

Sheep and goat meat production in disadvantaged areas: socio-economic indicators for Greece

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Summary

Sheep and goat meat is the most important sector of animal production in Greece, representing 43% of the gross value of animal production and 13% of the gross value of crop production. A large proportion of sheep and goat meat production takes place in disadvantaged areas. Disadvantaged areas are characterised by poor resources in comparison to other rural areas and remoteness from main centres of population. They are concentrated in hilly and mountainous areas. Livestock production, which is largely extensive, is one of the main economic activities in such areas and is considered to be a potential option for rural development.

The study of the production and marketing of sheep and goat meat is of particular interest because of its relationship with the environment. The sheep and goat-rearing sector is a sector of animal production that is friendly to the environment. The common view that the goat is the “destroyer” of the forest is poorly substantiated and has its origins in the fact that farmers use semi-mountainous and mountainous regions for goat rearing. This view is also disproved by the long history of goat rearing in Greece and the co-existence of goats and the forest.

The purpose of this paper is to construct an econometric model for the sheep and goat meat sector, which can be used to evaluate agricultural policy options, the effects of reform of the Common Agricultural Policy (CAP) and the General Agreement on Tariffs and Trade (GATT) as well as their potential socio-economic effects. The model can be divided into two stages: the first stage comprising the estimation of supply and demand elasticities and the second stage comprising the use of these estimated elasticities to produce forecasts. As far as the effects of CAP reform and the GATT Agreement on the Greek sheep and goat meat sector are concerned the following trends emerge:

- Inflows from the European Union (EU) into Greece will decrease slightly;
- Sheep and goat meat production in Greece will decrease slightly, whereas
- Consumption will increase by 2.5% by the year 2005.

It can therefore be concluded that there will be no substantial effect on the trade balance. As regards the social consequences of CAP Reform on the sheep and goat sector as a whole, the CAP does not directly influence the production of sheep and goat milk (although it can exercise an indirect influence on the price of feed). It does, however, directly effect the production of sheep and goat meat. Given that production in Greece is mainly milk-orientated, no socio-economic effects are expected, other than those related to the shift in employment from the sheep and goat rearing sector to

other sectors of the economy, for example into the primary sector or away from agriculture altogether. Given that a further decrease in agricultural population has been forecast it is anticipated that there will be some movement out of agriculture altogether.

Introduction

The sheep and goat meat sector is the most important sector of animal production in Greece and represents 43% of the gross value of animal production and 13% of the gross value of crop production. The European Union produces 16% of the world's sheep and goat meat, which is mainly attributable to goat meat production. Since 1981 a common organisation of the market (CMO) in sheep and goat meat has been in force. The CMO is established in Council Regulation 3013/89, as amended by Council Regulation 2062/92.

A large proportion of sheep and goat meat production takes place in disadvantaged areas. Disadvantaged areas are characterised by having poor resources in comparison to other rural areas and remoteness from main centres of population. They are also concentrated in hilly and mountainous areas (Apostolopoulos and Mergos, 1997). They suffer strong depopulation, economic decline and a deteriorating social fabric. Livestock production, which is largely extensive, is one of the main economic activities in such areas and is considered to be an option for potential development. Increasing productivity and efficiency are the main strategic objectives for achieving sustainable development and for reversing the trend of decline in disadvantaged areas. Increasing productivity and efficiency of livestock systems can be achieved by:

- Increasing the technology of production
- Reducing labour requirements
- Reducing distance costs by improving transportation, communication and marketing channels and
- Encouraging the development of local initiatives for addressing issues such as the management of common property resources, training, and financial constraints.

During the past decade there has been great demand for quantitative analysis of the effects of agricultural policy measures, in particular effects on world trade in agricultural products. During the General Agreement on Tariffs and Trade (GATT) negotiations, many efforts were made to evaluate the effect on world markets and world economic prosperity of state intervention to support agricultural prices in the EU and in other countries or groups of countries. No such quantitative evaluation exists of the impact of the GATT Agreement on Greece.

The methodology followed in this paper has also been used in a number of studies, which analyse the effects of trade liberalisation (Roningen *et al.*, 1991, Tyers and Anderson, 1992). The analysis is divided into two stages: the first stage comprising the estimation of supply and demand elasticities and the second stage comprising the use of these estimated elasticities to produce forecasts.

The main aim of this paper is to create a partial equilibrium model for the sheep and goat meat sector in Greece for the purposes of simulating policy choices and discussing their potential impacts on forests (forest and goat rearing sector) and the

socio-economic environment. The construction of a sector model for policy analysis is considered both useful and essential, particularly for Greece. Sector modelling is of vital importance for Greece as so far none has been undertaken and both CAP Reform and the GATT Agreement will have profound impacts on the structure, production, and income of Greek farms.

The theoretical model

The logic of the present model is fairly simple (Mergos, 1988; Mergos and Stoforos, 1994; Stoforos, 1997). In this model prices are determined by two exogenous factors: the world market and the government. These prices in turn determine the demand and supply of sheep and goat meat. Trade is the equilibrating mechanism for balancing demand and supply for sheep and goat meat given a certain set of prices.

The model is based on two key assumptions and simplifications. The first is that all prices are exogenous, determined by the government and the world market. The second assumption is that any imbalance between domestic demand and supply will result in trade. In fact, it is only incentives for trade, which are created and these may or may not be fulfilled. These incentives may be constrained by government intervention in the form of quotas, tariffs, etc. or simply lack of foreign currency.

This model is flexible enough to accommodate government policies (albeit rather crudely) that affect both the direction and volume of trade. An important characteristic of the model is that it incorporates dynamics in supply response. Demand is modelled as per capita demand and is specified as being a function of prices and income. Multiplication of per capita demand by population gives total retail demand.

The model simulates the impact of changes in a set of variables and changes in government policies on a set of endogenous variables. The model starts from a base year and then predicts the changes that will result from the implementation of different scenarios. The core of the model consists of two elasticity matrices, a matrix of demand elasticities and a matrix of supply elasticities (Tables 1 and 2). The model explicitly recognises the relationship between demand or supply and price changes (Stoforos and Apostolopoulos, 1997).

The demand function may be written as:

$$\ln Q^D = A + B \ln P + C \ln I \quad (\text{Equation 1})$$

where, Q^D = the vector of commodity demanded for each commodity, A = the vector of the constant parameters for each equation, B = the symmetrical matrix of demand elasticities, P = the vector of retail price for each commodity, C = the vector of the income elasticities of demand and I = the matrix of income.

Total output (= Q of any product) is given by the product of number of animals (= A) and yield (= Y). Thus we have, $QP = A * Y$, where, QP = vector of quantities produced, A = vector of number of animals, Y = vector of yield. The functions for number of animals (= A) and yield (= Y) are:

$$A_t = F(A_{t-1}, P_{t-n}, Z_A) \quad (\text{Equation 2})$$

where (Equation 2) is estimated using econometric methods, as mentioned above, in its logarithmic form and, P is the vector of prices, Z_A are other variables.

$$Y_t = H(Y_{t-1}, P_{t-n}, Z_B) \quad (\text{Equation 3})$$

where (Equation 3) is also estimated using econometric methods in its logarithmic form and, P is the vector of prices and Z_B are other variables (i.e. trend etc.).

Table 1. Supply elasticities

Products	Short-term	Long-term
Sheep meat:		
Number of animals	0.04	0.08
Yield	0.03	0.06
Goat meat		
Number of animals	0.03	0.06
Yield	0.03	0.05

Source: Apostolopoulos and Stoforos, 1996.

Table 2. Demand elasticities

Products	Price	Income
Sheep meat	-0.55	0.55
Goat meat	-0.50	0.50

Source: Baltas, 1990 p.76.

Production of commodities depends on number of animals and average yield response (equations 2 and 3). Domestic supply is the sum of production and starting stocks. Trade is usually calculated as the difference between total demand and domestic supply, implying that the government will import what is needed and export what is surplus. Total supply is equal to domestic supply plus imports. Per capita consumption is influenced by changes in price and income. Total food consumption is determined by multiplying population and per capita consumption. Industrial and other uses are defined as a fixed proportion of production or consumption, depending upon the product. Domestic demand is the sum of total demand for food, industrial and other uses and end stocks. In addition to the supply and demand components, aggregate measures are also included for per capita consumption, expenditure and self-sufficiency ratios.

It is assumed that producers have fixed inputs and that they allocate these inputs to alternative enterprises on the basis of relative product prices. It is assumed that consumers also allocate income to alternative goods on the basis of the relative prices of goods. The present production and consumption structure therefore provides the conditions of the status quo. This production and consumption pattern will change over time, primarily in response to price, income, inflation and exchange rate changes.

Implementation of the model begins with data collection. Given the structure of the model, described in previous paragraphs, the following data is required in order to implement the model: 1) Population and Income, 2) Demand and Supply Elasticities,

3) The quantities of different products produced, 4) Domestic Prices, 5) World Market Prices, 6) Taxes and Subsidies, 7) Cost of production Inputs, 8) Number of Animals.

CAP and the sheep and goat meat sector

In order to proceed and elaborate a statistical model for the Greek sheep and goat meat sector, it is important to consider some of the policy implications, which resulted from the 1992 CAP Reform. This analysis is of vital importance, since there is a direct relationship between the estimated elasticities and the effectiveness of various policy measures. As mentioned in the introduction, an analysis of supply response is crucial to understanding the effects of government intervention. Therefore, estimating the elasticity of supply relative to prices is a fundamental prerequisite for estimating the effects of the CAP on Greek producers.

The May 1992 Council of Ministers Agreement to reform the CAP contained several departures from previous EU policies. The reforms involved drastic reductions in support for sheep meat, with no compensation, whilst mild reforms in support for the milk and beef sectors were largely the result of reforms in the cereals and oilseed sectors.

Each year the Council fixes a basic price (the same throughout the EU) which is used for calculating the ewe premium. To take account of seasonal variations in the market, this price is seasonally adjusted. In order to ensure a fair standard of living for farmers and to stabilise markets, a premium was granted to compensate farmers for their loss of income. Before the 1989 Reform, the Community was divided into seven regions. At the end of the marketing year, the income loss was estimated for each region on the basis of the market prices recorded during that year. This income loss was calculated as being the difference between the basic price and the arithmetic mean of market prices recorded during the year. The amount of income lost then formed a basis on which to calculate the amount of ewe premium payable in each of the seven regions.

A Community quality standard was established based on the widespread production of specialised flocks. A distinction is made between light-lamb and heavy-lamb producers, all producers of sheep milk being classed as light-lamb producers, unless proven otherwise. The loss of income to producers is the difference between the basic price and the arithmetic mean of market prices recorded during the marketing year. The amount of premium paid is determined by applying a technical coefficient for "heavy lambs" or, 80% of this rate for "light lambs" to the loss of income. The full premium is paid for up to: i) 1000 animals per producer in less-favoured areas, ii) 500 animals per producer in other areas. Above these limits, the premium is reduced by 50%. Since the 1991 marketing year, an additional premium of 4 ECU per ewe has been paid as part of the rural development measures for hill and mountain farms and farms in other less favoured areas. This aid was increased to 5.5 ECU for the 1992 marketing year. Import arrangements differ according to the products imported.

Estimated results

In order to test the accuracy of the model and its ability to take account of changes in the economic environment an historical simulation was carried out. This means that the model's predictions for the years 1990-92 were compared to actual results. The

results of this simulation can be considered a success, given that the difference between the model's prediction prices and actual prices was 0-2%. Verifying the model against an historical example is essential as unless the model can reproduce known results its forecasts, where actual results cannot be known, will not be satisfactory.

In order to analyse the effects of CAP Reform and the GATT Agreement, the following scenario was used: in the first stage, the world market price of sheep and goat meat for the period 1986-1988 was calculated. In order to calculate the world market price the volume and value of imports and exports were used, taking into account the (1986-1988) tariff equivalent, as well as the reduction in this tariff equivalent which will take place over the next six years (1995-2000/1), as shown in the following equation:

$$P_i = P_d + x + y \quad \text{(Equation 4)}$$

where P_i is the predicted price for the year i , P_d the world market price, x the tariff equivalent and y the policy followed after CAP Reform. In this way it is possible to estimate the world market price for sheep and goat meat (Table 3). In addition it was also possible using equation 4 to calculate inflows into Greece from the rest of the EU. The results are presented in Tables 4-6. Inflows into Greece from the rest of the EU were calculated using data from the Ministry of Agriculture.

Table 3. World prices, tariff equivalents and Common Agricultural Policy

	(1) World Price ECU/t (86-88)	(2) Tariff Equivalent ECU/t (86-88)	(3) Tariff Equivalent ECU/t (2000/1)	(4) Policy (CAP)	(5) Prices 1995/96 ECU/t	(6) % Change in prices (1996- 2000/1)
Barley	85	145	93	54.34 ECU/t* Historic Yield	173.53	-15%
Maize	95	147	94	54.34 ECU/t* Historic Yield	173.53	-15%
Other cereals	95	147	94	54.34 ECU/t* Historic Yield	173.53	-15%
Sheep and goat meat	142	2013	1288	5040.7ECU/t+26.046 (subsidy for heavy/head) and 5040.7+20.83(subsidy for light/head)	5066.8	-20%

Sources: (1), (2), (3) Sarris *et al.* (1996), (4) Greek Ministry of Agriculture and European Commission (1993), (5) Greek Ministry of Agriculture, (6) Assumptions of the model.

Table 4. Predicted sheep and goat meat production, consumption and trade (000 tonnes)

Year	Production	Consumption	Trade
1993	155	145	10
2000	150	147	3
2005	148	148	0

Table 5. Predicted self-sufficiency ratio in sheep and goat meat

Year	1993	1994	1995	1998	1999	2000	2003	2005
	1.07	1.06	1.06	1.04	1.03	1.02	1.02	1.00

Table 6. Predicted imports of sheep and goat meat into Greece from the rest of the EU (ECU's)

Year	1993	2000	2005
	240 879 305	235 123 931	235 123 931

Conclusions

The purpose of this paper is to describe the construction of a model for the sheep and goat meat sector that would contribute to the evaluation of agricultural policy measures, to the socio-economic analysis of the sector and to the discussion of environmental issues, concerning predominantly the goat-rearing sector. The methodology used is based on previously applied econometric methods as well as the simulation method. According to the model the effects of CAP Reform and the GATT Agreement will be the following: 1) Inflows from the EU to Greece are expected to show a slight decrease due to a predicted reduction in domestic sheep and goat meat production, 2) The production of sheep and goat meat will also decrease slightly as a result of predicted price reductions. The consumption of sheep and goat meat is expected to increase by 2.5% to the year 2005, with the reduction in price principally being the result of consumer patterns. Given this, effects on the balance of trade are negligible.

Inflows from the rest of the EU to Greece are expected to decrease slightly due to a predicted decrease in domestic sheep and goat meat production. It is also predicted that under the Common Market Organisation there will be an improvement in the quality of slaughter houses for sheep and goat meat at a national level (quality controls, etc.).

The production of sheep and goat meat is expected to decrease slightly as a result of price reductions. Despite the fact that the fall in the price of sheep and goat meat is expected to be considerable, production will decrease only slightly. The reason behind this is the need to maintain the sector for the production of sheep and goat milk and traditional milk products such as cheese and yoghurt. The sheep and goat sector in Greece is traditionally based more on milk than meat production. This explains the differences in the decrease of prices and production predicted over the next decade.

The EU divides sheep and goat meat producers into two categories (depending on the type of production concerned). The first category consists of producers of sheep milk and sheep milk products, who are termed "light" sheep producers. This category also includes all goat producers. The second category consists of all other sheep meat producers, who are termed "heavy" sheep producers. Greece belongs to the first category; it rears 10% of the EU's sheep and approximately 40% of the goats. Greece

also uses 95% of its sheep for the production of milk, compared to 30% in the EU as a whole.

The supply elasticity for sheep and goat meat is very low, which means that Greek sheep and goat meat producers are not so much influenced by changes in the price of their product as in factors related to the stability of their family income i.e. risk minimisation.

As regards the social consequences of CAP Reform on the sheep and goat sector as a whole, the CAP does not directly influence the production of sheep and goat milk (although it can exercise an indirect influence on the price of feed). It does, however, directly effect the production of sheep and goat meat. Given that production in Greece is mainly milk orientated, no socio-economic effects are expected, other than those related to the shift in employment from the sheep and goat rearing sector to other sectors of the economy, for example into the primary sector or away from agriculture altogether. Given that a further decrease in agricultural population has been forecast it is anticipated that there will be some movement out of agriculture altogether. It is possible that an increase in the number of animals as well as an increase in productivity will contribute to a move away from traditional family farms and towards more intensive production. Although it is, perhaps, too early to draw this type of socio-economic conclusion.

The consumption of sheep and goat meat is expected to increase by just 2.5% by the year 2005 despite a considerable decrease in the price, a fact that is primarily related to consumption patterns. In Greece as in many other countries there has been an important shift towards the consumption of white meat over the last few years.

The sheep and goat sector is a sector of animal production that is friendly to the environment. The common view that the goat is the “destroyer” of the forest is poorly substantiated and has its origins in the fact that farmers use semi-mountainous and mountainous regions for goat rearing. This view is also disproved by the long history of goat rearing in Greece and the co-existence of goats and the forest. According to the model used in this paper, the number of sheep and goats in Greece will only increase slightly as a result of CAP Reform and therefore the current equilibrium between the goat and the forest will be maintained.

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