PERFORMING SYSTEMS OF OBTAINING QUANTITATIVE PRODUCTION AND QUALITATIVE IN SHEEP

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Abstract: *The categories of sheep raised in intensive or semi-intensive systems to obtain competitive quantitative and qualitative productions should adapt well to climate changes to respond to economic nutrition, to adapt to the grazing systems efficiently converting the vegetable resources depending on the management objectives implemented at the farm level, through integronic management strategies that should expressly include total quality management. Thus, through this scientific approach, managerial solutions have been identified by which both quantitative production and, especially, the qualitative one be improved depending on the operating system, without environmental risks, using biological material adapted to the existing environmental conditions for the optimal use of fodder resources, to preserve the ecosystem biodiversity in the area of professional sheep farms, and intensifying sheep exploitation by ensuring sheep welfare according to the animal category and identifying new quality production management solutions. Quality production management solutions must consider the systematic collection and interpretation of data on the biological and reproductive capacity of sheep, the economics of exploitation and technical data on sheep welfare, the zootechnical indicators of the farm and the types of diets, all for the provision of balanced diets depending on the forage available per season, balanced feeding by productive groups, physiological states and performances, the integration of nutrition into the management of quality production, the sustainable use of local resources and the reduction of environmental risk, through the degradation of natural environmental factors.*

Key words*: sheep, production, resources, quality.*

INTRODUCTION

Good grazing management [11,15,16] should include grazing distribution, appropriate number of animals, proportion of animals, season of use, grazing system, and type of animals, [2,3,4,6,18] because grazing distribution is affected by several factors: location of salt and minerals; location of water source; size of pasture; location of shading; population density; housing sites; grazing habits of sheep; palatability of forages; grazing system; [1,20,22,25] shelter spread type; type of sheep combination; type of electric fence/enclosure; type of vegetation; type and category of sheep and direction of prevailing winds. Sustainable pasture management plans should include: a distribution by sheep category, [8,13,23,24] a distribution by sheep type, an appropriate number of sheep, an appropriate grazing system, and other strategies that maximize animal production per unit area based on sustainable pasture management techniques. To improve quantitative and qualitative production in sheep, the following should be taken into account:

1. *adaptation of exploitation systems* [9,12,19] *to the supportability of the natural environment in the sheep farm area* through:
    a. management methods; [1,5,7,10,21,26]
2. *precision nutrition* through:
    a. development of precision equipment, feeding methods, [14,17,25] and software;

b. nutritional characterization and effects of cost-effective unconventional feeds and by-products that do not compete with the use by monogastric organisms and humans.

3. *assisted reproduction* through:
   a. development of non-hormonal synchronization of ovulations;
   b. identification of specific genes for the regulation of reproduction;
4. *health and welfare* through:
   a. knowledge of animal health concepts;
   b. increasing lamb survival rate.
5. *new breeding and exploitation technologies* through:
   a. monitoring by surveillance cameras;
   b. herd tracking systems and sensor technologies.

MATERIALS AND METHODS

To improve quantitative and qualitative production systems within this scientific endeavour, in addition to the obvious objective of improving production quality, the initial aspirations were also for the cross-compliance scheme to contribute to improving the image of sheep breeding and exploitation on modern farms. The farm model proposed for implementation has the potential to create a basis for increased cooperation between stakeholders, which contributes to moving conventional agriculture towards increased sustainability and responsible use of local feed resources by using modern methods of balancing rations. Integrated production management promotes a new orientation of exploitation towards increased sustainability, recovery and restoration of degraded lands, and reduction of desertification because a quality management system requires a rapid assessment of nutritional needs for qualitative production, the use in exploitation of biological material with high productive capacity adapted to the exploitation environment, together with the creation of rules on the sustainable use of resources. For this purpose, fodder resources (pastures) according to their nutritional value can be separated into high and low areas when land degradation is taken into account and monitoring systems can be used through cutting-edge technologies implemented for high-performance production at higher feed conversion yields.

RESEARCH RESULTS

Improving systems to obtain sustainable quantitative and qualitative production in the different categories of sheep raised and exploited in an intensive or semi-intensive system should take into account at least the following five objectives included in integrated production management strategies:

1. **adaptation of sheep to the exploitation system and the environment**, an objective that involves the implementation of the following management measures on farms:

- ***adaptation of grazing systems to environmental changes*** (plant and animal biodiversity, water availability, soil system, air temperature);
- ***mitigation of greenhouse gases***;
- ***selection of herds based on robustness and hoof quality***;
- ***use of biological material that produces less manure***;
- ***regulation of herds based on genetic value and production quality***.

2. **nutrition based on individual performance and production quality**, aiming to achieve the following objectives through management measures implemented through integrated production management:

- ***secondary objectives***:

a. *development of equipment for automating farm work* and avoiding waste of resources;

b. *balanced nutrition methods* based on performance and production quality, and precision software;

c. *nutritional characterization and effects of cost-effective unconventional feeds and by-products* that do not compete with the use by monogastric organisms and humans;

d. *genetic improvement of feeds and forage harvesting techniques*, plus development of nutritional sensors and indicators for frequent monitoring of sheep to reduce feed waste and nutritional imbalances and to improve sheep welfare;

e. *manipulation of the rumen and gut microbiota* and the use of probiotics (supplements containing live microorganisms intended to maintain or enhance the "good" bacteria in the body) and prebiotics (fibber-rich foods that act as food for the human microflora and serve as food for probiotics);

- ***challenges***:

a. *very high requirements* and, therefore, a very high feed intake and rumen passage rate with low feed digestibility;

b. *large flocks* with a large number of sheep to be monitored and a high variability in their performance;

c. *high prolificacy* and, therefore, frequent large losses of body reserves during the transition period between gestation and lactation;

d. *high risk of nutritional or metabolic disorders* due to the use of energy-enhancing food;

e. *high sensitivity to weather conditions*, given that production cycles are less seasonal compared to extensive systems, plus high sensitivity to the negative nutritional effects of low-quality feed;

- ***management solutions*** proposed for implementation, for good economic qualitative production:

a. *systematic collection and interpretation of biological, economic, and technical data* on sheep;

b. *continuous monitoring of the farm and animal performance*;

c. *provision of properly balanced diets* and control of refusals based on correct and detailed characterization of feed and by using modern nutritional models, for feeding groups of animals as homogeneous as possible in terms of physiological state and performance;

d. *integration of nutrition with the management of sheep welfare*, growth and health by adopting a holistic view of the herd and taking into account the numerous interactions between these factors;

e. *monitoring of feed intake, behaviour, performance* (milk production and composition, prolificacy, and growth rate) and nutritional disorders of animals;

f. *using a combination of sensor measurement technologies* (to assess milk yield, ingestion and rumination time, rumen pH, movement and environmental conditions) and more traditional nutritional indicators (e.g., milk composition, milk or blood urea, faecal score, and body condition score);

g. *reducing the negative effects of adverse weather conditions*;

h. *optimising environmental and comfort conditions in the housing*;

i. *reducing environmental impact* by avoiding nutrient deterioration and maximising the use of high quality fodder and by-products; using fodder and other sources of highly digestible fibre;

3. **improving reproductive systems** by achieving the following objectives imposed by the integrated production management system:

- ***secondary objectives***:

a. *development of non-hormonal synchronization* of ovulations;

b. *identification of specific genes* for regulating reproduction;

c. *improvement of methods for making semen cryopreservation more efficient*;

- ***use of assisted reproduction technologies***:

a. *induction and synchronization of oestrus* (with melatonin, progestagen, progesterone, prostaglandin), artificial insemination (cervical, intrauterine, transcervical), collection and cryopreservation of semen (electro-ejaculation, sexed sperm, frozen sperm, fresh sperm, artificial vagina), multiple ovulation;

b. *embryo transfer* (super-ovulation, egg collection, collection, cryopreservation and transfer of embryos), in vitro techniques (egg and embryo culture, egg fertilization, intra-cytoplasmic injection, egg maturation);

4. **control of the health and welfare of sheep**, by fulfilling the following objectives:

- ***main objectives***:

a. *knowledge of concepts* related to animal health;

b. *animal production and animal husbandry concepts* (convalescence rate, disease resilience – individual, herd or system, resilience);

c. *component traits of individual disease resilience* (disease resistance, disease tolerance); component traits of herd disease resilience – direct effects affecting the condition, health and performance of individuals (individual disease resilience), indirect effects, i.e., additional components related to the load of pathogens in the environment with the potential to affect the health and performance of susceptible members of the flock (duration of the infectious period, magnitude of contagiousness, susceptibility to infection);

- ***secondary objectives***:

a. *increase lamb survival rate*;

b. *develop new vaccines* that differentiate between vaccinated and infected animals;

c. *implement genetic markers* for parasite resistance;

d. *improve health diagnostic techniques*;

e. *reduce antimicrobial consumption*;

- ***management of the risk of sheep becoming ill*** with:

a. *bacteria – Brucella* spp., *Chlamydia abortus*, *Coxiella burnetii*, *Leptospira interrogans*;

b. *parasites – Toxoplasma gondii*;

c. *viruses* – bluetongue virus); Rift Valley fever virus;

- ***sheep welfare***:

a. *ability to exhibit natural behaviours* – ability to perform, natural behaviour, social comfort, frequency of abnormal behaviours observed in the herd, feeding, number of months of access to pasture, number of hours of grazing per day depending on the season, rest, possibility of running outdoors;

b. *housing conditions* – indoor stocking density, frequency of milking stress as a result of milking facilities, adequacy of animal handling facilities, available housing options, positioning of water to reduce the risk of contamination, positioning of

feed to reduce the risk of contamination, condition of housing, condition of bedding;

c. *feeding and watering systems* – degree of water availability during grazing periods in sheltered periods, feeding groups of animals according to physiological needs, percentage of feed converted into production gain, space available to animals when eating, feeding strategy;

5. **implementation of new breeding and exploitation technologies**, which use the most modern means of observation and control of the condition of sheep to obtain quantitative and qualitative productions that satisfy the economic efforts of farmers – precision zootechnics; for good monitoring of quantitative and qualitative production, farms that use intensive and semi-intensive breeding and exploitation systems should be equipped with special equipment that ensures:

- ***surveillance cameras*** to monitor nutrition, rest, rumination, and welfare of sheep;
- ***registration in the database***, genealogical register of breeders with high genetic value and special performances;
- ***containers to preserve semen and products*** for stimulating off-season ovulations;
- ***systems for tracking and monitoring herds*** with drones or other GIS systems;
- ***sensor technologies***.

All these monitoring systems should be provided for when designing professional farms or modernizing existing ones, for the control and efficiency of inputs in the quantitative and qualitative production of sheep.

CONCLUSIONS

To improve quantitative and qualitative sheep production without increasing the number of animals that has an effect on environmental factors, a farm model was proposed that has the potential to create a viable basis for integrated production management, contributing to the shift of conventional agriculture towards increased sustainability and responsible use of resources, by using modern methods of balancing diets according to the biological capacity of the categories of sheep being exploited.

Through the new integrated management model proposed for implementation, a new orientation of quantitative and qualitative production is promoted, towards increased sustainability, unaltered maintenance of the quality of environmental factors, and restoration of meadows or degraded lands due to excessive exploitation, because a total quality management system proposes rapid assessment of nutritional needs depending on the genetic value of the biological material exploited. Maintaining well-being and the biological capacity to manifest natural behaviours, ability to perform, social comfort, feeding frequency and balancing rations, the number of hours of grazing per day depending on the season, rest, and rumination supported by new growth and exploitation technologies become means for obtaining quantitative and qualitative productions that satisfy the economic efforts of farmers. For good monitoring of quantitative and qualitative precision production, farms using the new management model proposed for implementation depending on the exploitation system in stables or on pastures should be equipped with special equipment for quality control of environmental factors, sensor technologies, and drone herd tracking and monitoring systems.

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