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TECHNOLOGY AND MANAGEMENT TO ENSURE  
SUSTAINABLE AGRICULTURE, AGRO SYSTEMS,  
FORESTRY AND SAFETY

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## Farm Buildings and Working Conditions in Sheep Farms: Actual Situation in Trás-os-Montes, Portugal.

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### Summary

In the region of Trás-os-Montes, in the Northeast of Portugal, the breeding of sheep is quite relevant, not only because of meat and milk production, but also because breeders are dealing with mountainous areas or regions where agriculture is the main activity and alternative economic activities are very scarce.

Sheep are raised in extensive systems according to traditional farming systems and flocks are small.

In this region, sheep farms don't use animal housing intensively. Generally, buildings for sheep are simple, supplying shelter and the basic requirements to animals. Also, the utilization of equipment or machines to perform labor required by sheep production is scarce. Frequently, the farm buildings used to handle the flock present some constraints that make the utilization of machines or equipment difficult.

During last decade, some changes occurred in sheep farms, in the region, mainly related with handling techniques, feeding and milking. This evolution increased the importance and utilization of buildings for animal housing. Besides, the constraints and deficiencies in sheep housing interfere with labor and the working conditions in sheep farms.

We carried out a study, in this region, to identify the constraints and deficiencies in sheep buildings and the work and tasks performed by sheep breeders inside these buildings. We chose four variables: building plan; inside arrangement; width of the entrance; and the height of the walls, to analyze the functionality of these animal housing constructions.

Data collected allow us to conclude that, in this region, a large number of sheep farms continue to use very old constructions for sheep housing; many buildings are not suitable for the mechanization of work; and inside layout in sheep housing is not adequate to perform tasks in good conditions.

Many buildings lack facilities or equipment in order to perform work related to sheep handling activity; and the tasks for manure removal and milking are very arduous, because these works are carried out manually.

In the region, a large number of sheep farm buildings have many constraints and deficiencies in facilities and equipment that can affect working conditions inside these buildings.

*Keywords:* working conditions; animal housing; sheep housing.

### Introduction

Situated in the Northeast of Portugal, the region of Trás-os-Montes (approximately 41° to 42° N and 6.2° to 8° W) is bordered in the north and east by Spain. It is a mountainous region, composed of several plateaus above 700 m and several mountains with peaks between 1000 m and 1500 m. It is one of the most depopulated and least favoured Portuguese regions, where sheep farming has had a great socio-economic importance throughout time. This fact is particularly due to the scarcity of alternative economic activities, both at the local and regional level. Over the last decades, sheep farming has continued to be the main source of income for many families of the region.

Sheep are raised in extensive system, according to traditional farming systems and the flock range through mountains and valleys, around all over the unfenced and "free" plots of different landowners, according to old systems of land management. Traditional sheep farming is based on long-established knowledge and practices. Rangeland is the main feature of this system and is the essential feeding source to the flock (Barbosa and Portela, 2003).

Flocks are small and the main breeds that make up the flocks of Trás-os-Montes are local ones. There are six different local breeds which are raised according to the features of each breed. In the north, flocks are used for milk production or slaughter, whereas in the south milk production is dominant. Breeders value the animals' rusticity and ability to adapt to the environment, to endure long walks (from 4 to 6 km a day) and to survive when food lacks. Several attempts to introduce more productive breeds were not successful, as animals were raised according to the itinerary system and, therefore, they did not achieve their normal production levels (Barbosa and Portela, 2003). Most flocks have between 100 and 200 animals. According to the last census (INE, 2000), the region's sheep farms possessing over 200 animals represent only 7% of the total number.

During last decade, some changes occurred in sheep farms, in the region, mainly related to handling techniques, feeding and milking. This evolution is due, mainly, to the activity of associations of breeders or producers that are working on the development of sheep production; and to the valorization of sheep products (such as milk, cheese, lamb) and as a consequence there has been an increase in breeders' income. These circumstances stimulate sheep breeders to increase milk and/or lamb production and to improve the quality of these products.

In order to increase the quantity and quality of products, breeders are improving some handling techniques, feeding or increasing the number of sheep in the flock. We can not claim that breeders are turning to an intensive system, but it is clear that breeders are improving sheep farming system and care for the sheep. Although this evolution is a slow process, it has given more emphasis to the importance and utilization of buildings for sheep housing in the region.

Considering that sheep are raised according to an extensive farming system, sheep farms scarcely make use of buildings to handle flock. However, in the future, it is expected that breeders will increase the utilization of sheep housing. So, it is important to know the actual conditions about buildings used for sheep housing in the region and if these buildings have all the requisites to handle sheep.

The basic needs of sheep housing are simple and the organization and management of a sheep house is mainly determined by the breeding system and the type of production and feeding system (Slade and Stubbings, 1994). Buildings for animal housing must have a number of requisites, in order to meet the conditions of animal well-being; allow an advanced level of mechanization; have a positive effect on the organization of the work; make management and equipment costs compatible with the livestock-breeding investments; and make the building compatible with the environment and the surrounding area (Mennella, 1999). Besides, buildings and equipment have an important influence on the quality of the production, mainly on milk production. The building must give good working conditions to the breeder and ensure that all the requirements needed by the animals are properly met (Martyn and Astley-Cooper, 1992). Sheep housing allow breeders to work in comfort with all facilities to hand, and therefore they can look after more sheep (Brown and Meadowcroft, 1989).

In order to develop sheep raising in the region of Trás-os-Montes it is necessary to improve the working and production conditions on farms. For that purpose, it is necessary to introduce changes in the housing and equipment that are presently used by breeders, since buildings and equipment play an important role in the improvement of the working and production conditions and in the quality of the products (Barbosa and Fitas da Cruz, 2007). It is necessary to propose models and solutions that fit the local sheep farming system, so as to lead breeders to adopt more up-to-date techniques. However, it will be difficult to make breeders change their production system or introduce improvements in the buildings for sheep housing, unless the solutions can be afforded by the region's breeders (Barbosa, 2004).

The study of sheep housing and the identification of deficiencies in housing and equipment in the region is a good way to get knowledge, which is very important in order to carry out works to improve sheep housing conditions and equipment utilization; and to contribute to design buildings and equipment appropriated for sheep farms in the region of Trás-os-Montes

Having in mind that we need to know the actual conditions in sheep housing in the region, we carried out the present study aiming at:

- identifying the constraints and deficiencies in farm sheep buildings, in the region of Trás-os-Montes;
- studying the building plan and inside arrangement in sheep housing
- identifying the work and tasks performed by sheep farmers inside buildings
- contributing to the development of sheep production in the region.

To achieve these objectives, we have to get to know the way breeders in the region of Trás-os-Montes are making effective use of sheep housing and the variety and types of buildings they are using.

## Methodology

Due to the large area of Trás-os-Montes (nearly 12 000 km<sup>2</sup>) we had to select some villages to carry out this study.

Taking into account the last Census of Agriculture (INE, 2000) and the total number of sheep in each administrative territorial unit ("concelho" and "freguesia") we chose 23 villages in the municipalities with a higher number of sheep. In these villages, we studied buildings and equipment in 112 sheep holdings.

We collected data about buildings, construction and equipment used in sheep raising. We also inquired breeders about the work they carry out inside sheep housing; and we collected data about the procedures, techniques and equipment they use to perform the work (Barbosa and Fitas da Cruz, 2007).

The amount of data we collected, allows us to analyze the buildings for sheep in the region of Trás-os-Montes, from several points of view. The present study will focus on the functionality and working conditions in buildings for sheep breeding in this region.

Analyzing the data collected about these buildings, we chose four variables to identify the functionality of these animal housing constructions: building plan; inside arrangement; width of the entrance; and the height of the walls. We also took into account a fifth variable: the age of the building, in order to find changes or improvements in building construction throughout the time.

Since we have different scales of measurement for these variables, we consider all these variables as categorical variables. Giving emphasis to the functionality in sheep housing buildings we established, for each variable, the following categories:

- Building plan: enclosed building; open-front building; enclosed building with park; open-roofed building.
- Inside arrangement: single space; pen layout.
- Width of the entrance: width under 2 m; width over 2 m.

- **Height of the walls:** height under 2 m; height between 2 m and 3 m; height over 3 m.
- **Age:** built before 1950; built between 1950 and 1975; built after 1975.

Analyzing the data collected about the work in sheep housing, we identified the labor that breeders find more exhausting. We also identified the systems and/or equipment used to carry out the work related to manure management; milking; and feed handling.

## Results and Discussion

We consider the variables building plan; inside arrangement; width of the entrance; and the height of the walls, as good indicators to evaluate functionality and working conditions on farm sheep buildings.

Table 1 shows the frequencies of the categories for each variable. Concerning the building plan, the majority are enclosed buildings. A large number have a park outside, attached to the housing, which makes it easier to manage the flock.

Table 1. Frequency tables of the categorical variables analyzed.

Variables	Categories	Frequencies	%
Building plan	enclosed building	74	66,1
	open-front building	4	3,6
	enclosed building with park	31	27,7
	open-roofed building	3	2,7
Inside arrangement	single space	59	52,7
	pen layout	53	47,3
Width of the entrance	width under 2 m	58	51,8
	width over 2 m	54	48,2
Height of the walls	height under 2 m	10	8,9
	height between 2 m and 3 m	85	75,9
	height above 3 m	17	15,2
Age	built before 1950	50	44,6
	built between 1950 and 1975	13	11,6
	built after 1975	49	43,8

Concerning the inside arrangement, a larger number of buildings have a single space inside, without any division, pen or fencing. The whole flock (animals with different age, growth, sex and production) stays in the same area. This type of arrangement does not allow suitable supervision, organization or efficiency to perform the work.

When the inside space is divided into different pens and animals with different requirements are kept apart; or different areas are set apart and assigned to specific work (like feeding, milking, etc.) we can assume that these buildings have better conditions to work and manage the flock.

The majority of buildings analyzed have an entrance under 2 m wide. Thus, we can identify a constraint in these buildings, because this dimension is insufficient for the passage of some farm machinery, mainly for tractors and trailers.

Narrow doors, or other kinds of narrow entrances, become an obstacle to the transit of equipment or farm machinery that could be useful to accomplish indoor work.

A large number of buildings we studied have walls under 3 m high, and some are less than 2 m, and this can be regarded as a constraint in these buildings. The size of the walls can be an obstacle to the mechanization. Low walls (under 2 m) cause difficulties to the circulation of equipment and farm machinery. Besides, low walls reduce the capacity for storage of hay, straw or other supplies.

Generally, the constraints or deficiencies in buildings for sheep housing, are related to the date of construction. A large number of sheep farms we studied continue using old buildings. In many cases, the buildings used for sheep housing are over fifty years old.

Table 2 shows crosstabulations for the variable Age with all the other variables. In this table, it is possible to perceive that in all the variables there are some categories with higher frequencies in defined periods. In fact, data show that old buildings tend to be arranged in a single space inside, and tend to have narrow entrance. Also, low walls can be found mainly in old buildings.

In contrast, the very few buildings with open surfaces were, in most cases, built recently. Also, in modern constructions, a larger number of buildings is arranged in pens or delimited areas for specific functions.

In recent constructions, the number of buildings with high walls and large entrances has increased. This means that, over last decades, breeders have improved the construction of sheep housing.

It is essential to improve sheep housing, in order to ameliorate working conditions inside these buildings. We inquired sheep breeders for their personal judgement about work. They consider the labor in manure management and milking as the more arduous work.

Table 2. Crosstabulations for the variable Age with the other variables.

Variables		Age:		
		built before 1950	built between 1950 and 1975	built after 1975
Building plan	enclosed building	32	8	34
	open-front building	1	0	3
	enclosed building with park	17	4	10
	open-roofed building	0	1	2
Inside arrangement	single space	41	4	14
	pen layout	9	9	35
Width of the entrance	width under 2 m	40	3	15
	width over 2 m	10	10	34
Height of the walls	height under 2 m	9	1	0
	height between 2 m and 3 m	38	9	38
	height above 3 m	3	3	11

In the region of Trás-os-Montes, manure management is a manual work in the majority of sheep farms (Table 3) and ewes are hand-milked in all the sheep dairy farms that we studied.

Manure handling is entirely manual in the majority of sheep farms, where manure is gathered and carried outdoors manually. In a large number of buildings, manure is loaded up a trailer, which transports it outdoors. A small number have a mechanical system to handle manure; and only a few of the buildings have slatted floor to manure management.

Table 3. Floor type and manure management on sheep farms in Trás-os-Montes.

Floor	Manure handling system	n° sheep farms	
			%
Straw bedding	entirely hand removal	59	53
	hand loaded to a trailer	34	30
	front-loader	16	14
Slatted floor		3	3

The system and facilities used to manure management have been improving through the time. Table 4 shows the different manure management techniques on sheep farms, according to the period of construction of sheep buildings.

We found floors with slats only in sheep housings that were built during last decades. Besides, the breeders that are using mechanical systems to handle manure have built the sheep housing recently.

Entirely hand removal is more frequent in old buildings, perhaps due to the constraints and difficulties for the entry of trailers or other equipment inside the buildings.

Table 4. Age of buildings and manure management.

Floor	Manure handling system	Age:			
		Total	built before 1950	built between 1950 and 1975	built after 1975
Straw bedding	entirely hand removal	59	47	10	2
	hand loaded to a trailer	34	3	3	28
	front-loader	16	0	0	16
Slatted floor		3	0	0	3

Milking is another arduous work on sheep farms of the region. In our study, we did not find any sheep farm with milking parlor or milking machine. Ewes are hand-milked, generally inside the building in which they are housed. Usually, there is no specific place for milking and it is done in the straw-bedding area. While milking, the milker remains in an awkward posture that makes milking stressful labor and, also, potentially debilitating. Besides, in these places it is very difficult to ensure proper conditions of cleanliness and hygiene.

To deal with the work of milking, the breeder uses fences to contain lactating ewes, but he has to catch the animals by hand.

Feeding is a manual work, on all sheep farms, but it is not a hard work. In Trás-os-Montes, sheep are raised according traditional extensive farming systems and rangeland is the fundamental feeding source to sheep flocks. A large number of sheep buildings have hay feeders inside, generally along the walls, where fodder is supplied manually.

## Conclusion

We can conclude that, in this region, a large number of sheep farms continue to use very old buildings for sheep housing. Many constructive features, such as dimensions of doors and walls, are not suitable for the mechanization of work. Besides, in these buildings, inside layout is not adequate to perform tasks in good conditions.

Breeders regard the tasks for handling manure and milking as very arduous, mainly because these works are carried out manually.

A large number of sheep farm buildings have many constraints and are unsuitable to achieve good working conditions. Many buildings lack facilities or equipment in order to perform work related to sheep handling activity.

Development of sheep breeding in the region requires improvement in working conditions on sheep farms and emphasizing the importance of the use of equipment and facilities to ameliorate these working conditions.

It is also advisable to improve buildings used for sheep housing.

In many sheep houses, mainly in the old buildings, it would be possible to repair some elements, like enlarging doors or lifting up the roof. These repairs could improve or enable the mechanization of arduous work, like manure removal.

Besides, the old buildings are made of dry stone (wide walls built with little irregular pieces of granite or schist, without mortar) and repairing them requires special skills. So, it is advisable to provide technical support. However, not all old buildings can be improved due to technical difficulties or too expensive repairs.

In many cases, it will be possible to increase the sheep housing area by building annexes where the milking area, lambing or other sheep pens are placed.

For sheep housing to be built in the future, it is advisable to draw some templates of inside layout planning that may be available to breeders. It is also important to provide technical support and information about the construction and equipment, mainly related with milking, feeding and manure removal. To carry out these actions, it is necessary to engage the associations of breeders and producers.

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