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ABSTRACT

We compared energy and protein consumption among various Income classes in rural and urban areas of Egypt, The results indicate that adequate calories are provided at all income levels but inequalities exist in food distribution between rural and urban areas and among income classes. About two-thirds of Egypt's wheat, the country's basic food, is imported and the price is .heavily subsidized by the Government. Our analysis shows that removing the wheat price subsidy would create a large nutritional sacrifice for the poor, especially in rural areas. We also examined alternative policies for improving nutritional status and reducing Government subsidy costs.

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

Contents

INTRODUCTION

A country planning long-term food self-sufficiency must establish food production targets. These targets are generally based on projected national food demand. Average national figures for many developing countries provide little information about nutritional deficiencies. In contrast, the disaggregated consumption figures provide a different picture of nutritional situations and the needs of the population, especially groups vulnerable to malnutrition.

Increasing the availability of food 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 income on food, yet be unable to afford a nutritionally adequate diet (18)[1]. Hence, a policy aimed at reducing the food gap may require more than a simple increase in agricultural production.

Framing and evaluating such policies require an analysis of food availability among various socioeconomic groups. A public policy aimed at self-sufficiency which does not consider the society's nutritional improvement could be costly in the long run and may have inappropriate implications for planning.

Government intervention in Egypt's food economy is extensive and complex. Major food Items such as cereals, beans, cooking oil, sugar, and to some extent meat are subsidized through consumer prices1). The subsidy policy goals of the Government of Egypt are to provide a low cost of living, low wage rates and social equity for the population. In recent years, high income growth, high population growth, and increases in migration to urban areas have accentuated food demand.

Domestic food production has remained fairly stable for the last 10 years. The high demand growth, relative to production, increased the reliance on food imports. Egypt now imports about 50 percent of its total food requirement (JL). Increased quantities of imports and higher international prices have caused serious economic difficulties for the Government of Egypt. Even though food aid has been an important source of financing food imports, the agricultural trade deficit increased from $113 million to $3,680 million between 1974 and 1981. Food security is at the center of the Government's concern because of the country's high dependency on international food markets. The increased cost of food subsidies has forced the Government to look for alternative policies.

This paper examines the impact of the food subsidy policy in eliminating malnutrition, evaluates the impact of changes in current policy on nutrition, and discusses alternative policies which might improve nutritional status and reduce Government costs.

Estimation of Energy and Protein Requirements

[1] Underscored numbers in parentheses refer to items in the references.

An individual's energy requirement 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 Estimates by the Food and Agriculture Organization (FAO) and the world health organization (Table 1). Some believe that protein is not a problem if people receive enough calories. This is the major reason for concentrating on research to increase cereal production and Government subsidies of cereal consumption (12). Through the sixties the international and bilateral agencies emphasized that while an increase in cereal production might ensure adequate dietary calories, there is a parallel need to ensure adequate production of high-protein food (13). Protein requirements vary by age and sex. Young children and pregnant and nursing women require the most protein. In most developing1 countries, the intra-family food distribution is such that children and women receive the smallest amount of available food (4).

We estimated protein requirements using energy requirements. The percentage of total protein that cones from calories is 1referred 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 safe allowance for protein is about 7 percent of calories as eggs or milk (14).

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

Table 1: Energy requirements of Daily per capita calories for 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 1 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 Agriculture Organization (FAO) and World Health Organization (WHO), "Energy and Protein Requirements," WHO Chronicle, Vol. 27: 481-486, 1973.

Estimation of Energy and protein dietary intake

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

The average daily per capita energy consumption was derived based on the calorie content of each food item (Table 2). For food items such as some fruits, vegetables, and dairy products, where the quantities consumed are not explicitly recorded; monetary expenditure was divided by the corresponding average survey price to impute consumption quantities.

To estimate the calorie consumption requirements, consumption units based on adult male equivalents were computed using the weighting factors presented in table 1. The survey indicates that variations of household size among different income classes are very low. The average consumer unit in the urban area is 0.7931 (plus or minus 0.0045 SD) and 0.7725 (plus or minus 0.0035 SD) in the rural area. These statistics indicate nearly identical average nutritional scales within each group and among the two regions. The calorie consumption requirements in tables 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, 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 survey indicates that grains are the main source of food energy in Egypt (Table 3). Wheat is the basic food item, providing 58 percent of the total caloric consumption per day (Table 4). The average caloric intake for all income groups in rural and urban areas is above the recommended level. The ratio of the average caloric Intake to the recommended level is 118 percent for the urban and 115 percent for the rural areas.

This excess energy does not mean total elimination of malnutrition. Even though statistics are not available, enough evidence exists to suggest that most of the excess energy is simply wasted or utilized as animal feed. Some reviewers (10) assumed that all calories consumed are actually ingested. The high caloric intake is the result of the food subsidy policy, which is apparent when we compare Egypt with other countries in the same income range (1).

The data indicate a stronger association between income level and food consumption in rural than in urban areas (Tables 5 and 6). The caloric intake declines progressively below the aggregate average level for the lower income groups of the region, that is, rural and urban.

Table 2: Nutrient content of major food items in Egypt

Food item	calories	protein	Biological value	Food item	calories	protein	Biological value (BV)
	Kcal/gram	Percent			Kcal/gram	Percent	
Wheat	3.50	11.7	60	Artificial	8.84	0	0
Maize	3.60	9.3	60	liquid milk	0.87	3.4	85
Millet	3.43	10.1	60	Full cram	2.02	20.0	73
Wheat	3.70	0	52	Fatless	1.01	19.2	73
Bread	3.66	11.1	60	Butter	7.33	0.6	73
Milled rice	3.60	6.7	60	Ghee	9.40	0	0
Macaroni	3.62	0.5	52	Potato	0.82	2.0	67
Broad	3.45	22.2	60	Onion	0.40	1.4	55
Lentils	3.45	22.2	60	Tomato	0.27	1.8	55
Red meat	3.07	18.8	67	Orange	0.47	0.9	55
Poultry	1.29	12.6	70	Date	1.13	2.4	55
Fish	0.62	8.8	70	Sugar	0.87	0	0
Eggs	1.63	12.4	94	Honey	2.90	0	0
Vegetable	8.84	0	0	Halava tahini	4.81	9.1	78

Source: collected from (1) Ministry of Agriculture, under secretary for Agricultural Economics: Food Balance sheet of Egypt, 1979, Cairo (in Arabic); (2) Nutrition Institute of Egypt, Cairo, Food Nutritive values Tables, 1977

Table 3: Aggregate Daily Nutritional Pattern Per Capita in Egypt

Food item	Urban		Rural		National average	
	Daily per	Percentage of per capita intake	Daily per	Percentage of per	Daily per	Percentage of per
	Kcal	Percent	Kcal	percent	kcal	percent
Energy intake	2.800	100	2.670	150	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 grains	1	-	1	-	1	-
Legumes	80	2.8	72	2.7	76	2.8
Fats and oils	246	8.8	262	9.8	255	9.3
Sugars	156	5.6	147	5.5	151	4.6
Animal products	150	5.3	106	4.0	125	2.5
Vegetables and fruits	76	2.7	64	2.4	69	
	Grams		Grams		Grams	
Protein intake	66.2	83.7	63.5	86.9	64.7	85.5
Vegetable protein	12.9	16.3	9.6	13.1	11.0	14.5
Animal protein	79.1	160.0	73.1	100.0	75.7	100.0
total						
Protein quality (B.V)	-	61.7	-	62.4	-	62.1
NPU	48.8	-	45.6	-	47.6	-

- = Negligible.

Source: calculated from (1) Egypt (Arab Republic of) central Agency for public Mobilization and statistics, Household Budget sampling survey in Republic of Egypt, aggregate data of the four visits 1974 – 1975, Ref 80-12524/78, September 1978 (in Arabic), (2) tables 1 and 2.

Table 4: Daily Per Capita Calories of Wheat by Household Annual Expenditure Class

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
Urban:									
Cal./capita/day	1.554	1.729	1.756	1.808	1.760	1.866	1.832	1.769	1.771
Percent of total									
Cal. In diet	63.7	97.1	65.5	65.1	61.4	59.5	57.2	51.9	63.2
Rural:									
Cal./capita/day	1.105	1.089	1.178	1.283	1.292	1.500	1.784	1.877	1.189
Percent of total									
Cal. In diet	47.2	44.6	44.9	45	42.6	44.3	47.5	47.6	44.9

Source: calculated from (1) Egypt (Arab Republic of) central Agency for public Mobilization and statistics, Household Budget sampling survey in Republic of Egypt, aggregate data of the four visits 1974 – 1975, Ref 80-12524/78, September 1978 (in Arabic)

Dietary Protein Availability and Adequacy

In Egypt, most of the energy and therefore, protein intake comes from vegetable sources. The data indicate that there is no energy gap in the Egyptian diet. However, an adequate caloric intake does not ensure that protein requirements ere met for households or individuals. Protein quality is very important (21).

After adjusting the consumption scale and quality (B.V.), we found that, on the average, protein intake was slightly above the required level in urban areas, 48.7 grams versus 47.6 grams (Table 5). In rural areas, the average protein consumption was more than one percentage point lower than the recommended level (Table 6). If the available food was distributed according to need, very little additional protein would have been needed. Because of the skewed distribution of available food, a large segment of the population consumes less than the required amount of protein. The data in tables 5 and 6 indicate that 52 percent of the urban population and 74 percent of the rural population have inadequate protein consumption.

Table 5: per capita energy and protein availability by income class in urban Egypt

Annual household expenditure in L.E.	Percentage of		Daily per capita energy			Daily per capita protein			
	Urban population	Annual expenditure	consumption	Requirements	Net balance	Consumption: Gross protein	Consumption: Net protein utilization	Requirements	Net balance
	percent		Kilocalories			Grams			
Less than	5.7	2.62	2.437	2.240	197	68.2	41.5	44.8	-3.3
200-350	21.4	12.30	2.585	2.324	261	72.0	43.0	46.5	-3.1
350-500	24.4	17.55	2.681	2.373	309	75.3	46.2	47.5	-1.3
500-600	12.6	1097.16.60	2.777	2.400	377	80.0	49.2	48.0	1.2
600-800	15.7	10.60	2.865	2.406	459	81.0	50.1	48.0	2.1
800-1.000	7.5	13.50	3.136	2.416	720	88.0	55.1	48.3	6.8
1000-1.400	7.8	15.86	3.201	2.438	763	91.0	57.3	48.8	8.5
More than 1.400	4.9	100	3.427	2.454	963	100.7	64.4	49.2	15.2
Urban mean	100		2.800	2.378	422	79.1	48.7	47.6	1.1

Note: Average Protein Quality Score = $\frac{net protein\ utilized}{gross protein} = 61.5$ percent ± 0.09 percent SD.

Source: calculated from central Agency for public Mobilization and statics, Household Budget sampling survey in Arab Republic of Egypt: aggregate data of the four visits 1974 – 75, Ref, 80 -12, 524/78, September 1978 (in Arabic).

The problem, as expected, is closely associated with income level; protein consumption improves as income increases. But even for the higher income classes the protein requirement is met mainly through grain consumption.

Table 6: per capita energy and protein availability by income class in rural Egypt

Annual household expenditure in L.E.	Percentage of		Daily per capita energy			Daily per capita protein			
	Urban population	Annual expenditure	consumption	Requirements	Net balance	Consumption: Gross protein	Consumption: Net protein utilization	Requirements	Net balance
	Percent		kilocalories			Grams			
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	4.8
600-	8.68	11.75	3.042	2.331	+711	83.6	51.4	46.6	11.5
800-	4.39	6.77	3.386	2.327	+1.058	94.6	58.0	46.5	20.7
1.000-	2.80	5.59	3.752	2.376	+1.316	109.0	68.2	47.5	20.2
1.400+	1.98	5.76	3.647	2.706	+1.241	116.3	74.8	54.5	
Rural mean	100	100	2.670	2.324	+346	73.4	45.3	46.6	-1.2

Note: Average Protein quality Score = $\frac{net protein\, utilized}{gross protein} = 61.5$ percent ± 0.09 percent SD.

Source: calculated from central Agency for public Mobilization and statics, Household Budget sampling survey in Arab Republic of Egypt: aggregate data of the four visits 1974 – 75, Ref, 80 -12, 524/78, September 1978 (in Arabic)

This pattern of consumption might be suitable for adults. However, for young children, especially those under 6 years of age, the traditional diet is bulky, and they have difficulty eating enough to fully meet their nutritional needs (5). Protein malnutrition is more acute among children in lower income classes because the utilizable protein content of the diet decreases. A study conducted by the Nutrition Institute in 1978-79 showed that 2.3 percent of Egyptian preschool children suffered from acute malnutrition (that is less than 60 percent were the standard weight for their age), and 21.2 percent of them suffered chronic malnutrition (9).

The pattern of protein distribution among various income classes is generally similar to caloric distribution (Tables 5 and 6). The poorer segment of the population consumes less and lower quality protein, (Table 7). This lower quality protein intake derives from the lack of animal protein consumption. The poorer the socioeconomic group, the more vulnerable they are to acute and chronic infection or stress, and the more likely they are to need extra protein to recover, since the utilizable protein will be less.

Table 7: Daily per capita animal protein consumption by annual expenditure

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
Urban:									
Grams /capita/day	7.1	7.3	10.3	11.9	14.3	18.2	21.5	32.2	12.9
Percent gross									
protein	10.4	10.1	13.7	14.9	17.7	20.7	23.6	32.0	16.3
Rural:									
Grams/capita/day	8.2	8.9	10.5	12.0	14.7	16.0	22.9	22.1	9.6
Percent gross									
protein	12.5	13.1	14.5	15.0	20.1	17.0	21.9	19.0	13.1

Source: calculated from central Agency for public Mobilization and statics, Household Budget sampling survey in Arab Republic of Egypt: aggregate data of the four visits 1974-75, Ref, 80 -12, 524/78, September 1978 (in Arabic).

The aggregate data provided by the Ministry of Supply show that average food availability at the consumer level has increased by about 450 kilocalories / person / day since the consumption survey of 1974-75. The result must be higher protein consumption at the aggregate level. It is not possible to estimate how much additional consumption goes to low income households because there is no information on changes in the food distribution pattern.

Income Elasticities:

The impact of income changes on energy and protein consumption is shown in Table 8. The estimated elasticities are based on survey data for 16 various income groups. 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 with various sample sizes in each income group, the variance of errors is expected to be unequal among groups. The consequence is that the estimated regression parameters, using ordinary least squares (OLS) estimation, are still unbiased but inefficient, that is, the estimated variance is biased. To correct this problem, we applied the weighted least squares (WLS) method, weighting the regression by the number of observations in each income group (16). The estimated regressions and income elasticities for various nutrients are shown in Table 8.

The estimated elasticities for calories and protein in both rural and urban regions are smaller than one. This means that with a 1-percent increase in income, demand will increase by less than 1 percent. Income elasticities are smaller for calories than for gross protein intake. Income elasticities are much smaller for vegetable protein than for animal protein. 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. One reason might be the consumption habits and tastes in the rural areas, where grain and vegetable protein are quite popular and dominate the diet. Another reason is the significant difference in the income level between the two regions. Per capita income in urban areas was 40 percent higher than in rural areas, 102.4 L.E. versus 63.0 L.E. The high cost of animal products may make them unaffordable in rural areas.

Table 8: Estimated consumption function of daily calories and protein in Egypt.

Food ingredient	Urban				Rural			
	a	b	Coefficient of determination	Average estimated income elasticity	a	b	Coefficient of determination	Average estimated income elasticity
Calorie intake	2419.41	3.789	0.97	0.1498	182.408	13.81	0.98	0.3515
(t)	(37.33)	(6.88)	--	--	(21.02)	(10.56)	--	--
Gross protein	58.46	2192	91	2959	48.69	418	96	3804
(t)	(15.88)	(7.01)	--	--	(20.53)	(11.72)	--	--
Vegetable protein	55.35	122	92	1981	45.43	293	93	3157
(t)	(17.41)	(4.5)	--	--	(27.21)	(11.66)	--	--
Animal protein	3.11	097	96	7767	3.263	125	84	730
(t)	(4.82)	(17.7)	--	--	(3.39)	(8.65)	--	--

-- = Not applicable

Estimated equation is: $n_{ri}\ c_{jri} = (n_{ri})\ a + n_{ri} b\ y_{ri}$

Where: c_{jri} denotes daily per capita intake of ingredient j, region r, for income class I;

ri denotes number of observations in region r for income class i; and

n_{ri} denotes square root of the annual per capita expenditure of class i in region r.

Source: Estimated from data of central Agency for public Mobilization and statics, Household Budget sampling survey in Arab Republic of Egypt: aggregate data of the four visits 1974 – 75, Ref, 80 -12, 524/78, September 1978 (in Arabic).

Food price subsidy and its Impact on Nutrition

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

Under current consumer food subsidy policy, there is an energy surplus above the recommended level for all income classes. This surplus increases with income level, so that the highest urban income class consumes about 1.5 times the recommended calorie level.

The calorie surplus (wheat equivalent), derived from tables 5 and 6, weighted by 1981-82 population *is* about 1.7 million tons having a value of 255 million L.E. at the international price of 150 L.E. per ton.

Removing the wheat price subsidy could lower consumption. The magnitude of this decline depends on wheat price elasticity in each income class. However, cross-sectional data are not suitable for estimating price elasticities. Households are usually sampled during a brief period of time and price differences may be due to differences in taste, quality, income elasticities, and location. We estimated an aggregate wheat price elasticity using national time-series data for 1965-80. The functional form is double log. The estimated equation is:

LWD = 0.278 -0.2936LWP + 0.268LPI - 0.150D

t (2.9) (1.62) (1.83) (2.96)

R^2 = 0.82 D = 1.85

LWD = per capita wheat consumption (metric tons);

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

LPI = deflated per capita income by CPI; and

D = dummy variable = 1 when concessional food aid shipments were stopped (1967-75, and 0 otherwise.

The estimated income and price elasticities are 0.27 and 0.29, respectively. In a previous study, the reported wheat price elasticity was 0.25, based on specification of total demand for the country (20).

We estimated income elasticities for each income class and region using 1974-75 survey data. The method of estimation is weighted least squares (WLS) and the functional form is semi log. The equations are[2]:

Urban wheat consumption

WU = 924.3 + 5.60LPU + 96.36 LUI

t (3.85) (90.64) (1.86)

R^2= 0.50 D = 2.4

Rural wheat consumption

WR = - 92.19 - 712.81LPR + 507.47LRI

t (0.68) (21.70) (20.23)

R^2 = 0.98 D = 1.7

[2] The ordinary least squares gave slightly higher coefficients for the variables

Where:

WU and WR are per capita wheat consumption;

LPU and LPR are the square root of the population in each income class, and

LRI and LUI are per capita Income times the square root of the' population in each class

We assumed that the preference ordering for various food commodities was the same for different income classes; in other words, we assumed the ratio of income elasticity to price elasticity for all income levels was the same as the national level. Thus, we imputed 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 (0.29), wheat income elasticity of Income group i, and national wheat income, elasticity (0.27), respectively.

The imputed wheat income and price elasticities for each income class, by regions, are shown in Table 9. The Income elasticity coefficeints in the rural areas are higher overall than In the urban areas. In the urban areas wheat is widely consumed, while both wheat and maize are heavily consumed in the rural areas.

Nutritional Impact of Free Wheat Price

Freeing wheat prices from 60 L.E. to the 1981 international price of 150 L.E. would increase the relative wheat price by 150 percent. Given the domination of wheat in the Egyptian diet (wheat provides 53 percent of the national per capita energy intake); we assumed no reallocation of purchases following a price change[3]. Such a price increase would decrease per capita consumption of the lowest rural income class by 75 percent and the lowest urban income class by only 9 percent, of other factors being constant[4]. The range of decline in consumption is much higher in rural areas than In urban areas (45-75 percent versus 7-9 percent). Statistics indicate that the consumption decline would be much greater among low income classes than 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. By increasing its price to the world price level, the expected total quantity of wheat saved would be about 2.3 million tons, based on 1981-82 population statistics. About 85 percent, or 2 million tons, of consumption reduction is from the rural area (Table 10).

Such a decline in wheat consumption, even with a shift to the consumption of other cereals, would have a severe negative slop act on nutrition. As tables 11 and 12 Indicate, average -caloric 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-

[3] Maize is the second most important food item among grains in the Egyptian diet, providing 13 percent of Energy intake and it is also heavily subsidized.

[4] This was derived by multiplying the price elasticity of wheat by the percent increase in price (Table 9)

percent decline in calorie intake, the average calorie consumption would be about 12 percent above requirements. In the rural area, the average caloric intake would be 22 percent less than the required level. This means that 91 percent of the rural population would have some degree of calorie deficiency.

Table 9: Estimated income and price elasticities for wheat consumption by income class in Egypt

Variable	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	108.4	145.6	177.3	322.2	102.4
EY	0620	0557	0557	0533	0548	05164	0530	0544	0544
EP	-.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
EY	4551	4659	4397	3955	3927	3382	2844	2703	4268
EP	-.4985	-.5103	-.4816	-4332	-.4301	-.3705	-.3116	-.2961	-.4675

Where: Y denotes annul per capita expenditure in L.E.

E_Y denotes income (expenditure) elasticity of wheat; and

E_p denotes price elasticity of wheat.

Table 10: Decrease in wheat Egyptian consumption as implementation of its free market price

Annual household expenditure class (L.E.)	Rural			Urban			National	
	Population 1981 – 82 (1)	Quantity (2)	Value (3)	Population 1981 – 82	Quantity	Value	Quantity	Value
	thousands	1.000 MT	Million L.E.	thousands	1.000 MT	Million L.E.	1.000 MT	Million L.E.
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	4.757.6642.2.497.762	72.3	10.9	550.5	82.6
500-	1.88.927	169.6	25.7	3.112.291	38.0	5.7	207.6	3.1
600-	1.940.342	174.2	26.1	1.486.763	47.3	7.1	221.6	33.2
800-	981.348	88.1	13.2	1.546.239	22.6	3.4	110.7	16.6
1000-	625.917	56.2	8.4	951.528	23.5	3.5	79.7	12.0
1400-	442.613	39.8	6.0	19.823.508	14.5	2.1	54.3	8.2
total	22.354.169	2.007.4	301.1		301.4	45.2	2.305.8	346.3

(1) Calculated based on population structure in 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

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 grams in urban areas and from 73.4 to 44.6 in rural areas. The average protein intake in both regions would be less than the required level. Only 5 percent of the rural and 36 percent of the 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 (4percent fat) were used, about 4.43 million tons would be required. The market value would be at least L.E 655 millions, assuming an international market price of L.E. 212 per ton of dissolved dry milk equivalent

A study by Scrimshaw indicates that in a country where most of the food calories are supplied by cereal grains, the complementary foods are often low in nutrients. Therefore, any policy on staple foods must consider not only the caloric value but also the overall nutritive value of the diet (19). In Egypt, more attention has been paid to cereals and less to increasing the availability of legumes. Legumes are an important source of protein to complement cereal in diets. As table 13 indicates, considering the cost Involved, legumes are the cheapest source of protein and the most concentrated energy source.

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 legumes production is less availability in the rural areas, where people are nutritionally more vulnerable. One option is to supplement the cereal with peanut or soy-preparation, both high in protein content. The latter alternative raises the importance of evaluating the nutritional impact of the two alternative uses of soybeans: either for poultry feeds (the present situation) or as a processed food for human consumption. There is still some concern for adding other types of quality protein, especially to improve children's diets. It is likely that much more food deficiency might have been detected if intra-family food distribution were analyzed (18).

Table 11: Effect of free market wheat price on per capita energy and protein availability by income class in urban Egypt

Annual household expenditure in L.E.	Percentage of		Daily per capita energy (Kcal)			Daily per capita protein (gm)			
	Urban Population	Annual expenditure	consumption	Requirements	Net balance	Consumption: Gross protein	Consumption: Net protein utilization	Requirements	Net balance
200	5.6	2.62	2.291	2.240	+451	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

Source: calculated from tables 4, 5, 6, 9, and 10.

Table 12: Effect of free market wheat price on per capita energy and protein availability by income class in Rural Egypt

Annual household expenditure in L.E.	Percentage of		Daily per capita energy (Kcal)			Daily per capita protein (gm)			
	Rural Population	Annual expenditure	consumption	Requirements	Net balance	Consumption: Gross protein	Consumption: Net protein utilization	Requirements	Net balance
200	14.39	9.26	1.505	2.257	-752	36.6	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.

Table 13: Average value and net protein utilization of animal products, wheat and legumes

Item	Red meat	White meat	Eggs	Milk equivalent (4-percent fat)	Wheat	Legumes
Average border price (L.E. per ton)	1.600	1.280	1.200	212	150	150
Percent protein content	18.6	12	12.4	3.5	11.7	22.2
Percent protein quality (BV)	67	70	94	85	60	60
Net protein utilization per ton (KPU) (kg)	124.62	84.0	116.56	29.75	69.6	133.2
Average border price per gm NPU (L.E. per gm)	1.28	1.52	1.03	0.71	0.22	0.11

Source: Calculated from food and Agriculture Organization, Trade Yearbook, Rome, 1981.

Table 14: Production and 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.

SUMMARY AND CONCLUSION

The study indicates that while adequate calories are provided at all income levels, inequalities in the distribution of food between rural and urban areas and among various income classes are reflected in protein supplies. Large segments of the population consume less than the nutritionally recommended level of protein 52 percent of the urban population and 74 percent of the rural population. This is mainly because of the low quantity and 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 vegetable protein. The nutritional implication of the positive Income elasticities is that if the availability of food can be expanded to maintain constant food prices, income increases will considerably improve nutrition. This is true if Income distribution does not become more unequal. This approach will result in considerable social costs because a large part of the additional food will be available to the no deficit consumer groups. The urban high-income groups already consume as much as 1.4 times the required calorie level and 1.3 times the protein requirement.

Today, Egypt relies heavily on the international market for satisfying its food needs. In recent years, about two-thirds of Egypt's wheat was imported and heavily subsidized. Food subsidy costs are high and are expected to increase.

In 1977 a sudden change in food price policy led to a food riot. Our study indicates that a wheat price increase to international price levels implies *a* large nutritional sacrifice for the poor if the present income distribution continues. Domestic resource constraints and international market realities are forcing policymakers to look for the most cost-effective food policy.

Implementation of gradual, target-oriented nutritional programs could reduce the political and budgetary costs associated with competitive market pricing of wheat, and at the same time improve the well-being and nutritional status of the poor. The target-group oriented policies would generally be more cost-effective than a general food subsidy. Programs like food stamps, which tend to provide supplementary food purchases only for low-income people, are also an income relief because of the substitution of bonus stamps to purchase food. The characteristics of the program are similar to a negative income tax system and benefits could be allocated 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.

An option to overcome protein quality deficit in Egyptian diet is direct nutritional intervention programs such as school lunches. Increasing milk consumption as the least cost item out of other animal protein might be considered. 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 change in food pricing policies.

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