

Extensive beef cattle production in Portugal: the added value of indigenous breeds in the beef market

Rodrigues, A.M., Pinto de Andrade, L. & Várzea Rodrigues, J.

Escola Superior Agrária de Castelo Branco, Quinta da Sr^a de Mércules,
6000 Castelo Branco, Portugal

Summary

Beef production in less-favoured areas in Portugal is usually extensive, and along with forestry and agriculture is one of the main sources of income and employment. It has also an important role both in a social and environmental context. Portugal is not self-sufficient in beef production, though the BSE crisis has severely hit beef sales, and it is difficult to envisage consumption making a full recovery in the short to medium term. However, it is possible to see an emergent market for beef produced by Portuguese indigenous breeds from extensive production systems. Beef from indigenous breeds is considered to be a high quality product by producers and consumers, mainly because of the superior taste and structure of the meat resulting from the production methods: differences within breeds, slow growth rate and type of vegetation consumed. This product differentiation has allowed the enlargement of small niche markets and has led to an increase in the value of meat with a Protected Designation of Origin (PDO). The specificity of a product linked with a PDO has a fundamental role in the establishment of the strategies for agricultural enterprises and in rural development. Since Portuguese agriculture cannot compete on quantity or production cost with other competitors, differentiation and quality seem to be the alternatives that may stimulate rural activities in LFAs and create a regional added value able to contribute to sustainable development. Extensive animal production systems can be an important component of environmental and landscape protection, as well as contribute to the decrease of the human and physical desertification of our rural areas.

Introduction

Cattle, like all ruminants, have played, and will continue to play, a valuable role in sustainable agricultural systems. They are particularly useful in converting vast renewable resources from rangeland pasture and crop residues or other by-products into food edible for humans. Meat consumption *per capita* has been increasing and is usually higher in countries with larger economic resources. The appearance of Bovine Spongiform Encephalopathy (BSE) has led many consumers to prefer meat of another animal species. Other fears about meat consumption in Portugal are linked with indiscriminate use of hormones, the use of several chemicals and prophylactic antibiotics.

Intensive livestock production systems aim to improve the genetic potential of the animals and of the feeds used. Nevertheless, such systems can, if the appropriate investment is not made, lead to serious problems of environmental pollution.

The small farmer, with limited economic resources and technology, has little possibility to compete on unit prices with large-scale producers. This has been one cause of the abandonment of land and the increasing danger of desertification of large rural areas. There is an increasing need to produce quality meat that, besides its organoleptic qualities, also gives health warranties. The production system of such products may not be so "efficient" as others but, besides producing quality products, they allow a more balanced use of natural resources, they do not cause environmental pollution, and they may encourage farmers to settle in rural areas at risk of desertification. In Portugal, beef cattle production from indigenous breeds can carry out these functions, and such production could be supported and given incentives.

Cattle numbers, meat production and consumption

In Portugal cattle numbers have suffered a slight decrease in the last few years, from 1.42m in 1991 to 1.31m head in 1996. Of these, 21.8% were beef cows, 27.6% dairy cows, 26.7%

calves, 17.8% animals between 1 and 2 years old and 6.1% other cattle (Anuário Pecuário, 1997). These results show an overall decrease in breeding cows (-7.9%), particularly accentuated in the dairy sector (-8.1%), and only partially balanced by an increase in beef cattle (+1.2%).

Beef cattle production has major importance in the regions of Alentejo and the northern interior. The north of Portugal has a total of 79,000 beef cows (37% of the regional herd). The central region has 58,000 beef cows (32% of the regional herd), and the south has a population of 129,000 beef cows (85% of the regional herd). Of the beef cows in the south, 97% are in Alentejo. The number of beef cattle is higher than the number of dairy cattle in the northern interior (54%) and in the Alentejo (86%).

In 1995, 397,000 cattle (104,000 t) were slaughtered for meat. In 1996 there was a decrease in the number of slaughtered animals (to 391,000), as well as a fall in the amount of meat consumed (99,000 t), down 4.6%. The average carcass weight also decreased to 253kg. The geographical distribution of slaughtering indicates that 43% took place in the region of Entre Douro e Minho, 7.1% in Trás os Montes e Alto Douro, 11.3% in Beira Litoral, 1.5% in Beira Interior, 26.3% in Ribatejo e Oeste, 9.8% in Alentejo and 1% in Algarve. The combined kill in the northern interior (Trás os Montes e Alto Douro), central interior (Beira Interior) and Alentejo accounts for just 18.4% of the national total of animals slaughtered. This situation indicates that a significant proportion of the production was slaughtered outside the production area and usually is carried out close to the major centres of consumption, primarily on the Portuguese coast, north of the river Tejo.

Before 1996, the trend in Portugal was of increasing consumption of beef, from 137,000 t in 1988 to 174,000 t in 1995. In 1996, this declined dramatically as a result of consumer distrust, due to BSE. In some regions a decline of 70% in the consumption was observed. In contrast, this overall decrease in beef consumption was accompanied by an increase in the

demand for meat from indigenous breeds and kept in extensive systems (Anuário Pecuário, 1997).

Analysis of the national statistics shows that the meat consumption *per capita* and beef consumption *per capita* are lower in Portugal compared with the EU average (87 kg v. 94 kg meat/person/year and 17.0 kg v. 21.0 kg beef/person/year, respectively), but rising towards it, and self-sufficiency in beef has decreased from 79.0% in 1990 to 56.9% in 1995. Consumers are increasingly tending to seek quality products, namely the meat provided from indigenous breeds kept in extensive production systems with a regime based on pasture and on local forage production.

Extensive systems

In extensive systems, production is mainly monitored by man and not modified by him. This helps to ensure the diversity and quality of environment and landscape. The extensive livestock production systems are more “natural” and it is accepted that they tend have advantages over intensive systems in terms of ecological sustainability. There are also fewer behavioural restrictions on the livestock allowing such systems to have high animal welfare standards.

Table 1 briefly compares extensive systems with intensive production systems. The characteristics indicated for the extensive systems refer mainly to systems using indigenous breeds. The feeding of these breeds is based on natural resources and is affected by the conditions that influence those resources: soil and weather conditions (Table 2).

The traditional Portuguese extensive production systems are sustainable and based on the use of local available resources - indigenous cattle breeds and natural or seeded forages.

The traditional production systems are highly compatible with the current direction of change in the Common Agricultural Policy (CAP). Extensive livestock production is one way of giving life and quality to rural landscapes, avoiding rural desertification (Vaz Portugal, 1990).

The systems respect the soil and they are well adapted to the climatic conditions of the country. However, research is required on the productive parameters of indigenous breeds, which will allow the improvement of production performance under specific production conditions, and enable the characteristics of the final animal product to be guaranteed. Obviously, it is necessary to select the animals that show the best biological and productive indicators in their own environment.

Table 1. Some differential characteristics of the Portuguese extensive and intensive production systems

Extensive	Production Systems	Intensive
Indigenous breeds	Genetic Resources	Mainly crossbred imported x indigenous breeds
Local Resources Indigenous flora	Feed	Mainly imported concentrate
Quality variable with annual cycle Produced to local capacity of land	Feed	High energy and protein More expensive
Limited supply Specific characteristics	Produce quantity and quality	Mass supply Standardise product
Niche market Tending to expand	Demand	Wide market Declining
More expensive	Cost per unit produced	Less expensive
Aims to optimise use of locally available forage resources Low stocking density	Animal welfare	Aims to maximise income High stocking density
Well adapted, but less productive	Animal - Biological adaptation	Higher sensitivity to production diseases Higher production capacity
Regional	Location	General
Positive	Influence on environment	Potentially adverse
Limited requirement	Labour	High manpower requirement
Possible	Conservation of genetic resources	Unlikely

There are two principal extensive beef cattle production systems in Portugal. One is located in the north and the centre and the other one in the south of Portugal (Table 2). The extensive animal production systems are characterised by the use of low capital inputs but with production costs only

potentially competitive, the assurance of product quality and typicity, which are essential characteristics for the intended added value, specific preference and demand for the product by the consumer and protection of the environmental quality.

Table 2. Characteristics of the Portuguese Extensive Production Systems

north/centre	Characteristics	south
	Weather	
With Continental and Atlantic influence	Mediterranean	With Continental influence
≤ 15°C	Average annual rainfall	>15°C
> 800mm Gerês, Serra d'Ossa (≈ 3000mm)	Average annual rainfall	< 800mm Barrancos (400mm)
High Throughout 8 months Lameiros* (70 days)	Frost	- Low to medium depending on proximity to Atlantic Ocean
	Soils	
Steep Medium fertility & productivity Medium hydraulic erosion Low organic matter	Granite and Schistose soils with sandy soils, low pH Low levels of exchangeable bases	Essentially flat Low fertility and productivity High hydraulic erosion (esp. under cereal monoculture) Very low organic matter
	Production Systems	
Small farms ≈ 3 ha	Average farm size	Large farms ≈ 300 ha
3	Average size of the herd (animals)	75
Diversified and family type	Farmer characteristics	Entrepreneurial
Meat/traction	Aptitude of indigenous breeds	Meat
Natural irrigation + Dry land	Pasture	Dry land
April, May, June & July	High digestibility and high forage production	March, April & May
March & October	High digestibility and low forage production	October & November
August, September, November December, January & February	Period of null or low forage growth	June, July, August, September December, January & February
Hay, cereal, straw, turnip, ferrejos**, potatoes & fruit	Supplementary feeds	Cereal straw, hay, cereal grain & restolhos***
All year round 7 months	Calving Slaughter age	Two periods (Summer & Winter) 18-24 months

* Lameiros - permanent pastures of natural grassland in the slopes of mountains with run-off irrigation and overflow.

** ferrejos - barley or wheat cut as green forage.

*** restolho - cereal crop residues.



Figure 1. Geographic origin of Portuguese Indigenous Breeds

Table 3. Portuguese indigenous breeds, geographic origin and some characteristics of the production systems

Indigenous Breeds	Geographic Origin	Cows in the Herd Book	Average Age (Years)	Number of Animals per Farm	Slaughter Age (months)
Barrosã	north	6715	10 (15) [†]	2.4	5-7
Mirandesa	north	4270	10 (18)	3.5	7
Maronesa	north	7194	8 (15)	2.5	6-8
Arouquesa	centre	6118	10 (15)	2.1	6-8
Marinhosa	centre	4426	9 (16)	1.6	4-5
Alentejana	south	7430	8 (18)	75-80	18-24
Mertolenga	south	7370	10 (20)	55	20-24

[†] values in brackets are maximum ages

Table 4. Reproductive and productive parameters in Portuguese indigenous breeds

Indigenous Breeds	Fertility (%)	1st Calving (months)	Calving Interval (months)	Female Adult Weight (kg)	Male Birth Weight (Kg)	Female Birth Weight (kg)	Weaning Weight (kg)	Carcass Yield (%)
Barrosã	60/70(e)	36(e)	15/16(e)	350/400(a)	25	23	140/180(e)	61.4(n)
Mirandesa	60/80(j)	26/30(j)	12/13(j)	450/550(a)	39(a)	35(a)	170/200(j)	61.6(n)
Maronesa	±80(j)	28(j)	13(h)	300/400(a)	-	30MF(h)	150/200(g)	51.0(h)
Arouqueas	>80(d)	36(d)	12(d)	300/350(a)	30	26	150(d)	63.3(n)
Marinhosa	>80(f)	36(f)	12(f)	620(a)	35(a)	32(a)	200(f)	-
Alentejana	70/80(b)	34(c)	14/15(b)	600(a)	33(a)	30(a)	160/200(b)	61.5(n)
Mertolenga	>90(m)	36(i)	13.2(m)	300/400(a)	25.8(i)	23(i)	130(i)	62.1(o)

(a) D.G.P (1987); (b) Rosado *et al.* (1981); (c) Cláudio *et al.* (1988); (d) Machado *et al.* (1981a); (e) Garcia *et al.* (1981); (f) Machado *et al.* (1981b); (g) Leitão (1981); (h) Alves *et al.* (1987); (i) Monteiro *et al.* (1981); (j) Leitão *et al.* (1981); (m) Bettencourt e Vaz (1987); (n) Silva Portugal *et al.* (1973a); (o) Silva Portugal *et al.* (1973b).

“lameiros” during almost all year, in the south the grazing period for high quality grass is very short. In the seeded or spontaneous non-irrigated pastures of the south, pasture vegetative growth decreases and even ceases during the coldest part of the year. At the end of winter temperatures rise and, as there is a high availability of water in the soil, create ideal conditions for fast vegetative growth. At the end of spring, as temperatures increase and soil water content declines, the vegetative cycle is completed, dry matter content increases rapidly and digestibility declines.

Feeding is based on the use of natural or improved pasture, hay, cereal straw, crop residues and cereal grain. In the north, livestock are also fed *ferrejos*, turnips and the surplus from other crops, such as potatoes and fruit. In the south, acorns are used. Feed diversity is an important characteristic of these livestock production systems and should be maintained, based in the use of local feed production. The complementarity of the natural feed resources should also be maintained, such as the use of crop residues from cereal growing. Other resources may be better exploited, like acorns and the grass of agrosilvopastoral systems in the south of the country (Belo Moreira & Seita Coelho, 1997).

Mean farm unit size in the north and centre is approximately 3 ha and is commonly divided into small dispersed parcels of land. In the south (Alentejo), farms are around 300 ha and less fragmented. Given this land structure, the numbers of cattle per farm varies from between 1.6 and 3.5 head in the north and centre and between 55 and 80 animals in the south (average values). The land structure is one of diversified family agriculture, with a high degree of subsistence farming in the north and centre, and a more entrepreneurial commercial agriculture in the south.

On the small farms in the north and centre, farmers rarely fatten the cattle. Calves are sold at 4 to 8 months of age to avoid feed competition between calves and their mothers and the need for extra housing for the young animals. The sales of calves are an indispensable source of income for the maintenance of the family economy. In the south (Alentejo), the farm size allows an extensive livestock production system which involves rearing the calves to finishing at 18 to 24 months (Table 2). In these two types of farm enterprises there is no supplementary feeding (concentrate) of the animals.

The products of these extensive production systems are always limited in terms of beef production. The animal production system is limited to the capacity of the land to produce feed. Production levels cannot be predetermined, but depend on feed availability and quality, and the upper limit determining production is directly dependent on the edapho-climatic conditions.

There has been an increasing trend in Portugal towards the certification of products derived from these natural and environmentally favourable production systems. Certification in the case of beef cattle is mainly linked to the use of the indigenous breeds. Herd book registration allows the identification and the recording of all the registered animals, guaranteeing not only the authenticity of the breed and individual registration, but also the feed conditions, health control and livestock management. In this way we can guarantee a certified product.

Portuguese indigenous breeds

A significant proportion of extensive beef cattle production is

based on the use of animals with unique characteristics, differing from region to region, with good maternal aptitude, hardiness, a low growth performance (not specialised in meat production) and exceptional adaptation to the environment where they live, and especially to the local feed, naturally produced.

In Portugal seven breeds of cattle produce meat with a Protected Denomination of Origin (PDO) mark: Barrosã, Mirandesa, Maronesa, Arouquesa, Marinhosa, Alentejana e Mertolenga. These breeds are distributed in limited regions in the north, centre and south of Portugal, as can be seen in Figure 1.

The total number of adult females registered in the herd book for all the seven breeds is 43,523 cows varying between a minimum of 4270 in the Mirandesa and a maximum of 7430 in the Alentejana. The average age of the registered animals in the herd book (Table 3), varies between 8 and 10 years, with a few cows reaching 20 years.

The adult female liveweight reaches 600–620 kg in the Alentejana and Marinhosa breeds, 500 kg in the Mirandesa breed and 350 kg in the other breeds. The fertility varies between 60 and 90%. The female birth weight varies between 23 kg (Barrosã) and 35 kg (Mirandesa), and the weaning weight between 130 kg (Mertolenga) and 200 kg (Marinhosa) (Table 4).

These breeds are used as line mothers for pure- or cross-breeding. We can assume that indigenous breeds are the strategic reserve of beef cattle production in Portugal. Studies reveal that in the lighter breeds, calves are weaned with a greater liveweight per 100 kg of maternal liveweight (Cláudio et al., 1988). Results indicate that smaller females with good fertility rate, enough capacity to produce milk and low maintenance energy requirements present some advantages over heavier breeds when managed in extensive production systems. Good performance results (30 kg calf per 100 kg liveweight at weaning) can be achieved. Small cows can be maintained at higher numbers per unit area, and produce more offspring per unit area than larger breeds (Ralo, 1994).

In terms of reproductive management in the south Portuguese system, there are two calving seasons: the traditional summer season (from August until October) and the winter season (from January to March). In the north and centre of Portugal, calving takes place throughout the year. Summer is a less favourable season in terms of the expression of milk production capacities and consequently for the weaning weight of the calf. Often it is necessary to supplementary feed the cows with straw, hay and, in critical situations, with cereal grain. In the winter calving season the higher milk production of the mother can be better exploited. The cow benefits from the greater quantity and quality of pastures, increasing milk production and consequently calf daily liveweight gain (Rodrigues, 1998).

In the traditional systems of north and central Portugal, calves are slaughtered immediately after weaning. In the south, steers are slaughtered between 18 and 24 months of age. Steers born in winter, because they reach a heavier liveweight at weaning, as a result of higher milk consumption, are killed at 18 months. In the first 6 months after weaning, the steers are fed generally with a low quality feed, directly from the pasture or stored feed. The next 6-month period is the most productive period in the year, since it corresponds to spring,

when there is peak grass production with a high digestibility. At the end of this second period, steers are submitted to a finishing phase. In the summer-born animals slaughtered at 24 months of age, compensatory growth is used. However, there are some disadvantages, such as the possibility of limited bone development in the calves (Rodrigues, 1998). The advantage is that feed costs are lower, because the animal ingests the maximum possible quantity of low-cost energy (pasture), and the minimum of high-cost energy (processed feed).

Slaughtering age and liveweight are significant factors determining the value of finished cattle, and the profitability of the production system. In practice, the slaughtering age and liveweight, are dependant not only on the biological variables but also on two other important variables: tradition and local feed production capacity. Under conditions of scarce feed resources, where cows and calves compete for space and also for feed, it may be that other slaughter weights, rather than a pre-defined ideal, are optimal. An option under such circumstances would be to maintain more cows in order of producing more calves with lower liveweights at slaughter (Vaz Portugal, 1998).

Protected Denomination of Origin of Portuguese Indigenous Beef

It is generally accepted for some animal products that the floristic composition of vegetation has an effect, at the least residual, on the quality of the final products derived from it, and/or that breeding influences meat characteristics at the tissue level and chemical composition. This, associated with the traditional and balanced extensive production systems, as well

as the identification of the typical characteristics of the different meat products from indigenous breeds, is the basis for the certification of such products.

The EC regulation nº 2081/92 defines the Protected Designation of Origin (PDO) as the name of a region, place or, exceptionally, a country, which is used to designate an agricultural product originating from that region, locality or country whose quality and characteristics arise essentially or exclusively from geographical provenance, including natural and human factors, and whose production and processing occur in a geographically restricted area. The PDO can provide farmers with a higher income, rewarding higher quality output and provide consumers with high-quality products of guaranteed origin and processing.

The existence of a legal basis to protect agricultural production is crucial to Portuguese agriculture, due to its specificity within the European context. The natural environment, old production technologies and the weakness of agricultural entrepreneurship has led to a level of productivity below the European average. The CAP and the later reform of the Common Market in relation to Mediterranean products had a negative impact on Portuguese agriculture, which has been unable to compete either on quantity or cost with other competitors. Differentiation and quality products seem to be the only alternative able to stimulate rural activities in Less Favoured Areas and create a regional added value that promotes sustainable development (Pinto de Andrade *et al.*, 1997).

The success of this strategy depends upon creating quality management systems, financial incentives, setting up an aggressive marketing strategy able to give an image of

Table 5. Protected Designation of Origin (PDO) for Portuguese Beef Cattle

Certified Product	PDO Managing Group	Private Organization for the Quality Control
Barrosã	CAPOLIB - Cooperativa Agrícola de Boticas, CRL.	Norte e Qualidade - Instituto de Certificação de Produtos Agro-Alimentares
Mirandesa	AGROPEMA - Cooperativa Agro-Pecuária Mirandesa, CRL.	Associação dos Criadores de Bovinos da Raça Mirandesa
Maronesa Meat	Cooperativa Agrícola de Vila Real, CRL.	Associação dos Criadores do Maronês
Arouquesa	COOFAES - Cooperativa Agrícola Cinfanense, CRL.	Norte e Qualidade - Instituto de Certificação de Produtos Agro-Alimentares
Marinhosa Meat	Cooperativa Agrícola de Aveiro e Ilhavo	Associação de Criadores de Bovinos de Raça Marinhosa
Carnalentejana	Carnalentejana, S.A. - Agrupamento de Produtores de Bovinos da Raça Alentejana	Associação de Criadores de Bovinos de Raça Alentejana
Mertolenga Meat	Mertocar - Sociedade de Produtores de Carne de Qualidade, LDA.	Associação de Criadores de Bovinos Mertolengos

The above PDOs are already active. In Table 6, the annual variation in price of the PDO beef, as well as the price of meat of crossbred Charolais and Holstein Friesian cattle are given.

Table 6. Average annual price paid to the producer of PDO meat (Euros*/kg Carcass weight).

Years Breeds	1994	1995	1996	1997	1998
Barrosã	-	-	5.25	5.25	5.25
Mirandesa	-	4.75	4.75	4.75	4.75
Maronesa	4.63	4.63	4.63	4.63	4.63
Arouquesa	-	4.25	4.25	4.25	4.75
Marinhosa	-	-	4.25	4.25	4.25
Alentejana	3.80	3.60	3.48	3.70	3.70
Mertolenga	-	3.06	3.52	3.53	3.50
Crossbreed Charlois**	3.79	3.41	2.85	3.00	3.25
Holstein Friesian**	3.60	3.20	2.60	2.76	3.01

* 1 Euro = 200\$00 PTE, ** Anuário Pecuário (1997)

“products with history” and setting up global distribution channels in order to reach international markets. So far, seven PDOs related to Portuguese indigenous beef breeds are registered in the EU (Table 5).

As can be seen, the prices achieved for PDO meat is different in the north and centre relative to PDO meat produced in the south of Portugal (4.25 to 5.25 Euros vs 3.5 to 3.7 Euros/kg carcass). This situation is mainly the effect of slaughter age. In the north and centre, with slaughter at 5-7 months, the carcass weight is much lower but its price is higher. In the south, with slaughter at 18-24 months, carcass weight is higher and the meat price per kg lower. There was no significant variation in PDO meat price from year to year, apart from in the case of the Alentejana. For the Arouquesa breed, the certification programme was implemented only in 1998 and led to an increase of 0.5 Euro/kg carcass.

Meat from crossbred and Holstein-Friesian cattle was subject to large annual and monthly fluctuations. Both breeds experienced a decrease in the annual average meat price paid to the producers between 1994-1996, and there was an increase in prices during 1997 until October 1998. Crossbred Charolais beef has a value approximately 0.2 to 0.25 Euro/kg carcass higher than Holstein-Friesian. The comparison between the value of crossbred beef and that with a PDO, indicates a price differential (Euro/kg carcass) worth between Euro 0.3 and Euro 0.5 in the south and between 1.5 and 2 Euro in the north and centre. The PDO added value reaches 62% in meat from some breeds.

The value of meat from indigenous breeds meat varies little between breeds, nor is annual price fluctuation significant. The BSE crisis did not affect the demand of the PDO meat nor the meat price. At present, however, the differential between the price paid to the producer and the market price for PDO meat is not sufficient to cover the costs of the PDO Management Groups.

Production Structures

The PDO sector needs to be well organised in each region. The agents involved in PDOs are the Breed Societies, PDO

Management Groups and private organisations for quality control. There has been a consolidation of PDO meat production, resulting in the reinforcement of the PDO Managing Groups in the national meat market.

The collective aims of these agents are to keep the farmers interested in indigenous breeds and the registration animals in a herd book, providing information about the production systems in a way to guarantee the specificity of the product. They also provide technical advisory services and promote the quality of the product to the consumer. They guarantee a minimum price to the farmers for the animals registered in the herd book, negotiate with the retailer the added value of the certified meat and certify the product in the slaughterhouse.

The three stages in the market structure allow production, marketing and certification to be kept separate, giving more reliable guarantees to the certified product. These tasks, however, demands human resources and equipment and are expensive. The cost should be covered by the differential obtained from the better price of the certified meat but, in reality, the differential is not sufficient. The reasons for this are, the small number of animals marketed, mainly sold to niche markets, consumers with a low level of quality demand and with low purchasing power, no increase in the price of certified meat in recent years and the small difference between the guaranteed price to the producer and the market price.

The marketing structures have responsibilities towards production systems, controlling the way the meat is produced as well as meat marketing. Firm defence of the product characteristics, in its origin, and production techniques, on guarantees to avoid product adulteration and to promote demand are essential. The message that the meat quality results from the animals' genotypes, from the environment and from the production system should be conveyed to potential consumers. The level of rigour with which the marketing structures carry out their task will determine their success, and the success of these structures to influence the meat market will determine the fate of the indigenous breeds.

The activity of the PDO management structures and even their survival are dependent on the financial support given by

the Portuguese Government and by the EU. The supports are indispensable for maintaining and improving the activities of the farming structures to improve product quality.

Conclusions

Endogenous resources must be improved. This is only possible by producing what others cannot produce, either through lack of biological diversity or because of a different genetic potential. Indigenous national breeds are an important alternative in LFAs, contributing additional farm income, to rural development and the preservation of traditional landscapes. The regional breeds are a genetic inheritance that has been selected over many years and their preservation is important. In terms of productive levels, however, they cannot compete with imported breeds, and if they are not well-protected, they may disappear. For the preservation of these breeds it is necessary to add value to the retail price of the products in order to compensate the farmers for the low productivity of the extensive systems.

The indigenous breeds require protection, and the ageing of the rural population continues to result in abandonment of the rural areas, and in some cases a great risk of desertification exists, mainly in the interior areas of the country. The improvement of the indigenous breeds can contribute to the stabilisation of the rural population and help to increase the interest of young people in agricultural activities. Improvements in the production systems are necessary, provided that the concept of “extensive production system” is maintained.

Genetic selection is still required with the general objectives to improve adaptation to the environment, the increase of milking capacity and the decrease of maintenance requirements, while maintaining hardiness of the indigenous breeds. A typicity of the final product should be guaranteed and since production is limited, the product's type should be used to generate added market value.

It is necessary to support the improvement of the indigenous breeds in order to:

- a) conserve the genetic inheritance represented by the local breeds,
- b) diversify agricultural activities to ensure better use of the natural resources,
- c) increase farming income to prevent depopulation of rural areas with low population density,
- d) promote production systems with low stocking rates that conserve the environment, and
- e) maintain the characteristics of the indigenous breeds and their pasture management systems in order to obtain high and guaranteed quality, able to command an added retail value.

If the structures involved with PDOs accomplish their functions, they must be financially supported, but will give direct benefits to their members, to the region and to the community, promoting social equilibrium and contributing to the preservation of genetic diversity, landscape and environment. If the work done by the structures involved with PDOs to certify and promote meat products with a guarantee of quality continues, the niche markets will be expanded by motivated and discriminating consumers.

Acknowledgements

The authors gratefully acknowledge the Indigenous Cattle Producer Societies for the important information which allowed us to characterise the livestock production systems.

We also thanks to Dr Maria Eduarda Rodrigues for helping with the translation to English.

References

- Alves, V. C., Almeida, J. C., Matias, J. M., Carvalho, M. A., Real, F. and Fernandes, F. (1987). A produtividade e a rentabilidade dos bovinos locais. Projecto nº 11 - 3º Relatório Anual de Progresso. UTAD, VilaReal, Portugal.
- Anuário Pecuário (1997). Gabinete de Planeamento e Política Agro-Alimentar, Ministério da Agricultura, do Desenvolvimento Rural e das Pescas, Lisboa, Portugal.
- Belo Moreira, M. and Seita Coelho, I. (1997). The role of livestock in the “montados” system. In: Livestock systems in European rural development. *Proceedings of the 1st Conference of the LSIRD network*. Athens, Greece. pp: 133-134.
- Bettencourt, A.J. and Vaz, I.M. (1987). Raça bovina Mertolenga - sistema alimentar. Jornadas Hispano-Lusas, Salamanca, Espanha.
- Cláudio, D., Cortes Martins, L. and Vaz Portugal, A. (1988). Sistemas de selecção e produção de raças bovinas de carne especializadas ou não, na área Mediterrânica. *Revista de Medicina Veterinária*, **30**: 4-16.
- D.G.P. (1987). Fichas das raças autóctones. Direcção Geral de Pecuária, Lisboa.
- Garcia, M., Rosário, J. and Antunes, M. (1981). Raça bovina Barrosã. In: A.B. Rodrigues (Editor), *Bovinos em Portugal*. Direcção Geral de Pecuária, Ministério da Agricultura, Lisboa, Portugal. pp. 43-78.
- Leitão, M. (1981). Raça bovina Maronesa. In: A.B. Rodrigues (Editor), *Bovinos em Portugal*. Direcção Geral de Pecuária, Ministério da Agricultura, Lisboa, Portugal. pp. 101-128.
- Leitão, M., Ferreira, L. and Costa, A. (1981). Raça bovina Mirandesa. In: A. B. Rodrigues (Editor), *Bovinos em Portugal*. Direcção Geral de Pecuária, Ministério da Agricultura, Lisboa, Portugal. pp. 79-100.
- Machado, J., Valente, J. and Gaspar, P. (1981a). Raça bovina Arouquesa. In: A.B. Rodrigues (Editor), *Bovinos em Portugal*. Direcção Geral de Pecuária, Ministério da Agricultura, Lisboa, Portugal. pp. 129-150.
- Machado, J., Valente, J. and Gaspar, P. (1981b). Raça bovina Marinhoa. In: A.B. Rodrigues (Editor), *Bovinos em Portugal*. Direcção Geral de Pecuária, Ministério da Agricultura, Lisboa, Portugal. pp. 151-174.
- Monteiro, P., Bettencourt, J. and Pereira, R. (1981). Raça bovina Mertolenga. In: A. B. Rodrigues (Editor), *Bovinos em Portugal*. Direcção Geral de Pecuária, Ministério da Agricultura, Lisboa, Portugal. pp. 197-216.
- Pinto de Andrade, L., Alberto, D., Várzea Rodrigues, J. and Chabert, J. (1997). “Typical Livestock Products and Rural Development-The study case of Fine Wool”. 2nd European Workshop of the LSIRD Network.- “Improving market integration and value-adding in domestic livestock enterprises in disadvantaged regions- the implications for future research:” University of Kassel, Witzenhausen, Germany. 27-29th September, 1997.
- Ralo, J.C. (1994). Aspectos essenciais na produção de bovinos de carne. *Vida Rural*, **1586**: 24-25.
- Rodrigues, A. M. (1998). Sistemas de produção de bovinos de carne. *Revista Técnica de Extensivo*, **1**: 13-21.

- Rosado, J., Almeida, M., Gouveia, M., Sobral, M. and Lobo, S. (1981). Raça bovina Alentejana. In: A. B. Rodrigues (Editor), *Bovinos em Portugal*. Direcção Geral de Pecuária, Ministério da Agricultura, Lisboa, Portugal. pp. 175-196.
- Silva Portugal, J., Ralo, J.C., Antunes, T. M., Rosário, J. P., Machado, J.R., Lobo, J.M.S., Almeida, J.F. and Ferreira, L.S. (1973a). As populações bovinas indígenas: capacidades de produção. Direcção-Geral dos Serviços Pecuários, Lisboa, Portugal.
- Silva Portugal, J., Ralo, J.C., Bento, A.A. and Silveira, D.R. (1973b). Raça bovina Mertolenga: testes de performance. Direcção-Geral dos Serviços Pecuários, Lisboa, Portugal.
- Vaz Portugal, A. (1990). A produção pecuária Nacional. *Veterinária Técnica*, **1**, 14-17.
- Vaz Portugal, A. (1998). Como defender a produção animal com características próprias - defesa das raças autóctones. *Revista Técnica de Extensivo*, **1**, 8-12.