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By
Ibrahim Soliman, University of Zagazig, Egypt
Shahla Shapouri, Dept. of Agriculture, Washington D.C.

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Ibrahim Soliman, University of Zagazig, Egypt
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ABSTRACT

Energy and protein consumptions were compared and it was found while Egypt provides adequate diet on the average, there are inequalities in the distribution among different income classes and regions. Imports of wheat as a major component of Egyptian diet increased sharply in recent years, while its price is heavily subsidized. The analysis showed that removing the price subsidy on wheat implies a large nutritional sacrifice for the poor, especially in rural areas. The study examines alternative policies improving nutritional status and reducing Government subsidy costs.

Keywords: Egypt, energy requirement, protein requirement, calorie consumption, protein consumption, wheat consumption, income elasticities, price elasticities, food policy.

Introduction

In long-term planning for food self-sufficiency, food production targets are generally based on projections of national demand. Average national figures for many developing countries show little or no information about nutritional deficiencies. In contrast, the disaggregated consumption figures provide a different picture of nutritional situations and the needs of the population, especially the vulnerable groups. Increasing food availability does not automatically result in nutritional improvement for all income groups. Low-income consumers may spend a large part and in some cases all, of their incomes on food, yet be unable to afford a nutritionally adequate diet (18). Hence, a policy aimed at reducing the food gap would require more than in increase in agricultural production. Framing and evaluating such policies require analysis of food availability among different socio-economic groups. A public policy aimed at self-sufficiency which does not consider the nutritional improvement of the society could be costly in the long run and may have inappropriate implications for planning.

In Egypt, the government intervention in the food economy is extensive and complex. Major food items such as cereals, beans, cooking oil, sugar, and to some extent meat are subsidized (1). The government goal in subsidy policy is to provide low cost of living, low wage rates, and social equity for the population. However, in recent years high income growth, high population growth and an increase in migration to

urban areas put heavy pressure on the demand for food. Domestic food production remained fairly stable. The high demand growth relative to production increased the reliance on food imports. Deterioration of the food situation was such that Egypt started to import about 50 percent of its food requirements (1). Increases in quantities of imports plus increases in international prices were the cause of serious economic difficulties. Even though food aid contributed as an important source of financing food imports, still agricultural trade deficit increased from 113 to 3,680 million dollar from 1974 to 1981. Now, due to the high food dependency on international markets, the issue of food security is the center of government concern. In addition, the increased share of food subsidy costs in the government budget is forcing the government to look for alternative policies.

Over all, it is easier to measure the government subsidy costs than social welfare and nutritional improvement resulting from the food subsidy policy. The objective of this paper is to examine the success of the food subsidy policy in terms of eliminating malnutrition, evaluating the impact of changes in current policy on nutrition, and discussing alternative policies which might improve nutritional status and at the same time reduce government costs.

The first section is a discussion of the current dietary adequacy, including comparison of calorie and protein intakes with nutritional standards. In the second part, we made estimates of the potential impact of income growth on the nutritional level of different income classes in rural and urban areas. The third section is an evaluation of the

nutritional impact of alternative wheat policies. We estimated wheat income and price elasticities of demand and we analyzed the impact of free market prices on the nutritional level of different income classes. The final section includes conclusions and recommendations of alternative food policies.

Estimation of Energy and Protein Requirements

The energy requirement of an individual depends on several interrelated variables, such as physical activities, body size, sex, and environment. The daily energy requirement per person by sex and age group of moderate activity is adopted from FAO/WHO estimates (table 1).

In terms of protein requirement there are two different set of statements. One is the belief that protein is not a problem if people receive enough calories. This belef is the major reason for heavy concentration of research to increase cereal production and government subsidies of cereal consumption (12). However, through the 1960's it was emphasized by the international and bilateral agencies that while an increase in cereal production might ensure adequate dietary calories, there is a parallel need to ensure production of food providing more protein relative to calories (13). The range in protein requirements based on age and sex is very broad, and it is the young children and pregnant and nursing women who are vulnerable, and their protein needs are greater. Unfortunately, in most developing countries the intra

Table 1--Energy requirements per-caput per-day in calories of moderately active person by age and sex group

Age Group	Males		Females	
	Average body weight	Energy	Average body weight	Energy
	kg.	calories	kg.	calories
Less than one year	7.3	820	7.3	820
1-4	14.5	1,455	14.4	1,430
5-9	25.9	2,132	25.1	2,004
10-19	51.6	2,877	48.1	2,473
20-39	65.0	3,000	65.0	2,200
40-59	65.0	2,775	65.0	2,135
60 years and above	65.0	2,250	65.0	1,650

Source: Adapted From Food and Agricultural Organization and World Health Organization:
Energy and Protein Requirements, WHO CHRONICAL vol. 27 : 481-486, 1973.

family distribution is such that children and women receive lowest priority in the distribution of available food (4).

In our study we estimated protein requirements, using energy requirements as a basis. The percent of total protein that should come from calories is referred to as the protein/energy ratio (P:E ratio). The P:E ratio is used to determine the adequacy of dietary protein. The recommended FAO/WHO, 1973, "safe allowance" for protein is about 7 percent of calories as eggs or milk (14). However, there is strong evidence that this recommended protein level is too low for long-term maintenance of a normal adult.

Acute infections are quite frequent among under-privileged populations, particularly young children. The net result of the multiple effects of infections is the need for a margin above the normal protein requirement to allow for a rapid repletion before the next acute episode worsens the degree of depletion. Therefore, 30 percent higher protein requirement above the "safe allowance" was suggested by Scrimshaw (19). Further adjustment of the protein requirement to about 11 to 12 percent is also recommended for a good quality diet and a predominantly vegetable protein diet, as is the case of many developing countries (17). In this study, a P:E ratio of 8 percent was adopted as a basis to estimate protein requirement for each class of the population.

Estimation of Energy and Protein Dietary Intake

The quantity consumed of each food item recorded in a published family budget survey in 1974/75 was used to calculate the per capita daily calorie intake. The survery was conducted by the Central Agency for Public Mobilization and Statistics (CAPMAS). The survey included 66,000 households from urban and rural areas of Egypt at a ratio of 2 to 1 respectively. To capture the seasonal variations in consumption, the survey was conducted through four visits over one year and the results are summarized based on 16 different income groups.

To estimate calorie intake, daily per capita energy consumptions are derived based on calorie content of each food item (table 2). For those food items such as some fruits, vegetables, and dairy products where the quantities consumed are not explicitly recorded, their monetary expenditures are divided by their corresponding average prices from survey data to impute consumption quantities.

To estimate the calorie consumption requirements, consumption unit based on adult male equivalents are computed using weighting factors presented in table 1. The results of the survey indicate that variations of household scale per capita among different income classes are very low. The average consumer unit in the urban area is .7931 (±. 945 SD) and .7725 (± .0035 SD) in the rural area. These statistics indicate almost indentical nutritional scale within each group and among the two

Table 2—Nutrient contents of major food items in Egypt

Food Item	Calories	Protein	Biological value (B.V.)	Food Items	Calories	Protein	Biological Value (B.V.)
	KCal/gram	Percent	Percent		KCal/gram	Percent	Percent
Wheat	3.50	11.7	60	Artificial ghee	8.84	0.00	0
Maize	3.60	9.3	60	Liquid milk	0.87	3.39	85
Millet	3.43	10.1	60	Full cream white	2.02	20.0	73
Wheat flour	3.70	0.0	52	Fatless cheese	1.01	19.2	73
Bread	3.66	11.13	60	Butter	7.33	0.6	73
Milled rice	3.60	6.7	60	Ghee	9.4	0.0	0
Macaroni	3.62	0.5	52	Potato	0.82	2.0	67
Broad beans	3.45	22.2	60	Onion	0.4	1.4	55
Lentils	3.45	22.2	60	Tomato	0.27	1.8	55
Red Meat	2.07	18.8	67	Oranges	0.47	0.9	55
Poultry	1.29	12.6	70	Date	1.13	2.4	55
Fish	0.62	8.8	70	Sugar	3.87	0.00	0
Eggs	1.63	12.4	94	Honey	2.9	0.00	0
Vegetal Oils	8.84	0	0	Halava tahini	4.81	9.05	78

Source: Collected From

(1) Ministry of Agricultural - Under Secetary for Agricultural Economics: Food Balance sheet of Egypt, 1979, Cairo (in Arabic).

(2) Nutrition Institute of Egypt: Food Nutritive Values Tables, Cairo, 1977 (in Arabic).

regions. The calorie consumption requirements in table 5 and 6 are calculated based on adult equivalent units in each income class.

The protein intake is calculated as gross protein (GP) in grams which is based on the available information in table 2. Net protein utilized intake (NPU) is derived from GP by using the biological value (B.V.) of each food item consumed by the household.

Dietary Caloric Availability and Adequacy

The results of the survey indicate that grains are the main source of food energy in Egypt (table 3). Wheat as a basic food item provides 58 percent of the total caloric consumption per day (table 4). Overall, the average caloric intake for all income groups in rural and urban areas is above the recommended required level. The ratio of the average calorie intake to the average requirement is about 118 percent for the urban and 115 percent or the rural area. Part of this excess energy can be categorized as a kind of malnutrition. But most of it is simply wasted or utilized as animal feed. Some reviews have simply missed these latter points and assumed that all calories consumed by the household are actually ingested. The high calorie intake can be attributed as the success of the food subsidy policy, specially if we compare it with other countries in the same income range (1).

Data show that the positive correlation between income level and food consumption is more significant in the rural area than in the urban area

Table 3--Aggregate daily nutritional pattern-per caput in Egypt

Food item	Urban		Rural		National Average	
	Daily Per Caput Intake	% of per caput Intake	Daily Per Caput Intake	% of per caput Intake	Daily per Caput Intake	% of perput Intake
Energy Intake (kcal)	2,800	100	2,670	160	2,728	100
Wheat	1,771	63.2	1,198	44.9	1,448	53.1
Rice	246	8.8	267	10.0	258	9.5
Maize	74	2.6	553	20.7	346	12.7
Other Grain	1	--	1.0	--	0.8	--
Legumes	80	2.8	72	2.7	76	2.8
Fats & Oils	246	8.8	262	9.8	255	9.3
Sugares	156	5.6	147	5.5	151	5.5
Animal Products	150	5.31	106	4.0	125	4.6
Vegetables & Fruits	76	2.7	64	2.4	69.0	2.5
Protein Intake (grains):	79.1	160	73.1	100	75.7	100
Vegetal protein	66.2	83.7	63.5	86.9	64.7	85.5
Animal Protein	12.9	16.3	9.6	13.1	11.0	14.5
Protein Quality (B.V.)	--	61.7	--	62.4	--	62.1
NPU (gms)	48.8	--	45.6	--	47.6	--

Source: Calculated From

(1) Egypt (Arab Republic of) Central Agency for Public Mobilization and Statistics: Household Budget sampling: survey A.R.E.:

Aggregate Data of the Four visits 1974-1975, Ref 80-12524/78, September, 1978 (in Arabic)
2 Tables 1 and 2.

Table 4 — Wheat calories per - caput per day by annual expenditure class per household

Comparative Item	200 L.E.	200 - L.E.	350 - L.E.	500 - L.E.	600 - L.E.	800 - L.E.	1000 - L.E.	1400 + L.E.	Mean
				U R B A N					
Cal/Caput/day	1,554	1,729	1,756	1,808	1,760	1,866	1,832	1,769	1,771
% Total Cal.	63.7	67.1	65.5	65.1	61.4	59.5	57.2	51.9	63.2
				R U R A L					
Cal/Caput/day	1,105	1,089	1,178	1,283	1,292	1,500	1,784	1,877	1,189
% Total Cal	47.2	44.6	44.9	45.0	42.6	44.3	47.5	47.6	44.9

Source: Calculated From:

Egypt (Arab Republic of) - Central Agency for Pubic Mobilization and Statistics: Household Budget sampling survey in Arab Republic of Egypt: Aggregate Data of the Four visit 1974 - 1975, Ref. 80-12524/78, September, 1978 (in Arabic).

(tables 5 and 6). In general, for the lower income groups the caloric intake declines progressively below the aggregate average level of the country.

Dietary Protein Availability and Adequacy

According to the Egyptian diet pattern, most of the energy intake and therefore protein intake comes from vegetal sources. Data indicate that there is no energy gap in the Egyptian diet. However, an adequate caloric intake does not ensure that protein requirements are also met. Protein quality is very important (21). After adjusting the consumption scale and quality (B.V.) it was found that on the average the protein intake is slightly above the required level in urban areas, (48.7 grams versus 47.6 grams (table 5)). In rural areas, the average protein consumption is within one percentage point lower than the required level (table 6). If the available food were distributed according to the need, very little additional protein would have been needed. However, because of the skewed distribution of available food, a large segment of the population consumes less than required protein. The Data indicates that about 52 percent of urban population and 74 percent of rural population have inadequate protein consumption.

The problem, as expected, is more significant among the lower-income population and it improves as income increases. But even for the higher income classes the protein requirement is met mainly through grain consumption. This pattern of consumption might be suitable for adults. However, for young children, especially under 6 years of age, the

Table 5--Per caput energy and protein availability in urban Egypt by Income Class

Annual Household Expenditure In L.E.	percent of Urban Population	Annual Expenditure	Daily per-caupt Engery in Kilo Calories: Consumption	Requirements	Net Balance	Daily Per-Caput Protein in grams: Consumption: Gross Protein	Net Protein Utilization	Requirements In Net Protein Utilization	Net Balance In Net Protein Utilization
200	5.7	2.62	2,437	2,240	+197	68.2	41.5	44.8	-3.3
200-	21.4	12.30	2,585	2,324	+261	72.0	43.0	46.5	-3.1
350-	24.4	17.55	2,681	2,373	+309	75.3	46.2	47.5	-1.3
500-	12.6	10.97	2,777	2,400	+377	80.0	49.2	48.0	+1.2
600-	15.7	16.60	2,865	2,406	+459	81.0	50.1	48.0	+2.1
800-	7.5	10.60	3,136	2,416	+720	86.0	55.1	48.3	+6.8
1000-	7.8	13.50	3,201	2,438	+763	91.0	57.3	48.8	+8.5
1400+	4.9	15.86	3,427	2,454	+968	100.7	64.4	49.2	+15.2
Urban Mean	100	100	2,800	2,378	+422	79.1	48.7	47.6	+1.1

Note: Average Protein quantity score = $\frac{\text{Net Protein Utilized}}{\text{Gross Protein}}$ = 61.5% + .09% SD.

Source: Calculate From

Egypt (Arab Republic of) - Central Agency For Public Mobilization and Statistics: Household Budget Sampling Survey in A.R.E. Aggregate Data of the Four Visits 1974-75, Ref. 80 - 12,524 / 78 September . 1978 (in Arabic).

Table 6--Per caput energy and protein availability in rural Egypt by Income Class

Annual Household Expenditure In L.E.	percent of rural		Daily per-caupt Engery in Kilo Calories			Daily Per-Caput Protein in grams			
						Consumption			
	Population	Annual Expendiure	Consumption	Requirements	Net Balance	Gross Protein	Net Protein Utilization	Requirements in Net Protein Utilization	Net Balance in Net Protein Utilization
200	14.39	9.26	2,333	2,257	+176	65.4	39.9	45.1	-5.2
200 -	35.49	27.62	2,449	2,314	+135	67.8	41.3	46.3	-5.0
350 -	23.82	23.62	2,625	2,327	+298	72.4	44.3	46.5	-2.2
500 -	8.45	9.63	2,853	2,358	+495	80.0	49.4	47.2	+2.2
600 -	8.68	11.75	3,042	2,331	+711	83.6	51.4	46.6	+4.8
800 -	4.39	6.77	3,386	2,327	+1,058	94.6	58.0	46.5	+11.5
1000 -	2.80	5.59	3,752	2,376	+1,316	109.0	68.2	47.5	+20.7
1,400 +	1.98	5.76	3,947	2,706	+1,241	116.3	74.8	54.1	+20.2
Rural Mean	100	100	2,670	2,324	+346	73.4	45.3	46.6	-1.2

Note: Average Protein quality score = $\frac{\text{Net Protein Utilized}}{\text{Gross Protein}}$ = 61.3% + .065 SE.

Source : Calculated From:
Egypt (Arab Republic of) - Central Agency For Public Mobilization and Statistics : Household Budget Sampling survey in A.R.E. Aggregate Data of the Four visits 1974-1975, Ref. 80- 12,524/ 76 September, 1978 (in Arabic).

traditional diet is frequently very bulky, and they have difficulty in eating enough to meet fully the nutritional needs (5). This continuing protein malnutrition among children is quite clear once the utilizable protein content of the diet decreases with lower income. The result of the study conducted by the Nutrition Institute in 1978/79 showed that in Egypt 2.3 percent of the pre school children suffer from acute malnutrition, i.e. less than 60 percent of the standard weight for age, and 21.2 percent of them suffer chronic malnutrition (9).

In general, the pattern of protein distribution among different income classes is similar to that for calories (tables 5, 6). However, the poorer segments of the population not only consume less protein but also consume protein of poorer quality. This low-quality protein intake is most pronounced in the case of animal protein consumption (table 7). Moreover, the poorer the socio economic group the more vulnerable they are to acute and chronic infections or stress, and the more likely they need extra protein to recover since the utilizable protein even of the same B.V. will be less. The aggregate data provided by the Ministry of Supply show that average food availability has increased by about 450 kilo calories per person per day since 1974/75. The expected result is higher protein consumption on aggregate level. However, since there is no information on any changes in food distributional pattern, it is not possible to estimate how much actually goes to low income rural and urban households.

Table 7--Daily per-caput animal protein consumption by annual expenditure per household

Comparative Item	200 L.E.	200 - L.E.	350 - L.E.	500 - L.E.	600 - L.E.	800 - L.E.	1000 - L.E.	1400 + L.E.	Mean
				U R B A N					
gms/caput/day	7.1	7.3	10.3	11.9	14.3	18.2	21.5	32.2	12.9
% Gross Protein	10.4	10.1	13.7	14.9	17.7	20.7	23.6	32.0	16.3
				R U R A L					
gms/caput/day	8.2	8.9	10.5	12.0	14.7	16.0	22.9	22.1	9.6
% Gross Protein	12.5	13.1	14.5	15.0	20.1	17.0	21.9	19.0	13.1

Source: Calculated from

Egypt.(Arab Republic of) - Central Agency for Public Mobilization and Statistics: Household Budget Sampling Survey in A.R.E., 1974-1975, Ref. 80 - 12,524/78 1978 (in Arabic).

Income Elasticities

The impact of changes in income on energy and protein consumption is shown in table 8. The estimated elasticities are based on survey data for 16 different income groups in rural and urban area. The method of estimation is weighted least-squares, which is often used when the estimation is based on grouped data rather than on individual observations. In using grouped data, when the sample sizes are different in each income group, the variance of the errors is expected to be unequal. The consequence is that the estimated regression parameters, using OLS, are still unbiased but inefficient, i.e. the estimated variance is biased. To correct the problem we applied the WLS method, weighting the regression by the number of observations in each income group (16). The estimated regressions and income elasticities for different nutrients are shown in table 8.

Overall, the estimated elasticities for calories and protein in both regions, rural and urban, are smaller than one. This means that with a one percent increase in income, demand will increase by less than one percent. Income elasticities for calories are smaller than for gross protein intake. Among different types of protein, income elasticities for vegetal protein are much smaller than for animal protein. The principal reason is that income elasticities of demand tend to increase as quality of food increases.

Table 8—Estimated consumption function of daily calorie and protein in Egypt

Food Ingredient	Urban a	Urban b	Urban Cofficient of determination	Urban Average estimated income elasticity	Rural a	Rural b	Rural Coeficient of determination	Rural Average estimated elasticities
Calorie intake	2419.41	3.789	0.97	.1498	182.408	13.81	0.98	0.3515
(t)	(37.33)	(6.88)	—	—	(21.02)	(10.56)	—	—
gross protein	58.46	.2192	0.91	.2959	48.69	.418	0.96	0.3804
(t)	(15.88)	(7.01)	—	—	(20.53)	(11.72)	—	—
vegetal protein	55.35	.122	0.92	.1981	45.43	.293	0.93	0.3157
(t)	(17.41)	(4.5)	—	—	(27.21)	(11.66)	—	—
Animal protein	3.11	.097	.96	.7767	3.263	.125	0.84	0.730
(t)	(4.82)	(17.7)	—	—	(3.39)	(8.65)	—	—

Estimated equation is : $\sqrt{n_{ri}}\, C_{jri} = \sqrt{n_{ri}}\, a + \sqrt{n_{ri}}\, b\, Y_{ri}$

Where: C_{jri} denotes daily per-caput intake of ingredient j region r for in income class i,

n_{ri} denotes number of observation in region r for income class i, and

Y_{ri} denotes annual per-caput expenditure of group i region r.

Source: estimated from data of CAPMAS: Household Budget sampling survey in Arab Republic of Egypt 1974-75, Ref. 80-12,524/78 (in Arabic).

Comparing the estimated results of the two regions indicates that all income elasticities except for animal protein are higher in rural areas than urban areas. The reason is the consumption habits and tastes in therural area, where grains and vegetal protein are quite popular and dominated the diet. The high income elasticities for animal protein are a significant incentive to encourage production development to close the gap in terms of protein deficiency.

Food Price Subsidy and Its Impact on Nutrition

Food price subsidy policy in Egypt focuses most heavily on grains, particularly wheat as a staple food (1). Wheat consumption provides 58 percent of calorie consumption for the population as a whole, with the calorie contribution of 63 percent in rural and 45 percent in urban diets (tables 3). The average international wheat price was about 2.5 times of its local market price in 1981. The average international price was 150 L.E. per ton in 1981, while in the local market wheat was sold at 60 L.E. per ton.

Wheat in Egypt in mainly processed and consumed as bread (20). Under current subsidy policy there is an energy surplus above the requirements for all income classes. This surplus increases with increasing income level, such that for the highest urban income class calorie consumption is about 1.5 times of the requirement level.

The equivalent wheat tonnage of calorie surplus weighted by 1981/82 population is about 1,679.22 thousand tons of a value of 251. 883 million L.E. at international price. Some of this excess energy is wasted and some is used as animal feed; but still wheat is the major source of dietary energy and protein intake.

The impact of change in wheat price policy, i.e. removing the subsidy, could be a decline in the level of consumption. The magnitude of this decline depends on wheat price elasticity in each income class. However, it is difficult to estimate price elasticities using cross-sectional data. Households are usually sampled during a brief period of time and price differences may be due to differences in taste, quality income elasticities, and locations. Therefore, an aggregate wheat price elasticity was estimated using national time series data 1965-80. The functional form is doubled log. The estimated equation is:

$$LWD = .278 - .2936\ LWP + .268\ LPI - .150\ D$$

$$t\ (2.9)\quad (1.62)\qquad (1.83)\qquad (2.96)$$

$$R^2 = .82 \quad D = 1.85$$

where:

LWD = Per capita wheat consumption (Mt)

LWP = deflated wheat price by consumer price index (CPI)

LPI = deflated per capita consumption expenditure by CPI, and

D = Dummy variable, D = 1 for 1967 to 1975, where concessional food aid shipment was stopped, and D = 0 otherwise.

The estimated income and price elasticities are .27 and .29 respectively. In a previous study by Scobie the reported wheat price elasticity is .25, which is based on specification of total demand for the country (20).

We used the homogeneity condition of the demand function as a basis for imputing price elasticities for income classes. Euler's theorem for homogeneous conditions states that:

$$e_{ii} + e_{ij} + e_{iy} = 0$$

where: e_{ii} = own price elasticity of commodity i,

e_{ij} = cross price elasticity of commodity i for j, and

e_{iy} = income elasticity for commodity i.

This implies that the elasticities and income elasticities sum to zero. If we assume that the preference ordering for different food commodities is the same for different income class, we can input price elasticities for each income class as follows:

$$e_{ip} = e_p \frac{e_{iy}}{e_y}$$

where e_{ip}, e_p, e_{iy} and e_y are wheat price elasticity of income

group i, national price elasticity (.29), wheat income elasticity of income group i, and national wheat income elasticity (.27) respectively. The wheat calorie expenditure relation are estimated using survey of 1974/75 data. The method of estimation is WLS and the functional form is semilog.

The equations are as follows:

Urban wheat calorie consumption:

$$\begin{array}{lcccc} WV & = 924.3 + & 5.60\ LPU & + & 96.36\ LUT \\ t & \quad (3.85) & \quad (.64) & & \quad (1.86) \end{array}$$

$R^2 = .50 \quad D = 2.4$

Rural wheat calorie consumption:

$$\begin{array}{lcccc} WR & = -92.19 & + 712.81\ LPR & + & 507.47\ LRI \\ t & \quad (.68) & \quad (21.70) & & \quad (20.23) \end{array}$$

$R^2 = .98 \quad D = 1.7$

where: WV, and WR, are per capita wheat calorie consumption, LPV and LPR are square root of population in each income class, and LRI and LVI are per capita income times square root of population in each class (note: ordinary least squares gave slightly higher coefficients for the variables).

The imputed wheat calorie income and price elasticities for each income class by the regions are shown in table 9. Overall income elasticities in the rural area are higher than in the urban area. In the urban area wheat is widely consumed, while in the rural area consumers usually consume wheat and maize.

Table 9--Income and price elasticites estimated for wheat calorie consumption by income class in Egypt

Elasticity Coefficient	-200 L.E.	200+ L.E.	350+ L.E.	500+ L.E.	600+ L.E.	800+ L.E.	1000+ L.E.	1400+ L.E.	Mean
				URBAN					
Y	46.6	57.9	74.0	89.4	108.2	145.6	177.3	322.2	102.4
E_Y	.0620	.0557	.0549	.0533	.0548	.05164	.0530	.0544	.0544
E_P	-.0683	-.0613	.0605	-.0586	-.0603	-.0569	-.0584	-.0599	-.0599
				RURAL					
Y	38.0	47.8	62.5	71.8	85.3	79.1	125.5	182.7	63.0
E_Y	.4551	.4659	.4397	.3955	.3927	.3382	.2844	.2703	.4268
E_P	.4985	-.5103	-.4816	-.4332	.4301	-.3705	-.3116	-.2961	-.4675

Where Y denotes annual per-caput Expenditure in L.E.
E_Y denotes income (expenditure) elasticity of wheat, and
E_P denotes price elasticity of wheat.

Nutritional Impact of Free Wheat Price

As mentioned earlier, freeing wheat prices would increase the relative wheat price by 150 percent. Assuming no reallocation of purchases following a price change, such an increase would decrease per capita consumption of the lowest income class in rural area by 78 percent, while this decline for the lowest urban income class is only 9 percent, other factors being constant (table 9). In rural areas the range of decline in consumption is much higher than in urban areas (45-78 percent in rural versus 7-9 percent in urban). Statistics indicate that the decline in consumption among low by income classes would be much greater than for high income groups in both regions. The average per capita per year consumption decline is 15.2 kg in the urban and 89.8 kg in the rural area. The expected total quantity of wheat saved, by increasing its price to the world price level, would be about 2.3 million tons, based on 1981/82 population statistics. About 85 percent, or 2.0 million tons, of consumption reduction is from the rural area (table 10).

Such a decline in wheat consumption would have a severe negative impact on nutrition. As table 11 and 12 indicate, average calorie consumption would decline from 2,800 and 2,670 to 2,378 and 1,809 calories per day in the urban and rural areas respectively. In the urban area, even with a 6 percent decline in calorie intake, the average calorie consumption would be about 12 percent above requirements. In the rural area, the average calorie intake would be 22 percent less than the required level. This means that 91 percent of the rural population would

Table 10-Decrease in wheat consumption due to implementation of free market price of wheat in Egypt

Annual Household Expenditure Class (L.E.)	rural: Population (1000) persons 1981/82	rural: Wheat (1000) Mt (2)	rural: Value (L.E.) Million (2)	Urban: Population (1000) persons 1981/82	Urban: Wheat (1000) Mt	Urban: Value (L.E.) Million	National: Wheat (1000)	National: Value L.E. Million
200	3,216.765	288.4	43.3	1,110.116	16.9	2.5	305.8	45.9
200 -	7,933.499	712.4	106.9	4,361.172	66.3	9.9	778.7	116.8
350 -	5,324.763	478.2	71.7	4,757.642	72.3	10.9	550.5	82.6
500 -	1,888.927	169.6	25.4	2,497.762	38.0	5.7	207.6	3.1
600 -	1,940.342	174.2	26.1	3,112.291	47.3	7.1	221.5	33.2
800 -	981.348	88.1	13.2	1,486.763	22.6	3.4	110.7	16.6
1000 -	625.917	56.2	8.4	1,546.239	23.5	3.5	79.7	12.0
1400 +	442.613	39.8	6.0	951.528	14.5	2.1	54.3	8.2
Total	22,354.169	2,007.4	301.1	19,823.508	301.4	45.2	2,308.8	346.3

1) Calculated based on population structure on table 5 and total rural and urban population in 1981/82

2) Calculated from tables (4) and (9).

3) Valued at international price of wheat (150 L.E. per ton), in 1981.

Table 11--Effect of free market price of wheat on per-caput energy and protein avilability by income class in Urban Egypt.

Annual Household Expenditure Class In L.E.	percent of Urban		Daily per-caupt Engety in kilo Calories			Daily Per-Caput Protein in grams			
						Consumption			
	Population	Annual Expendiure	Consumption	Requirements	Net Balance	Gross Protein	Net Protein Utilization	Requirements in Net Protein Utilization	Net Balance
200	5.6	2.62	2,291	2,240	+51	63.3	38.6	44.8	-6.2
200 -	22.0	12.30	2,439	2,324	+112	67.1	40.1	46.5	-6.4
350 -	24.0	17.55	2,535	2,373	+162	70.4	43.3	47.5	-4.7
500 -	12.6	10.97	2,631	2,400	+231	75.1	46.3	48.0	-1.7
600 -	15.7	16.60	2,719	2,406	+313	76.1	47.2	48.0	+.8
800 -	7.5	10.60	2,990	2,416	+574	83.1	52.2	48.3	+3.9
1000 -	7.8	13.50	3,055	2,438	+617	86.1	54.4	48.8	+5.6
1400 +	4.8	15.86	3,278	2,459	+819	95.8	61.5	48.2	+13.3
Urban Mean	100	100	2,654	2,378	+276	74.2	45.8	47.6	-1.8

Calculated From Tables 4, 5, 6, 9 and 10.

Table 12: Effect of free market price of wheat on per-caput and protein availability by income class in rural Egypt.

Annual Household Expenditure In L.E.	percent of Rural		Daily per-caupt Engery in Kilo Calories			Daily Per-Caput Protein in grams			
						Consumption			
	Population	Annual Expendiure	Consumption	Requirements	Net Balance	Gross Protein	Net Protein Utilization	Require in Net Protein Utilization	Net nce on Net Protein Utilization
200	14.39	9.26	1,505	2,257	-752	366	22.6	45.2	-22.6
200 -	35.49	27.62	1,588	2,314	-726	39.0	24.0	46.3	-22.3
350 -	23.82	23.62	1,756	2,327	-571	43.6	27.0	46.5	-19.5
500 -	8.45	9.63	1,992	2,358	-366	51.2	32.1	47.2	-15.1
600 -	8.68	11.75	2,181	2,331	-150	54.8	34.1	46.6	-12.5
800 -	4.39	6.77	2,553	2,327	+226	65.8	40.7	46.5	-5.8
1000 -	2.80	5.59	2,891	2,376	+515	80.2	50.9	47.5	+3.4
1400 -	1.98	5.76	3,087	2,706	+881	87.6	57.5	54.1	+3.4
Rural Mean	100	100	1,809	2,324	-515	44.6	31.4	46.5	-15.1

Source: Calculated from tables 4, 5, 6, 9 and 11.

have some degree of calorie deficiency, with the lowest income category, 14 percent of rural population, consuming less than one third of the required calorie intake.

The assumed change in wheat price policy would have much worse consequences on protein consumption. On the average, protein intake would decline from 79.1 to 74.2 in the urban and from 73.4 to 44.6 in the rural area. The average protein intake in both regions would to be less than the required level. Only 5 percent of rural and 36 percent of urban population would have an adequate protein intake. To treat this severe nutritional deficit with any rich protein food would be very costly. For example, if milk (4 percent fat) were fed, about 4.43 million tons would be required. The market value would be at least 655 million L.E., assuming an international market price for milk of 212 L.E. per ton of dissolved dry milk equivalent.

Summary and Conclusion

The over all results of the study indicate that while adequate calories are provided at all income levels, inequalities in the distribution of food among different regions and between different income classes are reflected in protein supplies. Large segments of the population consume less than the nutritionally required protein--52 percent of the urban population and 74 percent of the rural population. This is mainly because of the poor quality of protein available to the lower income groups.

Income elasticities for calorie and gross protein consumption are below one and decline as income increases. Income elasticities are higher for animal protein than vegetal protein. The nutritional implication of the positive income elasticities is that if the availability of food can be expanded to maintain food prices constant, increases in income will result in a considerable improvement in nutrition. This is provided, of course, that the income distribution does not become more unequal in the process of development. This approach, however, will result in considerable social costs because a large part of the additional food will be consumed by nondeficit consumer groups. The high income groups in the urban area already are consuming as high as 1.4 times of the required calorie level and 1.3 times of the protein requirements.

Today, Egypt relies heavily on the international market for satisfying its food needs. In recent years about two thirds of wheat consumption, a major component of the Egyptian diet, has been imported and its price is heavily subsidized. It is a fact that food subsidy costs are quite high and they are expected to increase further (1).

The political cost of a sudden change in food price policy, which was tried in 1977 and led to a food riot, is known. In terms of nutritional cost our study showed that increase in wheat price equivalent to international price implies a large nutritional sacrifice for the poor if the present income distribution continues. However, domestic resource

constraints and international market realities are forcing policy makers to look for the most cost-effective food policy.

Any attempt at this stage to enforce a gradual target oriented nutritional program may prevent the political cost and budgetary cost to be paid and at the same time will improve the well being and nutritional standard of the poor. The target group oriented policies are generally more cost effective than a general food subsidy (4). Programs like food stamps which tend to provide supplementary food purchases only for low income people are also a net income relief because of the substitution of bonus stamps for money that recipients would otherwise spend on food. The characteristic of the program is like a negative income tax system and benefits could be according to family size and income.

We suggest that in the process of gradual change in general food subsidy there is a strong need for more comprehensive research in ranking of the commodities in terms of nutritional importance and their subsidy costs. Study by Scrimshaw indicates that when in a country most of the food calories are supplied by cereal grains often the complementary energy sources are low in nutrients. Therefore, any policy on staple foods must consider not only the calorie value but also the overall nutritive value of the staples (19). Overall, in Egypt much more attention was paid to cereals and less to increasing availability of legumes. Legumes are an important source of protein to complement cereal diets. As table 13 indicates, considering the cost involved, legumes are

Table 13--Average value and net protein utilization from different animal products, wheat, and legumes

Item	Red Meat	White Meat	Eggs	Liquid Milk Equivelant 4% fat	Wheat	Legumes
Average boarder price per ton (L.E.).	1,600	1,280	1,200	212	150	150
% protein content	18.6	12	12.4	3.5	11.7	22.2
%protein quality (B.V.)	67	70	94	85	60	60
Net Protein Utilization per ton (NPU) kgs.	124.62	84.0	116.56	29.75	69.6	133.2
Average boarder price per gm NPU PTT.	1.28	1.52	1.03	0.71	0.22	0.11

Source: Calculated from: FAO, Trade Year Book, Rome, 1981.

the cheapest source of protein and are the most concentrated source of energy.

Per capita consumption of legumes has declined since 1976 (table 14). The major reason is a sharp decline in domestic production. The direct consequence of the decline in bean production is less availability at the rural level, where people are nutritionally more vulnerable. One option is to supplement the cereal with peanut or soy-preparation, both high in protein concentration. The latter alternative raises the importance of evaluating the nutritional impact of the two alternative use of soybeans; either for poultry feeds (the present situation) or as a direct processed food for human consumption. However, there is still some concern for adding other rich quality types of protein specially to improve children's diet. For this purpose direct nutritional intervention programs such as school lunches are an option. Increasing milk consumption as the least cost item out of other animal protein might be considered, since it is likely that much more food deficiency might have been detected if intra family food distribution were analyzed (18). Naturally, to come up with an effective nutritional intervention policy, the behavior of the household in reaction to such policies must be analyzed prior to any action to change food pricing policies.

Table 14-- Production, Consumption of Lentils and Beans

Year	Lentils				Beans			
	Production	Imports	total Consumption	Per capita Consumption	Production	Imports	Total Consumption	Per capita consumption
	1,000 tons			Kg	1,000 tons			Kg
1970	33	7	58	1.76	227	0	267	8.09
1971	50	12	61	1.81	256	26	206	6.10
1972	54	7	61	1.76	361	11	243	7.02
1973	62	13	65	1.84	273	0	201	5.68
1974	51	13	62	1.71	234	22	294	8.12
1975	39	53	82	2.22	234	110	312	8.43
1976	38	68	89	2.35	254	82	296	7.81
1977	23	50	75	1.94	270	26	239	6.14
1978	16	49	87	2.18	221	18	285	7.14
1979	9	58	72	1.76	226	33	251	6.12
1980	7	69	76	1.80	213	37	247	5.85
1981	5	82	87	1.89	208	92	300	6.91

Source: Ministry of Supply - Egypt - Unpublished data.

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