995	202674	87120	26974	24540	386439	20662	67236	52922	195087	1496792

SOURCE:

COMPUTED FROM RURAL TOTAL DEMAND (TABLE 4-14) AND URBAN TOTAL DEMAND (TABLE 8-10.1).

period as a result of their relatively slow population growth rates.

In general, large annual increases are to be expected in Shoa and Eritrea because of their large and growing urban populations and high per capita consumption rates. The other provinces will increase demand for barley at a modest average rate of 2.2 percent per year.

Corn

Of the projected total demand for corn of 1.1 million metric tons in 1980, 56 percent is expected to come from four provinces--Shoa, 24 percent; Sidamo, 13 percent; Harar, 10 percent; and Eritrea about 9 percent. Other major provinces such as Tigre, Wollega, Wollo and Gojam will make up about 27 percent of the aggregate demand. The highest percentage increases in demand for corn are expected in Kaffa and Eritrea--129 percent and 118 percent each above the 1966 levels. Percentage increases over 1966 levels in the other provinces will be between 31 percent and 45 percent.

The aggregate demand for corn by provinces and by sectors is shown in Table 4-8 and Appendix B, Tables B-8.2, B-9.2, B-10.2, and B-11.2. On the average 72 percent of the demand for corn in 1980 can be expected to arise in rural sector. This is a big shift from 1966 when 91 percent of the demand came from the sector of the population.

Sorghum

Demand for sorghum will increase from 0.9 million tons in 1966 to 1.4 million tons in 1980, or by 51 percent. Of this demand in 1980, 20 percent will be generated in Harar, also the largest producer, and about 70 percent will come from Shoa, Eritrea, Wollo, Begemdir, Gojam, Tigre and Wollega; the other 10 percent will be divided among the remaining six

TABLE 4-8. PROJECTED TOTAL DEMAND FOR CORN
BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

	TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	25903	2122	36070	47784	47601	24646	85228	22826	29482	118256	97763	71802	47788	50653	707924
1967	26522	2178	36937	50100	48731	25232	87176	23622	30445	126526	100127	73517	49168	51860	732141
1968	27118	2230	37767	51648	49805	25797	89279	23893	30903	130874	102399	75156	50021	53004	749894
1969	27820	2294	38728	54125	51071	26335	91120	24740	31689	138235	105140	76884	51269	54143	773593
1970	28525	2348	39745	56655	52215	26916	93228	25446	32467	145755	107887	78768	52548	[illegible]	797942
1971	29064	2390	40454	58996	53046	27314	94642	25996	33010	152549	110008	80075	53516	56327	817387
1972	29769	2445	41425	61975	54168	27844	96550	26678	33727	161048	112800	81821	54802	57516	842568
1973	30512	2500	42446	65323	55320	28383	98501	27377	34462	170424	115761	83627	56178	58741	869555
1974	31296	2556	43521	69092	56507	28932	100496	28094	35216	180787	118907	85495	57653	60009	898561
1975	32123	2614	44653	73340	57725	29490	102535	28831	35993	192248	122252	87425	59240	61316	929785
1976	32998	2673	45847	78129	58979	30057	104619	29589	36790	204934	125817	89424	60952	62668	963476
1977	33926	2733	47110	83534	60271	30634	106751	30365	37609	218988	129622	91493	62803	64067	999906
1978	34909	2795	48445	89640	61598	31222	108930	31163	38450	234574	133688	93637	64814	65515	1039380
1979	35954	2857	49861	96539	62965	31819	111159	31982	39315	251864	138038	95858	67004	67013	1082228
1980	37065	2921	51361	104341	64375	32426	113438	32822	40203	271059	142702	98162	69397	68566	1128838

SOURCE:

COMPUTED FROM RURAL TOTAL DEMAND (TABLE 4-15) AND URBAN TOTAL DEMAND (TABLE 8-10.2) .

TABLE 4-9. PROJECTED TOTAL DEMAND FOR SORGHUM
BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	5808	1971	75540	89477	24428	80010	208201	15046	19038	83657	40408	81985	57636	127898	911143
1967	5947	2023	77343	93368	25010	81908	212873	15611	19660	89511	41385	83942	59301	130946	938828
1968	6080	2071	79062	96063	25561	83744	217974	15787	19956	92587	42326	85811	60331	133833	961186
1969	6238	2132	80876	99867	26210	85488	222317	16341	20463	97797	43477	87773	61838	136704	987523
1970	6395	2182	82888	103926	26798	87374	227387	16805	20964	103120	44622	89918	63380	139978	1015737
1971	6517	2221	84255	107550	27224	88663	230762	17165	21316	107929	45512	91402	64549	142221	1037286
1972	6674	2271	86141	112220	27799	90385	235323	17612	21778	113946	46679	93389	66104	145218	1065539
1973	6841	2322	88113	117447	28391	92136	239985	18069	22252	120583	47919	95442	67765	148313	1095578
1974	7016	2375	90182	123308	29000	93917	244748	18539	22739	127919	49238	97564	69546	151509	1127600
1975	7201	2428	92352	129887	29626	95729	249613	19022	23241	136031	50639	99759	71463	154809	1161800
1976	7397	2483	94631	137283	30269	97570	254586	19518	23755	145012	52136	102030	73529	158222	1198421
1977	7605	2539	97030	145605	30931	99444	259667	20025	24283	154961	53732	104381	75766	161752	1237721
1978	7825	2596	99558	154983	31613	101350	264860	20547	24825	165993	55439	106816	78196	165404	1280005
1979	8059	2654	102223	165555	32315	103287	270165	21083	25384	178234	57268	109337	80841	169186	1325591
1980	8308	2713	105040	177483	33038	105258	275588	21632	25957	191822	59228	111953	83731	173103	1374854

SOURCE:

COMPUTED FROM RURAL TOTAL DEMAND (TABLE 4-16) AND URBAN TOTAL DEMAND (TABLE 8-10.3).

provinces. The magnitudes of demand in the rural and urban sectors vary from province to province. The projection shows that on the average 77 percent of the aggregate demand in 1980 will accrue in rural areas.

Teff

The second largest increase in aggregate demand will be expected for teff. Consumption of teff as a direct food exceeds any other product in Ethiopia, and above all it is the most preferred food item among cereals, especially in rural areas. The level of demand for teff will reach 1.5 million tons in 1980 contrasted with 0.9 million tons in 1966 and 10 million tons in 1970. This amounts to 66 percent growth over the fifteen years, or a 4.4 percent increase per annum. Demand for teff in the urban sector will register an increase of 391 percent compared to only 27 percent in the rural sector.

Provincial distribution of demand for teff will undergo large shifts among the provinces. The most urbanized provinces such as Shoa and Eritrea will increase their share of the aggregate demand, whereas the less urbanized provinces will have a decreasing share. Demand in Shoa, for instance, will make up 32 percent of the total demand in 1980 compared to only 23 percent in 1966. Likewise, Eritrea's share will increase from 6 percent to 8 over the period. This clearly demonstrates the effects of high growth rates in population and per capita income in the more urbanized provinces.

On the basis of the underlying assumptions, by 1980 about 79 percent of the aggregate demand for teff will come from only seven provinces--Shoa, Wollo, Eritrea, Tigre, Gojam and Begemdir. As a group, these provinces represented 76 percent of total demand in 1966. For

TABLE 4-10. PROJECTED TOTAL DEMAND FOR TEFF
BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

	TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO	TOTAL
1966	40166	5567	70191	53179	25492	79990	63293	19334	23225	206048	51754	81736	48438	137381	905794
1967	41125	5716	71879	55795	26098	81900	64768	20009	24019	220858	53012	83696	49954	140663	939492
1968	42051	5856	73500	57535	26678	83737	66343	20239	24398	228559	54225	85578	50845	143777	963321
1969	43148	6041	75409	60361	27402	85510	67757	20962	25065	241777	55777	87651	52340	146968	994168
1970	44245	6182	77413	63236	28020	87395	69349	21560	25710	255234	57288	89852	53785	150542	1029811
1971	45086	6298	78816	65905	28480	88692	70425	22029	26171	267445	58479	91404	54955	153018	1057203
1972	46187	6447	80736	69299	29100	90422	71874	22608	26774	282706	60036	93466	56482	156315	1092452
1973	47345	6599	82754	73114	29740	92180	73356	23203	27395	299557	61691	95602	58132	159722	1130390
1974	48567	6753	84882	77412	30398	93969	74871	23815	28033	318193	63455	97814	59921	163245	1171328
1975	49859	6912	87125	82254	31073	95788	76422	24442	28691	338819	65336	100104	61868	166889	1215582
1976	51226	7074	89493	87719	31771	97637	78008	25085	29369	361667	67344	102480	63991	170661	1263525
1977	52674	7238	91999	93887	32491	99519	79631	25747	30064	386995	69492	104945	66311	174567	1315560
1978	54211	7407	94651	100858	33232	101431	81291	26429	30782	415098	71795	107501	68860	178615	1372157
1979	55843	7579	97464	108738	33996	103377	82989	27123	31520	446289	74263	110153	71662	182813	1433809
1980	57581	7754	100450	117650	34785	105355	84727	27839	32282	480937	76915	112911	74751	187167	1501104

SOURCE:

COMPUTED FROM RURAL TOTAL DEMAND (TABLE 4-17) AND URBAN TOTAL DEMAND (TABLE 8-10.4) .

detailed information on distribution of demand by province and sector see Table 4-10 and Appendix Tables B-8.4, B-9.4, B-10.4 and B-11.4.

Wheat

Between 1966 and 1980, the total all-Ethiopia demand for wheat is projected to increase by about 100 percent to 1.1 million tons. The major contributing factors are the population growth in the rural sector and both the income effect and the population effect in the urban sector.

The increase in total demand for wheat will be most marked in urban areas, where consumption is indicated to rise by about 500 percent over the projection period. With the 9.1 percent population growth, 5.4 percent per capita income growth and an income elasticity demand of 0.70, the total demand for wheat in urban sector will rise drastically, putting an upward pressure on the aggregate demand in the entire country. In Shoa, the most important wheat producing and consuming province, demand will rise by nearly 187 percent over the base year. At this rate, demand for wheat in Shoa will be about 41.2 percent of the total demand in the whole country by 1980.

The second largest demand will come from Eritrea, where production is insignificant, but consumption will rise rapidly as a result of the large urban population with higher income growth rate. Eritrea's share in the 1980 total Ethiopia demand will be 11.8 percent as contrasted to 7.6 percent in the base year. The shares of other major producing and consuming provinces such as Arussi, Gojam, Begemdir, and Wollo are expected to decline due to their relatively lower population growth, especially compared to urban provinces such as Shoa and Eritrea.

The most striking finding in the prospective demand for wheat is

the drastic shift in importance of rural and urban areas. Demand for wheat arising in urban areas accounted only for 14 percent of the 1966 total and 22 percent of the 1970 total, whereas the projection indicates urban demand will increase to 32 percent in 1975 and 45 percent in 1980. This means that 80 percent of the total population will generated only a little more than half of the total demand for wheat. The validity of the results depends entirely upon how will the underlying assumptions, especially rate of income growth and income elasticity of demand, represent the actual situation. If the assumed coefficients of income and elasticity are good estimates of what actually is occurring in the Ethiopian consumer economy, then the projected results should be accurate.

Pulses

Results of the projections of total demand for pulses in individual provinces are shown in Table 4-12. The corresponding demand projections by sector are shown in Appendix Tables B-10.6 and B-11.6. As the result of increases in population and per capita consumption, total demand for pulses is projected from 444 thousand tons in the base year to 719 thousand by the end of the projection period. This corresponds to an annual increase of about 4.2 percent.

Over the decade, 1970-80, the rural population will continue to be the major consumers of pulses, but with slow growth in per capita consumption; the rural share of total demand will decrease substantially from 90 percent in 1966 and 86 percent in 1970 to 78 percent in 1975 and 68 percent in 1980. Demand is projected to rise fastest in the urban sector where per capita incomes are high, and population growth is relatively fast. However, the fact that pulses and meat are close

TABLE 4-11. PROJECTED TOTAL DEMAND FOR WHEAT
BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

TOTAL DEMAND

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	60395	7006	29626	40870	4200	41644	58172	6264	12394	157014	10447	62764	972	49491	541454
1967	61975	7218	30424	43608	4314	42542	59771	6501	12865	170324	10746	64447	1160	50801	567046
1968	63524	7420	31201	45444	4428	44017	61431	6598	13115	177629	11046	66085	1226	52061	585225
1969	65363	7668	32176	48924	4607	45062	63073	6863	13530	190239	11545	67945	1564	53425	611984
1970	67215	7876	33177	52349	4733	46173	64816	7082	13934	203221	11982	69898	1809	54910	635175
1971	66708	8053	33935	55806	4841	46979	66111	7263	14247	215621	12380	71373	2134	56018	663439
1972	70625	8273	34962	60137	4984	48022	67786	7483	14641	231068	12880	73279	2460	57448	694028
1973	72665	8498	36018	65112	5133	49089	69518	7710	15053	248439	13423	75274	2875	58943	727750
1974	74843	8732	37168	70834	5290	50177	71307	7945	15479	268009	14016	77365	3357	60507	765031
1975	77170	8972	38401	77419	5453	51289	[illegible]	8189	15926	290071	14670	79557	3917	[illegible]	[illegible]
1976	79666	9221	39724	85000	5626	52426	75076	8441	16391	314964	15385	81859	4566	63861	852206
1977	82344	9477	41147	93734	5807	53587	77059	8701	16874	343073	16169	84278	5320	65662	903232
1978	85227	9741	42682	103800	5998	54774	79112	8972	17379	374842	17031	86822	6194	67556	960130
1979	88336	10013	44337	115400	6199	55987	81237	9251	17906	410756	17980	89498	7207	[illegible]	1023653
1980	91696	10294	46127	128775	6411	57226	83439	9540	18456	451386	19027	92320	8381	71541	1094719

SOURCE:

COMPUTED FROM RURAL TOTAL DEMAND (TABLE 4-18) AND URBAN TOTAL DEMAND (TABLE 6-10.5) .

substitutes in Ethiopia may mean that the income elasticity coefficient used in the projections is high, especially at the higher income levels. From experience, people in Ethiopia both rural and urban, tend to substitute meat for pulses as their incomes increase. At high levels of income consumption of pulses becomes less and less important. On the other hand the fact that pulses are perfect complements of teff, corn and sorghum in human food consumption in Ethiopia, would indicate notable increases in demand for pulses as demand for the cereals increases. This hypothesis may be true especially for the low income group of urban consumers and among the rural consumers as a whole.

Like the other food crops considered in this study, the variations in growth of demand for pulses among provinces is accounted for by the variations in population growth by sector. Increases in total demand for pulses from 1966 to 1980 range from 134 percent in Shoa to 21 percent in Gojam. Except in Eritrea where the projected increase is 96 percent, all other provinces are projected to have increases ranging 23 percent to 60 percent. The combination of high population growth and strong income effect is illustrated by the unprecedented increases increases indicated for Shoa and Eritrea, where about 70 percent of the projected urban population will be found by 1980.

Among the major consuming provinces, the projections indicate that Shoa and Harar will remain the dominant consumers, representing 47 percent of the expected total demand--7 percent above their combined share in 1966. Eighty-six percent of the total demand for pulses in 1980 will be accounted for by one-half of the provinces--Shoa, Harar, Wollo, Eritrea, Tigre, Gojam and Begemdir. However, except Shoa and Eritrea, which will gain 11 percent and 2 percent over their 1966 shares, all will register

TABLE 4-12. PROJECTED TOTAL DEMAND FOR PULSES
BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	13432	3103	31287	24219	7484	36522	67654	7209	6167	106763	11266	40737	15469	56088	427400
1967	13768	3188	32061	25472	7667	37414	69262	7467	6380	114161	11550	41736	15949	57462	443537
1968	14096	3269	32805	26318	7839	38279	70994	7560	6486	118215	11823	42692	16243	58766	455385
1969	14526	3372	33624	27709	8033	39101	72530	7839	6665	124894	12159	43648	16705	60035	470840
1970	14933	3454	34514	29125	8217	39995	74276	8068	6841	131791	12493	44721	17164	61498	487090
1971	15264	3522	35140	30464	8349	40615	75477	8252	6969	138074	12757	45469	17530	62512	500394
1972	15690	3609	35993	32161	8528	41435	77077	8477	7135	145936	13101	46464	18011	63858	517475
1973	16143	3697	36888	34082	8711	42270	78718	8708	7306	154643	13469	47493	18531	65250	535909
1974	16624	3788	37833	36256	8900	43120	80398	8947	7483	164308	13862	48558	19093	66688	555858
1975	17137	3880	38829	38720	9093	43987	82120	9192	7664	175046	14282	49661	19706	68176	577493
1976	17685	3976	39883	41519	9294	44868	83886	9445	7853	186987	14733	50803	20372	69717	601021
1977	18272	4072	40998	44695	9498	45766	85695	9704	8046	200278	15215	51988	21104	71314	626645
1978	18901	4172	42181	48307	9711	46681	87551	9971	8246	215089	15732	53215	21907	72969	654633
1979	19576	4273	43437	52412	9929	47613	89454	10246	8453	231602	16292	54489	22791	74686	685253
1980	20302	4377	44774	57083	10154	48562	91405	10529	8666	250026	16893	55812	23770	76469	718822

SOURCE:

COMPUTED FROM RURAL TOTAL DEMAND (TABLE 4-19) AND URBAN TOTAL DEMAND (TABLE B-10.6) .

declining percentage shares of the total demand. The minor consuming provinces will continue to account for a small share of total demand--a loss of about 2 percent to 14 percent by 1980.

Oilseeds

Aggregate demand for oilseeds, both in seed and oil form, is projected to increase at 4.2 percent per year during 1970 to 1980, reflecting the over all rate of population growth and a strong positive demand response to per capita income growth. Due to rapid population growth as well as increasing income levels, total demand in urban areas is expected to increase at 12.5 percent per year. Total demand in rural sectors will rise at only 1.8 percent per year (1.7 percent in the farm and 2.1 percent in the non-farm componant).

At the above rates, the aggregate demand for all Ethiopia will rise from 224 thousand tons in 1966 and 255 thousand tons in 1970 to a high level of about 379 thousand tons at the end of the projection period. Projections by sector indicate a large increase in the share demanded by the urban population. Out of the total demand in 1980, 31 percent or 118 thousand tons will arise in urban areas (see Appendix, Table B-11.7), and 69 percent or 261 thousand tons in rural areas (see Appendix B-10). The most surprising development in demand for oilseeds is the large change in urban share during the 1970's. Urban demand constituted only 9 percent in 1966 and 14 percent in 1970, but is projected to reach 21 percent in 1975 and 31 percent in 1980. As already indicated large shifts of varying magnitudes are expected in the demand for all products included in this study, because of the differences in the effects of the demand determinants between the rural and the urban sectors.

The results of the separate projections by province indicate that the total demand increases will be faster for the more urbanized provinces than for the more rural oriented provinces. By 1980 Shoa and Eritrea each will have total demand increases of 143 percent above 1966 levels. Increases for the other twelve provinces range from 35 percent for Illubabor to 57 percent for Sidamo. The absolute total demand levels by province are given in Table 4-13.

About 87 percent of the national total demand for oilseeds will be generated in eight provinces--Shoa, 30 percent; Harar, 12.1 percent; Wollo, 10.8 percent; Eritrea 10.4 percent; Tigre, 8 percent; Wollega, 5.4 percent; Begemdir, 5.2 percent and Gojam, 5 percent. This group consumed about 84 percent of the total supply in 1966, but Shoa and Eritrea alone account for the higher share for the group by 1980. The declining importance of the majority of the provinces can be explained by their relatively low proportion of the total population and lower rates of population growth in rural areas. Moreover, though not yet established through any type of study, it appears that in most rural areas, particularly the remote ones, consumption of oilseeds in extracted oil form is not habitual because of economic unavailability, lack of awareness, and food habits. However, with economic development and rural transformation, this situation is expected to change as cash purchasing power increases, distribution of processed food products starts expanding and consumers gradually develop tastes and preferences for vegetable oils.

Total rural demand distribution among the provinces does not show large shifts. In fact, all provinces virtually retain their 1966 and 1970 positions throughout the projection period under the assumption of uniform income effects. About 83 percent of the rural total demand is

TABLE 4-13. PROJECTED TOTAL DEMAND FOR OILSEEDS
BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

	TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO	TOTAL
1966	7664	1423	12613	16235	6832	14715	33691	5774	6321	46051	8340	20738	13510	29750	223657
1967	7858	1465	12938	17089	7004	15088	34497	5984	6546	49294	8558	21264	13922	30498	232005
1968	8046	1503	13250	17679	7166	15449	35378	6063	6662	51124	8769	21767	14185	31209	238250
1969	8259	1551	13605	18629	7346	15797	36138	6292	6854	54100	9039	22277	14566	31888	246341
1970	8478	1590	13985	19607	7521	16172	37021	6482	7043	57194	9304	22847	14959	32681	254884
1971	8649	1623	14260	20540	7648	16437	37634	6635	7183	60048	9520	23253	15267	33234	261931
1972	8871	1665	14631	21725	7817	16786	38444	6823	7364	63615	9798	23787	15672	33966	270964
1973	9105	1707	15022	23069	7991	17139	39273	7015	7551	67587	10097	24341	16107	34723	280727
1974	9353	1751	15437	24602	8170	17501	40126	7214	7744	72018	10418	24915	16577	35507	291333
1975	9617	1796	15879	26345	8355	17869	41000	7419	7944	76965	10763	25513	17088	36319	302872
1976	9898	1841	16347	28334	8545	18245	41897	7630	8151	82495	11136	26134	17645	37161	315459
1977	10196	1887	16847	30604	8742	18628	42820	7848	8366	88685	11538	26780	18253	38035	329229
1978	10515	1937	17378	33198	8945	19020	43766	8072	8590	95620	11972	27453	18920	38943	344329
1979	10856	1986	17947	36162	9155	19418	44737	8304	8820	103393	12443	28153	19657	39886	360917
1980	11222	2037	18556	39552	9372	19824	45735	8543	9060	112114	12955	28884	20469	40868	379191

SOURCE:

COMPUTED FROM RURAL TOTAL DEMAND (TABLE 4-20) AND URBAN TOTAL DEMAND (TABLE B-10.7).

expected from the above listed eight provinces where 78 percent of the total rural population will reside by 1980. The three major demand provinces will be Shoa, 18.4 percent; Harar, 15.9 percent; and Wollo, 14.1 percent of the projected total rural demand for oilseeds in Ethiopia.

In regard to the urban total demand, Shoa and Eritrea alone will account for about 74 percent of the country total in 1980 (compared to 60 percent in 1966). This is not surprising when the rates of urban population growth of the two are contrasted with those of the other provinces.

CHAPTER V

SUPPLY-DEMAND BALANCE AND IMPLICATIONS

The importance of knowing the relationships between supply and demand for food grains during the process of economic development in a country has been emphasized in Chapter I and elsewhere in this report. Independent projections of supply and demand usually provide little insight into the prospective future food situation in an economy; a comparison of the two is necessary in order to determine probable balances or imbalances. Awareness of the supply-demand relationships provides information or guidance for the formulation of policies with (1) respect to production, (2) inter-provincial and international food grain trade, (3) price support and control programs, (4) improved nutrition programs, and (5) programs to help solve the foreseeable production, distribution and consumption problems. Thus, comparison of supply and demand projections for the commodities under consideration in this study becomes an integral part of the research in order to test the hypothesis that "domestic supply of food grain may not keep in pace with domestic demand in Ethiopia."

In this chapter, then, the findings in Chapters III and IV are brought together and the results are presented in tables with only brief explanations. Since supply projections are based on gross production, it

is necessary to deduct those quantities which will be diverted from human food uses such as seeds, wastages and industrial uses, if any.

Demand for Seeds

Generally, Ethiopian farmers are generous for one reason or the other in the application of seeds per unit of area. Seeds used by the majority of the farmers have very low viability and purity, so that heavy application is almost necessary under the existing farming practices. Preliminary surveys of seeding rates in few parts of the country have disclosed large differences among regions depending upon soil fertility and structure, availability of moisture and intensity of weeds. Hence, use of the same rates of seeding for all provinces may be quite unrealistic.

In spite of the above problem, projections of demand for seeds is carried out on the assumption of uniform and constant rates of seeding for each crop as shown in Table 2.1. These average rates are reasonably comparable with case study findings in Shoa, Arussi and some of the major grain producing northern provinces. The projected results, obtained by multiplying the projected area by the seeding rates, are presented in Appendix C, Tables C-1.1 to C-1.7. Alternative projections have been made for barley and wheat at lower seeding rates (100 kgs. per hectare each); the latter assumptions are reflected in the second alternative supply curve in Figure 5.1. Results in tabular form have been omitted.

Under the assumptions of constant seeding rates, demand for seeds directly varies with change in the projected area planted. Large increases in area would entail large demand for seeds. Expressed as percentage of the projected gross production, the projected demand for

seeds in 1966, 1975 and 1980 is as follows:

	Barley	Corn	Sorghum	Teff	Wheat	Pulses	Oilseeds
1966	16%	5%	8%	8%	17%	10%	7%
1975 and 1980	14%	5%	5%	7%	18%	10%	4%

The projection does not account for the possible lower seeding rates which can be achieved with the expanded utilization of improved seeds and commercial fertilizers. Therefore, the results are subject to further modification for those provinces or areas having access to modern inputs which may change the traditional seeding rates.

Wastages

Another factor which determines level of available supply of food grains is that of losses on the farm and in the market channels. During the process of harvesting, threshing, storing and marketing, considerable amounts of cereals, pulses and oilseeds are believed to be wasted in Ethiopia. However, except for rough estimate of percentage losses, a detailed analysis of physical or quality losses as caused by various agents is not yet determined for most crops.

The projected quantities of wastages based on the assumptions given in Table 2.1 are shown in Appendix C, Tables C-2.1 to C-2.7. Alternative projections with assumptions of lower percentage losses--barley, 10 percent; corn, 7 percent; sorghum, 7 percent; teff, 15 percent; wheat, 10 percent; and pulses, 3 percent--also are shown graphically in Figures 5.1 to 5.2.

Surplus and Deficit

The last columns in each table (Tables 5.1 to 5.7) show surplus and deficit supplies of cereals, pulses and oilseeds for the entire

country. The indicated figures roughly approximate quantities that would be exported or imported. More precisely, those with positive signs represent potential exports while those with negative signs represent potential imports. Given all the assumptions regarding supply and demand, the projections indicate major deficits in all products except for sorghum and oilseeds. In other words, if domestic supply continues to increase at the average rates of the previous decade, 1961-70 and if demand increases at the rates determined by rates of population growth plus the product of assumed rates of per capita income growth and income elasticities of demand, the secular trends noted in the supply-demand balances are likely to occur.

Supplies of barley, corn, teff, wheat and pulses will be short of their respective demands by 7 percent, 20 percent, 25 percent, 45 percent and 25 percent by 1980. Figures 5.1 to 5.3 show levels of supply (also see Appendix C Tables C-3.1 to C-3.7) and demand for the seven products during 1966 to 1980. In Figure 5.1 the upper curves show the levels of barley supply and demand by years. The upper supply curve represents the second alternative projection based upon assumptions of lower rates of seeding and wastage; it indicates a substantial surplus through the late 1970's to 1980, but demand is rising at a higher rate so that the surplus is narrowing. Under the first alternative projection, barley supply remains below the demand level from 1973 onwards.

The lower curves in Figure 5.1 show the projected levels of supply and demand for wheat; they depict an ever expanding dificit from 48 thousand tons in 1966 to almost half a million tons in 1980. The large difference in rates of growth in supply and demand for wheat have been indicated in the last two chapters; the slopes of the lines illustrate

the difference and its consequence.

Figures 5.2 and 5.3 show the relations between supply (two alternatives) and demand for sorghum, corn, teff, pulses, and oilseeds. The two charts are read and interpreted in the same manner as Figure 5.1.

From Tables 5.1 to 5.7, it is easy to see that Eritrea, Tigre and Shoa are projected to experience a continuously increasing deficit throughout the projection years. Eritrea and Tigre had chronic food deficits during the past decades and the projections suggest that the same situation will continue unless production increases at higher rates to cope with the increases in demand. Shoa which has been a surplus province in wheat and pulses, and deficit in the others during the previous decade turns out to be the largest projected deficit province in all commodities because of the rapidly increasing demand in the large urban areas. However, without the demand arising in the capital city Addis Ababa, Shoa would be the largest surplus province. Serious shortages for all grains except sorghum are to be expected in Harar. Kaffa, Illubabor, Gemu Goffa and Sidamo will have small surpluses or be in balance in corn, sorghum and barley, but are projected to have shortages in other commodities. On the average, Gojam, Begemdir, Arussi, Wollega and Bale will be producing more than their respective demands for most commodities creating some exportable surplus to the deficit areas.

On the provincial level, various surplus and deficit trends are observed from the projections. In Table 5.1, Arussi, Bale, Gemu Goffa, Illubabor and Wollega indicate growing surpluses during the projection period. Gojam has a surplus of barley, but it is declining gradually. Shoa, Wollo and Harar, Eritrea, Tigre will be major deficit provinces while Kaffa and Sidamo will be self-sufficient or surplus areas through

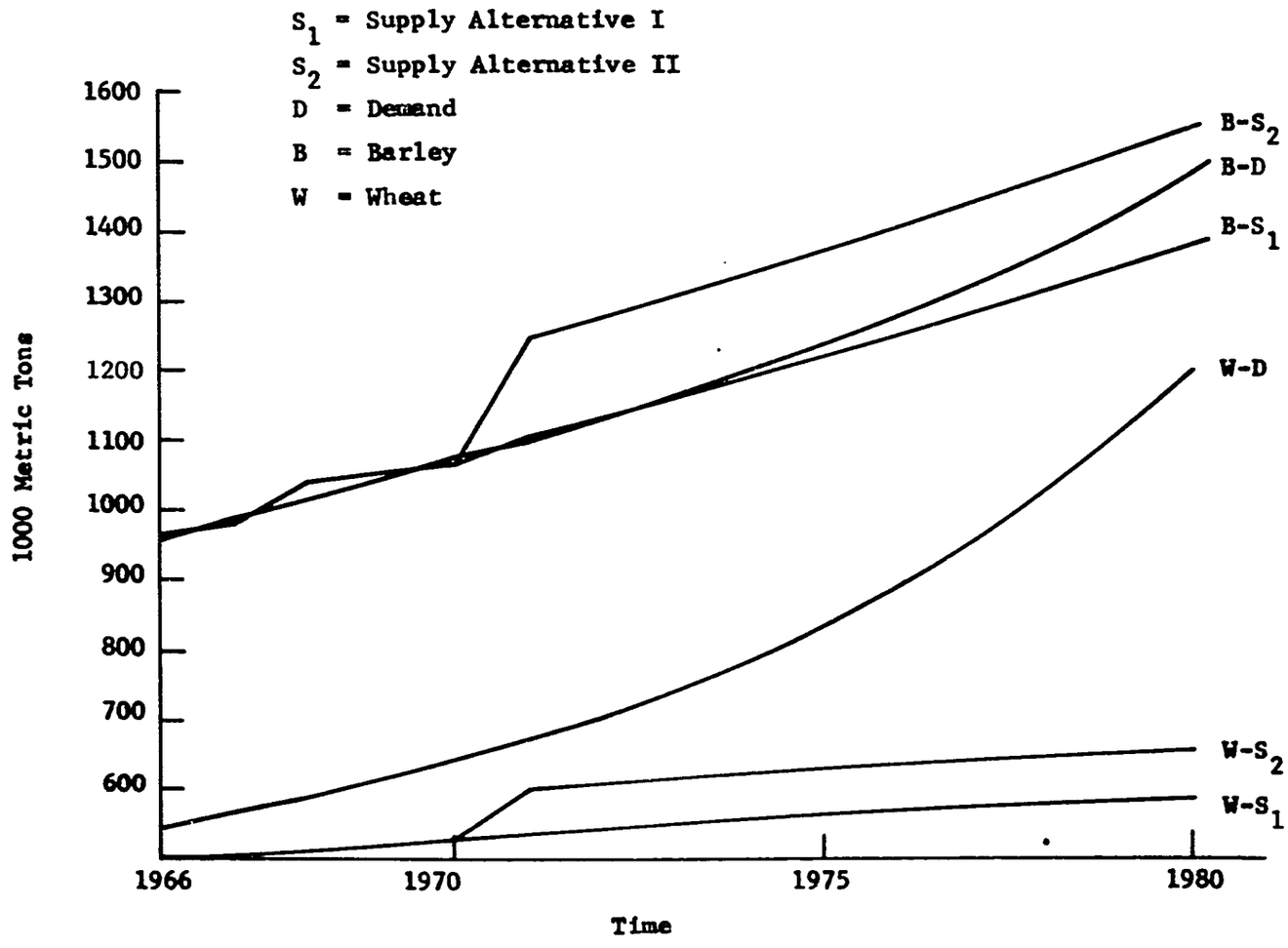

Fig. 5.1--Estimated and Projected Supply and Demand for Barley and Wheat in Ethiopia, 1966 to 1980.

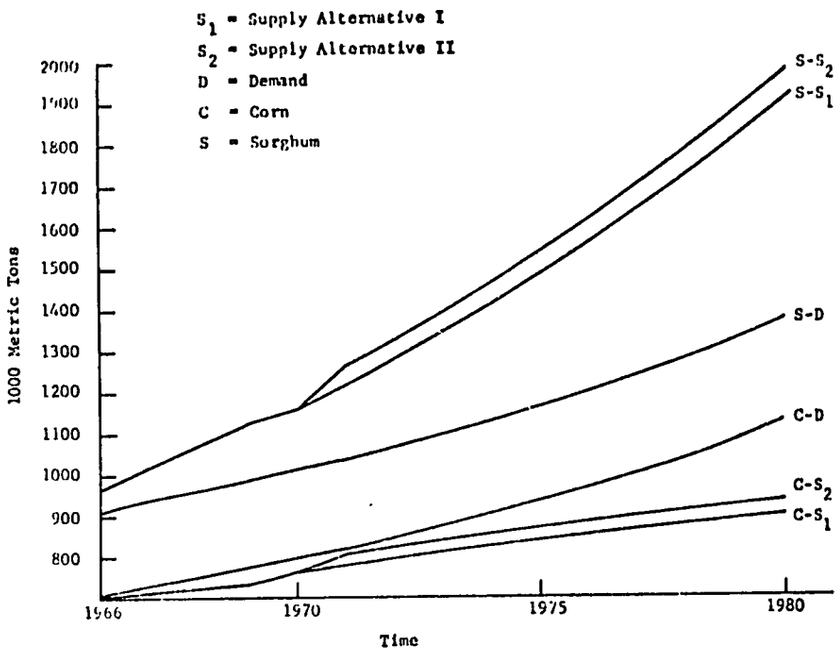

Fig. 5.2--Estimated and Projected Supply and Demand for Sorghum and Corn in Ethiopia, 1966 to 1980.

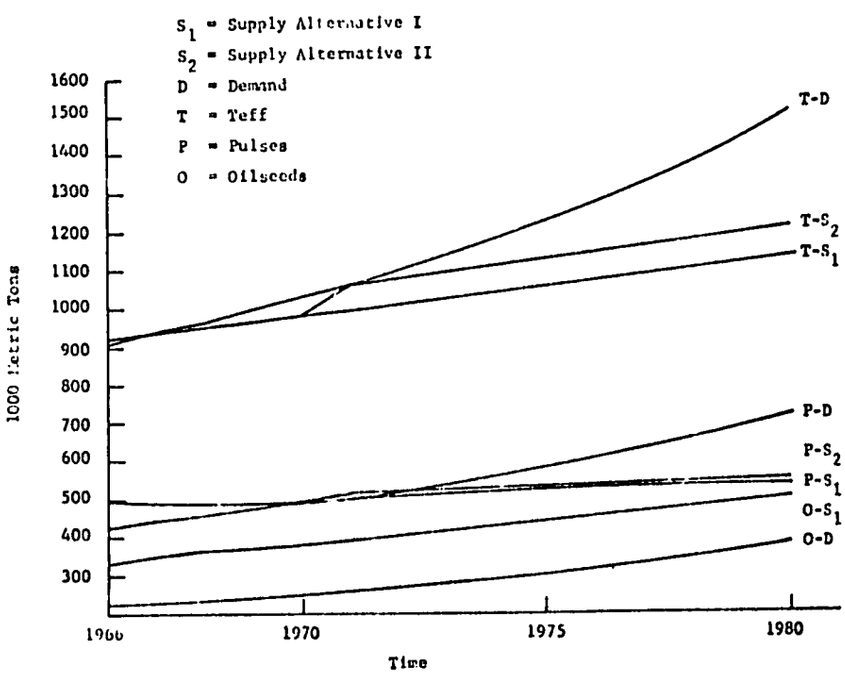

Fig. 5.3--Estimated and Projected Supply and Demand for Teff, Pulses and Oilseeds in Ethiopia, 1966 to 1980.

the mid-1970's. Specifically, of the projected 135 thousand tons of surplus barley, 83 percent will be found in Arussi, Gojam, Bale and Wollega; Arussi alone will have half of the surplus. On the other hand, large deficits are indicated for Shoa (55 percent), Harar (15 percent) and Eritrea (14 percent of the 236 thousand tons total provincial deficit in 1980).

The projected balances for corn point to increasing deficits in the central and northern provinces, with Shoa, Arussi, Begemdir, Wollo, Tigre and Eritrea composing 94 percent of the total provincial deficit. Again, Shoa and Eritrea will have major supply-demand imbalances due to the substantial increases in their demands. Begemdir and Harar will be slightly deficient throughout the projection period and tend to increase in the same direction beyond 1980. Wollega will supply 55 percent of the total projected surplus in 1980, and Kaffa and Illubabor together will contribute another 42 percent. Among the major corn producing and consuming provinces, Gemu Goffa and Harar will fall among supply deficient areas due to low rates of increases in production relative to increases in total demand.

Shortages of sorghum supply in Shoa, Tigre, Gojam and Kaffa will continuously rise during the projection period while Eritrea and Bale will tend towards self-sufficiency. Shoa, Tigre and Gojam together show 96 percent of the total deficit. The biggest surpluses in sorghum are expected to arise in Begemdir, Harar and Wollo (65 percent of total surplus). Begemdir alone will account for about 30 percent of the surplus, confirming the Ethiopian Government expectation as expressed in the Third Five Year Development Plan. Other provinces with substantial surpluses are Illubabor, Gemu Goffa, Arussi, Sidamo and Wollega. The

TABLE 5.1. ESTIMATED SUPPLY-DEMAND BALANCE OF BARLEY BY PROVINCES IN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

YEAR	SUPPLY-DEMAND BALANCE														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO	TOTAL
1966	20686	3229	18000	-16240	-15	33164	-23755	0	-10650	110	-4155	-13397	-15	56	7018
1967	21418	5524	14483	-16319	-213	30976	-24667	361	-8970	-9259	-3293	-13876	-443	-4340	-8618
1968	29422	5844	17343	-16390	780	36649	-24612	1484	-6553	-3796	-2982	-12513	2075	1383	28134
1969	28958	5759	12658	-16340	1687	33423	-26854	-245	-6923	-9579	-2221	-12145	1477	-210	9445
1970	29478	5660	11266	-17421	1560	30566	-27563	733	-7222	-17872	-2433	-13153	2382	-2353	-6372
1971	34286	7007	11505	-18121	1777	33351	-27355	1986	-5489	-20070	-1709	-11499	4291	-3064	6896
1972	37012	7804	9974	-18892	2175	33057	-27959	2489	-4474	-26248	-1224	-10960	5342	-4263	3833
1973	39878	8501	8256	-19779	2487	32833	-28678	3064	-3288	-33300	-739	-10322	6462	-5351	24
1974	42617	9270	6254	-20979	2872	32354	-29382	3711	-2116	-41695	-269	-9727	7654	-6835	-6271
1975	45325	10152	4010	-22365	3256	31646	-30257	4371	-860	-51491	200	-9119	8746	-8578	-14964
1976	48016	11005	1565	-23867	3539	30937	-31061	5102	468	-62917	755	-8425	9808	-10392	-25467
1977	50563	11859	-1249	-25683	4008	29944	-31952	5919	1767	-76173	1310	-7846	10940	-12406	-38999
1978	52967	12797	-4348	-27998	4378	28880	-32941	6622	3350	-91486	1837	-7196	11859	-14690	-55969
1979	55355	13821	-7876	-30515	4746	27474	-33916	7410	4905	-109185	2277	-6532	12762	-17330	-76604
1980	57512	14844	-11802	-33560	5115	25996	-35077	8198	6631	-129430	2788	-5869	13636	-20156	-101174

SOURCE:

CALCULATED BY SUBTRACTING TOTAL DEMAND FROM NET SUPPLY. NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSSES AND NON FOOD USES).

TABLE 5-2. ESTIMATED SUPPLY-DEMAND BALANCE OF CORN
BY PROVINCES IN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

SUPPLY-DEMAND BALANCE

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO	TOTAL
1966	-10379	25	-39	-43749	5	70	-944	22920	43775	-40169	8770	-36149	89935	-38664	-4593
1967	-10724	-74	-374	-45289	-1194	525	-1044	21990	43850	-47999	7905	-37349	91115	-39694	-18356
1968	-11154	-74	-849	-46069	-2419	270	-1949	22965	44925	-52819	6930	-39264	92205	-40714	-28016
1969	-11724	-89	-1234	-47809	-2409	110	-2604	22670	45865	-60679	5590	-40544	92685	-41639	-41811
1970	-10124	-4	-2359	-50074	-1344	1295	-324	23880	48215	-65129	6370	-41679	97295	-42429	-36411
1971	-10604	320	-1334	-52409	-2854	1480	-99	25310	49785	-71264	8155	-42459	100460	-43379	-38892
1972	-10714	490	-1639	-54999	-3639	1680	15	25900	51070	-78964	7950	-43724	102580	-44399	-48393
1973	-10734	650	-2044	-57889	-4319	1695	35	26405	52170	-87554	7370	-45174	104335	-45509	-60563
1974	-10944	715	-2639	-61374	-5194	1810	-124	26815	53275	-97329	6595	-46819	105895	-46714	-76032
1975	-11154	885	-3334	-65164	-6064	1825	-284	27225	54195	-108099	5525	-48374	107460	-47834	-93192
1976	-11459	955	-3929	-69649	-7039	1930	-544	27630	55205	-120169	4355	-50114	108730	-49139	-113237
1977	-11769	1210	-4814	-74644	-8009	1955	-989	27940	56125	-133729	2705	-51959	109815	-50449	-136612
1978	-12269	1280	-5604	-80424	-9064	1970	-1329	28170	57050	-148779	855	-53799	110715	-51754	-162982
1979	-12779	1345	-6599	-86919	-10224	1985	-1969	28480	57870	-165629	-1294	-55839	111405	-53164	-193331
1980	-13289	1515	-7684	-94404	-11389	1910	-2504	28705	58510	-184374	-3934	-57969	111710	-54669	-227866

SOURCE:

CALCULATED BY SUBTRACTING TOTAL DEMAND FROM NET SUPPLY. NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSSES AND NON-FOOD USES).

projections indicate total supply of sorghum in excess of total demand by 22 percent by 1975 and 28 percent by 1980, indicating the possibility of declining sorghum prices and expanding exports. As shown in Table 5.3, the total surplus over the domestic demand is projected to reach more than one-half million tons by 1980.

Unlike the situation for the other commodities, demand for teff notably exceeds the supply in all provinces except in Gojam, Begemdir, Wollega and Bale. These four provinces are projected to produce a surplus of 233 thousand tons, of which Gojam will make up 67 percent and Begemdir 26 percent. However, Gojam, Begemdir and Wollega show declining secular trends in available surpluses. Shoa, though the second largest producer, is expected to have the largest deficit, followed by Eritrea. Of the projected 605 thousand tons of provincial total deficits (sum of deficit in each province), Shoa will account for 40 percent, Eritrea 17 percent; Harar, 10 percent; Tigre, 9 percent; Sidamo, 7 percent; Arussi, 5 percent; and the other provinces 12 percent.

Substantial deficit or surplus in teff will likely cause a special problem. Teff is neither an importable nor exportable commodity at present, because only Ethiopia produces and consumes this crop. Both supply and demand for teff appear to be highly inelastic, which means that any shortage or excess supply would inflate or depress teff prices under a free competitive market system. According to the projected deficit supply or teff--one-third of the projected supply in 1980--rises in price will be inevitable, at least in the deficit provinces. To further aggravate the situation, appreciable deficits also are indicated for the substitute commodities such as wheat and corn, so that there will be upward pressure on the prices for these crops too. It is an important

TABLE 5-3. ESTIMATED SUPPLY-DEMAND BALANCE OF SORGHUM
BY PROVINCES IN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

SUPPLY-DEMAND BALANCE

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO	TOTAL
1966	-9	-1003	21166	-34521	5018	-73	65004	16790	8	-31379	-55	-27417	33960	5654	53143
1967	226	-1009	26482	-34353	7076	-1439	73630	19182	304	-32013	2208	-27925	35284	12116	79769
1968	1358	-1019	32326	-30561	10744	-1133	77434	20662	1018	-32041	4602	-26711	36852	16428	109459
1969	2758	-935	43120	-27497	11486	-4475	84390	22178	1796	-35381	5574	-27877	39324	22882	137343
1970	5132	-1035	46904	-29547	13202	-3813	82308	23970	1956	-38689	7216	-30541	40838	24418	142319
1971	6166	-945	59064	-25539	16234	-5407	91532	27440	888	-39079	11548	-32227	41112	32148	182935
1972	8030	-1051	70206	-23339	19120	-7203	97400	30490	682	-41251	14986	-34455	42236	38988	214839
1973	10258	-961	82462	-20853	22450	-9341	103248	33692	476	-43853	18868	-37013	43182	46340	248955
1974	12644	-971	96202	-18359	26122	-12005	109366	37342	286	-46695	23082	-40023	44128	54564	285683
1975	15390	-887	111438	-15683	30148	-15191	115380	41420	-81	-50067	27820	-43459	44606	63474	324308
1976	18484	-897	128336	-12847	34596	-19089	121366	45750	-549	-54075	32980	-47411	44994	73160	364798
1977	21926	-903	146624	-10209	39486	-23493	126712	50512	-1181	-58813	38568	-52079	44728	83342	405220
1978	25812	-913	166830	-7609	44900	-28777	132054	55802	-1807	-64101	44758	-57257	44284	94580	448556
1979	29952	-929	188890	-5153	50752	-35043	136846	61424	-2707	-70325	51282	-63225	43292	106404	491460
1980	34630	-749	212874	-3025	57036	-42179	141004	67578	-3775	-77679	58598	-70173	41556	119100	534796

SOURCE:

CALCULATED BY SUBTRACTING TOTAL DEMAND FROM NET SUPPLY. NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSSES AND NON-FOOD USES).

TABLE 5-4. ESTIMATED SUPPLY-DEMAND BALANCE OF TEFF
BY PROVINCES IN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

SUPPLY-DEMAND BALANCE

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO	TOTAL
1966	-24179	850	76115	-44989	-16039	162770	-47069	-11199	-18004	-27809	-36424	-28189	29975	55	15864
1967	-25129	1780	75420	-47714	-16584	161105	-47399	-12019	-17694	-36534	-36529	-29979	28710	-2479	-5045
1968	-25724	1820	76880	-49174	-16864	162210	-49534	-11979	-18044	-39769	-37329	-31469	27920	-2124	-13180
1969	-25499	1870	74535	-51929	-18469	159655	-49629	-11409	-17559	-47424	-38749	-32579	28070	-2784	-31900
1970	-26249	1765	74220	-53614	-18959	158860	-50959	-12014	-17049	-56659	-39889	-33824	27865	-1764	-48270
1971	-26674	2750	73865	-56094	-19084	160990	-51834	-11669	-18029	-66244	-38599	-35874	26255	-3079	-63320
1972	-27159	3285	72995	-59029	-19685	160740	-52934	-11639	-18159	-77304	-38749	-37649	25230	-3799	-83860
1973	-27649	3640	71925	-62364	-20214	160310	-53954	-11604	-18294	-89884	-39024	-39424	24020	-4624	-107140
1974	-28254	4070	70760	-66199	-20919	159790	-55054	-11489	-18349	-104174	-39394	-41379	22605	-5554	-133540
1975	-28939	4685	69585	-70554	-21624	159440	-56074	-11454	-18579	-120214	-39689	-43354	20995	-6514	-162290
1976	-29544	5115	67955	-75489	-22329	158840	-57274	-11444	-18734	-138719	-40179	-45514	19200	-7664	-195780
1977	-30344	5730	66395	-81139	-22949	158150	-58394	-11329	-18884	-159379	-40789	-47664	17285	-8744	-232055
1978	-31149	6245	64545	-87594	-23654	157450	-59694	-11314	-19034	-182764	-41499	-50024	14990	-10014	-273510
1979	-32054	6755	62595	-94849	-24459	156565	-60919	-11219	-19189	-209249	-42334	-52479	12490	-11399	-319745
1980	-33159	7270	60460	-103119	-25264	155600	-62139	-11204	-19359	-239054	-43264	-54934	9610	-12989	-371545

SOURCE:

CALCULATED BY SUBTRACTING TOTAL DEMAND FROM NET SUPPLY. NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSSES AND NON-FOOD USES).

point to remember that the indicated gaps between supply and demand may be avoided by careful planning and effective implementation, but if recent trends are allowed to continue, the projected deficits are very likely to occur in the years ahead.

The projections indicate a large wheat supply-demand imbalance, even greater than that shown for teff, but it is probable that the apparent wheat deficit is less soundly based than that for teff or other commodities. During 1970 to 1980 wheat domestic supply is projected to increase only by 13 percent while demand is projected to increase by 70 percent. Although, Ethiopia is a wheat importing country, it seems unlikely that the seventies will show a continuation of the rapid rate of increase in demand as suggested by the projections, so as to be deficit by 83 percent of the domestic supply by 1980. The trend projections for supply do not fully reflect the recent high yield increases during late 1960's and early 1970's; to the extent that this is true the projected level of production for 1980 is underestimated and the deficit may be smaller than that shown by the projections.

The most severe shortages of wheat are projected for Shoa and Eritrea, which together by 1980 will produce less than a quarter of the total national supply and demand more than half of the total national demand. The total provincial deficit of wheat is projected at about 536 thousand tons, of which 44 percent and 22 percent are indicated for Shoa and Eritrea, respectively (see Table 5.5). Other likely major deficit provinces include Harar and Tigre, accounting for 22 percent of the total shortage, while only 12 percent is projected to occur in the other eight provinces. Arussi and Bale have a projected surplus of 38 thousand tons over their own demand, but this represents only 7 percent of the deficits

TABLE 5-5. ESTIMATED SUPPLY-DEMAND BALANCE OF WHEAT
BY PROVINCES IN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

YEAR	SUPPLY-DEMAND BALANCE															
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	26805	14712	7339	-32089	-197	454	-34006	-1486	-8231	21161	-3161	-30068	-971	7	-39711
1967	26360	14620	6199	-34767	-238	-874	-35425	-1748	-8112	9244	-2930	-31524	-1159	-1386	-61742
1968	26436	15238	5422	-36621	-365	-2014	-36550	-1772	-6289	5654	-3085	-33187	-1225	-2528	-72886
1969	27055	15847	5104	-39954	-459	-3604	-38385	-1840	-8757	-2833	-3649	-35689	-1563	-4142	-92871
1970	27225	16047	4343	-43163	30	-3597	-40203	-1901	-9016	-9288	-3176	-38180	-1808	-5169	-107856
1971	27380	16500	4130	-45560	175	-4033	-41255	-2145	-9124	-21495	-3759	-36112	-2103	-5515	-125286
1972	27200	16835	3341	-49574	-283	-4921	-42955	-2292	-9325	-34092	-4007	-39813	-2459	-6740	-149085
1973	27080	17152	2567	-54211	-325	-5723	-44615	-2519	-9532	-48308	-4382	-41518	-2874	-7920	-175128
1974	26640	17473	1720	-59596	-362	-6546	-46331	-2682	-9838	-65076	-4725	-43392	-3356	-9181	-205252
1975	25978	17703	717	-65856	-405	-7478	-48184	-2926	-10093	-84590	-5209	-45366	-3916	-10673	-240298
1976	25147	17997	-388	-73099	-456	-8435	-50113	-3105	-10438	-106681	-5757	-47451	-4565	-12173	-279519
1977	24121	18296	-1581	-81496	-519	-9429	-52108	-3365	-10716	-132242	-6301	-49737	-5319	-13744	-324140
1978	22831	18502	-2886	-91224	-675	-10423	-54161	-3551	-11113	-161426	-6995	-52051	-6193	-15480	-374845
1979	21132	18687	-4396	-102487	-768	-11541	-56286	-3843	-11435	-195133	-7777	-54595	-7206	-17325	-432973
1980	19364	18961	-5956	-115609	-860	-12673	-58488	-4047	-11865	-233190	-8656	-57272	-8380	-19263	-497934

SOURCE:

CALCULATED BY SUBTRACTING TOTAL DEMAND FROM NET SUPPLY. NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSSES AND NON-FOOD USES).

registered in the other provinces.

Comparison of the projected supply and demand for pulses discloses the possibility that Ethiopia's pulses exports may decline, and the country in time may become substantial importer under the assumptions held in this study. The supply-demand balance indicated in this study conflicts with the efforts and intentions of the Ethiopian Government to rapidly increase production of pulses for export. However, when the past low achievement of increasing production as planned or intended is considered, the projected supply-demand relationships appear reasonable under the assumption adopted in the study.

Table 5.6 shows about 14 percent excess of supply over domestic demand in 1966 (the actual export to foreign countries). In contrast, the projections indicate excess demand of 11 percent in 1975 and 34 percent in 1980. Considering increasing demand, particularly in the rapidly expanding urban areas as well as past experiences (see Table 1.1) the indicated trend is likely to come about if effective counterbalancing actions are not taken.

Regarding provincial balances, Wollo, Gojam, Begemdir and Arussi should be in positions to meet their own demands and have about 75 thousand tons for possible shipment to the supply deficient markets in the other provinces. Shoa, which had substantial surplus in earlier years, will produce short of its total demand by 17 percent in 1975 and about 40 percent in 1980. Shoa together with Harar, Eritrea and Tigre is expected to account for 93 percent of the total provincial deficit projected for 1980. Some of the other provinces will be in balance, and some will have moderate deficits by 1980.

The large statistical difference between the projected supply and

TABLE 5-6. ESTIMATED SUPPLY-DEMAND BALANCE OF PULSES
BY PROVINCES IN ETHIOPIA, 1966 TO 1980
(UNIT: METRIC TONS)

SUPPLY-DEMAND BALANCE

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	7831	-110	21394	-21319	-3582	27932	-29841	335	-1477	28518	496	-12612	-2256	50993	66302
1967	7775	-305	20134	-22757	-3833	26542	-32245	-110	-1824	19868	216	-14379	-2736	49227	45573
1968	7367	113	18572	-23550	-3509	24700	-34683	-298	-1916	15488	-171	-16000	-2663	47247	30637
1969	7133	6	18247	-24965	-3672	23995	-36402	-410	-1554	9848	86	-16644	-3025	46902	19545
1970	4741	-86	17208	-26357	-3397	22970	-38707	-710	-1654	3870	-272	-18300	-3517	45344	3153
1971	7152	81	17616	-27699	-3768	23686	-38949	-384	-1802	799	-228	-18121	-3401	47560	2542
1972	7008	157	16979	-29319	-3887	23156	-40557	-409	-1727	-5619	-272	-19018	-3638	47285	-9861
1973	6959	137	16350	-31233	-4007	22534	-42252	-440	-1854	-13033	-409	-19923	-3970	47103	-24038
1974	6707	212	15611	-33455	-4126	21902	-43959	-560	-1973	-21658	-649	-20928	-4409	46524	-40761
1975	6456	193	14786	-35775	-4246	21185	-45659	-692	-2005	-30977	-793	-21926	-4746	46150	-58049
1976	6111	173	13854	-38589	-4366	20460	-47554	-717	-2125	-41976	-1025	-23026	-5278	45578	-78480
1977	5760	241	12930	-41804	-4485	19743	-49456	-841	-2152	-54179	-1364	-24124	-5809	44819	-100721
1978	5416	222	11905	-45418	-4605	19018	-51356	-1068	-2271	-67883	-1601	-25229	-6441	44054	-125257
1979	4964	202	10873	-49438	-4724	18301	-53351	-1093	-2491	-83294	-2040	-26521	-7173	43187	-152598
1980	4520	183	9648	-54153	-4944	17476	-55251	-1217	-2523	-100693	-2472	-27726	-8005	42323	-182834

SOURCE:

CALCULATED BY SUBTRACTING TOTAL DEMAND FROM NET SUPPLY. NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSSES AND NON-FOOD USES).

demand results is an excess supply of 122 thousand tons of oilseeds for the country as a whole in 1980; this is about 25 percent of total supply. The projections indicate that oilseeds exports can increase substantially. However, the demand estimates used in this study may be low (see Chapter 4), and the exportable surplus may not be as great as indicated by the projections.

The rise in the exportable surplus comes entirely from Begemdir, Gojam and Wollo, the three major producing provinces. Of the total surplus of 206 thousand tons, Begemdir represents 55 percent, Gojam 33 percent and Wollo 11 percent. Provinces such as Arussi, Harar, Illubabor, Kaffa, Tigre and Wollega are slightly deficit but tending toward self-sufficiency in the long run. In contrast, Shoa, Eritrea, Gemu Goffa and Sidamo are projected to experience increasing shortages throughout the projection period (see Table 5.7).

Estimated Quantities Entering Market Channels

In peasant agriculture, farmers produce subsistence crops primarily for their own families' consumption rather than for sale in the market. This does not mean that farmers consume one hundred percent of their produce; it simply means that production is not on a commercial basis. In Ethiopia, the peasant farmer produces some surplus over what the family prefers to consume and sells the surplus in the market in order to purchase non-farm goods and services to meet personal and community financial obligations. However, the amount of this surplus varies among farmers, regions, and provinces and with size of farms, access to market and state of technology. Results of a case study on different sizes of farms in Ethiopia illustrate existing marketing

TABLE 5-7. ESTIMATED SUPPLY-DEMAND BALANCE OF OILSEEDS
BY PROVINCES IN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

YEAR	SUPPLY-DEMAND BALANCE														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	-2685	-676	67686	-3605	-6437	59545	-7969	-3456	-2602	-373	-5990	-833	-5706	21378	108277
1967	-2711	-396	70665	-3643	-6637	61158	-7430	-3558	-2612	5752	-6195	-1064	-5457	22058	119930
1968	-2626	-414	74360	-3437	-6837	61625	-7018	-3204	-2374	5113	-5959	-1277	-5495	23293	125750
1969	-2455	-153	76148	-3709	-6937	61010	-7289	-3311	-2103	3415	-5686	-1798	-5731	22771	124172
1970	-2474	301	79236	-4375	-7137	60541	-7466	-3041	-2115	1771	-5896	-2216	-4736	22224	124617
1971	-2301	315	82251	-4433	-7237	63100	-6610	-3053	-2035	-4	-5913	-1620	-5128	23103	130435
1972	-2325	398	85550	-4906	-7342	63731	-6219	-3070	-1864	-2301	-5937	-1668	-4977	23235	132305
1973	-2154	673	88944	-5480	-7545	64562	-5830	-2897	-1788	-4899	-5964	-1714	-4823	23566	134651
1974	-2179	852	92527	-6155	-7745	65295	-5342	-2818	-1517	-7995	-5988	-1764	-4769	23702	136104
1975	-2008	1130	96004	-7030	-7945	65834	-4860	-2743	-1442	-11595	-6114	-1912	-4715	23836	136440
1976	-1937	1408	99681	-8207	-8045	66382	-4474	-2665	-1371	-15885	-6044	-1963	-4663	23875	136092
1977	-1864	1681	103264	-9585	-8245	66835	-3988	-2491	-1200	-20774	-6073	-2209	-4714	23825	134462
1978	-1793	1957	107121	-11267	-8445	67285	-3512	-2418	-934	-26367	-6204	-2455	-4666	23864	132166
1979	-1822	2230	111082	-13252	-8745	67645	-2933	-2245	-763	-32762	-6233	-2603	-4817	23712	128494
1980	-1656	2603	114741	-15732	-8852	67718	-2457	-2072	-693	-40343	-6465	-2851	-4970	23365	122336

SOURCE:

CALCULATED BY SUBTRACTING TOTAL DEMAND FROM NET SUPPLY. NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSSES AND NON-FOOD USES).

practices.[43]

With rapidly increasing demand for food in urban areas as a result of high population and income growth, information on the quantities marketable in each province and for the country as a whole becomes a need for planning establishment of facilities and improvement of the market system. However, the nature and structure of the existing market system pose difficult problems in attempting to measure the amount of a commodity marketed in a given province.

On the basis of the projected supply and demand, surpluses and deficits, assumptions were made to estimate quantities marketed in each provinces for 1966, 1970, 1975 and 1980. The fact that according to the projections some provinces are expected to have surplus in some years and deficit in other years complicates the estimation, and makes different assumptions necessary.

In a previous study conducted by Stanford Research Institute Mission to Ethiopia, 1967-1969, it was estimated that 100 percent of the rural non-farm, 95 percent of the urban, and 5 percent of the rural farm total demand for cereals and pulses are procured through market channels.[44] It was further indicated that these percentages vary among the provinces and among large and small cities. Because of availability of modern oil extracting factories, home processing of oilseeds appears to have declined rapidly during the recent past decades so that increasing percentages of consumed oil are purchased from market. On this premises, it was estimate (author's judgement) that urban and rural non-rural farm population

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[43]Thodey, Marketing of Grains and Pulses in Ethiopia, p. 74.

[44]Ibid., pp. 28-33.

purchase 100 percent while rural farm population purchase 80 percent of their total consumption requirements.

Without considering the provincial variation, then, the quantity to be marketed in a surplus province can be estimated by this simple equation:

$$(5.1) \quad Q_{sj} = \sum_{i=1}^{3} P_{ij} D_{ij} + S_j$$

Where Q_s = Quantity in market channel in a surplus province in a given year

j = year

i = population sector

P = assumed percentage of total demand for a given product purchased from market.

D = total demand

S = surplus in the given year

The equation assumes the disposal of all surplus commodities during the given year, e.g., neglects possible increases or decreases in carry over.

In supply deficit provinces and percentage of total demand purchased from market, urban and rural, most likely will be higher than in the surplus provinces. However, the approach through demand was abandoned to minimize the risk of errors. Instead, the problem was approached through supply, based on results of the SRI study and other case studies on peasant farms which found that farmers sell certain percentage of the produce. In Ethiopia, even if production does not satisfy family consumption needs, farmers tend to sell certain portions of their food grains to buy non-farm goods and services, and more seriously to pay taxes and debts, particularly in provinces where no cash crops such as coffee are grown. The amount sold appears to vary according to cash need, farm size, type of crop, market prices and other considerations.

Based on the results of the aforementioned case studies, the following assumptions on marketable surplus as a percent of production for each crop were used uniformily for all provinces showing deficits.

Barley	Corn	Sorghum	Teff	Wheat	Pulses	Oilseeds
30%	30%	30%	20%	50%	30%	80%

Then, the quantity of a commodity that enters the market channel in a deficit province can be expressed as:

$$(5.2) \quad Q_{dj} = PS_j + D_j$$

Where Q_d = quantity entering market channels in a deficit province in a given year.

j = year

P = percent of domestic supply (province) assumed to be marketed

S = supply

D = deficit

Similar to equation (5.1), this equation assumes inshipment of all commodities equivalent to the indicated deficits, despite the low inter-provincial product movements and strict policy controlling grain imports from other countries. Moreover, extrenal supply response for teff, which is projected to be nationally deficit, is perfectly inelastic so that any shortage of supply cannot be alleviated through import. Hence, the estimated quantities of teff, and to some extent other nationally deficit commodities supposed to get into market channel remain theoretical at least by the amount of national deficits indicated in Tables 5.1 to 5.7.

Table 5.8 shows the results of estimated yearly quantities of each commodity to be handled (either bought or sold in a single transaction) in market channels, including on-farm transactions in each province and for the country in total. The indicated total for the country is obtained by

TABLE 5.8. ESTIMATED QUANTITIES OF CEREALS, PULSES AND OILSEEDS THAT ENTER MARKET CHANNELS IN EACH PROVINCE, 1966, 1970, 1975 AND 1980
(UNIT: METRIC TONS)

PRODUCT	YEAR	PROVINCES														
		ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HAMAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
BARLEY	1966	38719	5369	31554	18567	6836	53575	36158	2414	12764	44821	4155	21823	3987	17886	298628
	1970	51633	8153	28205	20774	4916	53595	40683	3574	10935	17872	6101	21072	12221	2353	282117
	1975	75806	13175	27447	26815	7397	57634	44759	7817	7141	94697	8146	17450	22071	8578	418933
	1980	101337	18449	49331	39451	10323	55270	50683	12384	12422	189221	12932	14290	33104	20156	619353
CORN	1966	15034	176	10856	44963	5767	3299	26220	25803	48297	40974	23961	56454	96493	40595	438892
	1970	15636	692	13560	52061	16600	4933	28186	27258	53689	65871	25284	65449	105641	44570	519430
	1975	17437	1527	15743	67604	21554	5927	30948	31303	60964	108701	32684	77175	119860	50217	641644
	1980	20431	2281	20798	97372	27291	6525	35772	33640	66930	184870	4714	92391	132831	57324	783170
SORGHUM	1966	1745	1301	30876	51014	7973	24050	91026	18590	2924	31379	55	27533	40573	21465	350504
	1970	6084	1384	58826	51852	16701	28888	112740	26073	5485	38689	14994	30669	49333	43104	484822
	1975	16720	1340	127510	49947	34436	39343	151480	43952	7016	50067	38978	43599	57042	87016	748446
	1980	36564	1333	235474	55367	62391	61114	184094	70635	10442	77679	75248	70328	61379	149456	1151504
TEFF	1966	27382	2184	86321	46630	17930	172106	50314	12818	19042	63446	39498	38890	36182	17669	630412
	1970	29838	3345	86947	55530	20766	169463	54626	13930	18778	96366	43370	45038	36195	31510	705702
	1975	33130	6588	87134	72902	23523	171471	60138	14042	20602	163930	44810	54702	33913	38590	825475
	1980	38046	9547	85637	106014	27170	169207	66650	14522	21946	287422	49990	66526	31238	47830	1021745
WHEAT	1966	34804	16208	12013	36479	2198	5997	46088	3875	10302	68820	6803	46415	971	6564	297537
	1970	37511	17894	10422	47755	920	24884	52509	4491	11485	106254	7578	54039	1808	30039	407589
	1975	41234	20058	9682	71637	2939	29383	60670	5557	13009	187330	9939	62461	3916	36408	554223
	1980	43279	21958	26041	122191	3635	34949	70963	6793	15160	342287	13841	74796	8380	45452	829725
PULSES	1966	10075	1006	25607	22182	4757	32561	41198	1264	2893	55582	2213	16035	2256	57734	275363
	1970	9562	1109	22472	27179	4837	28232	49384	2926	3197	48411	657	22001	3517	53338	276822
	1975	10480	1192	22081	36652	5701	27192	56590	3244	3713	30977	1214	25915	4746	56278	285975
	1980	10531	1401	20230	55036	6520	24328	66095	4001	4375	130693	2933	32044	8005	55508	391700
OILSEEDS	1966	6696	1254	78016	13680	6726	71570	28552	5331	5559	36953	7837	16725	11940	40488	331327
	1970	7293	1633	90753	16554	7426	73778	31092	5807	6022	51178	8618	18682	12947	48881	380644
	1975	8080	2645	109223	22445	8308	80487	33771	6467	6608	63916	9861	20781	14622	53611	440825
	1980	9290	4332	131025	34825	9289	67718	37050	7213	7418	97747	11692	23689	17393	57095	515776

SOURCE:

CALCULATED FROM TABLES OF TOTAL DEMAND BY SECTOR, SEEDS, LOSSES AND SUPPLY -DEMAND BALANCES. ASSUMPTIONS ARE GIVEN IN TEXT.

simple addition of the provincial results, hence, apparent double counting by the amount of total provincial surplus less the national surplus in case of sorghum and oilseeds and by the amount of total provincial surplus in case of other commodities. In other words, the quantities involved in interprovincial shipments are double counted, once in exporting provinces and again in importing provinces.

In conclusion, it should be realized that these estimates are only indicative of the relative importance of individual provinces as to the expected magnitudes of the commodities passing through the market channels from producer to consumer. The estimates may provide only rough guidelines for needed adjustments or additions to the existing marketing facilities on basis of priority. The validity of the estimates depends entirely upon the plausibility of all underlying assumptions employed in this study. It is hoped that the effort will serve to stimulate further studies to establish the needed data and reduce the need for estimations and assumptions. The dramatically increasing demand for food in urban areas and the increasing imbalances among provinces are suggestive indicators not only for the need to increase production but also the urgent need for development of the market system to enhance orderly flow of commodities from producer to consumer.

CHAPTER VI

SUMMARY AND CONCLUSIONS

In this study the supply and demand for cereals, pulses and oilseeds in Ethiopia were projected over the period 1970 to 1980, and on the basis of the projections grain balances were investigated on both the national and provincial levels. The purpose of the study was to provide detailed information to the economic development planners for improving production and distribution of food grains in Ethiopia.

The review of literature disclosed the existing potentials and limitations of increasing food production in Ethiopia. It was found that, given the large investment requirement, production can be increased substantially through expanding cultivated areas in unsettled or thinly settled regions. Furthermore, it was pointed out that production can be increased through teaching and convincing the farmers to use improved farm inputs, establishing proper farm credit institutions, supplying the recommended inputs at the right time and place, and providing conducive land tenure and market incentives. Such programs are complex and formidable for existing conditions in Ethiopia, however.

In order to determine the projected levels of supply, historical data of crop production for 1961 to 1970 were fitted by an exponential regression equation on a rather pessimistic assumption that the future production trends could be best estimated on the basis of trends evident in the previous decade. The provincial historical data were estimated by

both objective and subjective methods on the basis of 1966 estimates. Projected levels of production for the country as a whole are summarized in Table 6. The levels of supply shown in the Table were derived by deducting the projected quantities of seeds and wastages from the projected production.

Analysis of the supply shows varying increases among the commodities from the base year to 1980. Sorghum and oilseeds are expected to increase substantially relative to the other commodities because of the high rates of growth established during the late sixties. Projected increases in the supply of barley are modest while those for the other grains show rather poor prospects. On the average, high rates of growth in supply are expected in Arussi, Shoa, Begemder and Eritrea, and these trends are confirmed by the recent relatively high technological changes being observed in these provinces. With respect to distribution, seven of the fourteen provinces, namely Shoa, Gojam, Wollo, Begemder, Wollega, Harar, and Arussi, account for 80 to 90 percent of the projected supply of each commodity during the projection period.

Changes in demand for food products, as found by reviewing literature, are determined by changes in population, income, relative prices, tastes and preferences. During economic development, as in Ethiopia, change in population and income are the two major factors that change demand for food grains or food as a whole. In spite of the rising food prices in Ethiopia, the demand for the commodities was projected on assumption of constant relative prices at the base year level, varying only with population and income changes.

Projections of population using a logarithmic regression equation, with a constant rate of growth of about 2 percent per annum indicate

TABLE 6. SUMMARY OF ESTIMATED AND PROJECTED SUPPLY AND DEMAND FOR CEREALS, PULSES AND OILSEEDS IN ETHIOPIA (UNIT: 1000 METRIC TONS)

	PRODUCTION				SUPPLY				PERCAPITA DEMAND				TOTAL DEMAND				BALANCE			
PRODUCT	1966	1970	1975	1980	1966	1970	1975	1980	1966	1970	1975	1980	1966	1970	1975	1980	1966	1970	1975	1980
CEREALS	5416	5972	6718	7530	4055	4501	5200	5934	174.89	180.66	190.13	203.95	4023	4560	5361	6597	+31	-56	-186	-664
BARLEY	1399	1540	1746	1956	964	1070	1232	1396	41.62	42.51	44.05	46.28	958	1077	1247	1497	+7	-6	-15	-101
CORN	827	895	991	1056	703	761	836	901	30.77	31.51	32.86	34.90	707	798	930	1129	-5	-36	-93	-228
SORGHUM	1165	1395	1710	2100	944	1158	1486	1910	39.60	40.11	41.06	42.51	911	1016	1162	1375	+53	+142	+324	+535
TEFF	1286	1362	1450	1544	922	981	1053	1130	39.37	40.66	42.96	46.41	906	1030	1216	1501	+16	-48	-162	-372
WHEAT	739	780	831	876	502	531	566	597	23.53	25.87	29.20	33.85	541	639	806	1095	-40	-108	-240	-498
PULSES	579	575	609	629	494	490	519	535	18.58	19.23	20.41	22.22	427	487	578	719	+66	+3	-58	-183
OILSEEDS	376	419	484	551	332	380	439	502	9.72	10.06	10.70	11.72	224	255	303	379	+108	+125	+136	+122
TOTAL	6371	6966	7811	8710	4881	5371	6158	6972	203.19	209.95	221.24	237.89	4674	5302	6242	7695	+205	+72	-108	-725

NOTE: POPULATION 1966 1970 1975 1980
(1000) 23008 25325 28299 32345

that population of Ethiopia will reach about 28.3 million in 1975 and 32.4 million in 1980. The results are comparable to the results of the FAO projections for the same period (see Table 1.7). Projections without disaggregating into rural and urban sectors predicted the population to reach only 27.8 million in 1975 and 30.6 million in 1980, but these results were not used in this study.

According to the projections, rapid urban population growth is anticipated during the seventies while in rural areas it will tend to remain low. Growth rates during 1970 to 1980 stand at 1.4 percent in rural areas and 9.9 percent in urban areas. The rapid relative shift of population from rural to urban areas as a consequence of the differential rates of growth probably arises from combinations of low death rates, high birth rates and high migration rates in urban areas. Provincial population projections, though subject to data limitations, reflect higher rates of growth in the more urbanized provinces of Shoa and Eritrea.

The income effect on demand for a product depends on the income elasticity for the product which varies among rural and urban consumers and among income groups. Also, income elasticities vary among food products, so that it was necessary to use different elasticities for cereals, pulses and oilseeds. On the assumed per capita income growth rate of 0.5 percent in the rural farm sector, 1.0 percent in the rural non-farm sector and 5.4 percent in urban areas, the highest increase in demand is expected for wheat, followed by oilseeds and pulses, because of relatively high income elasticities. The income disparity between rural and urban populations is causing a widening gap in per capita demand. For example, from 1966 to 1970 the demand for wheat rose by only 5.3 percent in rural areas compared to a rise of 77.4 percent in urban areas.

The obvious short coming of the per capita demand projections in this study is that the same income elasticities were used for both rural and urban populations. No nutritional consistency check has been made due to the paucity of nutritional standard data for Ethiopia. Thus, the high income elasticities combined with high rate of growth in per capita income have overstated the rate of growth in demand among urban people in Ethiopia. The author feels that this result should be studied in more detail prior to using the results for specific policy formulation.

Aggregate total demand was derived by multiplying the projected per capita demand by the projected population. As shown in Table 6, increases in demand for all commodities vary according to the income elasticities and the initial differences in per capita consumption rates between rural and urban areas. Commodities with high elasticities and high original consumption levels in urban areas show relatively greater increases in total demand over the projection period. Differential increases in total demand for a commodity among the provinces is accounted for by the differences in rates of population growth and the proportion of the total population living in urban areas. Large increases are projected for provinces such as Shoa and Eritrea, where the over-all population growth and the proportion of the population living in urban areas are expected to be high during the seventies.

The inadequate distribution and marketing facilities in Ethiopia may impede the transformation of the potential demand into effective market demand. Even if the supply matches the demand, the inefficient movement of products from farm to urban consumers and the limited inter-provincial communication may remain a serious problem.

The last four columns in Table 6 represent the statistical

differences between the projected supply and demand for each commodity, for total cereals and for the total of all products. It is evident from the table that the gap between supply and demand in aggregate is increasing at an increasing rate. Under the assumptions held in the study, a deficit amounting to more than one-half million tons (7 percent of total demand) for cereals alone is projected by 1980. By individual commodity, the projected deficits range from 45 percent for wheat to 7 percent for barley. Prospects for sorghum and oilseeds appear good, with substantial surpluses projected during the seventies. Severe shortages are projected for the other commodities.

During the last two decades Ethiopia has been a small wheat importer and the projection suggests imports will become more important in the future. However, there is some tangible evidence today in Ethiopia for not fully accepting this projected deficit in wheat. First, wheat productivity per hectare has been increased substantially in the two major producing provinces, Shoa and Arussi, (through expanding use of new variety seeds, fertilizers and farm machinery) during the last three or four years. With the prospect for more extensive use of these new inputs and improved handling at least in the two provinces and most likely in Gojam, Begemder and Wollo as well, the chances of increasing wheat supplies during the seventies appear to be good. Second, the projections of per capita demand appear inflated, particularly in urban areas, because of the strong income effect under assumption of constant prices. In reality, prices are not likely to remain constant in the long run, especially for import commodities like wheat. In fact, wheat prices in Ethiopia have risen from year to year because of the increasing demand relative to domestic supply and the strict import policy. Rising prices

usually restrain consumers from increasing their wheat consumption, which means that per capita demand probably will be lower than projected. Thus, with the high possibility of increasing domestic production and the constraint of prices and rigid import policy, the gap between supply and effective demand for wheat should be less than the projected levels, however, wheat imports may still increase.

The projected supply deficit for teff obviously will entail special problems exerting strong upward pressure on price unless domestic production is increased materially. The rising price may induce increase in production, particularly on commercial farms, offsetting some portion of the projected deficit. In case production cannot be increased to the level of effective demand, price control appears the best measure to avoid the foreseeable adverse effects on the economy.

Pulses, which have been an export commodity and presently are being exported, are projected to become deficit during the last half of the projection period. The projected levels of demand for pulses may be high, but the main problem seems to be the low projected increases in supply. Perhaps more current production data reflecting the impact of the current programs to increase output would show more realistic supply-demand balances for the pulses.

Deficits in corn apparently will be less serious relative to other products. Sorghum, which is projected to be surplus, is a close substitute for corn in most parts of Ethiopia. Moreover, implementation of commercial corn production programs in Shoa and Sidamo Provinces most likely will boost the supply at least enough to minimize import requirements.

Prospects for sorghum and oilseeds exports depend on the pressure of effective domestic demand, the problems of marketing, the basic

infrastructure for assembling the surpluses, the need to meet quality standards of the importing countries, and upon world market prices.

In conclusion, it should be pointed out that the results of this study are subject to several limitations of the statistical data. There is a critical need for continuous revision and modification as soon as more accurate and complete information is available. Factors which directly or indirectly determine the direction and magnitudes of supply and demand for food products need to be studied for more reliable and realistic projections. It is hoped that the methodology and preliminary findings of this study will help to stimulate the needed follow-up studies.

APPENDIX A

ESTIMATED AND PROJECTED AREA CULTIVATED AND

YIELDS OF CEREALS, PULSES AND OILSEEDS

IN ETHIOPIA, 1961 TO 1980

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TABLE A-1. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED TOTAL AREA UNDER CEREALS, PULSES AND OILSEEDS IN ETHIOPIA, THROUGH 1980
(UNIT: 1000 HECTARES)

EXPONENT

YEAR	AREA							
	BARLEY	CORN	SORGHUM	TEFF	WHEAT	PULSES	OIL SEEDS	COMBINED
1961	1560	744	1329	2206	917	700	673	8129
1962	1598	758	1351	2224	946	710	686	8273
1963	1636	793	1375	2262	963	727	717	8473
1964	1644	796	1384	2129	962	739	733	8387
1965	1653	812	1400	2147	989	755	738	8494
1966	1666	818	1421	2143	1012	772	783	8615
1967	1694	831	1492	2173	1021	765	778	8754
1968	1723	841	1537	2169	1034	760	788	8852
1969	1744	852	1594	2202	1041	766	802	9001
1970	1770	886	1641	2162	1054	766	822	9101
1971	1786	884	1671	2153	1072	786	836	9188
1972	1807	896	1718	2148	1085	792	850	9296
1973	1828	907	1768	2143	1098	798	863	9405
1974	1850	919	1819	2139	1110	805	876	9518
1975	1871	930	1871	2134	1122	811	890	9629
1976	1892	941	1925	2130	1134	817	903	9742
1977	1913	952	1980	2125	1146	823	915	9854
1978	1935	962	2037	2121	1158	829	928	9970
1979	1956	973	2095	2117	1169	835	940	10085
1980	1977	984	2154	2113	1181	841	953	10203
A	1551.80	722.52	1301.28	2218.43	895.50	695.61	645.25	
B	21.2727	23.7574	12.8638	-9.6342	25.9657	13.2164	27.9976	
RSQ	0.9759	9656	0.9689	0.1707	0.9836	0.8287	0.9719	

SOURCE:

"STATISTICAL ABSTRACT", CENTRAL STATISTICAL OFFICE ETHIOPIA, 1965 TO 1970.
"WORLD CROP STATISTECS AREA, PRODUCTION AND YIELD", FAO, ROME, 1966 TO 1970.

BARLEY AT 1.00; SORGHUM AT 1.40; OTHERS AT 0.80.

TABLE A-1.1. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AREA UNDER BARLEY BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 100 HECTARES)

EXPONENT IS 1.00

YEAR	AREA														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1961	2075	140	2106	452	468	2839	780	374	109	2574	203	998	421	2059	15592
1962	2141	160	2157	463	479	2860	799	399	112	2637	208	1023	447	2093	15972
1963	2192	164	2192	474	491	2879	818	425	131	2716	229	1047	474	2127	16353
1964	2201	164	2201	476	509	2874	821	443	131	2710	230	1051	493	2135	16434
1965	2229	165	2213	479	512	2873	809	462	165	2725	231	1057	495	2114	16523
1966	2247	166	2230	483	516	2879	816	466	183	2763	233	1065	516	2097	16654
1967	2282	169	2232	507	524	2874	828	507	203	2840	254	1082	524	2113	16935
1968	2321	206	2235	516	533	2906	825	516	241	2889	258	1101	550	2132	17223
1969	2372	209	2232	523	541	2912	837	523	244	2930	279	1116	558	2163	17435
1970	2412	213	2217	532	550	2944	834	532	248	3015	284	1171	568	2181	17694
1971	2434	218	2260	539	561	2924	843	567	280	3026	290	1157	594	2167	17852
1972	2468	226	2269	548	570	2928	847	586	300	3071	300	1173	611	2174	18064
1973	2502	234	2277	557	578	2932	851	606	321	3116	310	1188	628	2179	18274
1974	2538	243	2286	567	588	2936	855	627	342	3163	320	1205	646	2186	18491
1975	2573	251	2293	576	597	2937	858	647	363	3209	330	1220	664	2191	18704
1976	2607	260	2300	585	606	2938	862	668	385	3255	340	1236	682	2195	18915
1977	2642	269	2307	594	615	2939	865	689	408	3301	350	1252	700	2199	19124
1978	2678	278	2314	604	625	2940	869	711	430	3349	361	1269	719	2203	19342
1979	2713	287	2319	613	634	2939	872	733	453	3396	371	1285	738	2206	19553
1980	2748	296	2325	623	643	2937	875	755	477	3443	382	1300	757	2209	19763
A	0.1330	0.0088	0.1375	0.0286	0.0300	0.1823	0.0508	0.0238	0.0053	0.1636	0.0125	0.0636	0.0271	0.1331	
B	0.0003	0.0003	-0.0010	0.0001	0.0001	-0.0017	-0.0003	0.0007	0.0009	0.0005	0.0003	0.0001	0.0006	-0.0011	
RSQ	0.8322	0.7488	0.8233	0.7323	0.6720	0.9742	0.8976	0.9322	0.9528	0.7427	0.9105	0.2381	0.9364	0.9565	

SOURCE:

ESTIMATED FROM NATIONAL TOTAL AREA BASED ON W.EICHBERGER'S STUDY, 1966, AND IMPORTANCE OF THE CROP, FARM TYPES AND GOVERNMENT DEVELOPMENT PROGRAMS.

TABLE A-1.2. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AREA UNDER CORN BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 100 HECTARES)

EXPONENT IS 0.80

	AREA														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1961	112	7	350	60	558	268	937	484	759	893	1064	432	1384	134	7430
1962	129	8	357	61	561	273	956	493	774	895	1085	440	1411	137	7574
1963	151	16	373	63	587	285	999	515	809	920	1134	460	1475	143	7920
1964	167	16	374	88	597	287	1003	525	804	899	1138	462	1465	135	7952
1965	171	16	382	89	609	292	1023	536	828	909	1177	471	1494	122	8113
1966	172	25	384	90	613	286	1023	540	843	916	1186	466	1505	131	8173
1967	175	25	399	100	615	291	1039	548	864	914	1205	474	1529	133	8301
1968	177	25	404	118	622	294	1034	563	891	908	1228	463	1547	135	8403
1969	187	26	409	128	630	298	1039	588	903	912	1244	469	1551	136	8512
1970	195	27	434	133	629	319	1081	620	939	948	1302	478	1613	142	8853
1971	207	32	429	140	645	310	1080	610	939	925	1299	482	1608	134	8833
1972	215	34	436	148	652	314	1091	622	956	927	1320	485	1626	134	8953
1973	223	36	443	156	658	317	1101	633	972	927	1340	487	1643	134	9062
1974	231	39	450	165	665	320	1111	645	989	928	1361	490	1661	133	9184
1975	239	41	457	173	671	323	1121	657	1005	928	1381	493	1678	133	9293
1976	246	43	464	182	678	326	1131	668	1021	928	1401	495	1694	132	9403
1977	254	46	471	191	684	329	1140	680	1037	928	1421	498	1711	132	9512
1978	262	48	477	199	689	332	1148	690	1052	926	1439	500	1725	131	9615
1979	270	51	484	208	695	335	1158	702	1068	926	1459	502	1741	131	9723
1980	278	53	491	217	702	338	1167	713	1084	925	1479	504	1758	130	9834
A	0.0156	0.0007	0.0462	0.0056	0.0756	0.0363	0.1279	0.0633	0.0998	0.1220	0.1416	0.0598	0.1872	0.0184	
B	0.0012	0.0004	0.0003	0.0015	-0.0004	-0.0002	-0.0008	0.0008	0.0009	-0.0025	0.0008	-0.0008	-0.0008	-0.0005	
RSQ	0.7792	0.8586	0.6870	0.9254	0.3360	0.3391	0.7609	0.7493	0.7374	0.9725	0.8764	0.7737	0.7879	0.5924	

SOURCE:

ESTIMATED FROM NATIONAL TOTAL AREA BASED ON W.EICHBERGER'S STUDY, 1966, AND IMPORTANCE OF THE CROP, FARM TYPES AND GOVERNMENT DEVELOPMENT PROGRAMS.

TABLE A-1.3. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AREA UNDER SORGHUM BY PROVINCES IN ETHIOPIA, THROUGH 1990
(UNIT: 100 HECTARES)

EXPONENT IS 1.40

YEAR	AREA														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1961	53	13	1209	1183	452	1316	3256	492	359	824	558	1209	1143	1236	13295
1962	68	14	1243	1216	459	1337	3296	513	351	838	567	1229	1135	1256	13516
1963	69	14	1264	1264	495	1346	3310	536	357	852	577	1236	1154	1291	13756
1964	69	14	1301	1287	484	1342	3308	567	346	872	595	1218	1149	1301	13845
1965	84	14	1329	1301	503	1343	3329	587	350	881	601	1231	1161	1301	14005
1966	85	14	1364	1322	512	1364	3396	625	327	895	611	1208	1165	1336	14219
1967	89	15	1528	1409	564	1350	3530	653	356	934	667	1186	1216	1439	14926
1968	107	15	1574	1467	611	1344	3621	703	347	947	703	1192	1238	1497	15377
1969	127	16	1680	1553	634	1331	3755	697	349	982	761	1188	1236	1648	15947
1970	163	16	1796	1633	653	1339	3837	735	359	980	784	1192	1257	1682	16419
1971	159	17	1852	1670	690	1331	3867	793	349	1017	811	1160	1268	1724	16704
1972	176	17	1953	1741	727	1319	3949	837	346	1041	851	1139	1282	1800	17175
1973	195	18	2062	1818	766	1305	4036	884	343	1067	894	1115	1296	1881	17673
1974	215	18	2177	1897	808	1287	4123	933	338	1093	938	1087	1309	1966	18184
1975	236	19	2298	1980	852	1265	4209	985	333	1119	985	1054	1320	2055	18705
1976	259	19	2426	2068	898	1240	4297	1040	326	1146	1035	1016	1331	2149	19242
1977	283	20	2561	2159	946	1210	4384	1098	318	1173	1087	974	1339	2247	19794
1978	309	20	2703	2255	998	1176	4473	1160	309	1201	1142	927	1347	2350	20364
1979	336	21	2852	2354	1051	1137	4561	1224	299	1229	1200	874	1353	2457	20944
1980	366	22	3009	2458	1108	1092	4649	1291	288	1257	1260	816	1358	2568	21532
A	0.0039	0.0010	0.0889	0.0892	0.0336	0.1018	0.2436	0.0380	0.0267	0.0628	0.0410	0.0936	0.0858	0.0910	
B	0.0002	0.0000	0.0008	0.0004	0.0003	-0.0008	-0.0004	0.0003	-0.0002	-0.0001	0.0003	-0.0008	-0.0003	0.0004	
RSQ	0.8871	0.0000	0.9585	0.9464	0.9108	0.9378	0.8675	0.8144	0.8908	0.3058	0.9208	0.9676	0.9399	0.8032	

SOURCE:

ESTIMATED FROM NATIONAL TOTAL AREA BASED ON W.EICHBERGER'S STUDY, 1966, AND IMPORTANCE OF THE CROP, FARM TYPES AND GOVERNMENT DEVELOPMENT PROGRAMS.

TABLE A-1.4. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AREA UNDER TEFF BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 100 HECTARES)

EXPONENT IS 0.80

YEAR	AREA														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1961	287	132	4059	221	353	5118	463	243	199	3508	419	1677	2360	3022	22053
1962	289	134	4074	223	356	5165	468	245	200	3540	423	1692	2382	3050	22231
1963	316	158	4109	226	384	5237	451	248	203	3612	451	1716	2393	3115	22613
1964	298	149	3828	213	362	4934	468	234	191	3403	425	1616	2233	2935	21282
1965	301	150	3865	215	365	4960	472	236	193	3435	429	1632	2254	2963	21463
1966	300	150	3857	214	364	4950	450	236	193	3450	429	1650	2229	2957	21425
1967	326	152	3864	239	369	5015	456	260	195	3495	434	1672	2258	2996	21723
1968	325	152	3796	239	369	5010	455	260	217	3514	434	1670	2256	2993	21682
1969	352	154	3853	242	374	5065	462	242	220	3589	462	1696	2246	3061	22015
1970	346	151	3740	259	368	4908	476	259	238	3524	454	1665	2227	3005	21613
1971	347	158	3723	247	373	4926	463	254	222	3513	452	1663	2197	2992	21522
1972	352	159	3693	250	374	4908	463	256	224	3513	454	1662	2182	2988	21474
1973	358	160	3663	253	375	4890	463	257	227	3513	457	1661	2168	2985	21422
1974	363	162	3636	256	376	4874	463	258	230	3515	459	1660	2155	2983	21382
1975	368	163	3607	259	377	4856	463	259	232	3515	462	1659	2141	2979	21334
1976	373	165	3581	262	378	4840	463	261	235	3516	464	1659	2128	2977	21292
1977	377	166	3553	264	378	4822	463	262	237	3516	466	1657	2115	2973	21242
1978	382	167	3527	267	379	4806	463	263	239	3517	468	1657	2102	2971	21203
1979	387	169	3501	270	380	4791	464	264	242	3518	471	1656	2090	2968	21163
1980	392	170	3476	272	381	4776	464	265	244	3519	473	1655	2078	2966	21122
A	0.0122	0.0061	0.1866	0.0092	0.0161	0.2334	0.0208	0.0106	0.0083	0.1577	0.0187	0.0755	0.1080	0.1367	
B	0.0006	0.0002	-0.0020	0.0003	0.0002	-0.0007	0.0001	0.0002	0.0003	0.0008	0.0003	0.0003	-0.0009	0.0003	
RSQ	0.9039	0.5378	0.9360	0.6928	0.5470	0.6096	0.0838	0.4058	0.5734	0.8937	0.7872	0.7261	0.9075	0.8195	

SOURCE:

ESTIMATED FROM NATIONAL TOTAL AREA BASED ON W.EICHBERGER'S STUDY, 1966, AND IMPORTANCE OF THE CROP, FARM TYPES AND GOVERNMENT DEVELOPMENT PROGRAMS.

TABLE A-1.5. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AREA UNDER WHEAT BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 100 HECTARES)

EXPONENT IS 0.80

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
	AREA														
1961	1318	366	769	256	55	869	650	110	92	2535	137	961		1152	9172
1962	1362	378	795	265	57	889	672	114	104	2620	142	984		1178	9462
1963	1406	385	790	279	58	905	674	116	106	2668	144	992		1107	9632
1964	1414	394	789	279	67	904	664	115	106	2703	154	952		1077	9622
1965	1474	405	801	297	69	920	673	119	119	2789	158	969		1098	9892
1966	1518	425	810	304	81	941	678	121	121	2834	172	1002		11[illegible]	1[illegible]24
1967	1542	429	817	306	82	939	684	123	123	2859	184	1011		1113	10212
1968	1582	445	817	321	83	951	682	124	124	2895	186	1013		1117	10345
1969	1603	458	812	323	83	947	677	115	135	2946	198	1010		1103	10414
1970	1618	473	820	326	95	946	683	116	137	2995	200	1019		1114	10542
1971	1663	477	824	338	96	964	684	121	141	3034	208	1018		1121	10693
1972	1694	487	827	345	100	972	686	122	146	3078	215	1022		1125	10822
1973	1724	498	830	352	105	978	687	122	150	3118	222	1026		1127	10944
1974	1755	508	833	359	109	984	688	123	154	3155	229	1029		1130	11[illegible]64
1975	1785	518	835	367	113	990	688	123	159	3200	236	103[illegible]		1132	11.84
1976	1815	529	838	374	117	996	689	124	163	3241	243	1035		1135	11303
1977	1846	539	840	381	121	1003	690	124	167	3282	251	1038		1137	11424
1978	1875	549	842	388	125	1008	690	124	172	3320	258	1040		1138	11530
1979	1905	560	844	395	13[illegible]	1014	690	125	176	3361	265	1043		1140	11653
1980	1934	570	846	402	134	1019	690	125	180	3400	272	1045		1141	11763
A	0.1409	0.0382	0.0854	0.0273	0.0051	0.0960	0.0727	0.0124	0.0098	0.2752	0.0134	0.1057		0.1177	
B	0.0021	0.0009	-0.0012	0.0006	0.0006	-0.0008	-0.0013	-0.0002	0.0005	0.0013	0.0009	-0.0015		-0.0[illegible]5	
RSC	0.9759	0.9124	0.9700	0.9363	0.9067	0.9060	0.9762	0.4360	0.9029	0.7183	0.9348	0.8460		0.9488	

SOURCE:

ESTIMATED FROM NATIONAL TOTAL AREA BASED ON W.EICHBERGER'S STUDY, 1966, AND IMPORTANCE OF THE CROP, FARM TYPES AND GOVERNMENT DEVELOPMENT PROGRAMS.

TABLE A-1.3. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AREA UNDER PULSES BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 100 HECTARES)

EXPONENT IS 0.80

YEAR	AREA														
	ARUSSI	BALE	BEGENDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1961	280	35	728	126	63	910	504	84	91	1834	161	490	196	1498	6986
1962	298	35	731	128	64	916	511	85	92	1860	163	497	199	1519	7093
1963	314	44	723	131	66	912	504	102	109	1920	175	504	197	1569	7263
1964	310	37	754	133	67	953	532	89	96	1944	177	510	200	1589	7383
1965	323	38	767	135	68	963	526	98	105	1985	188	511	211	1632	7543
1966	332	46	772	139	62	973	540	100	108	2038	193	525	216	1675	7712
1967	337	46	757	145	69	949	520	107	115	2027	191	513	214	1660	7644
1968	334	53	745	144	76	935	517	106	114	2014	190	494	228	1649	759[illegible]
1969	329	54	758	146	84	935	521	107	115	2038	191	498	222	1662	7653
1970	328	53	764	145	84	939	512	107	115	2039	199	496	221	1657	7654
1971	347	56	769	150	82	954	524	113	121	2094	204	505	229	1711	7854
1972	351	58	772	152	84	956	525	115	123	2113	208	504	232	1726	7914
1973	355	60	774	154	86	957	525	118	126	2132	211	504	235	1742	7974
1974	360	62	779	157	88	960	526	120	128	2154	215	504	239	1759	8044
1975	365	64	760	159	90	961	526	123	131	2173	219	503	242	1774	8104
1976	369	66	783	161	92	963	526	125	133	2192	222	503	245	1790	8163
1977	374	69	785	163	94	964	527	127	136	2211	226	502	248	1805	8223
1978	378	71	787	165	96	966	527	130	138	2230	229	502	251	1820	8282
1979	383	73	790	167	98	967	527	132	140	2250	233	501	254	1836	8343
1980	387	75	792	169	100	969	527	134	143	2269	236	501	257	1851	8403
A	0.0409	0.0043	0.1040	0.0175	0.0081	0.1315	0.0732	0.0117	0.0127	0.2610	0.0226	0.0719	0.0269	0.2137	
B	0.0005	0.0004	-0.0009	0.0002	0.0004	-0.0015	-0.0010	0.0004	0.0004	0.0008	0.0005	-0.0011	0.0003	0.0006	
RSQ	0.5075	0.7075	0.6436	0.6684	0.4216	0.8171	0.7832	0.5581	0.5566	0.8324	0.8770	0.9264	0.4179	0.6393	

SOURCE:

ESTIMATED FROM NATIONAL TOTAL AREA BASED ON W.EICHBERGER'S STUDY, 1966, AND IMPORTANCE OF THE CROP, FARM TYPES AND GOVERNMENT DEVELOPMENT PROGRAMS.

TABLE A-1.7. ESTIMATED ANNUAL HISTORICAL (1961 TO 1978) AND PROJECTED AREA UNDER OILSEEDS BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 100 HECTARES)

EXPONENT IS 0.80

	AREA															
YEAR	ARUSSI	BALE	BEGENDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1961	108	7	1436	351	7	1450	486	40	67	1025	54	452	135	1119	6728
1962	117	14	1468	357	7	1475	501	41	75	1029	55	460	137	1132	6858
1963	122	7	1547	387	7	1511	544	43	79	1060	57	487	143	1182	7171
1964	124	15	1582	395	7	1523	571	44	81	1076	59	505	154	1201	7330
1965	125	15	1616	399	7	1513	576	52	81	1085	59	509	155	1196	7380
1966	133	16	1730	431	8	1589	626	55	86	1143	70	532	164	1253	7831
1967	140	16	1750	428	8	1540	622	54	86	1136	70	537	171	1229	7781
1968	142	24	1789	449	8	1537	630	63	102	1127	87	535	181	1214	7880
1969	144	32	1829	465	8	1548	650	64	104	1139	88	545	192	1219	8023
1970	148	41	1882	485	8	1578	666	66	107	1167	90	551	205	1233	8220
1971	153	35	1928	491	8	1576	694	69	109	1176	93	570	204	1253	8355
1972	157	38	1974	505	8	1582	713	72	113	1188	97	580	212	1261	8493
1973	161	42	2018	518	9	1586	731	75	117	1198	102	589	219	1267	8621
1974	165	45	2062	531	9	1589	749	78	121	1209	106	598	226	1273	8753
1975	169	48	2109	544	9	1594	768	82	125	1220	111	608	233	1280	8892
1976	173	51	2154	558	9	1597	787	85	129	1231	115	617	241	1285	9024
1977	176	54	2196	570	9	1598	804	88	133	1239	119	626	248	1289	9143
1978	180	58	2241	584	9	1600	823	91	137	1249	124	635	255	1294	9272
1979	184	61	2284	597	9	1600	841	94	141	1258	128	643	262	1297	9394
1980	188	64	2330	610	10	1601	860	97	145	1267	133	653	270	1302	9525
A	0.0160	0.0001	0.2081	0.0502	0.0010	0.2223	0.0713	0.0051	0.0095	0.1533	0.0065	0.0677	0.0182	0.1718	
B	0.0003	0.0006	0.0033	0.0013	0.0000	-0.0049	0.0017	0.0005	0.0005	-0.0018	0.0007	0.0001	0.0009	-0.0032	
RSQ	0.8151	0.7248	0.9489	0.9136	0.0000	0.9820	0.9046	0.8696	0.7310	0.9380	0.7688	0.0283	0.8571	0.9243	

SOURCE:

ESTIMATED FROM NATIONAL TOTAL AREA BASED ON W.EICHBERGER'S STUDY, 1966, AND IMPORTANCE OF THE CROP, FARM TYPES AND GOVERNMENT DEVELOPMENT PROGRAMS.

TABLE A-2. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AVERAGE YIELDS OF CEREALS, PULSES AND OILSEEDS IN ETHIOPIA, THROUGH 1980
(UNIT: KILOGRAMS PER HECTARE)

EXPONENT

YEAR	AVERAGE YIELDS						
	BARLEY	CORN	SORGHUM	TEFF	WHEAT	PULSES	OIL SEEDS
1961	800	900	800	550	700	740	490
1962	800	900	800	550	700	740	490
1963	810	900	800	550	710	740	480
1964	820	990	810	590	720	750	480
1965	830	1000	810	590	730	750	480
1966	840	1010	820	600	730	750	480
1967	840	1010	820	600	730	750	500
1968	870	1010	840	610	730	750	510
1969	870	1010	850	610	730	750	510
1970	870	1030	850	630	740	750	510
1971	888	1057	860	639	744	754	514
1972	899	1070	869	649	748	755	519
1973	909	1083	878	658	751	756	524
1974	920	1096	887	668	755	757	529
1975	932	1108	897	678	758	758	534
1976	943	1121	907	688	762	759	539
1977	954	1133	917	698	765	760	545
1978	966	1145	927	708	768	761	550
1979	977	1157	938	719	772	762	556
1980	989	1169	949	729	775	763	562
A	791.51	873.20	792.28	545.08	691.25	738.48	478.20
B	5.4314	26.9617	2.3599	5.3598	4.3935	2.2342	1.2601
RSQ	0.9554	0.7984	0.9444	0.8912	0.1247	0.6694	0.6020

SOURCE:

"STATISTICAL ABSTRACT", CENTRAL STATISTICAL OFFICE ETHIOPIA, 1965 TO 1970.
"WORLD CROP STATISTICS AREA, PRODUCTION AND YIELD", FAO, ROME, 1966 TO 1970.

BARLEY AT 1.20; SORGHUM AND OILSEEDS AT 1.40; TEFF 1.10; OTHERS AT 0.80.

TABLE A-2.1. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AVERAGE YIELD OF BARLEY BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: KILOGRAMS PER HECTARE)

EXPONENT IS 1.20

	AVERAGE YIELD PER HECTARE													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GERU GOFFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1961	940	1070	740	330	670	870	720	600	690	820	620	500	890	920
1962	940	1040	740	330	670	870	700	610	690	820	620	500	910	920
1963	950	1050	740	340	670	890	730	620	710	830	640	520	890	930
1964	980	1070	740	340	660	910	720	610	620	850	640	530	900	940
1965	980	1080	750	340	670	920	750	620	670	860	650	530	940	950
1966	1000	1100	760	350	680	920	750	630	610	870	660	550	950	970
1967	1010	1260	750	360	680	930	760	620	700	860	670	550	950	960
1968	1050	1090	780	380	700	960	780	640	750	900	700	570	980	1000
1969	1050	1090	770	410	730	960	760	610	750	910	710	580	980	1000
1970	1050	1080	780	410	730	950	780	640	750	890	700	570	1000	1000
1971	1060	1135	783	416	729	981	792	637	743	920	724	595	1014	1020
1972	1098	1143	788	428	737	993	802	640	753	932	737	606	1030	1032
1973	1116	1151	793	441	746	1006	811	642	763	944	751	618	1045	1044
1974	1133	1158	798	453	754	1018	821	645	773	955	764	630	1061	1056
1975	1152	1166	804	467	763	1032	831	647	784	968	778	642	1077	1069
1976	1170	1173	808	480	771	1044	840	649	794	980	792	654	1093	1081
1977	1190	1180	813	494	780	1058	850	652	804	992	806	667	1110	1094
1978	1210	1188	818	508	790	1072	861	654	816	1006	822	680	1128	1108
1979	1229	1195	822	523	798	1086	871	656	826	1018	837	693	1144	1121
1980	1249	1201	827	538	807	1099	881	658	837	1031	852	706	1161	1133
A	0.0907	0.1034	0.0715	0.0308	0.0637	0.0848	0.0691	0.0592	0.0640	0.0796	0.0597	0.0486	0.0860	0.0890
B	0.0002	-0.0003	-0.0002	0.0003	-0.0000	-0.0000	-0.0000	-0.0002	0.0000	-0.0000	0.0002	0.0002	0.0001	-0.0000
RSQ	0.4831	0.0820	0.7370	0.7282	0.0328	0.0007	0.0389	0.5838	0.0003	0.0003	0.7271	0.5940	0.1610	0.0831

SOURCE:

ESTIMATED FROM NATIONAL AVERAGE YIELD BASED ON PROVINCIAL OFFICIAL ESTIMATE, AND USE OF IMPROVED SEEDS, CULTURAL PRACTICES AND FERTILIZERS.

TABLE A-2.2. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AVERAGE YIELD OF CORN BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: KILOGRAMS PER HECTARE)

EXPONENT IS 0.80

YEAR	ARUSSI	BALE	BEGENDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBA BOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
	AVERAGE YIELD PER HECTARE													
1961	1051	1001	991	550	901	851	851	841	891	901	931	851	931	951
1962	1052	871	992	561	891	871	861	851	891	901	921	851	932	891
1963	950	870	1020	570	870	900	860	880	900	870	940	830	940	900
1964	1042	1001	1142	531	921	1042	931	971	1001	971	1022	901	1042	1052
1965	1040	1000	1100	550	930	1030	940	1000	1020	990	1030	900	1050	1130
1966	1059	999	1099	560	919	1009	969	999	1019	999	1049	909	1069	1079
1967	1061	1001	1071	590	911	1041	981	981	1011	1011	1051	901	1071	1071
1968	1059	999	1069	580	899	1039	989	979	999	1009	1039	919	1079	1069
1969	1011	1001	1071	600	911	1041	1001	951	1011	1001	1041	921	1091	1071
1970	1100	1000	1010	610	950	1040	1010	940	1010	1000	1030	920	1090	1070
1971	1055	1020	1082	601	928	1104	1043	1010	1055	1042	1081	938	1138	1133
1972	1054	1027	1085	605	930	1124	1060	1021	1067	1054	1092	945	1155	1150
1973	1055	1034	1088	610	932	1144	1077	1033	1080	1067	1105	953	1174	1167
1974	1055	1042	1092	615	934	1164	1095	1045	1093	1080	1117	961	1192	1185
1975	1055	1048	1095	619	936	1184	1112	1056	1106	1092	1129	968	1210	1202
1976	1054	1055	1097	623	937	1203	1129	1067	1118	1104	1141	975	1227	1219
1977	1054	1061	1100	628	939	1223	1146	1078	1131	1116	1152	982	1245	1236
1978	1053	1067	1102	631	939	1242	1162	1088	1143	1128	1163	988	1262	1253
1979	1052	1073	1104	636	941	1261	1179	1100	1155	1140	1175	995	1280	1270
1980	1051	1079	1106	640	941	1280	1195	1110	1167	1151	1186	1001	1297	1286
A	0.0844	0.0751	0.0836	0.0437	0.0725	0.0694	0.0670	0.0699	0.0721	0.0715	0.0749	0.0681	0.0738	0.0740
B	-0.0015	-0.0005	-0.0011	-0.0002	-0.0011	0.0012	0.0009	0.0002	0.0003	0.0003	0.0001	-0.0003	0.0009	0.0008
RSQ	0.4288	0.1139	0.4344	0.0286	0.6112	0.5941	0.7727	0.0206	0.2929	0.2672	0.1165	0.2779	0.9539	0.2605

SOURCE:

ESTIMATED FROM NATIONAL AVERAGE YIELD BASED ON PROVINCIAL OFFICIAL ESTIMATE AND USE OF IMPROVED SEEDS, CULTURAL PRACTICES AND FERTILIZERS.

TABLE A-2.3. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AVERAGE YIELD OF SORGHUM BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: KILOGRAMS PER HECTARE)

EXPONENT IS 1.40

AVERAGE YIELD PER HECTARE

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBA BOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1961	601	851	781	490	681	721	951	651	711	711	721	581	921	1141
1962	631	791	771	500	681	721	941	651	711	711	721	581	931	1151
1963	639	789	769	500	689	719	949	659	709	709	739	579	919	1149
1964	651	791	801	500	691	731	961	651	651	721	731	601	941	1161
1965	670	790	830	520	690	730	950	650	640	700	770	590	920	1170
1966	820	860	850	530	700	720	960	630	710	720	800	570	940	1180
1967	838	808	828	539	708	738	977	658	698	758	798	598	937	1177
1968	840	870	850	540	720	750	970	640	700	780	810	620	940	1180
1969	850	870	890	580	730	740	970	680	780	770	780	630	980	1140
1970	851	871	871	570	751	761	961	681	781	801	801	621	991	1151
1971	953	879	906	595	750	757	974	669	762	805	831	631	983	1163
1972	1003	890	925	610	760	762	976	672	774	820	846	638	992	1162
1973	1057	902	945	626	770	767	978	674	786	836	861	646	1001	1161
1974	1113	913	965	643	781	772	979	676	799	852	876	653	1009	1159
1975	1171	924	985	660	791	776	980	678	811	869	892	660	1018	1156
1976	1234	937	1007	678	803	781	981	680	825	887	909	669	1027	1153
1977	1298	949	1029	696	814	785	981	681	838	904	925	676	1035	1148
1978	1366	961	1052	716	825	789	981	682	852	923	942	684	1044	1143
1979	1437	974	1077	736	837	793	980	683	867	942	961	693	1053	1137
1980	1511	987	1101	757	849	797	979	684	882	962	979	701	1062	1130
A	0.0579	0.0767	0.0742	0.0468	0.0649	0.0691	0.0914	0.0622	0.0650	0.0669	0.0699	0.0554	0.0881	0.1115
B	0.0008	-0.0000	0.0001	0.0001	-0.0000	-0.0001	-0.0003	-0.0002	0.0000	0.0001	0.0000	-0.0000	-0.0001	-0.0004
RSQ	0.7931	0.0258	0.3097	0.8150	0.0777	0.6312	0.8867	0.4864	0.0014	0.2063	0.0538	0.0840	0.4294	0.8009

SOURCE:

ESTIMATED FROM NATIONAL AVERAGE YIELD BASED ON PROVINCIAL OFFICIAL ESTIMATE AND USE OF IMPROVED SEEDS, CULTURAL PRACTICES AND FERTILIZERS.

TABLE A-2.4. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AVERAGE YIELD OF TEFF BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: KILOGRAMS PER HECTARE)

EXPONENT IS 1.10

YEAR	AVERAGE YIELD PER HECTARE													
	ARUSSI	BALE	BEGENDER	ERITREA	GENU GOFFA	GOJAM	HARAR	ILLUBA BOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1961	629	459	499	379	379	629	469	349	369	649	349	459	459	589
1962	680	450	500	440	380	620	470	350	360	650	350	450	460	590
1963	628	469	499	439	359	628	499	349	369	648	329	449	469	588
1964	681	511	541	411	381	671	481	381	401	701	350	471	511	631
1965	672	511	541	471	381	672	481	431	391	702	381	471	501	632
1966	729	599	539	539	389	679	509	489	399	709	509	469	499	639
1967	670	680	540	480	380	670	540	450	470	720	540	460	500	640
1968	688	698	559	499	399	678	519	459	429	728	549	469	499	648
1969	690	700	550	500	360	670	550	560	490	740	520	470	510	650
1970	711	721	571	521	370	691	541	521	521	771	541	481	521	681
1971	711	794	575	548	372	696	556	573	519	775	615	473	525	680
1972	716	840	582	564	369	701	565	603	540	788	652	473	530	689
1973	719	886	588	579	365	704	573	633	560	801	690	472	534	696
1974	722	935	595	596	361	708	581	664	582	814	729	470	538	704
1975	725	986	601	612	356	711	590	697	604	826	771	468	542	712
1976	727	1038	606	629	350	714	598	730	626	839	813	466	545	719
1977	729	1092	612	647	349	716	607	765	650	852	857	463	549	727
1978	729	1147	617	664	338	718	614	800	673	864	902	459	552	733
1979	729	1204	622	681	330	718	622	836	697	876	948	455	554	739
1980	729	1263	626	699	322	719	630	874	722	888	996	450	556	745
A	0.0987	0.0630	0.0760	0.0616	0.0579	0.0960	0.0708	0.0495	0.0521	0.0978	0.0468	0.0694	0.0709	0.0893
B	-0.0010	0.0022	-0.0005	0.0003	-0.0010	-0.0010	-0.0003	0.0013	0.0007	-0.0004	0.0019	-0.0009	-0.0006	-0.0006
RSQ	0.7020	0.8642	0.6775	0.6670	0.9110	0.8482	0.2722	0.7088	0.4638	0.5026	0.6807	0.9101	0.6533	0.7473

SOURCE:

ESTIMATED FROM NATIONAL AVERAGE YIELD BASED ON PROVINCIAL OFFICIAL ESTIMATE, AND USE OF IMPROVED SEEDS, CULTURAL PRACTICES AND FERTILIZERS.

TABLE A-2.5. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AVERAGE YIELD OF WHEAT BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: KILOGRAMS PER HECTARE)

EXPONENT IS 0.80

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
	AVERAGE YIELD PER HECTARE													
1961	789	702	651	375	828	665	563	582	554	856	657	501		647
1962	792	701	649	400	807	663	561	640	510	856	655	485		651
1963	793	712	658	441	828	657	568	647	519	872	667	517		645
1964	799	739	668	498	821	667	574	600	519	872	675	532		663
1965	818	748	685	485	841	683	579	605	487	880	684	529		670
1966	823	748	684	487	728	676	566	612	554	887	645	531		67
1967	821	746	674	487	732	674	566	602	602	886	647	530		669
1968	816	746	674	470	723	667	576	605	605	852	651	529		669
1969	821	746	683	471	726	658	573	661	559	890	613	520		668
1970	834	742	685	479	737	677	571	672	569	909	665	513		673
1971	835	761	691	510	708	673	579	646	585	907	643	532		677
1972	839	765	695	518	697	674	576	649	591	911	641	535		680
1973	843	770	698	526	686	675	577	653	597	916	639	537		683
1974	847	774	701	534	676	675	577	657	603	920	637	539		685
1975	851	778	704	542	665	676	578	660	608	924	635	541		687
1976	855	783	708	550	695	677	579	664	614	928	633	543		689
1977	859	787	711	558	644	677	580	667	620	932	631	545		691
1978	863	791	714	565	634	678	580	671	625	936	629	547		694
1979	866	795	717	573	624	679	581	674	631	940	627	549		696
1980	870	799	720	580	614	679	582	677	636	944	626	551		698
A	779.04	697.71	645.28	394.99	862.26	663.02	563.16	593.42	500.80	845.77	672.03	501.33	0.00	644.16
B	8.2768	9.2549	6.7731	16.8673	-22.5975	1.4906	1.7164	7.6535	12.3256	8.9781	-4.2312	4.5559	0.0000	4.8883
RSQ	0.8536	0.6892	0.7233	0.5240	0.6321	0.0949	0.2685	0.2029	0.3135	0.9265	0.1472	0.2712	0.0000	0.7708

SOURCE:

ESTIMATED FROM NATIONAL AVERAGE YIELD BASED ON PROVINCIAL OFFICIAL ESTIMATE, AND USE OF IMPROVED SEEDS, CULTURAL PRACTICES AND FERTILIZERS.

TABLE A-2.6. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AVERAGE YIELD OF PULSES BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: KILOGRAMS PER HECTARE)

EXPONENT IS 0.80

YEAR	ARUSSI	BALE	BEGENDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBA BOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
	AVERAGE YIELD PER HECTARE													
1961	758	738	778	289	649	768	818	798	519	768	709	619	689	738
1962	740	740	780	290	660	770	820	800	510	760	710	620	680	740
1963	740	610	800	290	650	790	830	690	490	760	710	620	710	740
1964	770	760	790	290	660	770	810	880	570	770	720	630	720	750
1965	751	891	791	300	591	771	831	811	541	781	691	641	721	751
1966	751	761	791	290	741	771	811	871	541	781	721	641	721	751
1967	749	739	799	280	669	789	829	799	499	769	719	639	719	749
1968	750	750	800	280	670	790	820	800	500	780	720	650	700	750
1969	770	740	800	270	620	790	810	800	550	770	750	650	720	750
1970	769	749	789	280	679	779	809	799	549	779	719	639	729	759
1971	764	768	801	276	668	788	814	818	539	780	731	653	730	758
1972	765	772	802	275	669	790	813	820	541	782	733	656	733	759
1973	766	775	803	273	670	791	812	822	543	783	735	659	736	760
1974	768	778	804	271	672	792	811	824	545	784	737	662	739	762
1975	769	781	806	270	673	794	810	826	547	785	739	665	742	763
1976	770	785	807	268	674	795	809	828	549	786	742	668	745	765
1977	772	788	808	266	675	796	808	830	551	788	744	670	748	766
1978	773	791	809	265	677	798	807	832	553	789	746	673	751	767
1979	774	794	811	263	678	799	806	834	555	790	748	676	754	769
1980	775	797	812	262	679	800	805	836	557	791	750	679	757	770
A	0.0776	0.0753	0.0815	0.0311	0.0676	0.0801	0.0861	0.0822	0.0533	0.0795	0.0730	0.0639	0.0717	0.0768
B	-0.0001	0.0004	-0.0001	-0.0005	-0.0000	-0.0001	-0.0006	0.0001	0.0002	-0.0001	0.0001	0.0003	0.0003	-0.0000
RSQ	0.0086	0.0155	0.0097	0.6674	0.0001	0.0032	0.2562	0.0009	0.0203	0.0359	0.0181	0.3468	0.1608	0.0042

SOURCE:

ESTIMATED FROM NATIONAL AVERAGE YIELD BASED ON PROVINCIAL OFFICIAL ESTIMATE, AND USE OF IMPROVED SEEDS, CULTURAL PRACTICES AND FERTILIZERS.

TABLE A-2.7. ESTIMATED ANNUAL HISTORICAL (1961 TO 1970) AND PROJECTED AVERAGE YIELD OF OILSEEDS BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: KILOGRAMS PER HECTARE)

EXPONENT IS 1.40

	AVERAGE YIELD PER HECTARE													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFFA	GOJAM	HARAR	ILLUBA BOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1961	429	429	528	339	429	508	498	498	488	518	369	429	538	469
1962	399	499	529	339	429	509	499	489	449	529	359	419	539	469
1963	389	429	519	339	429	509	459	489	479	519	419	399	529	449
1964	390	470	520	330	570	510	460	480	480	520	360	400	530	450
1965	400	470	510	340	570	510	460	480	520	520	360	410	520	450
1966	419	499	509	329	499	519	459	469	479	519	369	419	519	449
1967	411	752	532	351	501	542	481	501	501	532	391	421	542	471
1968	419	499	539	359	499	549	499	509	469	549	369	429	529	499
1969	449	499	538	359	499	548	489	518	509	558	419	419	509	499
1970	450	510	550	350	500	540	490	580	500	560	420	420	550	490
1971	448	576	544	359	534	558	486	547	506	563	413	423	528	499
1972	455	592	547	362	543	565	487	557	510	569	419	424	526	505
1973	462	609	550	365	552	572	487	567	513	576	426	424	525	511
1974	470	627	553	369	562	581	488	579	517	583	433	425	523	519
1975	478	646	557	372	572	589	499	590	522	591	440	426	521	526
1976	486	665	560	376	583	597	490	602	525	598	448	427	519	533
1977	495	685	563	379	594	606	490	614	529	605	455	427	516	540
1978	504	707	567	383	605	615	491	627	534	614	463	428	514	548
1979	513	729	571	387	617	624	491	641	538	622	472	428	511	556
1980	523	751	574	391	629	633	491	654	542	630	480	429	508	564
A	0.0620	0.0720	0.0812	0.0524	0.0732	0.0789	0.0746	0.0741	0.0747	0.0805	0.0573	0.0648	0.0836	0.0707
B	0.0001	0.0004	-0.0001	-0.0000	0.0001	0.0000	-0.0002	0.0001	-0.0001	0.0000	0.0001	-0.0001	-0.0003	0.0000
RSQ	0.0635	0.0648	0.3158	0.0665	0.0140	0.0505	0.2834	0.1353	0.0463	0.0004	0.0220	0.4159	0.6881	0.0098

SOURCE:

ESTIMATED FROM NATIONAL AVERAGE YIELD BASED ON PROVINCIAL OFFICIAL ESTIMATE, AND USE OF IMPROVED SEEDS, CULTURAL PRACTICES AND FERTILIZERS.

APPENDIX B

ESTIMATED AND PROJECTED POPULATION, PER CAPITA

DEMAND AND AGGREGATE DEMAND BY SECTORS

AND PROVINCES IN ETHIOPIA

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TABLE 8-1. ESTIMATED ANNUAL HISTORICAL (1965 TO 1970) AND PROJECTED RURAL FARM POPULATION BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 10 PERSONS)

LOGARITHM PROJECTION

	FARM POPULATION															
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1965	100788	13088	120680	126904	76635	140704	299366	58055	59228	292120	135553	207007	129359	283842	2043323
1966	101590	13259	121398	125788	77752	143086	304031	59974	60104	295951	135937	209060	130717	286992	2065634
1967	103734	13561	123965	128445	79393	146116	309363	61883	61603	302113	138806	213449	133476	293062	2108963
1968	105704	13811	126305	130805	80903	148895	315792	62362	62242	307921	141435	217488	135375	298611	2147643
1969	106869	14010	127579	131149	82070	151219	319920	64170	63260	312079	142639	220099	137049	302389	2174502
1970	108710	14280	129690	132710	83640	154230	325880	65810	64410	317920	144870	224000	139310	307880	2213326
1971	109694	14438	130785	133218	84566	156050	329290	66956	65057	321278	145958	226147	140483	310959	2234873
1972	111186	14664	132483	134329	85886	158600	334234	68428	66007	326135	147717	229344	142302	315485	2266793
1973	112698	14893	134202	135450	87226	161192	339251	69932	66970	331064	149497	232586	144144	320077	2299174
1974	114230	15125	135943	136579	88586	163824	344341	71469	67946	336066	151297	235872	146010	324733	2332014
1975	115782	15362	137705	137716	89967	166499	349504	73039	68936	341140	153118	239202	147898	329453	2365312
1976	117355	15602	139489	138862	91369	169216	354744	74643	69941	346290	154960	242579	149810	334242	2399094
1977	118948	15845	141297	140017	92793	171978	360061	76282	70959	351517	156824	246003	151746	339099	2433366
1978	120563	16092	143126	141181	94238	174783	365455	77957	71993	356820	158709	249473	153706	344024	2468115
1979	122198	16343	144979	142354	95705	177633	370929	79668	73040	362201	160616	252990	155692	349019	2503365
1980	123856	16598	146855	143536	97195	180529	376483	81416	74103	367662	162546	256557	157701	354085	2539116
A	-3.0097	-5.0515	-2.8295	-2.7790	-3.2836	-2.6761	-1.9202	-3.5610	-3.5389	-1.9455	-2.7133	-2.2899	-2.7578	-1.9743	
B	-0.0006	0.0014	-0.0013	-0.0059	0.0013	0.0021	0.0007	0.0076	0.0003	0.0008	-0.0022	-0.0001	-0.0013	0.0003	
RSQ	-0.4826	0.1752	0.4577	0.7854	0.2874	0.8039	0.6300	0.7501	0.0404	-0.0002	0.9083	-0.0000	0.9601	-0.0967	

SOURCE:

HISTORICAL DATA BASED ON RURAL POPULATION SERIES FROM W. EICHBERGER'S STUDY FOR 1966, WITH ADJUSTMENTS TO CONFORM WITH TOTAL POPULATION ESTIMATES.

TABLE 8-2. ESTIMATED ANNUAL HISTORICAL (1965 TO 1970) AND PROJECTED RURAL NON-FARM POPULATION BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 10 PERSONS)

LOGARITHM PROJECTION

	NON-FARM POPULATION															
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1965	3110	400	3720	3920	2360	4340	9230	1790	1820	9020	4180	6390	3990	8760	63016
1966	3140	410	3750	3890	2400	4430	9400	1850	1860	9150	4200	6470	4040	8880	63856
1967	3211	420	3831	3971	2461	4501	9573	1911	1911	9353	4291	6602	4131	9063	65223
1968	3271	430	3912	4052	2501	4602	9774	1931	1931	9524	4372	6703	4192	9244	66[illegible]33
1969	3310	440	3949	4059	2540	4669	9909	1990	1970	9649	4409	6779	4249	9359	67272
1970	3370	450	4021	4111	2600	4761	10111	2040	2010	9841	4481	6901	4321	9541	68554
1971	3398	457	4053	4122	2626	4810	10210	2076	2034	9931	4510	6949	4357	9626	69153
1972	3446	467	4108	4157	2669	4886	10369	2124	2068	10080	4564	7038	4416	9768	70151
1973	3494	477	4163	4192	2713	4963	10530	2172	2103	10230	4619	7128	4475	9911	71162
1974	3543	487	4220	4227	2759	5042	10694	2222	2138	10383	4675	7219	4536	10057	72193
1975	3592	497	4277	4262	2804	5121	10860	2272	2174	10538	4730	73[illegible]	4597	10204	73233
1976	3641	508	4334	4297	2850	5201	11028	2324	2211	10694	4787	7404	4659	10353	74282
1977	3692	518	4392	4332	2898	5283	11199	2377	2248	10353	4844	7499	4721	10504	75351
1978	3743	529	4452	4369	2946	5366	11373	2431	2286	11015	4902	7595	4785	10658	76442
1979	3795	540	4512	4405	2994	5451	11549	2486	2324	11179	4960	7691	4850	10814	77544
1980	3848	552	4573	4441	3044	5536	11729	2543	2363	11345	5020	7790	4915	10972	78663
A	-3.0098	-5.0645	-2.3309	-2.7780	-3.2363	-2.6752	-1.9211	-3.5634	-3.5435	-1.9443	-2.7135	-2.2868	-2.7585	-1.9738	
B	-0.0005	0.0066	-0.0009	-0.0060	0.0022	0.0014	0.0011	0.0082	0.0024	0.0005	-0.0024	-0.0016	-0.0009	0.0003	
RSQ	-0.0001	0.6954	-0.0002	0.8064	0.4907	0.4249	0.7516	0.8026	0.4486	0.3118	0.8070	1.4204	0.8824	-0.0000	

SOURCE:

HISTORICAL DATA BASED ON RURAL POPULATION SERIES FROM W. EICHBERGER'S STUDY FOR 1966, WITH ADJUSTMENTS TO CONFORM WITH TOTAL POPULATION ESTIMATES.

TABLE B-3. ESTIMATED ANNUAL HISTORICAL (1965 TO 1970) AND PROJECTED URBAN POPULATION OF TOWNS 5000 AND UNDER BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 10 PERSONS)

LOGARITHM PROJECTION

5000 AND UNDER URBAN POPULATION

YEAR	ARUSSI	BALE	GEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1965	2130	1210	2710	2980	2030	3540	4340	1590	1030	8300	3100	2630	2060	1860	39496
1966	2700	1240	2670	3530	2160	3510	4510	1660	1050	8550	3950	2690	2470	2200	42876
1967	2748	1269	2728	3618	2199	3578	5167	1739	1369	8724	4037	2748	2868	2249	45035
1968	2810	1290	2780	3670	2250	3650	5270	1770	890	8400	4120	2810	2920	2290	44906
1969	3420	1410	2980	4330	2510	3930	6150	1980	1100	9230	5030	3070	3690	2690	51486
1970	3649	1420	2959	4529	2540	3899	6489	2020	1060	9088	5389	3079	4079	2819	53013
1971	3972	1447	2984	4832	2624	3940	6965	2092	1041	9132	5877	3145	4595	3003	55643
1972	4336	1483	3021	5170	2719	3996	7504	2177	1027	9207	6432	3223	5194	3212	58692
1973	4728	1517	3055	5525	2814	4047	8075	2263	1011	9272	7031	3299	5863	3431	61923
1974	5147	1550	3085	5895	2907	4093	8676	2348	994	9322	7673	3371	6609	3659	65323
1975	5596	1581	3110	6281	2999	4133	9307	2432	975	9339	8362	3440	7438	3894	68903
1976	6075	1611	3132	6684	3090	4168	9972	2517	956	9363	9101	3505	8361	4143	72495
1977	6585	1639	3149	7101	3179	4197	10669	2601	936	9394	9890	3567	9383	4400	76684
1978	7129	1665	3162	7534	3266	4221	11397	2683	915	9391	10732	3624	10516	4666	80894
1979	7706	1689	3170	7982	3351	4238	12158	2764	893	9375	11630	3677	11768	4940	85332
1980	8317	1711	3173	8444	3433	4249	12951	2844	870	9345	12584	3725	13151	5223	90013
A	-2.9144	-3.4796	-2.6735	-2.5778	-2.9628	-2.4061	-2.2603	-3.2191	-3.5386	-1.5249	-2.5399	-2.7045	-3.0115	-3.0494	
B	0.0402	-0.0233	-0.0351	0.0201	-0.0121	-0.0336	0.0270	-0.0078	-0.0619	-0.0394	0.0427	-0.0231	0.0749	0.0196	
RSQ	0.7965	0.8584	0.8584	0.7462	0.7628	0.8595	0.8094	0.5035	0.4683	0.9947	0.8088	0.8376	0.9810	0.7363	

SOURCE:

HISTORICAL DATA BASED ON PROVINCIAL URBAN POPULATION SERIES FROM ETHIOPIA STATISTICAL ABSTRACT 1965 TO 1970, WITH ADJUSTMENTS FOR 1965.

TABLE B-4. ESTIMATED ANNUAL HISTORICAL (1965 T/ 1970) AND PROJECTED URBAN POPULATION OF CITIES ABOVE 5000 BY PROVINCES IN ETHIOPIA, THROUGH 1980
(UNIT: 10 PERSONS)

LOGARITHM PROJECTION

ABOVE 5000 URBAN POPULATION

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1965	1043	682	2817	16151	114	3275	9523	741	3675	57780	3792	6238	1784	6141	113745
1966	1374	727	4284	19723	128	3365	9993	788	3920	61664	5012	7861	2203	7527	128562
1967	1390	730	4320	22932	147	3400	10081	790	3960	76765	5060	7941	2520	7611	147643
1968	1420	750	4410	24222	155	3470	10291	810	4550	81505	5160	8091	2570	7761	155161
1969	1640	780	5480	28930	170	3550	10610	840	4740	94180	5980	9150	3060	8660	177756
1970	1800	800	6239	32997	200	3590	10819	860	5029	106169	6529	9849	3450	9249	197572
1971	1944	811	7038	37260	214	3605	10914	870	5289	118518	7063	10500	3840	9785	217642
1972	2115	827	7985	42324	235	3638	11078	886	5594	133079	7684	11258	4303	10411	241415
1973	2300	844	9051	48029	259	3669	11234	902	5911	149286	8352	12060	4818	11067	267771
1974	2499	860	10250	54455	285	3696	11382	917	6240	167318	9070	12907	5389	11754	297013
1975	2712	875	11598	61689	313	3720	11522	931	6582	187369	9841	13802	6023	12472	329443
1976	2942	890	13113	69828	344	3741	11654	945	6937	209658	10669	14748	6726	13224	365414
1977	3188	904	14815	78983	378	3760	11779	959	7306	234425	11559	15747	7506	14012	405314
1978	3453	919	16726	89277	414	3777	11898	972	7689	261936	12514	16801	8371	14835	449575
1979	3737	932	18871	100845	454	3790	12009	985	8087	292481	13539	17915	9328	15697	498665
1980	4042	946	21279	113841	497	3802	12114	997	8500	326386	14639	19090	10389	16599	553115
A	-4.6107	-5.0352	-3.6150	-1.9565	-6.9058	-3.4649	-2.3968	-4.9509	-3.4091	-0.7186	-3.3178	-2.8194	-4.1345	-2.8360	
B	-0.0146	-0.0788	0.0270	0.0282	-0.0021	-0.0900	-0.0843	-0.0808	-0.0432	0.0166	-0.0149	-0.0295	0.0147	-0.0372	
RSQ	0.1937	0.9788	0.2393	0.9030	0.0355	0.9860	0.9858	0.9813	0.7734	0.5920	0.1952	0.5919	0.4917	0.7571	

SOURCE:

HISTORICAL DATA BASED ON PROVINCIAL URBAN POPULATION SERIES FROM ETHIOPIA STATISTICAL ABSTRACT 1965 TO 1970, WITH ADJUSTMENTS FOR 1965.

TABLE B-5.1. PROJECTED PER CAPITA DEMAND FOR BARLEY IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0020

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	8213	4030	4615	982	1755	6364	1259	1853	1664	2789	598	1365	1586	3003
1967	8229	4038	4624	984	1759	6377	1258	1857	1667	2795	599	1368	1589	3009
1968	8246	4046	4633	986	1762	6389	1260	1860	1671	2800	600	1370	1592	3015
1969	8262	4054	4643	988	1766	6402	1263	1864	1674	2806	602	1373	1596	3021
1970	8279	4062	4652	990	1769	6415	1265	1868	1677	2811	603	1376	1599	3027
1971	8295	4070	4661	992	1773	6428	1268	1872	1681	2817	604	1379	1602	3033
1972	8312	4079	4671	994	1776	6441	1270	1875	1684	2823	605	1381	1605	3039
1973	8329	4087	4680	996	1780	6454	1273	1879	1687	2828	606	1384	1608	3045
1974	8345	4095	4689	998	1783	6467	1275	1883	1691	2834	608	1387	1612	3051
1975	8362	4103	4699	1000	1787	6479	1278	1887	1694	2840	609	1390	1615	3057
1976	8379	4111	4708	1002	1790	6492	1280	1890	1698	2845	610	1393	1618	3064
1977	8395	4120	4718	1004	1794	6505	1283	1894	1701	2851	611	1395	1621	3070
1978	8412	4128	4727	1006	1798	6518	1285	1898	1704	2857	613	1398	1624	3076
1979	8429	4136	4736	1008	1801	6531	1288	1902	1708	2862	614	1401	1628	3082
1980	8446	4144	4746	1010	1805	6544	1291	1906	1711	2868	615	1404	1631	3088

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE 8-5.2. PROJECTED PER CAPITA DEMAND FOR CORN IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0020

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO
1966	1972	1114	2278	2567	4803	1335	2159	2967	3698	2584	5423	2623	2890	1377
1967	1976	1116	2283	2572	4813	1338	2163	2973	3705	2589	5434	2628	2896	1380
1968	1980	1118	2287	2577	4822	1340	2168	2979	3713	2594	5445	2634	2902	1383
1969	1984	1121	2292	2582	4832	1343	2172	2985	3720	2600	5456	2639	2907	1385
1970	1988	1123	2296	2588	4842	1346	2176	2991	3728	2605	5467	2644	2913	1388
1971	1992	1125	2301	2593	4851	1348	2181	2997	3735	2610	5477	2649	2919	1391
1972	1996	1127	2305	2598	4861	1351	2185	3003	3743	2615	5488	2655	2925	1394
1973	2000	1130	2310	2603	4871	1354	2189	3009	3750	2620	5499	2660	2931	1396
1974	2004	1132	2315	2608	4880	1357	2194	3015	3758	2626	5510	2665	2937	1399
1975	2008	1134	2319	2614	4890	1359	2198	3021	3765	2631	5521	2671	2942	1402
1976	2012	1136	2324	2619	4900	1362	2203	3027	3773	2636	5532	2676	2948	1405
1977	2016	1139	2329	2624	4910	1365	2207	3033	3780	2641	5543	2681	2954	1408
1978	2020	1141	2333	2629	4920	1367	2211	3039	3788	2647	5555	2687	2960	1410
1979	2024	1143	2338	2635	4929	1370	2216	3045	3795	2652	5566	2692	2966	1413
1980	2028	1146	2343	2640	4939	1373	2220	3051	3803	2657	5577	2697	2972	1416

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE 8-5.3. PROJECTED PER CAPITA DEMAND FOR SORGHUM IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0020

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	458	1074	5007	5226	2552	4488	5534	2047	2473	1892	2323	3106	3608	3608
1967	459	1076	5017	5236	2557	4497	5545	2051	2478	1896	2328	3112	3615	3615
1968	460	1078	5027	5247	2562	4506	5556	2055	2483	1900	2332	3118	3622	3622
1969	461	1080	5037	5257	2567	4515	5567	2059	2488	1903	2337	3125	3630	3630
1970	462	1083	5047	5268	2572	4524	5578	2063	2493	1907	2342	3131	3637	3637
1971	463	1085	5057	5278	2578	4533	5590	2068	2498	1911	2346	3137	3644	3644
1972	464	1087	5067	5289	2583	4542	5601	2072	2503	1915	2351	3143	3652	3652
1973	464	1089	5078	5300	2588	4551	5612	2076	2508	1919	2356	3150	3659	3659
1974	465	1091	5088	5310	2593	4560	5623	2080	2513	1922	2360	3156	3666	3666
1975	466	1093	5098	5321	2598	4569	5634	2084	2518	1926	2365	3162	3673	3673
1976	467	1096	5108	5331	2603	4579	5646	2088	2523	1930	2370	3169	3681	3681
1977	468	1098	5118	5342	2609	4588	5657	2092	2528	1934	2375	3175	3688	3688
1978	469	1100	5128	5353	2614	4597	5668	2097	2533	1938	2379	3181	3696	3696
1979	47	1102	5139	5363	2619	4606	5680	2101	2538	1942	2384	3188	3703	3703
1980	471	1104	5149	5374	2624	4615	5691	2105	2543	1946	2389	3194	3710	3710

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE B-5.4. PROJECTED PER CAPITA DEMAND FOR TEFF IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0020

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	3339	3088	4817	3106	2799	4817	1688	2744	3116	4883	3116	3236	3153	4073
1967	3346	3094	4827	3112	2805	4827	1691	2749	3122	4893	3122	3242	3159	4081
1968	3352	3100	4836	3118	2810	4836	1695	2755	3128	4903	3128	3249	3166	4089
1969	3359	3107	4846	3125	2816	4846	1698	2760	3135	4912	3135	3255	3172	4097
1970	3366	3113	4856	3131	2821	4856	1702	2766	3141	4922	3141	3262	3178	4106
1971	3373	3119	4865	3137	2827	4865	1705	2772	3147	4932	3147	3268	3185	4114
1972	3379	3125	4875	3143	2833	4875	1708	2777	3154	4942	3154	3275	3191	4122
1973	3386	3131	4885	3150	2838	4885	1712	2783	3160	4952	3160	3282	3197	4130
1974	3393	3138	4895	3156	2844	4895	1715	2788	3166	4962	3166	3288	3204	4139
1975	3400	3144	4904	3162	2850	4904	1719	2794	3173	4972	3173	3295	3210	4147
1976	3406	3150	4914	3169	2855	4914	1722	2799	3179	4982	3179	3301	3217	4155
1977	3413	3157	4924	3175	2861	4924	1726	2805	3185	4991	3185	3308	3223	4163
1978	3420	3163	4934	3181	2867	4934	1729	2811	3192	5001	3192	3315	3230	4172
1979	3427	3169	4944	3188	2873	4944	1732	2816	3198	5011	3198	3321	3236	4180
1980	3434	3176	4954	3194	2878	4954	1736	2822	3204	5021	3204	3328	3242	4189

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE 8-5.5. PROJECTED PER CAPITA DEMAND FOR WHEAT IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0035

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	4057	3250	1629	1733	355	1996	1263	705	1330	2865	472	2004	0	1177
1967	4071	3261	1635	1739	356	2003	1267	707	1335	2875	474	2011	0	1181
1968	4085	3273	1640	1745	357	2010	1272	710	1339	2885	475	2018	0	1185
1969	4100	3284	1646	1751	359	2017	1276	712	1344	2895	477	2025	0	1189
1970	4114	3296	1652	1757	360	2024	1281	715	1349	2905	479	2032	0	1194
1971	4128	3307	1658	1764	361	2031	1285	717	1353	2915	480	2039	0	1198
1972	4143	3319	1664	1770	363	2038	1290	720	1358	2926	482	2046	0	1202
1973	4157	3330	1669	1776	364	2045	1294	722	1363	2936	484	2054	0	1206
1974	4172	3342	1675	1782	365	2053	1299	725	1368	2946	485	2061	0	1210
1975	4187	3354	1681	1788	366	2060	1303	728	1372	2957	487	2068	0	1215
1976	4201	3366	1687	1795	368	2067	1308	730	1377	2967	489	2075	0	1219
1977	4216	3377	1693	1801	369	2074	1312	733	1382	2977	490	2083	0	1223
1978	4231	3389	1699	1807	370	2081	1317	735	1387	2988	492	2090	0	1227
1979	4246	3401	1705	1814	371	2089	1322	738	1392	2998	494	2097	0	1232
1980	4260	3413	1711	1820	373	2096	1326	740	1397	3009	496	2104	0	1236

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&1.0 ELASTICITY.

TABLE 8-5.6. PROJECTED PER CAPITA DEMAND FOR PULSES IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0025

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	1027	1695	2082	1343	799	2082	1794	978	799	2489	655	1589	969	1607
1967	1030	1699	2087	1346	801	2087	1798	980	801	2495	657	1593	971	1611
1968	1032	1703	2092	1350	803	2092	1803	983	803	2501	658	1597	974	1615
1969	1035	1708	2098	1353	805	2098	1807	985	805	2508	660	1601	976	1619
1970	1037	1712	2103	1356	807	2103	1812	988	807	2514	662	1605	979	1623
1971	1040	1716	2108	1360	809	2108	1817	990	809	2520	663	1609	981	1627
1972	1042	1721	2113	1363	811	2113	1821	993	811	2527	665	1613	984	1631
1973	1045	1725	2119	1367	813	2119	1826	995	813	2533	667	1617	986	1635
1974	1048	1729	2124	1370	815	2124	1830	998	815	2539	668	1621	989	1639
1975	1050	1734	2129	1374	817	2129	1835	1000	817	2546	670	1625	991	1644
1976	1053	1738	2135	1377	819	2135	1839	1003	819	2552	672	1629	993	1648
1977	1056	1742	2140	1380	821	2140	1844	1005	821	2558	673	1633	996	1652
1978	1058	1747	2145	1384	823	2145	1849	1008	823	2565	675	1637	998	1656
1979	1061	1751	2151	1387	825	2151	1853	1010	825	2571	677	1641	1001	1660
1980	1064	1755	2156	1391	827	2156	1858	1013	827	2578	678	1646	1003	1664

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.50 ELASTICITY.

TABLE 8-5.7. PROJECTED PER CAPITA DEMAND FOR OILSEEDS IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0030

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GENU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	207	267	282	306	246	282	306	264	276	363	162	271	288	290
1967	208	268	283	307	247	283	307	265	277	364	162	272	289	291
1968	208	269	284	308	247	284	308	266	278	365	163	273	290	292
1969	209	269	285	309	248	285	309	266	278	366	163	273	291	293
1970	209	270	285	310	249	285	310	267	279	367	164	274	291	293
1971	210	271	286	311	250	286	311	268	280	368	164	275	292	294
1972	211	272	287	312	250	287	312	269	281	370	165	276	293	295
1973	211	273	288	312	251	288	312	270	282	371	165	277	294	296
1974	212	273	289	313	252	289	313	270	283	372	166	278	295	297
1975	213	274	290	314	253	290	314	271	284	373	166	278	296	298
1976	213	275	291	315	253	291	315	272	284	374	167	279	297	299
1977	214	276	291	316	254	291	316	273	285	375	167	280	298	300
1978	215	277	292	317	255	292	317	274	286	376	168	281	299	301
1979	215	278	293	318	256	293	318	274	287	377	168	282	299	302
1980	216	278	294	319	257	294	319	275	288	379	169	283	300	302

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.60 ELASTICITY.

TABLE B-5.1.1. PROJECTED PER CAPITA DEMAND FOR BARLEY (GRAIN EQUIVALENT) IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0020

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	12635	6200	7100	1510	2700	9791	1930	2850	2560	4290	920	2100	2440	4620
1967	12660	6212	7114	1513	2706	9811	1935	2856	2564	4300	921	2104	2444	4629
1968	12686	6224	7127	1516	2710	9829	1938	2861	2570	4307	923	2107	2449	4638
1969	12711	6237	7143	1520	2716	9849	1943	2867	2575	4317	926	2112	2455	4647
1970	12737	6249	7157	1523	2721	9869	1946	2873	2580	4324	927	2116	2460	4657
1971	12761	6261	7170	1526	2727	9889	1950	2880	2586	4333	929	2121	2464	4666
1972	12788	6275	7186	1529	2732	9909	1953	2884	2590	4343	930	2124	2469	4675
1973	12814	6287	7200	1532	2738	9929	1958	2890	2595	4350	932	2129	2473	4684
1974	12838	6300	7214	1535	2743	9949	1961	2896	2601	4360	935	2133	2480	4693
1975	12864	6312	7229	1538	2749	9967	1966	2903	2606	4369	936	2138	2484	4703
1976	12891	6324	7243	1541	2753	9987	1969	2907	2612	4377	938	2143	2489	4713
1977	12915	6338	7258	1544	2760	10007	1973	2913	2616	4386	940	2146	2493	4723
1978	12941	6350	7272	1547	2766	10027	1976	2920	2621	4395	943	2150	2498	4732
1979	12968	6363	7286	1550	2770	10047	1981	2926	2627	4403	944	2155	2504	4741
1980	12994	6375	7301	1553	2776	10067	1986	2932	2632	4412	946	2160	2509	4750

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE B-[illegible].2.2. PROJECTED PER CAPITA DEMAND FOR CORN (GRAIN EQUIVALENT) IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0020

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	232[illegible]	1310	2680	3020	5650	1570	2540	3490	4350	3042	6383	3085	3400	162[illegible]
1967	2324	1312	2685	3025	5662	1574	2544	3497	4358	3045	6393	3091	3407	1623
1968	2329	1315	2690	3031	5673	1576	2550	3504	4368	3051	6406	3098	3414	1627
1969	2334	1318	2696	3037	5684	1580	2555	3511	4376	3058	6418	3104	3420	1629
1970	2338	1321	2701	3044	5696	1583	2560	3518	4385	3064	6431	3110	3427	1632
1971	2343	1323	2707	3050	5707	1595	2565	3525	4394	3070	6443	3116	3434	1636
1972	2348	1325	2711	3056	5718	1589	2570	3533	4403	3076	6456	3123	3441	1640
1973	2352	1329	2717	3062	5730	1592	2575	3540	4411	3082	6469	3129	3448	1642
1974	2357	1331	2723	3068	5741	1596	2581	3547	4421	3089	6482	3135	3455	1645
1975	2362	1334	2728	3075	5753	1598	2585	3554	4429	3095	6495	3142	3461	1649
1976	2367	1336	2734	3081	5764	1602	2591	3561	4438	3101	6508	3148	3468	1652
1977	2371	1340	2740	3087	5776	1605	2596	3568	4447	3107	6521	3154	3475	1656
1978	2376	1342	2744	3093	5788	1608	2601	3575	4456	3114	6535	3161	3482	1658
1979	2381	1344	2750	3100	5798	1611	2607	3582	4464	3120	6548	3167	3489	1662
1980	2385	1348	2756	3105	5810	1615	2611	3589	4474	3125	6561	3173	3496	1665

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE 8-5.3.3. PROJECTED PER CAPITA DEMAND FOR SORGHUM (GRAIN EQUIVALENT) IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0020

PER CAPITA DEMAND

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	520	1220	5689	5938	2900	5100	6288	2326	2810	2150	2639	3529	4100	4100
1967	521	1222	5701	5950	2905	5110	6301	2330	2815	2154	2645	3536	4108	4108
1968	522	1225	5712	5962	2911	5120	6313	2335	2821	2159	2650	3543	4116	4116
1969	523	1227	5724	5974	2917	5130	6326	2339	2827	2162	2655	3551	4125	4125
1970	525	1230	5735	5986	2922	5141	6338	2344	2833	2167	2661	3558	4133	4133
1971	526	1232	5746	5997	2929	5151	6352	2350	2838	2171	2665	3564	4141	4141
1972	527	1235	5758	6010	2935	5161	6364	2354	2844	2176	2671	3571	4150	4150
1973	527	1237	5770	6022	2941	5171	6377	2359	2850	2180	2677	3579	4158	4158
1974	528	1239	5781	6034	2946	5181	6389	2363	2855	2184	2681	3586	4166	4166
1975	529	1242	5793	6046	2952	5192	6402	2368	2861	2188	2687	3593	4173	4173
1976	530	1245	5804	6058	2958	5203	6416	2372	2867	2193	2693	3601	4183	4183
1977	531	1247	5816	6070	2964	5213	6428	2377	2872	2197	2698	3608	4191	4191
1978	532	1250	5827	6083	2970	5224	6441	2383	2878	2202	2703	3614	4200	4200
1979	534	1252	5839	6094	2976	5234	6454	2387	2884	2206	2709	3622	4208	4208
1980	535	1254	5851	6107	2981	5244	6467	2392	2889	2211	2714	3629	4216	4216

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOMEE0.40 ELASTICITY.

TABLE B-5.4.4. PROJECTED PER CAPITA DEMAND FOR TEFF (GRAIN EQUIVALENT) IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0020

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO
1966	3590	3320	5179	3339	3009	5179	1815	2950	3350	5250	3350	3479	3390	4375
1967	3597	3326	5190	3346	3016	5190	1818	2955	3357	5261	3357	3486	3396	4388
1968	3604	3333	5200	3352	3021	5200	1822	2962	3363	5272	3363	3493	3404	4396
1969	3611	3340	5210	3360	3028	5210	1825	2967	3371	5281	3371	3500	3410	4405
1970	3619	3347	5221	3366	3033	5221	1830	2974	3377	5292	3377	3507	3417	4415
1971	3626	3353	5231	3373	3035	5231	1833	2980	3383	5303	3383	3514	3424	4423
1972	3633	3360	5242	3379	3046	5242	1836	2986	3391	5314	3391	3521	3431	4432
1973	3640	3366	5252	3387	3051	5252	1840	2992	3397	5324	3397	3529	3437	4440
1974	3648	3374	5263	3393	3058	5263	1844	2997	3404	5335	3404	3535	3445	4450
1975	3656	3380	5273	3400	3064	5273	1848	3004	3411	5346	3411	3543	3451	4459
1976	3662	3387	5284	3407	3069	5284	1851	3009	3418	5357	3418	3549	3459	4467
1977	3669	3394	5294	3414	3076	5294	1855	3016	3424	5366	3424	3557	3465	4476
1978	3677	3401	5305	3420	3082	5305	1859	3022	3432	5377	3432	3564	3473	4484
1979	3685	3407	5316	3428	3089	5316	1862	3028	3438	5388	3438	3571	3479	4494
1980	3692	3415	5327	3434	3094	5327	1866	3034	3445	5399	3445	3578	3486	4504

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE 8-5.5.5. PROJECTED PER CAPITA DEMAND FOR WHEAT (GRAIN EQUIVALENT) IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0035

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO
1966	5409	4333	2171	2310	473	2661	1683	939	1773	3819	629	2671	0	1569
1967	5427	4347	2179	2318	474	2670	1689	942	1779	3833	631	2681	0	1574
1968	5446	4363	2186	2326	475	2679	1695	946	1785	3846	633	2690	0	1579
1969	5466	4378	2194	2334	478	2689	1701	949	1791	3859	635	2699	0	1585
1970	5485	4394	2202	2342	479	2698	1707	953	1798	3873	638	2709	0	1591
1971	5503	4409	2210	2351	481	2707	1713	955	1803	3886	639	2718	0	1597
1972	5523	4425	2218	2359	483	2717	1719	959	1810	3901	642	2727	0	1602
1973	5542	4439	2225	2367	485	2726	1725	962	1817	3914	645	2738	0	1607
1974	5562	4455	2233	2375	486	2737	1731	966	1823	3927	646	2747	0	1613
1975	5582	4471	2241	2383	487	2746	1737	970	182[illegible]	3942	649	2757	0	1619
1976	5601	4487	2249	2393	490	2755	1743	973	1835	3955	651	2766	0	1625
1977	5621	4502	2257	2401	491	2765	1749	977	1842	3969	653	2777	0	1630
1978	5641	4518	2265	2409	493	2774	1755	979	1849	3983	655	2786	0	1635
1979	5661	4534	2273	2418	494	2785	1762	983	1855	3997	658	2795	0	1642
1980	5679	4550	2281	2426	497	2794	1757	986	1862	4011	661	2805	0	1647

SOURCE :

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.[illegible] ANNUAL GROWTH RATE OF PER CAPITA INCOME(1.0 ELASTICITY.

TABLE B-5.6.6. PROJECTED PER CAPITA DEMAND FOR PULSES (GRAIN EQUIVALENT) IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0025

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	1153	1904	2339	1508	897	2339	2015	1098	897	2796	735	1785	1088	1805
1967	1157	1908	2344	1512	900	2344	2020	1101	900	2803	738	1789	1091	1810
1968	1159	1913	2350	1516	902	2350	2025	1104	902	2810	739	1794	1094	1814
1969	1162	1919	2357	1520	904	2357	2030	1106	904	2817	741	1798	1096	1819
1970	1165	1923	2362	1523	906	2362	2035	1110	906	2824	743	1803	1100	1823
1971	1168	1928	2368	1528	908	2368	2041	1112	908	2831	744	1807	1102	1828
1972	117[illegible]	1933	2374	1531	911	2374	2046	1115	911	2839	747	1812	1105	1832
1973	1174	1938	2380	1535	913	2380	2051	1117	913	2846	749	1816	1107	1837
1974	1177	1942	2386	1539	915	2386	2056	1121	915	2852	750	1821	1111	1841
1975	1179	1948	2392	1543	917	2392	2061	1123	917	2860	752	1825	1113	1847
1976	1183	1952	2398	1547	920	2398	2066	1126	920	2867	755	1830	1115	1851
1977	1186	1957	2404	1550	922	2404	2071	1129	922	2874	756	1834	1119	1856
1978	1188	1962	2410	1555	924	2410	2077	1132	924	2882	758	1839	1121	1860
1979	1192	1967	2416	1558	926	2416	2082	1134	926	2888	760	1843	1124	1865
1980	1195	1971	2422	1562	929	2422	2087	1138	929	2896	761	1849	1126	1869

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.50 ELASTICITY.

TABLE 8-5.7.7. PROJECTED PER CAPITA DEMAND FOR OILSEEDS (GRAIN EQUIVALENT) IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0030

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	689	889	939	1019	819	939	1019	879	919	1209	539	903	959	966
1967	693	893	943	1023	823	943	1023	883	923	1213	539	906	963	969
1968	693	896	946	1026	823	946	1026	886	926	1216	543	909	966	973
1969	696	896	949	1029	826	949	1029	886	926	1219	543	909	969	976
1970	696	899	949	1033	829	949	1033	889	929	1223	546	913	969	976
1971	699	903	953	1036	833	953	1036	893	933	1226	546	916	973	979
1972	703	906	956	1039	833	956	1039	896	936	1233	549	919	976	983
1973	703	909	959	1039	836	959	1039	899	939	1236	549	923	979	986
1974	706	909	943	1043	839	963	1043	899	943	1239	553	926	983	989
1975	709	913	966	1046	843	966	1046	903	946	1243	553	926	986	993
1976	709	916	969	1049	843	969	1049	906	946	1246	556	929	989	996
1977	713	919	969	1053	846	969	1053	909	949	1249	556	933	993	999
1978	716	923	973	1056	849	973	1056	913	953	1253	559	936	996	1003
1979	716	926	976	1059	853	976	1059	913	956	1256	559	939	996	1006
1980	719	926	979	1063	856	979	1063	916	959	1263	563	943	999	1006

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 0.5% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.60 ELASTICITY.

TABLE 8-6.1. PROJECTED PER CAPITA DEMAND FOR BARLEY IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0040

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	9185	4771	4979	1203	2100	7228	1469	2171	1859	2971	696	1625	1690	3484
1967	9222	4790	4999	1208	2108	7257	1475	2180	1866	2983	699	1631	1697	3498
1968	9259	4809	5019	1213	2117	7286	1481	2188	1874	2995	702	1638	1704	3512
1969	9296	4828	5039	1217	2125	7315	1487	2197	1881	3007	704	1645	1710	3526
1970	9333	4848	5059	1222	2134	7344	1493	2206	1889	3019	707	1651	1717	3540
1971	9370	4867	5079	1227	2142	7374	1499	2215	1896	3031	710	1658	1724	3554
1972	9408	4887	5100	1232	2151	7403	1505	2224	1904	3043	713	1664	1731	3568
1973	9445	4906	5120	1237	2160	7433	1511	2233	1912	3055	716	1671	1738	3583
1974	9483	4926	5141	1242	2168	7463	1517	2241	1919	3067	719	1678	1745	3597
1975	9521	4945	5161	1247	2177	7492	1523	2250	1927	3080	721	1684	1752	3611
1976	9559	4965	5182	1252	2186	7522	1529	2259	1935	3092	724	1691	1759	3626
1977	9597	4985	5202	1257	2194	7552	1535	2268	1942	3104	727	1698	1766	3640
1978	9636	5005	5223	1262	2203	7583	1541	2278	1950	3117	730	1705	1773	3655
1979	9674	5025	5244	1267	2212	7613	1547	2287	1958	3129	733	1712	1780	3670
1980	9713	5045	5265	1272	2221	7643	1553	2296	1966	3142	736	1718	1787	3684

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE 8-6.2. PROJECTED PER CAPITA DEMAND FOR CORN IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0040

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	2108	1326	2457	3128	5899	1564	2669	3664	4446	3086	6919	3349	3315	1700
1967	2116	1331	2467	3141	5923	1570	2680	3679	4464	3098	6947	3362	3328	1707
1968	2125	1337	2477	3153	5946	1577	2690	3693	4482	3111	6974	3376	3342	1714
1969	2133	1342	2487	3166	5970	1583	2701	3708	4500	3123	7002	3389	3355	1720
1970	2142	1347	2497	3178	5994	1589	2712	3723	4518	3136	7030	3403	3368	1727
1971	2150	1353	2507	3191	6018	1596	2723	3738	4536	3148	7058	3417	3382	1734
1972	2159	1358	2517	3204	6042	1602	2734	3753	4554	3161	7087	3430	3395	1741
1973	2168	1364	2527	3217	6066	1608	2745	3768	4572	3173	7115	3444	3409	1748
1974	2176	1369	2537	3230	6090	1615	2756	3783	4590	3186	7144	3458	3423	1755
1975	2185	1375	2547	3242	6115	1621	2767	3798	4609	3199	7172	3472	3436	1762
1976	2194	1380	2557	3255	6139	1628	2778	3813	4627	3212	7201	3485	3450	1769
1977	2203	1386	2567	3268	6164	1634	2789	3828	4646	3225	7230	3499	3464	1776
1978	2211	1391	2578	3281	6188	1641	2800	3844	4664	3237	7258	3513	3478	1783
1979	2220	1397	2588	3295	6213	1647	2811	3859	4683	3250	7288	3527	3492	1791
1980	2229	1402	2598	3308	6238	1654	2822	3875	4702	3263	7317	3541	3506	1798

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE B-6.3. PROJECTED PER CAPITA DEMAND FOR SORGHUM IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0040

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	484	1267	5377	5016	3133	5236	5834	2294	2966	2262	2702	3898	4145	4180
1967	486	1272	5399	5036	3146	5257	5857	2303	2978	2271	2713	3914	4162	4197
1968	488	1277	5420	5056	3158	5278	5881	2312	2990	2280	2724	3929	4178	4214
1969	490	1282	5442	5076	3171	5299	5904	2322	3002	2289	2735	3945	4195	4230
1970	492	1287	5464	5097	3183	5320	5928	2331	3014	2298	2745	3961	4212	4247
1971	494	1293	5485	5117	3196	5342	5952	2340	3026	2308	2756	3977	4229	4264
1972	496	1298	5507	5138	3209	5363	5975	2350	3038	2317	2767	3992	4245	4281
1973	498	1303	5529	5158	3222	5384	5999	2359	3050	2326	2779	4008	4262	4298
1974	500	1308	5551	5179	3235	5406	6023	2368	3062	2335	2790	4024	4279	4316
1975	502	1313	5574	5199	3248	5428	6047	2378	3074	2345	2801	4041	4297	4333
1976	504	1319	5596	5220	3261	5449	6072	2387	3087	2354	2812	4057	4314	4350
1977	506	1324	5618	5241	3274	5471	6096	2397	3099	2364	2823	4073	4331	4368
1978	508	1329	5641	5262	3287	5493	6120	2407	3112	2373	2835	4089	4348	4385
1979	510	1334	5663	5283	3300	5515	6145	2416	3124	2382	2846	4106	4366	4403
1980	512	1340	5686	5304	3313	5537	6169	2426	3136	2392	2857	4122	4383	4420

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE B-6.4. PROJECTED PER CAPITA DEMAND FOR TEFF IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0040

YEAR	PER CAPITA DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	3685	3887	5831	3813	3162	2031	3887	3339	3478	5441	3785	4111	3571	4752
1967	3700	3903	5854	3828	3175	2039	3903	3352	3492	5463	3800	4127	3585	4771
1968	3715	3918	5878	3844	3187	2047	3918	3366	3506	5485	3815	4144	3600	4790
1969	3729	3934	5901	3859	3200	2055	3934	3379	3520	5507	3831	4161	3614	4809
1970	3744	3950	5925	3874	3213	2064	3950	3393	3534	5529	3846	4177	3628	4828
1971	3759	3965	5949	3890	3226	2072	3965	3406	3548	5551	3861	4194	3643	4848
1972	3774	3981	5972	3905	3239	2080	3981	3420	3562	5573	3877	4211	3658	4867
1973	3789	3997	5996	3921	3252	2089	3997	3434	3577	5595	3892	4227	3672	4887
1974	3805	4013	6020	3937	3265	2097	4013	3447	3591	5618	3908	4244	3687	4906
1975	3820	4029	6044	3952	3278	2105	4029	3461	3605	5640	3923	4261	3702	4926
1976	3835	4045	6068	3968	3291	2114	4045	3475	3620	5663	3939	4278	3716	4946
1977	3850	4061	6093	3984	3304	2122	4061	3489	3634	5685	3955	4296	3731	4965
1978	3866	4078	6117	4000	3317	2131	4078	3503	3649	5708	3971	4313	3746	4985
1979	3881	4094	6142	4016	3330	2139	4094	3517	3663	5731	3987	4330	3761	5005
1980	3897	4110	6166	4032	3344	2148	4110	3531	3678	5754	4003	4347	3776	5025

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE B-6.5. PROJECTED PER CAPITA DEMAND FOR WHEAT IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0070

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	4320	3845	1778	2128	375	2125	1391	762	1500	3862	710	2183	0	1254
1967	4350	3872	1790	2143	378	2140	1401	767	1510	3889	715	2198	0	1263
1968	4381	3899	1803	2158	380	2155	1411	773	1521	3916	720	2214	0	1272
1969	4411	3926	1816	2173	383	2170	1420	778	1532	3944	725	2229	0	1281
1970	4442	3954	1828	2188	386	2185	1430	784	1542	3971	730	2245	0	1289
1971	4473	3981	1841	2204	388	2200	1440	789	1553	3999	735	2260	0	1299
1972	4505	4009	1854	2219	391	2216	1450	795	1564	4027	740	2276	0	1308
1973	4536	4037	1867	2234	394	2231	1461	800	1575	4055	746	2292	0	1317
1974	4568	4066	1880	2250	397	2247	1471	806	1586	4084	751	2308	0	1326
1975	4600	4094	1893	2266	399	2263	1481	811	1597	4112	756	2324	0	1335
1976	4632	4123	1906	2282	402	2279	1491	817	1608	4141	761	2341	0	1345
1977	4665	4152	1920	2298	405	2294	1502	823	1620	4170	767	2357	0	1354
1978	4697	4181	1933	2314	408	2311	1512	829	1631	4199	772	2374	0	1363
1979	4730	4210	1947	2330	411	2327	1523	834	1642	4229	777	2390	0	1373
1980	4763	4239	1960	2346	413	2343	1534	840	1654	4258	783	2407	0	1383

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&1.0 ELASTICITY.

TABLE B-6.6. PROJECTED PER CAPITA DEMAND FOR PULSES IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0050

	PER CAPITA DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	1952	1927	2354	1640	920	2354	2159	1148	918	2519	765	1615	1156	1913
1967	1962	1937	2366	1648	925	2366	2170	1154	923	2532	769	1623	1162	1923
1968	1972	1946	2378	1656	929	2378	2181	1160	927	2544	773	1631	1168	1932
1969	1981	1956	2389	1665	934	2389	2192	1165	932	2557	777	1639	1173	1942
1970	1991	1966	2401	1673	939	2401	2203	1171	936	2570	780	1648	1179	1952
1971	2001	1976	2413	1681	943	2413	2214	1177	941	2583	784	1656	1185	1961
1972	2011	1986	2425	1690	948	2425	2225	1183	946	2596	788	1664	1191	1971
1973	2021	1995	2438	1698	953	2438	2236	1189	951	2608	792	1672	1197	1981
1974	2031	2005	2450	1707	957	2450	2247	1195	955	2622	796	1681	1203	1991
1975	2042	2015	2462	1715	962	2462	2258	1201	960	2635	800	1689	1209	2001
1976	2052	2026	2474	1724	967	2474	2269	1207	965	2648	804	1698	1215	2011
1977	2062	2036	2487	1732	972	2487	2281	1213	970	2661	808	1706	1221	2021
1978	2072	2046	2499	1741	977	2499	2292	1219	975	2674	812	1715	1227	2031
1979	2083	2056	2512	1750	982	2512	2304	1225	979	2688	816	1723	1233	2041
1980	2093	2066	2524	1759	987	2524	2315	1231	984	2701	820	1732	1240	2051

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.50 ELASTICITY.

TABLE B-6.7. PROJECTED PER CAPITA DEMAND FOR OILSEEDS IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0060

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	234	279	312	351	288	312	315	309	315	369	207	326	336	295
1967	235	281	314	353	290	314	317	311	317	371	208	328	338	297
1968	237	282	316	355	291	316	319	313	319	373	209	330	340	299
1969	238	284	318	357	293	318	321	315	321	376	211	332	342	300
1970	240	286	320	359	295	320	323	316	323	378	212	334	344	302
1971	241	287	321	362	297	321	325	318	325	380	213	336	346	304
1972	243	289	323	364	299	323	327	320	327	382	215	338	348	306
1973	244	291	325	366	300	325	328	322	328	385	216	340	350	308
1974	245	293	327	368	302	327	330	324	330	387	217	342	352	309
1975	247	294	329	370	304	329	332	326	332	389	218	344	355	311
1976	248	296	331	373	306	331	334	328	334	392	220	346	357	313
1977	250	298	333	375	308	333	336	330	336	394	221	348	359	315
1978	251	300	335	377	309	335	338	332	338	396	222	350	361	317
1979	253	302	337	379	311	337	340	334	340	399	224	352	363	319
1980	254	303	339	382	313	339	343	336	343	401	225	354	365	321

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.60 ELASTICITY.

TABLE 8-6.1.1. PROJECTED PER CAPITA DEMAND FOR BARLEY (GRAIN EQUIVALENT) IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0040

	PER CAPITA DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	14131	7340	7660	1850	3230	11120	2260	3340	2860	4570	1070	2500	2600	5360
1967	14188	7369	7690	1858	3243	11164	2269	3353	2870	4589	1075	2509	2610	5381
1968	14244	7398	7721	1866	3257	11209	2278	3366	2883	4607	1080	2520	2621	5403
1969	14301	7427	7752	1872	3269	11254	2287	3380	2893	4626	1083	2530	2630	5424
1970	14358	7458	7783	1880	3283	11298	2296	3393	2906	4644	1087	2540	2641	5446
1971	14415	7487	7814	1887	3295	11344	2306	3407	2916	4663	1092	2550	2652	5467
1972	14474	7518	7846	1895	3309	11389	2315	3421	2929	4681	1096	2560	2663	5489
1973	14531	7547	7877	1903	3323	11435	2324	3435	2941	4700	1101	2570	2673	5512
1974	14589	7578	7909	1910	3335	11481	2333	3447	2952	4718	1106	2581	2684	5533
1975	14648	7607	7940	1918	3349	11526	2343	3461	2964	4738	1109	2590	2695	5555
1976	14706	7638	7972	1926	3363	11572	2352	3475	2976	4757	1113	2601	2706	5578
1977	14764	7669	8003	1933	3375	11618	2361	3489	2987	4775	1118	2612	2716	5600
1978	14824	7700	8035	1941	3389	11666	2370	3504	3000	4795	1123	2623	2727	5623
1979	14883	7730	8067	1949	3403	11712	2380	3518	3012	4813	1127	2633	2738	5646
1980	14943	7761	8100	1956	3417	11758	2389	3532	3024	4833	1132	2643	2749	5667

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE B-6.2.2. PROJECTED PER CAPITA DEMAND FOR CORN (GRAIN EQUIVALENT) IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0040

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	2480	1560	2890	3680	6940	1840	3140	4310	5230	3630	8140	3940	3900	2000
1967	2489	1565	2902	3695	6968	1847	3153	4328	5251	3644	8173	3955	3915	2008
1968	2500	1572	2914	3709	6995	1855	3164	4344	5273	3660	8204	3971	3931	2016
1969	2509	1578	2925	3724	7023	1862	3177	4362	5294	3674	8237	3987	3947	2023
1970	2520	1584	2937	3738	7051	1869	3190	4380	5315	3689	8270	4003	3962	2031
1971	2529	1591	2949	3754	7080	1877	3203	4397	5336	3703	8303	4020	3978	2040
1972	2540	1597	2961	3769	7108	1884	3216	4415	5357	3718	8337	4035	3994	2048
1973	2550	1604	2973	3784	7136	1891	3229	4433	5378	3733	8370	4051	4010	2056
1974	2560	1610	2984	3800	7164	1900	3242	4450	5400	3748	8404	4068	4027	2064
1975	2570	1617	2996	3814	7194	1907	3255	4468	5422	3763	8437	4084	4042	2072
1976	2581	1623	3008	3829	7222	1915	3268	4485	5443	3778	8471	4100	4058	2081
1977	2591	1630	3020	3844	7251	1922	3281	4503	5466	3794	8506	4116	4075	2089
1978	2601	1636	3033	3860	7280	1930	3294	4522	5487	3808	8539	4133	4091	2097
1979	2611	1643	3044	3876	7309	1937	3307	4540	5509	3823	8574	4149	4108	2107
1980	2622	1649	3056	3891	7339	1945	3320	4558	5531	3838	8608	4165	4124	2115

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE 8-6.3.3. PROJECTED PER CAPITA DEMAND FOR SORGHUM (GRAIN EQUIVALENT) IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0040

	PER CAPITA DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	550	1439	6110	5700	3560	5950	6629	2606	3370	2570	3070	4429	4710	4750
1967	552	1445	6135	5722	3575	5974	6655	2617	3384	2580	3083	4447	4729	4769
1968	554	1451	6159	5745	3588	5997	6683	2627	3397	2590	3095	4464	4747	4788
1969	556	1456	6184	5768	3603	6021	6709	2638	3411	2601	3108	4483	4767	4806
1970	559	1462	6209	5792	3617	6045	6736	2648	3425	2611	3119	4501	4786	4826
1971	561	1469	6233	5814	3631	6070	6763	2659	3438	2622	3131	4519	4805	4845
1972	563	1475	6258	5838	3646	6094	6789	2670	3452	2633	3144	4536	4824	4864
1973	565	1480	6283	5861	3661	6118	6817	2680	3466	2643	3158	4554	4843	4884
1974	568	1486	6308	5885	3676	6143	6844	2690	3479	2653	3170	4572	4862	4904
1975	570	1492	6334	5908	3691	6168	6871	2702	3493	2664	3183	4592	4883	4924
1976	572	1498	6359	5932	3705	6192	6900	2712	3508	2675	3195	4610	4902	4943
1977	575	1504	6384	5955	3720	6217	6927	2723	3521	2686	3208	4628	4921	4963
1978	577	1510	6410	5979	3735	6242	6954	2735	3536	2696	3221	4646	4941	4983
1979	579	1515	6435	6003	3750	6267	6983	2745	3550	2706	3234	4666	4961	5003
1980	581	1522	6461	6027	3764	6292	7010	2756	3563	2718	3246	4684	4980	5022

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE B-6.4.4. PROJECTED PER CAPITA DEMAND FOR TEFF (GRAIN EQUIVALENT) IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0040

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	3962	4179	6270	4100	3400	2183	4179	3590	3739	5850	4070	4420	3839	5109
1967	3978	4196	6294	4116	3414	2192	4196	3604	3754	5874	4086	4437	3854	5130
1968	3994	4213	6320	4133	3426	2201	4213	3619	3769	5898	4102	4456	3871	5150
1969	4009	4230	6345	4149	3440	2209	4230	3633	3785	5921	4119	4474	3886	5171
1970	4025	4247	6371	4165	3454	2219	4247	3648	3800	5945	4135	4491	3901	5191
1971	4042	4263	6396	4182	3468	2228	4263	3662	3815	5968	4151	4509	3917	5213
1972	4058	4280	6421	4199	3482	2236	4280	3677	3830	5992	4168	4528	3933	5233
1973	4074	4297	6447	4216	3496	2246	4297	3692	3846	6016	4185	4545	3948	5254
1974	4091	4315	6473	4233	3510	2254	4315	3706	3861	6041	4202	4563	3964	5275
1975	4107	4332	6499	4249	3524	2263	4332	3721	3876	6064	4218	4581	3980	5296
1976	4123	4349	6524	4266	3538	2273	4349	3736	3892	6089	4235	4600	3995	5318
1977	4139	4366	6551	4283	3552	2281	4366	3751	3907	6113	4252	4619	4011	5338
1978	4157	4385	6577	4301	3566	2291	4385	3766	3923	6137	4270	4637	4028	5360
1979	4173	4402	6604	4318	3580	2300	4402	3781	3938	6162	4287	4656	4044	5381
1980	4190	4419	6630	4335	3595	2309	4419	3796	3954	6187	4304	4674	4060	5403

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE B-6.5.5. PROJECTED PER CAPITA DEMAND FOR WHEAT (GRAIN EQUIVALENT) IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0070

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	5759	5126	2370	2837	499	2833	1854	1015	1999	5149	946	2910	0	1671
1967	5799	5162	2386	2857	503	2853	1867	1022	2013	5185	953	2930	0	1683
1968	5841	5198	2403	2877	506	2873	1881	1030	2027	5221	959	2951	0	1695
1969	5881	5234	2421	2897	510	2893	1893	1037	2042	5258	966	2971	0	1707
1970	5922	5271	2437	2917	514	2913	1906	1045	2055	5294	973	2993	0	1718
1971	5963	5307	2454	2938	517	2933	1919	1051	2070	5331	979	3013	0	1731
1972	6006	5345	2471	2958	521	2954	1933	1059	2085	5369	986	3034	0	1743
1973	6047	5382	2489	2978	525	2974	1947	1066	2099	5406	994	3055	0	1755
1974	6090	5421	2506	2999	529	2995	1961	1074	2114	5445	1001	3077	0	1767
1975	6133	5458	2523	3021	531	3017	1974	1081	2129	5482	1007	3098	0	1779
1976	6175	5497	2541	3042	535	3038	1987	1089	2143	5521	1014	3121	0	1793
1977	6219	5535	2559	3063	539	3058	2002	1097	2159	5559	1022	3142	0	1805
1978	6262	5574	2577	3085	543	3081	2015	1105	2174	5598	1029	3165	0	1817
1979	6306	5613	2595	3106	547	3102	2030	1111	2189	5638	1035	3186	0	1830
1980	6350	5651	2613	3127	550	3123	2045	1119	2205	5677	1043	3209	0	1843

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&1.0 ELASTICITY.

TABLE B-6.6.6. PROJECTED PER CAPITA DEMAND FOR PULSES (GRAIN EQUIVALENT) IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT= 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0050

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	2193	2165	2644	1842	1033	2644	2425	1289	1031	2830	859	1814	1298	2149
1967	2204	2176	2658	1851	1039	2658	2438	1296	1037	2844	864	1823	1305	2160
1968	2215	2186	26[illegible]	1860	1043	2671	2450	1303	1041	2858	868	1832	1312	2170
1969	2225	2197	2684	1870	1049	2684	2462	1308	1047	2873	873	1841	1317	2182
1970	2237	2208	2697	1879	1055	2697	2474	1315	1051	2887	876	1851	1324	2193
1971	2248	2220	2711	1888	1059	2711	2487	1322	1057	2902	880	1860	1331	2203
1972	2259	2231	2724	1898	1065	2724	2500	1329	1062	2916	885	1869	1338	2214
1973	2270	2241	2739	1907	1070	2739	2512	1335	1068	2930	889	1878	1344	2225
1974	2282	2252	2752	1917	1075	2752	2524	1342	1073	2946	894	1888	1351	2237
1975	2294	2264	2766	1926	1080	2766	2537	1349	1078	2960	898	1897	1358	2248
1976	2305	2276	2779	1937	1086	2779	2549	1356	1084	2975	903	1907	1365	2259
1977	2316	2287	2794	1946	1092	2794	2562	1362	1089	2989	907	1916	1371	2270
1978	2328	2298	2807	1956	1097	2807	2575	1369	1095	3004	912	1926	1378	2282
1979	2340	2310	2822	1966	1103	2822	2588	1376	1100	3020	916	1935	1385	2293
1980	2351	2321	2835	1976	1108	2835	2601	1383	1105	3034	921	1946	1393	2304

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.50 ELASTICITY.

TABLE B-6.7.7. PROJECTED PER CAPITA DEMAND FOR OILSEEDS (GRAIN EQUIVALENT) IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0069

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	779	929	1039	1169	959	1039	1049	1029	1049	1229	689	1086	1119	983
1967	783	936	1046	1176	966	1046	1056	1036	1056	1236	693	1093	1126	989
1968	789	939	1053	1183	969	1053	1063	1043	1063	1243	696	1099	1133	996
1969	793	946	1059	1189	976	1059	1069	1049	1069	1253	703	1106	1139	999
1970	799	953	1066	1196	983	1066	1076	1053	1076	1259	706	1113	1146	1006
1971	803	956	1069	1206	989	1069	1083	1059	1083	1266	709	1119	1153	1013
1972	809	963	1076	1213	996	1076	1089	1066	1089	1273	716	1126	1159	1019
1973	813	969	1083	1219	999	1083	1093	1073	1093	1283	719	1133	1166	1026
1974	816	976	1089	1226	1006	1089	1099	1079	1099	1289	723	1139	1173	1029
1975	823	979	1096	1233	1013	1096	1106	1086	1106	1296	726	1146	1183	1036
1976	826	986	1103	1243	1019	1103	1113	1093	1113	1306	733	1153	1189	1043
1977	833	993	1109	1249	1026	1109	1119	1099	1119	1313	736	1159	1196	1049
1978	836	999	1116	1256	1029	1116	1126	1106	1126	1319	739	1166	1203	1056
1979	843	1006	1123	1263	1036	1123	1133	1113	1133	1329	746	1173	1209	1063
1980	846	1009	1129	1273	1043	1129	1143	1119	1143	1336	749	1179	1216	1069

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 1% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.60 ELASTICITY.

TABLE B-7.1. PROJECTED PER CAPITA DEMAND FOR BARLEY IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0216

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	12000	4947	6260	1209	3127	8416	1931	2620	2321	3335	819	2113	2405	4531
1967	12259	5054	6395	1235	3195	8600	1973	2677	2371	3407	837	2159	2457	4629
1968	12524	5163	6533	1262	3264	8786	2015	2734	2422	3481	855	2205	2510	4729
1969	12795	5275	6674	1289	3334	8975	2059	2793	2475	3556	873	2253	2564	4831
1970	13071	5388	6819	1317	3406	9169	2103	2854	2528	3633	892	2302	2620	4935
1971	13353	5505	6966	1345	3480	9367	2149	2915	2583	3711	911	2351	2676	5042
1972	13642	5624	7116	1374	3555	9570	2195	2978	2639	3791	931	2402	2734	5151
1973	13936	5745	7270	1404	3632	9776	2243	3043	2696	3873	951	2454	2793	5262
1974	14237	5869	7427	1434	3710	9987	2291	3108	2754	3957	972	2507	2853	5376
1975	14545	5996	7588	1465	3790	10203	2341	3176	2813	4042	993	2561	2915	5492
1976	14859	6126	7751	1497	3872	10424	2391	3244	2874	4130	1014	2616	2978	5610
1977	15180	6258	7919	1529	3956	10649	2443	3314	2936	4219	1036	2673	3042	5732
1978	15508	6393	8090	1562	4041	10879	2495	3386	2999	4310	1058	2731	3108	5855
1979	15843	6531	8265	1596	4128	11114	2549	3459	3064	4403	1081	2790	3175	5982
1980	16185	6672	8443	1631	4218	11354	2604	3534	3130	4498	1105	2850	3244	6111

SOURCE:
THE BASE YEAR, 1966, PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME & 0.40 ELASTICITY.

TABLE 8-7.2. PROJECTED PER CAPITA DEMAND FOR CORN IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0216

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	3230	1377	2992	3060	7803	1675	2958	3783	4038	3026	7208	3817	3205	2083
1967	3300	1407	3057	3126	7972	1711	3022	3865	4125	3091	7364	3899	3274	2128
1968	3371	1437	3123	3194	8144	1748	3087	3948	4214	3158	7523	3984	3345	2174
1969	3444	1468	3190	3263	8320	1786	3154	4033	4305	3226	7685	4070	3417	2221
1970	3518	1500	3259	3333	8499	1824	3222	4121	4398	3296	7851	4158	3491	2269
1971	3594	1532	3329	3405	8683	1864	3292	4210	4493	3367	8021	4247	3566	2318
1972	3672	1565	3401	3479	8870	1904	3363	4301	4590	3440	8194	4339	3643	2368
1973	3751	1599	3475	3554	9062	1945	3435	4393	4690	3514	8371	4433	3722	2419
1974	3832	1634	3550	3631	9258	1987	3509	4488	4791	3590	8552	4529	3803	2471
1975	3915	1669	3627	3709	9458	2030	3585	4585	4894	3668	8737	4626	3885	2525
1976	4000	1705	3705	3789	9662	2074	3663	4684	5000	3747	8925	4726	3969	2579
1977	4086	1742	3785	3871	9871	2119	3742	4785	5108	3828	9118	4828	4054	2635
1978	4174	1780	3867	3954	10084	2165	3823	4889	5218	3911	9315	4933	4142	2692
1979	4264	1818	3950	4040	10302	2211	3905	4994	5331	3995	9516	5039	4231	2750
1980	4356	1857	4035	4127	10524	2259	3990	5102	5446	4081	9722	5148	4323	2809

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE 8-7.3. PROJECTED PER CAPITA DEMAND FOR SORGHUM IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0216

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO
1966	748	1311	5274	4757	4145	5614	6530	2338	2693	2218	3168	4444	4013	5438
1967	764	1339	5388	4860	4235	5735	6671	2389	2751	2266	3236	4540	4100	5555
1968	781	1368	5504	4965	4326	5859	6815	2440	2811	2315	3306	4638	4188	5675
1969	798	1398	5623	5072	4419	5986	6962	2493	2871	2365	3378	4738	4279	5798
1970	815	1428	5745	5182	4515	6115	7113	2547	2933	2416	3451	4841	4371	5923
1971	832	1459	5869	5293	4612	6247	7266	2602	2997	2468	3525	4945	4466	6051
1972	850	1490	5995	5408	4712	6382	7423	2658	3061	2521	3601	5052	4562	6182
1973	869	1523	6125	5525	4814	6520	7584	2715	3128	2576	3679	5161	4661	6315
1974	887	1555	6257	5644	4918	6661	7747	2774	3195	2632	3759	5273	4761	6452
1975	907	1589	6392	5766	5024	6805	7915	2834	3264	2688	3840	5386	4864	6591
1976	926	1623	6531	5890	5133	6952	8086	2895	3335	2746	3923	5503	4969	6734
1977	946	1658	6672	6018	5243	7102	8260	2958	3407	2806	4008	5622	5076	6879
1978	967	1694	6816	6148	5357	7255	8439	3021	3480	2866	4094	5743	5186	7028
1979	988	1731	6963	6280	5472	7412	8621	3087	3555	2928	4182	5867	5298	7179
1980	1009	1768	7113	6416	5591	7572	8807	3153	3632	2992	4273	5994	5413	7334

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE B-7.4. PROJECTED PER CAPITA DEMAND FOR TEFF IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0216

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	5561	4678	6622	3832	5441	6623	2678	3683	4473	6008	4659	5403	5096	6836
1967	5681	4779	6765	3915	5559	6766	2736	3763	4570	6138	4760	5520	5206	6984
1968	5804	4882	6911	3999	5679	6912	2795	3844	4668	6270	4862	5639	5319	7134
1969	5929	4988	7060	4086	5801	7062	2855	3927	4769	6406	4967	5761	5433	7289
1970	6057	5095	7213	4174	5927	7214	2917	4012	4872	6544	5075	5885	5551	7446
1971	6188	5206	7369	4264	6055	7370	2980	4098	4977	6685	5184	6012	5671	7607
1972	6322	5318	7528	4356	6185	7529	3044	4187	5085	6830	5296	6142	5793	7771
1973	6458	5433	7690	4450	6319	7692	3110	4277	5195	6977	5411	6275	5918	7939
1974	6598	5550	7857	4546	6455	7858	3177	4370	5307	7128	5528	6410	6046	8110
1975	6740	5670	8026	4645	6595	8028	3246	4464	5422	7282	5647	6549	6177	8286
1976	6886	5793	8200	4745	6737	8201	3316	4560	5539	7439	5769	6690	6310	8465
1977	7035	5918	8377	4847	6883	8378	3388	4659	5658	7600	5894	6835	6446	8647
1978	7187	6045	8558	4952	7031	8559	3461	4760	5781	7764	6021	6982	6586	8834
1979	7342	6176	8743	5059	7183	8744	3536	4862	5905	7932	6151	7133	6728	9025
1980	7500	6309	8931	5168	7339	8933	3612	4967	6033	8103	6284	7287	6873	9220

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE B-7.5. PROJECTED PER CAPITA DEMAND FOR WHEAT IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0378

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	6642	3991	2553	3455	1378	2731	2704	1338	2059	4199	1248	3570	1555	2290
1967	6893	4142	2650	3586	1430	2834	2806	1389	2137	4358	1295	3705	1614	2377
1968	7154	4298	2750	3721	1484	2941	2912	1441	2218	4522	1344	3845	1675	2466
1969	7424	4461	2854	3862	1540	3053	3022	1496	2301	4693	1395	3990	1738	2560
1970	7705	4630	2961	4008	1598	3168	3137	1552	2388	4871	1448	4141	1804	2656
1971	7996	4805	3073	4159	1659	3288	3255	1611	2479	5055	1502	4298	1872	2757
1972	8298	4986	3190	4316	1722	3412	3378	1672	2572	5246	1559	4460	1943	2861
1973	8612	5175	3310	4480	1787	3541	3506	1735	2670	5444	1618	4629	2016	2969
1974	8937	5370	3435	4649	1854	3675	3638	1800	2771	5650	1679	4804	2092	3081
1975	9275	5573	3565	4825	1924	3814	3776	1868	2875	5864	1743	4985	2171	3198
1976	9626	5784	3700	5007	1997	3958	3919	1939	2984	6085	1809	5174	2254	3319
1977	9990	6002	3840	5196	2073	4107	4067	2012	3097	6315	1877	5369	2339	3444
1978	10367	6229	3985	5393	2151	4263	4221	2088	3214	6554	1948	5572	2427	3574
1979	10759	6465	4135	5597	2232	4424	4380	2167	3335	6802	2022	5783	2519	3709
1980	11166	6709	4292	5808	2317	4591	4546	2249	3461	7059	2098	6001	2614	3850

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME& 0.70 ELASTICITY

TABLE B-7.6. PROJECTED PER CAPITA DEMAND FOR PULSES IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0270

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	2219	2202	2423	1732	1047	2423	2508	1377	1037	2717	893	1887	1352	2159
1967	2279	2261	2488	1779	1075	2488	2576	1414	1065	2790	917	1938	1389	2217
1968	2340	2323	2556	1827	1104	2556	2645	1452	1094	2866	942	1990	1426	2277
1969	2404	2385	2625	1876	1134	2625	2717	1492	1123	2943	967	2044	1464	2339
1970	2469	2450	2695	1927	1165	2695	2790	1532	1154	3023	993	2099	1504	2402
1971	2535	2516	2768	1979	1196	2768	2865	1573	1185	3104	1020	2156	1545	2467
1972	2604	2584	2843	2032	1228	2843	2943	1616	1217	3188	1048	2214	1586	2533
1973	2674	2653	2920	2087	1262	2920	3022	1659	1250	3274	1076	2274	1629	2602
1974	2746	2725	2999	2143	1296	2999	3104	1704	1283	3362	1105	2335	1673	2672
1975	2820	2799	3080	2201	1331	3080	3188	1750	1318	3453	1135	2398	1718	2744
1976	2896	2874	3163	2261	1367	3163	3274	1797	1354	3546	1166	2463	1765	2818
1977	2975	2952	3248	2322	1404	3248	3362	1846	1390	3642	1197	2530	1812	2894
1978	3055	3032	3336	2384	1441	3336	3453	1896	1428	3741	1229	2598	1861	2972
1979	3137	3113	3426	2449	1480	3426	3546	1947	1466	3842	1263	2668	1912	3053
1980	3222	3197	3518	2515	1520	3518	3642	1999	1506	3945	1297	2740	1963	3135

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.50 ELASTICITY.

TABLE 8-7.7. PROJECTED PER CAPITA DEMAND FOR OILSEEDS IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0324

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	300	312	350	381	312	350	350	372	360	390	237	327	326	350
1967	310	322	361	393	322	361	361	384	372	403	245	338	337	361
1968	320	333	373	406	333	373	373	396	384	416	253	349	347	373
1969	330	343	385	419	343	385	385	409	396	429	261	360	359	385
1970	341	354	398	433	354	398	398	423	409	443	269	371	370	398
1971	352	366	410	447	366	410	410	436	422	457	278	384	382	410
1972	363	378	424	461	378	424	424	450	436	472	287	396	395	424
1973	375	390	438	476	390	438	438	465	450	488	296	409	408	438
1974	387	403	452	492	403	452	452	480	465	503	306	422	421	452
1975	400	416	466	508	416	466	466	496	480	520	316	436	434	466
1976	413	429	481	524	429	481	481	512	495	536	326	450	448	481
1977	426	443	497	541	443	497	497	528	511	554	337	464	463	497
1978	440	457	513	559	457	513	513	545	528	572	347	479	478	513
1979	454	472	530	577	472	530	530	563	545	590	359	495	493	530
1980	469	488	547	595	488	547	547	581	563	609	370	511	509	547

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.60 ELASTICITY.

TABLE 8-7.1.1. PROJECTED PER CAPITA DEMAND FOR BARLEY (GRAIN EQUIVALENT) IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0216

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	18461	7610	9631	1860	4810	12951	2970	4030	3570	5130	1260	3250	3700	6970
1967	18860	7775	9838	1900	4915	13231	3035	4118	3647	5241	1287	3321	3780	7121
1968	19268	7943	10051	1941	5021	13517	3100	4206	3726	5355	1315	3392	3861	7275
1969	19685	8115	10267	1983	5129	13808	3167	4297	3807	5470	1343	3466	3944	7432
1970	20109	8289	10491	2026	5240	14106	3235	4390	3889	5589	1372	3541	4030	7592
1971	20543	8469	10717	2069	5353	14411	3306	4484	3973	5709	1401	3617	4117	7757
1972	20988	8652	10947	2113	5469	14723	3377	4581	4060	5832	1432	3695	4206	7924
1973	21440	8838	11184	2160	5587	15040	3450	4681	4147	5958	1463	3775	4297	8095
1974	21903	9029	11426	2206	5707	15364	3524	4781	4237	6087	1495	3857	4389	8270
1975	22377	9224	11674	2253	5830	15697	3601	4886	4327	6218	1527	3940	4484	8449
1976	22860	9424	11924	2303	5957	16037	3678	4990	4421	6354	1560	4024	4581	8630
1977	23354	9627	12183	2352	6086	16383	3758	5098	4517	6490	1593	4112	4680	8818
1978	23859	9835	12446	2403	6217	16737	3838	5209	4613	6630	1627	4201	4781	9007
1979	24374	10047	12715	2455	6350	17098	3921	5321	4713	6774	1663	4292	4884	9203
1980	24900	10264	12989	2509	6489	17468	4006	5437	4815	6920	1700	4384	4990	9401

SOURCE:
THE BASE YEAR, 1966, PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME (0.40 ELASTICITY.

TABLE B-7.2.2. PROJECTED PER CAPITA DEMAND FOR CORN (GAIN EQUIVALENT) IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0216

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	3800	1620	3520	3400	9180	1970	3480	4450	4750	3560	8480	4490	3770	2450
1967	3882	1655	3596	3677	9379	2012	3555	4547	4853	3636	8663	4587	3851	2503
1968	3965	1690	3674	3757	9581	2056	3631	4644	4957	3715	8850	4687	3935	2557
1969	4051	1727	3753	3838	9788	2101	3710	4744	5064	3795	9041	4788	4020	2613
1970	4138	1764	3834	3921	9999	2145	3790	4848	5174	3877	9236	4891	4107	2669
1971	4228	1802	3916	4005	10215	2192	3873	4953	5286	3961	9436	4996	4195	2727
1972	4320	1841	4001	4093	10435	2240	3956	5060	5400	4047	9640	5104	4285	2785
1973	4413	1881	4088	4181	10661	2288	4041	5168	5517	4134	9848	5215	4378	2845
1974	4508	1922	4176	4271	10892	2337	4128	5280	5636	4223	10061	5328	4474	2907
1975	4605	1963	4267	4363	11127	2388	4217	5394	5757	4315	10279	5442	4570	2970
1976	4705	2005	4358	4457	11367	2440	4309	5510	5882	4408	10500	5560	4669	3034
1977	4807	2049	4453	4554	11613	2493	4402	5629	6009	4503	10727	5680	4769	3100
1978	4910	2094	4549	4651	11863	2547	4497	5751	6138	4601	10959	5803	4873	3167
1979	5016	2138	4647	4753	12120	2601	4594	5875	6271	4700	11195	5928	4977	3235
1980	5124	2184	4747	4855	12381	2657	4694	6002	6407	4801	11437	6056	5086	3304

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE B-7.3.3. PROJECTED PER CAPITA DEMAND FOR SORGHUM (GRAIN EQUIVALENT) IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0216

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	850	1489	5993	5405	4710	6379	7420	2656	3060	2520	3600	5050	4560	6179
1967	868	1521	6122	5522	4812	6517	7580	2714	3126	2575	3677	5159	4659	6312
1968	887	1554	6254	5642	4916	6658	7744	2772	3194	2630	3756	5270	4759	6449
1969	906	1588	6389	5763	5021	6802	7911	2833	3262	2687	3838	5384	4862	6588
1970	926	1622	6528	5888	5130	6949	8083	2894	3333	2745	3921	5501	4967	6730
1971	945	1658	6669	6014	5241	7099	8257	2956	3405	2804	4005	5619	5075	6876
1972	965	1693	6812	6145	5354	7252	8435	3020	3478	2864	4092	5741	5184	7025
1973	987	1730	6960	6278	5470	7409	8618	3085	3554	2927	4180	5864	5296	7176
1974	1007	1767	7110	6413	5588	7569	8803	3152	3630	2991	4271	5992	5410	7332
1975	1030	1805	7263	6552	5709	7733	8994	3220	3709	3054	4363	6120	5527	7490
1976	1052	1844	7421	6693	5833	7900	9188	3289	3789	3120	4458	6253	5646	7652
1977	1075	1884	7582	6838	5958	8070	9386	3361	3871	3188	4554	6388	5768	7817
1978	1098	1925	7745	6986	6087	8244	9590	3433	3954	3256	4652	6526	5893	7986
1979	1122	1967	7912	7136	6218	8422	9796	3508	4039	3327	4752	6667	6020	8158
1980	1146	2009	8083	7291	6353	8604	10008	3583	4127	3400	4855	6811	6151	8334

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.40 ELASTICITY.

TABLE 8-7.4.4. PROJECTED PER CAPITA DEMAND FOR TEFF (GRAIN EQUIVALENT) IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0216

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	5979	5030	7120	4120	5850	7121	2879	3960	4809	6460	5009	5809	5479	7350
1967	6108	5138	7274	4209	5977	7275	2942	4046	4914	6600	5118	5935	5598	7509
1968	6241	5249	7431	4300	6106	7432	3005	4133	5019	6742	5228	6063	5719	7671
1969	6375	5363	7591	4393	6237	7593	3069	4222	5128	6688	5341	6194	5842	7837
1970	6513	5478	7756	4488	6373	7757	3136	4314	5238	7036	5457	6328	5968	8006
1971	6653	5598	7923	4585	6510	7924	3204	4406	5351	7188	5574	6464	6098	8179
1972	6798	5718	8094	4684	6650	8095	3273	4502	5467	7344	5694	6604	6229	8356
1973	6944	5842	8269	4785	6794	8271	3344	4599	5586	7502	5818	6747	6363	8536
1974	7094	5967	8448	4888	6941	8449	3416	4699	5706	7664	5944	6892	6501	8720
1975	7247	6096	8630	4994	7091	8632	3490	4800	5830	7830	6072	7042	6642	8909
1976	7404	6229	8817	5102	7244	8818	3565	4903	5956	7999	6203	7193	6785	9102
1977	7564	6363	9007	5211	7401	9008	3643	5009	6084	8172	6337	7349	6931	9298
1978	7728	6500	9202	5324	7560	9203	3721	5118	6216	8348	6474	7507	7081	9499
1979	7894	6641	9401	5439	7723	9402	3802	5228	6349	8529	6614	7670	7234	9704
1980	8064	6784	9603	5557	7891	9605	3883	5341	6487	8713	6757	7835	7390	9914

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.49 ELASTICITY.

TABLE B-7.5.5. PROJECTED PER CAPITA DEMAND FOR WHEAT (GRAIN EQUIVALENT) IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0378

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	8855	5321	3403	4606	1837	3641	3605	1783	2745	5598	1663	4759	2073	3053
1967	9190	5522	3533	4781	1906	3778	3741	1851	2849	5810	1726	4939	2151	3169
1968	9538	5730	3666	4961	1978	3921	3882	1921	2957	6029	1791	5126	2233	3287
1969	9898	5947	3805	5149	2053	4070	4029	1994	3067	6257	1859	5319	2317	3413
1970	10273	6173	3947	5343	2130	4223	4182	2069	3183	6494	1930	5521	2405	3541
1971	10661	6406	4097	5545	2211	4383	4339	2147	3305	6739	2002	5730	2495	3675
1972	11063	6647	4253	5754	2295	4549	4503	2229	3429	6994	2078	5946	2590	3814
1973	11482	6899	4413	5973	2382	4721	4674	2313	3559	7258	2157	6171	2687	3958
1974	11915	7159	4579	6198	2471	4899	4850	2399	3694	7533	2238	6405	2789	4107
1975	12366	7430	4753	6433	2565	5085	5034	2490	3833	7818	2323	6646	2894	4263
1976	12834	7711	4933	6675	2662	5277	5225	2585	3978	8113	2411	6898	3005	4425
1977	13319	8002	5119	6927	2763	5475	5422	2682	4129	8419	2502	7158	3118	4591
1978	13822	8305	5313	7190	2867	5683	5627	2783	4285	8738	2597	7429	3235	4765
1979	14344	8619	5513	7462	2975	5898	5839	2889	4446	9069	2695	7710	3358	4945
1980	14887	8945	5722	7743	3089	6121	6061	2998	4614	9411	2797	8001	3485	5133

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME& 0.70 ELASTICITY

TABLE 8-7.6.6. PROJECTED PER CAPITA DEMAND FOR PULSES (GRAIN EQUIVALENT) IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0270

YEAR	PER CAPITA DEMAND													
	ARUSSI	BALE	BEGEMDER	ERITREA	GENU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO
1966	2493	2474	2722	1946	1176	2722	2817	1547	1165	3052	1003	2120	1519	2425
1967	2560	2540	2795	1998	1207	2795	2894	1588	1196	3134	1030	2177	1560	2491
1968	2629	2610	2871	2052	1240	2871	2971	1631	1229	3220	1058	2235	1602	2556
1969	2701	2679	2949	2107	1274	2949	3052	1676	1261	3306	1086	2296	1644	2628
1970	2774	2752	3028	2165	1308	3028	3134	1721	1296	3396	1115	2358	1689	2698
1971	2848	2826	3110	2223	1343	3110	3219	1767	1331	3487	1146	2422	1735	2771
1972	2925	2903	3194	2283	1379	3194	3306	1815	1367	3582	1177	2487	1782	2846
1973	3004	2980	3280	2344	1417	3280	3395	1864	1404	3678	1208	2555	1830	2923
1974	3085	3061	3369	2407	1456	3369	3487	1914	1441	3777	1241	2623	1879	3002
1975	3168	3144	3460	2473	1495	3460	3582	1966	1480	3879	1275	2694	1930	3083
1976	3253	3229	3553	2540	1535	3553	3678	2019	1521	3984	1310	2767	1983	3166
1977	3342	3316	3649	2608	1577	3649	3777	2074	1561	4092	1344	2842	2035	3251
1978	3432	3406	3748	2678	1619	3748	3879	2130	1604	4203	1380	2919	2091	3339
1979	3524	3497	3849	2751	1662	3849	3984	2187	1647	4316	1419	2997	2148	3430
1980	3620	3592	3952	2825	1707	3952	4092	2246	1692	4432	1457	3078	2205	3522

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.50 ELASTICITY.

TABLE 8-7.7.7. PROJECTED PER CAPITA DEMAND FOR OILSEEDS (GRAIN EQUIVALENT) IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: 0.01 KILOGRAMS)

ANNUAL GROWTH RATE IS .0324

	PER CAPITA DEMAND													
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO
1966	999	1039	1166	1269	1039	1166	1166	1239	1199	1299	789	1089	1086	1166
1967	1033	1073	1203	1309	1073	1203	1203	1279	1239	1343	816	1126	1123	1203
1968	1066	1109	1243	1353	1109	1243	1243	1319	1279	1386	843	1163	1156	1243
1969	1099	1143	1283	1396	1143	1283	1283	1363	1319	1429	869	1199	1196	1283
1970	1136	1179	1326	1443	1179	1326	1326	1409	1353	1476	896	1236	1233	1326
1971	1173	1219	1366	1489	1219	1366	1366	1453	1406	1523	926	1279	1273	1366
1972	1209	1259	1413	1536	1259	1413	1413	1499	1453	1573	956	1319	1316	1413
1973	1249	1299	1459	1586	1299	1459	1459	1549	1499	1626	986	1363	1359	1459
1974	1289	1343	1506	1639	1343	1506	1506	1599	1549	1676	1019	1406	1403	1506
1975	1333	1386	1553	1693	1386	1553	1553	1653	1599	1733	1053	1453	1446	1553
1976	1376	1429	1603	1746	1429	1603	1603	1706	1649	1786	1086	1499	1493	1603
1977	1419	1476	1656	1803	1476	1656	1656	1759	1703	1846	1123	1546	1543	1656
1978	1466	1523	1709	1863	1523	1709	1709	1816	1759	1906	1156	1596	1593	1709
1979	1513	1573	1766	1923	1573	1766	1766	1876	1816	1966	1196	1649	1643	1766
1980	1563	1626	1823	1983	1626	1823	1823	1936	1876	2029	1233	1703	1696	1823

SOURCE:

THE BASE YEAR,1966,PER CAPITA CONSUMPTION ESTIMATED FROM EICHBERGER'S STUDY.
PROJECTIONS AT 5.4% ANNUAL GROWTH RATE OF PER CAPITA INCOME&0.60 ELASTICITY.

TABLE 8-8.1. PROJECTED TOTAL DEMAND FOR BARLEY IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOCAL
1966	128366	8221	86195	19004	20994	140096	58703	17098	15387	126989	12507	43904	31896	132594	841954
1967	131337	8425	88193	19444	21479	143348	59852	17673	15802	129892	12796	44915	32634	135669	861463
1968	134399	8597	90038	19841	21932	146367	61218	17850	15998	132654	13064	45856	33165	138514	879193
1969	135848	8739	91128	19933	22293	148949	62144	18404	16292	134714	13202	46500	33642	140547	892335
1970	138465	8925	92821	20211	22765	152218	63426	18912	16622	137510	13435	47419	34265	143385	910379
1971	139997	9042	93792	20329	23063	154322	64218	19280	16822	139240	13563	47969	34623	145109	921369
1972	142185	9202	95199	20539	23469	157158	65313	19743	17102	141628	13754	48744	35141	147515	936692
1973	144437	9364	96627	20752	23883	160046	[illegible]	20217	17386	144056	13948	49532	35667	149962	952273
1974	146663	9529	98077	20967	24304	162984	67557	20703	17675	146525	14144	50332	36201	152447	968108
1975	148953	9697	99546	21184	24732	165977	68707	21200	17968	149035	14343	51145	36743	154973	984203
1976	151278	9869	101038	21403	25168	169022	69877	21709	18267	151587	14544	51971	37292	157540	1000565
1977	153638	10042	102552	21624	25611	172125	71066	22230	18570	154183	14749	52810	37850	160149	1017199
1978	156036	10219	104087	21847	26062	175282	72275	22764	18878	156822	14956	53662	38415	162799	1034104
1979	158468	10400	105646	22073	26521	178496	73504	23310	19191	159505	15166	54527	38989	165494	1051290
1980	160939	10583	107227	22301	26988	181769	74754	23869	19509	162234	15379	55406	39571	168231	1068760

SOURCE:

COMPUTED FROM CORRESPONDING FARM SECTOR PER CAPITA DEMAND (TABLE 8-5.1) AND FARM POPULATION (TABLE 8-1) ; PROCESSING LOSS = 35%.

TABLE 8-8.2. PROJECTED TOTAL DEMAND FOR CORN IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO	TOTAL
1966	23569	1738	32535	37989	43936	22473	77226	20935	26149	89971	86730	64515	44445	46494	618705
1967	24115	1781	33290	38869	44953	22995	78737	21645	26855	92028	88737	66001	45474	47572	633052
1968	24622	1817	33986	39662	45899	23479	80534	21856	27188	93985	90599	67385	46213	48570	645795
1969	24943	1847	34398	39846	46654	23894	81752	22534	27688	95445	91553	68330	46878	49283	655045
1970	25424	1887	35037	40401	47642	24418	83440	23156	28248	97426	93171	69680	47747	50278	667955
1971	25725	1911	35403	40637	48266	24756	84481	23607	28588	98651	94058	70489	48245	50882	675679
1972	26107	1945	35934	41058	49117	25211	85921	24174	29064	100343	95382	71628	48967	51726	686577
1973	26515	1979	36474	41483	49983	25674	87385	24755	29547	102063	96724	72786	49700	52584	697652
1974	26929	2014	37021	41912	50864	26145	88874	25349	30037	103813	98085	73962	50444	53456	708905
1975	27349	2050	37575	42346	51760	26625	90387	25958	30536	105591	99464	75156	51199	54341	720337
1976	27776	2086	38138	42784	52672	27114	91925	26581	31043	107399	100862	76369	51965	55241	731955
1977	28210	2123	38710	43226	53600	27611	93490	27219	31558	109238	102279	77602	52741	56156	743763
1978	28650	2160	39289	43672	54543	28118	95080	27873	32082	111108	103715	78854	53529	57086	755759
1979	29097	2198	39878	44123	55503	28634	96697	28541	32614	113009	105171	80126	54329	58030	767950
1980	29550	2237	40474	44578	56480	29159	98341	29226	33154	114942	106648	81418	55141	58990	780338

SOURCE:

COMPUTED FROM CORRESPONDING FARM SECTOR PER CAPITA DEMAND (TABLE 8-5.2) AND FARM POPULATION (TABLE 8-1) ; PROCESSING LOSS = 15%.

TABLE B-8.3. PROJECTED TOTAL DEMAND FOR SORGHUM IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND															
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	5287	1618	69075	74703	22549	72976	191200	13951	16891	63631	35885	73791	53596	117670	812823
1967	5410	1658	70677	76434	23071	74670	194942	14424	17347	65086	36716	75491	54836	120400	831162
1968	5524	1692	72155	77994	23557	76243	199391	14565	17562	66470	37486	77073	55728	122925	848365
1969	5596	1720	73028	78355	23944	77588	202407	15017	17885	67502	37881	78154	56530	124729	860336
1970	5733	1757	74385	79446	24451	79291	206585	15432	18246	68903	38550	79699	57577	127248	877273
1971	5767	1780	75163	79910	24771	80387	209164	15732	18467	69770	38918	80623	58178	128777	887407
1972	5857	1811	76291	80737	25208	81864	212728	16110	18774	70967	39465	81927	59049	130913	901701
1973	5948	1843	77435	81574	25653	83368	216353	16497	19086	72183	40021	83251	59933	133084	916229
1974	6041	1876	78597	82418	26105	84899	220039	16893	19403	73421	40584	84596	60830	135290	930992
1975	6135	1909	79775	83271	26565	86458	223784	17299	19725	74678	41154	85962	61740	137531	945986
1976	6231	1943	80970	84132	27033	88044	227594	17714	20052	75957	41733	87350	62663	139809	961225
1977	6328	1977	82183	85001	27509	89660	231467	18139	20385	77258	42319	88760	63600	142124	976710
1978	6427	2012	83414	85879	27993	91305	235404	18574	20723	78580	42913	90192	64551	144477	992444
1979	6527	2047	84662	86766	28486	92979	239408	19020	21067	79925	43516	91646	65515	146868	1008432
1980	6629	2083	85929	87661	28987	94684	243478	19476	21416	81292	44127	93124	66493	149297	1024676

SOURCE:

COMPUTED FROM CORRESPONDING FARM SECTOR PER CAPITA DEMAND (TABLE B-5.3) AND FARM POPULATION (TABLE B-1) ; PROCESSING LOSS =12%.

TABLE B-8.4. PROJECTED TOTAL DEMAND FOR TEFF IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	36475	4403	62881	42012	23402	74114	55185	17696	20139	155395	45547	72746	44319	125694	780008
1967	37319	4512	64339	42985	23943	75835	56265	18296	20682	158947	46602	74422	45344	128609	798100
1968	38104	4604	65684	43862	24447	77432	57549	18474	20939	162327	47579	75982	46082	131306	814371
1969	38601	4680	66480	44065	24850	78798	58419	19048	21324	164848	48080	77048	46745	133233	826219
1970	39345	4780	67715	44679	25376	80528	59625	19574	21755	168269	48930	78570	47611	135924	842681
1971	39780	4842	68423	44940	25708	81641	60370	19955	22017	170386	49396	79482	48108	137558	852606
1972	40402	4928	69450	45405	26161	83141	61399	20434	22383	173308	50091	80766	48828	139839	866535
1973	41033	5015	70492	45876	26623	84668	62445	20925	22755	176279	50796	82072	49559	142158	880696
1974	41674	5103	71549	46351	27092	86223	63508	21428	23133	179300	51511	83398	50301	144514	895085
1975	42325	5194	72621	46830	27569	87806	64590	21942	23517	182371	52235	84744	51053	146908	909705
1976	42986	5285	73709	47314	28055	89417	65689	22469	23908	185494	52969	86113	51817	149341	924566
1977	43656	5378	74814	47803	28549	91058	66807	23008	24304	188671	53713	87503	52591	151814	939669
1978	44338	5473	75933	48297	29052	92729	67943	23560	24707	191900	54468	88915	53377	154327	955019
1979	45029	5570	77070	48796	29563	94429	69099	24126	25117	195183	55233	90348	54175	156881	970619
1980	45731	5668	78224	49299	30083	96160	70274	24704	25533	198522	56008	91806	54984	159476	986472

SOURCE:

COMPUTED FROM CORRESPONDING FARM SECTOR PER CAPITA DEMAND (TABLE B-5.4) AND FARM POPULATION (TABLE B-1) ; PROCESSING LOSS = 7%.

TABLE 8-8.5. PROJECTED TOTAL DEMAND FOR WHEAT IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

	TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO	TOTAL
1966	54952	5745	26367	29065	3680	38079	51197	5637	10658	113050	8555	55859	0	45037	447881
1967	56308	5897	27019	29782	3771	39021	52278	5837	10962	115808	8766	57232	0	46151	458832
1968	57578	6027	27625	30436	3856	39903	53551	5903	11115	118448	8963	58519	0	47189	469113
1969	58417	6135	28001	30623	3925	40667	54442	6095	11336	120467	9071	59429	0	47954	476562
1970	59631	6275	28564	31096	4015	41622	55649	6273	11582	123151	9245	60694	0	48995	486792
1971	60381	6367	28906	31324	4073	42261	56428	6405	11740	124888	9347	61490	0	49659	493269
1972	61417	6489	29384	31696	4151	43102	57476	6568	11953	127220	9493	62577	0	50558	502084
1973	62470	6613	29870	32072	4231	43960	58543	6736	12170	129594	9641	63684	0	51473	511057
1974	63541	6740	30363	32453	4312	44834	59629	6908	12390	132013	9791	64810	0	52405	520189
1975	64629	6869	30864	32837	4394	45725	60735	7085	12615	134475	9944	65955	0	53352	529479
1976	65737	7001	31373	33226	4478	46634	61861	7266	12844	136983	10099	67120	0	54317	538939
1977	66862	7135	31891	33620	4564	47561	63008	7451	13076	139537	10256	68306	0	55299	548566
1978	68007	7272	32417	34018	4651	48506	64176	7642	13313	142138	10415	69512	0	56299	558366
1979	69171	7411	32952	34421	4740	49469	65365	7837	13554	144786	10577	70738	0	57316	568337
1980	70354	7553	33495	34828	4831	50452	66576	8037	13799	147484	10742	71987	0	58352	578490

SOURCE:

COMPUTED FROM CORRESPONDING FARM SECTOR PER CAPITA DEMAND (TABLE 8-5.5) AND FARM POPULATION (TABLE 8-1) ; PROCESSING LOSS = 25%.

TABLE B-8.6. PROJECTED TOTAL DEMAND FOR PULSES IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

	TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	11723	2525	28399	18981	6980	33473	61285	6590	5396	82767	10004	37326	14232	51820	371501
1967	12009	2589	29072	19431	7145	34267	62515	6817	5544	84701	10241	38204	14569	53048	380143
1968	12259	2643	29695	19837	7299	35006	63974	6887	5616	86545	10461	39025	14813	54188	388248
1969	12425	2688	30069	19939	7423	35641	64974	7105	5722	87933	10577	39592	15034	55011	394133
1970	12670	2747	30643	20227	7584	36442	66348	7304	5840	89803	10769	40394	15320	56149	402240
1971	12817	2784	30979	20355	7687	36964	67210	7450	5914	90978	10877	40883	15487	56853	407238
1972	13024	2835	31460	20576	7827	37662	68389	7633	6015	92585	11035	41565	15727	57824	414157
1973	13234	2886	31948	20800	7969	38373	69590	7820	6118	94219	11196	42258	15971	58813	421195
1974	13447	2939	32443	21025	8113	39097	70810	8012	6223	95881	11359	42962	16218	59817	428346
1975	13664	2992	32946	21253	8260	39835	72052	8208	6329	97572	11525	43677	16469	60838	435620
1976	13884	3047	33456	21484	8410	40586	73315	8410	6438	99293	11693	44405	16723	61877	443021
1977	14108	3102	33974	21717	8562	41351	74599	8616	6548	101044	11863	45144	16982	62933	450543
1978	14335	3158	34500	21952	8718	42131	75906	8827	6660	102824	12035	45895	17244	64007	458192
1979	14566	3215	35034	22190	8875	42925	77236	9043	6773	104636	12211	46659	17510	65098	465971
1980	14801	3274	35576	22430	9036	43734	78588	9265	6889	106479	12388	47435	17781	66208	473884

SOURCE :

COMPUTED FROM CORRESPONDING FARM SECTOR PER CAPITA DEMAND (TABLE B-5.6) AND FARM POPULATION (TABLE B-1) ; PROCESSING LOSS = 11%.

TABLE 8-8.7. PROJECTED TOTAL DEMAND FOR OILSEEDS IN RURAL FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND															
	AKUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	7010	1180	11411	12830	6376	13450	31011	5278	5530	35810	7341	18885	12549	27742	196403
1967	7179	1211	11688	13141	6530	13776	31649	5462	5684	36665	7518	19339	12852	28414	201108
1968	7337	1237	11944	13422	6674	14080	32404	5521	5761	37482	7683	19764	13074	29039	205422
1969	7440	1258	12101	13498	6790	14343	32927	5698	5872	38102	7772	20061	13275	29494	208631
1970	7591	1286	12338	13699	6941	14672	33640	5861	5997	38931	7917	20478	13535	30120	213006
1971	7683	1304	12479	13793	7039	14890	34094	5981	6075	39461	8001	20737	13690	30512	215739
1972	7811	1329	12679	13950	7170	15179	34710	6131	6183	40177	8121	21093	13909	31049	219491
1973	7941	1354	12882	14108	7304	15473	35336	6284	6292	40907	8244	21455	14131	31596	223307
1974	8073	1379	13088	14269	7440	15773	35974	6442	6403	41649	8368	21823	14357	32152	227190
1975	8207	1405	13298	14431	7579	16078	36623	6603	6515	42405	8494	22198	14586	32717	231139
1976	8344	1431	13510	14594	7720	16390	37283	6768	6630	43174	8622	22579	14819	33292	235156
1977	8482	1457	13727	14760	7864	16707	37956	6938	6747	43957	8752	22966	15055	33877	239245
1978	8623	1485	13946	14927	8010	17031	38640	7111	6866	44754	8884	23360	15295	34472	243404
1979	8766	1512	14169	15096	8159	17360	39336	7289	6986	45566	9017	23760	15540	35077	247633
1980	8912	1540	14395	15267	8311	17696	40045	7471	7109	46391	9153	24168	15787	35693	251938

SOURCE:

COMPUTED FROM CORRESPONDING FARM SECTOR PER CAPITA DEMAND (TABLE 8-5.7) AND FARM POPULATION (TABLE 8-1) ; PROCESSING LOSS = 70%.

TABLE B-9.1. PROJECTED TOTAL DEMAND FOR BARLEY IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

	TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	4437	301	2873	720	775	4926	2124	618	532	4182	45[illegible]	1618	1[illegible]	476[illegible]	29366
1967	4556	313	2946	738	798	5025	2172	641	549	4292	461	1657	1[illegible]78	4877	30[illegible]
1968	4659	318	3021	756	815	5159	2227	650	557	4388	472	1689	1099	4995	30805
1969	4734	327	3061	760	831	5255	2266	673	570	4464	478	1715	1118	5[illegible]77	31329
1970	4839	336	3135	773	854	5380	2322	692	584	4571	488	1753	1142	5196	32[illegible]
1971	4899	342	3167	778	866	5457	2354	707	593	4631	493	1772	1156	5264	32479
1972	4988	351	3223	788	883	5565	2400	727	606	4719	5[illegible]1	18[illegible]2	1176	5363	33[illegible]92
1973	5[illegible]77	360	3279	798	901	5675	2447	746	619	4809	509	1833	1196	5463	33712
1974	5169	369	3337	808	920	5789	2495	766	631	49[illegible]	517	1863	1218	5566	34348
1975	5262	378	3396	818	939	5903	2544	787	645	4993	525	1895	1239	567[illegible]	34994
1976	5355	388	3455	828	958	6019	2594	808	658	5087	533	1926	1261	5775	35645
1977	5451	397	3515	838	978	6139	2645	830	672	5183	542	1959	1283	5883	36315
1978	5549	407	3578	848	999	6260	2696	852	686	5282	551	1992	1305	5993	36998
1979	5648	417	3640	859	1019	6385	2749	875	700	5382	559	2025	1328	6105	37691
1980	575[illegible]	428	3704	869	1040	6510	2803	898	715	5484	568	2059	1351	6219	38398

SOURCE :

COMPUTED FROM CORRESPONDING NON FARM SECTOR PER CAPITA DEMAND (TABLE B-6.1) AND NON FARM POPULATION (TABLE B-2) ;PROCESSING LOSS = 35%.

TABLE 8-9.2. PROJECTED TOTAL DEMAND FOR CORN IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

	TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	779	64	1084	1432	1666	815	2952	797	973	3322	3419	2549	1576	1776	23204
1967	80[illegible]	66	1112	1467	1715	832	3018	827	1004	3409	3507	2612	1618	1820	23807
1968	818	68	1140	1503	1750	854	3094	839	1018	3486	3587	2662	1648	1864	24331
1969	831	69	1155	1512	1784	869	3149	868	1043	3545	3632	2703	1677	1894	24731
1970	849	71	1181	1537	1833	890	3226	894	1068	3630	3706	2763	1712	1939	25299
1971	86[illegible]	73	1195	1548	1859	903	3271	913	1085	3678	3745	2793	1734	1964	25621
1972	875	75	1216	1567	1897	921	3335	938	1108	3748	3805	2840	1764	2001	26090
1973	891	77	1237	1586	1936	939	3400	963	1131	3819	3866	2888	1795	2038	26566
1974	9[illegible]7	78	1259	1606	1977	958	3467	989	1155	3892	3929	2937	1826	2077	27057
1975	923	80	1282	1626	2017	977	3535	1015	1179	3966	3991	2986	1858	2116	27551
1976	94[illegible]	82	1304	1646	2058	996	3604	1043	1204	4041	4055	3036	1891	2155	28055
1977	957	84	1327	1666	2102	1016	3674	1071	1229	4117	4120	3087	1924	2195	28569
1978	974	87	1350	1687	2145	1036	3746	1099	1254	4195	4186	3139	1958	2236	29092
1979	991	89	1374	1707	2189	1056	3820	1129	1280	4275	4253	3192	1992	2278	29625
198[illegible]	1009	91	1398	1728	2234	1077	3895	1159	1307	4356	4321	3246	2027	2321	30169

SOURCE:

COMPUTED FROM CORRESPONDING NON FARM SECTOR PER CAPITA DEMAND (TABLE 8-6.2) AND NON FARM POPULATION (TABLE 8-2) ; PROCESSING LOSS = 15%.

TABLE B-9.3. PROJECTED TOTAL DEMAND FOR SORGHUM IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

	TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	173	59	2291	2217	854	2636	6232	482	627	2352	1290	2866	1903	4218	28200
1967	177	61	2350	2273	880	2689	6372	500	647	2414	1323	2936	1954	4322	28898
1968	181	62	2410	2328	898	2760	6532	507	656	2468	1353	2993	1990	4426	29564
1969	184	64	2442	2342	915	2812	6649	525	672	2510	1370	3039	2026	4499	30049
1970	188	66	2497	2381	941	2878	6811	540	688	2570	1398	3106	2068	4605	30737
1971	191	67	2526	2397	954	2920	6905	552	699	2604	1413	3140	2094	4665	31127
1972	194	69	2571	2427	973	2978	7041	567	714	2654	1435	3193	2131	4752	31699
1973	198	71	2616	2457	993	3037	7179	582	729	2704	1458	3247	2168	4841	32280
1974	201	72	2662	2488	1014	3097	7320	598	744	2756	1482	3302	2206	4932	32874
1975	205	74	2709	2518	1035	3159	7463	614	760	2808	1505	3357	2245	5024	33476
1976	208	76	2756	2549	1056	3221	7609	631	776	2861	1530	3413	2284	5118	34088
1977	212	78	2804	2580	1078	3285	7758	647	792	2915	1554	3471	2324	5214	34712
1978	216	80	2854	2613	1100	3350	7910	665	808	2970	1579	3529	2364	5311	35349
1979	220	82	2904	2645	1123	3416	8064	683	825	3027	1604	3588	2406	5410	35997
1980	224	84	2955	2677	1146	3483	8223	701	842	3084	1630	3649	2448	5511	36657

SOURCE:

COMPUTED FROM CORRESPONDING NON FARM SECTOR PER CAPITA DEMAND(TABLE B-6.3) AND NON FARM POPULATION (TABLE B-2) ; PROCESSING LOSS = 12%.

TABLE B-9.4. PROJECTED TOTAL DEMAND FOR TEFF IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO	TOTAL
1966	1244	171	2351	1595	816	967	3929	664	696	5353	1709	2860	1551	4538	28444
1967	1277	176	2412	1635	840	987	4017	689	718	5494	1753	2930	1593	4650	29171
1968	1307	181	2473	1675	857	1013	4118	699	728	5617	1794	2987	1623	4761	29833
1969	1327	186	2516	1684	874	1032	4192	723	746	5713	1816	3033	1651	4840	30323
1970	1357	191	2562	1713	898	1057	4294	744	764	5850	1853	3100	1686	4954	31523
1971	1374	195	2592	1724	911	1072	4353	760	776	5927	1873	3134	1707	5018	31416
1972	1399	200	2638	1746	929	1093	4439	781	792	6040	1903	3187	1737	5112	31996
1973	1424	205	2684	1767	949	1115	4526	802	809	6155	1933	3240	1767	5208	32584
1974	1449	210	2732	1789	969	1137	4615	824	826	6272	1964	3295	1798	5306	33186
1975	1475	215	2780	1811	988	1159	4705	846	843	6391	1996	3350	1830	5405	33794
1976	1501	221	2828	1834	1008	1182	4797	868	861	6512	2028	3406	1862	5506	34414
1977	1529	226	2877	1856	1030	1206	4891	892	878	6635	2060	3464	1894	5608	35046
1978	1556	232	2928	1879	1051	1229	4987	916	897	6761	2093	3522	1928	5713	35692
1979	1584	238	2980	1902	1072	1254	5084	940	915	6889	2126	3581	1962	5820	36347
1980	1612	244	3032	1926	1094	1279	5184	966	935	7019	2161	3642	1996	5929	37019

SOURCE :

COMPUTED FROM CORRESPONDING NON FARM SECTOR PER CAPITA DEMAND (TABLE B-6.4) AND NON FARM POPULATION (TABLE B-2) ; PROCESSING LOSS = 7%.

TABLE 8-9.5. PROJECTED TOTAL DEMAND FOR WHEAT IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	1809	210	889	1104	120	1255	1743	188	372	4712	398	1883	0	1485	16168
1967	1862	217	915	1135	124	1284	1788	196	385	4850	409	1935	0	1526	16626
1968	1911	224	940	1166	127	1322	1838	199	392	4973	420	1978	0	1567	17057
1969	1947	230	956	1176	130	1351	1877	206	402	5074	426	2015	0	1598	17388
1970	1996	237	980	1199	134	1387	1928	213	413	5211	436	2065	0	1640	17839
1971	2027	243	995	1211	136	1411	1961	218	421	5295	442	2094	0	1667	18121
1972	2070	250	1015	1230	139	1443	2005	225	431	5412	451	2136	0	1703	18510
1973	2113	257	1036	1249	142	1477	2051	232	442	5531	459	2178	0	1740	18907
1974	2158	264	1058	1268	146	1511	2097	239	452	5653	468	2222	0	1778	19314
1975	2203	271	1080	1288	149	1545	2145	246	463	5778	477	2266	0	1817	19728
1976	2249	279	1102	1307	153	1580	2193	253	474	5904	486	2311	0	1856	20147
1977	2296	287	1124	1327	156	1616	2243	261	485	6034	495	2357	0	1896	20577
1978	2344	295	1148	1348	160	1653	2293	269	497	6167	505	2404	0	1938	21021
1979	2393	303	1171	1368	164	1691	2345	277	509	6303	514	2451	0	1980	21469
1980	2444	312	1195	1389	168	1729	2398	285	521	6441	524	2500	0	2023	21929

SOURCE :

COMPUTED FROM CORRESPONDING NON FARM SECTOR PER CAPITA DEMAND (TABLE 8-6.5) AND NON FARM POPULATION (TABLE 8-2) ;PROCESSING LOSS = 25%.

TABLE 8-9.6. PROJECTED TOTAL DEMAND FOR PULSES IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	689	89	992	717	248	1172	2280	239	192	2590	361	1174	525	1909	13177
1967	708	91	1018	735	256	1196	2334	248	198	2660	371	1204	539	1958	13516
1968	725	94	1045	754	261	1229	2395	252	201	2723	380	1229	550	2007	13845
1969	737	97	1060	759	267	1254	2440	261	206	2772	385	1249	560	2042	14089
1970	754	99	1085	773	274	1285	2502	268	212	2841	393	1277	573	2092	14428
1971	764	101	1099	779	278	1304	2539	275	215	2882	397	1293	580	2121	14627
1972	779	104	1120	789	284	1332	2592	282	220	2940	404	1316	591	2163	14916
1973	794	107	1140	800	290	1359	2645	290	225	2998	411	1339	602	2206	15206
1974	809	110	1162	811	297	1388	2700	298	230	3058	418	1363	613	2250	15507
1975	824	113	1183	821	303	1417	2755	307	235	3120	425	1388	625	2294	15810
1976	839	116	1205	832	310	1446	2812	315	240	3182	433	1412	636	2339	16117
1977	855	118	1227	843	316	1476	2870	324	245	3245	440	1438	648	2385	16430
1978	872	122	1250	855	323	1507	2929	333	250	3310	447	1463	660	2432	16753
1979	888	125	1273	866	330	1538	2989	342	256	3376	455	1489	672	2480	17079
1980	905	128	1297	878	337	1570	3051	352	261	3443	463	1516	685	2529	17415

SOURCE:

COMPUTED FROM CORRESPONDING NON FARM SECTOR PER CAPITA DEMAND (TABLE 8-6.6) AND NON FARM POPULATION (TABLE 8-2) ; PROCESSING LOSS = 11%.

TABLE B-9.7. PROJECTED TOTAL DEMAND FOR OILSEEDS IN RURAL NON FARM SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND															
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	245	38	390	455	230	461	987	191	195	1125	290	703	452	873	6635
1967	252	39	401	467	238	471	1011	198	202	1157	298	722	465	897	6818
1968	258	40	412	480	243	484	1039	201	205	1186	305	737	475	920	6985
1969	263	42	418	483	248	494	1059	209	211	1208	310	750	484	937	7116
1970	269	43	428	493	256	507	1087	215	216	1240	317	768	496	961	7296
1971	273	44	434	497	260	515	1105	220	220	1259	321	778	503	975	7404
1972	279	45	443	504	266	527	1129	227	225	1285	326	793	513	996	7558
1973	284	46	451	511	272	538	1153	233	230	1312	332	808	523	1016	7709
1974	290	48	460	519	278	550	1178	240	235	1340	338	823	533	1037	7869
1975	296	49	469	526	284	562	1203	247	241	1368	344	838	543	1059	8029
1976	302	50	479	534	290	574	1229	254	246	1396	351	854	554	1081	8194
1977	308	51	488	541	297	587	1256	261	252	1426	357	870	565	1103	8362
1978	314	53	497	549	304	600	1283	269	258	1456	363	887	576	1126	8535
1979	320	54	507	557	311	613	1311	277	264	1486	370	903	587	1149	8709
1980	326	56	517	565	318	626	1339	285	270	1517	377	920	599	1173	8858

SOURCE:

COMPUTED FROM CORRESPONDING NON FARM SECTOR PER CAPITA DEMAND (TABLE B-6.7) AND NON FARM POPULATION (TABLE B-2) ; PROCESSING LOSS = 70%.

TABLE 8-10.1. PROJECTED TOTAL DEMAND FOR BARLEY IN RURAL SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

	RURAL TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	132803	8522	89068	19724	21769	145022	60827	17716	15919	131171	12957	45522	32946	137354	871320
1967	135893	8735	91139	20182	22277	148373	62024	18318	16351	134184	13257	46572	33712	140546	891563
1968	138758	8915	93059	20597	22747	151526	63445	18500	16595	137042	13536	47545	34264	143509	909998
1969	140582	9066	94189	20693	23124	154204	64410	19077	16862	139178	13680	48215	34760	145624	923664
1970	143304	9261	95951	20984	23619	157598	65748	19604	17206	142081	13923	49172	35407	148581	942439
1971	144896	9384	96959	21107	23929	159779	66572	19987	17415	143871	14056	49741	35779	150373	953848
1972	147173	9553	98422	21327	24352	162723	67713	20470	17708	146347	14255	50546	36317	152878	969784
1973	149484	9724	99906	21550	24784	165721	68873	20963	18005	148865	14457	51365	36863	155425	985985
1974	151832	9898	101414	21775	25224	168773	70052	21469	18306	151425	14661	52195	37419	158013	1002456
1975	154215	10075	102942	22002	25671	171880	71251	21987	18613	154028	14868	53040	37982	160643	1019197
1976	156633	10257	104493	22231	26126	175041	72471	22517	18925	156674	15077	53897	38553	163315	1036210
1977	159089	10439	106067	22462	26589	178264	73711	23060	19242	159366	15291	54769	39133	166032	1053514
1978	161585	10626	107665	22695	27061	181542	74971	23616	19564	162104	15507	55654	39720	168792	1071102
1979	164116	10817	109286	22932	27540	184881	76253	24185	19891	164887	15725	56552	40317	171599	1088981
1980	166689	11011	110931	23170	28028	188279	77557	24767	20224	167718	15947	57465	40922	174450	1107158

SOURCE:

COMPUTED FROM RURAL FARM TOTAL DEMAND (TABLE 8-8.1) AND RURAL NON FARM TOTAL DEMAND (TABLE 8-9.1) .

TABLE 8-10.2. PROJECTED TOTAL DEMAND FOR CORN IN RURAL SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	RURAL TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	24348	1802	33619	39421	45602	23288	80178	21732	27122	93293	90149	67064	46021	48270	641909
1967	24915	1847	34402	40336	46668	23827	81755	22472	27859	95437	92244	68613	47092	49392	656859
1968	25440	1885	35126	41165	47649	24333	83628	22695	28206	97471	94186	70047	47861	50434	670126
1969	25774	1916	35553	41358	48438	24763	84901	23402	28731	98990	95185	71033	48555	51177	679776
1970	26273	1958	36218	41938	49475	25308	86666	24050	29316	101056	96877	72443	49459	52217	693254
1971	26565	1984	36598	42185	50125	25659	87752	24520	29673	102329	97803	73282	49979	52846	701300
1972	26982	2020	37150	42625	51014	26132	89256	25112	30172	104091	99187	74468	50731	53727	712667
1973	27406	2056	37711	43069	51919	26613	90785	25718	30678	105882	100590	75674	51495	54622	724218
1974	27836	2092	38280	43518	52841	27103	92341	26338	31192	107705	102014	76899	52270	55533	735962
1975	28272	2130	38857	43972	53777	27602	93922	26973	31715	109557	103455	78142	53057	56457	747888
1976	28716	2168	39442	44430	54730	28110	95529	27624	32247	111440	104917	79405	53856	57396	760010
1977	29167	2207	40037	44892	55702	28627	97164	28290	32787	113355	106399	80689	54665	58351	772332
1978	29624	2247	40639	45359	56688	29154	98826	28972	33336	115303	107901	81993	55487	59322	784851
1979	30088	2287	41252	45830	57692	29690	100517	29670	33894	117284	109424	83318	56321	60308	797575
1980	30559	2328	41872	46306	58714	30236	102236	30385	34461	119298	110969	84664	57168	61311	810507

SOURCE:

COMPUTED FROM RURAL FARM TOTAL DEMAND (TABLE 8-8.2) AND RURAL NON FARM TOTAL DEMAND (TABLE 8-9.2) .

TABLE 8-10.3. PROJECTED TOTAL DEMAND FOR SORGHUM IN RURAL SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

RURAL TOTAL DEMAND

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO	TOTAL
1966	5460	1677	71366	76920	23403	75612	197432	14433	17518	65983	37175	76657	55499	121888	841023
1967	5587	1719	73027	78707	23951	77359	201314	14924	17994	67500	38039	78427	56790	124722	860060
1968	5705	1754	74565	80322	24455	79003	205923	15072	18218	68938	38839	80066	57718	127351	877929
1969	5780	1784	75470	80697	24859	80400	209056	15542	18557	70012	39251	81193	58556	129228	890385
1970	5891	1823	76882	81827	25392	82169	213396	15972	18934	71473	39948	82805	59645	131853	908010
1971	5958	1847	77689	82307	25725	83307	216069	16284	19166	72374	40331	83763	60272	133442	918534
1972	6051	1880	78862	83164	26181	84842	219769	16677	19488	73621	40900	85120	61180	135665	933400
1973	6146	1914	80051	84031	26646	86405	223532	17079	19815	74887	41479	86498	62101	137925	948509
1974	6242	1948	81259	84906	27119	87996	227359	17491	20147	76177	42066	87898	63036	140222	963866
1975	6340	1983	82484	85789	27600	89617	231247	17913	20485	77486	42659	89319	63985	142555	979462
1976	6439	2019	83726	86681	28089	91265	235203	18345	20828	78818	43263	90763	64947	144927	995313
1977	6540	2055	84987	87581	28587	92945	239225	18786	21177	80173	43873	92231	65924	147338	1011422
1978	6643	2092	86268	88492	29093	94655	243314	19239	21531	81550	44492	93721	66915	149788	1027793
1979	6747	2129	87566	89411	29609	96395	247472	19703	21892	82952	45120	95234	67921	152278	1044429
1980	6853	2167	88884	90338	30133	98167	251701	20177	22258	84376	45757	96773	68941	154808	1061333

SOURCE:

COMPUTED FROM RURAL FARM TOTAL DEMAND (TABLE 8-8.3) AND RURAL NON FARM TOTAL DEMAND (TABLE 8-9.3) .

TABLE 8-10.4. PROJECTED TOTAL DEMAND FOR TEFF IN RURAL SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

	RURAL TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	37719	4574	65232	43607	24218	75081	59114	18360	20835	160748	47256	75606	45870	130232	808452
1967	38596	4688	66751	44620	24783	76822	60282	18985	21400	164441	48355	77352	46937	133259	827271
1968	39411	4785	68157	45537	25304	78445	61667	19173	21667	167944	49373	78969	47705	136047	844204
1969	39928	4866	68986	45749	25724	79830	62611	19771	22070	170561	49896	80081	48396	138073	856542
1970	40702	4971	70277	46392	26274	81585	63919	20318	22519	174119	50783	81670	49297	140878	873704
1971	41154	5037	71015	46664	26619	82713	64723	20715	22793	176313	51269	82616	49815	142576	884022
1972	41801	5128	72088	47151	27090	84234	65838	21215	23175	179348	51994	83953	50565	144951	898531
1973	42457	5220	73176	47643	27572	85783	66971	21727	23564	182434	52729	85312	51326	147366	913280
1974	43123	5313	74281	48140	28061	87360	68123	22252	23959	185572	53475	86693	52099	149820	928271
1975	43800	5409	75401	48641	28557	88965	69295	22788	24360	188762	54231	88094	52883	152313	943499
1976	44467	5506	76537	49148	29063	90599	70486	23337	24769	192006	54997	89519	53679	154847	958980
1977	45185	5604	77691	49659	29579	92264	71698	23900	25182	195306	55773	90967	54485	157422	974715
1978	45894	5705	78861	50176	30103	93958	72930	24476	25604	198661	56561	92437	55305	160040	990711
1979	46613	5808	80050	50698	30635	95683	74183	25066	26032	202072	57359	93929	56137	162701	1006966
1980	47343	5912	81256	51225	31177	97439	75458	25670	26468	205541	58169	95448	56980	165405	1023491

SOURCE:

COMPUTED FROM RURAL FARM TOTAL DEMAND (TABLE 8-8.4) AND RURAL NON FARM TOTAL DEMAND (TABLE 8-9.4).

TABLE 8-10.5. PROJECTED TOTAL DEMAND FOR WHEAT IN RURAL SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

	RURAL TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	56761	5955	27256	30169	3800	39334	52940	5825	11030	117762	8953	57742	0	46522	464049
1967	58170	6114	27934	30917	3895	40305	54066	6033	11347	120650	9175	59167	0	47677	475458
1968	59489	6251	28565	31602	3983	41225	55389	6102	11507	123421	9383	60497	0	48756	486170
1969	60364	6365	28957	31799	4055	42018	56319	6301	11738	125541	9497	61444	0	49552	493950
1970	61627	6512	29544	32295	4149	43009	57577	6486	11995	128362	9681	62759	0	50635	504631
1971	62408	6610	29901	32535	4209	43672	58389	6623	12161	130183	9789	63584	0	51326	511390
1972	63487	6739	30399	32926	4290	44545	59481	6793	12384	132632	9944	64713	0	52261	520594
1973	64583	6870	30906	33321	4373	45437	60594	6968	12612	135125	10100	65862	0	53213	529964
1974	65699	7004	31421	33721	4458	46345	61726	7147	12842	137666	10259	67032	0	54183	539503
1975	66832	7140	31944	34125	4543	47270	62880	7331	13078	140253	10421	68221	0	55169	549207
1976	67986	7280	32475	34533	4631	48214	64054	7519	13318	142887	10585	69431	0	56173	559086
1977	69158	7422	33015	34947	4720	49177	65251	7712	13561	145571	10751	70663	0	57195	569143
1978	70351	7567	33565	35366	4811	50159	66469	7911	13810	148305	10920	71916	0	58237	579387
1979	71564	7714	34123	35789	4904	51160	67710	8114	14063	151089	11091	73189	0	59296	589806
1980	72798	7865	34690	36217	4999	52181	68974	8322	14320	153925	11266	74487	0	60375	600419

SOURCE:

COMPUTED FROM RURAL FARM TOTAL DEMAND (TABLE 8-8.5) AND RURAL NON FARM TOTAL DEMAND (TABLE 8-9.5) .

TABLE 8-10.6. PROJECTED TOTAL DEMAND FOR PULSES IN RURAL SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	RURAL TOTAL DEMAND															
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	12412	2614	29391	19698	7228	34645	63565	6829	5588	85357	10365	38500	14757	53729	384678
1967	12708	2680	30090	20166	7401	35463	64849	7065	5742	87361	10612	39408	15108	55006	393659
1968	12984	2737	30740	20591	7560	36235	66369	7139	5817	89268	10841	40254	15363	56195	402093
1969	13162	2785	31129	20698	7690	36895	67414	7366	5928	90705	10962	40841	15994	57053	408222
1970	13424	2846	31728	21000	7858	37727	68850	7572	6052	92644	11162	41671	15893	58241	416668
1971	13581	2885	32078	21134	7965	38268	69749	7725	6129	93860	11274	42176	16067	58974	421865
1972	13803	2939	32580	21365	8111	38994	70981	7915	6235	95525	11439	42881	16318	59987	429073
1973	14028	2993	33088	21600	8259	39732	72235	8110	6343	97217	11607	43597	16573	61019	436401
1974	14256	3049	33605	21836	8410	40485	73510	8310	6453	98939	11777	44325	16831	62067	443853
1975	14488	3105	34129	22074	8563	41252	74807	8515	6564	100692	11950	45065	17094	63132	451430
1976	14723	3163	34461	22316	8720	42032	76127	8725	6678	102475	12126	45817	17359	64216	459138
1977	14963	3220	35201	22560	8878	42827	77469	8940	6793	104289	12303	46582	17630	65318	466973
1978	15207	3280	35750	22807	9041	43638	78835	9160	6910	106134	12482	47358	17904	66439	474945
1979	15454	3340	36307	23056	9205	44463	80225	9385	7029	108012	12666	48148	18182	67578	483050
1980	15706	3402	36873	23308	9373	45304	81639	9617	7150	109922	12851	48951	18466	68737	491299

SOURCE:

COMPUTED FROM RURAL FARM TOTAL DEMAND (TABLE 8-8.6) AND RURAL NON FARM TOTAL DEMAND (TABLE 8-9.6).

TABLE 8-20.7. PROJECTED TOTAL DEMAND FOR OILSEEDS IN RURAL SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

	RURAL TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO	TOTAL
1966	7255	1218	11801	13285	6606	13911	31998	5469	5725	36935	7631	19588	13001	28615	203038
1967	7431	1250	12089	13608	6768	14247	32660	5660	5886	37822	7816	20061	13317	29311	207926
1968	7595	1277	12356	13902	6917	14564	33443	5722	5966	38668	7988	20501	13549	29959	212407
1969	7703	1300	12519	13981	7038	14837	33986	5907	6083	39310	8082	20811	13759	30431	215747
1970	7860	1329	12766	14192	7197	15179	34727	6076	6213	40171	8234	21246	14031	31081	220302
1971	7956	1348	12913	14290	7299	15405	35199	6201	6295	40720	8322	21515	14193	31487	223143
1972	8090	1374	13122	14454	7436	15706	35839	6358	6408	41462	8447	21886	14422	32045	227049
1973	8225	1400	13333	14619	7576	16011	36489	6517	6522	42219	8576	22263	14654	32612	231016
1974	8363	1427	13548	14788	7718	16323	37152	6682	6638	42989	8706	22646	14890	33189	235059
1975	8503	1454	13767	14957	7863	16640	37826	6850	6756	43773	8838	23036	15129	33776	239168
1976	8646	1481	13989	15128	8010	16964	38512	7022	6876	44570	8973	23433	15373	34373	243350
1977	8790	1508	14215	15301	8161	17294	39212	7199	6999	45383	9109	23836	15620	34980	247607
1978	8937	1538	14443	15476	8314	17631	39923	7380	7124	46210	9247	24247	15871	35598	251939
1979	9086	1566	14676	15653	8470	17973	40647	7566	7250	47052	9387	24663	16127	36226	256342
1980	9238	1596	14912	15832	8629	18322	41384	7756	7379	47908	9530	25088	16386	36866	260826

SOURCE:

COMPUTED FROM RURAL FARM TOTAL DEMAND (TABLE 8-8.7) AND RURAL NON FARM TOTAL DEMAND (TABLE 8-9.7) .

TABLE 8-11.1. PROJECTED TOTAL DEMAND FOR BARLEY IN URBAN SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

	TOTAL DEMAND														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	7555	1503	6707	4321	1047	8927	4311	991	1774	35978	1131	3430	1734	6779	86188
1967	7838	1555	6936	5045	1081	9234	4628	1042	1944	44807	1171	3550	2037	7021	97859
1968	8150	1620	7227	5416	1130	9424	4824	1085	2027	48141	1220	3698	2120	7312	103594
1969	9941	1777	8687	6596	1380	10329	5309	1212	2223	56561	1479	4236	2663	8436	120829
1970	10940	1832	9651	7604	1436	10566	5601	1264	2369	64422	1636	4578	3031	9165	134095
1971	12139	1908	10551	8686	1531	10873	5882	1337	2508	72378	1814	4917	3471	9903	147898
1972	13541	1996	11696	9998	1653	11253	6227	1418	2672	82088	2023	5323	3995	10777	164660
1973	15092	2086	12954	11498	1782	11634	6587	1503	2844	93020	2254	5757	4596	11718	183325
1974	16809	2179	14338	13213	1921	12019	6962	1591	3023	105328	2510	6222	5282	12732	204131
1975	18707	2274	15857	15173	2069	12407	7353	1683	3215	119176	2793	6720	6067	13823	227317
1976	20805	2372	17523	17411	2227	12799	7768	1779	3415	134746	3105	7252	6963	14997	253154
1977	23121	2472	19352	19965	2394	13193	8184	1879	3625	152241	3451	7821	7986	16259	281943
1978	25677	2575	21357	22878	2573	13590	8626	1984	3844	171896	3832	8429	9153	17615	314029
1979	28498	2680	23553	26200	2764	13992	9085	2094	4075	193959	4252	9078	10483	19073	349786
1980	31609	2787	25961	29985	2967	14395	9563	2207	4316	218721	4715	9771	12000	20637	389634

SOURCE:

COMPUTED FROM CORRESPONDING URBAN SECTOR PER CAPITA DEMAND (TABLE 8-7.1) AND URBAN POPULATION (TABLE 4-6).: PROCESSING LOSS = 35%.

TABLE 8-11.2. PROJECTED TOTAL DEMAND FOR CORN IN URBAN SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	1555	320	2451	8363	1999	1358	5050	1094	2360	24963	7614	4738	1767	2383	66015
1967	1607	331	2535	9764	2063	1405	5421	1150	2586	31089	7883	4904	2076	2468	75282
1968	1678	345	2641	10483	2156	1464	5651	1198	2697	33403	8213	5109	2160	2570	79768
1969	2046	378	3175	12767	2633	1572	6219	1338	2958	39245	9955	5851	2714	2966	93817
1970	2252	390	3527	14717	2740	1608	6562	1396	3151	44699	11010	6325	3089	3222	104688
1971	2499	406	3856	16811	2921	1655	6890	1476	3337	50220	12205	6793	3537	3481	116087
1972	2787	425	4275	19350	3154	1712	7294	1566	3555	56957	13613	7353	4071	3789	129901
1973	3106	444	4735	22254	3401	1770	7716	1659	3784	64542	15171	7953	4683	4119	145337
1974	3460	464	5241	25574	3666	1829	8155	1756	4024	73082	16893	8596	5383	4476	162599
1975	3851	484	5796	29368	3948	1888	8613	1858	4278	82691	18797	9283	6183	4859	181897
1976	4282	505	6405	33699	4249	1947	9090	1965	4543	93494	20900	10019	7096	5272	203466
1977	4759	526	7073	38642	4569	2007	9587	2075	4822	105633	23223	10804	8138	5716	227574
1978	5285	548	7806	44281	4910	2068	10104	2191	5114	119271	25787	11644	9327	6193	254529
1979	5866	570	8609	50709	5273	2129	10642	2312	5421	134580	28614	12540	10683	6705	284653
1980	6506	593	9489	58035	5661	2190	11202	2437	5742	151761	31733	13498	12229	7255	318331

SOURCE:

COMPUTED FROM CORRESPONDING URBAN SECTOR PER CAPITA DEMAND (TABLE 8-7.2) AND URBAN POPULATION (TABLE 4-6).: PROCESSING LOSS = 15%.

TABLE B-11.3. PROJECTED TOTAL DEMAND FOR SORGHUM IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	348	294	4174	12557	1025	4398	10769	653	1520	17674	3233	5328	2137	6010	70120
1967	360	304	4316	14661	1059	4549	11559	687	1666	22011	3346	5515	2511	6224	78768
1968	375	317	4497	15741	1106	4741	12051	715	1738	23649	3487	5745	2613	6482	83257
1969	458	348	5406	19170	1351	5088	13261	799	1906	27785	4226	6580	3282	7478	97138
1970	504	359	6006	22099	1406	5205	13991	833	2030	31647	4674	7113	3735	8125	107727
1971	559	374	6566	25243	1499	5356	14693	881	2150	35555	5181	7639	4277	8779	118752
1972	623	391	7279	29056	1618	5543	15554	935	2290	40325	5779	8269	4924	9553	132139
1973	695	408	8062	33416	1745	5731	16453	990	2437	45696	6440	8944	5664	10388	147069
1974	774	427	8923	38402	1881	5921	17389	1048	2592	51742	7172	9666	6510	11287	163734
1975	861	445	9868	44098	2026	6112	18366	1109	2756	58545	7980	10440	7478	12254	182338
1976	958	464	10905	50602	2180	6305	19383	1173	2927	66194	8873	11267	8582	13295	203108
1977	1065	484	12043	58024	2344	6499	20442	1239	3106	74788	9859	12150	9842	14414	226299
1978	1182	504	13290	66491	2520	6695	21546	1308	3294	84443	10947	13095	11281	15616	252212
1979	1312	525	14657	76144	2706	6892	22693	1380	3492	95282	12148	14103	12920	16908	281162
1980	1455	546	16156	87145	2905	7091	23887	1455	3699	107446	13471	15180	14790	18295	313521

SOURCE:

COMPUTED FROM CORRESPONDING URBAN SECTOR PER CAPITA DEMAND (TABLE B-7.3) AND URBAN POPULATION (TABLE 4-6).: PROCESSING LOSS = 12%.

TABLE 8-11.4. PROJECTED TOTAL DEMAND FOR TEFF IN URBAN SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO	TOTAL
1966	2447	993	4959	9572	1274	4909	4179	974	2390	45300	4498	6130	2562	7149	97342
1967	2529	1028	5128	11175	1315	5078	4486	1024	2619	56417	4657	6344	3017	7404	112221
1968	2640	1071	5343	11998	1374	5292	4676	1066	2731	60615	4852	6609	3140	7710	119117
1969	3220	1175	6423	14612	1678	5680	5146	1191	2995	71216	5881	7570	3944	8895	139626
1970	3543	1211	7136	16844	1746	5810	5430	1242	3191	81115	6505	8182	4488	9664	156107
1971	3932	1261	7801	19241	1861	5979	5702	1314	3378	91132	7210	8788	5140	10442	173181
1972	4386	1319	8648	22148	2010	6188	6036	1393	3599	103358	8042	9513	5917	11364	193921
1973	4888	1379	9578	25471	2168	6397	6385	1476	3831	117123	8962	10290	6806	12356	217110
1974	5444	1440	10601	29272	2337	6609	6748	1563	4074	132621	9980	11121	7822	13425	243057
1975	6059	1503	11724	33613	2516	6823	7127	1654	4331	150057	11105	12010	8985	14576	272083
1976	6739	1568	12956	38571	2708	7038	7522	1748	4600	169661	12347	12961	10312	15814	304545
1977	7489	1634	14308	44228	2912	7255	7933	1847	4882	191689	13719	13978	11826	17145	340845
1978	8317	1702	15790	50682	3129	7473	8361	1949	5178	216437	15234	15064	13555	18575	381446
1979	9230	1771	17414	58040	3361	7694	8806	2057	5488	244217	16904	16224	15525	20112	426843
1980	10238	1842	19194	66425	3608	7916	9269	2169	5814	275396	18746	17463	17771	21762	477613

SOURCE:

COMPUTED FROM CORRESPONDING URBAN SECTOR PER CAPITA DEMAND (TABLE 8-7.4) AND URBAN POPULATION (TABLE 4-61.) PROCESSING LOSS = 7%.

TABLE B-11.5. PROJECTED TOTAL DEMAND FOR WHEAT IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

TOTAL DEMAND

YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	3624	1051	2376	10701	400	2510	5232	439	1364	39257	1494	5022	972	2969	77405
1967	3805	1104	2490	12691	419	2637	5705	468	1518	49666	1571	5280	1160	3124	91638
1968	4035	1169	2636	13842	445	2792	6042	496	1608	54208	1663	5588	1226	3305	99055
1969	4999	1303	3219	17125	552	3044	6754	562	1792	64698	2048	6501	1564	3873	118034
1970	5588	1364	3633	20054	584	3164	7239	596	1939	74859	2401	7139	1809	4275	134544
1971	6300	1443	4034	23271	632	3307	7722	640	2086	85436	2591	7789	2104	4692	152049
1972	7138	1534	4543	27211	694	3477	8305	690	2257	98436	2936	8566	2460	5187	173434
1973	8082	1628	5112	31791	760	3652	8924	742	2441	113314	3323	9412	2875	5730	197786
1974	9144	1728	5747	37113	832	3832	9581	798	2637	130343	3759	10333	3357	6324	225528
1975	10338	1832	6457	43294	910	4019	10280	856	2848	149818	4249	11336	3917	6975	257151
1976	11680	1941	7249	50467	995	4212	11022	922	3073	172077	4800	12428	4566	7688	293120
1977	13186	2055	8132	58787	1087	4410	11808	989	3313	197502	5418	13615	5320	8467	334089
1978	14876	2174	9117	68434	1187	4615	12643	1061	3569	226537	6111	14906	6194	9319	380743
1979	16772	2299	10214	79611	1295	4827	13527	1137	3843	259667	6889	16309	7207	10250	433647
1980	18898	2429	11437	92558	1412	5045	14465	1218	4136	297461	7761	17833	8381	11286	494330

SOURCE:

COMPUTED FROM CORRESPONDING URBAN SECTOR PER CAPITA DEMAND (TABLE B-7.5) AND URBAN POPULATION (TABLE 4-61.: PROCESSING LOSS = 25%.

TABLE B-11.4. PROJECTED TOTAL DEMAND FOR PULSES IN URBAN SECTOR BY PROVINCES IN ETHIOPIA
(UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	1020	489	1896	4521	256	1877	4089	380	579	21406	901	2237	712	2359	42722
1967	1063	508	1971	5306	266	1951	4413	402	638	26800	938	2328	841	2456	49878
1968	1112	532	2065	5727	279	2044	4625	421	669	28947	982	2438	880	2571	53292
1969	1364	587	2495	7011	343	2206	5116	473	737	34169	1197	2807	1111	2982	62618
1970	1509	608	2786	8125	339	2268	5426	496	789	39147	1331	3050	1271	3257	70422
1971	1683	637	3062	9330	384	2347	5728	527	840	44214	1483	3293	1463	3538	78529
1972	1887	670	3413	10796	417	2441	6096	562	900	50411	1662	3583	1693	3871	88402
1973	2115	704	3800	12482	452	2538	6483	598	963	57426	1862	3896	1958	4233	99508
1974	2368	739	4228	14420	490	2635	6888	637	1030	65369	2085	4233	2262	4621	112005
1975	2649	775	4700	16646	530	2735	7313	677	1100	74354	2332	4596	2612	5044	126063
1976	2962	813	5222	19203	574	2836	7759	720	1175	84512	2607	4986	3013	5501	141883
1977	3309	852	5797	22135	620	2939	8226	764	1253	95989	2912	5406	3474	5996	159672
1978	3694	892	6431	25500	670	3043	8716	811	1336	108955	3250	5857	4003	6530	179688
1979	4122	933	7130	29356	724	3150	9229	861	1424	123590	3626	6341	4609	7108	202203
1980	4596	975	7901	33775	781	3258	9766	912	1516	140104	4042	6861	5304	7732	227523

SOURCE:

COMPUTED FROM CORRESPONDING URBAN SECTOR PER CAPITA DEMAND (TABLE B-7.6) AND URBAN POPULATION (TABLE 4-6).: PROCESSING LOSS = 11%.

TABLE 8-11.7. PROJECTED TOTAL DEMAND FOR OILSEEDS IN URBAN SECTOR BY PROVINCES IN ETHIOPIA (UNIT: METRIC TONS)

LOGARITHM PROJECTION

YEAR	TOTAL DEMAND														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	409	205	812	2950	226	804	1693	305	596	9116	709	1150	509	1135	20619
1967	427	215	849	3481	236	841	1837	324	660	11472	742	1203	605	1187	24079
1968	451	226	894	3777	249	885	1935	341	696	12456	781	1266	636	1250	25843
1969	556	251	1086	4648	308	940	2152	385	771	14790	957	1466	807	1457	30594
1970	618	261	1219	5415	324	993	2294	406	830	17023	1070	1601	928	1600	34582
1971	693	275	1347	6250	349	1032	2435	434	888	19328	1198	1738	1074	1747	38788
1972	781	291	1509	7271	381	1080	2605	465	956	22193	1351	1901	1250	1921	43915
1973	880	307	1689	8450	415	1128	2784	498	1029	25368	1521	2078	1453	2111	49711
1974	990	324	1889	9814	452	1178	2974	532	1106	29029	1712	2269	1687	2318	56274
1975	1114	342	2112	11388	492	1229	3174	569	1188	33192	1925	2477	1959	2543	63794
1976	1252	360	2358	13206	535	1281	3385	608	1275	37925	2163	2701	2272	2788	72109
1977	1406	379	2632	15303	581	1334	3608	649	1367	43302	2429	2944	2633	3055	81622
1978	1578	399	2935	17722	631	1389	3843	692	1466	49410	2725	3206	3049	3345	92390
1979	1770	420	3271	20509	685	1445	4090	738	1570	56341	3056	3490	3530	3660	104575
1980	1984	441	3644	23720	743	1502	4351	787	1681	64206	3425	3796	4083	4002	118365

SOURCE:

COMPUTED FROM CORRESPONDING URBAN SECTOR PER CAPITA DEMAND (TABLE 8-7.7) AND URBAN POPULATION (TABLE 4-61.; PROCESSING LOSS = 70%.

APPENDIX C

ESTIMATED QUANTITIES OF SEEDS,

LOSSES AND SUPPLY BY PROVINCES

IN ETHIOPIA, 1966 TO 1980

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TABLE C-1.1. ESTIMATED QUANTITY OF BARLEY FOR SEED
BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

	BARLEY SEED														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO	TOTAL
1966	30334	2241	30105	6520	6966	38866	11016	6291	2470	37300	3145	14377	6966	28309	224910
1967	30807	2281	30132	6844	7074	38799	11178	6844	2740	38340	3429	14607	7074	28525	228676
1968	31333	2781	30172	6966	7195	39231	11137	6966	3253	39001	3483	14863	7425	28782	232591
1969	32022	2821	30132	7060	7303	39312	11299	7060	3294	39555	3766	15066	7533	29200	235426
1970	32562	2875	29929	7182	7425	39744	11259	7182	3348	40702	3834	15908	7668	29443	238963
1971	32859	2943	30510	7276	7573	39474	11380	7654	3780	40851	3915	15619	8019	29254	241110
1972	33318	3051	30631	7398	7695	39528	11434	7911	4050	41458	4050	15835	8248	29349	243958
1973	33777	3159	30739	7519	7803	39587	11488	8181	4333	42066	4185	16038	8478	29416	246766
1974	34263	3280	30861	7654	7938	396[illegible]	11542	8464	4617	42700	4320	16267	8721	29511	249777
1975	34735	3388	30955	7776	8059	39649	11583	8734	4900	43321	4455	16470	8964	29578	252571
1976	35194	3510	31050	7897	8181	39663	11637	9018	5197	43942	4590	16686	9207	29632	255406
1977	35667	3631	31144	8019	8302	39676	11677	9301	5508	44563	4725	16902	9450	29686	258255
1978	36153	3753	31239	8154	8437	39690	11731	9598	5805	45211	4873	17131	9706	29740	261225
1979	36625	3874	31306	8275	8559	39676	11772	9895	6115	45846	5008	17347	9963	29781	264046
1980	37098	3996	31387	8410	8680	39649	11812	10192	6439	46480	5157	17550	10219	29821	266895

SOURCE:

BASED ON THE HISTORICAL AND PROJECTED CROP AREA, AND SEEDING RATE OF 135 KGS PER HECTARE. SEEDING RATE IS CONSTANT OVER THE PROJECTION PERIODS.

TABLE C-1.2. ESTIMATED QUANTITY OF CORN FOR SEED
BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

YEAR	CORN SEED															
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	860	125	1920	450	3065	1430	5115	2700	4215	4580	5930	2330	7525	655	40900
1967	875	125	1995	500	3075	1455	5195	2740	4320	4570	6025	2370	7645	665	41555
1968	885	125	2020	590	3110	1470	5170	2815	4455	4540	6140	2315	7735	675	42045
1969	935	130	2045	640	3150	1490	5195	2940	4515	4560	6220	2345	7755	680	42600
1970	975	135	2170	665	3145	1595	5405	3100	4695	4740	6510	2390	8065	710	44300
1971	1035	160	2145	700	3225	1550	5400	3050	4695	4625	6495	2410	8040	670	44200
1972	1075	170	2180	740	3260	1570	5455	3110	4780	4635	6600	2425	8130	670	44800
1973	1115	180	2215	780	3290	1583	5505	3165	4860	4635	6700	2435	8215	670	45350
1974	1155	195	2250	825	3325	1600	5555	3225	4945	4640	6805	2450	8305	665	45940
1975	1195	209	2285	865	3355	1615	5605	3285	5025	4640	6905	2465	8390	665	46500
1976	1230	215	2320	910	3390	1630	5655	3340	5105	4640	7005	2475	8470	660	47045
1977	1270	230	2355	955	3420	1645	5700	3400	5185	4640	7105	2490	8555	660	47610
1978	1310	240	2385	995	3445	1660	5740	3450	5260	4630	7195	2500	8625	655	48090
1979	1350	255	2420	1040	3475	1675	5790	3510	5340	4630	7295	2510	8705	655	48650
1980	1390	265	2455	1085	3510	1690	5835	3565	5420	4625	7395	2520	8790	650	49195

SOURCE:

BASED ON THE HISTORICAL AND PROJECTED CROP AREA, AND SEEDING RATE OF 50 KGS PER HECTARE. SEEDING RATE IS CONSTANT OVER THE PROJECTION PERIODS.

TABLE C-1.3. ESTIMATED QUANTITY OF SORGHUM FOR SEED
BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

	SORGHUM SEED														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WOLLO	TOTAL
1966	510	84	8184	7932	3072	8184	20376	3750	1962	5370	3666	7248	6990	8016	85344
1967	534	90	9168	8454	3384	8100	21180	3918	2136	5604	4002	7116	7296	8634	89616
1968	642	90	9444	8802	3666	8064	21726	4218	2202	5682	4218	7152	7428	8982	92316
1969	762	96	10080	9318	3804	7986	22530	4182	2094	5892	4566	7128	7416	9888	95742
1970	978	96	10776	9798	3918	8034	23022	4410	2154	5880	4704	7152	7542	10092	98556
1971	924	96	10716	9660	3996	7698	22368	4590	2022	5880	4692	6708	7338	9972	96660
1972	1020	102	11274	10050	4200	7614	22800	4830	1998	6012	4914	6576	7404	10392	99186
1973	1122	102	11868	10464	4410	7512	23232	5088	1974	6144	5142	6414	7458	10830	101760
1974	1236	102	12498	10890	4638	7386	23664	5358	1944	6276	5388	6234	7512	11286	104412
1975	1350	108	13152	11334	4872	7242	24090	5640	1902	6408	5640	6030	7554	11766	107088
1976	1476	108	13854	11808	5124	7080	24534	5940	1860	6546	5910	5802	7596	12270	109908
1977	1614	114	14586	12300	5394	6894	24978	6258	1812	6684	6192	5550	7632	12798	112806
1978	1758	114	15360	12810	5670	6678	25416	6588	1758	6822	6492	5268	7656	13350	115740
1979	1908	120	16170	13344	5958	6444	25854	6936	1698	6966	6798	4956	7668	13926	118746
1980	2070	120	17016	13896	6264	6180	26286	7302	1626	7110	7122	4614	7674	14520	121800

SOURCE:

BASED ON THE HISTORICAL AND PROJECTED CROP AREA, AND SEEDING RATE OF 60 KGS PER HECTARE. SEEDING RATE IS CONSTANT OVER THE PROJECTION PERIODS.

TABLE C-1.4. ESTIMATED QUANTITY OF TEFF FOR SEED
BY PROVINCES IN ETHIOPIA, 1961 TO 1990
(UNIT: METERIC TONS)

	TEFF SEED														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	1500	750	19285	1070	1820	24750	2250	1180	965	17250	2145	8250	11145	14785	107145
1967	1630	760	19320	1195	1845	25075	2280	1300	975	17475	2170	8360	11290	14980	108655
1968	1625	760	18980	1195	1845	25050	2275	1300	1085	17570	2170	8350	11280	14965	108450
1969	1760	770	19265	1210	1870	25325	2310	1210	1100	17945	2310	8480	11230	15305	110090
1970	1730	755	18700	1295	1840	24540	2380	1295	1190	17620	2270	8325	11135	15025	108100
1971	1735	790	18615	1235	1865	24630	2315	1270	1110	17565	2260	8315	10985	14960	107650
1972	1760	795	18465	1250	1870	24540	2315	1280	1120	17565	2270	8310	10910	14940	107390
1973	1790	800	18315	1265	1875	24450	2315	1285	1135	17565	2285	8305	10840	14925	107150
1974	1815	810	18180	1280	1880	24370	2315	1290	1150	17575	2295	8300	10775	14915	106950
1975	1840	815	18035	1295	1885	24280	2315	1295	1160	17575	2310	8295	10705	14895	106700
1976	1865	825	17905	1310	1890	24200	2315	1305	1175	17580	2320	8295	10640	14885	106510
1977	1885	830	17765	1320	1890	24110	2315	1310	1185	17580	2330	8285	10575	14865	106245
1978	1910	835	17635	1333	1895	24030	2315	1315	1195	17585	2340	8285	10510	14855	106040
1979	1935	845	17505	1350	1900	23955	2320	1320	1210	17590	2355	8280	10450	14840	105855
1980	1960	850	17380	1360	1905	23880	2320	1325	1220	17595	2365	8275	10390	14830	105655

SOURCE:

BASED ON THE HISTORICAL AND PROJECTED CROP AREA, AND SEEDING RATE OF 50 KGS PER HECTARE. SEEDING RATE IS CONSTANT OVER THE PROJECTION PERIODS.

TABLE C-1.5. ESTIMATED QUANTITY OF WHEAT FOR SEED
BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

	WHEAT SEED															
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	18975	5312	10125	3800	1012	11762	8475	1512	1512	35425	2150	12525	0	13912	126500
1967	19275	5362	10212	3825	1025	11737	8550	1537	1537	35737	2300	12637	0	13912	127650
1968	19775	5562	10212	4012	1037	11887	8525	1550	1550	36187	2325	12662	0	13962	129250
1969	20037	5725	10150	4037	1037	11837	8462	1437	1687	36825	2475	12625	0	13787	130125
1970	20225	5912	10250	4075	1187	11825	8537	1450	1712	37437	2500	12737	0	13925	131775
1971	20787	5962	10300	4225	1200	12050	8550	1512	1762	37925	2600	12725	0	14012	133612
1972	21175	6087	10337	4312	1250	12150	8575	1525	1825	38475	2687	12775	0	14062	135237
1973	21550	6225	10375	4400	1312	12225	8587	1525	1875	38975	2775	12825	0	14087	136737
1974	21937	6350	10412	4487	1362	12300	8600	1537	1925	39487	2862	12862	0	14125	138250
1975	22312	6475	10437	4587	1412	12375	8600	1537	1987	40000	2950	12900	0	14150	139725
1976	22687	6612	10475	4675	1462	12450	8612	1550	2037	40512	3037	12937	0	14187	141237
1977	23075	6737	10500	4762	1512	12537	8625	1550	2087	41025	3137	12975	0	14212	142737
1978	23437	6862	10525	4850	1562	12600	8625	1550	2150	41500	3225	13000	0	14225	144112
1979	23812	7000	10550	4937	1625	12675	8625	1562	2200	42012	3312	13037	0	14250	145600
1980	24175	7125	10575	5025	1675	12737	8625	1562	2250	42500	3400	13062	0	14262	146975

SOURCE :

BASED ON THE HISTORICAL AND PROJECTED CROP AREA, AND SEEDING RATE OF 125 KGS PER HECTARE. SEEDING RATE IS CONSTANT OVER THE PROJECTION PERIODS.

TABLE C-1.6. ESTIMATED QUANTITY OF PULSES FOR SEED
BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

	PULSES SEEDS														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO	TOTAL
1966	2423	335	5635	1014	452	7102	3941	729	788	14877	1408	3832	1576	12227	56348
1967	2460	335	5526	1058	503	6927	3795	781	839	14797	1394	3744	1562	12117	55844
1968	2438	386	5438	1051	554	6825	3774	773	832	14702	1386	3606	1664	12037	55472
1969	2401	394	5533	1065	613	6825	3803	781	839	14877	1394	3635	1620	12132	55917
1970	2394	386	5577	1058	613	6854	3737	781	839	14884	1452	3620	1613	12096	55910
1971	2533	408	5613	1094	598	6964	3825	824	883	15286	1489	3686	1671	12490	57370
1972	2562	423	5635	1109	613	6978	3832	839	897	15424	1518	3679	1693	12599	57808
1973	2591	437	5650	1124	627	6986	3832	861	919	15563	1540	3679	1715	12716	58246
1974	2627	452	5679	1146	642	7007	3839	875	934	15724	1569	3679	1744	12840	58764
1975	2664	467	5693	1160	656	7015	3839	897	956	15862	1598	3671	1766	12950	59202
1976	2693	481	5715	1175	671	7029	3839	912	970	16001	1620	3671	1788	13066	59640
1977	2730	503	5730	1189	686	7037	3847	927	992	16140	1649	3664	1810	13176	60086
1978	2759	518	5745	1204	700	7051	3847	948	1007	16278	1671	3664	1832	13285	60516
1979	2795	532	5766	1219	715	7059	3847	963	1021	16424	1700	3657	1854	13402	60962
1980	2825	547	5781	1233	729	7073	3847	978	1043	16563	1722	3657	1876	13512	61392

SOURCE:

BASED ON THE HISTORICAL AND PROJECTED CROP AREA, AND SEEDING RATE OF 73 KGS PER HECTARE. SEEDING RATE IS CONSTANT OVER THE PROJECTION PERIODS.

TABLE C-1.7. ESTIMATED QUANTITY OF OILSEEDS FOR SEED
BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

YEAR	OIL SEEDS														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	305	36	3978	991	18	3654	1439	126	197	2628	160	1223	377	2881	18022
1967	321	36	4024	984	18	3541	1430	124	197	2612	160	1235	393	2826	17910
1968	326	55	4114	1032	18	3535	1448	144	234	2592	200	1232	416	2792	18144
1969	331	73	4206	1069	18	3560	1494	147	239	2619	202	1253	441	2803	18462
1970	340	94	4328	1115	18	3629	1531	151	246	2684	206	1267	471	2835	18922
1971	351	80	4434	1129	18	3624	1596	158	250	2704	213	1310	469	2881	19225
1972	361	87	4540	1161	18	3638	1639	165	259	2732	223	1333	487	2900	19549
1973	370	96	4641	1191	20	3647	1681	172	269	2755	234	1354	503	2914	19853
1974	379	103	4742	1221	20	3654	1722	179	278	2780	243	1375	519	2927	20150
1975	388	110	4850	1251	20	3666	1766	188	287	2805	255	1398	535	2943	20469
1976	397	117	4954	1283	20	3673	1810	195	296	2831	264	1419	554	2955	20773
1977	404	124	5050	1310	20	3675	1849	202	305	2849	273	1439	570	2964	21042
1978	413	133	5154	1343	20	3679	1892	209	315	2872	285	1460	586	2976	21343
1979	423	140	5253	1373	20	3679	1934	216	324	2893	294	1478	602	2983	21617
1980	432	147	5358	1402	22	3682	1977	223	333	2914	305	1501	620	2994	21918

SOURCE:

BASED ON THE HISTORICAL AND PROJECTED CROP AREA, AND SEEDING RATE OF 23 KGS PER HECTARE. SEEDING RATE IS CONSTANT OVER THE PROJECTION PERIODS.

TABLE C-2.1. ESTIMATED QUANTITY OF BARLEY LOSSES ON FARM AND IN MARKETING SYSTEM BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METRIC TONS)

YEAR	LOSSES															
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO	TOTAL
1966	33780	2730	25395	2520	5250	39870	9240	4410	1680	36090	2310	8820	7350	30435	209880
1967	34575	3195	25185	2775	5340	40125	9390	4695	2130	36720	2565	8970	7470	30315	213450
1968	36645	3375	26085	2925	5625	41820	9675	4950	2700	38895	2700	9450	8100	31935	224880
1969	37320	3420	25710	3180	5910	41865	9555	4785	2730	39825	2955	9780	8190	32310	227535
1970	38160	3465	25905	3240	6015	42090	9705	5085	2775	40470	3000	9945	8550	32610	231015
1971	39555	3750	26385	3345	6150	42975	9975	5460	3210	41820	3195	10380	9090	32910	238200
1972	40770	3945	26595	3495	6330	43515	10125	5700	3525	42990	3375	10725	9510	33315	243915
1973	42045	4140	26805	3660	6510	44085	10290	5955	3855	44235	3555	11085	9960	33735	249915
1974	43320	4350	26985	3825	6690	44610	10440	6225	4200	45495	3750	11460	10425	34125	255900
1975	44640	4560	27135	3990	6885	45105	10575	6495	4560	46770	3945	11850	10890	34500	261900
1976	45990	4785	27285	4170	7080	45600	10725	6780	4935	48075	4155	12240	11385	34860	268065
1977	47370	5010	27405	4365	7290	46080	10875	7080	5325	49410	4365	12645	11910	35220	274350
1978	48780	5250	27510	4545	7485	46530	11010	7380	5745	50775	4590	13065	12435	35550	280650
1979	50220	5505	27570	4740	7695	46950	11145	7695	6180	52140	4815	13485	12975	35850	286965
1980	51690	5760	27615	4950	7905	47355	11265	8010	6630	53550	5055	13920	13545	36135	293385

SOURCE:

CALCULATED FROM TOTAL PRODUCTION AND 15.0% LOSSES ESTIMATED BY W. EICHBERGER "FOOD PRODUCTION AND UTILIZATION IN ETHIOPIA", 1968. RATE CONSTANT OVER TIME

TABLE C-2.2. ESTIMATED QUANTITY OF CORN LOSSES ON FARM AND IN MARKETING SYSTEM BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

	LOSSES														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	1870	250	4220	500	5630	2900	9930	5380	8610	9190	12500	4220	16140	1410	82700
1967	1850	250	4280	590	5620	3020	10150	5370	8730	9230	12670	4260	16440	1430	83910
1968	1870	250	4330	680	5610	3060	10280	5520	8920	9180	12830	4250	16660	1440	84880
1969	1890	260	4390	770	5760	3100	10410	5590	9120	9120	12990	4300	16860	1460	86020
1970	2150	270	4390	810	6000	3310	10920	5820	9490	9490	13420	4390	17540	1520	89520
1971	2170	320	4590	810	5930	3370	11100	6040	9720	9540	13850	4450	18000	1510	91400
1972	2240	340	4660	860	5980	3450	11330	6190	9950	9630	14150	4500	18390	1530	93200
1973	2320	370	4730	910	6030	3520	11560	6330	10170	9720	14430	4540	18750	1540	94920
1974	2390	390	4790	950	6070	3590	11770	6460	10380	9790	14700	4570	19100	1550	96500
1975	2460	410	4850	1000	6110	3640	11980	6590	10580	9860	14976	4610	19450	1570	98100
1976	2530	430	4910	1040	6150	3740	12190	6730	10790	9930	15240	4640	19800	1580	99700
1977	2600	460	4960	1090	6190	3800	12390	6860	10990	9090	15490	4670	20130	1590	101210
1978	2660	480	5020	1130	6220	3870	12590	6980	11190	10050	15750	4700	20460	1600	102700
1979	2730	500	5080	1180	6250	3940	12780	7110	11390	10100	16000	4730	20790	1610	104190
1980	2800	520	5130	1220	6280	4000	12970	7230	11570	10150	16240	4750	21100	1620	105580

SOURCE:

CALCULATED FROM TOTAL PRODUCTION AND 10.0% LOSSES ESTIMATED BY W. EICHBERGER "FOOD PRODUCTION AND UTILIZATION IN ETHIOPIA", 1968. RATE CONSTANT OVER TIME

TABLE C-2.3. ESTIMATED QUANTITY OF SORGHUM LOSSES ON FARM AND MARKETING SYSTEM BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

YEAR	LOSSES														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	700	120	11650	6990	3610	9790	32620	3960	2330	6410	4890	6870	10950	15730	116620
1967	740	120	12550	7500	3940	9840	34190	4300	2460	7010	5290	7010	11320	16850	123120
1968	900	130	13430	8260	4390	10070	35240	4520	2580	7360	5680	7360	11620	17690	129230
1969	1080	140	14900	9080	4810	9890	36580	4740	2710	7590	5960	7450	12060	18830	135620
1970	1390	140	15620	9350	4880	10180	36970	5020	2790	7810	6280	7390	12420	19390	139630
1971	1510	150	17120	10180	5270	10110	38300	5470	2690	8300	6860	7320	12550	20480	146310
1972	1750	150	18620	10990	5680	10090	39500	5880	2720	8740	7400	7280	12860	21620	153280
1973	2020	160	20270	11890	6140	10030	40720	6320	2750	9210	7990	7200	13160	22830	160690
1974	2320	170	22100	12870	6640	9920	41970	6800	2770	9720	8630	7090	13460	24150	168610
1975	2660	180	24110	13950	7180	9750	43230	7340	2780	10260	9340	6930	13740	25560	177010
1976	3040	190	26310	15140	7780	9510	44500	7910	2790	10830	10110	6710	14010	27070	185900
1977	3460	190	28690	16410	8420	9200	45710	8530	2770	11430	10940	6430	14240	28660	195080
1978	3930	200	31310	17800	9130	8800	46930	9210	2750	12080	11850	6090	14460	30370	204910
1979	4440	210	34140	19310	9890	8300	48100	9940	2710	12760	12820	5670	14640	32170	215100
1980	5000	230	37210	20930	10700	7700	49210	10720	2650	13470	13880	5160	14770	34080	225710

SOURCE:

CALCULATED FROM TOTAL PRODUCTION AND 10.0% LOSSES ESTIMATED BY W. EICHBERGER "FOOD PRODUCTION AND UTILIZATION IN ETHIOPIA", 1968. RATE CONSTANT OVER TIME

TABLE C-2.4. ESTIMATED QUANTITY OF TEFF LOSSES ON FARM AND IN MARKETING SYSTEM BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

	LOSSES														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	4380	1800	41400	2320	2820	66880	4620	2320	1540	48860	4380	15440	22380	38060	257200
1967	4400	2060	41660	2320	2840	67020	4920	2320	1820	50460	4460	15520	22500	38300	260800
1968	4500	2120	42340	2380	2920	67740	4760	2380	1860	51600	4760	15620	22500	39160	264640
1969	4840	2160	42300	2420	2700	67620	5120	2700	2160	53080	4840	15900	22900	39880	268620
1970	4920	2180	42580	2720	2720	67730	5180	2720	2460	54040	4920	16100	23200	40940	272380
1971	5040	2460	42820	2760	2820	68580	5220	2900	2320	54680	5540	15960	23060	41220	275380
1972	5200	2620	43040	2880	2820	68920	5320	3060	2440	55740	5880	16040	23160	41860	278980
1973	5360	2760	43260	3000	2840	69240	5440	3220	2560	56820	6240	16120	23240	42500	282600
1974	5540	2920	43460	3120	2840	69540	5540	3400	2700	57900	6600	16180	23320	43140	286200
1975	5700	3100	43680	3260	2840	69880	5660	3560	2820	59040	6980	16260	23400	43820	290000
1976	5880	3260	43840	3380	2840	70160	5760	3740	2960	60140	7360	16320	23460	44480	293580
1977	6060	3440	44040	3520	2860	70440	5880	3920	3100	61300	7760	16380	23540	45180	297420
1978	6240	3620	44220	3660	2860	70720	5980	4100	3240	62480	8160	16440	23600	45860	301180
1979	6420	3800	44400	3800	2860	70980	6100	4300	3380	63660	8580	16500	23660	46560	305000
1980	6600	3980	44560	3960	2860	71220	6220	4480	3540	64860	9000	16560	23700	47260	308800

SOURCE:

CALCULATED FROM TOTAL PRODUCTION AND 20% LOSSES ESTIMATED BY W. EICHBERGER, "FOOD PRODUCTION AND UTILIZATION IN ETHIOPIA", 1968. RATE CONSTANT OVER TIME

TABLE C-2.5. ESTIMATED QUANTITY OF WHEAT LOSSES ON FARM AND MARKETING SYSTEM BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

	LOSSES														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	18735	4770	8310	2220	885	9540	5760	1110	1005	37695	1665	7980	0	11190	110865
1967	18990	4800	8265	2235	900	9495	5805	1110	1110	37995	1785	8040	0	11175	111705
1968	19365	4980	8265	2265	900	9510	5895	1125	1125	38730	1815	8040	0	11205	113220
1969	19845	5160	8370	2295	915	9405	5850	1140	1140	39570	1830	7920	0	11130	114570
1970	20235	5265	8430	2340	1050	9600	5850	1170	1170	40830	1995	7845	0	11235	117015
1971	20625	5385	8535	2550	1035	9705	5895	1170	1215	40950	1980	8115	0	11385	118545
1972	21000	5505	8580	2625	1050	9750	5895	1185	1260	41550	2040	8160	0	11430	120030
1973	21405	5625	8640	2700	1080	9810	5910	1185	1305	42195	2085	8220	0	11490	121650
1974	21780	5745	8700	2775	1110	9870	5925	1200	1335	42780	2145	8265	0	11550	123180
1975	22140	5850	8745	2850	1140	9915	5925	1200	1380	43320	2190	8310	0	11580	124545
1976	22500	5970	8790	2925	1170	9960	5925	1215	1410	43905	2235	8355	0	11625	125985
1977	22860	6090	8835	3000	1200	10005	5925	1215	1455	44445	2295	8385	0	11670	127380
1978	23205	6195	8880	3075	1215	10050	5925	1230	1485	44985	2340	8430	0	11700	128715
1979	23520	6300	8910	3150	1245	10080	5925	1230	1530	45465	2385	8460	0	11730	129930
1980	23865	6420	8955	3210	1275	10110	5925	1245	1560	46005	2430	8490	0	11760	131250

SOURCE:

CALCULATED FROM TOTAL PRODUCTION AND 15% LOSSES ESTIMATED BY W. EICHBERGER, "FOOD PRODUCTION AND UTILIZATION IN ETHIOPIA", 1968. RATE CONSTANT OVER TIME

TABLE C-2.6. ESTIMATED QUANTITY OF PULSES LOSSES ON FARM AND IN MARKETING SYSTEM BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

	LOSSES														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WELLEGA	WELLO	TOTAL
1966	1245	175	3070	205	230	3765	2200	435	290	7905	695	1680	780	6280	28955
1967	1265	170	3040	200	230	3730	2150	430	285	7835	690	1635	775	6255	28690
1968	1255	200	2990	200	255	3675	2110	425	285	7810	685	1595	800	6215	28500
1969	1265	200	3020	200	260	3680	2100	430	315	7875	720	1610	805	6265	28745
1970	1265	200	3015	200	285	3675	2070	430	315	7925	720	1580	805	6260	28745
1971	1315	210	3070	203	270	3750	2125	460	320	8115	740	1635	830	6450	29495
1972	1330	220	3085	210	275	3765	2125	470	330	8195	755	1640	845	6515	29760
1973	1350	225	3100	210	280	3780	2120	480	335	8270	770	1645	855	6580	30000
1974	1365	235	3110	210	285	3790	2120	485	340	8335	780	1650	865	6635	30205
1975	1380	240	3120	215	290	3800	2120	495	350	8415	795	1655	880	6700	30455
1976	1395	245	3130	215	295	3810	2115	505	355	8475	805	1655	890	6755	30645
1977	1410	255	3140	215	300	3820	2110	515	360	8540	815	1660	900	6805	30845
1978	1425	260	3150	215	305	3830	2110	520	365	8605	830	1665	910	6860	31050
1979	1440	265	3160	220	310	3840	2105	530	370	8670	840	1665	920	6910	31245
1980	1455	270	3170	220	315	3850	2105	540	380	8730	850	1670	930	6965	31450

SOURCE:

CALCULATED FROM TOTAL PRODUCTION AND 5% LOSSES ESTIMATED BY W. EICHBERGER, "FOOD PRODUCTION AND UTILIZATION IN ETHIOPIA", 1968. RATE CONSTANT OVER TIME

TABLE C-2.7. ESTIMATED QUANTITY OF OILSEEDS LOSSES ON FARM AND IN MARKETING SYSTEM BY PROVINCES IN ETHIOPIA, 1961 TO 1980
(UNIT: METERIC TONS)

	LOSSES														
YEAR	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	280	40	4435	715	20	4100	1430	130	205	2545	130	1110	430	2840	18410
1967	290	60	4610	760	20	4200	1500	135	215	3035	135	1130	465	2915	19470
1968	300	60	4825	805	20	4240	1570	160	240	3095	160	1145	480	3015	20115
1969	325	80	4945	840	20	4230	1595	165	265	3165	185	1145	490	3025	20475
1970	335	105	5135	860	20	4230	1635	190	270	3245	190	1150	565	3040	20970
1971	350	105	5315	905	20	4375	1715	195	285	3300	200	1210	560	3115	21650
1972	365	115	5510	945	25	4430	1780	205	305	3370	215	1235	590	3165	22255
1973	385	130	5715	990	25	4490	1850	225	320	3445	230	1260	620	3220	22905
1974	400	145	5930	1035	25	4550	1920	240	340	3515	245	1290	650	3270	23555
1975	420	160	6145	1080	25	4660	1995	255	355	3590	260	1315	680	3320	24200
1976	440	175	6365	1125	25	4645	2065	270	375	3655	280	1345	710	3370	24845
1977	460	195	6585	1175	25	4690	2140	290	395	3725	300	1370	745	3410	25505
1978	480	210	6825	1225	25	4735	2220	310	420	3795	320	1395	780	3460	26200
1979	500	230	7065	1280	25	4775	2300	330	440	3870	340	1425	815	3505	26900
1980	525	250	7300	1330	30	4800	2380	350	460	3930	360	1450	850	3540	27555

SOURCE:

CALCULATED FROM TOTAL PRODUCTION AND 5% LOSSES ESTIMATED BY W. EICHBERGER, "FOOD PRODUCTION AND UTILIZATION IN ETHIOPIA", 1968. RATE CONSTANT OVER TIME

TABLE - C-1.1. ESTIMATED NET SUPPLY OF BARLEY BY PROVINCESIN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

YEAR	NET SUPPLY														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	161086	13229	113800	7760	22784	187064	41344	18699	7050	167210	9945	35003	34684	144156	964414
1967	165118	15824	112583	8881	23186	188576	42032	19761	9330	169740	11106	36223	35256	143260	980876
1968	176322	16344	117643	9609	24680	197749	43688	21084	12047	181404	11817	38687	38475	152183	1041732
1969	179458	16559	115558	10960	26187	197923	42846	20055	12176	186120	12979	40354	38877	153890	1053942
1970	183676	16760	116866	11178	26660	198766	43736	21633	12377	188628	13166	40547	40782	155347	1070124
1971	191286	18307	119005	11679	27277	204051	45145	23286	14410	196129	14190	43201	43491	157236	1108693
1972	197712	19304	120074	12407	28175	207057	45941	24389	15925	202152	15075	44940	45642	159436	1138229
1973	204478	20301	121156	13221	29087	210233	46822	25544	17512	208599	15960	46777	47962	161749	1169421
1974	211217	21370	122054	14021	29972	213154	47618	26811	19183	215105	16930	48673	50354	163864	1200326
1975	218225	22452	122810	14834	30956	215946	48342	28071	20940	221709	17900	50680	52746	165922	1231533
1976	225416	23605	123565	15733	31939	218737	49138	29402	22748	228483	18955	52674	55308	167908	1263631
1977	232763	24759	124151	16716	33008	221444	49948	30819	24667	235427	20010	54753	58040	169894	1296399
1978	240267	25997	124651	17601	33978	223980	50659	32222	26750	242514	21137	56904	60759	171710	1329129
1979	247955	27321	124924	18585	35046	226374	51383	33710	28905	249614	22277	59068	63562	173349	1362093
1980	255812	28644	125098	19640	36115	228496	52023	35198	31131	256970	23488	61330	66536	174944	1395625

SOURCE:

NET SUPPLY = TOTAL PRODUCTION - (SFED + LOSS AND NON-FOOD USES).
SEE TABLES 3.2, C-1.1 AND C-2.1.

TABLE - (-.-.). ESTIMATED NET SUPPLY OF CORN BY PROVINCESIN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

YEAR	NET SUPPLY														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	15520	2125	36060	4050	47605	24670	84255	45720	73275	78130	106570	35650	137735	12035	703400
1967	15775	2125	36525	4810	47505	25725	86155	45590	74250	78500	108005	36150	140315	12205	713635
1968	15945	2125	36950	5530	47380	26070	87350	46865	75825	78080	109330	35935	142205	12285	721875
1969	16075	2210	37465	6290	48690	26410	88495	47370	77565	77520	110690	36355	143985	12460	731580
1970	18375	2295	37340	6625	50855	28195	92875	49280	80715	80670	114270	37120	149795	12970	761380
1971	18495	2720	39165	6590	50145	28780	94500	51310	82785	81235	118155	37640	153960	12920	778400
1972	19085	2890	39760	7000	50560	29480	96515	52600	84770	82035	120750	38075	157380	13100	794000
1973	19765	3150	40355	7410	50980	30095	98535	53805	86670	82845	123170	38425	160535	13190	808930
1974	20355	3315	40860	7725	51305	30710	100375	54915	88475	83470	125495	38680	163595	13285	822560
1975	20945	3485	41365	8135	51635	31325	102215	56025	90195	84100	127825	39025	166660	13465	836400
1976	21540	3655	41870	8450	51960	32030	104055	57230	92005	84730	130155	39285	169730	13560	850255
1977	22130	3910	42285	8855	52290	32555	105810	58340	93725	85270	132305	39540	172615	13650	863280
1978	22630	4080	42795	9175	52535	33170	107570	59370	95450	85820	134555	39800	175515	13745	876210
1979	23220	4245	43300	9580	52775	33785	109230	60480	97170	86270	136705	40060	178405	13835	889060
1980	23810	4415	43715	9895	53010	34310	110895	61505	98710	86725	138765	40230	181110	13930	901025

SOURCE:

NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSS AND NON-FOOD USES).
SEE TABLES 3.3, C-1.2 AND C-2.2.

TABLE - C-3.3. ESTIMATED NET SUPPLY OF SORGHUM BY PROVINCESIN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

YEAR	NET SUPPLY														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	5790	996	96666	54978	29418	79926	273204	31890	19008	52320	40344	54582	91560	133554	964236
1967	6126	990	103782	59046	32076	80460	286530	34782	20004	57486	43608	55974	94584	143016	1018464
1968	7458	1080	111426	65538	35844	82566	295434	36462	21018	60558	46902	59088	97152	150228	1070754
1969	8958	1164	124020	72402	37686	81024	306690	38478	22296	62418	49074	59922	101124	159582	1124838
1970	11532	1164	129804	74352	40002	83586	309708	40770	22956	64410	51816	59358	104238	164418	1158114
1971	12666	1254	143364	81960	43434	83292	322332	44640	22188	68820	57048	59172	105612	174348	1220130
1972	14730	1248	156306	88860	46920	83196	332700	48090	22482	72648	61686	58944	108336	184188	1280334
1973	17058	1338	170562	96546	50850	82758	343248	51792	22776	76746	66768	58386	110982	194640	1344450
1974	19644	1428	186402	104940	55122	81894	354084	55842	22986	81204	72282	57576	113628	206064	1413078
1975	22590	1512	203838	114216	59748	80508	364980	60420	23118	85932	78420	56340	116106	218274	1486002
1976	25884	1602	222936	124452	64896	78510	375966	65250	23250	90924	85080	54588	118494	231360	1563192
1977	29526	1596	243624	135390	70386	75906	386412	70512	23118	96186	92268	52320	120528	245142	1642914
1978	33612	1686	266430	147390	76500	72522	396954	76302	22992	101898	100158	49542	122484	259980	1728450
1979	38052	1770	291090	160446	83052	68256	407046	82524	22692	107874	108582	46074	124092	275604	1817154
1980	42930	1950	317874	174474	90036	63120	416604	89178	22224	114120	117798	41826	125256	292200	1909590

SOURCE:

NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSS AND NON-FOOD USES).
SEE TABLES 3.4, C-1.3 AND C-2.3.

TABLE - C-3.4. ESTIMATED NET SUPPLY OF TEFF BY PROVINCESIN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

YEAR	NET SUPPLY														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	16020	6450	146315	8210	9460	242770	16230	8100	5195	178190	15375	53510	78375	137455	921655
1967	15970	7480	147320	8085	9515	243055	17400	7980	6305	184365	16470	53720	78710	138220	934545
1968	16375	7720	150380	8325	9835	245910	16765	8220	6355	188830	16870	54130	78720	141675	950110
1969	17600	7870	149935	8470	8930	245155	18170	9590	7540	194375	17050	55120	80370	144215	964390
1970	17950	7965	151620	9585	9040	246260	18340	9585	8650	198540	17410	56075	81665	148735	981420
1971	18425	9050	152665	9805	9415	249690	18565	10330	8170	201155	19900	55525	81255	149920	993870
1972	19040	9685	153695	10270	9410	251140	18965	10960	8640	205395	21250	55850	81730	152500	1008530
1973	19650	10240	154725	10735	9485	252510	19445	11595	9105	209715	22675	56175	82120	155075	1023250
1974	20345	10870	155660	11200	9480	253790	19845	12310	9650	214025	24105	56420	82505	157645	1037850
1975	20960	11585	156685	11745	9475	255240	20325	12945	10120	218585	25610	56745	82895	160385	1053300
1976	21655	12215	157455	12210	9470	256440	20725	13655	10665	222980	27120	56985	83200	163035	1067810
1977	22355	12930	158395	12760	9550	257650	21205	14370	11215	227620	28710	57235	83585	165855	1083435
1978	23050	13645	159245	13305	9545	258850	21685	15085	11765	232335	30300	57475	82890	168585	1098680
1979	23745	14355	160095	13850	9540	259965	22080	15880	12310	237050	31965	57720	84190	171400	1114145
1980	24440	15070	160860	14480	9535	261000	22560	16595	12940	241845	33635	57965	84410	174210	1129545

SOURCE:

NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSS AND NON-FOOD USES).
SEE TABLES 3.5, C-1.4 AND C-2.4.

TABLE - .-3.5. ESTIMATED NET SUPPLY OF WHEAT BY PROVINCESIN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

	NET SUPPLY														
YEAR	AWUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	87190	21718	36965	8780	4003	42298	24165	4778	4183	178180	7285	32695	0	49498	501738
1967	89335	21838	36623	8940	4075	42068	24345	4753	4753	179568	7815	32923	0	49413	505349
1968	89960	22658	36623	8823	4063	42003	24880	4825	4825	183283	7960	32898	0	49533	512334
1969	92418	23515	37280	8968	4148	41458	24688	5023	4773	187405	7895	32255	0	49283	519109
1970	94440	23923	37520	9185	4763	42575	24613	5180	4918	193933	8805	31718	0	49740	531313
1971	96089	24553	38065	10225	4665	42945	24855	5118	5123	194125	8620	33260	0	50503	538145
1972	97625	25108	38283	10563	4700	43100	24830	5190	5315	196975	8873	33465	0	50708	544935
1973	99745	25650	38585	10900	4808	43365	24903	5190	5520	200130	9040	33755	0	51023	552614
1974	101483	26205	38888	11238	4928	43630	24975	5263	5640	202933	9293	33973	0	51325	559774
1975	103148	26675	39118	11563	5048	43810	24975	5263	5833	205480	9460	34190	0	51470	566033
1976	104813	27218	39335	11900	5168	43990	24963	5335	5953	208283	9628	34408	0	51688	572682
1977	106465	27773	39565	12238	5288	44158	24950	5335	6158	210830	9868	34540	0	51918	579086
1978	108058	28243	39795	12575	5323	44350	24950	5420	6265	213415	10035	34770	0	52075	585274
1979	109468	28700	39940	12913	5430	44445	24950	5408	6470	215623	10203	34903	0	52220	590673
1980	111060	29255	40170	13165	5550	44553	24950	5493	6590	218195	10370	35048	0	52378	596777

SOURCE:

NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSS AND NON-FOOD USES).
SEE TABLES 3.6, C-1.5 AND C-2.5.

TABLE - C-3.6. ESTIMATED NET SUPPLY OF PULSES BY PROVINCESIN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

YEAR	NET SUPPLY															
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	21231	2989	52694	2880	3917	64432	37658	7535	4722	135318	11796	28088	13243	107093	493796
1967	21575	2894	52234	2742	3866	63942	37054	7389	4576	134068	11716	27320	13163	106727	489266
1968	21407	3413	51372	2749	4290	63000	36316	7301	4583	133688	11628	26699	13536	106047	486029
1969	21633	3406	51847	2734	4327	63095	36097	7389	5146	134748	12286	26955	13674	106902	490239
1970	21641	3413	51708	2742	4802	62970	35592	7389	5146	135690	12227	26399	13682	106844	490245
1971	22452	3581	52716	2800	4531	64286	36550	7915	5197	138899	12571	27379	14098	110060	503035
1972	22708	3757	52979	2880	4612	64556	36543	8091	5372	140280	12827	27481	14361	111185	507632
1973	23059	3837	53250	2866	4692	64834	36448	8259	5445	141566	13090	27576	14530	112303	511755
1974	23307	4012	53411	2844	4773	65002	36440	8339	5526	142641	13251	27671	14690	113224	515131
1975	23556	4093	53586	2924	4853	65185	36440	8507	5694	144022	13506	27773	14933	114350	519442
1976	23811	4173	53754	2910	4933	65360	36345	8683	5774	145023	13674	27773	15122	115273	522613
1977	24060	4341	53930	2895	5014	65543	36243	8858	5847	146120	13835	27875	15290	116119	525970
1978	24316	4422	54105	2881	5094	65718	36243	8931	5928	147216	14098	27970	15458	117054	529434
1979	24564	4502	54273	2961	5175	65901	36148	9106	6008	148305	14259	27978	15626	117887	532693
1980	24820	4583	54448	2946	5255	66076	36148	9282	6176	149306	14427	28073	15794	118823	536157

SOURCE:

NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSS AND NON-FOOD USES).
SEE TABLES 3.7, C-1.6 AND C-2.6.

TABLE - C-3.7. ESTIMATED NET SUPPLY OF OILSEEDS BY PROVINCESIN ETHIOPIA, 1966 TO 1980
(UNIT: METERIC TONS)

YEAR	NET SUPPLY														
	ARUSSI	BALE	BEGEMDER	ERITREA	GEMU GOFA	GOJAM	HARAR	ILLUBABOR	KAFFA	SHOA	SIDAMO	TIGRE	WOLLEGA	WOLLO	TOTAL
1966	5014	723	90286	12594	362	74245	25730	2344	3697	45726	2309	19866	7793	51078	331767
1967	5188	1103	83565	13456	362	76258	27069	2441	3887	55052	2404	20235	8442	52558	352020
1968	5373	1085	87560	14262	362	77025	28381	2895	4325	56213	2840	20522	8704	54493	364040
1969	5844	1446	89748	14891	362	76810	28810	2988	4796	57515	3313	20502	8868	54671	370564
1970	6025	1901	93236	15225	362	76741	29533	3458	4884	58971	3403	20583	10264	54924	379510
1971	6293	1915	96551	16066	362	79500	30989	3546	5164	59995	3586	21679	10171	56303	392125
1972	6574	2098	100150	16794	457	80531	32180	3729	5535	61298	3862	22131	10722	57235	403296
1973	6945	2373	103944	17619	454	81662	33469	4103	5811	62700	4135	22585	11276	58266	415342
1974	7221	2652	107927	18444	454	82795	34757	4381	6182	64004	4411	23135	11830	59202	427395
1975	7591	2930	111904	19269	454	83734	36139	4656	6458	65404	4685	23587	12384	60136	439331
1976	7962	3208	115981	20092	454	84582	37425	4935	6828	66614	5056	24136	12936	61075	451284
1977	8335	3581	120064	21014	454	85435	38811	5308	7199	67925	5426	24590	13585	61825	463552
1978	8706	3857	124521	21932	454	86285	40287	5481	7665	69232	5795	25045	14234	62764	476458
1979	9077	4230	128982	22947	454	87045	41766	6054	8036	70637	6166	25596	14882	63612	489484
1980	9543	4603	133341	23867	547	87518	43242	6427	8407	71756	6534	26048	15529	64265	501627

SOURCE:

NET SUPPLY = TOTAL PRODUCTION - (SEED + LOSS AND NON-FOOD USES).
SEE TABLES 3.8, C-1.7 AND C-2.7

APPENDIX D

REGRESSION PROJECTION PROGRAM WITH MULTIPLE OPTIONS

A Documented Fortran Program

```
C     REGRESSION PROJECTION PROGRAM WITH MULTIPLE OPTIONS
C
C                  PROFESSOR RICHARD PHILLIPS
C                    DEPARTMENT OF ECONOMICS
C                    KANSAS STATE UNIVERSITY
C
C     1.  PROJECTION MODEL OPTIONS INCLUDE (MODEL IDENTIFIED IN PRINTOUT):
C         EXPONENTIAL (VARIABLE STARTING AND ENDING EXPONENT)
C         LOGARITHMIC (BASE E)
C         LINEAR
C         GIVEN RATE
C     2.  OPTION FOR ESTIMATING Y-DATA FROM UP TO 8 RELATED VARIABLES
C         (DIFFERENT PROJECTION MODEL MAY BE USED FOR EACH X-VARIABLE)
C     3.  OPTION FOR COMBINING X-VARIABLES BY +, *, -, OR /
C     4.  OPTION FOR FITTING SUBAREA TABLES (E.G., COUNTY) TO COLUMN TOTALS
C     5.  OPTION FOR INSERTING OVERRIDE DATA IN PLACE OF Y-ESTIMATES IN
C         SUBAREA TABLES
C     6.  OPTION FOR FITTING AND PROJECTING CYCLE (E.G., SEASONAL) PATTERNS
C     7.  OPTION FOR PRODUCING SECOND SET OF TABLES, E.G., CONCENTRATE
C     8.  OPTION FOR PUNCHING CARDS OF OUTPUT TABLES
C     9.  OPTION TO OMIT PRINTING STATE X-TABLES
C     10. VARIABLE YEARS OF INPUT AND YEARS OF PROJECTIONS
C     11. VARIABLE NUMBER OF COLUMNS AND NUMBER OF PAGES OF OUTPUT TABLES
C     12. OPTION FOR PRINTING MORE YEARS OF DATA THAN USED AS INPUT
C     13. UP TO 5 LINES FOR TABLE TITLE AND COLUMN HEADINGS
C     14. OPTION FOR PRINTING DATA SOURCE AND METHODOLOGY FOOTNOTES
C     15. OPTION TO OMIT PRINTING A, B, AND R-SQUARE VALUES
C     16. OPTIONAL TOTAL COLUMN IN STATE PROJECTION TABLES
C     17. N PROJECTION TABLES PER RUN; SEPARATE DATA SETS BY BLANK CARD
C     18. DIMENSIONED FOR UP TO 37 YEARS AND 78 COLUMNS OF DATA PER SET
C     19. CORE REQUIREMENT ABOUT 120 K
C
      REAL MATRIX,MATRIN
      INTEGER TOTVEC,RATE,CARDM,CARDT,CFORM,ATRIP,TABLY
      DIMENSION MATRIX(40,80),Y(40),X(40),IPRT(80)
      DIMENSION TOTVEC(40),PARHED( 80),CONHED( 80),IHEAD(240),CONVRT(40)
      DIMENSION BCOEF(8),IEXCP(19),STATPR(40),YEARPR(40),VECTIN(12)
      DIMENSION ITITLE(80),MATRIN (40,80), IOUTLI(15),IPWH (400)
      DIMENSION VECTOR (40),IDIST(10),IHOLD(80)
      DIMENSION DOCSTA(38), DOCOUN(38)
      DIMENSION INSET(15),MULT(40),BRATE(40)
      DIMENSION STATPJ(40,79),ICRDNO(40),ITOTNO(40),CONVEC(40)
      DATA IKSU,IMANHN,IKANS/'(CON','TINU','ED)'/
    1 FORMAT (80A1)
    4 FORMAT (' ',132('-'))
    5 FORMAT (/)
    7 FORMAT(' ',I8,13I9)
   17 FORMAT (' ',7X,'A',12F10.2)
   18 FORMAT (' ',7X,'B',12F10.4)
   19 FORMAT (' ',5X,'RSQ',12F10.4)
   23 FORMAT(' ',20A4)
   24 FORMAT('+',80X,13A4)
   26 FORMAT ('1')
   76 FORMAT (I4,4X,12F6.0)
   77 FORMAT(' ',I4,4X,12I10)
   78 FORMAT (I4,4X,12I6)
   79 FORMAT (I4,I2,A2,12I6)
   96 FORMAT(20A4)
```

```
   99 FORMAT(I4,4X,9F8.0)
  100 FORMAT ('  LOGARITHM PROJECTION ')
  101 FORMAT ('  EXPONENT IS ',F5.2)
  102 FORMAT (10I4)
  103 FORMAT (' ',6X,F6.2)
  104 FORMAT(15I4)
  105 FORMAT (I4,F8.4)
  106 FORMAT(2I4)
  107 FORMAT ('  ANNUAL GROWTH RATE IS ',F 5.4)
  177 FORMAT (' ',7X,'A',12F9.4)
  188 FORMAT (' ',7X,'B',12F9.4)
  199 FORMAT (' ',5X,'RSQ',12F9.4)
  402 FORMAT (2F8.4)
  404 FORMAT(16I5)
  504 FORMAT(1H1,'THE FIRST YEAR OF INPUT FOR PART DATA IS PRIOR TO THE
     1FIRST YEAR OF WHOLE DATA.')
  509 FORMAT(' ',8X,124('-'))
  511 FORMAT (9F8.5)
  512 FORMAT(20I4)
  901 FORMAT(3X,19A4,1X)
  902 FORMAT(1H0,'SOURCE:',/)
  903 FORMAT(1H ,19A4)
  904 FORMAT(A2,1X,19A4,1X)
  999 FORMAT(' ',7X,12F6.0)
      CALC(L,W)=(FLOAT(L))**W
      ATRIP = 0
      TABLY = 0
      DO 40 I = 1,40
      DO 40 J = 1,80
   40 MATRIN(I,J) = 0.0
C
C     STEP I.  READ DATA FOR SECOND STATE TABLES
C
  190 ICONCU = 0
      IF (TABLY.EQ.0) GO TO 195
      DO 193 I = 1,40
      DO 193 J = 1,80
  193 MATRIN (I,J) = 0.0
      TABLY = 0
      ATRIP = 0
C
C     1. SEE IF SECOND SET OF STATE TABLES ORDERED
C                  FORMAT 105 = I4, F 8.4
C        INSERT BLANK CARD IF SECOND TABLES NOT ORDERED
C
  195 READ (1,105,END=300) IFIRST,CONST
      IF (IFIRST.EQ.0) GO TO 89
      IF (IFIRST.EQ.9999) GO TO 300
      ICONCU = 1
      DO 191 I = 1,40
  191 CONVRT(I) = CONST
C
C     2. READ FACTORS FOR CONVERTING FOR 2ND SET OF STATE TABLES
C                  FORMAT 105 = I4, F 8.4
C        OMIT IF SECOND STATE TABLES NOT ORDERED
C        INSERT BLANK CARD IF CONVERSION FACTOR CONSTANT OVER TIME
C      IF CONVERSION FACTOR CARDS INSERTED, FOLLOW WITH BLANK CARD
C
```

```
  192 READ(1,105) IYEAR, CONST
      IF (IYEAR.EQ.0) GO TO 90
      IPOSI = IYEAR-IFIRST+1
      CONVRT(IPOSI) = CONST
      GO TO 192
C
C     3.  READ TITLE CARDS FOR SECOND TABLES IF ORDERED
C        (1) 2 CARDS (CENTERED IN 130 COLUMNS) FOR 1ST LINE OF TITLE
C        (2) 2 CARDS AS ABOVE FOR 2ND LINE OF TABLE TITLE
C                 FORMAT 96 = 20 A4
C        OMIT IF SECOND STATE TABLES NOT ORDERED
C
   90 READ(1,96) (CONHED(I),I = 1,20)
      READ(1,96) (CONHED(I),I = 21,40)
      READ(1,96) (CONHED(I),I = 41,60)
      READ(1,96) (CONHED(I),I = 61,80)
C
C     STEP II.  READ CONTROL CARDS AND DATA FOR MAIN STATE TABLES
C
C     4. READ MASTER CONTROL CARD FOR STATE PROJECTIONS:
C        NI    = NUMBER OF YEARS INPUT TO READ IN
C        NU    = NUMBER OF YEARS DATA TO USE FOR FITTING REGRESSION
C        IX1   = BEGINNING EXPONENT, READ AS INTEGER,E.G,1.2 ENTERED AS 2
C        IX2   = ENDING EXPONENT FOR LAST PROJECTION TO BE FITTED
C        NP    = NUMBER OF YEARS TO PROJECT
C        NC    = NUMBER OF COLUMNS (STATES) TO PROJECT (INCLUDE ONE EXTRA
C                FOR YEAR COLUMN, BUT NONE FOR TOTAL COLUMN)
C        NCS    = NUMBER OF CARDS PER YEAR PER VARIABLE
C        IYIN = CALENDAR YEAR OF FIRST DATA FOR FITTING PROJECTION
C        NFAC = NUMBER OF X VARIABLES (Y = 1)
C        LPRJ = LOG RATHER THAN EXPONENTIAL MODEL: YES = 1, NO = 0
C        NOTL = OMIT TOTAL IN STATE TABLES:  YES = 1, NO = 0
C        IFORM = FORMULA FOR ESTIMATING Y  FROM X :
C              1 = A + BX
C              2 = A X BX
C              3 = A - BX
C              4 = A  / BX
C        NOPRT = OMIT PRINTING STATE TABLE FOR THIS VARIABLE: YES = 1, NO = 0
C        RATE = PROJECTION AT A GIVEN RATE: YES = 1, NO = 0
C        CARDM = PUNCH CARDS OF MAIN STATE PROJECTIONS: YES = 1, NO = 0
C        CARDT = PUNCH CARDS OF SECOND STATE TABLES: YES = 1, NO = 0
C        CFORM = CONDENSED READ FORMAT FOR STATE DATA : YES = 1, NO = 0
C        NOMOD = OMIT PRINTING TYPE OF PROJECTION MODEL: YES=1, NO=0
C              FORMAT 512 IS  20 I 4
C        THIS CARD MUST BE INCLUDED FOR ALL RUNS
C
   89 READ (1,512) NI,NU,IX1,IX2,NP,NC,NCS,IYIN,NFAC,LPRJ,NOTL,
     1IFORM,NOPRT,RATE,CARDM,CARDT,CFORM,NOMOD
C
C     5.  READ A INTERCEPT AND B-VALUE FOR THIS X-VARIABLE
C              FORMAT 402 = 2 F 8.4
C        THIS CARD MUST BE INCLUDED FOR ALL RUNS
C        IF Y-DATA ARE PROVIDED DIRECTLY, ENTER 1.0 IN 2ND FIELD
C
      READ(1,402) ACEPT,WCOEF
C
C     6.  READ NUMBER OF CARDS AND COLUMNS OF INPUT
C                 FORMAT 404 = 16 I 5
```

```
C          THIS CARD MUST BE INCLUDED FOR ALL RUNS
C
      READ (1,404) NCS,(INSET(I),I=1,NCS)
C
C     7.  READ NUMBER OF PAGES AND COLUMNS OF OUTPUT
C                 FORMAT 404 = 16 I 5
C          THIS CARD MUST BE INCLUDED FOR ALL RUNS
C
      READ(1,404) INC, IOUTLI
      IF (RATE.EQ.0) GO TO 44
C
C     6.  IF PROJECTION RATES GIVEN, READ THE RATES
C         OMIT UNLESS PROJECTION AT A GIVEN PERCENTAGE RATE
C               FORMAT 105 IS I 4, F 8.4
C         IF PERCENTAGE RATE CONSTANT THROUGH TOTAL PROJECTION PERIOD,
C           INSERT FIRST CARD FOLLOWED BY ONE BLANK CARD
C         IF PERCENTAGE RATE VARIES OVER TIME, INSERT RATES FOR
C           EACH YEAR, FOLLOWED BY ONE BLANK CARD
C
      READ (1,105) ISTART,WRATE
      DO 46 I = 1,40
   46 BRATE(I) = WRATE
   47 READ (1,105) IREST,ARATE
      IF (IREST.EQ.0) GO TO 44
      IPOSI = IREST - ISTART + 1
      BRATE (IPOSI) = ARATE
      GO TO 47
   44 CONTINUE
      REWIND 4
      INO2 = INO *2
      ISINGL = 0
      DO 210 I = 1,10
C
C     9. READ TITLE CARDS FOR STATE TABLES AS FOLLOWS (10 IN ALL):
C                 FORMAT 1 = 80 A 1
C         (1) 2 CARDS (CENTERED IN 130 COLUMNS) FOR 1ST LINE OF TITLE
C         (2) 2 CARDS AS ABOVE FOR 2ND LINE OF TABLE
C         (3) 2 CARDS AS ABOVE FOR 3RD LINE OF TABLE TITLE
C         (4) 2 CARDS AS ABOVE WITH "STATE" OR OTHER IDENT. OF COLUMNS
C         (5) 2 CARDS FOR 2ND LINE OF COLUMN HEADINGS (OR BLANK CARDS)
C         THIS CARD MUST BE INCLUDED FOR ALL RUNS
C
      READ(1,1) ITITLE
  210 WRITE(4,1) ITITLE
      DO 405 I = 1, INO2
      IN3 = (I-1) * 20 +1
      IN4 = IN3 + 19
C
C     10.  READ COLUMN HEADER CARDS FOR STATE TABLES (INO X 2)
C                 FORMAT 96 = 20 A 4
C     WRITE FORMAT IS I5, 4X, 12 I10 ON 2 CARDS FOR 132 COLUMNS
C         THIS CARD MUST BE INCLUDED FOR ALL RUNS
C
      READ(1,96) ( IPWH(L) , L = IN3,IN4)
  405 CONTINUE
C
C     11. READ SOURCE OF DATA FOOTNOTES (2 CARDS,80 COLUMNS EACH)
C                 FORMAT 901 = 3X, 19 A4, 1X
```

```
C
  420 READ(1,901) (DOCSTA(J1),J1 = 1,19)
      READ(1,901) (DOCSTA(J1),J1 = 20,38)
      WRITE(4,901) (DOCSTA(J1),J1 = 1,19)
      WRITE(4,901) (DOCSTA(J1),J1 = 20,38)
  415 CONTINUE
      REWIND 4
C
C     ICUE IS SIGNAL FOR DOING COUNTY TABLES
C
      ICUE = 0
      IF (NC.EQ.0) NC=10
      IX1=IX1+1
      IX2=IX2+1
      ND=NI-NU+1
      NE=NI-NU
      NO=NI+NP
      NPRO = NI +1
      WRITE (3,26)
      ICN9=1
      DO 403 I = 1,40
      DO 403 J = 1, 80
  403 MATRIX(I,J) = 0.0
      IF (ATRIP.EQ.NFAC) GO TO 406
      DO 211 MP = 1, NCS
      ICN8=ICN9 + 1
      ICN9=ICN9+INSET(MP)
      DO 211 I = 1, NI
C
C     12. READ STATE INPUT DATA, ASSEMBLED IN FOLLOWING ORDER:
C        CARD SET NO. 1, ALL YEARS
C        CARD SET NO. 2, ALL YEARS
C             FORMAT 99 IS I4, 4X, 9F8.0  (REGULAR)
C             FORMAT 76 IS I4,4X,12F6.0  (CONDENSED)
C
      IF (CFORM.EQ.1) GO TO 70
      READ(1,99) IYR,(MATRIX(I,J),J=ICN8,ICN9)
      GO TO 211
   70 READ(1,76) IYR,(MATRIX(I,J),J=ICN8,ICN9)
  211 CONTINUE
  406 LIM = NI+NP
      DO 401 I = 1,NO
  401 MATRIX (I,1) = IYIN + I - 1
C
C     13. SEE WHETHER OR NOT CYCLE FACTORS ARE TO BE USED
C                 FORMAT 103 = 7X,F6.2
C        INSERT BLANK CARD IF NC CYCLE FACTORS INCLUDED
C
      IF (ATRIP.EQ.NFAC) GO TO 214
      READ(1,103) VECTOR(1)
      IF(VECTOR(1).EQ.0.0) GO TO 214
      DO 212 I = 2,NO
C
C     14. READ IN THE CYCLE FACTORS
C                 FORMAT 103 = 7X,F6.2
C        OMIT IF CYCLE FACTORS NOT INCLUDED
C
  212 READ(1,103) VECTOR(I)
```

```
      DO 213 I = 1,NI
      DO 213 J = 2,NC
C
C     STEP III.  ADJUST STATE DATA BY APPLYING CYCLE FACTORS
C
  213 MATRIX(I,J) = MATRIX(I,J)*VECTOR(I)
      GO TO 216
  214 DO 215 I = 1,NO
  215 VECTOR(I) = 1.0
      GO TO 216
C
C     STEP XI.  READ CONTROL CARDS FOR COUNTY TABLES
C
C     15. READ MASTER CONTROL CARD FOR SUBAREA (COUNTY) PROJECTIONS:
C          ISTATE = IDENTIFICATION NUMBER OF STATE
C        REMEMBER THAT COLUMN 1 IS FOR YEAR
C          IX1     = BEGINNING EXPONENT
C          IX2     = ENDING EXPONENT
C          ICYEAR  = CALENDAR YEAR IN WHICH INPUT BEGINS
C          NI      = NUMBER OF YEARS INPUT TO READ IN AND PRINT
C          IYES  = REGRESSION USED TO ESTIMATE COUNTY DATA: YES = 1, NO = 0
C          NOLOOP  = NUMBER OF DATA SETS FOR EACH COUNTY
C          ISINGL  = ONLY ONE YEAR OF COUNTY DATA PROVIDED: YES = 1, NO = 0
C          IFEED  = CALL FOR SECOND SET OF COUNTY TABLES: YES = 1, NO = 0
C        NOMOD = OMIT PRINTING TYPE OF PROJECTION MODEL: YES=1, NO=0
C        ICARDM = PUNCH CARDS OF MAIN COUNTY PROJECTIONS: YES = 1, NO = 0
C        ICARDS = PUNCH CARDS FOR 2ND SET OF COUNTY TABLE  YES = 1, NO = 0
C        LPRJ = LOG RATHER THAN EXPONENTIAL MODEL: YES = 1, NO = 0
C                  FORMAT 104 = 15 I 4
C        INSERT BLANK CARD IF NO COUNTY TABLES DESIRED
C
  217 READ(1,104) ISTATE,IX1,IX2,ICYEAR,NI,IYES,NOLOOP,ISINGL,IFEED,
     1NOMOD,ICARDM,ICARDS,LPRJ
      IF(ISTATE.EQ.0) GO TO 190
      NO = NI
      ICONCO = IFEED
      RATE = 0
C
C     16. READ SEQUENCE OF CROP REPORTING DISTRICTS
C                  FORMAT 102 = 10 I 4
C         IF TOTAL PROJECTIONS TO BE PRORATED ARE NOT DIVIDED BY DISTRICT,
C         ENTER "1" IN FIRST FIELD
C
      READ(1,102) IDIST
C
C     17. READ FOOTNOTES FOR COUNTY TABLES
C      FORMAT 904 = A2,1X,19A4,1X  FORMAT 901 = 3X,19A4,1X
C
      READ(1,904) IDENT,(DOCOUN(J1),J1 = 1,19)
      READ(1,901) (DOCOUN(J1),J1 = 20,38)
      IF(IYES.EQ.0) GO TO 510
C
C     18.  IF USED, READ A-INTERCEPT AND B-COEFFICIENTS FOR X VARIABLES
C                  FORMAT 511 IS 9 F 8.5
C        OMIT IF COUNTY Y-DATA PROVIDED DIRECTLY
C
      READ(1,511) ATRCEP,(BCOEF(I), I = 1,NOLOOP)
C
```

```
C     19.  IF USED, READ CONTROL CARD FOR OVERRIDE DATA
C             NOEXCP = NUMBER OF OVERRIDE YEARS
C             IEXCP = CALENDAR YEARS OF OVERRIDE DATA
C                  FORMAT 512 = 20 I 4
C        INSERT BLANK CARD IF NO OVERRIDE DATA
C        OMIT IF COUNTY DATA PROVIDED DIRECTLY
C
      READ(1,512) NOEXCP,IEXCP
  510 ICHANG = ICYEAR - MATRIX(1,1)
      IF(ICHANG) 501,502,503
  501 WRITE(3,504)
      GO TO 505
  503 LIM2 = LIM - ICHANG
      NP = LIM2 - NI
      ND = 1
      NE = 0
      NO = NI + NP
      NPRO = NI + 1
      LOOPER = LIM2
      DO 506 I = 1,LOOPER
      IPARM = I + ICHANG
      YEARPR(I) = MATRIX(IPARM,1)
  506 STATPR(I) = STATPJ(IPARM,ISTATE)
      GO TO 570
C
C     STEP XII.  READ DATA FOR SECOND COUNTY TABLES
C
  502 NO = LIM
      NP = NO-NI
      ND = 1
      NE = 0
      NPRO = NI +1
      DO 569 J1 = 1,LIM
      YEARPR(J1) = MATRIX(J1,1)
  569 STATPR(J1) = STATPJ(J1,ISTATE)
  570 IF(ICONCU.EQ.0) GO TO 500
C
C     20.  READ 1ST YEAR CONVERSION FACTOR FOR OPTIONAL 2ND COUNTY TABLES
C             FORMAT 105 = I 4,  F 8.4
C        OMIT IF SECOND COUNTY TABLES NOT ORDERED
C
      READ(1,105) IFIRST,CONST
      DO 507 I = 1,40
  507 CONVRT(I) = CONST
C
C     21. READ CONVERSION FACTORS FOR 2ND SET OF COUNTY TABLES
C             FORMAT 105 = I 4,  F 8.4
C        OMIT IF SECOND COUNTY TABLES NOT ORDERED
C        INSERT BLANK CARD IF CONVERSION FACTOR CONSTANT OVER TIME
C      IF CONVERSION FACTOR CARDS INSERTED, FOLLOW WITH BLANK CARD
C
  508 READ(1,105) IYEAR,CONST
      IF(IYEAR.EQ.0) GO TO 500
      IPOSI = IYEAR - IFIRST +1
      CONVRT(IPOSI) = CONST
      GO TO 508
  500 IX1 = IX1 +1
      IX2 = IX2 +1
```

```
      REWIND 4
  229 ICUE = 1
      ILOOP = 12
      IF (ICONCU.EQ.1) ILOOP = 16
      ICOUTY = 0
      ISUMNO = 0
      INOCON = 1
C
C     STEP XIII.  READ DATA FOR MAIN COUNTY TABLES
C
      DO 520 I = 1,40
      DO 520 I1 = 2,80
  520 MATRIX(I,I1) = 0.0
C
C     22. READ NUMBER OF COUNTIES IN TABLE AND IN CRD TOTAL
C                    FORMAT 106 = 2 I 4
C        THIS CARD AND ALL THAT FOLLOW TO BE REPEATED FOR ALL DISTRICTS
C          IN STATE FOR WHICH COUNTY RUNS ARE TO BE  MADE
C     IF 14 COLUMNS IN TOTAL AND 10 COLUMNS ON FIRST SET OF CARDS,
C       ENTER 10   14 FOR FIRST SET AND  4   0 FOR SECOND SET
C
  221 READ(1,106) INUMC,INOINT
      IF(INUMC.EQ.0) GO TO 225
      INUMIN = INUMC
      ICOUTY = ICOUTY +1
      ICRDNO(ICOUTY) = INUMC
      IF(INOINT.EQ.0) GO TO 218
      ISUMNO = ISUMNO +1
      ITOTNO (ISUMNO) = INOINT
  218 DO 288 I = 1,ILOOP
C
C     23. READ AND STORE TITLES AND COLUMN HEADINGS FOR COUNTY TABLES:
C          (1) 2 CARDS (CENTERED IN 130 COLUMNS) FOR 1ST LINE OF TITLE
C          (2) 2 CARDS AS ABOVE FOR SECOND LINE OF TITLE, INCLUDING UNIT
C                IN TABLE. NOTE: UNITS IN COUNTY TABLES ARE THOSE IN
C                STATE TABLE DIVIDED BY 10
C          (3) 2 CARDS AS ABOVE FOR STATE AND CRD IDENTIFICATION
C          (4) 2 CARDS AS ABOVE FOR "COUNTY" OR OTHER IDENT. OF COLUMNS
C          (5) 2 BLANK SPACER CARDS (OR ADDITIONAL HEADERS)
C          (6) 2 COLUMN HEADER CARDS, CENTERED IN FIELDS OF 19, STARTING
C                WITH "YEAR" AND ENDING WITH "TOTAL"
C          (7) 2 CARDS FOR 1ST LINE OF TITLE OF 2ND TABLE, IF ORDERED
C                (OMIT IF 2ND TABLES NOT ORDERED)
C          (8) 2 CARDS FOR 2ND LINE OF TITLE OF 2ND TABLE, IF ORDERED
C                (OMIT IF 2ND TABLES NOT ORDERED)
C                  FORMAT 1 = 80 A 1
C
      READ(1,1) ITITLE
  288 WRITE(4,1) ITITLE
      INUMC = INUMC + INOCON
      INOCON = INOCON +1
      IF(IYES.EQ.1) GO TO 515
      IF(ISINGL.EQ.1) GO TO 906
      DO 219 I = 1,NJ
C
C     24. READ COUNTY INPUT DATA. NOTE: COUNTY DATA DO NOT HAVE TO BE IN
C         SAME UNIT AS STATE SINCE THEY ARE PROPORTIONED AND FORCED INTO
C         STATE TOTALS SO THAT CONVERSION IS AUTOMATIC.
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C                    FORMAT 999 IS 8X, 12 F6.0
C              COLS 1 TO 4 = CALENDAR YEAR
C              COLS 5 TO 6 = STATE IDENTIFICATION NUMBER
C              COLS 7 TO 8 = CROP REPORTING DIST. NO. (SEE FORMAT 106)
C              COLS 9 TO 80= COUNTY DATA IN 12F6.0
C
C         NOTE: INCLUDE ONE COUNTY DATA CARD FOR EACH YEAR PLUS ONE
C           BLANK CARD AT END OF EACH SET OF COUNTY DATA
C
  219 READ(1,999) (MATRIX(I,J),J = INOCON,INUMC)
      GO TO 530
  906 READ(1,999) (MATRIX(1,J),J = INOCON,INUMC)
      GO TO 530
C
C     25.  IF PROVIDED, READ THE COUNTY OVERRIDE DATA
C          OMIT IF NO OVERRIDE DATA USED
C          FORMAT IS IDENTICAL TO THAT IN STEP 24
C          OVERRIDE DATA SHOULD MATCH YEARS IN STEP 19
C
  515 IF (NOEXCP.EQ.0) NOEXCP = 1
      DO 516 I = 1,NOLOOP
      DO 516 I1 = 1,NI
      IYER = ICYEAR + I1 -1
      DO 517 I2 = 1,NOEXCP
      IF (IYER.EQ.IEXCP(I2)) GO TO 525
  517 CONTINUE
      READ(1,999) (VECTIN(I5),I5 = 1,INUMIN)
      DO 518 I3 = 1,INUMIN
      IPARM2 = INOCON + I3 -1
  518 MATRIX(I1,IPARM2) = MATRIX(I1,IPARM2) + BCOEF(I)*VECTIN(I3)
      IF(I.GT.1) GO TO 516
      DO 519 I3 = INOCON,INUMC
  519 MATRIX(I1,I3) = MATRIX(I1,I3)+ ATRCEP
      GO TO 516
  525 READ(1,999) (VECTIN(I6),I6 = 1,INUMIN)
      IF(I.GT.1) GO TO 516
      DO 526 I2 = 1,INUMIN
      IPARM3 = INOCON + I2 -1
  526 MATRIX(I1,IPARM3) = VECTIN(I2)
  516 CONTINUE
  530 INOCON = INUMC
      GO TO 221
C
C     26.  SIGNAL TO MOVE TO NEXT DATA SET (STATE OR VARIABLE)
C          INSERT ONE BLANK CARD (SEE STEP 22)
C          THIS CARD MUST BE INSERTED FOR ALL DATA SETS FOR WHICH
C             MASTER COUNTY CONTROL CARD (STEP 15) IS PROVIDED.
C
  225 IF(ISINGL.NE.1) GO TO 908
      DEVIDE = 0.0
      DO 909 K1 = 2,INOCON
  909 DEVIDE = DEVIDE + MATRIX(1,K1)
C
C     27.  CONTROL CARDS AND HEADERS FOR Y-TABLES
C          OMIT IF Y-TABLES ARE NOT TO BE PRODUCED
C        THE FOLLOWING A-STEPS ARE USED WHEN Y-TABLES DESIRED
C        THESE STEPS ARE INSERTED AFTER ALL DATA FOR THE X-VARIABLES
C             1A. TO 11A.  IDENTICAL TO STEPS 1 TO 11
```

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C                                OMIT STEPS 12 TO 14
C                 15A.  THIS STEP IDENTICAL TO STEP 15
C                 16A. TO 26A.  THE APPROPRIATE OF THESE STEPS REPEATED
C                                IF COUNTY Y-TABLES DESIRED
C
C       28.  END OF DATA FOR ENTIRE RUN
C       INSERT 9999 CARD AT END OF DATA FOR ENTIRE RUN
C                 FORMAT IS I4
C
      DO 910 K2 = 2,INOCON
      MATRIX(1,K2) = (MATRIX(1,K2)/DEVIDE)
      DO 910 K3 = 2,NO
  910 MATRIX(K3,K2) = MATRIX(1,K2)
      GO TO 911
C
C     STEP XIV.  COMPUTE COUNTY HISTORICAL DATA
C
  908 DO 226 I = 1,NI
      DEVIDE = 0.0
      DO 227 I1 = 2,INOCON
  227 DEVIDE = DEVIDE + MATRIX(I,I1)
      DO 228 I2 = 2,INOCON
  228 MATRIX(I,I2) = MATRIX(I,I2)/DEVIDE
  226 CONTINUE
  911 WRITE(3,26)
      REWIND 4
      NC = INOCON
C
C     STEP IV.  PRINT HEADINGS FOR MAIN AND SECOND STATE TABLES
C
  216 IF(ICUE.EQ.1) GO TO 33
      DO 281 I = 1,10
      IFIRST = (I-1)*20+1
      ISEC = IFIRST+19
  281 READ(4,96)(IHEAD(I1),I1=IFIRST,ISEC)
  421 READ(4,901) (DOCSTA(J1) ,J1 = 1,19)
      READ(4,901) (DCCSTA(J1),J1 = 20,38)
  416 CONTINUE
      REWIND 4
   33 DO 60 KK=IX1,IX2,2
      INOUT = 0
      NI1 = 1
      W = 1.+FLOAT(KK-1)/10.
      IF(ISINGL.EQ.1) GO TO 912
      IF(ICUE.EQ.1) GO TO 34
      IDONE = 0
   35 IF(IDONE.EQ.0) GO TO 36
      WRITE(3,23) (CONHED(I),I = 1,20)
      WRITE(3,24) (CONHED(I),I = 21,33)
      WRITE(3,23) (CONHED(I),I = 41,60)
      WRITE(3,24) (CONHED(I),I = 61,73)
      GO TO 37
   36 CONTINUE
      INOUT = INOUT +1
      IF (NOPRT.EQ.1) GO TO 45
      WRITE(3,23)(IHEAD(I),I=1,20)
      WRITE(3,24)(IHEAD(I),I=21,33)
      WRITE(3,23)(IHEAD(I),I=41,60)
```

```
      WRITE(3,24)(IHEAD(I),I=61,73)
   37 WRITE(3,23)(IHEAD(I),I=81,100)
      WRITE(3,24)(IHEAD(I),I=101,113)
      WRITE(3,5)
      IF(NOMOD.EQ.1) GO TO 39
      IF (LPRJ.EQ.1) GO TO 38
      IF (RATE.EQ.1) GO TO 42
      WRITE(3,101) W
      GO TO 39
   42 WRITE (3,107) WRATE
      GO TO 39
   38 WRITE (3,100)
   39 WRITE (3,4)
      WRITE(3,4)
      WRITE(3,23)(IHEAD(I),I=121,140)
      WRITE(3,24)(IHEAD(I),I=141,153)
      WRITE(3,23)(IHEAD(I),I=161,180)
      WRITE(3,24)(IHEAD(I),I=181,193)
      WRITE(3,509)
      IN3 = (INOUT -1) * 40 +1
      IN4 = IN3 +19
      IN5 = IN4 +1
      IN6 = IN5 +12
      WRITE(3,23) (IPWH(I), I = IN3,IN4)
      WRITE(3,24) (IPWH(I), I = IN5,IN6)
      WRITE(3,4)
      WRITE(3,5)
   45 IF(IDONE.EQ.1) GO TO 232
      IF(INOUT.GT.1) GO TO 407
      IF (ATRIP.EQ.NFAC) GO TO 479
C
C     STEP V & XV.  FIT THE STATE (AND COUNTY) PROJECTIONS
C
   34 IF (NOMOD.EQ.1) GO TO 130
      IF (LPRJ.EQ.1) GO TO 620
      IF (RATE.EQ.1) GO TO 630
      DO 9 I = 2,NC
      DO 10 J=ND,NI
      IF (MATRIX(J,I).EQ.0) MATRIX(J,I)=.001
      Y(J-NE)=MATRIX(J,I)
   10 X(J-NE)=CALC(J-NE,W)
      CALL REG(NU,X,Y,A,B,RSQ)
      MATRIX(NO+1,I)=A
      MATRIX(NO+2,I)=B
      MATRIX(NO+3,I)=RSQ
      IF (NP.EQ.0) GO TO 9
      CALL PROJCT (NU,NP,A,B,Y,W)
      LL=NI+1
      JJ=NI+NP
      DO 11 J=LL,JJ
   11 MATRIX(J,I)=Y(J-NI)
    9 CONTINUE
      GO TO 130
  620 DO 623 I = 2,NC
      DO 621 J = ND, NI
      IF (MATRIX(J,I).EQ.0) MATRIX(J,I) = .001
      Y(J-NE) = MATRIX(J,I)
      Y(J-NE) = ALOG(Y(J-NE))
```

```
  621 X(J-NE) = J - NE
      CALL REG(NU,X,Y,A,B,RSQ)
      MATRIX(NU+1,I)=A
      MATRIX(NU+2,I)=B
      MATRIX(NU+3,I)=RSQ
      IF (NP.EQ.0) GO TO 623
      CALL LOGPRJ (NU,NP,A,B,Y)
      LL=NI+1
      JJ = NI + NP
      DO 622 J =LL,JJ
  622 MATRIX (J,I) = EXP(Y(J-NI))
  623 CONTINUE
      GO TO 130
  630 CONTINUE
      DO 631 I = 2,NU
      IO = I - 1
      CMULT(I) = (1.0 + BRATE(IO))
      DO 635 J = 2, NC
  635 MATRIX (I,J) = MATRIX (IO,J) * CMULT(I)
  631 CONTINUE
  130 CONTINUE
  131 IF (ICOE.EQ.1) GO TO 233
C
C     STEP VI.  ADJUST PROJECTIONS FOR CYCLE FACTORS
C
      DO 408 I = 1,NU
      STATPJ (I,1) = MATRIX (I,1)
      IF (WCOEF.EQ.0) WCOEF = 1.0
      DO 411 J = 2,NC
  411 MATRIX (I,J)  = MATRIX (I,J)/VECTOR (I)
  408 CONTINUE
C
C     STEP VII.  CALCULATE THE STATE Y TABLE FROM X VARIABLES
C
      IF (NFAC.EQ.1) GO TO 407
      IF (ATRIP.GT.0) GO TO 450
      DO 440 I = 1,NU
      DO 440 J = 2,NC
      MATRIN(I,J) = WCOEF * MATRIX(I,J)
  440 CONTINUE
      ATRIP = 1
      GO TO 407
  450 CONTINUE
      ATRIP = ATRIP + 1
      GO TO (451,452,453,454),IFORM
  451 DO 455 I = 1,NU
      DO 455 J = 2,NC
  455 MATRIN(I,J) = MATRIN (I,J) + (WCOEF * MATRIX(I,J))
      GO TO 407
  452 DO 456 I = 1,NU
      DO 456 J = 2,NC
  456 MATRIN(I,J) = MATRIN(I,J) * (WCOEF * MATRIX(I,J))
      GO TO 407
  453 DO 457 I = 1,NU
      DO 457 J = 2,NC
  457 MATRIN(I,J) = MATRIN(I,J) - (WCOEF *MATRIX(I,J))
      GO TO 407
  454 DO 458 I = 1,NU
```

```
      DO 458 J = 2,NC
  458 MATRIN(I,J) = MATRIN(I,J) / (WCOEF * MATRIX(I,J))
      GO TO 407
C
C     STEP VIII.  APPLY A-INTERCEPT FOR STATE Y TABLE
C
  479 TABLY = 1
      DO 475 I = 1,NO
      DO 474 J = 2,NC
      MATRIN(I,J) = ACEPT + MATRIN(I,J)
  474 MATRIX(I,J) = MATRIN(I,J)
  475 STATPJ(I,1) = MATRIX(I,1)
C
C     STEP IX.  PRINT THE STATE TABLES
C
  407 NIO = NI1 +1
      NI1 = NI1 + IOUTLI(INOUT)
      ID = NI1 - NIO + 2
      IDIF = NI1 - NIO + 3
  201 DO 16 N=1,NO,5
      L=N+4
      DO 13 I=N,L
      IF (I.GT.NO) GO TO 13
      IF(INOUT.GT.1) GO TO 20
      IHOLD(I)=0
      DO 15 J = NIO, NI1
      IF (ATRIP.EQ.NFAC) GO TO 21
      IF (MATRIX(I,J).LT.0) MATRIX(I,J)=0.
   21 J1 = J - NIO +2
      IPRT(J1) = MATRIX(I,J) + .5
      IHOLD(I)=IHOLD(I)+IPRT(J1)
   15 STATPJ(I,J) = IPRT(J1)
      IPRT(1) = STATPJ(I,1)
      IF (INOUT.LT.INO) GO TO 114
      IF (NOTL.EQ.1) GO TO 114
      IPRT(IDIF) = IHOLD(I)
   20 IF (CARDM.EQ.1) WRITE (2,78) (IPRT(K),K = 1,IDIF)
      IF (NOPRT.EQ.0) WRITE (3,77)(IPRT(K),K=1,IDIF)
      GO TO 13
  114 IF (CARDM.EQ.1) WRITE (2,78) (IPRT(K),K = 1,ID)
      IF (NOPRT.EQ.0) WRITE (3,77)(IPRT(K),K=1,ID)
   13 CONTINUE
   16 WRITE (3,5)
  160 IF(IDONE.EQ.1) GO TO 161
      IF (NOPRT.EQ.1) GO TO 409
      IF (TABLY.GT.0) GO TO 161
      IF (RATE.EQ.1) GO TO 161
      IF (NP.EQ.0) GO TO 161
      WRITE(3,4)
      WRITE (3,17) (MATRIX(NO+1,J),J=NIO,NI1)
      WRITE (3,18) (MATRIX(NO+2,J),J=NIO,NI1)
      WRITE (3,19) (MATRIX(NO+3,J),J=NIO,NI1)
  161 WRITE (3,4)
  422 WRITE(3,902)
      WRITE(3,903) (DOCSTA(J1),J1 = 1,19)
      WRITE(3,903) (DOCSTA(J1),J1 = 20,38)
      WRITE (3,26)
  409 CONTINUE
```

```
      IF(ICONCU.EQ.0) GO TO 410
      IF(IDONE.EQ.1) GO TO 410
      IDONE = 1
      GO TO 35
  410 CONTINUE
      IF(INOUT.EQ.INO) GO TO 60
      IDONE = 0
      GO TO 36
C
C     STEP X.  COMPUTE AND PRINT SECOND STATE TABLES
C
  232 DO 230 I = 1,NO
      DO 231 J = NIO,NI1
      J1 = J - NIO +2
  231 IPRT(J1) = STATPJ(I,J) *CONVRT(I)
      IPRT(1) = STATPJ(I,1)
      IF (INOUT.LT.INO) GO TO 234
      IF (NOTL.EQ.1) GO TO 234
      IPRT(IDIF) = IHOLD(I)
      IPRT(IDIF) = IPRT(IDIF) * CONVRT(I)
      IF (CARDT.EQ.1) WRITE (2,78) (IPRT(K),K = 1,IDIF)
      WRITE (3,77)(IPRT(K),K=1,IDIF)
      GO TO 230
  234 IF (CARDT.EQ.1) WRITE (2,78) (IPRT(K),K = 1,ID)
      WRITE (3,77) (IPRT(K),K=1,ID)
  230 IF(I.EQ.I/5*5) WRITE(3,5)
      GO TO 160
C
C     STEP XVI.  FORCE COUNTY PROJECTIONS TO STATE TOTALS
C
  233 ICONCU = IFEED
      DO 236 I = NPRO,NO
      DEVID = 0
      DO 237 I1 = 2,INOCON
      IF(MATRIX(I,I1).LT.0.0) MATRIX(I,I1) = 0.0
  237 DEVID = DEVID + MATRIX(I,I1)
      DO 238 I1 = 2,INOCON
  238 MATRIX(I,I1) = (MATRIX(I,I1)/DEVID)*STATPR(I)*10.0
  236 CONTINUE
      DO 239 I = 1,NI
      DO 239 I1 = 2,INOCON
      IF (MATRIX(I,I1).GT.1.5) GO TO 239
      MATRIX(I,I1) = MATRIX(I,I1)*STATPR(I)*10.0
  239 CONTINUE
      GO TO 914
  912 DO 913 I = 1,NO
      DO 913 I1 = 2,INOCON
      IF (MATRIX(I,I1).GT.1.5) GO TO 913
      MATRIX(I,I1) = MATRIX(I,I1) * STATPR(I) * 10.0
  913 CONTINUE
  914 IK1 = 0
      IPRINT = 1
      IK = 0
  240 IK = IK +1
      DO 246 I = 1,NO
      TOTVEC(I) = 0
  246 CONVEC(I) = 0
      ISUMS = ITOTNO(IK)
```

```
      ILISUM = 0
  241 IK1 = IK1 +1
      ILINE = ICRDNO(IK1)
      ILISUM = ILISUM + ILINE
      IPR2 = IPRINT + ILINE
      IPRINT = IPRINT +1
      DO 242 I = 1,12
      IFIRST = (I-1) *20 + 1
      ISEC = IFIRST +19
  242 READ (4,96) (IHEAD(I1),I1 = IFIRST,ISEC)
      IF (ICONCO.EQ.0) GO TO 342
      READ (4,96) (PARHED(I),I = 1,20)
      READ(4,96) (PARHED(I),I = 21,33)
      READ (4,96) (PARHED(I),I = 41,60)
      READ(4,96) (PARHED(I),I = 61,73)
  342 DO 247 I = 1,NO
      DO 247 I1 = IPRINT,IPR2
  247 TOTVEC(I) = TOTVEC(I)+MATRIX(I,I1)
      IDONE = 0
      GO TO 244
C
C     STEP XVII.  PRINT HEADINGS FOR COUNTY TABLES
C
  243 WRITE(3,23) (PARHED(I),I = 1,20)
      WRITE(3,24) (PARHED(I),I = 21,33)
      WRITE(3,23) (PARHED(I),I = 41,60)
      WRITE(3,24) (PARHED(I),I = 61,73)
      IDONE = 1
      GO TO 245
  244 WRITE(3,23)(IHEAD(I),I=1,20)
      WRITE(3,24)(IHEAD(I),I=21,33)
      WRITE(3,23)(IHEAD(I),I=41,60)
      WRITE(3,24)(IHEAD(I),I=61,73)
  245 WRITE(3,23)(IHEAD(I),I=81,100)
      WRITE(3,24)(IHEAD(I),I=101,113)
      WRITE(3,5)
      IF (LPRJ.EQ.1) GO TO 624
      IF (NOMOD.EQ.1) GO TO 625
      WRITE(3,101) W
      GO TO 625
  624 WRITE (3,100)
  625 WRITE (3,4)
      WRITE(3,4)
      WRITE(3,23)(IHEAD(I),I=121,140)
      WRITE(3,24)(IHEAD(I),I=141,153)
      WRITE(3,23)(IHEAD(I),I=161,180)
      WRITE(3,24)(IHEAD(I),I=181,193)
      WRITE(3,509)
      WRITE(3,23)(IHEAD(I),I=201,220)
      WRITE(3,24)(IHEAD(I),I=221,233)
      WRITE(3,4)
      WRITE(3,5)
      IF(IDONE.EQ.0) GO TO 252
C
C     STEP XVIII.  COMPUTE SECOND COUNTY TABLES
C
      DO 250 I = 1,NO
      DO 250 I1 = IPRINT,IPR2
```

```
  250 MATRIX(I,II) = MATRIX(I,II) * CONVRT(I)
      DO 251 I = 1,NO
      DO 251 II = IPRINT,IPR2
  251 CONVEC(I) = CONVEC(I) + MATRIX(I,II)
  252 IF(ILISUM.EQ.ISUMS) GO TO 260
C
C     STEP XIX.  PRINT MAIN (AND SECOND) COUNTY TABLES
C
      DO 253 N = 1,NO,5
      L = N +4
      DO 254 I = N,L
      IF(I.GT.NO) GO TO 253
      DO 255 J = IPRINT,IPR2
      IPRT(J) = MATRIX(I,J)+0.5
  255 CONTINUE
      IYRPR = YEARPR(I)
      IF (IDONE.EQ.1) GO TO 256
      IF (ICARDM.EQ.1) WRITE (2,79) IYRPR,IDIST(IK),IDENT,(IPRT(K),
     1K = IPRINT,IPR2)
      GO TO 254
  256 IF (ICARDS.EQ.1) WRITE (2,79) IYRPR,IDIST(K),IDENT,(IPRT(K),
     1K = IPRINT,IPR2)
  254 WRITE(3,7)   IYRPR, (IPRT(K),K = IPRINT,IPR2)
  253 WRITE(3,5)
      WRITE (3,4)
      GO TO 270
  260 IF (IDONE.EQ.0) GO TO 259
      DO 258 I = 1,NO
  258 TOTVEC(I) = CONVEC(I)
  259 DO 261 N = 1,NO,5
      L = N +4
      DO 262 I = N,L
      IF (I.GT.NO) GO TO 261
      DO 263 J = IPRINT,IPR2
      IPRT(J) = MATRIX(I,J)+0.5
  263 CONTINUE
      IYRPR = YEARPR(I)
      IF (IDONE.EQ.1) GO TO 264
      IF (ICARDM.EQ.1) WRITE (2,79) IYRPR,IDIST(IK),IDENT,(IPRT(K),
     1K = IPRINT,IPR2)
      GO TO 262
  264 IF (ICARDS.EQ.1) WRITE (2,79) IYRPR,IDIST(IK),IDENT,(IPRT(K),
     1K = IPRINT,IPR2)
  262 WRITE(3,7)   IYRPR, (IPRT(K),K = IPRINT,IPR2), TOTVEC(I)
  261 WRITE(3,5)
      WRITE(3,4)
  270 IF(ISINGL.EQ.1) GO TO 915
      IF (TABLY.EQ.1) GO TO 915
      IF(IDONE.EQ.1) GO TO 915
      WRITE(3,177)(MATRIX(NO+1,J),J = IPRINT,IPR2)
      WRITE(3,198)(MATRIX(NO+2,J),J = IPRINT,IPR2)
      WRITE(3,199)(MATRIX(NO+3,J),J = IPRINT,IPR2)
      WRITE(3,4)
C
C     PRINT FOOTNOTES TO COUNTY TABLES
C
  915 WRITE(3,902)
      WRITE(3,903) (DOCOUN(J1),J1 = 1,19)
```

```
      WRITE(3,903) (DOCOUN(J1),J1 = 20,38)
      WRITE(3,26)
      IF(ICONCU.EQ.0) GO TO 280
      IF(IDONE.EQ.1) GO TO 280
      GO TO 243
280   IPRINT = IPR2
      IF (IPRINT.EQ.INOCON) GO TO 60
      IF (ILISUM.EQ.ISUMS) GO TO 240
      GO TO 241
 60   REPEND 4
      GO TO 217
300   WRITE(3,111)
111   FORMAT(1H1,'NORMAL END OF PROGRAM')
505   CONTINUE
      STOP
      END
      SUBROUTINE PROJCT (N,L,A,B,Y,W)
      DIMENSION Y(20)
      DO 3 I=1,L
  3   Y(I)=A+B*FLOAT(N+I)**W
      RETURN
      END
      SUBROUTINE REG (N,X,Y,A,B,RSQ)
      DIMENSION X(20),Y(20)
      SUMXY=0.
      SUMY=0.
      SUMX=0.
      SUMXX=0.
      SUMYY=0.
      DO 1 I=1,N
      SUMXY=SUMXY+X(I)*Y(I)
      SUMY=SUMY+Y(I)
      SUMX=SUMX+X(I)
      SUMXX=SUMXX+X(I)*X(I)
  1   SUMYY=SUMYY+Y(I)*Y(I)
      IF (SUMYY.EQ.0.) SUMYY=0.001
      IF (SUMXX.EQ.0.) SUMXX=.001
      IF (SUMXY.EQ.0.) SUMXY=.001
      IF (SUMX.EQ.0.) SUMX=.001
      IF (SUMY.EQ.0.) SUMY=.001
      T=N
      IF (T.EQ.0.) T=.001
      XBAR=SUMX/T
      YBAR=SUMY/T
      C=SUMXY-SUMY*XBAR
      D=SUMXX-SUMX*XBAR
      B=C/D
      A=YBAR-B*XBAR
      RSQ=C*C/(D*(SUMYY-SUMY*YBAR))
      RETURN
      END
      SUBROUTINE LOGPRJ (N,L,A,B,Y)
      DIMENSION Y (20)
      DO 2 I=1,L
  2   Y(I) = A + B*FLOAT (N+I)
      RETURN
      END
```

APPENDIX E

MAIN AREAS OF CEREAL GRAIN

AND PULSE PRODUCTION

1966*

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1.	Main Areas of Wheat Production in Ethiopia - 1966	281
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6.	Main Areas of Production of All Pulses in Ethiopia - 1966.	286

*Clarence J. Miller et al. Production of Grains and Pulses in Ethiopia, Report No. 10. (Standford Research Institute, Menlo Park, California: 1969), pp. 10, 12, 14, 16, 19, 22.

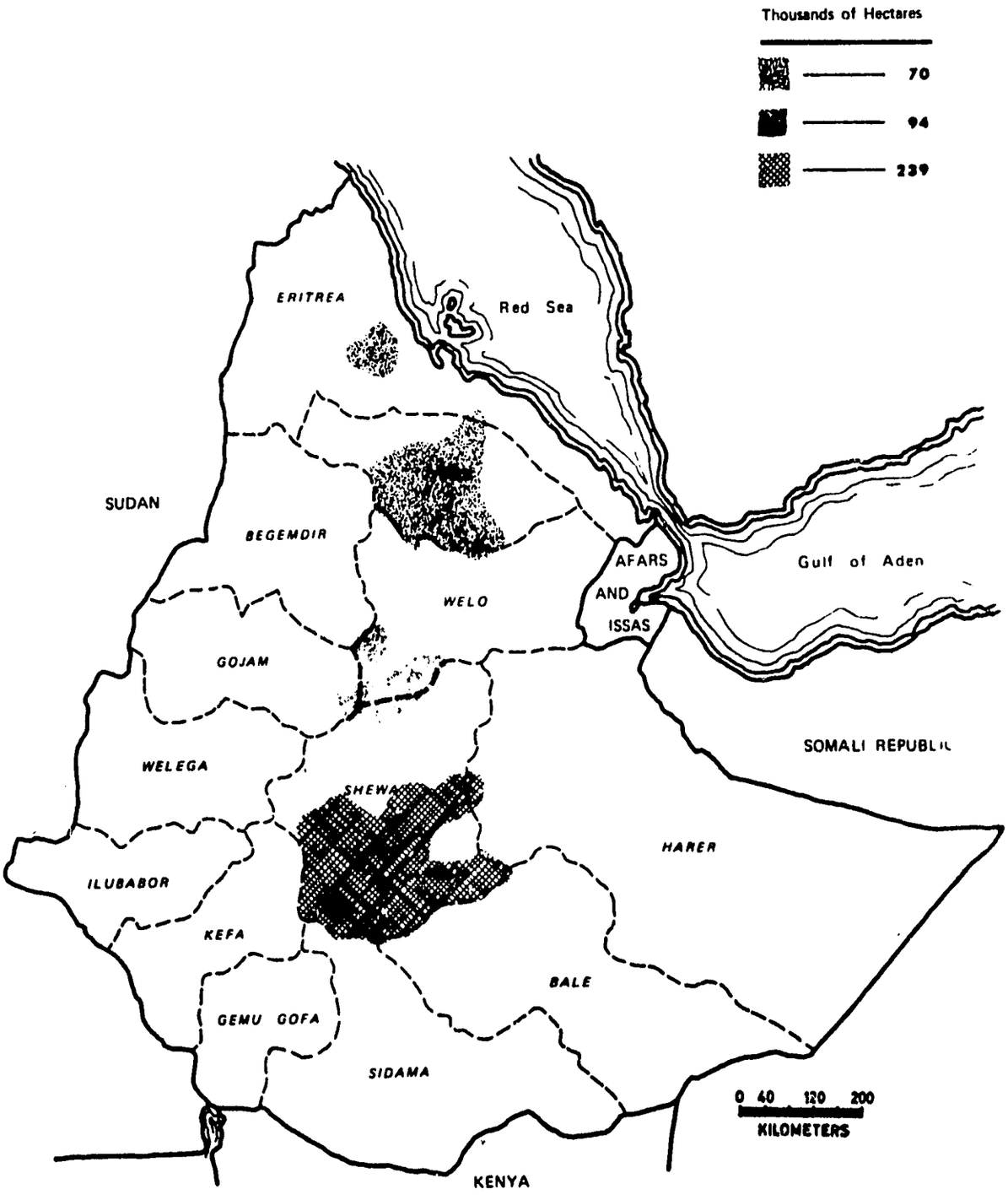

FIG. 1 MAIN AREAS OF WHEAT PRODUCTION IN ETHIOPIA – 1966

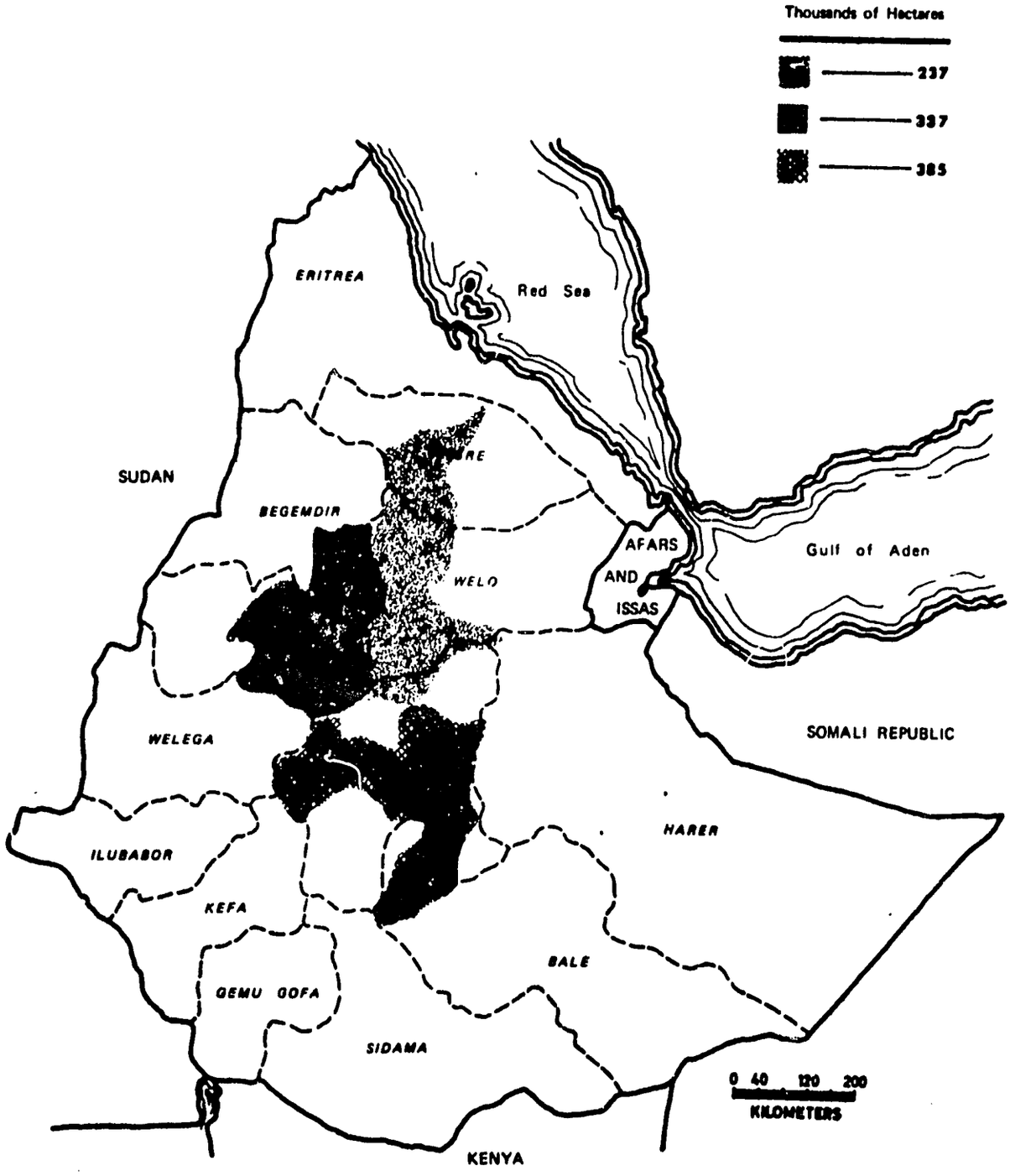

FIG. 2 MAIN AREAS OF BARLEY PRODUCTION IN ETHIOPIA – 1966

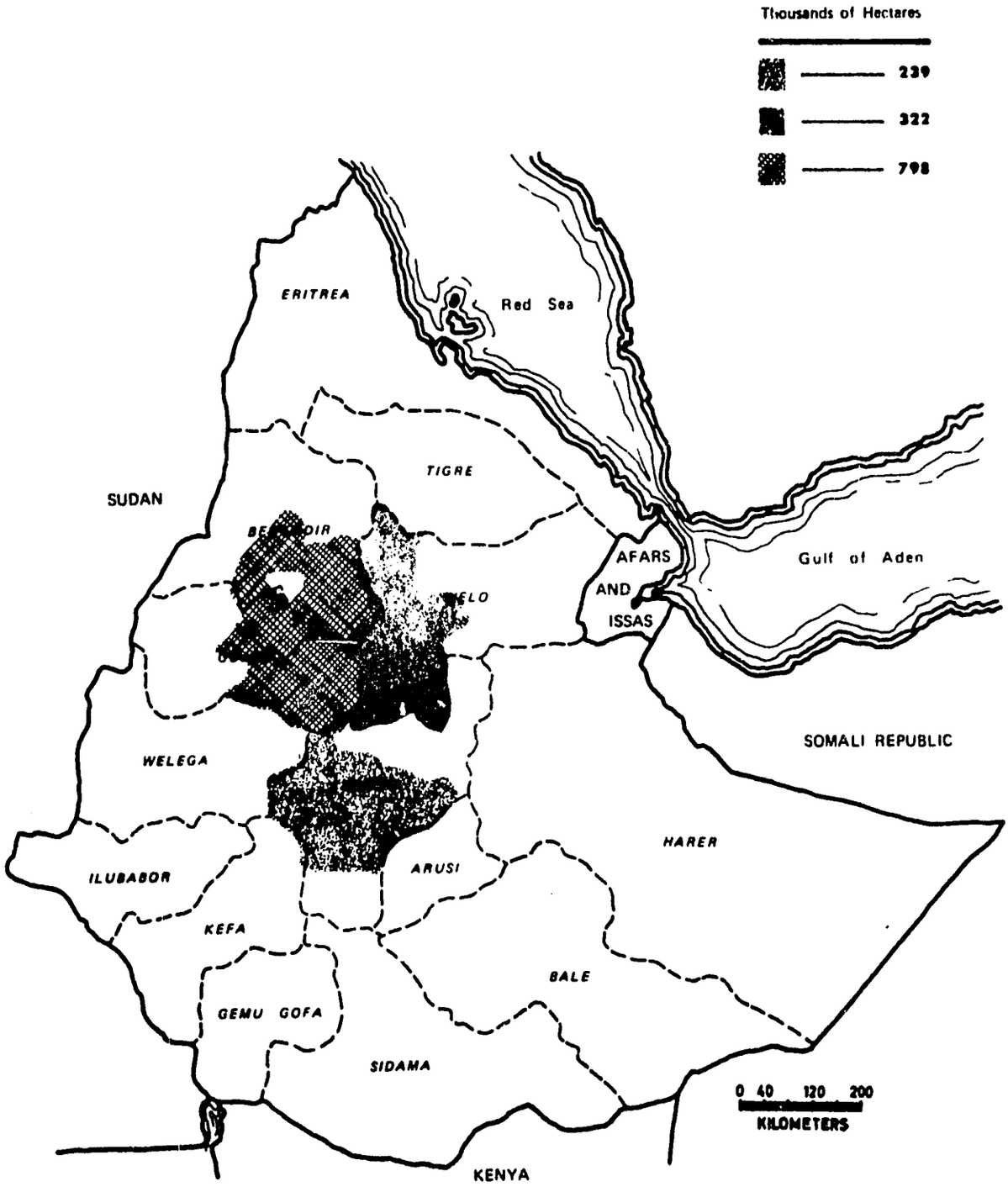

FIG. 3 MAIN AREAS OF TEFF PRODUCTION IN ETHIOPIA – 1966

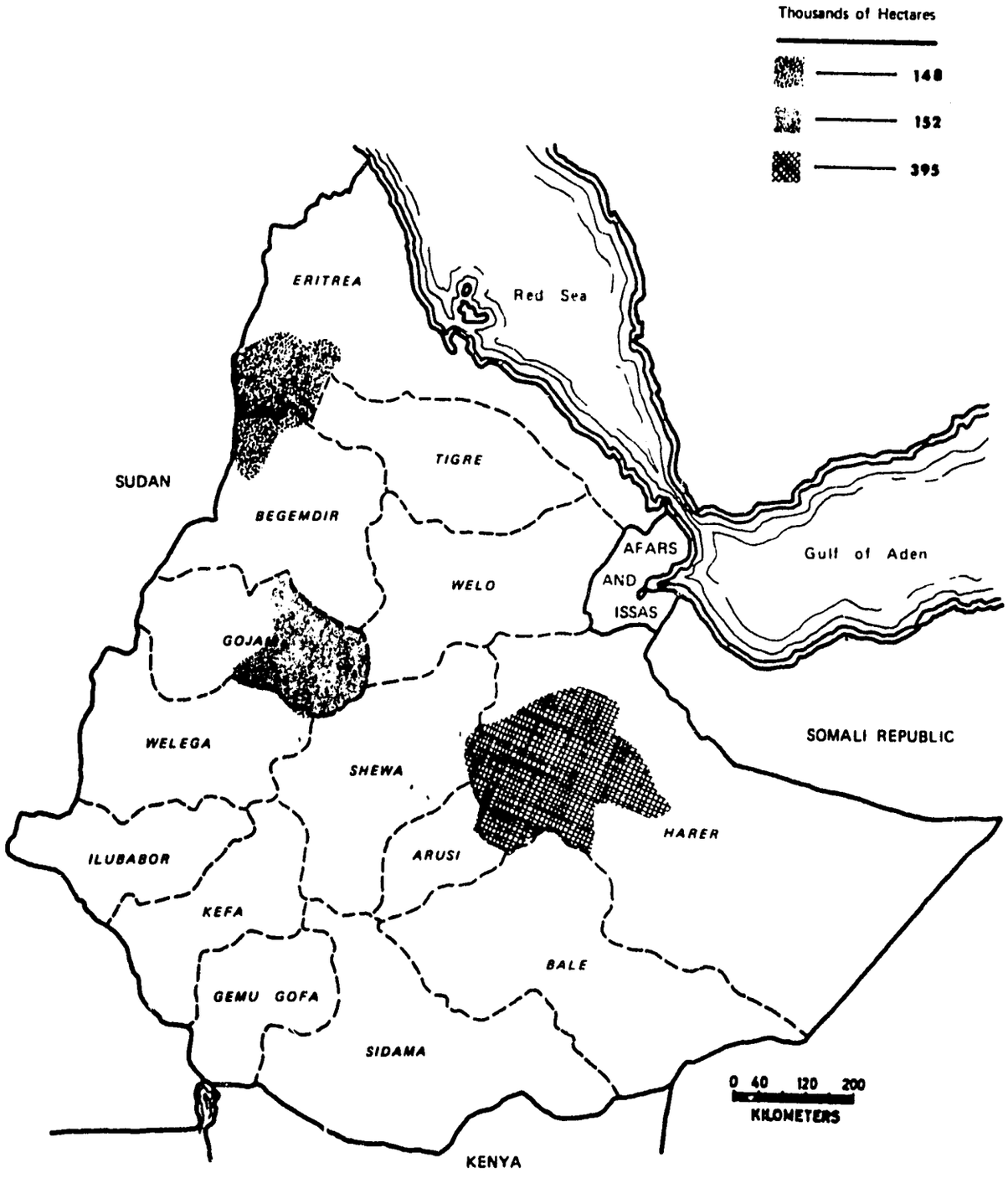

FIG. 4 MAIN AREAS OF SORGHUM AND MILLET PRODUCTION IN ETHIOPIA – 1966

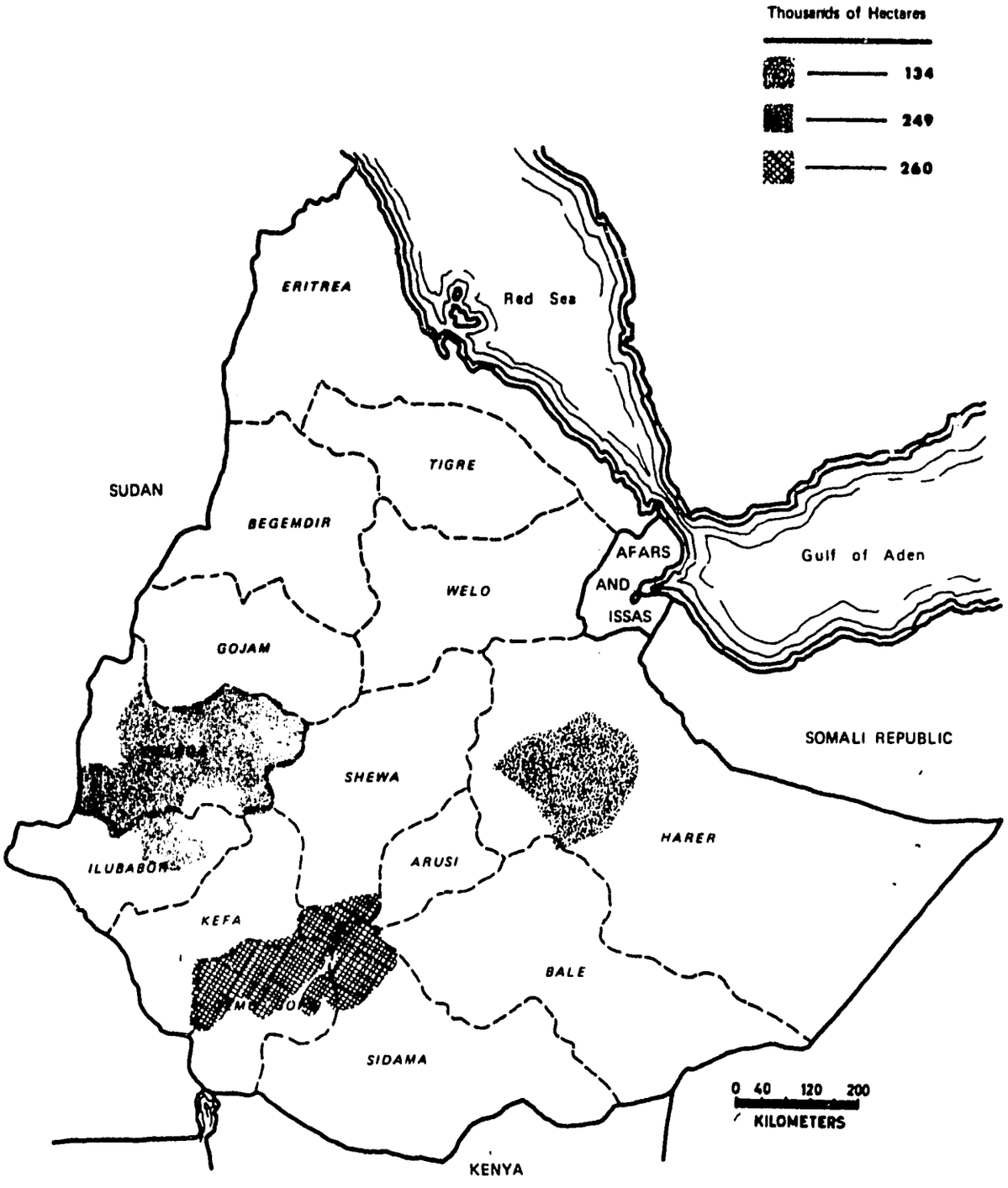

FIG. 5 MAIN AREAS OF MAIZE PRODUCTION IN ETHIOPIA – 1966

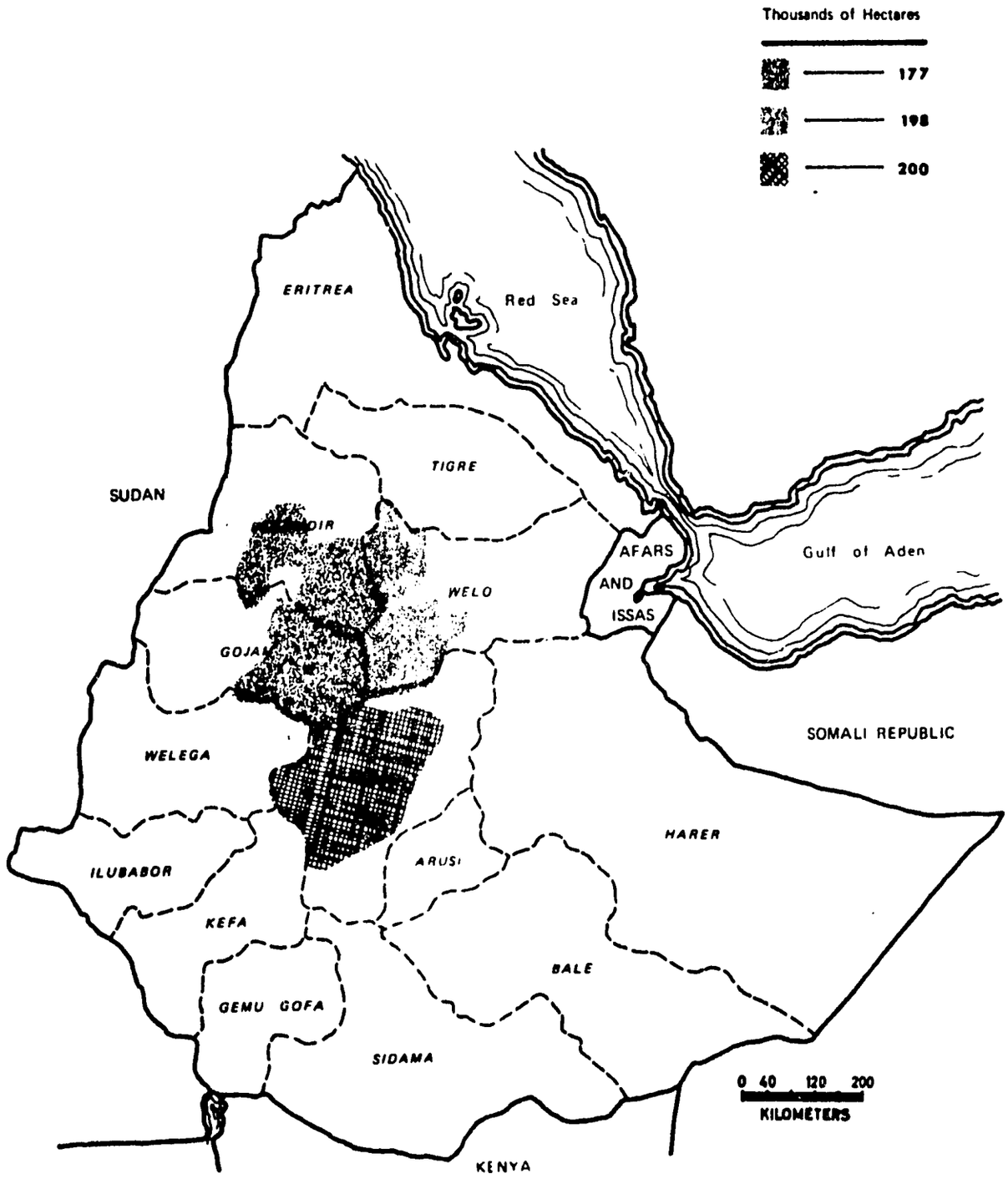

FIG. 6 MAIN AREAS OF PRODUCTION OF ALL PULSES IN ETHIOPIA – 1966

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