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## Dairy goat breeding systems in the South of Spain

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**SUMMARY** - Goat population in Spain is around 3.6 million concentrated in the South, mainly in Andalucía which is the first producer of goat milk (189 million of litres in 1992) used for cheese production. Two breeds account for 60% of milk production. They are the Murciano-granadina and the Malagueña breeds. Their prolificacy is around 1.9 and they have an average milk yield of 500 kg per doe and lactation, with 5% of fat and 3% of protein. Goats are always associated with poor quality land, with difficult access and low fertility. A typical farm will have 40 to 80 does and an area of 40 to 70 ha. The kiddings are in autumn-winter in most of the cases. The common feeding system is grazing through the day and housing at night where a supplementation with concentrate is given. The selection program has started in 1993 and it is based in milk yield but it will change soon to protein yield and content.

**Key words:** Dairy goats, Andalucía, breeding systems, cheese production.

**RESUME** - L'effectif caprin espagnol est de 3,6 millions de têtes concentré dans le Sud, principalement en Andalousie qui est le premier producteur de lait de chèvre (189 millions de litres en 1992) utilisé pour la production de fromage. Deux races en sont les principales productrices: la Murciano-granadina et la Malagueña. Leur prolificité est autour de 1,9 et elles ont une production moyenne de 500 kg de lait par chèvre et lactation, avec 5% de matières grasses et 3% de matières protéiques. Les chèvres sont toujours associées avec des terres de mauvaise qualité, d'accès difficile et de basse fertilité. Une ferme typique serait de 40 à 70 ha avec 40 à 80 chèvres. Les mises-bas ont lieu en automne-hiver dans la majorité des cas. Les animaux sont sous un système extensif en pâturant toute la journée avec stabulation durant la nuit où ils reçoivent une complémentation en concentré. Le programme de sélection a démarré en 1993 et il est basé sur la production laitière mais il changera très prochainement pour se baser sur la production et le pourcentage de matières protéiques.

**Mots-clés :** Chèvres, Andalousie, systèmes d'élevage, production de fromage.

### Introduction

Spain, with 3.6 million of goats, has the second largest population in Europe, after Greece. More than the third is located in the South: mainly in Andalucía (see Fig. 1).

Goats were in the past, dual purpose animals, used both for milk and meat production. In the fifties and sixties their number decreased drastically, being displaced by cattle and sheep. However, since 1980 the number has increased (Fig. 2). At the same time the proportion of milk used for cheese production has increased while

human consumption of milk has decreased. This has produced an increase in the price of goat milk (Fig. 3). So, breeders have now specialized in milk production to supply the cheese factories.

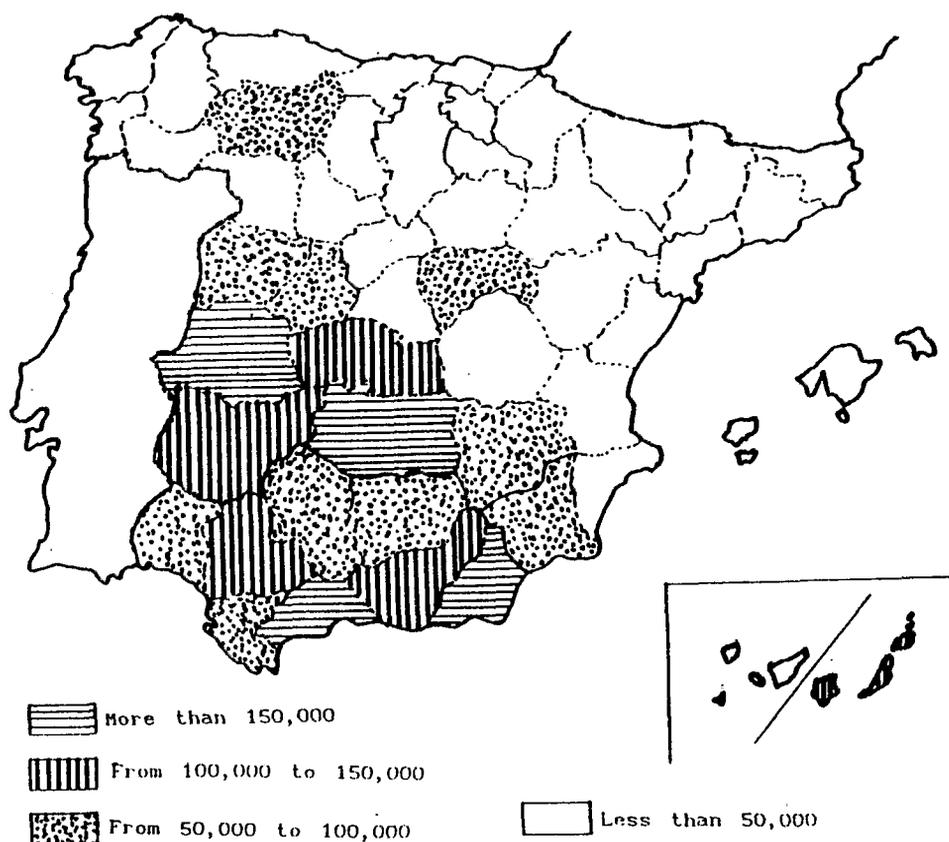


Fig. 1. Distribution of goats in Spain (García Rollán, 1988).

Andalucía is the region with the highest production of goat cheese. More than 1.9 million litres of milk being processed (see Table 1).

Two breeds: the Murciano-granadina and the Malagueña, account for most of the production of goat milk in Andalucía (Table 2). The Malagueña is mainly located in the province of Málaga and in the southern coastal area, while the Murciano-granadina is more widely spread and it is found in all parts of the South of Spain (Andalucía and Murcia). The origin of these breeds is supposed to be a mixture of the Pyrenean and the Maltese trunks. Both breeds are very similar. Their profile is concave and horns are of the Aegagrus type.

They are medium sized, with adult weight about 50 kg and 70 kg for females and males, respectively. Their prolificacy is around 1.9 and they have an average milk yield of 500 kg per doe and lactation, with approximately 5% of fat and 3% of protein, (Falagan, 1990; Díaz-Carrillo *et al.*, 1993).

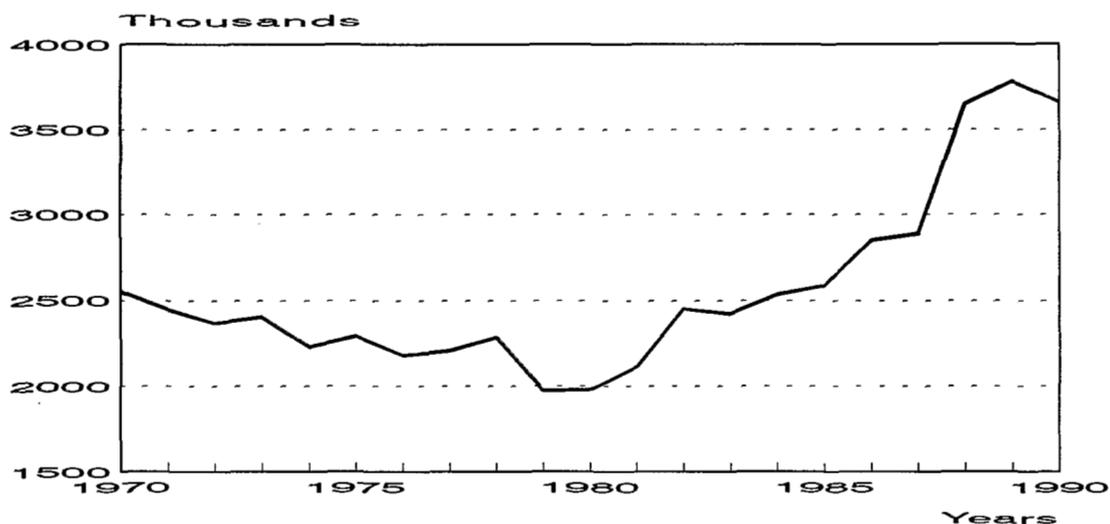


Fig. 2. Number of goats in Spain (MAPA, 1992).

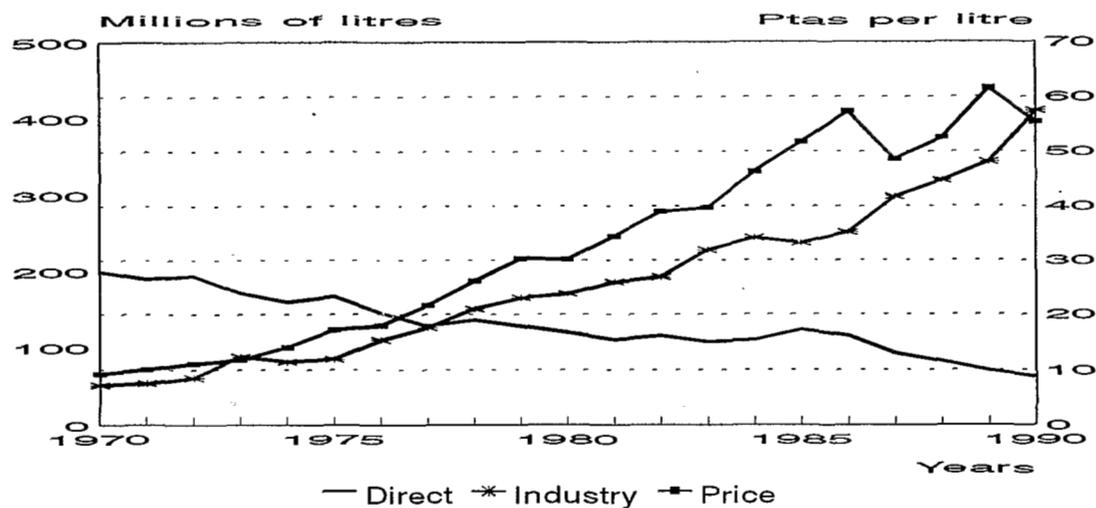


Fig. 3. Trends in the consumption and the price of goat milk in Spain (MAPA, 1992).

### Structure of the farms

There is a great variability in the size of farms in Andalucía (Table 3). The area varies from less than 1 ha to more than 2,500 ha. But, as the size of the farms

increases the proportion of land in permanent pasture increases. More than 30% of farms are larger than 100 ha and of these, 17% have goat herds. More than 68% of farms in Andalucía are smaller than 5 ha, about 4% of these farms have goats. However, a further 0.9% of agricultural enterprises are defined as landless. 50% of these landless enterprises have goat herds.

Table 1. Quantity (kl) of goat milk processed on farms or delivered to cheese factories in the Spanish regions with important goat populations (MAPA, 1992)

Autonomous Community	Processed on farms	Delivered to factories
Andalucía	8,949	188,915
Castilla-La Mancha	2,131	62,946
Canary Islands	21,598	18,906
Castilla-León	363	26,158
Extremadura	7,948	14,575
Murcia	2,185	18,702

Table 2. Total number of milked does and total milk production (kl) in April, May and June of 1994 in Andalucía (BIAP, 1994)

Breeds	Milked does	Milk obtained
Murciano-granadina	155,282	20,482
Malagueña	130,366	16,360
Others	241,271	24,873

Table 3. Size of farms (ha), land distribution (ha), number (n) and percentage (%) of farms with goats in Andalucía (IAE, 1989)

Size	Number	Cultivated	Pastures	With goats	(n,%)
All	427,471	3,388,184	1,149,004	27,984	6.5
Landless	3,826	0	0	1,915	50.0
< 1	107,438	48,957	702	2,760	2.6
1-5	182,785	376,179	11,247	8,848	4.8
5-20	89,683	700,430	44,336	8,390	9.4
20-100	32,524	937,802	129,083	4,163	12.8
100-500	9,019	892,204	350,540	1,564	17.3
> 500	2,196	432,612	613,094	340	15.5

The size of flocks varies from less than 30 to more than 400 adult does (Table 4). 50% have less than 50 goats, although they only constitute 14% of total goats population.

Table 4. Distribution of herd size and percentage of total number of herds or goats (BIAP, 1992)

	1-29	30-49	50-99	100-199	200-399	>400
Herds	4,485	1,961	3,012	2,224	834	193
(%)	35	15	24	18	7	1
Goats	59,112	74,471	209,922	294,890	216,345	114,395
(%)	6	8	22	30	22	12

Goats are always associated with poor quality land, with difficult access and low fertility. A typical goat farm in the region will have 40 to 80 does and an area of 40 to 70 ha (farmer's property or/and rented). It will be sited in an area with woodland and scrub making up more than 50% of this area, and 10% of land in almond and olive trees. The remaining land are which is of low productivity, are used for cereal production, although it is grazed or in fallow. Frequently, there is a small irrigated area (<0.5 ha) used for vegetable production for consumption by the family (Boza, 1990).

## Management

The traditional system was extensive, on hill areas with steep slopes, little rain and poor pasture production, using seasonal pastures, bushes, natural pasture and occasionally fallows. In recent years, due to an increase of the value of the outputs (milk for cheese production), this traditional extensive system is giving place to a semi-intensive one, with animals housed at night, where they are supplemented with concentrates according to their production level. Farms remain, however, predominantly family enterprises.

## Reproduction

Puberty generally occurs at about 6 months. Under good nutrition, goats are in oestrus all through the year and are very sensitive to male effect. First matings take place at one year of age in 68% of does, at 9 months in 18% and at the first heats in 6% of them. Few breeders wait until the full development of the doe at 14-18 months (Boza, 1990). 70% of the does in the flocks are mated in May-June and 30% in September. Mating is generally not controlled. Few breeders separate sexes and practice mating in groups, selecting the bucks for every does group. In small flocks, bucks remain in the flock all the year and breeders stop mating by using aprons on

males. In large flocks, does and bucks are separated until mating season. The average fertility of adult females is about 0.95 (Boza, 1990).

The common system is one kidding per year. 70% occurs in September-November, in order to sell kids at Christmas when prices are higher, and 30% in February to ensure production of milk through the year to supply cheese factories. Lactation length is 4 to 10 months. If they are not mated, does can continue giving milk for more than one year (Boza, 1990). Generally, there is only one milking in the morning, but does with high production are milked again in the evening after grazing, during the first months of lactation.

The most important period of kidding for the breeders is from September to November (Table 5). This is due to two reasons: kids and milk are sold at a higher price and lactations are longer. Nevertheless, not all flocks kid in this season, for three reasons: seasonal anoestrus may exist and this decreases fertility in spring. This period coincides with scarceness of pasture that increases the cost of feeding. Some breeders cooperatives have a contract stipulating delivery of a fixed quantity of milk to the factories throughout the year.

Table 5. Distribution of kidding through the year (Falagan, 1990)

Breed	Province	Percentage of kidding does			
		Spring	Summer	Autumn	Winter
Murciano-granadina	Almería	10	1	39	50
	Granada	6	18	50	26
	Murcia	16	12	54	18
Malagueña	Málaga	9	1	68	22

## Feeding

The most common system of feeding is grazing through the day and housing at night, when animals receive feed supplementation. On rainy or very windy days, animals stay indoors. Grazing is rotated through different parts of the farm to use all available resources, including stubble and fallows. The slopes of mountains are used to give other areas a recuperation period for seeding and regrowth. It was estimated in Almería that goats walked 5-12 km daily. The quantity of dry matter ingested per doe, recorded in one experiment cited by Boza (1990), was 1,72 g in winter, 1,74 g in autumn and 1,96 g in spring. The pattern of the diet ingested was: grasses and shoots of bushes in spring; stubble, bushes, succulents and dry pasture in summer; grass shrubs on the lower slopes and almond shells in autumn; and in winter fallow, olive and holm-oak branches, hay and by-products from crops on the farm (Boza, 1990). The supplementation with concentrates is about 300 g per kg of milk produced. The concentrate usually consists of 70% of cereals (oats, barley and maize) and 30%

of legume seeds (bean, vetch and tare). Some breeders substitute beet dry pulp or wheat bran for cereals, and sun-flower cake for legumes. Animals have block of salt available, but few breeders use mineral supplements in the diet.

## Health

All breeders vaccinate against endemic diseases in the region: Brucellosis and Enterotoxemia. Brucellosis vaccination is obligatory and the cost is supported by the Government. Antiparasitic treatment of animals and stalls is frequent (Boza, 1990).

## Housing

It is usually near the villages and no further than 20 km from centres of population. New buildings allowing easy management of animals are rare. Most of the housing is adapted from old buildings for horses or cattle, with separation of bucks and kids and an area for milking. In general the level of investment and technology is low. Only large farms have a milking machine or an artificial rearing system for kids (Boza, 1990).

## Commercial aspects

Generally, farmers belong to cooperatives to which they deliver their milk production daily. They are paid for the quantity of milk plus a bonus for fat content. The cooperative arranges sale contracts with the cheese factories. Nevertheless, 10% of total cheese is produced on the farms or by small family enterprises, where 8% of this craft cheese is for home consumption (see Table 6). In the factories, milk is processed using traditional methods. However, 90% of cheese produced is made with a blend of milk from different species (cattle, sheep and goats) where the percentage of goat milk varies from 20% to 95%.

Table 6. Production and commercialization of goat milk in Andalucía (Ares and Camo, 1990)

% of total production	Craft	Factories
Quantity processed	10	90
Blended milk	5	95
Sold out of the village	2	75

Meat production represents 30% of the total income of the farm. Dairy flocks produce essentially sucking kids of about 6-9 kg of live weight at 1-2 months of age.

To avoid management complications during kidding period, most breeders sell new born kids to small specialized enterprises who collect these animals and rear them on milk until the slaughter age (Falagan, 1990). But the main problem of goat products is the lack of stability in prices due to the fluctuation of milk production through the year (see Fig. 4) and from year to year. This keeps the sector under permanent instability and makes it difficult to establish a long or medium term farm policy.

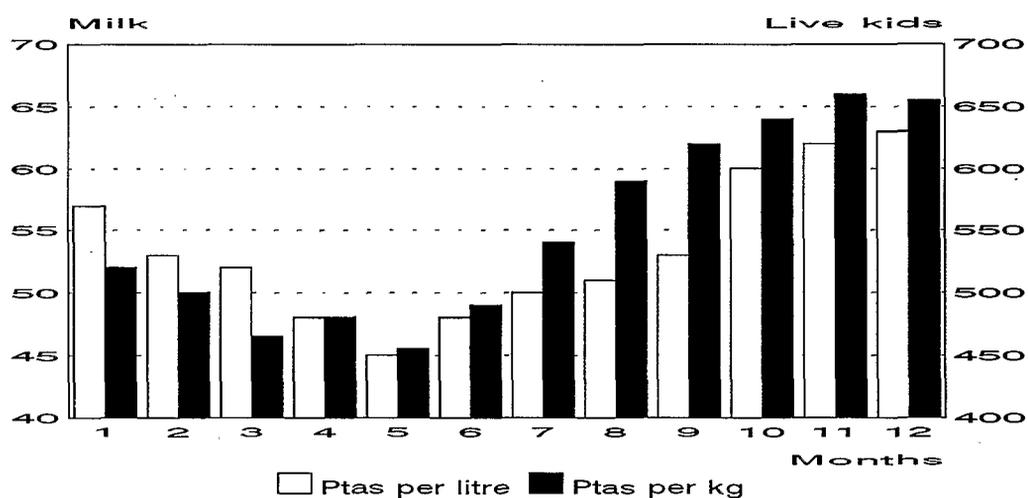


Fig. 4. Pattern of price of goat products during the year (Falagan, 1990).

## Genetic improvement program

### Organization

Breeders are organized in Breeders Associations for genetic improvement, an association for each of the breeds. Breeders associations are responsible for their genetic improvement programs, but these programs have to be officially approved by the Ministry of Agriculture. Breeders activities are heavily subsidized by the Government with very small economic contribution of the breeders. The genetic improvement of both breeds is based on purebred selection performed on the basis of genetic evaluation of all animals. There is a selection nucleus for each breed. For milk recording, farms are in two groups in the case of the Murciano-granadina breed (one in Almería and the other in Granada) and in a single group for the Malagueña breed (Table 7). The objective of the selection program at this stage is milk production, but it will change soon to use protein yield. Although, genetic evaluation is performed for every trait (milk yield, fat and protein yields and contents). Only milk yield is used so far as selection criterium. In a short term both protein yield and protein content will be used.

Table 7. Total of does in each province and number of does and herds in each selection nucleus (Evaluation data base, 1995).

Province	Total	Nucleus	Herds	Breed
Almería	113,422	1,803	23	Murciano-granadina
Granada	116,000	7,060	80	Murciano-granadina
Málaga	177,000	6,974	62	Malagueña

## Recording Strategy

The recording is carried out by official recorders employed by the Breeders Associations. First record must be registered within 45 days since the birth of the first kid in the herd, and the interval between two records must not exceed 33 days. In each round the following information is collected:

- Date of kidding.
- Number of kidding.
- Number of born kids.
- Milk yield.
- Number of milking per day.
- Number of suckling kids.
- Incidence (death, selling, abortion, rearing, etc.)
- The dam of each kid is registered (sire identification is seldom registered).

The recorder takes a sample of milk of every milked doe for analysis by the Official Animal Breeding Laboratory for percentages of fat and protein. Data are registered and kept in a magnetic disk which is sent to the Laboratory of Fisiogenetics in the University of Córdoba. There, data are processed to obtain a pedigree file and a yield data file with lactations standardized to 240 days.

## Genetic evaluation methodology

Data and pedigree files generated are analyzed by mixed-model methodology following a simple repeatability model in 3 single-trait analysis (Quaas *et al.*, 1987). Herd, year and season of kidding, type of birth and lactation number are fixed effects considered in the model. The evaluations obtained are returned to the Association in three files (one file per trait) where animals are ordered from best to worst. All computations are done in the Computing Centre of the University of Córdoba. The first evaluations were done in 1990 but the breeders began to use the evaluations in 1993.

## Selection schemes

In 1992, two selection schemes have been officially approved for the Associations.

The first is based on natural service without Artificial Insemination (A.I.). The second is based on nucleus selection with A.I. But, A.I. is still in an experimental stage, only the first scheme is now in operation (Fig. 5). It starts with requirement for 334 bucks to mate 10,000 does that constitute the nucleus. The bucks are expected to have three years of reproductive life, which means the yearly replacement of 112 bucks. The best dams are chosen to give young bucks to be sent to the collective breeding centre. These young bucks will be returned to the herds after selection (S3) on growth, morphology and seminal qualities, with the restriction that they will not go back to their own herd. The sisters of these young bucks are kept for female replacements with the daughters of the best remaining dams.

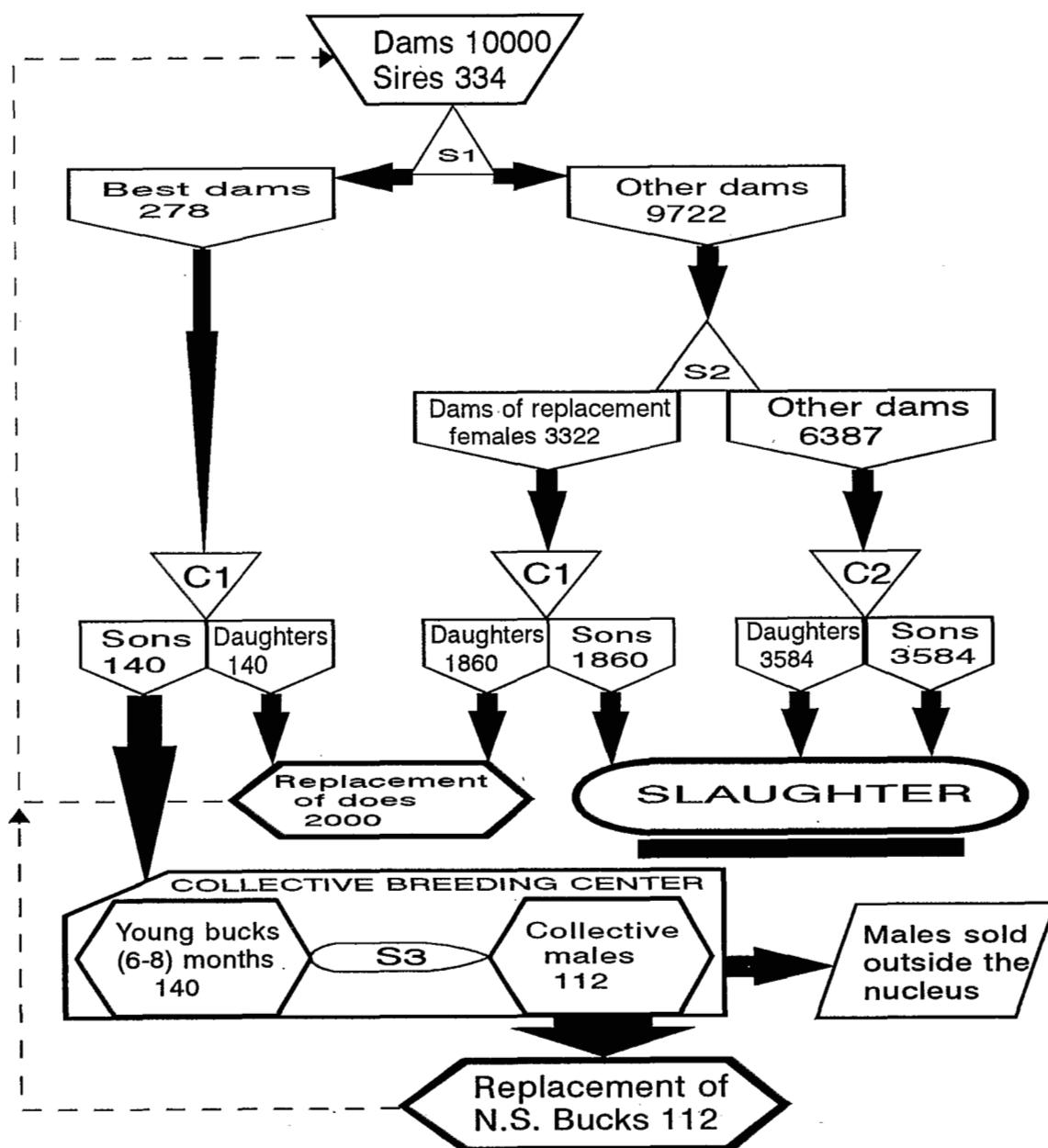


Fig. 5. Selection scheme without the use of A.I.

The remaining animals are destined for slaughter. The different stages of the scheme are: a first selection (S1) based on indexes of quantity and percentage of protein and udder morphology is applied to 10,000 dams. The best 278 of them are mated with the best bucks (C1) to give 140 young bucks to supply the collective breeding centre and 140 daughters for female replacements. The next best 3,322 dams out of 10,000 are mated with the best sires (C1) to cover the remaining requirements for female replacements. Sons are sent for slaughter. The rest of dams (6,387) are mated with the rest of the bucks (C2) and all their offspring is sent for slaughter. In the collective centre for raising young bucks the best 112 are used to replace bucks in the nucleus. The rest of them are sold outside the selection nucleus. The parameter values used in the scheme are a fertility of 0.7 and prolificacy of 1.6 in C1 and C2. Selection pressure of 0.3 in S1, 0.38 in S2 and 0.8 in S3. A population of 10,000 dams with male/female relation equals to 1/30.

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