

Research Report Series No. 150

Research Report Series No. 150

**ENERGY AND PROTEIN INTAKES:
A CASE STUDY OF RURAL PAKISTAN**

Shaheen A. Butt and Tallat Mahmood
Staff Economists

October 1986

PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS
POST BOX NO. 1091, ISLAMABAD
(Pakistan)

Research Report Editorial Committee

Dr M. Ghaffar Chaudhry (Convenor)

Dr Khwaja Sarmad (Member)

ACKNOWLEDGEMENTS

The authors are Staff Economists at the Pakistan Institute of Development Economics. They would like to express their gratitude to Professor Syed Nawab Haider Naqvi, Director, Pakistan Institute of Development Economics, for his constant encouragement during the study. They are also grateful to Dr Heather W. Goldman (Family Health Project Officer: USAID) for ~~his~~ valuable comments and innumerable discussions which ~~they~~ made on an earlier draft of this paper. The excellent typing assistance provided by Mr Pervaiz Akhter is also acknowledged.

ENERGY AND PROTEIN INTAKES
(A case study of Rural Pakistan)

INTRODUCTION

The determination of household food consumption requires the knowledge of a number of factors. Dietary habits of people, household income, household size and number of earners in a household are just a few among them. There have been detailed studies of the consumption for food items for the rural sector of Pakistan [3,5,16,18,28]. In these studies income/expenditure and household size elasticities for food items has been analysed for various socio-economic groups of the economy. Studies on the food consumption patterns at different income levels reveal household preferences for food items. Although such information is important as far as predicting changes in demand for food commodities with changes in relative prices or income level are concerned, it is not sufficient to gauge the adequacy¹ or inadequacy of prevalent diet pattern particularly with reference to recommended allowances. On the other hand, a study done by the nutritionists suggests that people living in rural areas of Pakistan have levels of energy and protein intakes which are marginally sufficient to meet the recommended intakes of energy and protein (these figures are 2044 kcal and 34 gm respectively) [12]. Studies by Alauddin [1] and Naseem [21], reveal that the household lying in lower income brackets are extremely deficient in energy intakes.

1. Diet which supply the WHO/FAO recommended intakes of energy and protein are described as a adequate in the present study. See [26,32].

The objective of the present study is to describe the adequacy or otherwise of the energy and protein intakes based on diet patterns among different income brackets and professions for rural sector of Pakistan. The diet pattern of the rural people is evaluated on the basis of their revealed preferences for different food items estimated through the income/expenditure elasticities. The figures of income/expenditure elasticities for different food items across income groups are selected from other studies done on the issue of consumption patterns of Pakistan /5,16/ whereas the expenditure elasticities for occupation are estimated by ourself.

The paper is divided into five sections. Section 2 contains the methodology by which the demand pattern of consumers engaged in different occupational activities are studied. Data requirements and problems are discussed in section 3. In section 4 the empirical results are presented and analysed. The summary of results and the major conclusions are presented in section 5.

2. METHODOLOGY

To estimate an average level of energy and protein intake, we will first analyse food items consumed by looking at the quantity of components consumed i.e. carbohydrates, fats and protein. The value of total protein and energy intake is obtained simply adding the protein and energy content of different food items consumed. Information on metabolic energy supplied per gram of carbohydrates, fats and protein was gathered from FAO/34)²

2. They are 4 kcal, 9 kcal and 4 kcal respectively for carbohydrates, fats and protein.

Protein and energy intakes across income groups will be computed by using informations from Household Income and Expenditure Survey for period 1970-71 and 1978-79 /10/. The income defined in the Household Income and Expenditure Survey in two different time periods are not the same. Thus a direct comparison of the energy and protein intake of different income groups between 1970-71 and 1979 is not straight forward. However, the figures of food expenditure are more or less close to each other excluding exceptions. Hence one can draw a general analysis about the changes in energy and protein intakes across years.

Energy intakes across various occupations e.g. landlords, peasants, tenants, shopkeepers, artisans, farm workers and moens is computed using the information from /26/ for rural Punjab. Land ownership and tenancy status are expected to effect the level of dietary intake of households. This is because in rural sector the consumption of food items e.g. cereals, pulses and milk and milk products which supply the bulk of calorie and protein depend upon the farm production activity. Form example fodder which is grown by the cultivating families is utilized as a diet for those animals which produce milk and milk products for the consumers. Therefore we have placed all those professions together in the category of cultivators which are involved in farm production activity.

In order to study the demand preferences of cultivator and non-cultivator families three types of Engel curves will be estimated

for different food items. These functional forms are specified as;

- 1. $\text{LN}X_i = \alpha_i + \beta_i \text{LN}Y$ (Double-log)
- 2. $\text{LN}X_i = \alpha_i + \beta_i \frac{1}{Y}$ (Log-Reciprocal)
- 3. $\text{LN}X_i = \alpha_i + \beta_i \frac{1}{Y} + \gamma_i \text{LN}Y$ (Log-Log-Reciprocal)

where X_i = Per capita consumption of food goods
(measured in chitanqs²)

Y = Per capita total expenditure
(measured in rupees)

i = stands for food goods

The objective of applying various functional forms of Engel curve is to investigate the consumer behaviour which varies across food items. Secondly, it provides information on whether income/expenditure elasticity varies with changes in income level. This hypothesis has been tested by applying log-log-reciprocal and log-reciprocal Engel curves [for detail see 2/]. In the analysis of consumption pattern the most commonly used procedure to select the best fitted Engel curve is Cox-Box test. This test is not an appropriate device to choose the correct functional form as it only depends on the value of weighted residual sum of square. It does not select an equation on the basis of the significance of parameters which are equally important for the choice of functional forms, e.g. consider a following quadratic Engel curve

$$X_i = \alpha_i + \beta_1 Y + \gamma_1 Y^2$$

In this case significance of γ_1 depicts whether Engel curve is linear or curvilinear. If adjusted R^2 for the quadratic Engel curve

2. One kilogram=17.1456 chitanqs

is relatively higher than the adjusted R^2 of linear Engel curve and at the same time γ_1 is insignificant, then we can not state that the correct specification is curvilinear. Therefore for the choice of appropriate Engel curve we have to rely both on the values of adjusted R^2 and the significance of the parameters.

To evaluate significant differences in consumption patterns across cultivator and non-cultivator families heterogeneity test³ will be applied.

3. DATA PROBLEMS

This study is primarily based on data from Farm Accounts and Family Budgets /26/ and from the Household Income and Expenditure Survey /10/. The data available on milk and milk products and meat in the former source are disaggregated further into milk, butter, desi-ghee, meat, beef and fish. The weights used to disaggregate are taken from the various issues of Household Income and Expenditure Survey. The detailed data on fruits and vegetables are not available in the 'Farm Accounts and Family Budget'. Therefore the values computed for energy intake for various occupational activities are slightly downward biased. Roughly an average of 2.5% of the total energy intake is obtained from the consumption of vegetables and fruits /12/.

4. RESULTS AND ANALYSIS

PROTEIN REQUIREMENTS AND INTAKES

Recommended protein intakes for growth and maintenance have been suggested differently in different studies. In the

3. For detail see /17/.

Micro-Nutrient Survey /127, 34.00 grams of protein is taken as the standard nutritional requirement of human body for rural people of Pakistan. According to this study the protein intakes are more than 100% of recommended daily allowances. In an other study on "Protein Problems of Pakistan" /22/, 69.8 gram of protein per head per day has been suggested as recommended daily allowance. The figure account for losses and uneven distribution of protein consumed and are therefore higher than the value computed in the Micro-Nutrient Survey. These days nutritionists do not suggest this figure as the daily recommended allowance except in recovery from febrile illness. For the analysis of protein intakes, however, we will take 34.00 gram of protein as the recommended daily allowance of protein. Because this figure is suggested by FAO/WHO for the people of Pakistan and account for height, weight, sex and age distribution of the population and also the NPU of of the typical diet.

The general impression which one gets from table 2 is that the protein intakes of rural masses are more than the daily recommended allowances. Major portion of protein consumed by the rural masses is obtained from the vegetable source of food items (i.e. wheat, rice, pulses etc). The share of animal protein in total protein intakes rises with the increase in income level and for the highest income groups this share is more than 30 percent. The share of protein obtained from mutton, chicken and eggs increases as their income level rises particularly in 1975, however the

TABLE 1. PROTEIN INTAKES FOR DIFFERENT INCOME GROUPS 1970-71 (FOR RURAL PAKISTAN)

Income groups at constant prices of 1969-70 (Rs./months)	Total food expenditure at constant prices of 1969-70 (Rs./month)	Family size	Total protein intakes (gm.)	Animal protein (in %)	Vegetable protein intakes (in %)
1	2	3	4	5	6
upto Rs. 93	40.65	2.3	66	12	88
Rs. 94 - "	76.26	4.1	67	13	77
" 141 - "	100.63	5.1	67	14	86
" 188 - "	124.79	5.8	72	15	85
" 236 - "	145.57	6.5	72	17	83
" 293 - "	169.61	6.9	76	17	83
" 377 - "	222.85	8.5	77	19	81
" 471 - "	254.34	8.6	69	27	73
" 707 - "	353.17	11.1	95	23	77
" 942 - "	479.67	8.1	106	46	54
" 14126 above	545.22	10.8	107	33	67

same pattern is not observed in 1970-71 [see appendix table

A & B]. Table A and B further explain that over the time, the

share of eggs and chicken protein in total animal protein has

significantly increased.

TABLE 2: PROTEIN INTAKE FOR DIFFERENT INCOME GROUPS 1978-79 (FOR RURAL PAKISTAN)

Income groups at constant prices of 1969-70 (Rs./month)	Total food expenditure at constant prices of 1969- 70 (Rs./month)	Family size	Total protein intakes (gm.)	Animal protein intakes (in %)	Vegetable protein intake (in %)
1	2	3	4	5	6
upto Rs. 104	57.44	3.0	55	14	86
Rs. 105 - " 138	80.51	4.0	60	16	74
" 139 - " 173	97.07	4.6	61	18	82
" 174 - " 207	115.44	5.1	62	19	81
" 208 - " 276	140.33	5.9	64	21	79
" 277 - " 345	171.72	6.9	65	21	79
" 346 - " 518	213.74	7.5	72	24	76
" 519 - " 690	275.69	8.7	76	25	75
" 691 - " 1035	351.36	10.1	80	26	72
" 1037 - " 1208	402.63	10.9	79	27	73
" 1209 & above	579.78	11.0	107	31	69

The basic diet of the low-income groups, is based on cereals (wheat, rice, maize etc.). The proteins in cereals are often low in nourishment value owing to the fact that most of them are deficient in one or more essential amino acids. For example rice is low in lysine and threonine and wheat is low in lysine [36]. From point of view of nutrition adequate amount of protein can be consumed only when the incomplete protein of cereals is improved in quality by consuming supplementary animal protein [13].

ENERGY REQUIREMENTS AND INTAKES

The break down of total energy intakes into vegetable and animal sources are shown in Tables 3 and 4. On average daily energy requirements assessed by different studies varies from 2000 kcal to 2600 kcal per head. Since these average estimates of energy recommended allowances account for sex-age distribution of population and are also effected by the weight of reference adult man and woman therefore its value varies from one study to another. According to Alauddin [1], considering sex-age composition of population, the daily per person energy required is 2586 kcal and

TABLE 3. ENERGY INTAKES FOR DIFFERENT INCOME GROUPS 1970-71 (FOR RURAL PAKISTAN)

Income groups at constant prices of 1969-70 (Rs./month)	Protein energy ratio (in %)	Total calorie intakes (kcal)	Animal source of calorie intakes (in %)	Vegetable source of calorie intakes (in %)
upto Rs. 93	13	1841	12	88
Rs. 94 - " 140	15	1760	14	86
" 141 - " 187	15	1907	16	84
" 188 - " 235	15	1905	18	82
" 236 - " 282	15	1935	19	81
" 283 - " 376	15	2028	20	80
" 377 - " 470	15	1980	23	77
" 471 - " 706	13	2189	26	74
" 707 - " 941	15	2621	27	73
" 942 - " 1412	18	4187	31	69
" 1412 & above	18	2417	36	64

according to the Micro-Nutrient Survey the same is 2044 kcal. The energy requirement computed in the present study is 2124 kcal per head per day for 60 kg weight of the adults and 2058 kcal for 50 kg weight of the adults. These computed figures also keep in view the age and sex composition in total population for the period 1981/247. According to tables 3 and 4 the income groups falling beyond the real income Rs.346-Rs.518 level are not malnourished in 1979 if the standard energy requirement is considered as 2124 kcal but in 1970-71 the real income groups falling beyond Rs.471-Rs.706 are not malnourished. However, the comparison of poverty level based on the nutritive intakes of the rural people is very sensitive to the methodology adopted in the computation of energy intake figures.

Table 4: ENERGY INTAKES FOR DIFFERENT INCOME GROUPS 1978-79 (FOR RURAL PAKISTAN)

Income groups at constant prices of 1969-70(Rs.month)	Protein energy ratio (in %)	Total calorie intakes (in %)	Animal source of calorie intakes (in %)	Vegetable source of calorie intakes (in %)
upto Rs. 104	13	1761	10	90
Rs. 105- "	138	1820	12	88
" 139- "	173	1846	13	87
" 174- "	207	1862	14	86
" 208- "	276	1962	16	84
" 277- "	345	1999	16	84
" 346- "	518	2168	18	82
" 519- "	690	2311	19	81
" 691- "	1036	2411	21	79
" 1037 "	1208	2425	21	79
" 1209&above	13	3201	23	71

Animal source of calories intakes are positively affected by an increase in income level. In 1979 for the highest income group, 25% calories intake is obtained from animal food item and for the lowest income group it is 10%. The share of calories from mutton, chicken and eggs increases and of milk, fish and beef decreases in total animal calories intake with the increase in income level in 1979. [See appendix Table D].

4. III. PROTEIN AND ENERGY INTAKES; A MIX ANALYSIS

In this section we have investigated the protein intake of the rural people living in lower income groups keeping in view their level of energy intake. From tables 1 to 4 insufficient energy levels were recorded for the household constituting the lower income brackets. It is strongly argued by a number of experts that protein is inefficiently metabolized whenever energy intakes are inadequate for human body requirements [13, 34, 35, 36]. From the results shown in tables 1 to 4, we may conclude that in lower income groups protein is used more for energy and hence is not available for tissue maintenance and growth purpose. The nutritionists have emphasized in the literature that the adequacy of energy intake must receive first consideration, so that any additional protein supplied to meet the estimated protein needs will efficiently be utilized for the purpose of body growth, repair and maintenance. Economists support this principle since foods which supply quantities of higher quality protein (animal products) are generally much more expensive per unit than carbohydrate sources (cereals and cereals products etc. and sugar).

The suggested level of protein energy ratio in the diet varies from one source to another, therefore there is not hard and fast rule which may be used to identify whether consumed protein-energy ratio is desirable or not. The diet pattern of poor has improved in a sense that their level of energy intake has marginally increased and that of protein intake decreased and also the share of animal protein in total protein increased over the time. This behaviour is recorded because use of eggs and chicken in the diet has increased. Chicken and eggs are by products of each other and their production has increased in the country particularly in the seventies.

Table 5 highlights the quality of diet of consumer in developed and underdeveloped countries. As regards energy intakes almost all underdeveloped countries are malnourished as compared to developed countries but in protein intake they are self sufficient. In under-developed countries income elasticities for calorie intakes is close to 0.5 but in developed countries income elasticity for calorie intake is zero. Use of animal protein is considered as luxury in most under-developed countries.

4. Passmore states that there is no fit criteria or evidence that the exact protein-derived energy intake is compatible with a healthy, vigorous life. But in the diet of a healthy community 10% or more of the energy is provided by protein /35/. In an other study by FAO/WHO /33/ 11% to 13% of the protein energy is said to be nutritionally desirable while Miller /33/ suggests this ratio as 8%, 7.8%, 5.9%, 8.4%, 14.6% and 3.5% accordingly for infant, toddler, child, adolescent, adult and female.

Calorie intake in the rich class of an underdeveloped country like Pakistan, is closely associated with the recognised living standards. To explain the higher income/expenditure elasticity for animal protein (i.e. meat), different experts give different arguments. High prices and scarce supply of meat are attributed by many to be the main cause of this tendency/57.

TABLE 5. QUALITY OF DIET INTAKE IN DEVELOPED AND UNDERDEVELOPED COUNTRIES

Countries	Calorie intakes (kcal)	Protein intakes (gm)	Income elasticity		
			Calorie intakes	Protein intakes	Animal protein intakes
<u>Developed countries</u>					
United States	3100	91.2	.02	.01	.05
Canada	3017	91.2	.00	.02	.07
France	2975	103.0	.05	.04	.29
Germany	2964	80.3	.05	.09	.28
U.K.	3276	89.0	.00	.06	.20
Japan	2228	69.1	.20	.20	.51
<u>Undeveloped countries</u>					
Pakistan	2092	47.8	.51	.54	1.30
Ceylon	2080	43.6	.56	.55	.87
India	2017	51.5	.56	.50	1.50
Indonesia	2156	43.3	.53	.54	1.38
Malaysia	2261	52.8	.34	.24	.81

Source: /32/

Another reason may be an increasing awareness of vulnerable groups about the calorie/protein mix in their food consumption. In this context sociological aspects should not be over-looked as the consumption of meat is considered to be the symbol of prosperity and delicacy in eating habits. Various studies done so far on the consumption pattern of rural sector of Pakistan also explain that animal sources of food are preferred in diet pattern particularly in lower income bracket inspite of the fact that they are extremely deficient in energy intake. The poor are deficient in energy intake therefore their first preference should be for those food items which carry higher units of energy. Bousink ¹⁵⁷ has estimated the income elasticities for different food items for the period 1963-64 for lower income groups of rural sector of Pakistan. The estimated income elasticities are : wheat (.36), rice (1.07), pulses (.15), vegetable fats (-.32), sugar (.14), milk (1.74), desi-ghee, butter (1.20) and meat (1.33). These estimates explain that even the poor masses of rural sector are highly sensitive to the demand of meat, milk and desi-ghee. It is interesting to note that vegetable fats are considered as inferior food good in rural Pakistan during that year, inspite of the fact that it carry higher units of energy. In another unpublished study by Irfan and Mahmood ¹⁶⁷, the income elasticities obtained for these food items are: wheat (.21), rice (.61), pulses (.44), oils and fats (.46), sugar (.54), milk (.88), meat (.58) for the period 1973. Meat and milk which were treated as luxury items in the former study are observed to be necessities in the latter study. Fats and oils are commonly used now-a-days as the substitute of desi-ghee. We can relate these changes in food consumption pattern to that of changes in relative prices of food goods. The prices of these

food goods are relatively higher which are scarce in production/ supply. But if the prices of all food goods are moving at more or less the same rate in one direction than any change in the consumption pattern may be attributed to the changes in the taste of consumers rather than the relative prices.

Our results further show that among the rich the desire to include meat in their food far exceeds the recognised nutritional requirements. Signs of obesity and calorie overfeeding are found in the rich class of rural Pakistan as they are generally not involved in very active professions.

ENERGY INTAKES BY DIFFERENT OCCUPATION GROUPS
IN RURAL PUNJAB 1950-51 AND 1965-66 TO 1970-71

Table 6 shows that energy intake by cultivating families is much higher than the non-cultivating families during 1950-51, 1965-66 and 1970-71. Landlords and peasants attain the highest level of energy intake in the rural sector. They are self sufficient in achieving the recognised standards. Artisans, tenants and shopkeepers consume more or less the same level. Moens and agricultural labourers are generally malnourished. The main cause may have been their low wages and low share in crop yield. The major share of crop production goes to the landlord which enable him to have high nutritional level. Peasants though they own small holdings, can compensate the shortage of foodgrain by adopting measures to improve their crop yield.

Energy consumption of cultivators rose from 2397.95 kcal in 1950-51 to 2720.40 kcal 1970-71 whereas for the non-cultivators

it increased from 1952.44 kcal to 2108.43 kcal during the same period.

TABLE 6 CALORIE INTAKES(KCAL) FOR DIFFERENT OCCUPATIONAL GROUPS 1950-51 AND 1965-66 TO 1970-71

Year	Culti-vators	Non-culti-vator	Big land-lords	Peasant	Tenant	Agri-culture labourer	Artisan	Moens	Shop-keepers
1950-51	2397.95	1952.44	2890.91	2315.86	1987.07	1672.60	2190.86	2099.87	1956.1
1965-66	2037.40	1838.36	2239.52	1815.94	2056.97	1819.69	1091.69	1810.57	1831.1
1966-67	2344.04	1979.67	2615.73	2482.53	1953.97	1902.16	2098.79	2013.90	1907.1
1967-68	2456.29	2025.09	2753.18	2464.77	2120.92	2094.01	2061.36	1957.98	1987.1
1968-69	2464.53	1980.31	2918.46	2365.97	2109.17	1958.71	2126.71	1920.05	1905.1
1969-70	2336.34	1953.99	2722.42	2396.19	1890.40	1770.92	2055.06	1832.50	2117.1
1970-71	2720.47	2108.43	3270.00	2599.70	2291.72	2100.70	2254.0	1642.96	2229.1

Table 7 shows the variation in energy requirements by the change in physical activity. Labourers, peasants and tenants according to table 7 demand higher units of energy as compared to other professions. Therefore the standard energy allowances suggested previously can not be used to see the nutritional status of those professions which are involved in farm production activity. The average energy intake figures computed for a household do not explain the details of the energy intake level of different family members. The malnourishment in a household also depends upon how total energy intake is distributed to various family members of different age group and sex. There can be a compensation of the calorie intake by the

TABLE 7
ENERGY REQUIREMENT IN SPECIFIED ACTIVITIES

	kcal per min
In bed asleep or resting	1.00
Sitting quietly	1.39
Standing quietly	1.75
Walking 3 mile/hour	3.7
Walking 3 miles/hours with a 10 kg	4.0
Office work lead	1.80
Domestic work	
Cooking	2.1
Light cleaning	3.1
Moderate cleaning	4.3
Printing	2.3
Tailoring	2.8
Shoemaking	3.0
Carpenters	4.0
Driving horry	1.6
Labouring(building industry)	6.0
Farming	
Mowing	5.1-7.9
Watering	4.1-7.5
Weeding,digging and transplanting	2.3-9.1

Source: [35]

head of the family because children require and consume below the average level of energy intake. In a study by Francois, Perisse and Kamoan [11], it has been observed for the Tanzanian economy that the risk of malnutrition is the highest in the cases of households with large family size and low incomes. In the case of the rural society of Pakistan, it has been observed that the households lying in the lower income brackets have relatively small family size (due to high rate of mortality [19]) as compared to those households who fall in medium or high income brackets.

It is not necessary that a consumer having low expenditure elasticity for wheat and high expenditure elasticity for meat must be spending more/less on wheat and less/more on meat but it simply explains the tendency how marginal increase in income is distributed among various food items. The knowledge about the distribution of additional income among food goods generated in the rural society is necessary for the nutritionists so that they can gauge and project the demand of food goods. From Table 3, we examined the significant difference in food consumption pattern among cultivator and non-cultivator families. Significant differences exist for wheat, rice, maize, milk and milk product, meat and pulses. Cultivator families have extremely different type of preferences for food goods especially the use of rice and maize is preferred in the cultivating families. The high expenditure elasticity for maize is questionable because maize is considered to be an inferior substitute for wheat and rice in the dietary habits of rural people, but on the other hand maize is biologically more valuable than wheat and rice [20].

By the application of various forms of Engel curves we have evaluated the consumer behaviour for food items. Log-Log Reciprocal Engel curve is found to be the best fit for all food goods except sugar. The signs of β and γ are observed positive which explains that the shape of the said function is just opposite to that of shown in $\sqrt{2}$. This explains that the very poor people are slightly consuming more units of food items as compared to poor people (the same can be observed from table 3). The energy intake figures of the lowest income group (i.e. Rs.93) is 1841 kcal while for the high income groups (i.e. Rs.94-Rs.140 & Rs.141-Rs.187) these figures are 1760 kcal and 1807 kcal respectively). in 1970-71.

TABLE 8 OVERALL HOMOGENEITY TEST OF ITEMWISE ENGEL CURVES ACROSS CULTIVATORS AND NON-CULTIVATORS (1970-71)

	L.L.	L.R.	L.L.R.	Itemwise expenditure elasticity based on L.L. specification	
				Cultivators	Non-cultivators
Wheat	-	-	-	.28	.28
Rice	**	**	**	.45	.22
Maize	**	**	**	.50	.15
Pulses	**	**	**	.28	.15
Milk & milk products	**	**	*	.63	.59
Meat	**	**	-	.80	.75
Sugar	-	*	-	1.02	1.05

Note: Following symbols are defined as:-

- L.L. Log-log-Engel curve
- L.L.R. Log-log Reciprocal Engel Curve
- * Differences at 5% level of significance
- ** Differences at 1% level of significance

Such results are recorded because we have regressed per capita consumption of food goods (which is measured in quantity) that on total expenditure. Since data used do not account for the quality of

food goods consumed by the households and hence the poor can purchase more units of those food goods which are relatively cheap in quality. For example meat consumed account for beef, mutton, fish and poultry. Beef is cheaper than mutton, fish and poultry. Now suppose if very poor are consuming $1\frac{1}{2}$ kg of beef weekly and poor are consuming 1 kg of mutton weekly then the very poor people are consuming more units of meat than poor people. The another reason which can be given to support the analysis that there might be some food items consumed by the very poor for which they do not pay any money and their expenditure on these food items is not included in the total expenditure of a household.

5. CONCLUSION

A tentative conclusion which emerges from this paper is that Pakistan's rural economy is self-sufficient in protein intake but deficient in energy consumption. However among lower income brackets protein intake is mostly used only to meet the deficient units of calorie intake rather than growth and repair of the muscles and tissues. An additional dose of protein is effective for body growth only after attaining the required level of calorie intake. The diet pattern of the poor people is not accordingly to their biological requirements. Therefore a change in their diet pattern is required so that they can meet the recommended allowances of energy and protein required for human body.

Cultivating families are better off in calorie intake as compared to those of non-cultivators. Income (nutritional level) of the cultivators mostly depends on their crop share. Tenants, meens and agricultural labourers are in poor condition because of their relatively smaller share in crop yield and low purchasing power.

REFERENCES

1. Alauddin, T. 'Mass Poverty in Pakistan: A Further Study' Pakistan Development Review, Vol.XIV. No.4 Winter 1975.
2. Asian Productivity Organisation, Changes in Food habits in relation to increase of productivity. Report of the symposium held in Manila, August 22-28, 1972.
3. Aziz-ur-Rehman, A.N.M. "Expenditure Elasticity in Rural West Pakistan". Pakistan Development Review, Vol.III, No.2 Summer 1963.
4. Becker G.S. "Economic Theory" Alfred A. Knopf, Inc. New York: 1971.
5. Bussink W.C.F., A Complete Set of Consumption Coefficients for West Pakistan. Pakistan Development Review, Vol.X No.2 Summer 1970.
6. Cepede. M., "Sociology and Nutrition", Food & Nutrition Bulletin Vol.1 No.2, 1975.
7. Coondoo, D. R. Mukherjee, D.S.P Rao, "Occupational Variation in the pattern of consumer expenditure in Rural India", "Indian Journal of Agriculture Economics, Vol.XXX, No.4 Oct.-Dec. 1975.
8. Deaton, A.S. "The Analysis of Consumer Demand in United Kingdom 1900-1970" Econometrica, 42, pg.341-67 1974(a).
9. Deaton, A.S. Essays in the theory and measurement of consumer behaviour, Cambridge University Press, Sydney. 1981.
10. Federal Bureau of Statistics, Household Income and Expenditure Survey 1979, 1970-71; Karachi.
11. Francois P., J. Perisse and A. Kamoun The Effect of Household Size and Income on the Probability of Energy Inadequacy. Food and Nutrition Bulletin Vol.8 No.1 1982.
12. Government of Pakistan, Nutritional Cell; Planning and Development Division, Micro Nutrient Survey of Pakistan (1976-77). June 1978.
13. Goldman H.W. and C.G. Ranade "Analysis of Income Effect on Food Consumption in Rural and Urban Philippines". Journal of Agricultural Economics and Development Vol.VII, No.2 July 1977.
14. Houthakhar, H.S. and Lester D. Taylor., Consumer Demand in the United States: Analysis and Projections: Harvard University Press; 1970.

15. Intrilligator M.D. Econometric Models, Techniques, & Applications New Jersey: U.S.A. 1978. ch.7.
16. Infan M. and T. Mahmood, Consumption Patterns in Pakistan 1978-79.
17. Johnston J. Econometric Methods; McGraw-Hill Inc. Tokyo, 1970.
18. Khan, M.I. "A Note on Consumption Patterns in Rural Areas of East Pakistan". Pakistan Development Review. Vol.III, No.3, Autumn 1983.
19. Knowles, J.C., The determinants of Mortality in a low income area of Karachi, Pakistan Journal of Applied Economics; Vol.I, No.1 Summer 1982.
20. Lesser, C.V. "Forms of Engel Functions". Econometrica Vol.31, No.4, October 1963.
21. Naseem S.M. "Under Development, Poverty and Inequality in Pakistan" vanguard publications Ltd., Lahore, Pakistan 1981.
22. Pakistan, National Science Council, "Protein Problems of Pakistan", 1968.
23. Philips, L. Applied Consumption Analysis. Amsterdam:North-Holland. 1974 ch.4.
24. Population Census Organization Division, Census Report of Pakistan 1981, Islamabad 1984.
25. Prais, S.J. and U.S. Houthakkar. The Analysis of Family Budget Cambridge: Cambridge University Press 1955.
26. Punjab, Economic Research Institute, Farm Accounts and Family Budget. various issues, Lahore
27. Robertson, T.S. Consumer Behaviour, Harvard University, Scott Foresman and Company, U.S.A. 1970.
28. Siddiqui, R. "An Analysis of Consumption Pattern in Pakistan" Pakistan Development Review, Vol.XXI, No.4, Winter 1982.
29. Stigler, G.I. "The Early History of Empirical Studies of Consumer Behaviour". Journal of Political Economy, Vol.II, No.2 April 1964.
30. Serimshaw N.S. and R. Lockwood Interpretation of Data on Human Food Availability and Nutrient Consumption, Food and Nutrition Bulletin, Vol.2, No.1, January 1980.
31. United Nations; Food and Agriculture Organisation "Nutrition in relation to Agricultural Product" Rome, 1965.

32. United Nations; Food and Agriculture Organisation "Agricultural Commodities-Projection for 1975 and 1985" Vol.I & II, Rome, 1967.
33. United Nations; Food and Agriculture Organisation "Energy and Protein Requirements" FAO Nutrition meeting report series No.52, Rome 1973.
34. United Nations; Food and Agriculture Organisation, "Hand Book on Human Nutritional Requirements", Rome, 1974.
35. United Nations; Food and Agriculture Organisation, "Energy and Protein Requirements" Rome, 22 March - April 1971, 1973.
36. United Nations, Recommendations by a joint FAO/WHO Informal Gathering of Experts. "Energy and Protein Requirements". Food and Nutrition, Quarterly Review, Vol.I, No.2, 1975.

APPENDIX

TABLE A
PROTEIN INTAKES BY INCOME GROUPS 1970-71

Income groups at constant prices of 1969-70 (Rs./month)	Total protein intakes in gm/person	% of total protein intakes		% of total animal protein intakes							
		Vegetable source	Animal source	Milk fresh & boiled	Butter	Desi-ghee	Mutton	Fish	Chicken	Beef	Egg
up to Rs. 93	56.08	87.94	12.07	48.09	.03	.26	1.13	.79	0	28.44	21.32
Rs. 94 - "	66.65	86.60	13.40	51.47	.05	.23	3.64	5.34	1.33	27.92	9.97
" 141 - "	67.23	85.53	14.47	56.46	.06	.25	4.01	4.20	.91	24.89	9.23
" 188 - "	71.61	84.79	15.21	60.51	.06	.27	4.77	3.76	1.09	22.24	7.25
" 236 - "	71.77	83.49	16.51	58.06	.06	.25	4.39	3.45	.75	23.44	9.62
" 283 - "	75.52	82.60	17.40	58.22	.05	.28	6.34	2.54	1.58	22.22	8.64
" 377 - "	76.61	80.80	19.20	56.70	.06	.23	10.16	4.17	1.01	20.34	7.34
" 471 - "	68.60	73.16	26.84	50.52	.05	.24	7.41	4.44	1.94	18.18	17.22
" 707 - "	95.01	77.54	22.46	58.72	.12	.14	11.27	.96	2.93	11.02	14.85
" 942 - " 1412 *	186.42	54.17	45.83	13.89	.04	.06	6.85	3.07	61.90	7.42	7.15
" 1412 & above	107.28	67.08	32.92	27.51	.04	.13	8.46	.77	2.95	22.12	42.86

* The figures of food items in this income group are incorrectly reported in Household Income and Expenditure Survey for the period 1970-71.

TABLE B
PROTEIN INTAKES BY INCOME GROUPS 1978-79

Income groups at constant prices of 1969-70 (Rs./month)	Total protein intakes in gm/person	% of total protein intakes		% of Animal protein intakes							
		Vegetable source	Animal source	Milk fresh & boiled	Butter	Desi-ghee	Mutton	Beef	Fish	Chicken	Egg
up to Rs. 104	58.11	86.50	13.50	54.05	.00	.10	2.66	19.47	1.86	2.09	19.76
Rs. 105 - "	60.21	83.69	16.31	48.86	.00	.10	.92	19.42	2.97	1.67	24.84
" 139 - "	60.53	81.98	18.01	51.91	.00	.10	2.56	18.20	3.35	1.50	22.38
" 174 - "	61.59	80.61	19.39	52.03	.00	.11	3.50	17.90	3.06	1.37	22.03
" 208 - "	64.15	78.97	21.03	50.50	.00	.11	3.62	16.98	3.25	1.82	23.72
" 277 - "	65.24	78.36	21.64	51.44	.00	.12	3.94	17.84	2.58	2.32	21.75
" 346 - "	71.22	76.44	23.56	47.68	.00	.12	4.98	16.83	2.18	2.93	26.37
" 519 - "	75.62	76.30	24.70	47.38	.00	.10	5.97	15.53	1.95	3.95	25.11
" 691 - "	79.92	72.24	27.76	41.85	.00	.12	5.95	15.95	1.81	5.18	29.16
" 1037 - "	78.67	73.50	26.50	47.77	.00	.14	7.02	16.84	1.39	4.33	22.50
" 1209 and above	106.72	69.24	30.76	38.56	.00	.11	9.55	15.81	1.78	5.74	28.45

TABLE C

ENERGY INTAKES BY INCOME GROUPS 1970-71

Income groups at constant prices of 1969-70(Rs./month)	Total calorie intakes in kcal/person	% of total calorie intakes		Percentage of animal calories							
		Vegetable source	Animal source	Milk fresh & boiled	Butter	Desi-ghee	Mutton	Beaf	Fish	Chicken	Egg
up to Rs. 93	1840.74	87.99	12.03	42.72	8.14	27.20	.49	5.87	.18	0.00	15.54
Rs. 94 - "	1760.41	85.90	14.10	46.24	13.61	24.67	1.48	5.66	1.13	.24	6.96
" 141 - "	1807.35	83.55	16.45	46.15	16.66	24.34	1.49	4.59	.81	.15	5.80
" 188 - "	1904.67	81.15	18.15	47.61	15.69	25.77	1.71	3.95	.69	.17	4.46
" 236 - "	1935.01	81.08	18.92	46.94	15.69	24.63	1.62	4.27	.66	.12	6.06
" 283 - "	2028.19	79.79	20.21	46.62	12.64	27.17	2.35	4.01	.49	.25	6.47
" 377 - "	1960.12	77.45	22.55	46.65	17.65	22.44	3.81	3.77	.81	.17	4.70
" 471 - "	2188.56	74.79	25.21	42.18	15.61	23.71	2.82	3.42	.87	.32	11.17
" 707 - "	2620.97	73.21	26.79	44.55	30.14	12.68	3.90	1.88	2.06	.44	8.79
" 942 - "	4186.97	69.08	30.92	26.19	23.49	11.61	5.15	2.76	1.18	20.45	9.19
" 1412 & above	2417.48	64.06	35.94	27.93	12.44	15.38	3.92	5.26	.18	.60	33.93

* The figure of food items lie in this income group are incorrectly reported in Household Income and Expenditure Survey for the period 1970-71.

TABLE D

ENERGY INTAKES BY INCOME GROUPS 1978-79

Income groups at constant prices of 1969-70(Rs./month)	Total calorie intakes in kcal/person	% of total calorie intakes		% of total animal Calorie intakes							
		Vegetable source	Animal source	Milk fresh & boiled	Butter	Desi-ghee	Mutton	Beaf	Fish	Chicken	Egg
up to Rs. 104	1761.44	90.33	9.67	57.58	2.84	14.02	1.40	5.04	.50	.30	17.74
Rs. 105 - "	1819.57	88.08	11.92	51.57	5.56	13.75	1.10	4.96	.79	.37	21.89
" 139 - "	1846.21	86.65	13.35	53.54	6.85	13.32	1.29	4.54	.87	.33	19.26
" 174 - "	1861.57	85.55	14.45	53.82	5.38	14.42	1.77	4.48	.80	.30	19.03
" 208 - "	1961.57	83.96	16.04	50.46	8.44	14.22	1.76	4.10	.82	.39	19.83
" 277 - "	1999.20	83.58	16.42	51.56	7.35	15.45	1.93	4.32	.65	.50	18.22
" 346 - "	2167.77	82.00	18.00	47.79	8.04	15.29	2.44	4.08	.55	.63	21.18
" 519 - "	2311.29	80.93	19.07	46.79	7.67	16.92	2.88	3.71	.49	.84	20.71
" 691 - "	2410.91	78.45	20.55	43.63	5.92	16.34	3.03	4.01	.48	.16	25.44
" 1037 - "	2425.38	79.51	20.49	46.70	8.25	18.00	3.35	3.98	.44	.91	18.36
" 1209 and above	3200.78	77.58	22.42	41.11	7.73	14.96	4.97	4.07	.48	1.31	25.34

TABLE E

APPROPRIATE ENGEL CURVES AND EXPENDITURE ELASTICITIES
FOR DIFFERENT FOOD ITEMS FOR THE YEAR 1970-71

Commodity	Functional form	Constant	$\ln Y_i$	$\frac{1}{Y_i}$	\bar{R}^2	F.Ratio	$E_{x,y}$
Wheat	L.L.R	-.47	0.44 (13.05)	19.85 (6.52)	0.64	92.42	0<.28<1
Milk & by product	L.L.R	-3.62	.91 (10.44)	35.60 (4.51)	0.53	13.59	0<.63<1
Maize	L.L.R	-9.57	1.25 (1.71)	92.13 (1.4)	0.009	1.51	.09=0
Sugar	L.R	-1.62		-35.14 (-2.59)	0.50	6.70	.91=1
Rice	L.L.R	-8.68	1.09 (4.20)	80.73 (3.42)	0.13	9.02	0<.46<1
Meat	L.L.R	-9.23	1.14 (8.00)	43.71 (3.38)	0.40	37.13	.80=1
Pulses	L.L.R	-4.23	.40 (5.41)	16.49 (2.43)	0.22	16.53	0<.28<1

Note: 1) Figures given in the parentheses are t-values
2) Following symbol is defined as:-

$E_{x,y}$ = Expenditure elasticity

This work is licensed under a
Creative Commons
Attribution – NonCommercial - NoDerivs 3.0 Licence.

To view a copy of the licence please see:
<http://creativecommons.org/licenses/by-nc-nd/3.0/>