SMALL RUMINANTS
RESEARCH
AND DEVELOPMENT
IN THE NEAR EAST

PROCEEDINGS OF A WORKSHOP
HELD IN CAIRO, EGYPT,
2–4 NOVEMBER 1988
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SMALL RUMINANTS RESEARCH AND DEVELOPMENT IN THE NEAR EAST

Proceedings of a workshop
held in Cairo, Egypt, 2-4 November 1988

Editor: A.M. Aboul-Naga

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ABSTRACT

Stratification systems use mainly crossbreeding to bridge the gap between poor low-priced land and the good high-priced land. Genotypes used/produced are suited to and maximize production from the particular environments. Stratification systems can have wide range of applications in livestock production.

The paper reviews stratification systems in some sheep producing countries. It discusses possible models for stratification systems to combine lamb/kid and milk production in both sheep and goats under arid or semi-arid conditions.

INTRODUCTION

Stratification of a livestock production system is dividing up the system into layers, in time or space, where each layer specializes in a certain product or a step of production in order to maximize the utilization of resources. Due to the numerous sheep breeds available and the varied environments in which they can live the concept of stratification in sheep production has long been in practice. However, in goats no systematic stratification has been recorded.

Within a purebreeding structure a stratification could mean dividing the breed population into stud breeders, multipliers and producers. This aspect of stratification is not the aim of this presentation.

The objectives of this paper is to review current production-systems stratification in small ruminants, propose possible ones and examine a simulation study of different stratification systems using the Egyptian Barki sheep breed as the basic population.
CURRENT STRATIFICATION SYSTEMS IN SHEEP

Stratification systems discussed below are based on geography and land use (Lerner and Donald, 1966) and crossbreeding is used to bridge the gap between the poor low-priced land to the good high-priced land (Hammond, 1960 and Nichols, 1957).

The main concept in all these systems is that ewes from a basic population, whose animals are hardy and well adapted to less favorable conditions but less productive, are mated to rams from higher producing breeds. Crossbred lambs are transferred to better environments either to be prepared for slaughter or to be used for breeding in more favorable environments. In the U.K. for example altitude provides from high to low, rainfall, high to low; temperature, extreme to equable; poor natural pasture grazing to intensive grazing; slow to rapid growth; poor mutton to good mutton to lamb; slow to rapid capital turnover and low to high land values. Stratification systems usually goes beyond genetic considerations. The utilization of F1 ewes, e.g., does not presuppose the presence of heterosis or maternal effect but the main prerequisites are the economic use for such ewes and the willingness of producers to integrate into the system (Nitter, 1978).

United Kingdom

Ewes from hill sheep noted for their hardiness and suitability to harsh conditions, e.g. Cheviot, Blackfaced Welsh and Swaledale, are mated to rams of more early maturing, higher fertility and high milk producing breeds, e.g. Border Leicester. Male lambs produced are sold for meat production while female lambs are sent to the stratum with good pasture land to be mated to rams from the still faster growing, earlier maturing down breeds, e.g. Suffolk or Southdown, to produce progeny sold as fat lamb. This stratification proceeds from high altitude and relatively poor environments to lower altitude with relatively higher value land and more favorable environment (Nichols, 1957).

Australia

The Merino is the basic stock. The cull Merino ewes of the semi-arid and arid ranges are taken to the wheat belt and crossed with Border Leicester, Romney or Dorset Horn rams. The males are sold for slaughter while the females are sent to the subterranean clover or irrigated areas to be mated with Southdown rams for the production of fat lamb (Hammond, 1960).
New Zealand

In the North Island, where the rain fall is too heavy for the Merino or breeds with high composition of it, e.g. Corriedale, the basic stock is the Romney. Cull Romney ewes are sent to the rich pastures of the dairy districts of North Island or the agricultural Canterbury plains of South Island where they are mated to Southdown rams or any other down breed to produce fat lamb (Epestein, 1965).

In South Island the basic stocks are the Merino and Corriedale kept in the mountains on the unfavorable native pastures. Cull and surplus ewes are sent to lower elevations to be mated to rams from longwool breeds, e.g. Romney, Border Leicester or Lincoln. The half-bred ewes are taken to the plains and farm areas to be bred to Southdown rams for fat lamb production.

United States

The basic stocks are generally fine wool breeds, i.e. Merino or Rambouillet raised on poorer ranges. Ewes from these stocks are mated to rams from faster growing breeds, e.g. Lincoln. Male lambs are sold for slaughter while the females are bred to rams from down breeds, e.g. Hampshire or Suffolk, under more favorable conditions and the resulting lambs are sold for fat lamb production.

Prolific breeds, e.g. Finnish Landrace or Romanov are entered into these stratified systems for more intensive lamb production.

PROPOSED MODELS FOR STRATIFICATION SYSTEMS FOR MEAT AND MILK PRODUCTION IN NEAR EAST

Sheep stratified production systems are followed in countries where the animal industry has matured and acquired recognized features. Producers operating such systems are sophisticated and have a degree of awareness of the market and the economics of production. These might be impediments against the wide application of stratification or the concept of it in the Near East but some producers in the region have the necessary prerequisites to operate such system.

Most sheep in the Near East are raised under range conditions where the breeds are well adapted to the harsh conditions. Lambs are either marketed immature off the range, at yearling age after they have added some weight or after a period of fattening. Examples for these breeds are
the Barbari of North Africa, the Barki of Egypt and Awassi of East Mediterranean. The stratification models discussed below would use these breeds as the basics stock and integrate their meager environment into more favorable environments.

Meat production. The simplest system is where part of the ewes from the basic stock (B) is mated to rams from the same breed to produce replacements and the rest is mated to rams from an earlier maturing faster growing Mutton breed (M), e.g. Suffolk. This step takes place at the range (stratum 1). Surplus B lambs and all crossbred lambs are sent to stratum 2, near consumption centers, for fattening on irrigated pastures, dry feeding or both (Figure 1). This model may be further developed by first mating B ewes to rams from prolific breeds where F1 ewes are sent to stratum 2 to be mated to M ram. Surplus B lambs and all F1 male lambs and all M.FB lambs are sent to stratum 3 for fattening.

Meat and milk production. Morag (1972) and Gall (1975) discussed a stratified system for meat and milk production. This system is operated in three strata. The basic (stratum 1) is where B ewes are partly mated to B rams to produce replacements and partly to rams from a dairy breed (D), e.g. East Friesian or Improved Awassi. F1 ewes (DB) are sent to stratum 2 for production to be mated to M rams to produce M.DB. Surplus B lambs, all DB male lambs and all M.DB. lambs are sent to stratum 3 for fattening (Figure 2).

Goats

Gall (1981) suggested dividing the female herd into dry does on range grazing and lactating does on more intensive feeding, and rotating them as their physiological state changed. Goats have been widely thought of as inefficient in fattening, produce low quality carcasses and have little scope for intensification due relatively high cost and the variable demand on their products. However, with more information being available on goat germ-plasm and the solid demand on goat meat in some countries, e.g. West Africa, this picture may change. Skinner (1972), in South Africa, reported a successful example of extensively managing the Boer does, kidding twice a year on the range while intensively fattening their kids. The Boer goat is characterized by a high average daily gain for kids (250-291 g and 180-272 g for males and females, respectively, Naude and Haufmeyer, 1981) and feed conversion rate as low as 3.9 in the kids.

Flamant and Morand-Fehr (1982) cited an experience in stratified system in goat production in Corsica.
Figure 1. Mutton production stratification System.

STRATUM I
Basic

STRATUM II
Fattening

L : Local extensive
M : Meat
Figure 2. Mutton and dairy production stratification system.

L : Local extensive
D : Dairy
ranged from one with zero input and local breeds to three with intensified inputs including specialized dairy breeds. Although stratum one was biologically the least efficient it was economically more favorable because of the low level of inputs.

With the emerging recognition of meat type breeds like the Boer goats similar stratified systems, either for meat production, dairy production, or for meat and dairy production, as those for sheep may be proposed in the same manner as above (Galal, 1987). An excellent dairy goat (D) breed from the region is the Damascus. It may be used in a stratified system for dairy production by mating B does partly to B bucks to produce replacement and partly to D to produce F1 kids in stratum 1. Surplus B kids and all F1 male kids are sold for slaughter while female F1's are sent to stratum 2 for dairying. Stratified system for meat production in goats will not require the extra step in sheep to introduce high prolificacy since most goat breeds are quite prolific.

A SIMULATION STUDY ON STRATIFICATION IN EGYPTIAN BARKI SHEEP

A study was made on a commercial Barki flock kept on a newly reclaimed land on the fringes of the desert to evaluate the performance of the flock and the economics of the system. The study was extended to hypothetical, but possible, systems of intensifying lamb production through integrated varied environments and crossbreeding by simulation. The main sources for biological coefficients used were the basic study on the Barki flock and other pertinent experiments made in Egypt.

Three systems were examined.

1. Purebreeding. Results on this system are actual. They serve as a control for the other two systems.
2. Two strata crossbreeding. The basic stratum of Barki ewes is divided into two parts, one mated to Barki rams to produce replacements and the other mated to rams from a mutton breed to produce market lambs that are sent to stratum 2 for fattening.
3. Three strata crossbreeding. The basic stratum is the Barki flock where a part of the ewes are mated to Barki rams for replacements and the other part mated to rams from prolific sheep, e.g. Finnish Landrace or Romanov. F1 male lambs are sent to stratum 3 for fattening while F1 females are sent to stratum 2 to be mated to a terminal sire from a mutton sheep, e.g. Suffolk. All 3-way cross lambs are fattened in stratum 3.
All three systems were examined when their flock structure became stable. Biological coefficients varied with the system were:

- live weights/growth rate
- conception rate
- litter size
- mortality rates

For the lack of reliable estimates feed conversion rate on fattening was kept constant across all genotypes.

Table 1 shows comparisons among the three systems (unpublished results).

**TABLE 1**

Biological performance of the three systems.

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<th>System 2b</th>
<th>System 3c</th>
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<tr>
<td>No. of lambs weaned/ewe joined</td>
<td>0.628</td>
<td>0.628</td>
<td>0.74</td>
</tr>
<tr>
<td>kg of lambs weaned/ewe joined</td>
<td>11.53</td>
<td>12.09</td>
<td>14.46</td>
</tr>
<tr>
<td>No. of lambs marketed/ewe joined</td>
<td>0.36</td>
<td>0.37</td>
<td>0.47</td>
</tr>
<tr>
<td>kg of lambs marketed/ewe joined</td>
<td>13.50</td>
<td>15.15</td>
<td>19.54</td>
</tr>
<tr>
<td>kg of lambs marketed/kg ewe joined</td>
<td>0.386</td>
<td>0.433</td>
<td>0.436</td>
</tr>
</tbody>
</table>

- Purebreeding Barki
- Two strata crossbreeding, basic stratum Barki and terminal sire Suffolk.
- Three strata crossbreeding, basic stratum Barki, stratum 2 first cross ewes between Finn rams and Barki ewes, F1 ewes mated to terminal Suffolk rams, stratum 3 for fattening when flock reaches full use of F1 ewes (730 ewes).

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Nichols, J. E. 1957. Livestock Improvement. 4th Ed. Iowa State University, Ames, Iowa, USA.
