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ANIMAL GENETIC RESOURCES INFORMATION

BULLETIN D'INFORMATION SUR LE RESSOURCES GÉNÉTIQUES ANIMALES

BOLETIN DE INFORMACION SOBRE RECURSOS GENETICOS ANIMALES

Food and Agriculture Organization of the United Nations
Organisation des Nations Unies pour l'alimentation et l'agriculture
Organización de las Naciones Unidas para la Agricultura y la Alimentatción

UNEP

Initiative for Domestic Animal Diversity
Initiative pour la Diversité des Animaux Domestiques
Iniciativa para la Diversidad de los Animales Domésticos

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Editorial

Sustainable Livestock Development: Inputs and Outputs -2

To realise and maintain food security, many countries must achieve continued increases over time in agricultural **production**, because human numbers are still increasing and often also because a level of food poverty currently prevails. Further, virtually all countries must now also increase **productivity** as the resultant pressure on the supply of inputs such as water, available land, animal feed etc intensifies. In addition, the management of such inputs to ensure continuity of supply over time reduces the risk of production failure due particularly to periodic and often irregular major rainfall deficits. We term the active manipulation of the processes of production and productivity , *through the deployment of more inputs in the system* , whilst at least restraining risk of system failure over time, sustainable intensification.

Of course instead of addressing production (output) and productivity (output per unit of input) we could deal only with the two primary variables, *i.e. inputs and outputs.* Indeed during most of this century, with lesser pressure on input resource availability, agriculturists - crop and livestock farmers, researchers, trainers, consultants etc - primarily considered the system output side of the productivity function. Commonly only the main output*(s)* from each type of plant and animal was considered, e.g. units of milk, or meat or fibre, or eggs. Although **multi-purpose production** prevailed in most circumstances, frequently only the main output which was consumed directly was considered in production development. So, for instance, outputs such as draught for cultivation, transport, etc, manure for fuel and fertiliser, the employment generating contribution, and the major asset value of animals utilised by farmers for risk management, often also comprise important contributions by them to farming communities. Of course, sustainable intensification of a biological system cannot be maintained by only addressing some of the important outputs or by neglecting the inputs. More formally, whilst important variables are excluded from a functional relationship describing a production situation even the relative emphases accorded those variables will be incorrect, and badly so in some cases.

A further important aspect of agricultural production which has contributed to the development of social diversity of human communities is **product quality**. The nature of the environment has shaped the production system and the living habits of people, their housing, clothing, and particularly their food and customs. Further, and depending on the quality of fresh food products, different secondary products such as cheeses, yoghurts, preserved meats, fabrics, etc are made and differentiation of communities in cuisines has been the result. As the developed countries in particular enter the information age, increased market segregation even within communities is occurring with demand increasing simultaneously for both greater variety and more consistent products. This range of demands within and amongst communities suggests that whilst food and agricultural product quality considerations may well be of minor importance to communities in poverty they cannot be neglected in planning for sustainable intensification of production at the country, regional and global levels.

Sustainable intensification of production may, *thus*, be achievable at all input-output levels and not simply in the highly industrialised (high input) production systems. The challenge is to ensure that the technologies etc employed to achieve the intensification process are appropriate to the production system.

The Editors

Développement durable en élevage: ressources et productions - 2

Pour atteindre et conserver la sécurité alimentaire, la plupart des pays doivent réaliser des augmentations continues dans le temps en matière de **production** agricole, étant donnée que le nombre d'habitants est en augmentation et que souvent aussi le niveau de pauvreté alimentaire est courant. En outre, tous les pays doivent maintenant augmenter la **productivité** comme résultat de la pression intense exercée sur les ressources telles que l'eau, la disponibilité de terre, l'alimentation animale etc. D'autre part, une gestion de ces ressources qui puisse permettre d'assurer la continuité des apports dans le temps diminue le risque d'échec de la production qui est dû surtout au déficit provoqué par les périodiques et souvent irrégulières pluviométries. Nous califions ainsi la manipulation active des processus de production et de productivité - *à travers le déploi de plus de ressources dans le système* - tandis que le risque d'un échec du système dans le temps diminue par le biais d'une intensification durable.

Nous pourrions, bien sûr, au lieu de nous référer à la production et à la productivité (production par unité de ressource) traiter seulement les deux variables primaires, c'est-à-dire, *les ressources et les productions*. De fait, presque tout au long de ce siècle, qui a subi moins de pression sur les ressources disponibles, les agronomes, vus comme éleveurs et agriculteurs, chercheurs, enseignants, consultants etc., ont considéré en premier lieu la partie du système de production qui correspond à la fonction de productivité. Très souvent seulement les principales productions de chaque type de plante ou d'animal ont été prises en considération, par example les unités de lait, de viande ou de fibre, des oeufs. Bien que la **production à buts multiples** soit souvent la plus importante, fréquement seules les productions qui sont consommées directement viennent prises en considération dans le cadre du développement. De ce fait, les productions telles que la traction animale dans l'agriculture, le transport etc., le fumier pour l'utilisation comme carburant et fertilisant, la génération d'emploi, ainsi que la principale valeur, les animaux utilisés par les éleveurs pour la gestion du risque, souvent contiennent des contributions importantes pour la communauté agricole. Bien sûr l'intensification durable d'un système biologique ne peut pas être soutenue seulement par la sélection de certaines parmi les productions plus importantes ou par l'exclusion des ressources. Plus concrètement nous pouvons dire que, tandis que des variables importantes sont exclues d'une relation fonctionnelle qui décrit une situation de production, l'importance relative accordée à ces variables sera incorrecte, voir négative dans certains cas.

Un autre facteur important de la production agricole qui a contribué au développement de la diversité sociale des communautés humaines est la **qualité du produit**. La nature de l'environnement a déterminé le système de production et les habitudes des peuples, leurs maisons, leurs habits, et, en particulier, leur nourriture et habitudes alimentaires. En outre, et selon la qualité des aliments frais, certains produits secondaires se sont développés, tels que le fromage, le yogurt, les viandes en conserve, les tissus etc., donnant lieu ainsi à une plus grande différentiation entre les communautés du point de vue de la gratronomie. Etant donné que, surtout les pays développés, entrent maintenant dans l'ère de l'information, on observe une augmentation dans la ségrégation des marchés même à l'intérieur d'une communauté, avec, simultanément, une augmentation de la demande de meilleures variétés et de produits plus consistents. Cette partie des demandes à l'intérieur et entre les communautés fait penser que les considérations sur la qualité des aliments et des produits agricoles peuvent être de

moindre importance pour les communautés plus pauvres, mais ne doivent pas être négligées lors de la planification d'une intensification durable de la production au niveau d'un pays, d'une région ou même au niveau mondial.

L'intensification durable de la production doit donc être atteinte à tous les niveaux de ressource-production et non seulement dans les systèmes de production hautement industrialisés (haute production). Le défi consiste à assurer que les technologies employées pour atteindre le processus d'intensification soient appropriées au système de production.

Les Editeurs

Desarrollo ganadero sostenible: recursos y producción- 2

Para conseguir y mantener la seguridad alimentaria la mayoría de los países debe llevar a cabo contínuos incrementos en la **producción** agrícola, ya que el número de la población humana sigue creciendo y, a menudo, prevalece un escaso nivel alimentario. Por otro lado, todos los países deben ahora incrementar también la **productividad** como resultado de la intensa presión ejercida sobre los recursos tales como el agua, el terreno disponible, la alimentación animal etc. Además, la gestión de estos recursos que permita asegurar una continuidad del suministro a lo largo del tiempo, disminuye el riesgo de un fracaso en la producción, debido en particular a las lluvias periódicas y a menudo escasas. Calificamos la manipulación activa de los procesos de producción y de productividad - *a través del despliegue de mayores recursos en el sistema* - mientras se restringe el riesgo de un fracaso del sistema en el tiempo mediante una intensificación sostenible.

Por supuesto en vez de referirnos a la producción y a la productividad (producción por unidad de recurso) podríamos tratar solamente con las dos variables primarias, es decir, *los recursos y la producción*. De hecho, durante gran parte de este siglo, debido a una menor presión sobre los recursos disponibles, los agrónomos, entendidos como ganaderos y agricultores, investigadores, enseñantes, consultores, etc., consideraban en primer lugar la parte del sistema de producción referida a la función de productividad. A menudo se tomaban en consideración sólo las principales producciones de cada tipo de planta o animal, por ejemplo, unidades de leche, o de carne, o de fibra, o de huevos. A pesar de que **la producción con varios propósitos** prevaleció en la mayoría de los casos, a menudo sólo la producción principal consumida venía considerada para el desarrollo. Por todo ello, las producciones tales como la tracción animal en la agricultura, el transporte etc., el estiércol para carburante y fertilizante, el empleo ajeno, y el principal valor, los animales utilizados por los ganaderos para la gestión del riesgo, a menudo también aportan importantes contribuciones para la comunidad agrícola. Por supuesto, la intensificación sostenible de un sistema biológico no puede mantenerse sólo seleccionando algunas de las producciones más importantes o dejando de lado los recursos. Más concretamente, mientras algunas variables importantes queden excluidas de la relación funcional que describe una situación de producción, incluso el énfasis relativo concedido a aquellas variables será incorrecto y en algunos casos incluso negativo.

Otro factor importante de la producción agrícola que ha contribuido al desarrollo de la diversidad social en las comunidades humanas es **la calidad del producto**. La naturaleza del ambiente ha determinado el sistema de producción y las costumbres de vida de la gente, sus casas, vestidos, y, en particular, su alimentación y hábitos. Además, y dependiendo de la calidad de los productos frescos alimentarios, han surgido distintos productos secundarios tales como los quesos, yogurt, carnes en conserva, tejidos etc., y el resultado ha sido una diferenciación en los tipos de cocina de cada comunidad. Dado que, en particular los países desarrollados, han entrado en la era de la información, se ha producido una mayor segregación del mercado, incluso dentro de las comunidades, con al mismo tiempo un incremento de la demanda tanto de mejores variedades como de productos más consistentes. Este tipo de demandas dentro y entre comunidades sugiere que, mientras la alimentación y la calidad del producto agrícola pueden muy bien ser de menor importancia para las comunidades más pobres, no puede ser dejado de lado en la planificación de una intensificación sostenible

de la producción a nivel de un país, una región o incluso mundial.

La intensificación sostenible de la producción puede, *por tanto*, ser alcanzada a todos los niveles de recursos-producción y no solamente en los casos de alta industrialización de los sistemas de producción (alta producción). El desafío consiste en asegurar que las tecnologías empleadas para alcanzar el proceso de intensificación sean apropiadas al sistema de producción.

Los Editores

The Betizu Cattle of the Basque country

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Summary

The Betizu feral cattle breed is considered as one of the most endangered and ancient in Europe. It is native to the Basque Country (Euskadi). A small number survives in Bizkaia, Gipuzkoa (Basque Autonomous Community), the Navarre and the Atlantic Pyrenees Department of France (Lapurdi). This paper describes the origin, habitat, zootechnical characteristics, aptitudes and attributes of this breed. At present, conservation projects have been initiated in order to preserve the remaining populations.

Resumen

La raza Betizu que está considerada como una de las poblaciones bovinas más antiguas de Europa, se encuentra en grave peligro de extinción. Originaria de Euskal Herria (País Vasco), quedan contados animales en Bizkaia, Gipuzkoa (Comunidad Autónoma Vasca), Navarra y Lapurdi (Departamento de Pirineos Atlánticos de Francia). En este artículo describimos el origen, hábitat, características zootécnicas, aptitudes y cualidades de esta raza. En la actualidad se han iniciado proyectos de conservación para preservar esta población.

Key words: *Betizu Cattle, Basque Country, Conservation, Utilization*

Introduction

The word Betizu, arises from the Basque language where *behi* means cattle (cow) and *izua* wild, in reference to the wild characteristics of these cattle which tend to hide in forested areas (Gómez, 1996). Etymologically, it means wild (Barandiarán, 1972) or elusive cow. Other synonyms traditionally used by farmers during past decades are "*herri ganadua*" (Echevarría, 1975), "*herri behiak*" (Staffe, 1926), "*behi auzoa*", "*etxeko behiak*" (Seiliez, 1975), "*abel gorriak*" or "*kata bizarrak*". In some publications erroneous terms such as "*betizuak*", "*betitzu*" or "*betiso*" (Darrigade, 1979) have been transcribed.

Origin, Population Numbers and Distribution

Much discussion has been held and full agreement has not been reached about the origin of this breed (García Dory, 1986). The most accepted thesis indicates that the Betizu constitutes a residual group of the ancient cattle known as Basque or Pyrenean breeds (Plazaola, 1992 and Asociación de Amigos de la Betizu, 1995). Most of them underwent an improvement process while another group became wilder. Some other theories relate it to the aurochs, from various fossil and drawing testimonies of wild cattle in different archaeological excavations. Most researchers seem to agree on the relationship between these feral cattle and the first human inhabitants of the Pyrenees. These cattle can

Figure 1. The Basque and Navarre Communities, and the Department of the Atlantic Pyrenees.

be described as a group of animals, small in size, very rustic and well adapted to wild conditions.

Nearly 160 individuals survive as pure-breds, grouped in four nuclei, one more or less wild group, based in the Bizkaia area (Figure 1) with 10 head (9 females and 1 male) in Dima and a group of around 15 individuals on the Gorbea mountain, the second, with 30 head (20 females and 10 males) in the Ibardin and Mondarrain areas (Lapurdi) in the Atlantic Pyrenees Department, the third, belonging to the Navarre Regional Government, inhabits an area in the Finca of Sastoia in Urraul Alto and includes 75 animals, descendant from a group that was taken from the Goizueta mountains in 1973 (ITGV, 1996) and the fourth is a group of 30 individuals in Gipuzkoa.

They live in totally free and wild conditions without any human intervention, feeding on the vegetation around them. They graze in herds that have rarely been domesticated or taken into a cowshed.

Characteristics of the Breed

Animals are small in size with wither height around 130 cm for males and 120 cm for females. The average weight for males is around 400 kg and 300 kg for females. The fore quarters (shoulders, withers and neck) are more developed than the hind part with smaller reduced hindquarters and buttocks (Figure 2). This difference is more notable in males. The colour at birth is dappled yellow

which develops with growth into tawny varying from blonde to red depending on sex and season. There is no pigmentation in the mucous membrane and hoofs. Animals have a big head, narrow face and muzzle and a plain forehead (figure 3). The horns are pearly white at the base and the end and the tip is coloured with crescent shapes. The small eyes, short neck and the remarkable dewlap are also characteristics of the breed. Other characteristics are notable withers, a straight dorsal line rising slightly towards the hindquarters (in many cases the dorsal-lumber line has a "saddle shape"), little body development, small udders, without any pigment, covered with long hair and a highly inserted tail

The natural reproductive cycle is associated with seasons. Cows calve approximately in March, every two years and average age at first calving is 3 years, cows giving 5 or 6 young during their life. The bullock stays with the mother for the first 15 months. The animals are suited to walking using the tips of the hoofs. Life span is 14-15 years. There are two traditional uses that humans have given to this breed;, traditional hunting that is often helped by the use of the "Encartaciones" area, hunting with dogs and bullfighting.

Research Priorities

The Betizu, together with other Basque domestic endangered breeds are in danger of extinction. However the Agricultural Department of the Bizkaia, Araba and Gipuzkoa province council and the Basque Government are supporting a research project to conserve these genetic resources. In 1996 the Department of the Bizkaia province council carried out field work to evaluate the photozoometric index of animals in this province.

I*n situ* and *ex situ* conservation plans have been initiated including the conservation of semen, ova and embryos. The first phase was started in 1989 through the collaboration

Figure 2. Betizu bull

between a farmer and an animal genetics enterprise (Rekagorri, 1991). A total of 215 doses of frozen semen were obtained by electroejaculation. In 1996, five bulls were selected from the 3 pure herds for semen collection. For 1997, ten 2-year-old heifers have been selected and are being prepared for ova collection. With this genetic material, embryos will be obtained to produce bullocks to repopulate the breed and distribute to interested farmers. These can also be introduced into some of the Basque Natural Parks areas where these breeds used to live in ancient times.

This breed has been included in a funded programme to promote methods of agricultural production compatible with the requirements of the environment and the conservation of natural areas together with the conservation of local breeds. This programme is in accordance with the EEC regulation number 2.078/92 of 30th of June of 1992 and the Bizkaia Province Council Act number 18/1996 of 27 February 1996.

Conclusions

Apart from its historical and cultural value, the Betizu breed can be used as an unbeatable "mountain gardener", making use of marginal zones and mountainsides with poor pasture which would otherwise turn into a thicket vegetation. Their distinctive rusticity adaptation to the environment, ability to use fodder with low feeding value and good maternal ability, are all fundamental requirements for extensive systems. Due to scientific, cultural, historical and possibly economic reasons the conservation of this breed is considered to be of great importance, not only to conserve the genetic biodiversity necessary for the equilibrium of the ecosystem but also to enrich the gene pool with elements that someday could be exploited.

Figure 3. Betizu cow

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The Florina (Pellagonia) sheep breed

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Summary

The Florina (or Pellagonia) sheep, which have descended from ancient indigenous Greek populations, are on the way to extinction. A small number of animals are found in the region of West Macedonia. The breed belongs to the semi fat-tailed Ruda wool type sheep, is well adapted to harsh mountain conditions and shows resistance to diseases. Recorded farms are kept at the Agricultural Research Station of Koila in Kozani, at the T.E.I. farm of Florina, at the Animal Husbandry Institute of Gianitsa and at the Agricultural Research Station of Komotini. The average commercialised milk production is 96±38.6 kg during a lactation period of 156 days and the average litter size is 1.4±0.52.

Résumé

La race ovine Florina (Pellagonia), à l'origine de races rustiques, est menacée d'extinction. Un petit nombre d'animaux se trouvent dans la région Ouest de la Macédoine. Cette race est bien adaptée aux conditions climatiques rudes et elle est résistante aux maladies. Des troupeaux contrôllés se trouvent dans la Station de Recherche d'Agronomie à Koila, Kozani, au T.E.I. à Florina, à l'Institut de l'élevage à Gianitsa et à la Station de Recherche d'Agronomie à Komotini.
La production laitière moyenne est de 96±38.6 kg et la taille de portée de 1.4±0.52.

Key words*: Characteristics, Florina, Pellargonia, Greece, Zackel*

Introduction

The majority of the sheep population in Greece belongs to the Zackel type, which is found all over the country and is characterised by the long tail and coarse wool. A second group includes breeds of the Ruda type, which have finer and more uniform wool and are found mainly in Macedonia, Thrace and on some Aegean islands. There is a third category of sheep of the so-called semi fat-tailed type, found on the East Aegean islands. Today's evolution and distribution of the different sheep types and breeds are the result of developments and changes that have taken place over the last thirty years. Uncontrolled cross-breeding and the unplanned extension of artificial insemination have played a major role in the disappearance of certain smaller breeds and the diminishing number of the pure-bred mountain populations. The Florina breed belongs to the Ruda type and is one of the native breeds, which is at the risk of extinction (Hatziminaoglu *et al*., 1985).

Location and Numbers

The sheep of Pellagonia or Florina descend from the ancient indigenous sheep and are probably the result of the crossing of lowland with mountain breeds (FAO, 1995).

This breed was raised traditionally, in the region of Monastiri of Skopia, where pure-bred animals are no longer found. From 1950, the breed has been found in West Macedonia and particularly in the county of

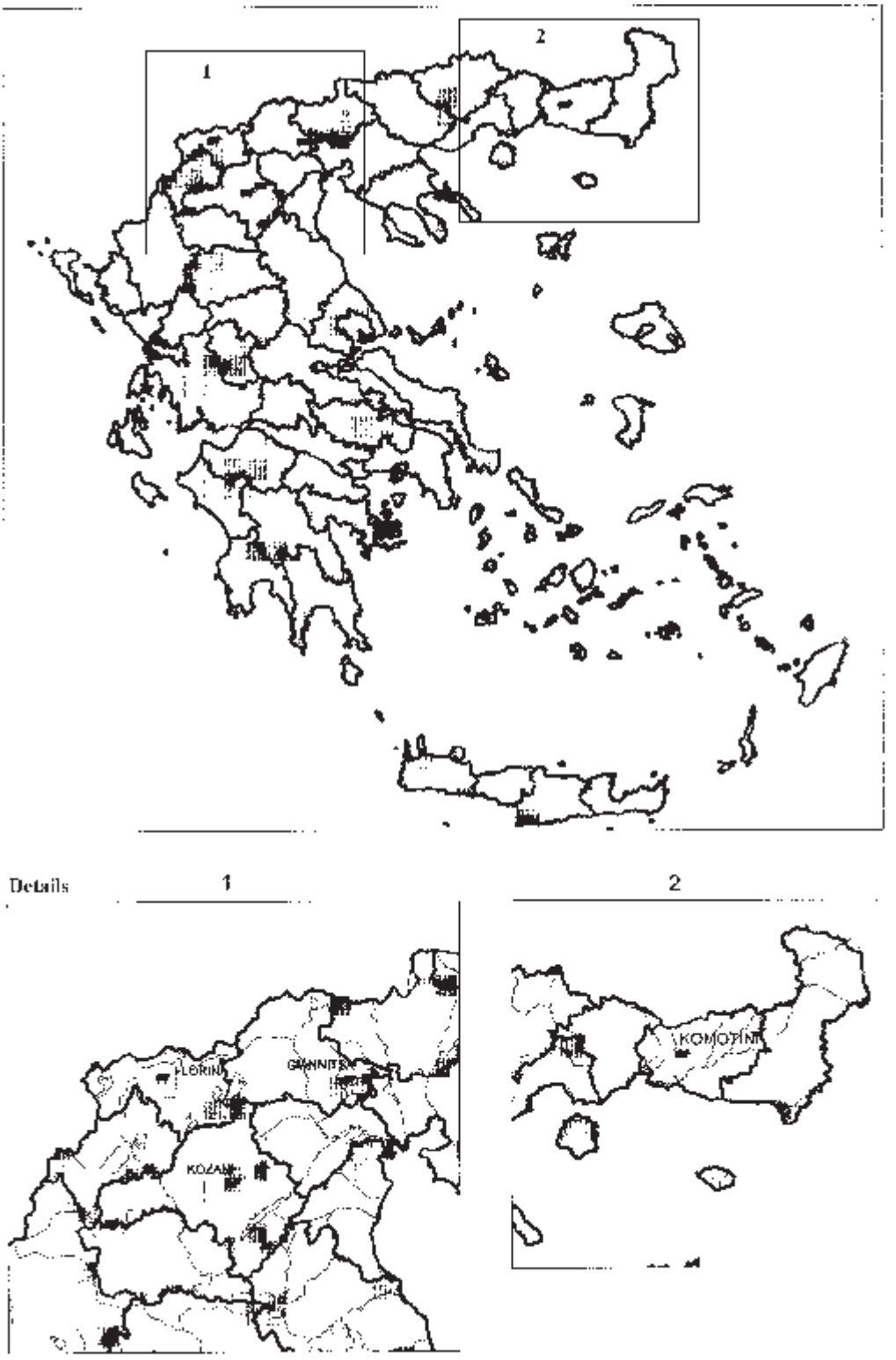

Figure 1. Distribution of Florina sheep breed in Greece.

Florina, where a small number of animals are still kept today. A small number of animals are also raised in the nearby county of Kozani. Recorded farms are found in the Agricultural Research Station of Koila at Kozani, on the T.E.I. farm of Florina, in the Animal Husbandry Institute of Gianitsa and in the Agricultural Research Station of Komotini (figure 1). In table 1 the numbers of ewes and rams recorded are given.

Breed Characteristics and Husbandry Information

The Florina sheep belong to the semi fat-tailed Ruda wool type sheep. The typical colour is white with a characteristic black ring around the eyes and black spots on the nose and legs. The body is long with a straight dorsal line, strong legs and large udder. The head is big with drooping ears. The height of the ewes is about 70 cm with a live weight of 55-60 kg and rams measure 80 cm and weigh 80-85 kg. The ewes are polled, while the rams have spiral horns (respectively figures 2 and 3).

Main characteristics of Florina sheep are reported in table 2.

The sheep are hardy and well adapted to harsh mountain conditions. The low quality pastures of autumn and early spring can be exploited, due to their low feeding requirements. Furthermore these sheep show resistance to diseases.

Table 1. Location and numbers of the Florina (Pellagonia) sheep[1]

Location	Males	Females
Agricultural Research Station of Koila	15	165
Agricultural Research Station of Komotini	16	120
T.E.I. of Florina	15	35
Animal Husbandry Institute of Gianitsa	25	100
Kozani country	5	58
Total	*76*	*478*

[1]October 1997

Table 2. Characteristics of the Florina (Pellagonia) sheep

	Males		Females	
Body weight (kg)	80		55	
Height at wither (cm)	80		70	
Birth weight (kg)	3.9	±0.04[1] (n=262)	3.7	±0.03[1] (n=288)
Weaning weight (kg)	12.9	±0.14[1] (n=262)	11.9	±0.13[1] (n=288)
Average daily gain till weaning (g)	215	±3[1] (n=262)	196	±3[1] (n=288)
Litter size			1.4	±0.32[2] (n=1741)
Milk production (kg)			96	±38.6322 (n=1741)
Lactation length (days)			159	±22.33[2] (n=1741)

Source: Agricultural Research Station of Koila, Kozani. Data collected during 1982 -1990.
[1]Standard Error; [2]Standard Deviation
Standard Error and Standard Deviation for mature body weight and height not available

Figure 2. Florina ewe at her second lambing; triplets.

Ewes are early maturing and can be bred at the age of 8 months (Triantafillidis *et al*., 1994). The breeding season begins in July and lasts until the end of October. The distribution of the parturitions peeks in January, while first lambings are more widely distributed in the months of January, February and March. Ewes with twin lambings are common, with some litters of 3 and 4 lambs. The suckling period lasts 42 days, after which weaned lambs are selected according to the dam's milk production and litter size. The birth weight of male lambs is 3.85±0.04 and of females 3.65±0.03, the weaning weights being 12.9±0.14 and 11.93±0.13 respectively. The average daily gain was 215±3 gr for the male lambs and 196±3 for the females (Alexandridis *et al*., 1989; Triantafillidis *et al*., 1992). A Florina flock is shown in figure 4.

The Florina sheep is used mainly as a dairy and secondly as a meat breed. The carcass of the lambs is of good quality and is preferred by the consumers due to its low fat content.

From the analysis of the data collected at the Agricultural Research Station of Koila, from 1982 till 1990, the average commercialised milk yield was 96±38.6 kg in 159±22.3 days (table 3). Forty percent of the ewes produce over 95 kg milk. The average litter size was 1.4±0.52 (Pappa-Michailidou *et al*., 1997; Triantafillids *et al*., 1997). Estimates of heritability for commercial milk yield and litter size was 0.21±0.11 and 0.10±0.07, respectively. Figure 5 shows the distribution of commercialised milk yield.

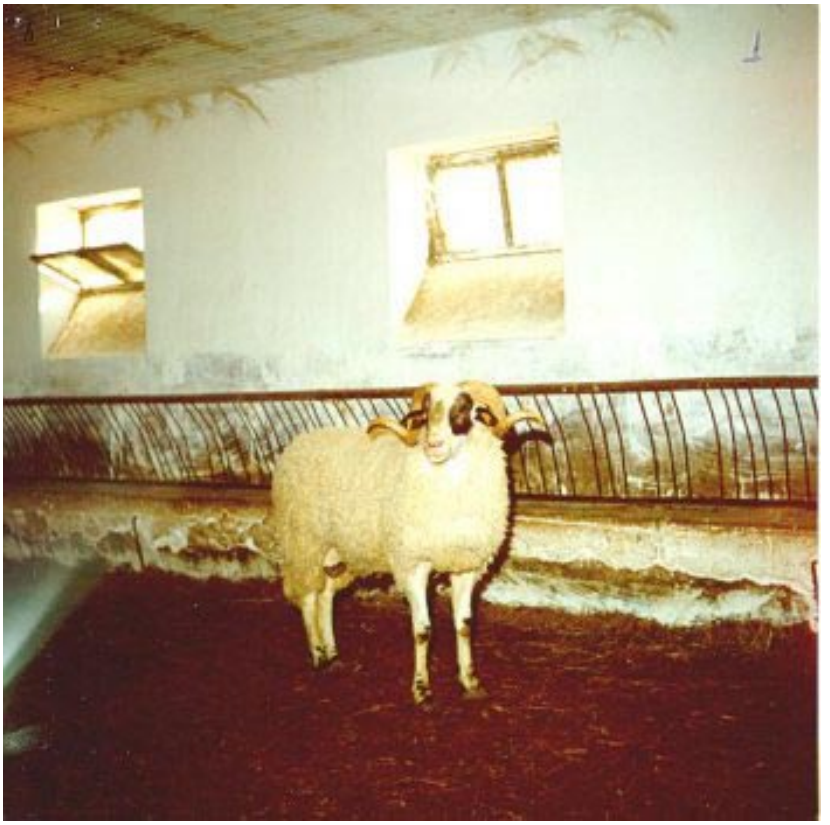

Figure 3. Two-year-old Florina ram.

Table 3. Averages of milk yield and litter size by parity.

Parity	Commercialised milk (kg±Standard Deviation)	Litter size (±Standard Deviation)
1st	81±41.4	1.2±0.39
2nd	95±35.6	1.3±0.49
3rd	103±33.1	1.5±0.53
4th	106±37.4	1.6±0.54

Source: Agricultural Research Station of Koila, Kozani.
Data collected during 1982 -1990.

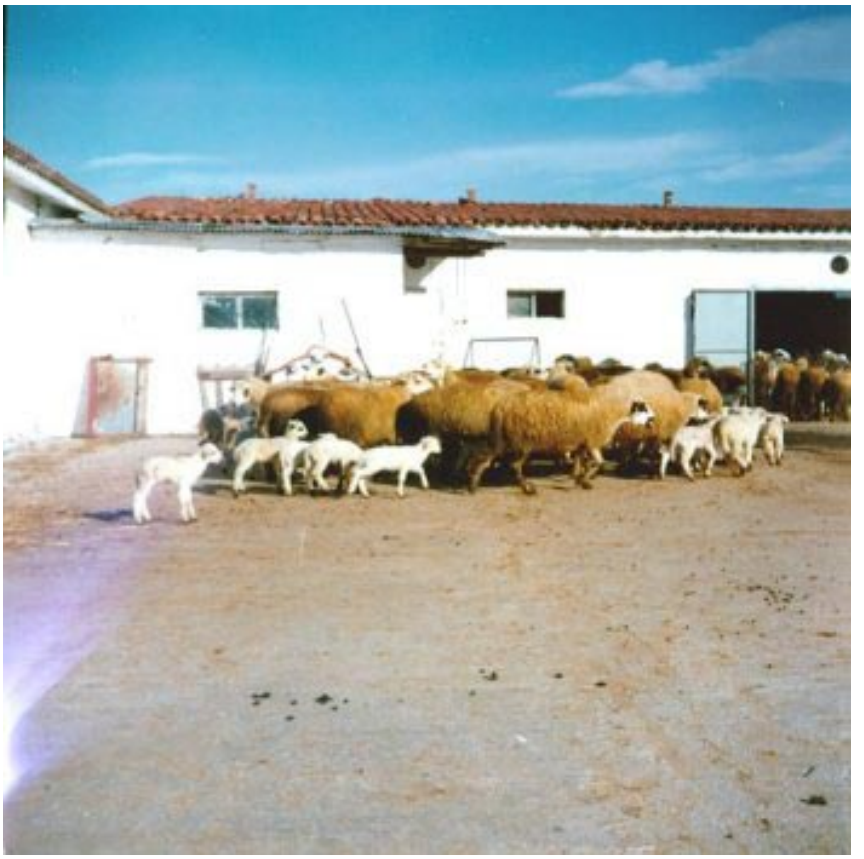

Figure 4. A Florina flock.

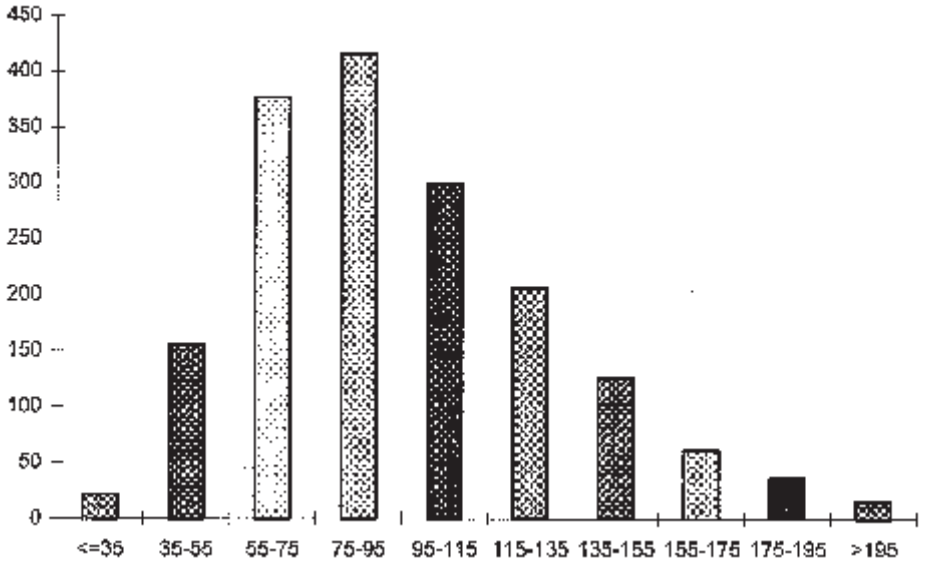

Figure 5. Distribution of commercialised milk yield.

Conclusions

The breed is competitive with other indigenous breeds for litter size. It produces a good quality carcass and taking into consideration the adaptability of the breed in the mountain conditions, selection programmes for the conservation of the breed and its genetic improvement are under consideration.

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Characteristics of Bonpala sheep

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Summary

Bonpala is a dual purpose sheep breed found in Sikkim, Western Bhutan and Eastern Nepal. A sample survey was conducted in east Sikkim to record characteristics of Bonpala sheep. Information was recorded on morphological characteristics, management practices and body measurements. Bonpala sheep have mixed colours ranging from all white, white and black or all black. Measurements were recorded of body length, height, heart girth, paunch girth, rump width, pin width, face length, face width, ear length, tail length, horn length and horn circumference.

Resumen

La raza ovina Bonpala es una raza a doble propósito que se encuentra en la zona de Sikkim, al oeste de Bhutan y al este del Nepal. Se llevó a cabo una encuesta en el este de Sikkim para registrar las características de la oveja Bonpala. Los datos tomados se referían a las características morfológicas, las prácticas de manejo y las medidas corporales. La oveja Bonpala presenta un manto de colores mixtos que van del blanco al blanco y negro o al negro. Se tomaron medidas sobre la longitud corporal, altura y circunferencia de diversas partes del cuerpo, así como la longitud y circunferencia de los cuernos.

Key words: *Bhutan, Nepal, Sikkim, Bonpala, Gharpala*

Introduction

Bonpala is a typical migratory dual purpose sheep breed found in Sikkim and its neighbouring western part of Bhutan and eastern region of Nepal (figure 1) (Acharya, 1982). Another strain of sheep i.e. Gharpala is found in this region. These sheep are small in size and are home reared. Bonpala is large in size, migratory and grazes at different altitudes. Local people call it Banpala. In fact, these strains derive their names from the mode of rearing i.e. Ban: forest; Ghar: home and Pala: rearing. Bonpala sheep produce hairy wool while Gharpala provide fairly good meat. These sheep are reared mostly by the traditional shepherd tribe called *Gurung*. Sheep are reared mainly on grazing. Even the home reared are also grazed on nearby areas. Hardly any concentrate is fed to them. Southern Sikkim has lot of pastures for grazing and the climate is conducive to sheep rearing.

Sikkim is a small state situated in the eastern Himalayas between 27.5° and 28° north latitude and between 88.4° and 88.58° east longitude. It comprises an area of 7 300 km^2. It is entirely hilly with altitudes ranging from 300 m to 8 500 m above sea level. Precipitation is above 160 cm in summer and 10-20 cm in winter.

Materials and Methods

Sikkim had about 16 268 sheep in 1992 (Census Report, 1992) registering an increase of about 49% over the population in 1987. This population included mainly the Tibetan, Bonpala and Gharpala breeds. The population

Figure 1. Distribution of Bonpala sheep.

of different breeds is not known but Acharya and Arora (1978) reported that about 60% of total sheep population are of Bonpala type. Though indigenous sheep breeds have been defined by quite a few workers, literature on Bonpala sheep is very limited (Katiyar *et al.*, 1981; Acharya, 1982). Information was collected on morphological characteristics, body measurements, management practices and performance under field conditions for describing this breed. A sample survey was conducted in the Padamchen and Lingtam blocks of East Sikkim bordering Bhutan to record information on characteristics of the same breed.

Results and Discussion

Morphological characteristics

These sheep have generally mixed colours of white and black. Complete white or black animals are also found. Face, neck, knees, legs and hooves are generally black in colour. Muzzle is white or pink in colour. Areas behind neck and lower side of the body are white in colour. Nose is typically Roman type. Katiyar *et al.* (1981) also reported Roman nose in Bonpala which was more prominent in males. Both sexes are horned. Horns are directed slightly upward before running backward, downward, and then twist forward and outward. Horns are thick and long in rams and thin and small in ewes. Ears are short and tubular. Tail is short. Belly and legs are generally devoid of wool (figure 2 and 3).

Body measurements

Length, height, heart girth and paunch girth averaged 63.33±1.08, 69.67±2.23, 82.44±1.87 and 90.33±1.45 cm, respectively in ewes and 72.5±0.50, 74.0±2.0, 85.0 and 96.0±2.0 cm respectively in rams. Males had a longer (30.0±4.0 cm) and wider (31.0 cm) face compared to that of females (23.66±0.65 and 23.44±0.71 cm). Horn dimensions differed markedly between both sexes. Horn length and circumference averaged 11.40±1.12 and 9.0±1.38 cm in ewes and 37.0 and 25.0±1.9 cm in rams (table 1). Similar measurements for length, height, girth, head length, ears, horns and tail length were also reported by Katiyar *et al*. (1981) and Acharya (1982) in Bonpala sheep.

Performance

Flock owners were interviewed to collect information on the performance of Bonpala sheep. Wool is coarse and hairy and is around 1/2 kg per shearing with two shearings in a year in March/April before migration and in

Figure 2. Adult ram

Figure 3. Adult ewe

October/November after returning from the high ranges. Acharya (1982) reported average fibre diameter, fibre length and modulation percentage as 66±25, 9.63±0.47 cm and 95±1.4% respectively. Age at puberty is around 6 months and first lambing around 10-11 months. Lambing interval is around 1 year.

Acknowledgements

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The Chokla Sheep in India

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Summary

There are approximately 41 million sheep in India, 0.51 million of which are made up by the Chokla population. This breed is generally found around Churu, Jhunjhunu, Sikar and bordering areas of the Bikaner, Jaipur and Nagaur districts of Rajasthan. The animals have a light to medium-sized body, a small head and are reddish brown or dark tan in colour as far as the middle of the neck, with a white body. The skin is pink. The ears are small to medium in length and tubular in shape. The Chokla sheep are hardy and well adapted to arid and semi-arid tropical environments and are suited for the region where migration is a common practice. The Chokla is a comparatively fine-wool producing type among the Indian sheep. The wool produced by Chokla animals is heterogeneous in quality and generally mixed with coarser fleece of other sheep for their utilisation as carpet wool.

Resumen

Existen aproximadamente 41 millones de ovinos en India, 0,51 millones de los cuales pertenecen a la raza Chokla. Esta raza se encuentra generalmente alrededor de Churu, Jhunjhunu, Sikar y en la zonas fronterizas de los distritos del Rajasthan de Bikaner, Jaipur y Nagaur. Los animales poseen un tamaño corporal bajo-medio, una cabeza pequeña y son de color marrón-rojizo o oscuro hasta mitad del cuello y con el cuerpo blanco. La piel es rosa. Las orejas son de longitud pequeña o media y en forma de tubo. La raza Chokla es robusta, está bien adaptada a los medios áridos y semiáridos tropicales y resulta adecuada para las regiones donde se practica normalmente la migración. La raza Chokla se halla entre las razas indias ovinas buenas productoras de lana fina. La lana producida por los animales Chokla es heterogénea en cuanto a calidad y viene normalmente mezclada con lana gruesa de otras ovejas para la confección de alfombras de lana.

***Key Words:** Chokla, Sheep, Carpet wool, Production performance*

Introduction

Chokla sheep are comparatively a finer carpet-wool producing type among the Indian sheep. Wool produced by Chokla sheep is heterogeneous in quality, and is generally mixed with coarser fleece of other sheep for carpet wool. The bulk of the wool produced by Chokla sheep is, therefore, used for manufacturing carpets, blankets and suchlike. This breed is generally found around Churu, Jhunjunu, Sikar and bordering areas of the Bikaner, Jaipur and Nagaur districts of Rajasthan. Animals true to the breed type are found in the Sikar and Churu districts. Sheep farmers in the region generally name this breed “Rato munda”, meaning the sheep with dark brown or tan face. Chokla is also known as Shekhawati\Chapper in the main breeding tract. These sheep are reared by the Khatika, Jat and Meena people. Each farmer rears about 100 sheep on average, kept in roofless pens fenced with thorny hedges. They graze in the outskirts of the villages, sometimes on stubble in the fields of harvested autumn\spring crops.

Population and Distribution

Of the approximately 41 million sheep in India, 33 % are found in Rajasthan (Anonymous, 1993), the major sheep rearing state in India. Chokla sheep are found around Churu, Jhunjhunu, Sikar and bordering areas of the Bikaner, Jaipur and Nagaur districts of Rajasthan which have an annual rainfall of 20 to 40 cm. Animals true to the breed type are found in the Sikar and Churu districts of Rajasthan. According to the 1972 and 1977 censuses, the Chokla population was 0.53 and 0.51 million, respectively. The latest sheep population figures of this breed are not available, but it is apparent that numbers are declining due to natural reasons to large scale crossbreeding programmes for converting Chokla to apparel-wool production. Nor are farmers obtaining better prices for the quality wool produced by the Chokla sheep in comparison to coarser wool, hence they are opting to keep the heavy breeds so that their lambs can be sold to the butcher at an early age for a better price.

The average flock size is 115 head, including 13 adult males, 73 adult females and 29 lambs (Acharya, 1982).

Appearance and Size

Arora *et al* (1975), Acharya (1982) and Mason (1988) gave good descriptions of Chokla sheep. The animals are light to medium size, with a square and compact body, and a small head, reddish brown or dark tan in colour extending up to the middle of the neck with a white body (figure 1 and 2) and pink skin. Both sexes are polled. The tail is thin and the coat is dense and relatively fine, covering the entire body including the belly and the greater part of the legs. The animals have fairly developed quarters, with small udders and teats in ewes. The body measurements viz. length, height, distance between eyes, length of the ear and tail of different age groups as reported by Arora *et al* (1975) are given in table 1.

Adaptability, Behaviour and Temperament

Chokla animals are hardy and well adapted to the arid and semi-arid environments where they have been reared for centuries. The studies on adaptation of this breed to heat stress (Singh and Acharya, 1977; Singh *et al*,

Table 1. Body measurements in Chokla ewes at different ages (Arora et al*. 1975).*

Parameter (cm)	milk teeth (n=46)	2 teeth (n=133)	4 teeth (n=93)	6 teeth (n=16)
Length	60.3±0.39	61.1±0.22	61.5±0.40	72.0±0.84
Height	62.4±0.36	61.8±0.24	61.8±0.27	62.5±0.46
Heart girth	66.8±0.43	67.9±0.26	68.0±0.43	68.3±0.62
Paunch girth	68.3±0.60	69.8±0.37	69.7±0.36	69.5±0.95
Head	23.8±0.12	24.1±0.09	24.1±0.08	24.3±0.23
Eye	15.6±0.12	15.6±0.14	15.5±0.08	15.7±0.23
Ear	8.1±0.05	8.0±0.14	7.3±0.13	7.5±0.33
Tail	24.2±0.34	24.6±0.19	24.6±0.22	24.6±0.05

Figure 1. Chokla ram

1980; Gupta and Acharya, 1987) revealed that the feed and water intake was maximum in Chokla animals as compared to the Merino and crossbred when the animals were exposed to the sun for 8 to 15 hours, with temperatures ranging from 13°C to 42°C. Higher feed intake by Chokla during the heat stress period indicated its ability to eat under high ambient temperatures. More and Sahni (1973) reported that watering of Chokla sheep at intervals of 72 hours did not pose any physical or managemental difficulty. Maximum water economy was ensured through provision of water at intervals of 96 h. However it is not safe to deprive the pregnant sheep from water beyond 72 h. During the rainy season there was no need to water the sheep.

The Chokla animals are the best suited for the region where migration is a common practice. These sheep, having traditionally been reared in small flocks in close association with man, are gentle and docile but do not react well to strange animals i.e., dogs and cats, and are thus susceptible to predation. The ewes generally show poor maternal behaviour. Their milk production is comparatively low (above 0.5 kg per day) but enough to feed a single lamb adequately.

Epidemiological studies (Sharma *et al.*, 1986) showed that Chokla animals are more resistant to sheep pox than the Nali.

Production Characteristics

There is not much variation in performance of production characters among Chokla sheep in their native tract. This may be because the climatic conditions in their native tract is similar and that the husbandry practices adopted thereon have been similar. A flock of Chokla sheep was maintained as a contemporary for comparison with its crossbreds at the Central Sheep and Wool Research Institute (CSWRI), Avikanagar, under the All India Co-ordinated Research Project (AICRP) on Sheep Breeding. Data spread from 1977 to 1994 were subjected to least squares analysis for body weight at different ages taking sex, season and year as

factors. A summary of the results obtained is reported in table 2. The effect of sex, season, and year were all significant for the whole body weight except 12 month-weight where season had a non significant effect. The average birth, weaning, six and twelve-month body weights were 2.79, 12.9, 17.4 and 22.0 kg, respectively. Birth weight ranged between 2.26 kg (Arora *et al*. 1975) to 2.87 kg (Anonymous, 1994), weaning weight between 10.3 (Arora *et al*. 1975) to 13.4 kg (Anonymous, 1994) while adult body weight ranged from 20.6 (Malik *et al*. 1971) to 21.5 kg (Anonymous, 1994).

Least squares means of male and female body weights at different ages, as reported by Singh *et al*., 1996, are presented in table 3. Body weights increased with age up to 4-5 years. Following this age body weights were maintained or fluctuated. Adult body weights in females were lower than the males ($P<0.01$).

Average pre-weaning (0-3 months) daily weight gain was 112 g, while post weaning (3-6 months) gain was 53 g (table 4).

Animals were sheared twice a year i.e. spring and autumn. Average greasy fleece weight for the first six months of age and the second six months of age was 0.978 kg and 0.820 kg, respectively (table 5). Average adult six monthly and adult annual greasy fleece weights were 1.041 kg and 2.130 kg, respectively. In the field, it is a common practice to shear the animals three times a

Table 2. Least squares means of body weight in kg.

Parameter	No.	Male	No.	Female	No	Pooled
Birth wt.	568	2.9±0.02	587	2.7±0.02	1155	2.8±0.02
Weaning wt.	478	13.3±0.14	502	12.6±0.14	980	12.9±0.12
6 month wt.	381	18.5±0.20	426	16.3±0.20	807	17.4±0.17
12 month wt.	240	24.2±0.30	337	19.8±0.29	557	22.0±0.26

Table 3. Least squares means of body weight at different ages in kg.

Age (year)	No.	Male	No.	Female
1-2	567	27.5±0.24	986	24.4±0.12
2-3	211	34.2±0.42	668	25.1±0.15
3-4	152	37.1±0.50	540	27.4±0.16
4-5	126	38.7±0.35	1246	29.1±0.13
5-6	347	36.4±0.38	1128	28.0±0.13
6-7	95	39.9±0.65	770	28.3±0.16

Source: Singh et.al., 1996.

Table 4. Least squares means of average daily body weight gain.

Parameter	No.	Male	No.	Female	No.	Pooled
Pre-weaning (0-3 month)	478	115±1.00	502	108±1.00	980	112±1.00
Post-weaning (3-6 month)	373	60±2.00	414	46±2.00	787	53±2.00

Table 5. Least squares means of greasy fleece weight in kg.

Age	No.	Male	No.	Female	No.	Pooled
1st 6 month	351	0.930±0.014	397	1.027±0.014	748	0.978±0.010
2nd 6 month	206	0.892±0.024	321	0.748±0.020	527	0.820±0.018
Adult 6 month	--	--	--	--	--	1.041

year hence the wool yield is slightly higher but with shorter staples.

The average fibre diameter, medullation and staple length of six monthly growth were 28.2 μ, 24.00 % and 4.7 cm, respectively.

Chokla ewes are very poor milkers and generally not milked (Acharya, 1982). The average milk yield recorded indirectly by the lamb suckling technique (3 to 4 times a day and twice weekly) ranged from 0.546 to 0.552 kg per day in the autumn season (Uppal *et al.*, 1971). The Chokla also has a poor mothering ability particularly in the first lambing. This usually results in higher lamb mortality (Singh *et al.*, 1973). Maximum milk yield was found in the fourth lactation.

Figure 2. Chokla ewe

Reproduction and Breeding

It is customary among the farmers to keep breeding rams in the flock at all times, and exert no control over mating. This system requires at least 3-4 rams for every 100 ewes. In Government/commercial farms controlled mating is practised.

In the farmer's flock, age at first mating was estimated at 15 and 18 months in males and females, respectively (Acharya, 1982). Studies under AICRP on Sheep Breeding reported 742±17 days as age at first breeding in ewes and 970±18 days as age at first lambing under restricted breeding. Higher age at first service and age at first lambing reported in AICRP results were high because of the restricted breeding practices. In the farmer's field, age at first service, as reported by the farmers during the visit of the first author, varied between 365 to 450 days.

In figure 3 a Chokla ewe with her lamb are shown.

The Chokla sheep are known to breed throughout the year although the majority of them breed during July-August, immediately after the onset of the monsoon season when plenty of natural grazing is available (Acharya and Patnayak, 1974). Litter size is single (Acharya, 1982).

Honmode (1970) and Sahni & Pant (1978) reported 152 days average gestation length in Chokla animals. Involution of the uterus in Chokla ewes was estimated at 26 days and ranged from 16-30 days post partum (Bhaik & Kohli, 1980).

Figure 4 shows a Chokla flock.

Breeding Structure

This breed is found in a very limited area and the population is also small. There is no breeders association for this breed in the country. In the native tract of Chokla, farmers used to exchange breeding rams from one flock to another at their level. The State

Figure 3. Chokla ewe with lamb

Government of Rajasthan was also distributing rams to the farmers under a ram rearing scheme. In this scheme male lambs at the age of three months were purchased and reared in the Government farm up to breeding age and then distributed in the field.

Attempts for Improvement

From 1990-91, A network project on sheep improvement was started with the objective of undertaking the survey, evaluation and improvement of indigenous sheep breeds. Under this scheme, a project on Chokla sheep entitled "Evaluation and improvement of Chokla sheep for carpet wool" was initiated in CSWRI from 1992. The objective of the project was to increase the wool production through selective breeding. Breeding rams are selected using selection indices based on greasy fleece weight and body weight at six months of age. The project is in progress. Surplus breeding rams are being distributed to the farmers through the State Government of Rajasthan. Average adult six monthly greasy fleece yield (GFY) in ewes is 1.09 kg and in rams 1.46 kg. Average annual GFY (pooled GFY of both the seasons) in adult ewes is around 2.0 kg. In rams/males, which are less in number, GFY is around 3.0 kg. in a year.

Earlier, this breed was used for crossbreeding with exotic sheep (Rambouillet and Russian Merino) to develop apparel type sheep. The new breed Avivastra with 50 % exotic inheritance and Bharat Merino with 75 % exotic inheritance had been developed at CSWRI.

Figure 4. Chokla flock

Acknowledgements

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