Discussion Draft

AGP12

TOWARD GREATER FOOD SECURITY FOR MOROCCO

An Overview of Issues and Prospects

Country Case Study Report prepared as part
of the Food Security Policy Work Program

AGREP Division Working Paper No. 12

Economics and Policy Division
Agriculture and Rural Development Department
January 8, 1978

TOWARD GREATER FOOD SECURITY FOR MOROCCO

An Overview of Issues and Prospects

TABLE OF CONTENTS

APPENDIX

List of Tables

List of Figures

Figure No

TOWARD GREATER FOOD SECURITY FOR MOROCCO

An Overview of Issues and Propects

SUMMARY AND CONCLUSIONS

1. Morocco's nutritional problem in the base year (1971) derived largely from the lack of income of the lowest two population deciles rather than from a low propensity to consume calories. Incomes of the bottom two groups in 1970-71 was only US$63 and $83 respectively. This compared with an expenditure needed to purchase the FAO/WHO calorie requirement of about $160. Calorie malnutrition is widespread, despite a traditional diet based on cereals and oil. Using the definitions of the Ministry of Health, fully 20 percent of the Moroccans would be suffering from moderate malnutrition (between 80 and 60 percent of the requirement) and almost 10 percent from severe malnutrition (60 percent or less than the requirement).

2. Because of the high propensity to consume calories among the poorer groups, and prospects for relatively rapid income growth, Morocco is characterized by a relatively large amount of malnutrition in the base year with more hopeful prospects for the future. While closing the market gap by 1985 would thus require annual per capita income growth in excess of 8 percent, a more moderate growth would be sufficient to sharply reduce the problem of hunger and deprivation of most of the poor.

3. While the present study does not provide new foograin supply projections, a survey of other studies suggests that Morocco will experience major deficits in three important dietary components: wheat, vegetable oil and sugar. For most other food items, including meat fruits, and vegetables, self sufficiency or a commercial surplus are expected. The nutritional gap is also likely to be small by 1985, with food deficits concentrated in few items of the traditional diet and commercial surpluses are projected for several profitable export crops. The results suggest a strategy of modernization and specialization of the agricultural sector, rather than one of emphasis on traditional food crops and subsistence farms. Both the present policies of the Moroccan Government and activities of the private sector appear to be moving in this direction.

I. INTRODUCTION[1/]

Background

1.01 Morocco is located in the Northwest corner of Africa, separated from Europe by the Strait of Gilbrater. It extends for 174,000 square miles of which only about 31,320 are arable land, from an area of rich and open plains in the Northeast to poor mountains, plateaus and deserts in the East and the South.

1.02 Because of its location, Morocco has strong historical ties to Spain and France. Its population, which in 1976 was 16.7 million, growing at 2.9 percent per annum, is ethnically derived from Barber and Arab immigration. About 40% of the population is Barber-speaking and resides mainly in rural areas. The Arab-speaking population accounts for the balance and resides mainly in urban areas.

1.03 Although the importance of agriculture has declined slightly in recent years, Morocco remains primarily an agricultural nation. In 1976, 75% of the population depended on agricultural production and 25% of gross national product came from this sector. Since agricultural production is very vulnerable to rainfall levels, the production varies greatly over the years.

1.04 The per capita income level of the Morocco Population is currently about 2133 Dirhams (US$473). Income data for 1960 and 1970 suggest an increasingly skewed distribution. The expenditure survey conducted in 1971[2/],

---

1/ The main sources of this introduction are:World Bank, Country Economic Memorandum on Morocco, 1977 and American University, Foreign Area Studies, Area Handbook for Morocco, 1972.

2/ 1970-71 Household Budget Survey, see Appendix.

confirms this skewness, with a Gini coefficient of 0.49 and the bottom quintile claiming only 5% of total income.

1.05 Major crops produced in Morocco are cereals (mainly barley, hard wheat and corn), vegetables, fruits and nuts. In a normal year production of these crops is sufficient to supply domestic markets and permit significant exports. However, Morocco is a net importer of soft wheat and sugar, both very important items in typical diets.

1.06 The Moroccan diet is of the classical Mediterranean type, based on cereals and oil. Among cereals, wheat and maize are replacing more traditional barley and oats. Vegetables are regularly consumed. According to a recent study[1/], 50 percent of the population does not consume any meat and generally the diet of all income groups appears to be low in proteins and vitamins.

1.07 The 1971 household survey showed an average per capita intake of 2200 and 2600 calories for urban and rural areas, respectively. Using standard body weights of 65 kg per men and 56 kg per women, and the average age distribution in 1971, and FAO/WHO calorie requirement for adults is 2476 calories.

1.08 With this standard, about 53 percent of the Moroccan population showed calorie malnourishement in 1971. Not surprisingly, the most severely malnourished group of people were infants of poor parents. According to the most recent nutritional survey, 45 percent of the infant population sampled was suffering from moderate malnutrition and about 6 percent were severely malnourished. Among all ages the nutritional deficiencies were greatest in rural areas.

1/ Robin Menes & Julie Weissman, Background Paper on Health, Morocco, January 1976, Office of International Health Division of Program Analysis.

Food Production and Alternative Growth Strategies

1.09 Land distribution in Morocco is skewed and characterized by large fragmentation of holdings but few very large farms. According to the most recent estimates[1/], the top 10 percent of the owners hold about 49 percent of the land, while the bottom 10 percent hold only 1 percent. While the greatest majority of the land is privately owned, 15 percent is under collective ownership.

1.10 Fully 35 percent of the farmers are recorded as not having any marketed output and an additional 20 percent participate to only a limited extent in the market economy. A modest agrariam reform program since 1956, based on the redistribution of 610,000 ha confiscated from foreign settlers, will benefit an estimated 4 percent of all landless workers, sharecroppers and subsistence level farmers.

1.11 Because of their limited contact with the market economy, the vagaries of the wheather and the traditional dietary habits and technology, small farmers in Morocco are poor and engaged largely in dryland production of basic foodstuff. Irrigable land comprises only 12 percent of total arable land and is suited for cultivation of more income elastic goods such as vegetables, sugar beets and cotton. Yields in these crop, however, are not high and it is not clear that Morocco has a comparative advantage in their production.

1.12 Potential for yeld increases in hard wheat, barley, corn, pulses and citrus is great. Modern farms in the same agroclimatic areas have often yields

---

1/ World Bank, Country Economic Memorandum on Morocco, June 30, 1977.

up to three times those realized on traditional farms. But yield gains are likely to be limited by low fertility of many of the soils, the riskness involved in the application of modern techniques and the amount of investment required. Production gains beyond self-sufficiency among the poor farmers are likely to lead to marketing and price problems because of low demand elasticity for output and relatively poor export prospects.

1.13 Despite a family planning program dating back to the late sixties, population growth has been rapid, with the growth rate increasing from 2.5 percent per year in 1970 to 2.9 percent in 1976. While people are apparently not opposed to population control policies, the age structure of the Moroccans is such that a reduction in the rate of growth can only be expected over a period of perhaps ten years or more. If population growth rates fail, however, an alternative growth strategy for agriculture could be based on the expansion of the modern sector, producing high quality vegetables, citrus, sugar beets and cotton, and taking advantage of irrigated land fertilization and improved varieties.

1.14 As a result of recent investments in irrigation works and the increasing emphasis on development of rainfed agricultrue, Morocco has acquired capacity for agricultural GDP growth of the order of 3.0 to 3.5 percent per year. In the longer run, emphasis on basic food production might imply a lower rate of growth, e.g. 2.0 to 2.5 per year, reflecting greater concentration on the subsistence sector and on rainfed production.

1.15 In summary, development prospects for Moroccan agriculture range from a high growth possibilities, based on irrigated farming of vegetables and industrial plants . to a low growth perspective based on self-sufficiency in rainfed crops produced on traditional farms. The most practical policy is likely to be a mixture of the two coupled with development of the other sectors and efforts to expand external markets.

II. BASIC CONSUMPTION RELATIONS

2.01 Per capita average annual expenditure and calorie intakes reported in Table 1 were used to estimate simple Engel equations. Weighted regression results are reported in Table 2. While generally enelastic, the range of the estimated demand - expenditure responses appears to be above what is reported for most other countries. The elasticity of the calorie equation, furthermore, is higher than the figures quoted by Reutlinger and Selowsky[1/].

2.02 These relatively high elasticities for food, cereals and calories appear to correspond to the character of the Moroccan diet and the importance of consumption of food and cereals for the lowest income groups when self-consumption is taken into account[2/]. In normal circumstances, the fact that the elasticity of demand for calories decreases sharply with income gains has an important redistribution effect since it tends to make less dramatic the impact of income on nutritional levels. Calories are thus more evenly distributed than income. The high elasticities for basic foods in Morocco imply therefore higher calorie deficits for the lowest income groups, higher surpluses (as compared to nutritional needs) for people with higher income and, as a result, a higher total calorie deficit.

2.03 As Table 3 shows, use of the calculated nutritional requirement of 2,476 calories per adult per day yields a poverty line of about US$160 and an estimated 8 million malnourished people 5370 of the total population. Dramatic as it may seem from these figures, the problem of malnutrition is somewhat lessened by the fact that the caloric gap declines raplidly as

---

1/ Shlomo Reutlinger and Marcelo Selowsky, Malnutrition and Poverty, World Bank, Staff Occasional Paper, #23, 1976. In this study the authors estimate calorie-income elasticities for reigons ranging from -0.1 to + 0.40 Among these, South America has the lowest (-0.01) and Northwest Africa the highest (+ .40)

2/ One notable feature of the 1970 Household survey is its consideration of self-consumption for rural households.

TABLE 1

MOROCCO

BASE YEAR CONSUMPTION AND EXPENDITURE DATA

(Base year = 1971)

Population Percentage	Average Annual p.c. Expenditure (in DH) 1970-71	Per Capita Daily Calorie Purchases				Average Annual p.c. (D.H) Expenditure	
		Urban Households	Rural Households	Total	Calorie from Cereals	Food	Cereal
9.52	0 - 214	451	668	616			
"	214 - 310	899	1352	1267	830.0	204.50	69.39
"	310 - 384	1203	1762	1652	1049.2	261.93	89.03
"	384 - 466	1395	1883	1784	1216.4	312.21	94.35
"	466 - 542	1641	2251	2033	1357.0	356.76	105.07
"	542 - 627	1694	2408	2236	1472.8	380.64	112.63
"	627 - 732	1840	2930	2582	1604.0	528.13	130.98
4.77	732 - 864	1961	3187	2790	1735.9	563.16	139.70
"	864 - 943	2467	3170	2952	1838.8	590.86	151.36
"	943 -1042	2054	3703	3024	1916.2	611.02	152.37
"	1042 -1171	2514	3464	3076	2005.8	761.30	204.07
4.76	1171 -1358	2243	4605	3961	2113.5	829.31	159.61
"	1358 -1641	2798	3274	3395	2258.6	903.89	197.45
"	1641 -1977	2646	4408	3204	2410.8	1019.41	205.52
"	1977 -2682	3335	5977	4442	2619.1	1210.43	
"	2682 - +	3839	5885	4460			

MOROCCO

TABLE 2. WEIGHTED REGRESSION RESULTS FOR ENGEL EQUATIONS

Dependent Variable	Constant	Logarithm of p.c. expenditure (in Dirhams) *	Elasticity at the average	R^2	D.W.
--- Per capita ---					
Calorie Consumption	- 6219	1339 (11.7)	0.50	0.89	2.37
Food Expenditure (in Dirhams)	- 1993	381 (19)	0.79	0.96	0.68
Cereal Calorie Consumption	-3758	822 (469)	0.51	0.99	1.45
Cereal Expenditure (in Dirhams)	- 322	69 (10.8)	0.53	0.88	2.82

Source: Estimated from 1971 Household Survey.

*Standard error in parenthesis.

Table 3

MOROCCO

CALORIE DEFICITS BY INCOME GROUP 91970 - 1971)

Average p.c. Expenditure		Per Capita Calorie in take	Per Capita Calorie deficit	Population			Total Deficit	
(DH)	($)			000	%	Cum %	Million Calories p. day	Annual Cereal Equiv. (metric) tons
262	63	1267	1,209.0	1464	9.52	9.52	1770	184,600
347	83	1652	824.0	1464	9.52	19.04	1206	125,800
425	102	1784	692.0	1464	9.52	28.56	1013	105,600
504	121	2033	443.0	1464	9.52	38.08	649	67,600
585	140	2236	240.0	1464	9.52	47.60	451	47,100
Poverty Line								
661	160	2570	30.0	330	2.15	52.60	10	1,043
TOTAL				8,084			5,089	530,700

Source: 1970-71 Household Survey and Estimates of Table 2.

income increases. The situation, however remains serious. Using the definitions of the Ministry of Health, Table 3 shows that more than one-fifth of all Moroccans are suffering from moderate malnutrition (between 80 and 60 percent of the requirement) and almost 10 percent from severe malnutrition (60 percent or less than the requirement). These results change only slightly if the norm is lowered to 2276 calories. In practice they are likely to be compounded by the skewness of the distribution within the income classes, and, by the traditional habit of feeding the men first, resulting in more severe malnutrition of women and children.

III. FOOD GAP AND TARGET POPULATION PROJECTIONS

3.01 Table 4 presents basic projections for the case of unchanged income distribution and price policies and a high per capita income growth rate[1/]. Results are reported in the text. All other simulations, reported in tables in the appendix are to be judged with reference to this benchmark projection.

2.02 As the table shows, an increase in per capita income by the amount assumed in the national plan, would considerably reduce both the nutritional gap and the size of the malnourished population. By 1995 the gap would be essentially eliminated, if the income growth rate can be sustained.

3.03 Because of the high propensity to consume calories and the more than proportional increase in the calorie-income elasticity for the poorer consumers, Morocco is characterized by relatively large amount of malnourishement in the base year with more hopeful prospects for the future. While eliminating the demand gap by 1985 would require per capita income gains of more than 8 percent, a more moderate growth with modest additional efforts to supply food to the poor would sharply reduce the problem of hunger among those groups.

3.04 For example, at the rate of growth of income of 3.9 percent, a direct food subsidy to the calorie deficient groups would close the nutritional gap by 1985 at a budgetary cost roughly estimated at less than US$100 million a year. A similar effect would be obtained, with greater cost effectiveness, by an increase in the progressivity of taxation as reflected in a 10 percent decrese

---

1/ A 3.9 percent increase in per capita income can be considered a likely possibility for Morocco and coresponds to the actual rate realized in 1968-76.

TABLE 4. PROJECTIONS OF PER CAPITA CALORIE CONSUMPTION WITH PER CAPITA INCOME GROWTH RATE OF 3.9%

CONSTANT RELATIVE PRICE AND INCOME DISTRIBUTION

Average P.C. 1971 Expenditure (1971 Dirhams)	Per Capita Daily Calorie Consumption		Per Capita Calorie Deficit		Population (in Thousands)		Nutritional Gap million Calories	
	1985	1995	1985	1995	1985	1995	1985	1995
262	1954	2466	558.91	71.7	2190.1	1915	1224	137
347	2330	2843	182.70	-	2190.1		400	
425	2602	3114	-	-	326.8		60	-
504	2830	3342	-	-	-	-	-	-
585	3028	3541	-	-	-	-	-	-
680	3230	3742	-	-	-	-	-	-
798	3445	3958	-	-	-	-	-	-
904	3612	4124	-	-	-	-	-	-
993	3737	4250	-	-	-	-	-	-
1107	3883	4395	-	-	-	-	-	-
1265	4062	4574	-	-	-	-	-	-
1500	4290	4802	-	-	-	-	-	-
1809	4541	5053	-	-	-	-	-	-
2330	4880	5392	-	-	-	-	-	-
TOTAL					3,904	1,587	1,346	1,137

Annual Cereal Equivalents (metric tons)
Source: Our projections.

Note: Target population 21% in 1985, 6% in 1995

Table 5

MOROCCO

COST EFFECTIVENESS OF DIFFERENT POLICY MEASURES

REQUIRED TO CLOSE THE NUTRITIONAL GAP IN 1985

(Based on 3.9% per capita income growth rate, constant relative price and income distribution)

Policy Measure	Fiscal Cost (million US$)	Annual Per Capita Subsidy Equivalent 2/ (US dollars)
Food Subsidy	94	20.0
Income Redistribution & Food Subsidy	53	11.3
Price Subsidy 1/	279	59.3
Income Subsidy	155	32.9
Redistribution + Subsidy	81	17.2

1/ In terms of 1971 cereal prices.

2/ The annual per capita income projected in 1985 for the lowest two income classes is $108

in the Gini coefficient. As Table 5 shows, other policy measures would also be inferior to the redistribution instrument from a fiscal point of view.

3.06 If moderately high growth cannot be realized, the problem of malnourishment will remain dramatic for Morocco for all the foreseable future. Table 6 presents projection results relating to different scenarios under a low growth (2% in p.c. income) assumption and shows that almost all the policy options considered would be powerless in reducing malnutrition in the case of insufficient growth by 1985. For the longer time horizon (1995) a combination of income redistribution and cereal price decreases brings down the target population to its lowest figure: a sizable 15%. Overall, the effect of low growth rate is to increase proportionally the time needed to close the gap: this time goes from 19 years (from the base year 1971) for the high neutral growth assumption, to 41 years for the case of low growth with no other policy measures and declines only slightly when redistribution and/or price subsidies are attempted.

3.07 While low income growth can be considered improbable on average, Morocco's dependence on highly variable agricultural output makes an uneven economic performance a likely event. If high growth rate is maintained on average, but output fluctuations around the trend line are high, the projection results can be interpreted as pointing out a high treshold for food security. The skewed income distribution and the high calorie elasticities would both determine rapid and sizable increases in malnutrition during a bad year. They would also cause a relatively large number of poor people to fall below survival levels. Thus not only a sizable average supply of food is needed, but also adequate buffer stocks will have to be maintained <u>even in the case of high growth</u> if the very poor have to be kept from starving in bad agricultural years

Table 6.

MOROCCO

PROJECTION RESULTS OF LOW INCOME GROWTH RATE (2%) WITH ALTERNATIVE POLICIES OF INCOME REDISTRIBUTION AND SUBSIDIES TO PRICE OF CEREALS

	Policy Measure	Malnourished Population (%)		Annual Nutritional Gap (million tons) of cereal equiv.		Annual total Food Needs (million tons)	
		1985	1995	1985	1995	1985	1995
	Base Year (1971)	53%		0.53		4.56	
1)	Constant income distribution and constant price	35%	24%	.39	.29	7.31	10.16
2)	10% decrease in Gini coefficient and constant price	32%	21%	.33	.24	7.33	10.21
3)	Constant income distribution and 50% decrease in price	31%	22%	.34	.25	7.41	10.30
4)	Constant income distribution and 50% decrease in price	27%	18%	.25	.16	7.53	10.47
5)	10% decrease in Gini coefficient and 25% decrease in price	29%	19%	.26	.17	7.41	10.32
6)	10% decrease in Gini coefficient and 50% decrease in price	24%	15%	.21	.11	7.57	10.50

IV SUPPLY PROSPECTS

4.01 The major constraints to increase agricultural production in Morocco lie in the backward conditions of most of its agricultural sector. About 85 percent of agricultural land is cultivated by poor peasants in small plots or under difficult tenure conditions. Traditional methods used offer a textbook illustration of primitive agriculture: depleted soils due to continuous planting of one crop on the same plot, little or no use of fertizers and insecticides, lack of modern equipment, widespread pests and diseases and very low yields. Furthermore, most of the acreage in the traditional sector is used for grazing.

4.02 Although the modern sector comprised only 15 percent of agricultural land, in part because it includes the most fertile soils and the great majority of irrigated land, it is also responsible for a large share (about 85%) of commercialized production. Furthermore modern farms are the chief suppliers of export crops including almost all of the citrus fruit, fresh vegetables, wine and soft wheat. Constraints to increase production in this sector are largely due to marketing and adjustment problems following the "Morocconization" of the previously French-owned farms and to the difficulty of expanding the small irrigated acreage.

4.03 Agriculture in Morocco is also confronted with a general climatic problem of increasing lack of water as one moves from northwest to southwest and high variability of rainfall. As a consequence, all non irrigated land is subject to the risk of droughts and floods, pests and diseases are widespread and the crops such as olives and grapes show extremely variable performances.

4.04 In terms of food production, the traditional sector directly supports about 1.5 million of subsistence farmers who have only marginal contacts with the market. Increases of production in this sector are possible only through yield increases since expansion of cropland could only be accomplished by reduction of the already scarce low fertility grazing lands. Potential for yield increases appear to be good through upgrading of the traditional irrigation facilities, and use of modern inputs. However, improvement of land tenure and consolidation of the overly fragmented small holdings is a pre-condition for any significant technical improvement.

4.05 While the main condition for increasing food production lies in the transformation of the traditional farms into more modern and dynamic units, the modern sector also appears to have good prospects of growth. Recent efforts of the government to step up agricultural production have been particularly succesful in irrigated areas where the Regional Office for Agricultural Development has provided the farmers with generally competent management of water supply and intensive technical assistance[1/]. An impressive success story in this respect concerns the cultivation of sugar beets, which has been actively encouraged by the government in order to reduce the import of sugar, one of the most costly import items in terms of hard currencies. As a direct consequence of these efforts sugar beet production rose from zero output in 1961 to around 1 million metric tons in 1970, a quantity sufficient to supply almost a half of domestic consumption.

1/ See World Bank, Appraisal of DonKkahe II Irrigation Project, Kindgdom of Morocco, Washington, D.C. April 12, 1977.

4.06 In 1970-74 annual production of cereals in Morocco exceeded human consumption by roughly one million metric tons (Table 7)

TABLE 7. SUPPLY- DEMAND BALANCE FOR CEREALS, AVERAGE 1970-74

(000 metric tons)

Product	Production	Import	Export	Consumption by livestock	Stock variation	Seed	Waste	Human Consumption
Wheat	1,915	729	-	-	+249	193	96	2,106
Barley	2,126	29	12	672	+163	195	106	1,008
Corn	337	23	-	46	+ 29	18	17	249
Rice	16	-	30	31	+ 6	6	6	51
Total	4,515	781	42	749	+436	413	226	3,431

Source: Royaume du Maroc.- Ministere de L'Agriculture et de la Reforme Agraire - Projection de la Demande de Produits Alimentaires, 1982-2000, Fevrier 1977.

However, because of cereal consumption by livestock, annual imports exceeded exports by about 700,000 tons. This deficit is largely in wheat, for which production is just about enough to satisfy human consumption in a normal year, but a buffer stock is needed to offset poor crops in bad years.

TABLE 8. PROJECTION OF SUPPLY NEEDS IN 1985 PER CAPITA INCOME GROWTH RATE EQUAL TO 3.9 PERCENT (in million metric tons)

Product	Cereals Requirements[1/]	Required Prod. Increase from 1970-74 for self-sufficiency	IFPRI Projection of Production
Wheat	4.4	2.48	3.15
Barley	2.1	--	3.49
Corn	0.5	0.15	0.55
Rice	0.03	--	0.03
Other	0.11	--	0.20
Total	7.14	2.63	7.42

4.07 While the present study does not examine details of supply prospects, a survey of other studies by FAO, IFPRI and Morocco government agencies shows that major future deficits are likely to occurr for wheat, sugar and oil - For most of other food items including meat, fruits, vegetables, etc., self-sufficiency or commercial surpluses are predicted. Table 8 presents an attempt to quantify cereal supply needs for 1985 under the high income growth hypothesis. The estimates concurr with the results of other studies in indicating need for a large increase in wheat production.

4.08 To sum up: since Morocco's economic growth heavily depends of its agricultural sector performance and consumption patterns favor high caloric food at all income levels (high calorie-income elasticities), reasonably high neutral growth is likely to make both food and nutritional gaps small by 1980. Food gaps would be concentrated among a few items of the traditional diet and commercial surpluses appear likely for several products with attractive export markets. For the high growth case, the refore, these considerations suggest a strategy which includes modernization and specialization of the agricultural sector. But if food needs of the poorest groups are to be met, it also requires development emphasis on food crops and subsistence farms.

4.09 If the high growth path cannot be maintained, on the other hand, Morocco's nutritional prospects would be rather bleak. Because of the very skewed income distribution send the insufficient income increase of the poor, malnourishement would be intolerably high for any reasonably close time horizon. In this case one would also expect agricultural production to staguate and higher food gaps to persist despite of the reduced demand of the poor. The simulations performed clearly show that moderate income distribution and selective price subsidies could considerably improve the nutritional status of the poor, if adequate food supplies can be secure.

4.10 Although dependence on rainfed agriculture will tend to decrease in the future, variability of food production may be a major problem for

Moroccan food balance. If requirements for a buffer stock at least adequate to avoid hunger in bad years were added to food needs, deficits for cereals would be much larger than predicted.

APPENDIX

1970-71 Household Budget Survey

The 1970-71 household budget survey is used as the primary data source. Volume I of the survey provides a short summary of the results. Volume IV provides more detailed information concerning food consumption and nutritional status by expenditure class for urban and rural households. Other information includes the average consumption of different subgroups of the population in terms of occupation, region, or by type of urban dwelling.

This sample survey consists of 6546 households. Among them, 2960 were from urban areas and 3349 for rural. The sampling was stratified: six urban strata and five rural strata were selected from the 1960 census.

The basic information selected from the survey are presented as Table 1 in the text and Table A.1 in the Appendix.

Table A.1

MOROCCO

ANNUAL PER CAPITA CONSUMPTION AND EXPENDITURES (in DH)

Type of Goods	Consumption	Expenses	Accounting Price 1/
Cereals	193.32	123	0.636
Milk & Dairy Products	29.79	22	0.739
Oils and Fats	13.19	41	3.108
Meats	17.89	107	5.981
Fish	3.57	6	1.681
Vegetables	88.72	39	0.440
Fruit	45.50	23	.505
Sugar	29.68	58	1.954
Other Sugar Products	0.46	3	6.522
Tea and Aromatic Plants	6.62	29	4.381
Spices and Condiments	9.62	9	0.936
Meals taken outside	0.91	14.85	16.319
Other		11.25	
Total		486	

Source: 1970-1971 Household Survey

1/ The accounting price is the ratio of expenses to consumption; it therefore takes into account self-consumption.

Table A.2

MOROCCO

POPULATION PROJECTIONS BY AGE GROUP (in thousands)

	1975		1985		1995	
Age Group	Male	Female	Male	Female	Male	Female
0-1	322	311	381	367	453	437
1-3	965	934	1142	1103	1360	1310
4-6	852	825	1042	1008	1268	1225
7-9	796	771	991	960	1221	1182
10-12	720	695	910	883	1094	1060
13-15	682	645	866	841	1054	1022
16-19	806	726	1039	1006	1300	1263
20-39	1926	2172	3280	3203	4826	4642
40-49	660	725	699	899	1082	1146
50-59	455	413	593	675	636	845
60-69	269	256	363	352	483	588
70+	194	185	196	206	265	292
Total	8647	8658	11502	11503	15043	15012
National Total	17305		23005		30054	
Population growth rate (per thousand)	28.8		28.2		27.4	

Source: Projections prepared by Population and Human Resources Division of Development Economics Department, World Bank.

Table A.3

MOROCCO

HUMAN ENERGY REQUIREMENTS IN CALORIES [1/]

Age Groups	Requirements [2/]	Adjustment according to weight & age	Population Distribution (%) [3/] 1971	1985	1995
Children					
0-1	1090	1090	3.66	3.25	2.96
1-3	1360	1360	10.97	9.76	8.88
4-6	1830	1830	9.69	8.91	8.30
7-9	2190	2190	9.06	8.48	8.00
Male Adolescents/Adults					
10-12	2600	2600	4.16	3.96	3.64
13-15	M x 0.97	2900	3.94	3.76	3.51
16-19	M x 1.02	3050	4.66	4.52	4.33
20-39	BWM x 46	M = 2990	11.13	14.26	16.06
40-49	M x 0.95	2841	3.81	3.04	3.60
50-59	M x 0.90	2691	2.63	2.58	2.12
60-69	M x 0.80	2392	1.55	1.58	1.61
70+	M x 0.70	2093	1.12	.85	.88
Female Adolescents/Adults					
10-12	2350	2350	4.02	3.84	3.53
13-15	F x 1.13	2531	3.72	3.66	3.40
16-19	F x 1.05	2352	4.20	4.37	4.20
20-39	BWF x 40	F=2240	12.55	13.92	15.44
40-49	F x 0.95	2128	4.19	3.91	3.81
50-59	F x 0.90	2016	2.39	2.93	2.81
60-69	F x 0.80	1792	1.48	1.53	1.96
70+	F x 0.70	1568	1.07	0.90	.97
Per capita caloric requirement			2225	2286	2307
+ 10% waste			225	227	231
Gross per capita requirement			2476	2513	2538

1/ Average body weight, male (BWM): 65 kg
Average body weight, female (BWF): 56 kg
Since the average infant body weights of Morocco are very close to those of Algeria, the adult average body weights of the Algeria are used for Morocco.

2/ Based on a report of the joint FAO/WHO Ad Hoc Expert Committee, World Health Organization, Technical Report Series, No. 522, 1973 WHO, Geneva.

3/ Population projections by age group are taken from projections prepared by Population and Human Resources Division of Development Economics Department, World Bank.

Source: P.B. Eveleth and J.M. Tanner, Worldwide Variation in Human Growth (London, Cambridge University Press, 1976) p. 173.

Table A.4

MOROCCO

VOLUME AND VALUE OF AGRICULTURAL PRODUCTS, 1961-75

	Average 1961-65	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975 (Premliminary)
	1,000 metric tons										
Wheat (durum & Bread)	1,336	1,149	1,268	2,778	1,594	1,801	2,188	2,161	1,574	1,853	1,575
Rice, Paddy	20	25	28	41	50	40	3	14	12	14	29
Corn	352	157	236	415	450	320	390	368	217	389	371
Barley	1,314	610	1,320	3,494	2,205	1,953	2,572	2,466	1,255	2,389	1,585
Oats	18	13	19	21	11	12	15	24	13	43	28
Sorghum	74	47	48	87	41	48	121	59	52	74	74
Other grains	22	14	17	24	10	48	26	17	13	15	16
Beans, dry	4	3	5	7	4	3	4	2	2	2	3
Broad beans	75	89	97	170	115	190	243	267	189	345	212
Lentils	15	9	15	18	20	20	16	20	11	27	34
Chick peas	42	68	66	118	73	137	32	34	79	164	61
Dry peas	34	30	32	47	41	60	50	62	37	124	98
Potatoes	193	275	205	160	300	275	275	280	280	275	275
Sugar beets	86	391	367	785	918	1,000	1,584	1,677	1,293	1,950	1,792
Tobacco	2	2	2	1	2	3	3	4	4	4	3
Cotton	6	8	5	6	6	6	8	8	9	6	5
Cottonseed	13	16	11	13	12	13	16	16	16	12	12
Flaxseed	6	3	3	5	7	3	3	5	1	3	2
Sunflower seed	6	5	9	4	8	21	12	25	18	14	25
Tomatoes	232	302	277	245	270	280	300	350	350	325	325
Oranges & Tangerines	528	676	775	720	819	753	821	838	925	820	580
Lemons	7	9	5	5	3	3	8	4	4	3	3
Grapefruits	13	17	15	13	8	5	15	8	10	17	16
Figs, fresh	76	59	65	65	60	60	65	65	65	65	65
Almonds (in shell)	18	20	24	14	13	13	12	19	13	17	10
Grapes	404	362	238	310	160	203	276	264	282	240	220
Dates	71	95	75	100	100	100	75	100	90	95	50
Olive oil	25	18	18	50	16	30	55	30	35	30	20
Meats	154	168	174	175	180	175	175	180	176	210	220
Milk	421	501	520	525	535	525	535	550	525	525	350
Wool, greasy basis	15										20
Gross Value of Production (Million Dh at 1961-65 constant prices).											
Crops	1,644.0	1,464.8	1,642.5	2,911.0	2,071.6	2,181.9	2,518.4	2,499.1	1,958.2	2,483.9	1,926.3
Livestock	602.6	670.0	692.7	692.2	722.6	703.8	702.8	738.3	723.6	798.0	733.2
Total Agriculture	2,246.6	2,134.8	2,335.2	3,603.2	2,794.2	2,885.7	3,221.2	3,237.4	2,681.8	3,281.9	2,659.5
Total food	2,173.8	2,059.9	2,270.0	3,542.0	2,712.7	2,808.3	3,143.3	3,137.7	2,573.0	3,187.3	2,559.4
Indices of Production (1961-65=100)											
Crops	100	89	100	177	126	133	153	152	119	151	117
Total agriculture	100	95	104	160	124	128	143	144	119	146	118
Total food	100	95	104	163	125	129	145	144	118	147	118
Per cap. agriculture	100	87	92	137	103	103	111	108	87	103	80
Per cap. food	100	87	92	140	104	104	113	108	86	103	80
Index of Population											
1961-65=12,375,000	100	109.5	113.0	116.7	120.5	124.5	128.6	133.0	137.4	142.1	146.6

Source: U.S. Department of Agriculture and Ministere de l'Agriculture et de la Reforme Agraire.

Table A.5
MOROCCO

AVERAGE YIELDS OF MAJOR CROP PRODUCTION (unit = Kg/ha)

Crop	1969	1970	1971	1972	1973	1974	1975
Wheat	819.5	951.6	1090.8	1081.3	771.8	966.6	931.2
Rice	5000	5000	2700	4483	3867	3224	4710
Barley	1069	1021	1272	1261	616	1196	861
Maize	967	627	861	764	487	870	754
Potatoes	10714	12500	10714	11300	11750	11500	10000
Sugar Cane						5000	14273
Broad beans	930	1049	1277	1030	678	1520	966
Sorghum	738	810	1452	896	973	1244	1282
Cereals NES	421	732	579	1071	1319	430	838
Dry peas	641	548	689	677	364	1135	717
Chicken peas	854	868	17.6	645	938	1036	618
Seed Cotton	1243	1119	1581	1719	1093	994	1299

Source: FAO Production Tape, 1961-75

Table A.6

MOROCCO

BALANCE OF PAYMENTS (in millions of current US$)

	1972	1975	1976
Imports			
Food stuffs	136	640	447
Petroleum	56	277	295
Intermediate	307	757	793
Capital goods	154	615	779
Consumer Goods	124	286	308
Non factor services	199	422	898
Total	977	2997	3520
Exports			
Phosphate rock	146	846	496
Agricultural products	357	433	471
Other minerals	44	63	666
Manufacturers	93	187	214
Non-factor services	302	490	471
Total	943	2019	1717
Resource balance	-34	-977	-1803
Current account balance	47	-546	-1358
Public M+LT loans (net disbursement)	32	404	774

Source: Country Economic Memorandum on Morocco, 1977

Table A.7

MOROCCO

ALTERNATIVE PROJECTIONS OF PER CAPITA CALORIE CONSUMPTION WITH 10% DECREASE IN GINI COEFFICIENT AND PER CAPITA INCOME GROWTH RATE OF 3.9%

Per Capita Annual Expenditure		Per Capita Daily Calorie Consumption		Per Capita Calorie Deficit		National Nutrition Gap (in million calories)	
1985	1995	1985	1995	1985	1995	1985	1995
489	716	2071	2584	441	---	967	---
635	931	2423	2935	90	---	167	---
768	1125	2676	3188	---	---	---	---
900	1319	2889	3401	---	---	---	---
1033	1515	3074	3587	---	---	---	---
1189	1744	3263	3775	---	---	---	---
1382	2026	3463	3976	---	---	---	---
1552	2275	3619	4131	---	---	---	---
1694	2483	3736	4248	---	---	---	---
1875	2748	3872	4384	---	---	---	---
2123	3113	4039	4551	---	---	---	---
2489	3650	4251	4764	---	---	---	---
2966	4348	4486	4998	---	---	---	---
3755	5505	4802	5314	---	---	---	---
Total						1134	0

Source: Our projections.

Note: ; 1) 1134 million calories are equivalent to 118,241 metric tons of cereals.

2) The target population are 17.5% in 1985 and 3.7% in 1995

Table A.8

MOROCCO

ALTERNATIVE PROJECTIONS OF PER CAPITA CALORIE CONSUMPTION WITH PER CAPITA INCOME GROWTH RATE OF 3.9% AND 50% PRICE INCREASE

Average P.C. Expenditure (DH)	Per Capita Daily Calorie Consumption		Per Capita daily Calorie Deficit		Target Population (in thousands)		National nutrition gap (in millions) calories)	
1971	1985	1995	1985	1995	1985	1995	1985	1995
262	1836	2364	677	174	2190	2608	1482	453
347	2224	2753	289	----	2190	----	633	----
425	2504	3034	9	----	1161	----	10	----
504	2741	3270	----	----	----	----	----	----
585	2946	3475	----	----	----	----	----	----
680	3154	3682	----	----	----	----	----	----
798	3376	3903	----	----	----	----	----	----
904	3548	4074	----	----	----	----	----	----
993	3677	4203	----	----	----	----	----	----
1107	3827	4352	----	----	----	----	----	----
1265	4010	4534	----	----	----	----	----	----
1500	4244	4767	----	----	----	----	----	----
1809	4500	5023	----	----	----	----	----	----
2330	4846	5367	----	----	----	----	----	----
Total					5541	2608	2125	453
Annual Cereal Equivalents (metric tons)							221,617	47,227

Source: Our projections

Note: Target population: 24% in 1985, 9% in 1995

Table A.9

MOROCCO

ALTERNATIVE PROJECTIONS OF PER CAPITA CALORIE CONSUMPTION WITH

PER CAPITA INCOME GROWTH RATE OF 3.9% AND 50% PRICE DECREASE

Average p.c. Expenditure (DH)	Per Capita Daily Calorie Consumption		Per Capita Calorie Deficit		Target Population (in thousands)		National Nutrition Gap (in million calories)	
1971	1985	1995	1985	1995	1985	1995	1985	1995
262	2155	2641	358	---	2190	745	784	125
347	2512	2995	0.6	---	1151	---	---	---
425	2768	3251	---	---	---	---	---	---
504	2983	3466	---	---	---	---	---	---
585	3170	3654	---	---	---	---	---	---
680	3360	3845	---	---	---	---	---	---
798	3563	4050	---	---	---	---	---	---
904	3721	4209	---	---	---	---	---	---
993	3841	4330	---	---	---	---	---	---
1107	3979	4470	---	---	---	---	---	---
1265	4150	4642	---	---	---	---	---	---
1500	4388	4862	---	---	---	---	---	---
1809	4610	5106	---	---	---	---	---	---
2330	4937	5435	---	---	---	---	---	---
Total							784	125
Annual Cereal Equivalents (metric tons)					3341	745	81,788	13,075

Source: Our projections

Note: Target population: 22% in 1985, 7% in 1995

Table A.10

MOROCCO

ALTERNATIVE PROJECTIONS OF PER CAPITA CALORIE CONSUMPTION WITH PER CAPITA INCOME GROWTH RATE OF 2%

Average p.c. Expenditure (DH)	Per Capita Daily Calorie Consumption		Per Capita Calorie Deficit		Target Population (in thousands)		National Nutrition Gap (in million calories)	
1971	1985	1995	1985	1995	1985	1995	1985	1995
262	1608	1873	905	665	2190	2861	1982	1902
347	1984	2249	529	289	2190	2861	1158	825
425	2256	2521	257	17	2190	1620	563	28
504	2484	2749	29	--	1387	--	40	--
585	2682	2948	--	--		--	--	--
680	2884	3149	--	--	--	--	--	--
798	3099	3365	--	--	--	--	--	--
904	3266	3531	--	--	--	--	--	--
993	3391	3657	--	--	--	--	--	--
1107	3537	3802	--	--	--	--	--	--
1265	3716	3981	--	--	--	--	--	--
1500	3944	4209	--	--	--	--	--	--
1809	4195	4460	--	--	--	--	--	--
2330	4534	4799	--	--	--	--	--	--
					7957	7342	3743	2755
Total Annual Cereal Equivalents (metric tons)							390,326	287,294

Source: Our Projections

Note: Target populations: 34.6% in 1985, 24.4% in 1995

Table A. 11

MOROCCO

ALTERNATIVE PROJECTIONS OF PER CAPITA CALORIE CONSUMPTION

WITH PER CAPITA INCOME GROWTH RATE OF 2% AND

10% DECREASE IN GINI COEFFICIENT

erage p.c. penditure (DH)	Per Capita Daily Calorie Consumption		Per Capita Calorie Deficit		Target Population (in thousands)		National Nutrition Gap (in Million calories)	
1971	1985	1995	1985	1995	1985	1995	1985	1995
262	1728	1993	785	545	2190	2861	1720	1559
347	2078	2344	434	194	2190	2861	952	556
425	2332	2597	181	---	2190	718	397	140
504	2544	2809	---	---	748	---	136	---
585	2729	2994	---	---	---	---	---	---
680	2917	3182	---	---	---	---	---	---
798	3118	3383	---	---	---	---	---	---
904	3273	3538	---	---	---	---	---	---
993	3390	3655	---	---	---	---	---	---
1107	3526	3791	---	---	---	---	---	---
1265	3692	3957	---	---	---	---	---	---
1500	3905	4170	---	---	---	---	---	---
1809	4139	4404	---	---	---	---	---	---
2330	4454	4720	---	---	---	---	---	---
otal					7318	6440	3205	2255
nnual Cereal Equivalents (metric tons)							334,213	235,138

ource: Our Projections

ote: Target population: 32% in 1985, 21% in 1995

Table A.12

ALTERNATIVE PROJECTIONS OF PER CAPITA CALORIE CONSUMPTION

WITH PER CAPITA INCOME GROWTH RATE OF 2%

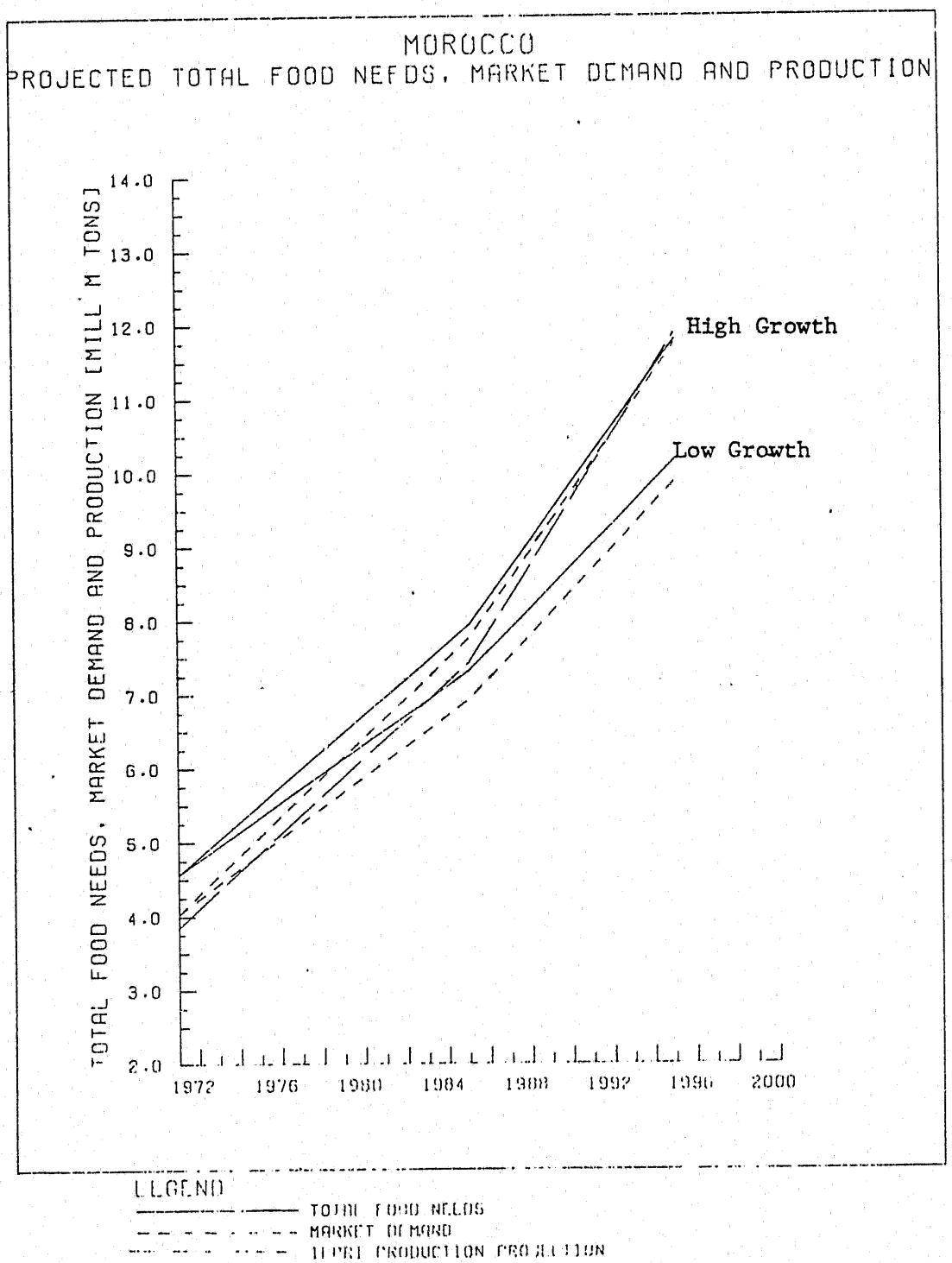
10% DECREASE IN GINI COEFFICIENT AND 25% PRICE DECREASE

Average p.c. Expenditure (DH)	Per Capita Daily Calorie Consumption		Per Capita Calorie Deficit		Target Population (in thousands)		National Nutrition Gap (in million calories)	
1971	1985	1995	1985	1995	1985	1995	1985	1995
262	1815	2076	698	462	2190	2861	1529	1323
347	2160	2419	353	119	2190	2767	774	341
425	2407	2666	106	---	2186	---	232	12
504	2615	2873	---	---	---	---	---	---
585	2795	3054	---	---	---	---	---	---
680	2979	3237	---	---	---	---	---	---
798	3174	3433	---	---	---	---	---	---
904	3326	3585	---	---	---	---	---	---
993	3440	3700	---	---	---	---	---	---
1207	3573	3832	---	---	---	---	---	---
1265	3736	3996	---	---	---	---	---	---
1500	3944	4205	---	---	---	---	---	---
1809	4174	4435	---	---	---	---	---	---
2330	4484	4746	---	---	---	---	---	---
Total					6566	5628	2535	1652
Annual Cereal Equivalents (metric tons)							264,374	172,275

Source: Our Projections

Note: Target Population: 29% in 1985, 19% in 1995

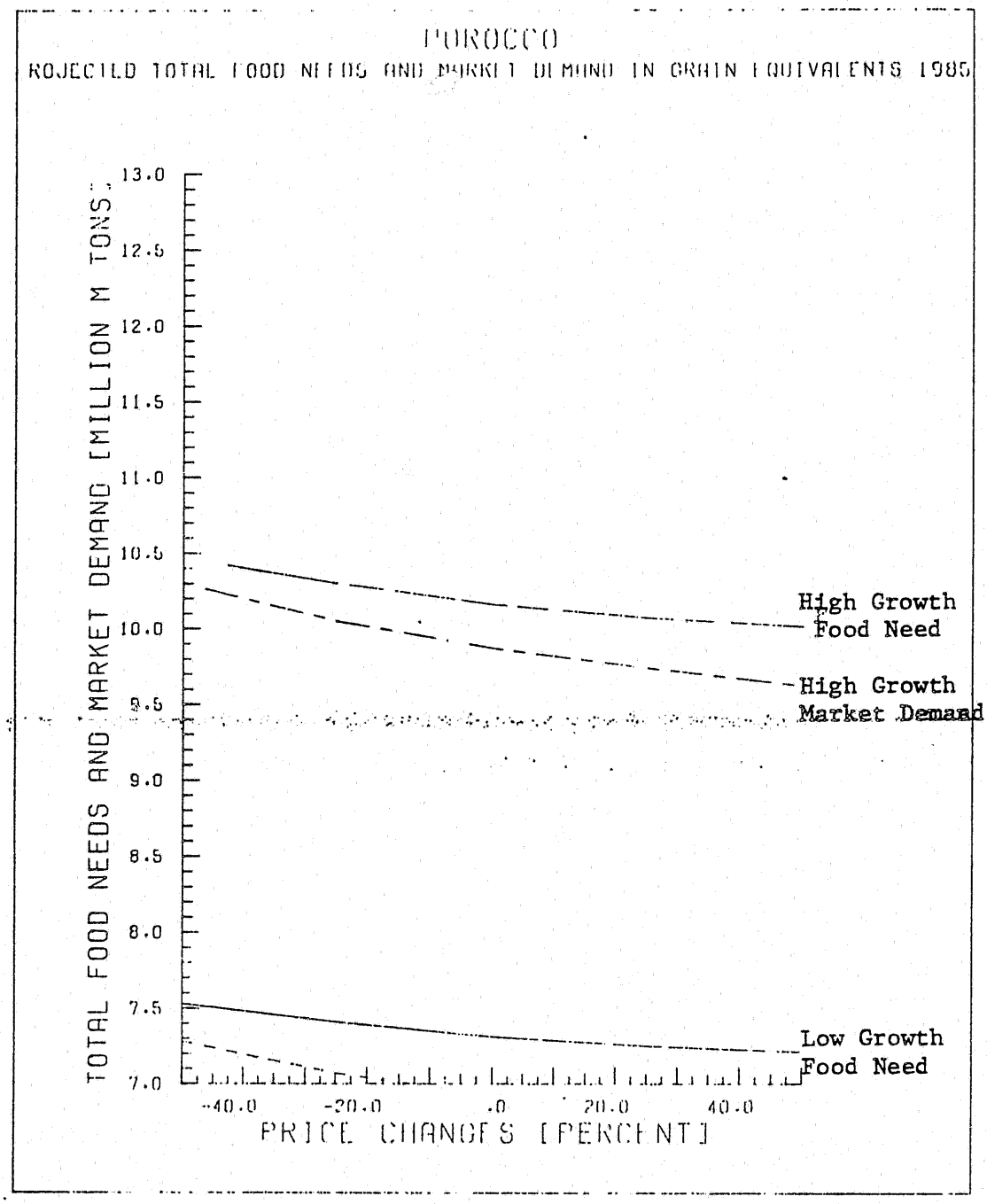
Figure 1



Assumed Annual Growth Rate of Per Capita Income

High = 3.9% Low = 2%

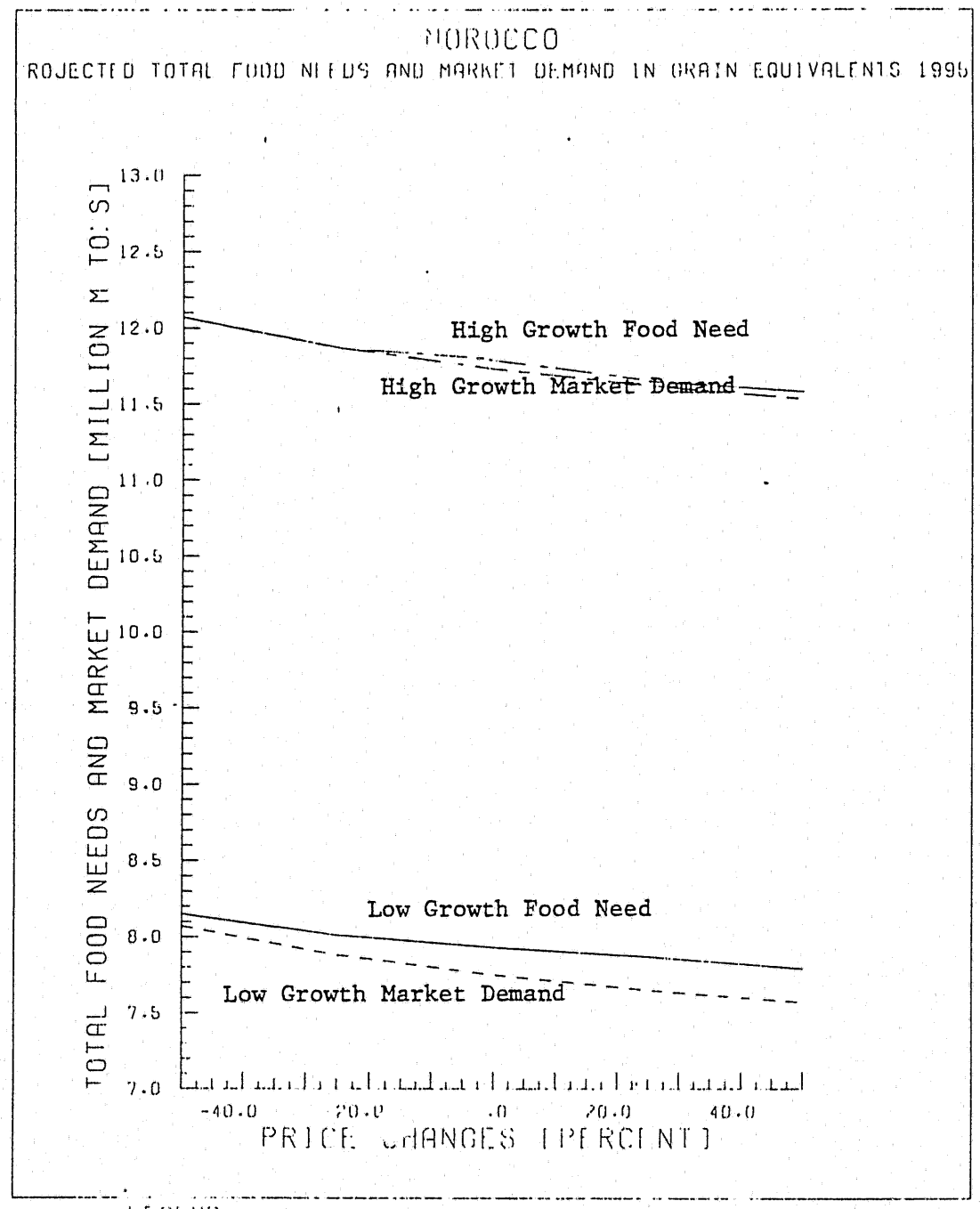
Figure 2



Assumed Annual Growth Rate of Per Capita Income

High = 3.9% Low = 2%

Food 3



LEGEND

---- —— TOTAL FOOD NEEDS WITH LOW GROWTH RATE

- - - - — — MARKET DEMAND WITH LOW GROWTH RATE

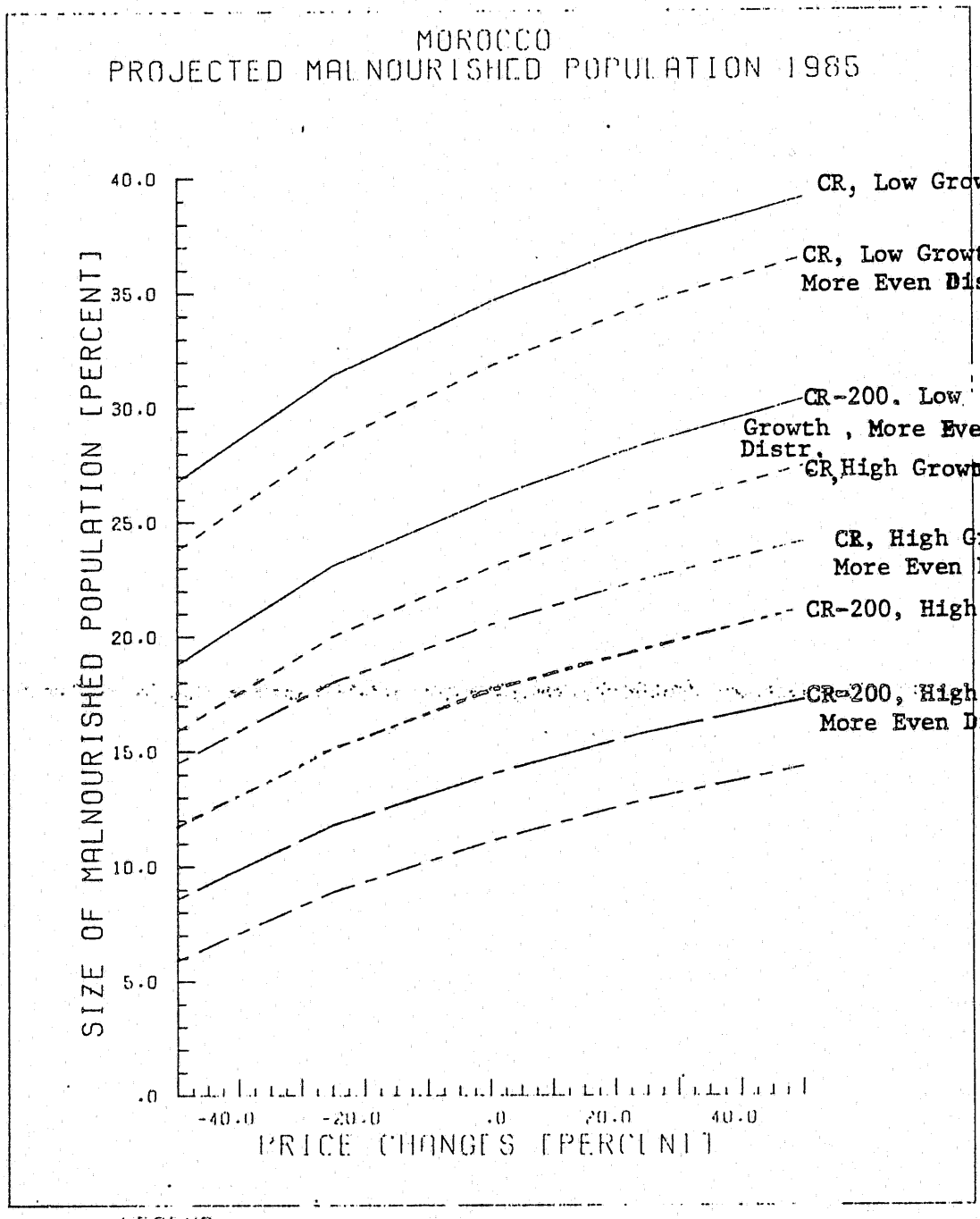
— - — - —— TOTAL FOOD NEEDS WITH HIGH GROWTH RATE

- - - - — — MARKET DEMAND WITH HIGH GROWTH RATE

Assumed Annual Growth Rate of Per Capita Income

High= 3.9% Low = 2%

Figure 4



CR: at minimum calorie requirement level
CR-200: at 200 calories less than CR level

High Growth: 3.9% Low Growth: 2%

Figure 5

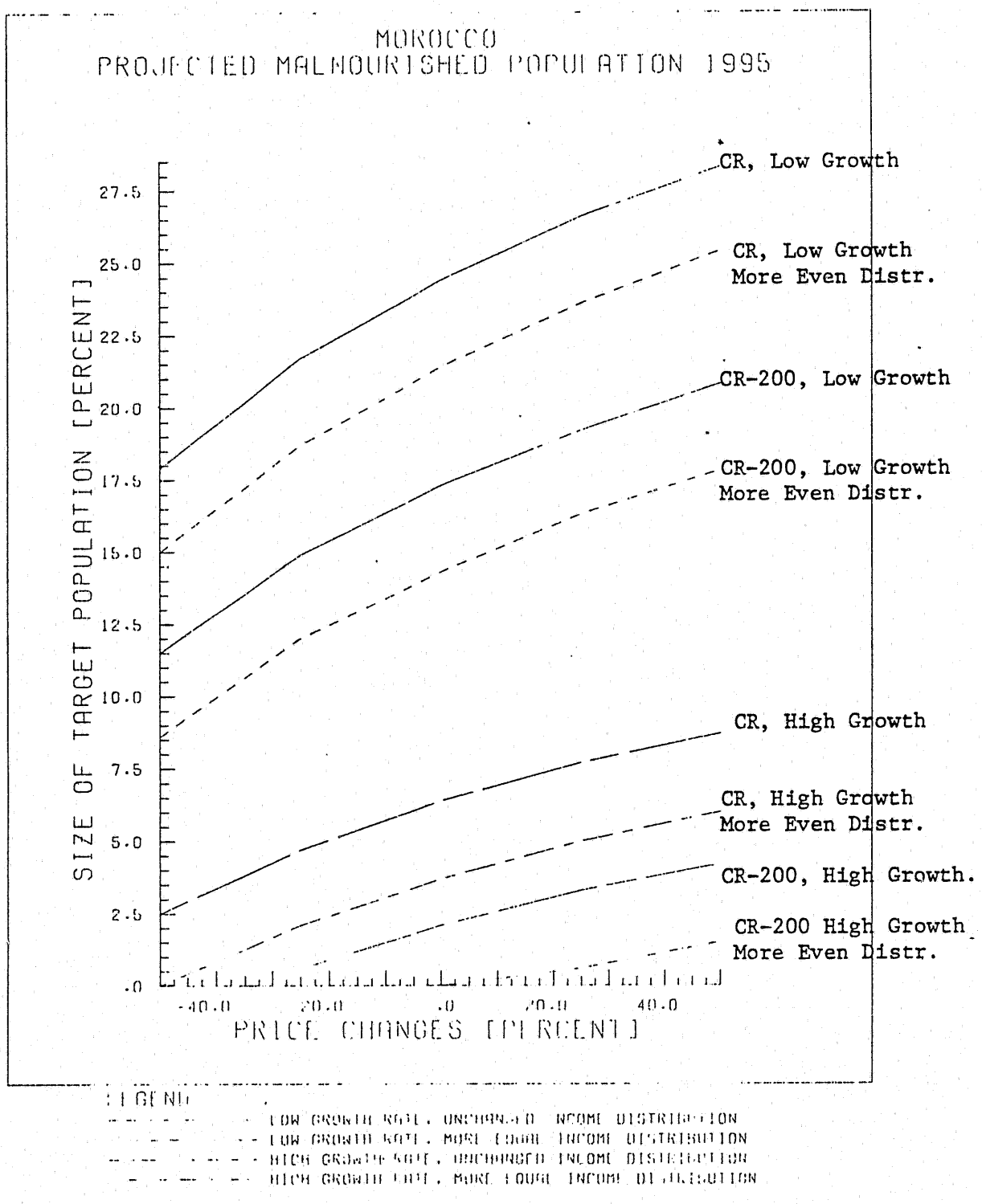
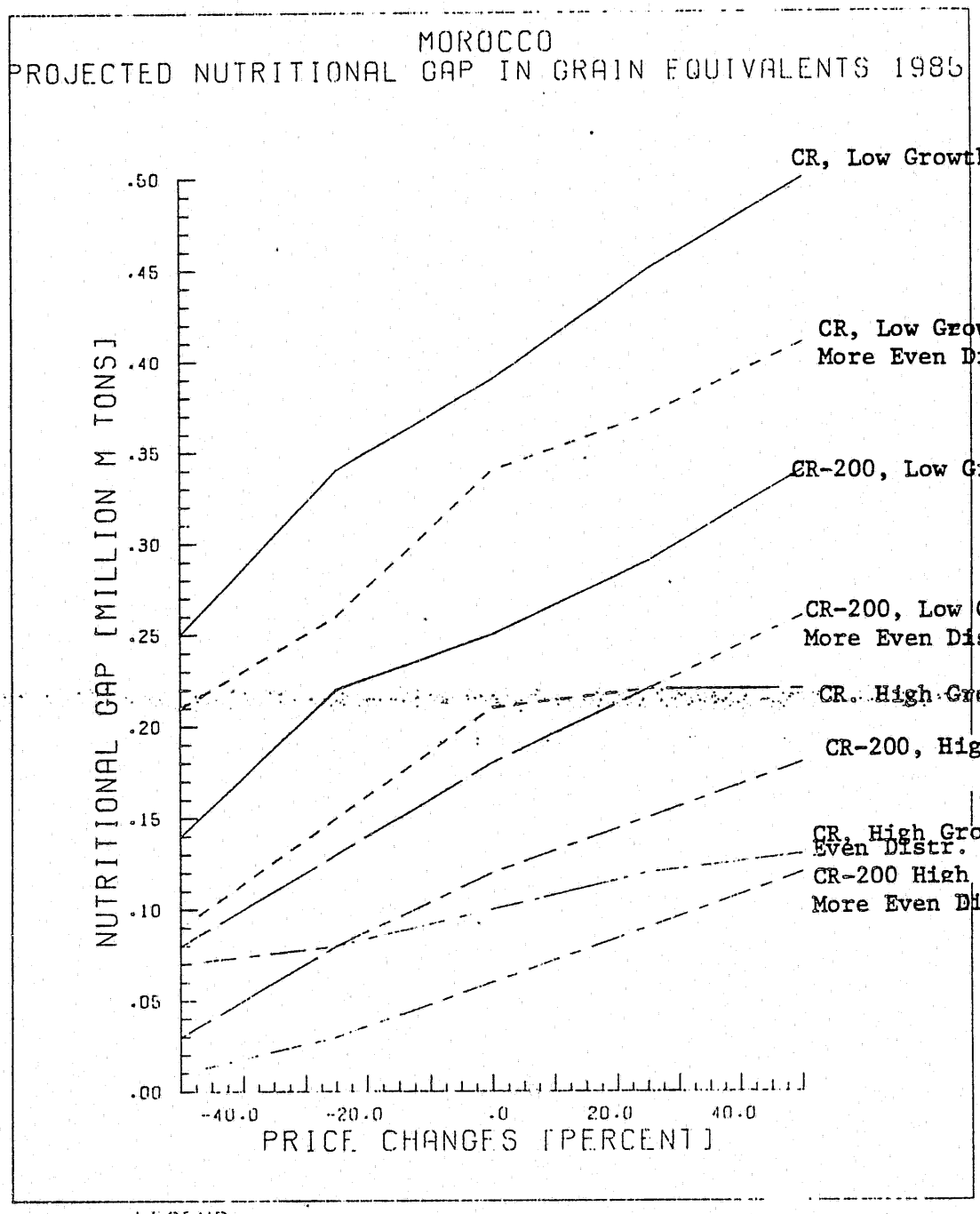

MOROCCO
PROJECTED MALNOURISHED POPULATION 1995
SIZE OF TARGET POPULATION [PERCENT]
27.5
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
.0
-40.0
-20.0
.0
20.0
40.0
PRICE CHANGES [PERCENT]
CR, Low Growth
CR, Low Growth More Even Distr.
CR-200, Low Growth
CR-200, Low Growth More Even Distr.
CR, High Growth
CR, High Growth More Even Distr.
CR-200, High Growth.
CR-200 High Growth More Even Distr.
LEGEND
LOW GROWTH RATE, UNCHANGED INCOME DISTRIBUTION
LOW GROWTH RATE, MORE EQUAL INCOME DISTRIBUTION
HIGH GROWTH RATE, UNCHANGED INCOME DISTRIBUTION
HIGH GROWTH RATE, MORE EQUAL INCOME DISTRIBUTION

Figure 6



CR =at minimum calorie requirement level
CR-200 =at 200 calories less than CR level
High Growth = 3.9% Low Growth = 2%

Figure 7

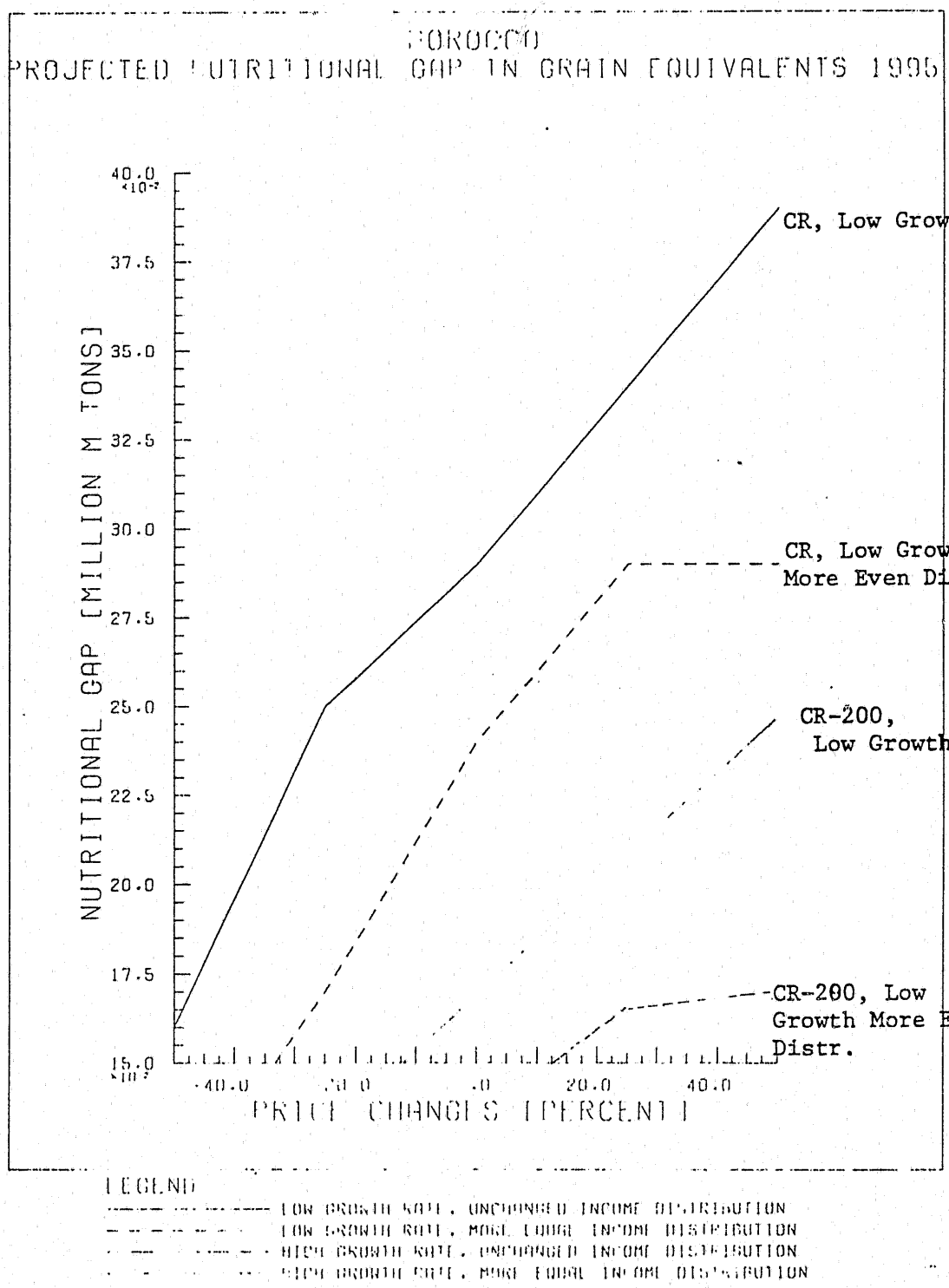
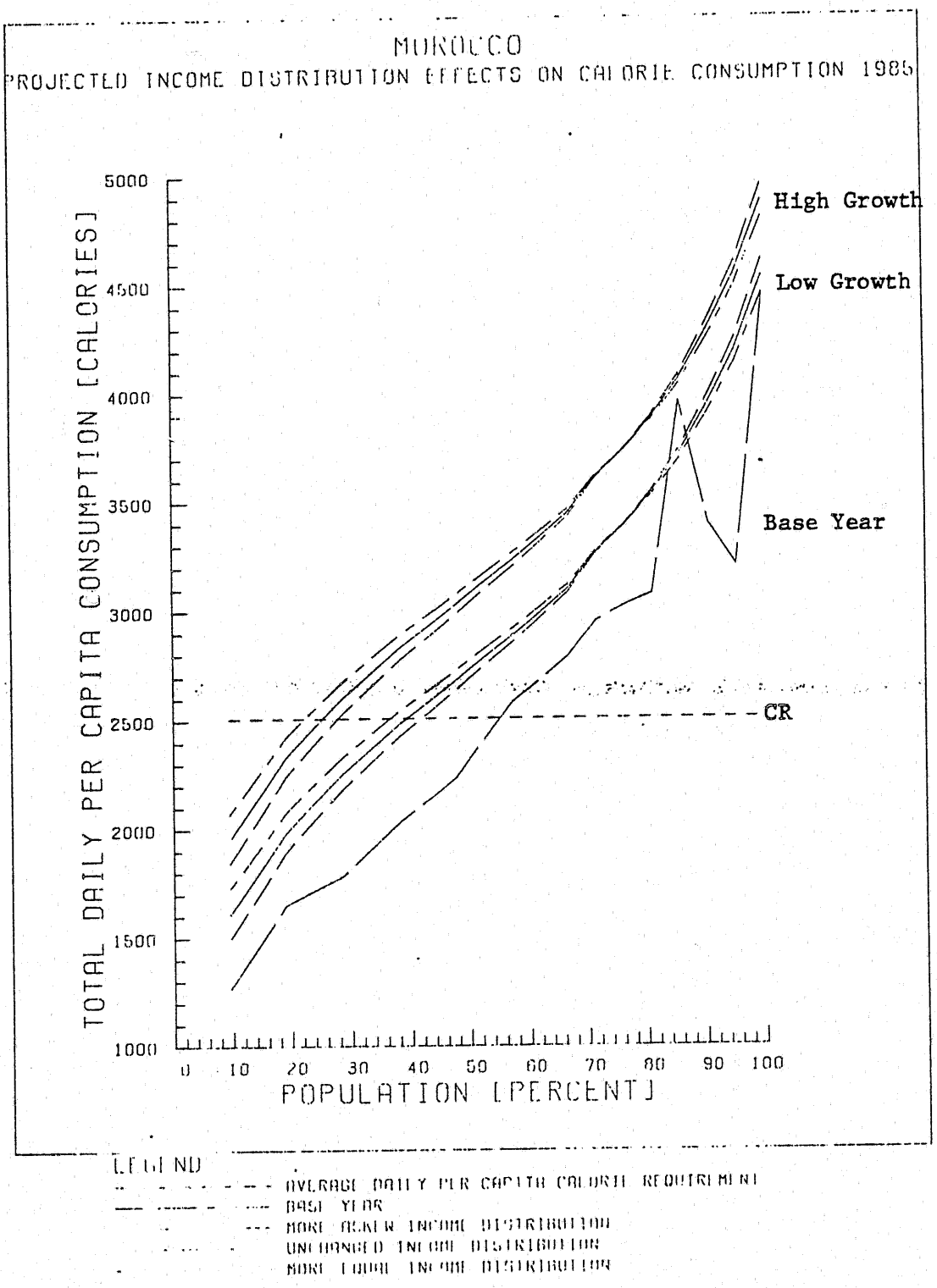

MOROCCO
PROJECTED NUTRITIONAL GAP IN GRAIN EQUIVALENTS 1995
NUTRITIONAL GAP (MILLION M TONS)
40.0
37.5
35.0
32.5
30.0
27.5
25.0
22.5
20.0
17.5
15.0
-40.0
-20.0
.0
20.0
40.0
PRICE CHANGES (PERCENT)
CR, Low Growth
CR, Low Growth More Even Distr.
CR-200, Low Growth
CR-200, Low Growth More Even Distr.
LEGEND
LOW GROWTH RATE, UNCHANGED INCOME DISTRIBUTION
LOW GROWTH RATE, MORE EQUAL INCOME DISTRIBUTION
HIGH GROWTH RATE, UNCHANGED INCOME DISTRIBUTION
HIGH GROWTH RATE, MORE EQUAL INCOME DISTRIBUTION

Figure 8



High Growth= 3.9% Low Growth = 2%

Figure 9

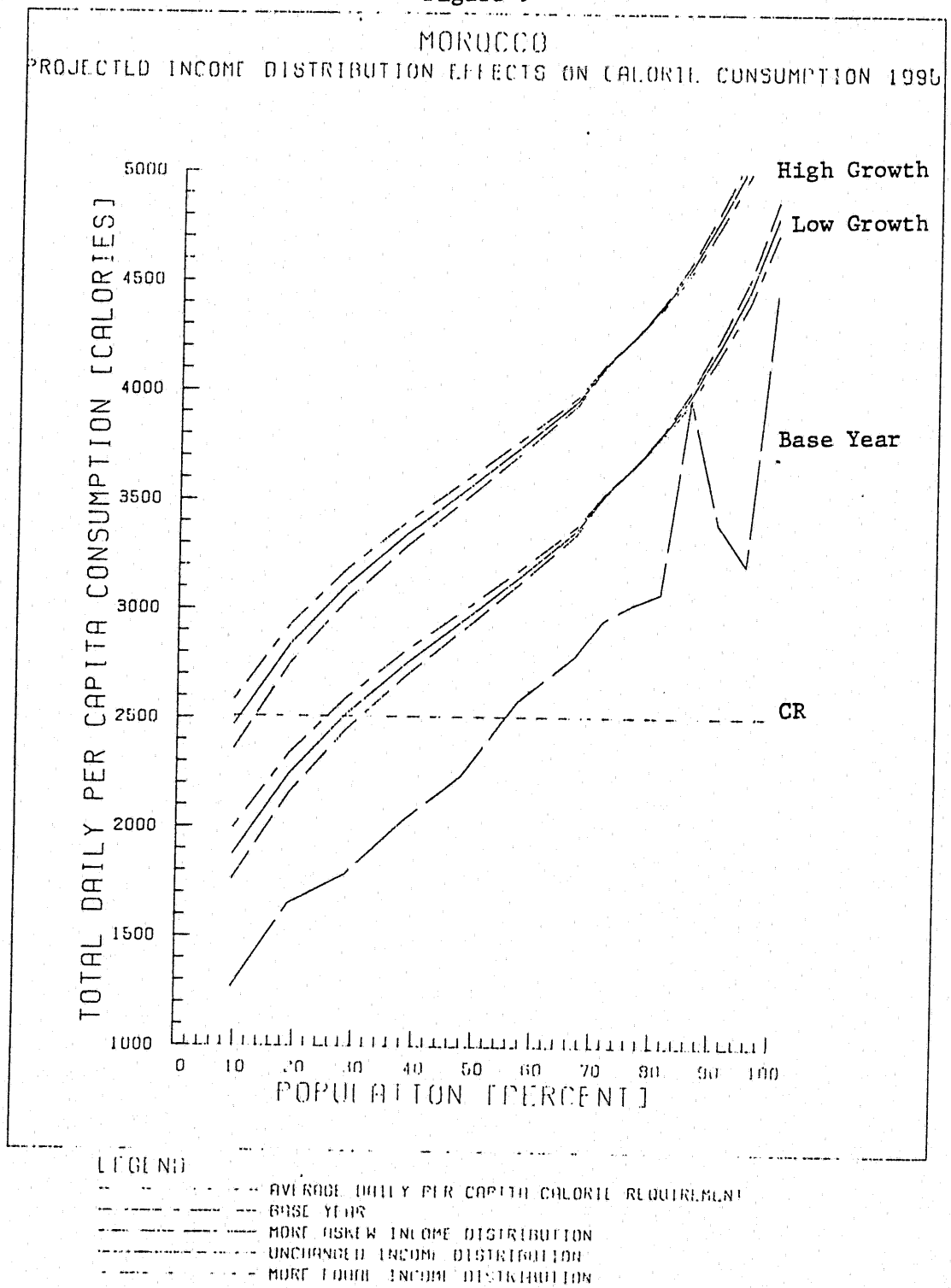
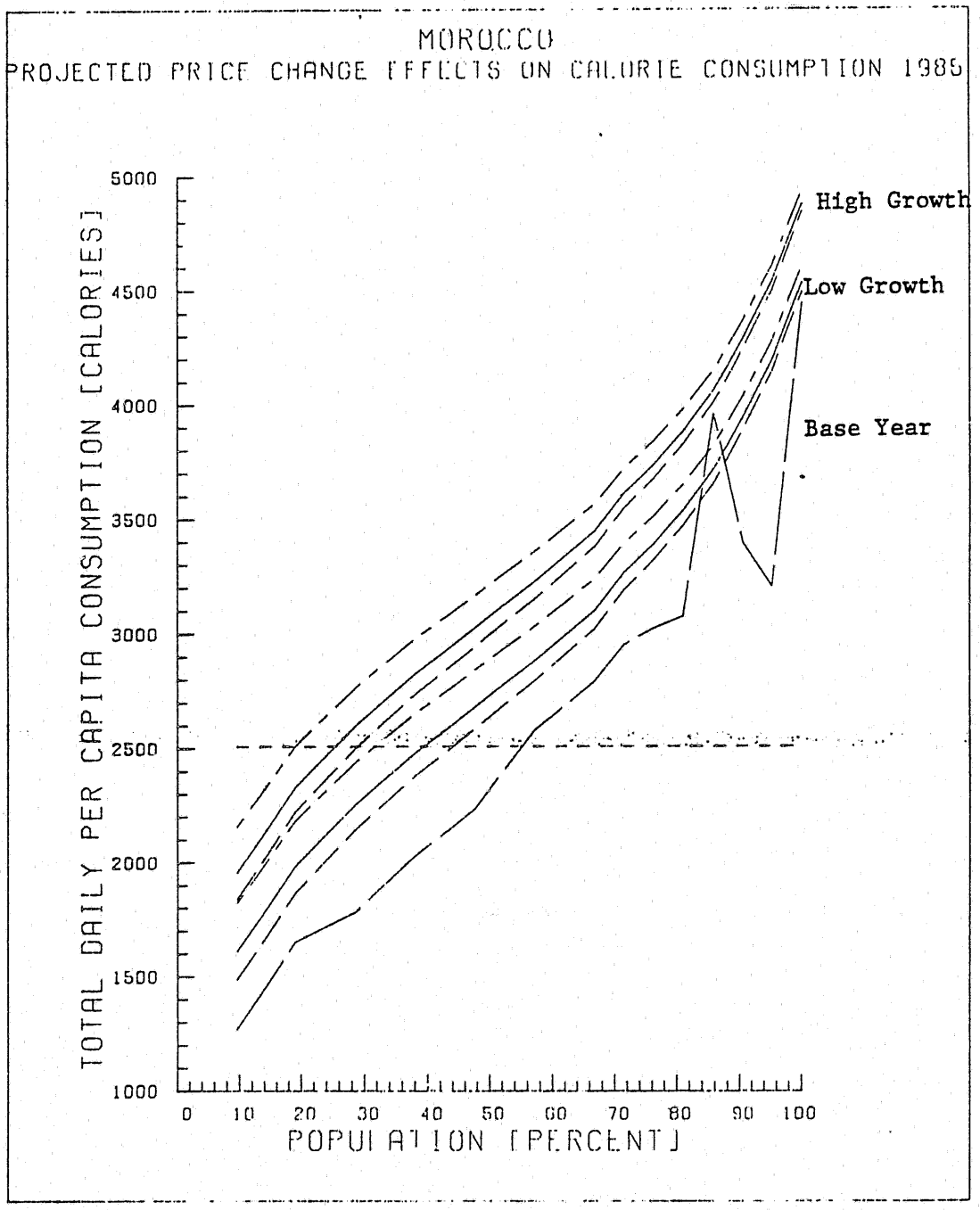
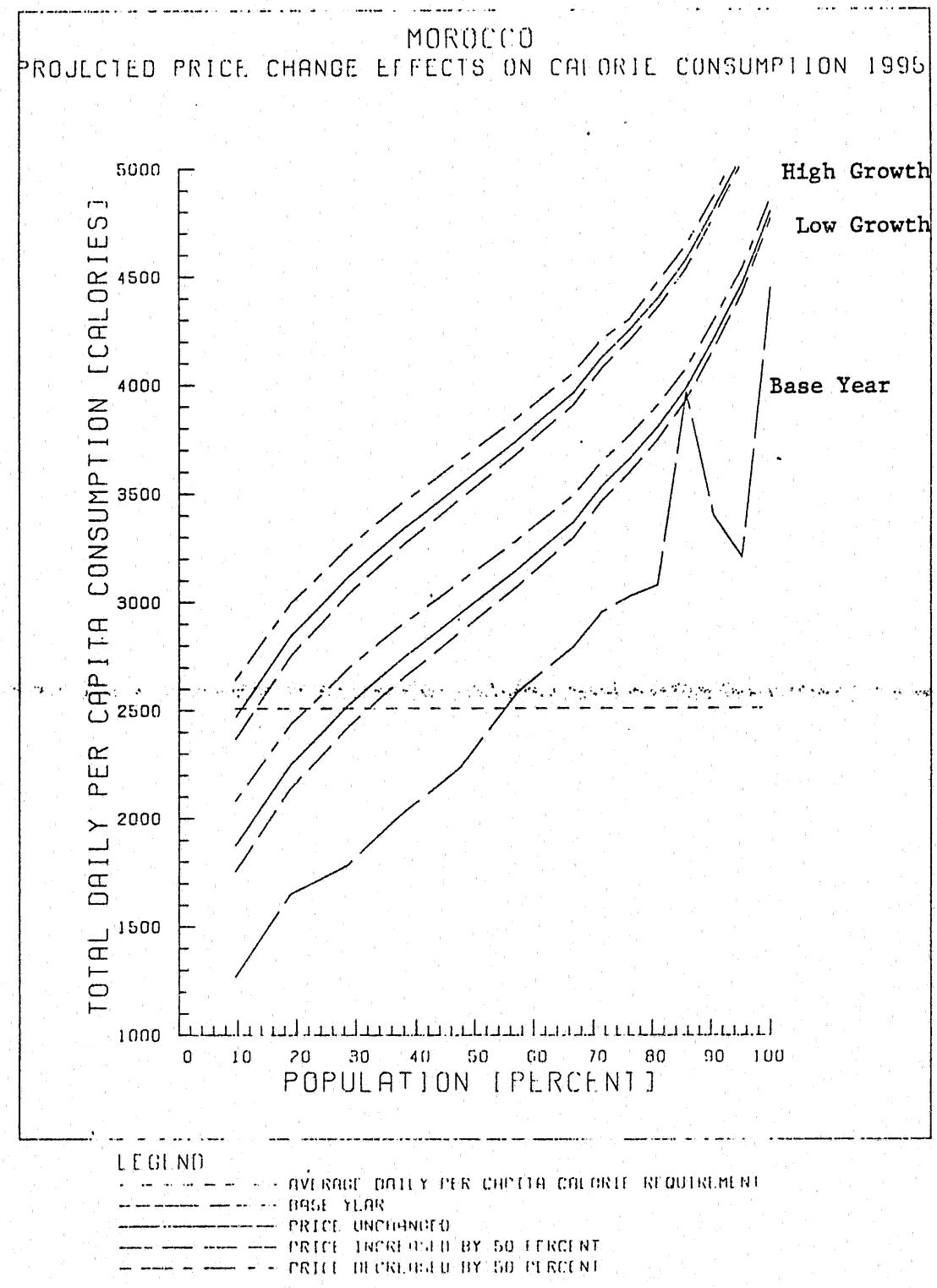

MOROCCO
PROJECTED INCOME DISTRIBUTION EFFECTS ON CALORIE CONSUMPTION 1990
TOTAL DAILY PER CAPITA CONSUMPTION (CALORIES)
5000
4500
4000
3500
3000
2500
2000
1500
1000
0
10
20
30
40
50
60
70
80
90
100
POPULATION (PERCENT)
High Growth
Low Growth
Base Year
CR
LEGEND
AVERAGE DAILY PER CAPITA CALORIE REQUIREMENT
BASE YEAR
MORE SKEW INCOME DISTRIBUTION
UNCHANGED INCOME DISTRIBUTION
MORE EQUAL INCOME DISTRIBUTION

Figure 10



High Growth = 3.9% Low Growth= 2%

Figure 11


MOROCCO
PROJECTED PRICE CHANGE EFFECTS ON CALORIE CONSUMPTION 1995
TOTAL DAILY PER CAPITA CONSUMPTION [CALORIES]
5000
4500
4000
3500
3000
2500
2000
1500
1000
0
10
20
30
40
50
60
70
80
90
100
POPULATION [PERCENT]
High Growth
Low Growth
Base Year
LEGEND
AVERAGE DAILY PER CAPITA CALORIE REQUIREMENT
BASE YEAR
PRICE UNCHANGED
PRICE INCREASED BY 50 PERCENT
PRICE DECREASED BY 50 PERCENT