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Concerted actions to underline and promote the quality of wool and its products from local sheep breeds in Epirus

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Abstract. In Greece sheep are bred for milk (75% of income) and lamb meat (25%). Wool production, an internationally important production line, is nowadays considered worthless and in most cases, sheep wool is discarded resulting a burden for the environment. The aim of this study was to make known the actions that have been taking place in Epirus (Western Greece) since 2015, in order to underline the advantages of sheep wool from local breeds and to explore alternative uses for commercial exploitation. Firstly, Idea Generation Meetings between representatives of local agents (AGRCI and ATSBE) and the ATELIER "Wools of Europe" were held and a specific 5 year action plan was designed. Secondly, a number of wool quality analyses in three local sheep breeds (Katsika, Kalarrytiki and Frizarta, n=159) were carried out so as to explore the specific characteristics of their wool. Additionally, the "Sheep Wool Day 2017" festival was organized in Epirus, which included scientific conference, display of wool products, book and photo exhibition and children's workshops relative to wool. Finally, the possibility of using wool from the above sheep breeds as an insulating material was investigated with encouraging results. Seeking new alternative uses of wool is expected to add value to the textile product and improve farmers' income.

Keywords: Sheep - Breeds - Wool - Greece.

Races ovines locales en Épire et perspectives d'exploitation de la laine

Résumé. En Grèce, les ovins sont élevés pour le lait (75% du revenu) et la viande d'agneau (25%). La production de laine, une chaîne de production d'importance internationale, est aujourd'hui considérée comme inutile et dans la plupart des cas, la laine de mouton est rejetée comme un fardeau pour l'environnement. Le but de cette étude était de faire connaître les actions en cours en Épire (Grèce occidentale) depuis 2015, afin de souligner les avantages de la laine de mouton de races locales et d'explorer la recherche d'utilisations alternatives à des fins d'exploitation commerciale. Premièrement, des Réunions de génération d'idées entre des représentants d'agents locaux (Centre de ressources zoo génétiques de loannina, Association des éleveurs de transhumance) et l'ATELIER «Laines d'Europe» ont eu lieu et un plan d'action de 5 ans a été conçu. Deuxièmement, un certain nombre d'analyses de la qualité de la laine chez trois races de moutons locales (Katsika, Kalarrytiki et Frizarta, n = 159), ont été réalisées de manière à explorer les caractéristiques spécifiques de leur laine. En outre, le festival «Journée de la laine ovine 2017» a été organisé à Épire. Il comprenait une conférence scientifique, une exposition de produits en laine, de livres et de photos et des ateliers pour enfants relatifs à la laine. Enfin, la possibilité d'utiliser de la laine provenant des races de moutons susmentionnées comme matériau isolant a été étudiée avec des résultats encourageants. La recherche de nouvelles utilisations alternatives de la laine devrait ajouter de la valeur au produit textile et améliorer les revenus des agriculteurs.

Mots-clés. Moutons - Races - Laine - Grèce.

I – Introduction

In the entire Mediterranean region and particularly in Greece, sheep and goat farming is the main livestock production sector, with a significant contribution to the national economy, rural sustainability & development and preservation of life in countryside (Di Trana *et al.*, 2015). Sheep and goat

farming offers many comparative advantages, due both to the specific environmental conditions of Greece and to tradition emerging through the centuries as part of its cultural heritage. Thousands of families obtain or supplement their income from small ruminant farming.

Sheep in Greece are mostly bred for milk production which accounts for approximately 75% of the producer's income, while lamb meat production accounts for 25% of it. However, sheep wool has a marginal economic value for farmers. Wool is the product harvested in sheep's compulsory shearing at the end of spring or early summer and contributes almost nothing to the farmer. On the contrary, in some other countries worldwide (e.g. Australia and New Zealand), wool production is the main productive and economic line of sheep farming.

In 2017, sheep population in Greece was 8 592,619 in 87,109 flocks (ELSTAT, 2017). It is worth noting that the statistics over time (since 2002) show that the number of sheep has remained relatively stable, while flocks have decreased by around 20%. In the region of Epirus, in the same year 714,551 sheep were bred (8.3% of the country) while the sheep flocks were 9,351 (10.1% of the country). Finally, since 2002, the average size of sheep flocks is low, around 78 sheep and 38 goats (ELSTAT, 2017). From the total population of sheep, only a small part (about 5%) is classified as pure breeds. Furthermore, the population of these breeds has been reduced and some of them are threatened by genetic erosion and extinction. In Epirus, the purebred sheep amounts to lowlands about 65,000. The most populous breed is Frizarta, which is a domestic "synthetic" breed that was created in the flat part of the region of Arta. It has high milk yield and adjustability in a wide range of humidothermal conditions. Its wool is semi-fine with production around 1.5 kg per animal. The other purebred breeds are Katsika loanninon, Kalarritiki, Mountain breed of Epirus and Sarakatsaniki, which are threatened indigenous breeds with very low population (1163, 6961, 1639 and 4754 total animals, respectively). Their wool production is between 1.5 and 1.8 kg. These breeds have some common characteristics such as disease resistance, durability to adverse and changing weather conditions, ability to use poor pastures and to survive on limited food and water resources. Ewes milk yield and lamb meat production of the above breeds are low and they do not cover the demands of the modern intensive sheep farming systems. On the contrary, many wool analyses have shown that the quality of their products is exceptional (Kondyli et al., 2012).

The wool-productive sheep breeds produce extremely thin wool, which is used by the yarns industry for fabrics, clothes, knits, etc. (Chaupin, 2005). The majority of sheep breeds in Greece have long coarse-wool fleece. The main feature distinguishing the Greek wool is its great heterogeneity. Breeds have evolved over time and there are no recent studies on the wool traits. In the past many craftsmen manufactured carpets, flocks, blankets, duvets, pillows, capes, trays and other utilitarian items, but since the country's entry into the EU (in 1980) the wool processing industry has shrunk and almost disappeared. In recent years, efforts are being made to exploit the wool so that it is not a waste of rearing.

In the past, wool production provided a low additional income for the small ruminant farmer. Unfortunately, today it is only a by-product of sheep farming, often rejected as a process, because it is considered unprofitable. In addition, the price of the wool is so low in some cases that it does not cover the expenses for the harvest. The aim of this study was to make known the actions that have been taking place in Epirus (Western Greece) in order to highlight the advantages of sheep wool from local breeds and to propose alternative uses for commercial exploitation.

II – Materials and methods

A number of actions have taken place in Epirus (Western Greece) since 2015 in order to show the advantages of sheep wool from local breeds. They can conveniently be sorted out as Workshops and Wool Quality Analyses:

1. Workshops

A number of Idea Generation Meetings between representatives of local agents (Animal Genetic Resources Center of Ioannina –AGRCI, Association of Transhumance Stock Breeders of Epirus –ATSBE) and the ATELIER (European Association for Study, Liaison, Innovation, Research into Textiles) "Wools of Europe" were held in Epirus and a specific –5 year– action plan was designed since 2015. The representative of the local wool handcrafters contributed their experiences from the wool market and presented the problems they face. Two sheep farmers offered gratis the annual wool production of their Katsika breed flocks in order to be examined from the specialized laboratory of the Agricultural University of Athens and additionally to be used by a handicraftsman to create exquisite products, adjusted to the type of the wool.

Moreover, the "Sheep Wool Day 2017" festival was organized in Epirus, to present the wool products that were produced and to promote the advantages of wool. The festival included scientific conferences, display of wool products, book and photo exhibition and children's workshops relative to wool (Pappas, 2017). Subsequently, 15 farmers from Greece participated in a 15 days mobility program in South France for training on wool actions in 2018.

2. Wool quality analyses

Firstly, a study was carried out in order to estimate the quality of wool in two Greek sheep breeds reared in Epirus: (i) Kalarrytiki (KL) and (ii) Katsika Ioanninon (KI), with the ultimate goal of highlighting the quality of the wool and exploring the possibilities of its utilization. The sampling took place from April to June 2016. 50 and 56 samples from KL and KI were analyzed. The samples were assessed for the thinness of the wool (estimation of the fiber diameter) with optical microscope, the length of the staples and the weight of unwashed wool.

Secondly, a study is in process since May 2018. It includes 53 samples from Frizarta breed, assessing the same wool traits.

Thirdly, another study has been carried out in order to investigate the possibilities of using wool for the manufacture of composite materials. Specifically, the length of the staples, the weight and the diameter of wool were measured in samplings from 34 animals of the KL and KI sheep breeds. Then, a polymer composite matrix material was created which included the epoxy resin as a matrix material and the wool as the fibrous material. Ten (10) wool samples of each breed were constructed. The processing formulation of the samples was carried out in a heated pressure chamber. Mechanical properties measurements followed such as Bending Testing and Shear Testing.

II – Results and discussion

Based on the results of the first study, the wool diameter was significantly higher in the KL compared to KI breed. Additionally, the effect of sex was significant with rams having longer diameter than ewes, while statistically significant differences were found among flocks in each breed. The variance coefficients expressing the degree of heterogeneity for wool diameter in each individual showed that there was a very large heterogeneity for this trait (Xarchakos *et al.*, 2017). Thin diameters (<30 μ) are extremely small and the majority of fibers have a diameter of 40 – 80 μ m. Considering that KI and KL breeds are milk productive breeds and milk production is negatively correlated with wool production, specifically with the thinness of the fiber, account for the fact that Greek wools are not used in weaving fine fabrics, because the resulting fabrics give the sense of roughness in direct contact with the human skin. The quality of Greek wool makes it more suitable for the textile industry for the fabrication of carpets or for other alternative uses. The results of the third study concluded that the mechanical properties of the epoxy resin are not degraded when combined with sheep wool. Additionally, it was found that adding wool to an epoxy matrix causes a slight increase in flexural strength of the composite material (Pardou *et al.*, 2018). Furthermore, it can be concluded that wool can enhance thermal insulation performance of compound materials by a significant percentage. Specimens with wool of KL breed had a coefficient of thermal conductivity reduced by 25%, while specimens with wool from the KI breed by 30%. The different heat-insulating behavior of composite materials with sheep wool is probably due to differences in the diameter of the wool.

III – Conclusions

According to the International Wool Textile Organization (IWTO), "all wool finds its use" (www.iwto.org). It is a natural and renewable resource that is produced invariably every year. Wool has many natural properties that are beneficial for health, wellness and comfort. Wool products, for example, can offer UV protection, humidity control, high thermal resistance, breathability, sound reduction and toxic chemical absorption. Considering its unique properties makes it worth rediscovering and reconfiguring it. The amount of wool produced each year in Greece and generally around the Mediterranean region, is so high that it is worth trying to bring it back to the production system. Additionally, the use of wool for the manufacture of composite materials will contribute to the construction of products that are durable and environmentally friendly. Also, the adaptation of the use of wool to the requirements of modern society (layers, pillows, clothing, thermal insulation, sound insulation etc.) is expected to boost wool production. The collaboration of the domestic crafts with industries that are involved in the production process can help towards this direction. The consumers should be informed and made aware of the benefits of wool products compared to both synthetic and cotton wool.

Seeking new alternative uses of wool, classifying it on the basis of quality and certifying the sheep breed it originates from, is expected to add value to the product and improve farmers' income.

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