

THE DIRECT AND INDIRECT ECONOMIC IMPACT OF GATT AGREEMENT AND NEW CAP POLICIES ON THE COMPETITIVENESS OF SHEEP PRODUCTION IN THE SOUTH OF PORTUGAL

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The non-separation of the agricultural income aid policies from the market variables, in the EU, has created strong incentives for an increase in agricultural productivity and production and has subsequently led to a loss of competitiveness of the products thus turned into surplus. These products, with prices much higher than those at the international level, had few chances of being absorbed by the international market.

The new guidelines of the Common Agricultural Policy (CAP), approved by the European Committee in July 1991, in virtue of pressures from the Uruguay Round, were a result of the need to adjust the policies in order to improve the functioning of the international markets. With the new CAP, a policy of incentives to production was changed to a policy of direct compensation to income, independently of the farmer being or not competitive. If he is, he will produce and complement his income. If not, he can still subsist with reasonable compensations of his income.

The purpose of this paper, *The direct and indirect economic impact of GATT agreement and new CAP policies on the competitiveness of sheep production in the south of Portugal*, is to analyze the impact of the expected

ABSTRACT

Aid to income through institutional pricing has created strong incentives for increases in productivity and agricultural production, creating within the European Community a surplus of most of these products which consequently become less competitive in the global market. With the new CAP this policy of incentives to production is replaced by a policy of direct compensation to income, whether the farmer is competitive or not. Based on five representative sheep producing farms in southern Portugal, that is, the Alentejo region, this report seeks to analyze the impact of the expected changes in agricultural incentive programs of the new agricultural policy resulting from the reform of the CAP and GATT agreements on the evolution of competitiveness of sheep production systems. This impact is assessed both directly and indirectly, that is, through its effect on cereal production, which is complementary to sheep production. The results indicate that the effects of continuous decrease in prices and in the levels of income aids on the competitiveness of the sheep meat in the Alentejo region are not very negative. One can even admit that the present levels of competitiveness can be maintained or improved through the adoption of technological improvements in the production systems.

RÉSUMÉ

L'aide au revenu à travers la tarification institutionnelle a créé de fortes incitations à l'accroissement de la productivité et à la production agricole, ce qui a créé, à l'intérieur de la Communauté européenne, des excédents de produits qui deviennent, par conséquent, moins compétitifs sur le marché global. Avec la nouvelle PAC, cette politique des incitations à la production est remplacée par une politique de compensation directe au revenu, qu'il s'agisse d'un agriculteur compétitif ou non.

Considérant cinq entreprises représentatives qui s'occupent de l'élevage de moutons au sud du Portugal, dans la région d'Alentejo, ce rapport essaie d'analyser l'impact des changements attendus dans le programmes d'incitations agricoles pour la nouvelle politique agricole qui résulte de la réforme de la PAC et des accords GATT, sur l'évolution de la compétitivité des systèmes de production de moutons. Cet impact est évalué tant directement qu'indirectement, à savoir, à travers son effet sur la production de céréales, qui est complémentaire à la production de moutons. Les résultats indiquent que les effets de la baisse continue des prix et des niveaux d'aides au revenu sur la compétitivité de la viande de mouton dans la région d'Alentejo ne sont pas très négatifs. L'on pourrait même admettre que les niveaux actuels de compétitivité peuvent être maintenus ou améliorés à travers l'adoption de meilleures technologies dans les systèmes de production.

changes in agricultural incentives program of the new agricultural policy resulting from the reform of the CAP and GATT agreements, namely the role of the direct income transfer policy, as a consequence of the new agricultural policy model, on the competitiveness of the sheep producing systems considered as representative in the south of Portugal. Some of the sheep producing farms also include a cereal producing component, complementary to the animal activity, and therefore the changes in the incentive system for cereals has an indirect impact on the sheep production, and will also be analyzed here.

In addition to the introduction, the report is organized into four other sections. In the first section, competitiveness is defined and the factors that determine it are identified and characterized. The second section is dedicated to methodology and empirical implementation of the linear programming model applied to the farms studied here. In the third section

the results that translate the effects of the CAP reform on sheep production are presented. Finally, in the fourth section some conclusions are presented that translate the most relevant aspects of the report regarding the main objective.

CONCEPT AND DETERMINANT FACTORS OF COMPETITIVENESS

Competitiveness of a region or of a country in a sector or a product is the capacity of that country or region to

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produce the goods included in that sector or that product at competitive prices. This capacity on the side of the products market has a duality on the side of the factors market, which is to guarantee the remuneration of the production factors used in that sector or product, at prices that are competitive with other alternative economic uses (Marques et al., 1995b). Competitiveness is determined by three types of factors: natural factors, related to the environmental conditions; technical and institutional factors which are related to the technological and institutional capacity, i.e. related to production, transformation, storage, transportation, distribution and sale of the product; and economic factors which are related to the economic measures that positively or negatively affect the prices of the factors and the products in relation to other regions and countries (Marques, et al., 1995a). Gain or loss of competitiveness is possible through intervention at the level of the three types of above-mentioned factors. The natural conditions that characterize a region define the type of production and system to be adopted. The technical and institutional conditions related to the technological know-how determine the types of productive, technological and structural solutions capable of providing an answer to eventual changes in the economic framework. Finally, the economic conditions promote or inhibit this competitiveness. The introduction of a new model of agricultural policy as a consequence of CAP reform and the agreements under the agricultural component of the Uruguay Round, as well as the implementation of the Single Market and consequent creation of the Economic and Monetary Union, are some of the economic factors that, implying changes in the system of incentives to production, have consequences on the competitive-

ness of the Portuguese sheep production systems. The GATT agreement does not include any specific agreement on sheep meat (Avillez, 1993) and thus does not have, at this level, any direct implications. Regarding the CAP reform, the changes concerning the OCM of sheep and goat meat are relatively reduced and are related to the form and scope of application of the compensations in effect. Regarding cereals, a production complementary to the sheep activity, and consequently the oil seeds and protein seeds, which maintain a fixed price relationship with cereals, the measures of the CAP reform present profound changes, fundamentally a reduction in prices in order to bring them closer to the international prices, compensating the farmers with a per hectare aid and the exclusion of a part of the land which is also financially compensated. As a complement, the Portuguese government has assumed the commitment to pay specific aids to the marketing of soft wheat, barley, rye and triticale.

METHODOLOGY AND EMPIRICAL IMPLEMENTATION

As it is impossible to analyze all the sheep producing farms in the south of Portugal, five typical producers of the Alentejo region were selected. The typical producers (designated 1 to 5), are individual producers with farms larger than 200 hectares. Alentejo is the largest agricultural region of the country, where more than 50 percent of the total sheep are concentrated. For each representative producer a stochastic discreet sequential programming model of the type built by Marques (1988) was developed. Each model includes the different technologies of sheep production, as well as beef production due to its competition with the sheep production systems, defined in terms of animal husbandry

Table 1 Simplified Matrix of the model with risk for a typical producer.

Activities Constraints	Production		Factors Purchase	Weighed Average			State of Nature 1						State of Nature 12						Res Sign	RHS							
	Crop Prod. Activ.	Anim. Prod. Activ.		Conc.	Op. Cap.	Crop Sell	Op. Capital	Crop Sell	Consumption		Total Cost		Til. Crop Sell Incom	Neg.	Op. Capital	Crop Sell	Consumption				Total Cost		Til. Crop Sell Incom	Neg. Dev.			
									Intem P.	Conc.	Conc.	Op. Cap.					Intem P.	Conc.			Conc.	Op. Cap.					
Objective Func.	S_c	S_i	$-W_p$	-1	-1	1																					
Land	A_{sc}																								\leq	T_s	
Labor (Crop Act)	A_{bc}		$-Z_b$																						\leq	T_b	
Traction	A_{cc}	A_{ci}	$-Z_c$																						\leq	T_c	
Combine	A_{dc}		$-Z_d$																						\leq	T_d	
Irrigation water	A_{ic}																								\leq	T_i	
Shepherd		A_{oi}	$-Z_o$																						\leq	T_o	
<i>State Nature 1</i>																											
Operating Cap.	A_{cc}	A_{ci}					-1					W_h														\leq	T_e
Nutrient Requir.		E_{ri}										$-G_{ri}$	$-G_{rh}$													\leq	0
Max. Intake		$-I_i$										H_i	H_h													\leq	0
Availability of feeds	$-S'_{ic}$										1	1														\leq	0
Purchase Conc.													$-W_h$	1												$=$	0
Purch. O. Capital							$-W_e$							1												$=$	0
Sell Products												W_v														$=$	0
Neg. Deviation 1	M^1_c			1	1	-1																				\geq	0
<i>State Nature 12</i>																											
Operating Cap.	A_{cc}	A_{ci}																								\leq	T_e
Nutrient Requir.		E_{ri}											$-G_{ri}$	$-G_{rh}$												\leq	0
Max. Intake		$-I_i$										H_i	H_h													\leq	0
Availability of feeds	$-S''_{ic}$										1	1														\leq	0
Purchase Conc.														$-W_h$	1											$=$	0
Purch. O.Capital							$-W_e$							1												$=$	0
Sell Products												W_v														$=$	0
Neg. Deviation 12	M^{12}_c																									\geq	0
Conc. Weigh C.						-1																				$=$	0
O. Capital W.C.																										$=$	0
W. Inc. Crop sell																										$=$	0
Total Deviation																										\leq	θ

units, Ql and the main crop rotations defined in terms of area, Qc. It also includes the risk associated with variability in the production of pasture and forage, which is introduced in the models using stochastic coefficients that represent the values of the intermediary productions throughout the various years. Through the different states of nature, the different levels of production according to the characterizing elements of these states of nature are also modeled. The simplified scheme of the model's matrix with risk is presented in **table 1**. In table 1, $Ank = (nxk)$ is the matrix of the coefficients related to the needs of production factors, namely land needed for crop production, Aac, labor needed for crop production, Abc, mechanical traction needed for crop production, Adc, and animal production, Acl, combine needed for crop production, Adc, operating capital needed for all activities related to crop production, Aec, and animal production, Ael, water needs for irrigation and crop production activities, Afc, and Aol, and shepherd needed for sheep production activities. The producers were characterized according to the availability of their resources, reflecting their different combination and degrees of usage. In **table 1**, the dimension vector, $Tx (n \times 1)$ is the upper limit of the availability of production factors considered limiting and thus modeled in the restrictions (Hazell and Norton, 1986), namely land, Ta, labor, Tb, traction, Tc, combine, Td, number of shepherds, T0 and water, Tf. The remaining restrictions included in the matrix represent a problem of animal feeding (**table 1**). This problem is modeled through balance restrictions, that is, of use and production of animal feeds and the minimum nutrient needs (matrix Erl (rxl)) and maximum dry matter ingestion capacities (Il). This problem is repeated in each one of the states of nature, as production and consumption of animal feeds varies in each one of them. Also needs of operating capital varies in each state of nature, with different levels of concentrated feeds purchase and products sales (see **table 1**). The seasonal variation in use and availability, as well as the quality and quantity of feeds produced on the farms along the year, was modeled defining five seasons along the year, according to the information suggested and adapted from Abreu (1992). Also the nutritional needs of the animals (energy, in Megajoules/kg of dry matter and gross protein in grams/kg of dry matter) and the voluntary ingestion of dry matter (Kilograms), were estimated for the five periods of feed availability. Calculations of these needs were based on a set of Nutrition Research Council (N.R.C., 1985) equations, where the respective parameters can be calculated as a function of physiological and productive states of the animals, their live weight, and the characteristics of the diet. Analysis of the impact of changes in price and subsidy levels in the income of sheep producers were performed for the years 1991/92, 1995/96 and

Table 2 Alternative scenarios of real market prices and aids to agricultural products.

Products	Prices (esc./kg)			
	Year	1991/92	1995/96	2003/04
Green Tax (esc.) ⇒		206,3	206,3	206,3
Sheep (SP): February		317,0	317,0	317,0
March		320,0	320,0	320,0
April		312,0	312,0	312,0
May		287,0	287,0	287,0
June		280,0	280,0	280,0
July		313,0	313,0	313,0
August		328,0	328,0	328,0
September		348,0	348,0	348,0
October		357,0	357,0	357,0
November		388,0	388,0	388,0
December		396,0	396,0	396,0
Milk (esc./liter)		250,0	250,0	150,0
Wool		100,0	100,0	100,0
Replacement Animals (esc. /head)		4.000,0	4.000,0	4.000,0
Bovines (SP): February		468,0	303,0	303,0
May		455,0	296,0	296,0
August		447,0	289,0	289,0
Steers (SP):				
February		408,0	266,0	266,0
May		409,0	267,0	267,0
August		400,0	248,0	248,0
Replacement Animals		239,0	156,0	156,0
Crop: Durum Wheat		42,8	21,6	21,6
Wheat		31,7	21,6	21,6
Triticale		31,4	21,9	21,9
Barley		29,1	21,2	21,2
Rye		36,5	25,7	25,7
Sunflower		33,6	35,3	35,3
Protein Seeds		36,9	31,4	31,4
Corn		34,2	24,9	24,9
specific Co-financ. (esc./kg):				
Wheat		14,8	16,5	-
Corn		12,5	8,5	-
Sorghum		10,8	7,4	-
Barley, Oat and Triticale		16,2	10,8	-
Aid to Durum Wheat (esc./ha)		37.954,0	37.954,0	37.954,0
Aid to Sunflower (esc./ton) (*)		19.350,9	16.091,4	16.091,4
Comp. Cereal Aid (esc./ton) (*)		-	9.283,5	9.283,5
Set-aside (esc./ton) (*)		-	15.874,8	12.340,9
Bovines (esc./eligible animal)				
Bulls: Base value		8.200,0	18.567,0	18.567,0
Extensification		-	6.189,0	6.189,0
Milk cow: Base value		10.433,0	31.976,5	29.913,5
Extensification		-	5.157,5	5.157,5
Sheep (esc./animal) (**)				
Producer heavy lambs		5.094,0	5.735,1	5.735,1
Producer light lambs		3.119,3	4.456,1	4.456,1

Source: GAPTE, 1993, SIMA, 1992, I.R.O.M.A., 1992 e IMAIAA, 1994.
Notes: (*) The amount of aid per hectare is obtained multiplying the unitary aid presented in the table, by the income class attributed to each farm; (**) includes the subsidies plus an aid relative to the rural world.

2003/04. The real prices of the farm products considered in the models for the above mentioned periods are presented in **table 2**. The choice of these years is justified by the fact that they correspond to the end of enforcement of a type of policy or to price and aid adjustment of the policies affecting the products considered: 1991/92 was the last year of the enforcement of pre-re-

Table 3 Results per typical producer with and without application of the new CAP and GATT agreements.

Activity	Producer 1			Producer 2			Producer 3			Producer 4			Producer 5		
	1991/92	1995/96	2003/04	1991/92	1995/96	2003/04	1991/92	1995/96	2003/04	1991/92	1995/96	2003/04	1991/92	1995/96	2003/04
Total Income (10 ³ escudos)	11679,0	10940,1	10844,1	25062,5	26890,4	13946,9	12363,2	11451,7	9317,4	12169,3	11016,8	9455,0	7782,7	7948,2	7205,8
Areas (hectares)															
Set-aside	-	-	-	-	74,3	66,8	-	23,2	11,4	-	13,1	13,1	-	13,2	13,2
Cereals	-	-	-	252,5	214,5	193,4	122,4	99,5	51,5	63,0	53,6	53,6	87,8	74,7	74,7
Oil Seeds	-	-	-	242,5	206,1	184,9	40,8	32,1	13,3	24,3	20,7	20,7	-	-	-
Forage Hay	22,5	22,5	22,5	22,6	22,6	22,6	40,8	48,9	56,5	14,4	14,4	14,4	173,2	173,3	173,3
Silage grazeland:	22,5	22,5	22,5	-	-	-	-	-	13,6	-	-	-	-	-	-
Sown	88,4	68,2	66,0	60,0	60,0	60,0	-	-	-	86,4	86,4	86,4	14,4	13,8	13,8
Natural	101,6	121,8	124,0	12,6	12,6	12,6	136,1	136,3	123,2	112,0	112,0	112,0	483,8	484,0	484,0
Irrigated	25,0	25,0	25,0	-	-	-	13,0	13,0	13,0	10,0	10,0	10,0	-	-	-
Animais (N°)															
sheep	984	317	380	785	1000	1000	993	990	990	1000	733	733	1000	1000	1000
Bovines	72	107	100	-	-	-	-	-	-	33	52	52	-	-	-

Source: Results from Models (Ventura-Lucas, 1995).

form CAP, 1995/96 was the last year of price adjustment foreseen in the CAP reform and 2003/04 is the year foreseen for the end of the specific aids.

RESULTS

The results of the models incorporating the measures of the new CAP and the agricultural component of the GATT agreement are presented in **table 3**. The comparison of the total income, of the combination of productions and the assignment of resources for the 1995/96 and 2003/2004 years with the values obtained in the base year (1991/92) which reflects the situation before the reform of the Common Agricultural Policy, allows us to assess the direct and indirect effects of the policy of direct aid to income of the new CAP and GATT treaty on the evolution of competitiveness of sheep producing systems in Alentejo. Globally the results indicate that the new aids for cereals introduced with the CAP reform, with direct and indirect implications on animal production considered for the year 1995/96, will make it possible to compensate the communitary price reductions.

That year, all the sheep production systems will maintain their profitability in absolute and relative terms. Nevertheless, in the mixed cereal-animal systems (producer 4) and the exclusively animal producing system (producer 1), one can observe a replacement of the sheep production in relation to beef production, mainly due to the system of incentives and premiums for the

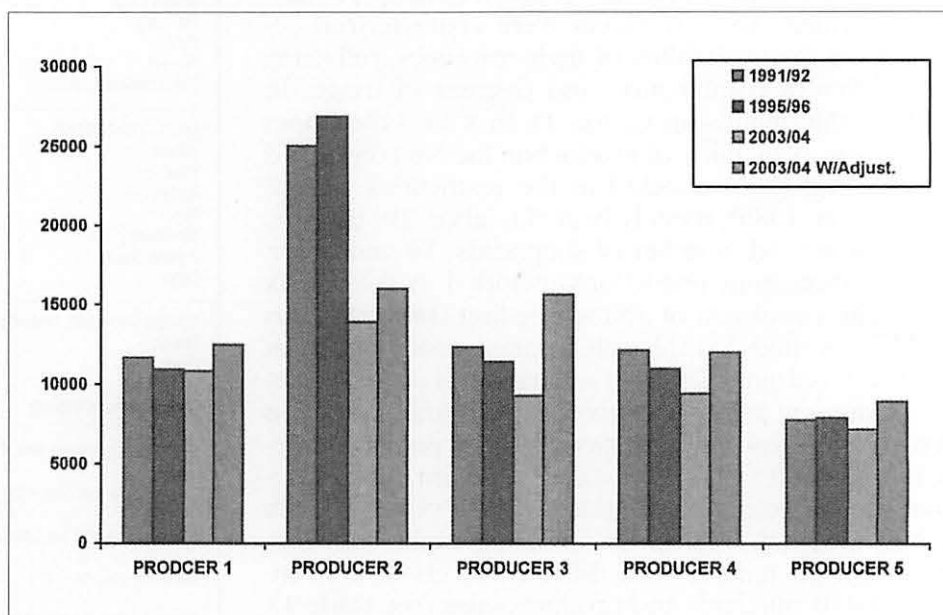


Figure 1 - Evolution of total farm income (thousands of escudos).

latter. The income of farms with mixed cereal-animal systems (producers 3 and 4) will remain constant and that of farms that are more cereal oriented (producer 2) could even increase (**figure 1**). For the year 2003/4 there are no important changes in the evolution of profitability and the consequent competitiveness of sheep production systems in animal production oriented farms (producers 1 and 5).

This is not the case of the other producers (**figure 1**). Elimination of specific aids to marketing of cereal relative to 1995/96 or high prices in base year result in higher reductions in income, even though adjustments in the crop production areas are very small and favor the production of animal feeds, which results in an increased competitiveness of the sheep production sys-

Table 4 Results per typical producer with technological adjustments.

Activity	Producer 1			Producer 2			Producer 3			Producer 4			Producer 5		
	1991/92	1995/96	2003/04	1991/92	1995/96	2003/04	1991/92	1995/96	2003/04	1991/92	1995/96	2003/04	1991/92	1995/96	2003/04
Total income (10 ³ escudos)	11679,0	11226,4	12507,6	25062,5	27974,2	16029,1	12363,2	11670,7	15651,9	12169,3	12249,2	12035,4	7782,7	8683,6	8972,5
Areas (hectares)															
Set-aside	-	-	-	-	73,4	51,5	-	21,4	8,3	-	13,1	7,7	-	11,3	10,5
Cereals	-	-	-	252,5	212,4	150,0	122,4	91,9	37,1	63,0	53,7	35,0	87,8	63,8	59,5
Oil Seeds	-	-	-	242,5	203,9	141,5	40,8	29,7	9,9	24,3	20,7	11,4	-	-	-
Forage:															
Hay	22,5	22,5	22,5	22,6	22,6	22,6	40,8	44,8	38,0	14,4	14,4	14,4	173,2	126,4	126,0
Silage grazeland:															
Sown	88,4	60,0	65,0	60,0	60,0	60,0	-	-	-	86,4	86,4	86,4	14,4	141,0	84,1
Sown (NT)	-	-	-	-	30,5	4,7	-	3,4	8,8	-	-	24,7	-	-	-
Natural	101,6	130,0	125,0	12,6	-	159,9	95,3	113,6	93,8	112,0	112,0	112,0	483,8	415,8	479,0
Irrigated	25,0	25,0	25,0	-	-	-	13,0	13,0	13,0	10,0	10,0	10,0	-	-	-
Animals (N°)															
Sheep	984	570	812	785	1000	1000	993	990	1000	1000	1000	1000	1000	1000	1000
Bovines	72	81	27	-	-	-	-	-	-	33	19	21	-	-	-

Source: Results from Models (Ventura-Lucas, 1995).

tems used in each one of the farms (figures 2 and 3).

TECHNOLOGICAL ADJUSTMENTS

The results of the previously analyzed models show the need for introducing technological changes that decrease costs and /or increase income from present production systems. Adoption of technological adjustments in the sheep production systems, taking into consideration the characteristics of each farm, are some of the aspects to be analyzed at this point.

The technological adjustments considered are related to improvements in feed and reproduction management, changes in soil tillage and crop production, namely replacement of traditional tillage by minimum tillage, and the introduction of new activities, such as sown pasture and forage.

The results of the models of sheep producing farms are presented in table 4. Its analysis shows that the introduction of new pastures, namely of raygrass in association with persian clover (referred in table 4 as NT Pasture (New Technology), in better quality soils and an increase in the areas of natural pasture and/or underground clover in the poorer soils, are fundamental for stabilizing the sheep herds and even increasing their number (figure 2). Technological improvements in the sheep produc-

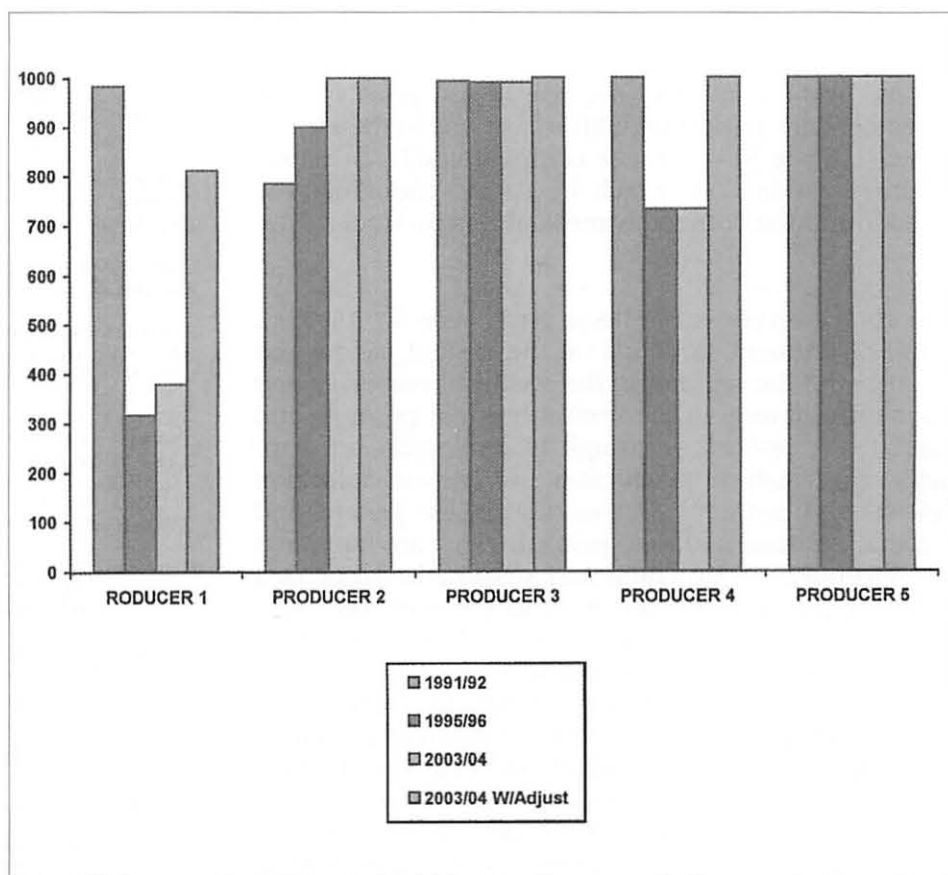


Figure 2 - Evolution of sheep herds on farms (n. heads).

tion systems that imply higher productivity rates and/or more efficient use of pasture tend to maintain or increase their competitiveness in all of the studied farms. Very important is the fact that the policy of premiums to sheep limits this production to herds that have less than a 1000 animals. This means that the decreases in farm

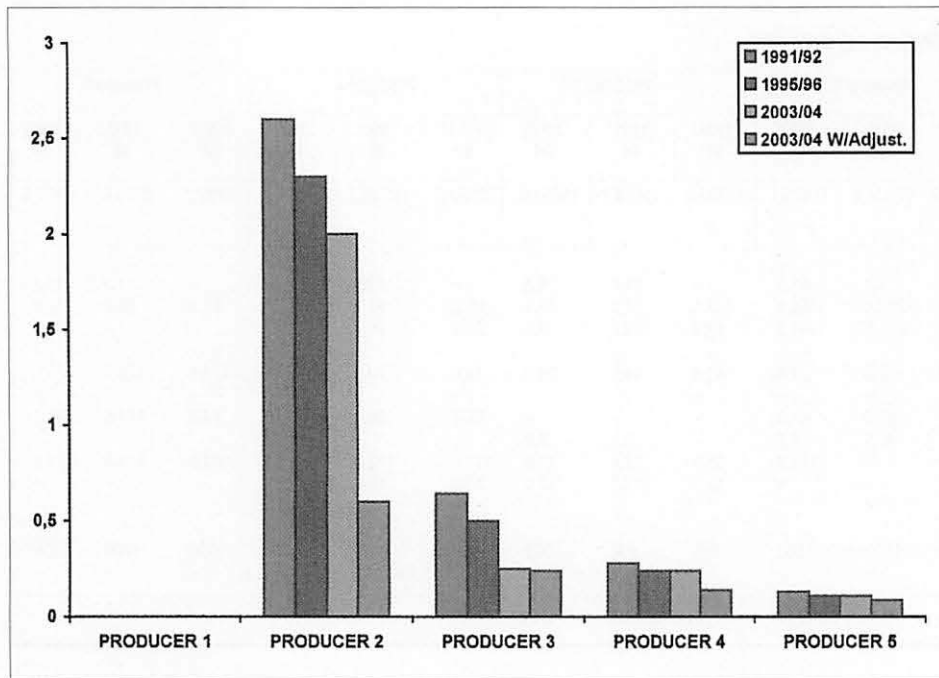


Figure 3 - Evolution of the area of cereals/forage and dry land crop.

income in the context of the considered price system, fundamentally associated with reductions in the area of cereals (**figure 3**), cannot be compensated by increases in sheep production, which in a way, conditions the evolution of the competitiveness of this product.

CONCLUSIONS

The competitiveness of sheep production in Alentejo, South of Portugal, depends on the natural factors and resources of the region, on the technical resources and on the functioning of the institutions that promote and value these resources through technological development of agricultural production and commercialization systems and economic factors, that is, the general and sectarian policies and their measures that are translated into incentives to structural and sustained change of a sector or into discouragement and contradictory signs that create economic instability and a lack of guidance for the economic agents in that sector.

The complete adoption of the CAP which will take place along the next 2 to 7 years constitutes a scenery that will continue to be characterized by a continuous decrease of prices at the producers and of the levels of aid to income. The effects of this decrease in competitiveness in sheep production in the south of Portugal is not very negative. In farms with cereal production, this will be, as expected, most penalized, with significant decreases

in the farmer's income. In the animal production sector, the decreases in income are small and it is admissible to presume the maintenance of the present levels of competitiveness.

After complete harmonization with CAP, in the sheep

production systems, the adoption of improvements in reproductive management and tillage practices as well as the introduction of sown pastures and forages in the various soil types, promotes its competitiveness in the region. Finally, it should be mentioned that the application to Portugal of the levels of aid to income foreseen in the context of the new CAP and of the agricultural component of the GATT treaty, not only provides sheep production with maintained or increased competitiveness, but can also indicate a minimally efficient role for this production in the process of the recovery of less or not competitive production systems. ●

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