

## **MILKING PARLORS' THROUGHPUT FOR DAIRY SHEEP AND FACTORS THAT INFLUENCE IT**

### **CAPACITATEA DE PRODUCȚIE A INSTALAȚIILOR DE MULS PENTRU OILE ÎN LACTAȚIE ȘI FACTORI CARE O INFLUENȚEAZĂ**

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*The aim of this study was to investigate the parlors' throughput for dairy ewes and influencing factors in some European countries and in Greece. A great progress was done in this direction with the simultaneous improvement of the animals' milkability, the technological characteristics of milking machines and the technical knowledge provided to the farmers. Nowadays the average parlors' throughput for the "Casse" system milking machines is 160-200 ewes/milker/h, while for the "Carrousel" type milking machines it is 200-280 ewes/milker/h. In the case of installation of the automatic cup removal system the parlors' throughput ranges between 300-400 ewes/milker/h. In Greece, the average throughput for the "Casse" system parlors was found to range from 59 to 127 ewes/milker/h, while for the "Carrousel" type milking machines was found around 90-100 ewes/milker/h.*

**Keywords:** dairy sheep; parlors, throughput

#### **Introduction**

Sheep production in Greece constitutes the most important sector of livestock production contributing 35.9% to the total output of country's animal production (Skapetas and Katanos, 2008). Machine milking efficiency of sheep can be summarized as the recuperation of the maximum amount of milk, with the maximum amount of solids, in the shortest amount of time without causing harm to the udder and with minimal manual interventions by the milker (Billon, 2004; Sinapis et al., 2008). On the other hand machine milking must be carried out in optimal working conditions for the milkers (Le Du, 1986; Berger, 2001; Billon, 2004). With the development of the dairy sheep industry in Greece the determination of the parlor throughput in each farm has a special importance. This correlates directly with the total milking time of sheep flocks and the life quality of the farmers (Laga et al., 2005). On the other hand, it helps on the solution of the

problem of the absence of the milkers. In the past, the European countries having dairy sheep industry have given attention only on the quantitative and qualitative production of milk, but no attention on the milking time of dairy flocks and on the working conditions of farmers. In the last years the concepts on the life quality of sheep farmers in the European countries have changed. Today's objective is the increase of parlors' throughput (200 ewes/milker/hour) and the decrease of flocks' average milking time (1.5-2 h/milking) with the final aim to decrease the manual work of the farmers (Billon, 2004). Machine milking efficiency of dairy sheep is influenced by many factors such as milk yield and milking characteristics of the animals, type, size, working regimen and technology of milking machines, technical knowledge and ability of the milkers, as well as labor organization in the milking parlors. By other words the above factors are regarded with the triptixon: animals-milking machines-milkers. If this system works well then the ewes can be milked efficiently and rapidly without protracted manual interventions by the milkers with the parlors' throughput ranging between desirable levels.

#### A. Milking parlors' throughput

The evolution of milking parlors' throughput during the period 1961-2007 is summarized In Table 1.

Table 1

Evolution of milking parlors' throughput in Europe

| Year | Parlor's type                    | Milked ewes/<br>milker/h | Milking units/milker |
|------|----------------------------------|--------------------------|----------------------|
| 1932 | With milking buckets             | 40                       |                      |
| 1961 | Traditional<br>"CASSE"<br>System | 80                       | 4                    |
| 1963 |                                  | 120                      | 12                   |
| 1972 |                                  | 140-160                  | 12                   |
| 1972 |                                  | 140-200                  | 12-24                |
| 2004 |                                  | 150-220<br>(300)*        | 12-24                |
| 2004 | Modern<br>"CASSE" system         | 160-210<br>(300-320)*    | 12-24                |
| 1971 | Carrousel<br>(Rotolactor)        | 180                      | 14                   |
| 1971 |                                  | 260                      |                      |
| 1974 |                                  | 280                      |                      |
| 2004 |                                  | 300-350*                 |                      |

\* Automatic cup removal (ACR).

The throughput of milking parlors for dairy ewes when the machine milking was used for the first time in the "Casse" farm in France was relatively low (80 ewes/milker/h). Since then a great progress was done with the parallel improvement of the milking characteristics of the animals, the technological evolution of milking machines and better ergonomic and labor organization in the milking parlors. As a consequence the efficiency of milking machines was improved significantly. The number of milking units that are used per milker during the milking was also significantly increased, with the Carrousel (Rotolactor)

milking systems and the modern “Casse” systems (fast exit or rapid flow) having the higher throughput.

Nowadays the average parlors’ throughput for the “Casse” system milking machines is ranged from 160-200 ewes/milker/h, while for the “Carrousel” type milking machines 200-280 ewes/milker/h. In the case of installation of the automatic cup removal system the parlors’ throughput ranges within 300-400 ewes/milker/h.

Data regarding milking parlors’ throughput for dairy ewes in Greece are summarized in Table 2. It’s evident that throughput in Greece is ranged to middle or low levels. Parlors with milking buckets have the lower throughput (28-45 ewes/milker/h). The throughput of “Casse” type parlors ranged between 59 to 112 ewes/milker/h. In the modern “Casse” type parlors the throughput increased 7 to 15% (63-129 ewes/milker/h).

Table 2

Milking parlors’ throughput for dairy ewes in Greece

| Parlor’s type              |                                  | Milked ewes/milker/h | Duration of flock’s milking (h) |
|----------------------------|----------------------------------|----------------------|---------------------------------|
| Milking buckets            |                                  | 28-45                | 1,5-1,8                         |
| Traditional «CASSE»        | 1×24                             | 59                   | 2                               |
|                            | 2×24                             | 86-92                | 1.5                             |
|                            | 2×30                             | 112                  | 1.4                             |
| Modern «CASSE» (Fast exit) | 1×24                             | 63-127               | 1.5                             |
|                            | 1×24 (1:1)                       | 87                   | 2                               |
|                            | 1×24 (1:2)                       | 70                   | 2.2                             |
|                            | 2×33                             | 129                  | 2                               |
|                            | Carrousel with 48 milking places | 93                   | 1.7                             |

## B. Factors influencing milking parlors’ throughput

### 1. Animal related factors

Concerning the animals, the morphology and internal construction of the udder (cistern department) from one hand, and the physiology of milk emission, plays an important role (Labussiere, 1988). A good udder must have big volume, with spheroid shape and good suspension with elastic parenchyma and developed gland cistern and middle size teats. The udder and teats morphological defects decrease the milking efficiency, demand manual interventions during the milking and increase the milking time of the flock. The shape and other characteristics of the udder have satisfactory heritabilities, so the selection gives positive results.

As regards udder physiology it must be said that the animals which have developed milk ejection reflex guarantee fast emission of alveolar and cisternal milk, too. In comparison with the cows the milk ejection reflex in small ruminants is activated relatively easily. The attachment of teat cups, without applying udder stripping, is adequate for oxytocin secretion. With other words the anatomy and the

physiology of animals' udder determine the "labor routine" in the milking parlors, and, as a consequence, the number of the animals being milked and the milking units that each milker could handle. The above mentioned factors determine the milking characteristics of sheep and the demand of applying manual interventions during the milking (Tables 3 and 4).

Table 3

Influence of hand stripping on the milking time and the quantity of milk during the machine milking of Chios breed sheep

|                               | Milking time of ewes' group (min) | Milk quantity (l) |
|-------------------------------|-----------------------------------|-------------------|
| Machine milking and stripping | 6.25                              | 192.6             |
| Hand stripping                | 3.35 (34.9%)                      | 42.12 (18.5%)     |
| Full milking routine          | 9.60                              | 228.12            |

Table 4

Influence of hand stripping omission on the machine milking efficiency of the Chios breed ewes.

|                        | Ewes/ h | Ewes/milker/h | Flock milking time (h) |
|------------------------|---------|---------------|------------------------|
| With hand stripping    | 172.4   | 86.2          | 2.05                   |
| Without hand stripping | 250.6   | 125.3         | 1.3                    |
| Change (%)             | +45.35  | +45.35        | -33.58                 |

In small ruminants that are being milked in relatively large groups, the homogeneity in milk yield and milking characteristics (milking time, average and maximum milk flow, latency time etc.) in the flock level significantly influence the milking machines – parlors throughput and the milkers. The large heterogeneity in animals' milk yield leads some ewes to overmilking and some others to the unsatisfactory udder recuperation. The milking speed in individual level depends by the animals' ability to maintain the milk flow rate in high levels. The milk flow rate in the ruminants depends by the anatomical and functional characteristics of the udder teats such as the length and the diameter of the teat channel and the tonicity and elasticity of the teat sphincter. Recent research has proved that the milking characteristics are heritable, so they can be improved through the selection (Sinapis et al., 2000, 2006). It has also been proved that the selection for the increase of milk yield improves in parallel the milking characteristics of the animals, too.

Animals' addiction on the milking machine significantly influences its efficiency (Marnet and McKusick, 2001). In this direction the supply of concentrated feed during the milking also helps. In this case the milk ejection reflex works better, but the manual supply of concentrate in the parlor is considered a restrictive factor of ewes' "flow" in the milking machine.

## **2. Factors related with milking machines-parlors**

### **Designing and installation of milking machines**

Milking machines should be designed correctly taking into account the breed characteristics. The effective reserve and the vacuum pump capacity, the type of the vacuum pump according the milking units' number in the parlors, the diameter of the milklines, and the vacuum lines, type and dimensions of the teat cups, the inclination of the milk duct, are factors that influence the efficiency of the milking machines–parlors. The materials' quality of different milking machines systems plays a significant role on the parlors throughput. The technological evolution of the different systems of machines improves parlors' throughput.

### **Working parameters of the milking machines**

The working regimen of the milking machines for dairy ewes directly influences the milkability of the animals and the milking time of the flock (Billon et al., 1999). The vacuum level 34-38 kPa in combination with the pulsation rate 150 pulsation/min and pulsation ratio 1/1 is the recommended regimen for sheep. The local Greek sheep breeds can be milked and with lower vacuum levels because the vacuum needed for the teat opening is lower.

### **Type of the milking machines**

The fast exit milking machines (modern “Casse” system parlors) have a greater throughput (+15-20%). The Carrousel milking machines of axial type have greater throughput in comparison with the radial type. In addition, parlors throughput increases significantly when the ratio milking places/milking units are 1/1 comparatively with the ratio 2/1.

## **3. Factors related with the milkers**

### **Technical knowledge of the farmers**

The farmers must have basic knowledge regarding the morphology and the construction of animals' udder, as well as the physiology of milk secretion and emission. They must also know the construction, the operation, the maintenance and the cleanness of milking machines, as well as the milking techniques of the ewes.

### **Maintenance and cleanness of milking machines**

The farmers must follow the directives of the construction firms for the maintenance of milking machines. The milking machines must be controlled by experts once a year.

### **Parlors' ergonomic and Labor organization**

The milkers must have good labor organization but also comfortable working conditions. The proper working conditions are determined by the ergonomic of the parlor and its dimensions. One of the most important dimensions is the height of the pit. The floor of the parlor must be constructed by proper nonskid material.

## Conclusions

In the European countries the efficiency of milking machines-parlors for dairy ewes was improved in parallel with the improvement of udder morphology and milking characteristics of the animals, the technological evolution of the milking machines and the technical knowledge of the milkers. In Greece, parlors' throughput is relatively medium or low, because of the unsatisfactory milkability of the animals and technical knowledge of the farmers.

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