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# Demand Functions for Agro-food Products

# by Product and Household Categories

# in Romania

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**ABSTRACT**

The objective of this paper is to estimate Engel curves, based on about fifteen food products, for three income groups, urban and agricultural households being treated separately, for the period of transition in Romania using Household Budget Survey data for the period 1991-1994. The analysis covers only food items purchased by the household, although consumption of own-produced food commodities (subsistence production) is high, in particular for some commodities (poultry meat, eggs, potatoes, apples). The estimated income elasticities are generally high. Income elasticities for total food purchases range from 0.45 (high income) to 0.70 (low income) for agricultural households and from 0.49 (high income) to 0.84 (low income) for urban households. Individual commodity elasticities range according to a priori expectations with the lowest elasticities observed for bread and the highest elasticities observed for meat and citrus fruit.

**Keywords:**
ROMANIA, FOOD DEMAND ANALYSIS, ENGEL CURVES, TRANSITION ECONOMIES

## 1. Introduction

The estimation of demand has been a favourite subject of many economists, especially in the period following the 60s with the development of mathematical and statistical methods for estimating the parameters of econometric functions. From the methodological point of view, the analysis of the demand for agro-food products passed through several stages, starting with the estimation of some simple equations for one product or for a group of products and finishing with the definition of complex systems of simultaneous demand equations (e.g. the model AIDS - Almost Ideal Demand System, by Deaton and Muellbauer, 1981).

The present paper endeavours to provide an econometric analysis of food demand in Romania through the estimation of Engel curves, using data from family budgets in 1991-1994. Due to the change in the sample as well as the methodology applied for the calculation of the family budget in 1995, the information about this year could not be used because of its lack of homogeneity with that from previous years.

The problem of estimating the demand equations in the countries during transition implies certain difficulties which are mainly linked to the use of non-market levers for regulation of the socio-economic environment (such as subsidies) and also to the lack of reliable statistical data which would permit the use of more sophisticated econometric models. Studies concerned with the analysis of the demand for food according to the evolution of real income and the estimation of the elasticities of income already exist in the writings of some economists in the countries under transition. Mention should be made here of the paper of Nose (1988) concerning the estimation of Engel curves for

Slovenia, as well as the paper of Shaffer which deals with a similar problem in the case of Lithuania.

Due to the lack of coherence in the data on prices, Shapes appreciates that the use of Engel curves in the case of Lithuania provides superior advantages when compared to any other system of demand analysis. For the consumption function he chooses the semi-logarithmic and bi-logarithmic shapes and tries to calculate the income elasticities for urban and rural households for 11 groups of food products. Despite the fact that he used what is considered to be a simple method, it was appreciated that the results he obtained had quite a high degree of consistency and were suitable for the analysis of food policies.

Mention should also be made of the study coordinated by Mizzi, concerning the demand for food in Slovenia; it uses a more sophisticated modelling technique, i.e. the application of the AIDS model for evaluating the food demand elasticities in the country.

## 2. Method and Data Used

The data used originate from the official statistical sources and refer to the income, expenditure and consumption of the wage-earners and peasant families, analysed on the basis of the family budgets, by groups (deciles), according to total net income per person during 1991-1994. Table 1 presents only the income groups corresponding to the years 1991 and 1994; in the paper the data corresponding to the whole period were used. It should be mentioned that the sample used by the National Commission for Statistics includes other types of household besides those of the wage earners and the peasants; also, all information relating to income, expenditure and consumption constitutes the yearly averages.

The data on income and expenditure were transformed from nominal into real terms, by calculating their ratio to the general consumption price index and food price index respectively, corresponding to each year of the period analysed, with 1990 as a base year. The use of this method has both advantages and disadvantages. The main advantage was that this way, a relatively large volume of data was obtained (a series of 39 values for each product), thus allowing the econometric estimation of consumption functions.

The most important disadvantage is related to the fact that the relative lack of homogeneity of data on the temporal side allows a distortion of the results through the alteration of consumer behaviour under the effect of "monetary illusion", as a result of which consumers, perceiving that their wage has doubled, feel richer and thus spend more, even if prices have tripled and their purchasing power has in reality decreased.

Five functional specifications for Engel curves were tested: linear, double-logarithmic, semi-logarithmic, log-inverse and double-log-inverse. Parameter estimation was made using the Least Square method (OLS), and the choice of the functional form was made according to the R-squared (maximum), standard error for estimated $y$ (minimum), and standard error for the consumption function coefficients (minimum). The appreciation of estimation consistency was made with the application of the F-test at a 1% significance level. The estimation of the demand parameters was made separately for wage-earners and peasant families, for the main agro-food products.

Modelling consumption with Engel functions starts with the assumption that there is a valid empirical link between the purchases of different products and total income. The analysis of data on food expenditure in the peasant families revealed a relatively weak link with income in the case of most of the products analysed, except for sugar, edible oil, citrus fruits and alcoholic beverages. The reason for this is the high degree of self-consumption in families of this kind (the value of self-produced food products was more than 80% of the total food consumption expenditure in 1994).

In order to reduce the influence of income disparity, a more detailed analysis was made by splitting samples for each household type into 3 sub-groups: families with low income (deciles 1-3), families

with medium income (deciles 4-6), and families with high income (deciles 7-10). The results confirmed both the existence of sensibly higher demand elasticities for livestock products in the low income groups and Bennett's law, according to which the ratio of the staple food products (potatoes) in the household basket decreases along with an increase in income.

**Table 1** - Income groups, by total net monthly income per person (in Lei)

| Income Groups | Wage earners' families | | | | Peasant families | | | |
|---|---|---|---|---|---|---|---|---|
| | 1991 | | 1994 | | 1991 | | 1994 | |
| | Income range | Number of families | Income range | Number of families | Income range | Number of families | Income range | Number of families |
| I | < 2,600 | 289 | < 46,132 | 569 | < 1,900 | 232 | < 28,777 | 270 |
| II | 2,600-3,399 | 555 | 46,133-55,457 | 570 | 1,900-2,599 | 316 | 28,778-41,465 | ›270 |
| III | 3,400-4,299 | 943 | 55,458-63,405 | 569 | 2,600-3,299 | 388 | 41,466-50,397 | 270 |
| IV | 4,300-5,199 | 1,148 | 63,405-70,546 | 570 | 3,300-4,199 | 437 | 50,398-59,795 | 270 |
| V | 5,200-6,099 | 976 | 70,547-78,000 | 570 | 4,200-5,099 | 414 | 59,796-69,268 | 270 |
| VI | 6,100-7,299 | 817 | 78,001-86,750 | 569 | 5,100-6,099 | 307 | 69,269-78,697 | 270 |
| VII | 7,300-8,499 | 509 | 86,751-97,095 | 570 | 6,100-7,299 | 219 | 78,698-90,892 | 270 |
| VIII | 8,500-9,999 | 324 | 9,096-112,177 | 570 | 7,300-9,099 | 193 | 90,893-106,254 | 270 |
| IX | 10,000-12,990 | 248 | 112,178-137,033 | 570 | 9,100-12,990 | 133 | 106,266-133,156 | 270 |
| X | | | > 137,033 | 570 | | | > 133,156 | 270 |

Source of data: Income, expenditure and consumption of the wage-earners' and peasant families studied through the family budgets, by groups (deciles), according to the level of total net monthly income per person, and by income groups and family size, 1991 -1994.

## 3. Demographic Factors

**Table 2** - Family size and occupational structure

| Income Group | Wage earners' families | | | | Peasant families | | | |
|---|---|---|---|---|---|---|---|---|
| | 1991 | | 1994 | | 1991 | | 1994 | |
| | No. of members | of which: wage earners (%) | No. of members | of which: wage earners (%) | No. of members | of which: peasants (%) | No. of members | of which: peasants (%) |
| I | 5.304 | 24.2 | 4.827 | 27.7 | 3.613 | 46.5 | 3.119 | 56.5 |
| II | 4.665 | 32.0 | 4.205 | 34.5 | 3.411 | 47.4 | 3.394 | 51.5 |
| III | 4.1 | 41.2 | 3.944 | 40.5 | 2.994 | 54.0 | 3.124 | 54.3 |
| IV | 3.783 | 47.1 | 3.774 | 43.6 | 2.877 | 55.8 | 3.091 | 54.7 |
| V | 3.439 | 53.0 | 3.639 | 45.4 | 2.516 | 57.3 | 2.859 | 52.9 |
| VI | 3.116 | 58.8 | 3.502 | 49.3 | 2.319 | 62.3 | 2.559 | 57.1 |
| VII | 2.747 | 64.2 | 3.309 | 51.5 | 2.223 | 63.0 | 2.453 | 57.1 |
| VIII | 2.351 | 70.6 | 2.999 | 55.6 | 2.155 | 67.1 | 2.275 | 62.7 |
| IX | 2.036 | 76.6 | 2.727 | 61.1 | 1.971 | 66.8 | 2.09 | 60.0 |
| X | | | 2.106 | 72.4 | | | 1.931 | 64.3 |

Source: Income, expenditure and consumption of wage earners' and peasant families studied through the family budgets, by groups (deciles), according to the level of total net monthly income per person, and by income group, 1991-1994.

The main demographic variables of the sample are shown in Table 2. A reverse correlation is obvious between family size and the level of income, for both family types studied. At the same time, important changes in the occupational structure within the wage earners' families can be noticed;

thus the share of the wage earners in household composition decreases in 1994 as compared to 1991 for most of the income groups (groups III-X), while the reverse phenomenon occurs only for the *low income groups (I and II). A relatively similar observation is also valid in the case of peasant* families; the percentage of persons who are peasants is lower in 1994 when compared to 1991 for the medium and high income groups (deciles IV-X). A possible explanation for this may be found in the occupational status of the families studied, with the ranking of individuals in a superior income class as a result of the many-sided character of their activities.

## 4. Income and Expenditure Structure

### 4.1. Total income and expenditure

In order to analyse the income structure and its dynamics we considered only the cash income of both types of the households studied. This option has a double motivation; firstly, only the cash income is able to influence the purchase structure (food products included). On the other hand, the nominal income includes consumption of own-produced food, which is a much harder variable to evaluate and which has reached very high levels (33.5% for families with wage income and 81.5% for the peasant families out of food consumption expenditure in 1994). For the wage earners' families other income, originating from the social funds (allowances, scholarships, pensions) as well as amounts coming from other social provisions, are included for income groups II-VIII (Table 3).

For the peasant families, wages, cash payments from agricultural companies and other working income were included in the column labelled "amounts from work payment". Data in Table 3 show that the greatest weight of the income derives from work repayment for groups I-IV; for the income groups VI-X the income from sales became the most important source for the rural household (the sales' weight in income increased in 1994 when compared to 1991 for all groups).

**Table 3 -** Cash income structure (cash money income = 100%) in %

| Groups | Wage earners | | Peasants | | | |
|---|---|---|---|---|---|---|
| | 1991 | 1994 | 1991 | | 1994 | |
| | % wages | % wages | % work payment | % sales | % work payment | % sales |
| I | 75.8 | 78.1 | 43.6 | 35.8 | 24.5 | 54.7 |
| II | 80.5 | 81.9 | 50.1 | 32.5 | 34.7 | 38.7 |
| III | 85.7 | 84.4 | 46.3 | 37.01 | 38.5 | 38.3 |
| IV | 88.2 | 85.6 | 49.4 | 38.03 | 39.07 | 40.2 |
| V | 88.5 | 86.1 | 48.1 | 40.7 | 39.02 | 40.4 |
| VI | 88.3 | 87.6 | 47.5 | 42.9 | 38.6 | 43.9 |
| VII | 88.05 | 87.1 | 43.1 | 48.4 | 41.7 | 39.8 |
| VIII | 85.4 | 85.3 | 41.4 | 47.4 | 36.9 | 46.9 |
| IX | 81.4 | 86.7 | 32.4 | 54.2 | 33.1 | 48.4 |
| X | | 83.4 | | | 29.1 | 54.4 |

Source: Income, expenditure and consumption of wage earners' and peasant families studied through the family budgets, by groups (deciles), according to the level of total net monthly income per person, and by income groups and family size, 1991-1994.

The structure of total expenditure shows a decrease in the share of food expenditure in the higher income groups for both of the household types studied, as expected. At the same time, also for higher income groups, the share of food expenditure in the total consumption expenditure is relatively high (in the case of decile X it was 50.7% in the wage earners' families and 70% in the peasant families in 1995), indicating the fact that in Romania, even in households which have the highest income, the standard of living is below the average of that of the middle class in the developed countries (Table 4).

In real terms, during the period under analysis, disparities in the wage earners' families continued (the ratio between the cash income of deciles 1 and 10 is 1:5). In the peasant households, such

disparities were not as pronounced (the income of maximal decile / the income of the minimal decile was 4.82 in 1991 and 3.26 in 1994).

It is important to note that during the period under examination (1991-1994) the purchasing power of all income groups decreased, the trend being more obvious in the higher income groups. Thus, among wage earners' families, the purchasing power of deciles I-IV decreased by 20-30%, and for deciles V-X by 40-50%, so that families which were poor in 1991 became very poor in 1994, and those with medium income in 1991 migrated to the group of poor families in 1994. This trend became more prominent in the case of the peasant families, where purchasing power decreased by 8-35% for deciles I-III and 45-60% for deciles IV-X.

**Table 4 -** Total expenditure structure (total expenditure - 100%) in %

| Group | Wage earners | | | | | | Peasants | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1991 | | | 1994 | | | 1991 | | | 1994 | | |
| | Con-sumption expend-iture | Food con-sumption | Self-con-sumption | Con-sumption expend-iture | Food con-sumption | Self-con-sumption | Con-sumption expend-iture | Food con-sumptio n | Self-con-sumptio n | Con-sumption expend-iture | Food con-sumption | Self-con-sumption |
| I | 82.3 | 52.7 | 15.9 | 81.9 | 57.5 | 21.3 | 92.1 | 69.7 | 49.0 | 93.8 | 74.2 | 58.7 |
| II | 79.9 | 47.6 | 12.9 | 79.9 | 53.0 | 17.9 | 91.8 | 68.0 | 48.5 | 93.5 | 75.6 | 59.1 |
| III | 77.7 | 43.5 | 11.0 | 79.1 | 50.7 | 16.2 | 90.1 | 66.2 | 49.1 | 94.3 | 74.2 | 58.8 |
| IV | 75.9 | 40.3 | 9.3 | 78.2 | 49.0 | 15.5 | 89.5 | 63.4 | 47.8 | 93.8 | 74.5 | 59.3 |
| V | 74.7 | 37.6 | 9.0 | 77.3 | 47.3 | 14.3 | 88.5 | 62.6 | 47.9 | 91.9 | 71.1 | 57.5 |
| VI | 73.6 | 36.4 | 9.4 | 76.3 | 45.5 | 13.5 | 88.0 | 61.5 | 47.7 | 92.7 | 71.7 | 58.6 |
| VII | 73.6 | 34.2 | 9.6 | 76.3 | 44.9 | 15.3 | 87.6 | 61.0 | 48.9 | 91.9 | 70.0 | 56.8 |
| VIII | 72.6 | 32.8 | 9.7 | 75.9 | 43.2 | 14.7 | 88.0 | 60.5 | 48.4 | 92.6 | 70.2 | 58.2 |
| IX | 71.4 | 30.3 | 8.0 | 74.7 | 41.7 | 14.7 | 86.3 | 58.2 | 47.1 | 91.8 | 69.6 | 58.7 |
| X | | | | 72.9 | 37.0 | 13.0 | | | | 90.4 | 63.2 | 52.6 |

## 4.2. Purchases of food products

The structure of food product purchasing expenditure demonstrates different types of consumer behaviour according to income group and socio-economic category (Appendix 1). Taken in the perspective of a single year (1994 for example), the share of the food expenditure for some staple foods such as bread, edible oil, milk, white beans, and potatoes decreases, while income increases. A completely reverse evolution, that is an expenditure increase in the higher deciles, is obvious for pork, poultry meat, meat products, cheese and cream, fruit, and alcoholic beverages. These observations are mainly valid for the wage earners' families and provide some information about consumer behaviour when income is increasing, because these household types, due to their social and occupational status, are more sensitive to market signals. An analysis of the situation over time (in 1994 as compared to 1991) reveals an increase in share of expenditure for bread, poultry meat, edible oil, milk, and sugar in all income groups as a corroboratory effect of the gradual reduction of both consumer subsidies and purchasing power - leading to the orientation of consumers, including those in the medium deciles, towards the basic products. In the case of the peasant families (Appendix 2), this information has less relevance due to the very high share of self-consumption in this type of household. However, an increase in the share of expenditure on sugar and edible oil in 1994 as compared to 1990 can be noted in all income groups. Also of significance is the decrease, over time, of the share of alcoholic beverages, because they are produced within the household itself (wine) and because they are perceived as luxury products (beer, alcohol).

## 5. Income Demand Elasticity

In order to estimate the demand elasticity for food items during 1991-1994, we tested some of the functional forms of Engel curves. Only the results obtained by using the double-log and semi-log

specifications will be presented in this paper:

$$\log y_{ij} = a_i + b_i \quad \log x_j + u_{ij};$$

$$y_{ij} = a_i + b_i \quad \log x_j + u_{ij}$$

where: $y_{ij}$ = consumption (measured as expenditure or quantities of the good *i*, household group **j**

$x_j$ = total income or expenditure of the group.

The reasons for this choice are the following: (i) the doublei-log specification provides a constant elasticity coefficient throughout the period under analysis, thus making it considerably easier to interpret the results from the economic point of view, (ii) the semi-log function provides good adjustments when the consumption is expressed in quantity terms and behaves in a satisfactory way for most food products, (iii) the agro-food purchases made by the socio-professional categories are located on the ascending part of the Engel curve (meaning that they are far from reaching the saturation quantity threshold and passing to quality substitutions), and (iv) the estimations of the average elasticities, using different shapes of the consumption function, do not register significant differences and are practically nil in the medium income groups. It should also be noted that the double-log and semi-log specifications are currently used in FAO papers for studying the consumer demand for food products.

Estimation of parameter consistency was made using an F-test at a 1% significance level. It must also be mentioned that all data concerning expenditure, income, and purchases of foodstuffs were transformed into real terms. Some of the results are presented below.

### 5.1. Consumption functions and demand elasticity in wage earners' families

In the case of the wage earners' families (Table 5) note should be taken of the high values of the expenditure elasticity cofficient (both for total and consumption) as compared to the income, which is in fact a consequence of the large share of expenditure in income, indicating the relatively low possibility for savings in this socio-professional category.

**Table 5 -** Consumption function parameters and demand elasticity in the wage earners' families - estimations based upon semi-log specification

| Variable | a | b | $(r^2)$ | Estimated elasticity coefficient |
|---|---|---|---|---|
| Total expenditure | 0.2315 | 0.9399 | 0.995 | 0.939 |
| Consumption expenditure | 0.3323 | 0.871 | 0.991 | 0.871 |
| Food consumption expenditure | 0.756 | 0.641 | 0.950 | 0.641 |
| Food purchases | 0.745 | 0.591 | 0.977 | 0.591 |

The difference between the elasticity coefficient of food consumption expenditure and food purchases reflects the instance of own-produced food, which in the case of the wage earners' families (mostly in the urban areas) might be a consequence of food transfers from relatives in rural areas.

In an analysis of the income elasticity for food product purchases (Table 6) the following observations must be made: i) the determination degree of food purchases out of real income is very high for all products, except for bread and milk, ii) a range of products, such as bread, meat, edible oil, milk, and sugar exhibit lower elasticity values in Romania as compared to those of other countries under transition; this fact is really an effect of consumer subsidies for these products during 1990-

1994, and iii) the higher elasticity coefficient for unsubsidised livestock products (meat products, cheese) should be noted, as well as that for citrus fruits and alcoholic beverages.

In order to reduce the income disparities, we divided the wage earners' families into 3 groups: families with low income (deciles I-III), families with medium income (deciles IV-VI) and families with high income (deciles VII-X). Thus, the income disparity between families with low and high income is 1:2.6, which is not very large.

**Table 6 -** Average food demand elasticities' coefficients for the wage earners families

| Product | Semi-logarithmic function | | Double-logarithmic function | |
|---|---|---|---|---|
| | Elasticity coefficient | $r^2$ | Elasticity coefficient | $r^2$ |
| Bread | 0.095 | 0.51 | 0.094 | 0.50 |
| Pork | 0.602 | 0.91 | 0.567 | 0.92 |
| Poultry meat | 0.421 | 0.73 | 0.429 | 0.71 |
| Meat products | 0.765 | 0.88 | 0.709 | 0.87 |
| Edible oil | 0.295 | 0.83 | 0.293 | 0.84 |
| Milk | 0.296 | 0.50 | 0.285 | 0.50 |
| Cheese | 0.668 | 0.97 | 0.630 | 0.97 |
| Eggs | 0.485 | 0.90 | 0.473 | 0.90 |
| Sugar | 0.403 | 0.81 | 0.397 | 0.84 |
| Potatoes | 0.273 | 0.77 | 0.267 | 0.77 |
| Tomatoes | 0.469 | 0.89 | 0.464 | 0.87 |
| Apples and pears | 0.495 | 0.81 | 0.487 | 0.79 |
| Citrus fruit | 0.846 | 0.81 | 0.783 | 0.81 |
| Alcoholic beverages | 0.685 | 0.96 | 0.652 | 0.96 |

**Table 7 -** Demand elasticity coefficients for the main food products, by group, in the wage earners' families

| Products | First group - low income- | Second group - medium income - | Third group - high income - |
|---|---|---|---|
| Food purchases | 0.841 | 0.606 | 0.490 |
| Bread | 0.98 | 0.94 | 0.91 |
| Pork | 0.791 | 0.571 | 0.476 |
| Poultry meat | 0.551 | 0.394 | 0.337 |
| Meat products | 1.073 | 0.711 | 0.562 |
| Edible oil | 0.346 | 0.292 | 0.257 |
| Milk | 0.330 | 0.291 | 0.273 |
| Cheese | 0.923 | 0.630 | 0.496 |
| Eggs | 0.620 | 0.454 | 0.402 |
| Sugar | 0.498 | 0.401 | 0.329 |
| Potatoes | 0.315 | 0.267 | 0.243 |
| Tomatoes | 0.616 | 0.445 | 0.370 |
| Apples and pears | 0.656 | 0.470 | 0.384 |
| Citrus fruit | 1.320 | 0.764 | 0.532 |
| Alcoholic beverages | 0.947 | 0.652 | 0.502 |

Note: estimations using the semi-logarithmic specification

More significant is the fact that the share of the food consumption expenditure in the total consumption expenditure is not very different for the three groups (54.4% for the first group, 50.2% for the second, and 44.5% for the third). This reflects another fact, namely that even the group with high income is far from reaching the area of "saturation" and quality substitution for food consumption. In reality, as long as the share of the food consumption in the total consumption expenditure represents an indicator of the quality of life, these values indicate a decrease in the

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purchasing power of all categories of wage earners and a homogenisation in the area of poverty. This aspect is also reflected by the dynamic of the quantities of purchased food, which differs only by a few hundred grams per month between the "rich" and the "poor" categories (the differences between the third and the first group amount to 760 g of bread, 460 g of pork, 410 g of meat products, 4 eggs, etc.).

Food demand elasticity, differentiated by group (Table 7), shows an increase of this indicator in the low income group for all products of animal origin - i.e. meat, meat products, cheese, and eggs. The high elasticity coefficient for meat (1.073) and citrus fruits (1.320) should be noted, because they are perceived by this category of consumer as luxury products.

## 5.2. Consumption functions and demand elasticities among peasant families

The values for the average elasticities in food consumption expenditure for the purchase of food products by peasant families are relatively close to those for the wage earners' households (Table 8). Demand elasticity according to type of food product shows a number of specific features, generated mainly by the autarchic nature of the economy of this type of household, and thus a very high weight of consumption from own sources is determined. Therefore, for some products such as poultry meat, eggs, potatoes, and apples, there is no statistical link between purchases and cash income ($r^2<0.1$); for this reason  the elasticities of market demand were not estimated. In any case, for some of these products (e,g, poultry meat), the monthly average quantity purchased by one person is very low (less than 100 grams). At the same time, a relatively weak link can be observed between income and the purchases of bread, milk, and cheese; this fact influences the  quality of the estimations of the elasticity coefficients for these products (Table 9). In the case of livestock products (pork, meat products), citrus fruit and alcoholic beverages, the analysis reveals much higher values for the elasticity coefficients, proving that there is a greater sensitivity of purchase of such products when there are income variations. Inelastic demand and elasticity values similar to those registered for wage earners' families can be observed for edible oil and sugar.

**Table 8 -** Parameters of consumption functions and demand elasticity in the peasant families

| Variable | a | b | $r^2$ | Elasticity coefficient |
|---|---|---|---|---|
| 1. Consumption expenditure | 1.0216 | 0.7300 | 0.97 | 0.730 |
| 2. Food consumption expenditure | 1.0857 | 0.645 | 0.99 | 0.645 |
| Food Purchases | 0.511 | 0.584 | 0.37 | 0.584 |

Note: estimations using a double-logarithmic specification

Income elasticity differentiated according to income groups also indicates, in the case of peasant families, the perception of livestock products (mainly meat) and citrus fruit as luxuries by low income households. A high elasticity is also observed for alcoholic beverages (Table 10).

**Table 9 -** The average food demand elasticity coefficients for peasant families

| | Semi-log function | | Double-log function | |
|---|---|---|---|---|
| | Elasticity coefficient | $r^2$ | Elasticity coefficient | $r^2$ |
| Bread | 0.215 | 0.31 | 0.205 | 0.30 |
| Pork | 0.729 | 0.60 | 0.577 | 0.61 |
| Meat products | 0.837 | 0.53 | 0.704 | 0.56 |
| Edible oil | 0.316 | 0.64 | 0.304 | 0.69 |
| Milk | 0.403 | 0.43 | 0.334 | 0.45 |
| Cheese | 0.490 | 0.51 | 0.407 | 0.55 |
| Sugar | 0.407 | 0.68 | 0.393 | 0.71 |
| Tomatoes | 0.392 | 0.62 | 0.352 | 0.59 |
| Citrus fruit | 0.721 | 0.73 | 0.643 | 0.74 |
| Alcoholic beverages | 0.633 | 0.77 | 0.565 | 0.84 |

**Table 10** - Demand elasticity coefficients for the main food products, by group (peasant families)*

| Products | First group - low income | Second group - medium income | Third group - high income |
|---|---|---|---|
| Food purchases | 0.696 | 0.552 | 0.453 |
| Bread | 0.229 | 0.210 | 0.209 |
| Pork | 0.856 | 0.761 | 0.603 |
| Meat products | 1.076 | 0.802 | 0.674 |
| Edible oil | 0.376 | 0.318 | 0.268 |
| Milk | 0.446 | 0.397 | 0.374 |
| Cheese | 0.562 | 0.483 | 0.437 |
| Sugar | 0.513 | 0.406 | 0.323 |
| Tomatoes | 0.437 | 0.395 | 0.354 |
| Citrus fruit | 1.050 | 0.705 | 0.470 |
| Alcoholic beverages | 0.839 | 0.634 | 0.468 |

*Estimations using the semilog function

# 6. Conclusions

The hypothesis of this paper is that there is a consistent statistical link between the real cash money income of wage earners' and peasant families and the quantities of food products purchased. Proceeding with this assumption, the parameters for several functional forms of Engel curves were estimated and the average income elasticities calculated for the main food products during the period 1991-1994. The merits of this approach are vindicated both from the methodological point of view as well as from a policy point of view. Some of the conclusions and results we obtained at this stage of research are as follows:

**1.** The socio-professional categories which were studied exhibit different behaviour where the market demand for food commodities is concerned; the influence of the degree of the household cash income is crucial in this respect. Thus, in the wage earners' families, purchases are strongly dependent on the cash income of the household for all the products studied (except pulses). The peasant family, due to the subsistence character of rural households, is characterised by a much weaker link between the market demand for food and income, so that for some products (poultry meat, potatoes, eggs, apples), estimation of Engel function parameters failed statistically.

**2.** In the case of wage earners' families, livestock products (pork, meat products, eggs), as well as citrus fruit exhibit much higher elasticity coefficients when compared to the staple foods (bread, milk, sugar). This phenomenon is more pronounced in the case of the low income groups, where meat products are perceived by consumers as luxury products.

**3.** The analysis of demand elasticities according to income groups (low, medium, high) does not exhibit strong differences. However, the low income groups have higher elasticities, as expected, especially for livestock products (meat and meat products).

**4.** In the case of peasant families, the method used provides more consistent results for some products only; among these the most relevant are edible oils, sugar, citrus fruits and alcoholic beverages. The high elasticities of the market demand for pork, meat products, citrus fruit and alcoholic beverages should be noted, since purchases of these products are more responsive to changes in real cash income. The rest of the products, such as sugar, edible oils and bread, demonstrate a relatively inelastic demand.

Elasticity estimates provide information concerning consumer behaviour when the main variables influencing demand (prices, income) are changing. Therefore they are useful in predicting demandand its adjustment when incomes or prices change.

The results of the analysis show that the decrease in real income which occurred in the period 1990-

1996 had a strong adverse impact (high income elasticities) upon purchases of livestock products (mainly meat and meat products), and fruit and alcoholic beverages, and that this effect will be stronger in the future if tandardsof living continue to decrease. If however strong economic growth prevails, it will certainly have a positive impact on the purchasing power of the population, and thus the demand for these products will show a sharp increase in comparison to those products for which there is a relatively inelastic demand (bread, milk, edible oils, etc.). This will have a positive impact on agriculture.

At any rate, the expansion of the agro-food sector is strongly influenced by general economic and social policies, which should aim especially to increase the purchasing power of the population and consequently increase market demand. Where the income-consumption relationship is concerned, most households in the country are located on the ascending side of the Engel curves, far away from the saturation and quality substitution threshold, thus there is a significant possibility to increase the domestic consumption of food products. In this context, studying the elasticities of the market demand for food products provides valuable information for supply orientation and diversification towards those food products categories which are the most sensitive to income changes, and for which significant increases in consumption can be foreseen under conditions of an increase in real income.

## References

Albisu, M., Azucena G., Laajimi A. - The demand for food in Spain : An application of the AIDS model with demographic effects, - lucrare prezentata la Congresul al VIII-lea al EAAE, Edinburgh.

Allaya, M. (1991). *Analyse et prevision de la demande alimentaire*, CIHEAM, Montpellier, 1991.

Baron, T., Biji, E., Tovissi, L., Wagner, P. (1996). Statistica teoretica si economica, Editura didactica si pedagogica, Bucuresti.

Dumitru, M., Florian V., Gavrilescu, D., Serbanescu, C., Alexandri, C. (1996). Cererea, oferta si preturile agricole in perioada 1990-1995, CIDE, 1996.

Fuglie, K.O. (1994). The demand for potatoes in Tunisia. Are they a cereal substitute? *European Review of Agricultural Economics*, nos.21-2.

Griffiths, W.E., Carter Hill, R., Judge, G.G. (1993). *Learning and practicing econometrics*, John Willey and Sons Inc., USA.

Harrigan, J., Loader, R., Thirtle, C. (1995). La politique de prix agricoles : le gouvernement et le marché, FAO, Rome.

Malassis, L., Ghersi, G. (1992). *Initiation à l'économie agroalimentaire*, Hatier-Aupelf.

Maniu, I., Andrei, T., Badescu, M. (1995). *Lucrari aplicative de statistica*, Editura F.F.Press, Bucuresti.

Mergos, G.J., Mizzi, L., et al. (1996). Food demand and welfare in Slovenia. Paper presented in PHARE-ACE Programme, Ljubljana.

Pecican, E.S. (1994). Econometria, Editura All, Bucuresti.

Rickertsen, K. (1996). The dmand for meat in the Nordic countries - paper presented at the 8th EAAE Congress, Edinburgh.

## Appendix 1

**Structure of expenditure for food product purchases in the wage earners' families - % of the total food purchases**

| Products | I | II | III | IV | V | VI | VII | VIII | IX | X |
|---|---|---|---|---|---|---|---|---|---|---|
| *Bread* | | | | | | | | | | |
| 1991 | 20.7 | 18.2 | 15.8 | 14.0 | 13.2 | 12.3 | 12.1 | 11.8 | 10.5 | |
| 1994 | 22.2 | 19.3 | 17.4 | 16.2 | 15.5 | 14.6 | 14.7 | 13.4 | 13.1 | 11.2 |
| *Pork* | | | | | | | | | | |
| 1991 | 8.0 | 9.4 | 9.4 | 9.6 | 9.8 | 9.8 | 9.7 | 10.0 | 10.0 | |
| 1994 | 8.0 | 8.4 | 8.9 | 8.8 | 9.1 | 9.0 | 8.6 | 8.8 | 9.2 | 9.2 |
| *Poultry meat* | | | | | | | | | | |
| 1991 | 3.0 | 3.1 | 3.3 | 3.7 | 3.3 | 3.4 | 3.2 | 3.3 | 3.3 | |
| 1994 | 4.3 | 4.7 | 4.9 | 4.9 | 5.0 | 5.2 | 5.2 | 4.9 | 4.9 | 4.7 |
| *Meat products* | | | | | | | | | | |
| 1991 | 7.9 | 8.4 | 9.0 | 9.7 | 9.7 | 9.5 | 10.0 | 10.0 | 10.0 | |
| 1994 | 6.2 | 7.2 | 7.9 | 8.5 | 8.4 | 8.5 | 9.2 | 9.4 | 9.4 | |
| *Edible oil* | | | | | | | | | | |
| 1991 | 2.7 | 2.4 | 2.2 | 2.0 | 1.9 | 1.8 | 1.8 | 1.8 | 1.7 | |
| 1994 | 5.3 | 4.9 | 4.8 | 4.6 | 4.5 | 4.4 | 4.2 | 4.3 | 4.2 | 3.9 |
| *Milk* | | | | | | | | | | |
| 1991 | 4.4 | 3.8 | 3.8 | 3.3 | 3.1 | 3.0 | 2.9 | 2.8 | 2.7 | |
| 1994 | 3.9 | 3.6 | 3.8 | 3.5 | 3.5 | 3.4 | 3.6 | 3.5 | 3.0 | 2.8 |
| *Cheese and cream* | | | | | | | | | | |
| 1991 | 5.2 | 5.4 | 5.6 | 5.9 | 5.8 | 6.1 | 6.3 | 6.3 | 6.4 | 6.2 |
| 1994 | 4.7 | 5.3 | 5.5 | 6.1 | 5.8 | 6.2 | 6.3 | 6.3 | 6.3 | 7.2 |
| *Eggs* | | | | | | | | | | |
| 1991 | 3.4 | 3.5 | 3.5 | 3.5 | 3.4 | 3.4 | 3.3 | 3.4 | 3.3 | |
| 1994 | 3.7 | 3.7 | 3.7 | 3.9 | 3.9 | 3.8 | 3.6 | 3.6 | 3.6 | 3.3 |
| *Sugar* | | | | | | | | | | |
| 1991 | 2.7 | 2.4 | 2.2 | 2.0 | 1.9 | 1.9 | 1.8 | 1.9 | 1.9 | |
| 1994 | 3.4 | 3.2 | 3.0 | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 |
| *White beans* | | | | | | | | | | |
| 1991 | 0.8 | 0.7 | 0.5 | 0.5 | 0.5 | 0.4 | 0.4 | 0.4 | 0.4 | |
| 1994 | 0.7 | 0.5 | 0.5 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.2 |
| *Potatoes* | | | | | | | | | | |
| 1991 | 3.9 | 4.0 | 3.8 | 3.7 | 3.7 | 3.8 | 3.6 | 3.5 | 3.3 | |
| 1994 | 2.7 | 2.4 | 2.4 | 2.2 | 2.2 | 2.2 | 2.0 | 1.8 | 1.9 | 1.9 |
| *Tomatoes* | | | | | | | | | | |
| 1991 | 1.9 | 1.8 | 1.8 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |
| 1994 | 1.4 | 1.4 | 1.5 | 1.5 | 1.5 | 1.6 | 1.6 | 1.6 | 1.6 | 1.7 |
| *Apples and pears* | | | | | | | | | | |
| 1991 | 1.6 | 1.6 | 1.7 | 1.7 | 1.7 | 1.6 | 1.7 | 1.6 | 1.7 | |
| 1994 | 1.1 | 1.2 | 1.2 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.4 | 1.3 |
| *Citrus fruit* | | | | | | | | | | |
| 1991 | 1.3 | 1.5 | 1.8 | 2.0 | 2.1 | 2.3 | 2.3 | 2.6 | 2.5 | |
| 1994 | 1.3 | 1.6 | 1.9 | 1.9 | 2.1 | 2.2 | 2.3 | 2.5 | 2.6 | 2.9 |
| *Alcoholic beverages* | | | | | | | | | | |
| 1991 | 7.8 | 8.3 | 8.5 | 8.4 | 9.0 | 9.0 | 9.0 | 8.3 | 9.6 | |
| 1994 | 3.7 | 1.3 | 4.0 | 4.2 | 4.3 | 4.4 | 4.3 | 4.7 | 4.8 | 5.2 |

Source: Calculations using data on income, expenditure and consumption of the wage earners' and peasant families, studied through family budgets by groups (deciles), and by the level of monthly total net income per person, income groups and family Isize, 1991-1994.

## Appendix 2

**Structure of expenditure for food product purchases in peasant families - % of total food purchases**

| Products | I | II | III | IV | V | VI | VII | VIII | IX | X |
|---|---|---|---|---|---|---|---|---|---|---|
| *Bread* | | | | | | | | | | |
| 1991 | 19.4 | 18.9 | 18.3 | 18.2 | 16.1 | 15.6 | 14.3 | 14.0 | 11.6 | |
| 1994 | 18.7 | 21.9 | 20.0 | 20.5 | 19.0 | 17.4 | 17.8 | 15.6 | 14.5 | 13.8 |
| *Pork* | | | | | | | | | | |
| 1991 | 3.7 | 5.0 | 4.7 | 4.9 | 5.8 | 4.5 | 4.5 | 6.4 | 6.9 | |
| 1994 | 4.8 | 3.1 | 3.9 | 3.4 | 3.1 | 3.1 | 3.7 | 3.2 | 4.0 | 3.9 |
| *Poultry meat* | | | | | | | | | | |
| 1991 | 0.8 | 0.6 | 0.7 | 0.7 | 0.7 | 0.5 | 0.5 | 0.4 | 0.8 | |
| 1994 | 1.3 | 1.2 | 1.2 | 1.1 | 0.6 | 1.0 | 0.7 | 0.9 | 0.4 | 0.8 |
| *Meat products* | | | | | | | | | | |
| 1991 | 5.9 | 5.8 | 5.7 | 5.6 | 5.8 | 5.6 | 5.0 | 5.1 | 5.0 | |
| 1994 | 2.9 | 2.6 | 3.3 | 3.9 | 3.2 | 4.1 | 3.8 | 3.8 | 3.4 | 4.6 |
| *Edible oil* | | | | | | | | | | |
| 1991 | 4.9 | 4.2 | 4.3 | 3.9 | 3.7 | 3.9 | 3.7 | 3.3 | 3.2 | |
| 1994 | 10.9 | 10.2 | 10.1 | 9.6 | 9.6 | 10.0 | 9.6 | 10.0 | 9.6 | 9.2 |
| *Milk* | | | | | | | | | | |
| 1991 | 2.5 | 2.6 | 2.3 | 2.0 | 2.2 | 2.4 | 1.9 | 1.9 | 2.4 | |
| 1994 | 2.4 | 2.1 | 2.2 | 1.8 | 1.8 | 1.8 | 1.5 | 1.7 | 1.4 | 1.4 |
| *Cheese and cream* | | | | | | | | | | |
| 1991 | 4.2 | 4.2 | 4.6 | 4.2 | 4.4 | 4.5 | 4.7 | 4.2 | 6.0 | |
| 1994 | 4.0 | 3.5 | 3.7 | 3.7 | 3.3 | 4.5 | 3.8 | 3.3 | 3.4 | 3.1 |
| *Eggs* | | | | | | | | | | |
| 1991 | 1.1 | 0.9 | 0.9 | 0.7 | 0.9 | 0.8 | 0.7 | 0.5 | 1.3 | |
| 1994 | 1.0 | 0.9 | 0.9 | 0.7 | 0.7 | 0.6 | 0.6 | 0.5 | 0.7 | 0.7 |
| *Sugar* | | | | | | | | | | |
| 1991 | 4.7 | 4.0 | 4.2 | 4.1 | 4.0 | 4.0 | 3.5 | 3.6 | 4.0 | |
| 1994 | 6.7 | 6.4 | 6.7 | 6.6 | 7.1 | 7.5 | 7.2 | 6.9 | 7.3 | 7.5 |
| *White beans* | | | | | | | | | | |
| 1991 | 0.6 | 0.5 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.4 | 0.4 | |
| 1994 | 0.4 | 0.5 | 0.3 | 0.3 | 0.4 | 0.3 | 0.3 | 0.3 | 0.2 | 0.3 |
| *Potatoes* | | | | | | | | | | |
| 1991 | 1.7 | 1.7 | 1.7 | 1.5 | 2.1 | 1.7 | 2.0 | 2.0 | 2.0 | |
| 1994 | 0.9 | 1.4 | 1.0 | 1.2 | 1.4 | 0.8 | 1.1 | 1.6 | -0.9 | 1.3 |
| *Tomatoes* | | | | | | | | | | |
| 1991 | 2.1 | 2.1 | 1.9 | 1.8 | 1.8 | 1.8 | 2.0 | 1.8 | 1.7 | |
| 1994 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 |
| *Apples and pears* | | | | | | | | | | |
| 1991 | 0.9 | 1.3 | 1.3 | 1.7 | 2.0 | 1.9 | 1.7 | 1.7 | 1.4 | |
| 1994 | 0.8 | 0.7 | 1.0 | 1.2 | 0.9 | 1.1 | 1.1 | 1.3 | 1.2 | 1.3 |
| *Citrus fruit* | | | | | | | | | | |
| 1991 | 0.8 | 0.9 | 1.08 | 1.1 | 1.2 | 1.7 | 1.6 | 1.9 | 2.4 | |
| 1994 | 1.8 | 1.5 | 1.6 | 1.7 | 1.6 | 1.8 | 2.1 | 2.1 | 2.2 | 2.3 |
| *Alcoholic beverages* | | | | | | | | | | |
| 1991 | 13.2 | 13.5 | 12.4 | 14.3 | 13.2 | 14.8 | 15.4 | 18.2 | 11.4 | |
| 1994 | 7.0 | 7.4 | 7.6 | 7.6 | 7.0 | 7.4 | 7.8 | 8.6 | 10.7 | 8.7 |

Source: Calculations using data on income, expenditure and consumption of the wage earners' and peasant families, studied through family budgets, by groups (deciles), by the level of monthly total net income per person, income groups and family size, 1991-1994.