Standard operating procedures for efficient management of small ruminant farms

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Background

Dairy Sheep & Goat sector

• Significant livestock sector in EU
• Challenges → limited expertise, management training & innovation adoption
• Status → low animal productivity, poor animal health & welfare, high production costs, low farm income

Solution

Education of farmers on management practices detailing step-by-step procedures
Objective

To develop farmer-friendly standard operating procedures (SOPs) for training employees and recording protocols to cater the needs of efficient farm management
Materials and Methods

• Existing guidelines
  – Milk production recording and udder morphology assessment → ICAR
  – Protocols for animal welfare indicators assessment → AWIN

• Available literature
  – Reproduction technologies
  – Newborn management
  – Nutritional management
  – Milking procedure & milking parlor critical points
  – Biosecurity measures

• Decision support tools
  – Farm economic performance assessment
Reproduction management SOPs

Assessment of males and females

**Males**
- BCS → 3-4
- Clinical examination of genitalia
- Testicular size
  - >30 cm for rams
  - >25 cm for bucks
- Lameness assessment
- Clinical examination of jaw & teeth

**Females**
- BCS → 2.5-3.5
- Age at first mating → 7-8 months
- Lameness assessment
- Clinical examination of jaw & teeth
- Genetic improvement criteria
Reproduction management SOPs

Artificial insemination

- Selection of the best females
  - Age → 1st – 3rd lactation period
  - BCS → 2.5-3.5
  - Health
    - Productivity, udder morphology & SCC
- Estrus synchronization → intravaginal fluogestone acetate sponges or CIDR devices
- Insemination 50-55 hours after removal of sponges
- Proper animal handling following AI
- Pregnancy diagnosis 30-40 days after AI using ultrasonography
Reproduction management SOPs

Natural mating

- Estrus synchronization $\rightarrow$ 1 / 10 male to female ratio
- Melatonin implants $\rightarrow$ 1 / 25 male to female ratio
- Flushing
- Pedigree records
- No random mating practices
Newborn management SOPs

Colostrum management

- Individual housing for 2-4 days after lambing/kidding
- Assessment of colostrum quality → Brix refractometer
- Colostrum pasteurization to reduce microbial load
- Storage of high-quality colostrum
- Thawing and warming of colostrum

<table>
<thead>
<tr>
<th>Activity</th>
<th>Temperature (°C)</th>
<th>Time (min)</th>
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</thead>
<tbody>
<tr>
<td>Pasteurization</td>
<td>55</td>
<td>80</td>
</tr>
<tr>
<td>Thawing</td>
<td>40</td>
<td>45-60</td>
</tr>
<tr>
<td>Warming</td>
<td>45</td>
<td>15-30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Brix (%)</th>
<th>Colostrum quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>Poor</td>
</tr>
<tr>
<td>20-24</td>
<td>Borderline</td>
</tr>
<tr>
<td>25-29</td>
<td>Good</td>
</tr>
<tr>
<td>&gt;30</td>
<td>Very good</td>
</tr>
</tbody>
</table>
Newborn management SOPs

Artificial rearing

- Smooth transition, observation and assistance of lambs/kids
- Use of high-quality milk replacer
- Provision of a warm and dry environment
- Provision of pelleted concentrate and forage feedstuffs → 1 week old
- Weaning → 35-40 days & 15 kg
Nutritional management SOPs

Mating period & gestation

• Mating period & 1\textsuperscript{st} month of gestation
  – nutritional management of respective lactation stage
• 2\textsuperscript{nd} – 4\textsuperscript{th} month of gestation
  – requirements for maintenance & pregnancy
• 5\textsuperscript{th} month of gestation
  – High energy & protein demands
  – Reduced feed intake
  – Decrease of forage supplementation
  – Increase of concentrate feed provided in many meals/day

Lactation period

• Early stages of lactation
• High energy & protein demands
  – Lucerne hay/silage $\rightarrow$ 1.5-2 kg
  – Concentrate feed $\rightarrow$ 1-1.5 kg
  – Straw $\rightarrow$ 150-200 g
Nutritional management SOPs

**Lambs/kids after weaning**

• **Weaning – 5 months**
  – Concentrate feed → ad libitum
  – Lucerne hay → 500-600 g
  – Straw → ad libitum

• **5 months – first mating**
  – Concentrate feed → 500-700 g
  – Lucerne hay → 500-600 g
  – Straw → ad libitum

**Males**

• **Nutritional requirements mainly for maintenance**

• **2 months prior to mating → increase of concentrate feed to 1kg/animal/day**
  – Energy demands
  – Semen quality

Frequent collection of feed samples and chemical analysis
Milking procedure SOPs

• Use of gloves by milkers
• Use of discrete measures to indicate animals with mastitis → milked separately
• Pre-stripping & observation of milk for signs of mastitis
• Attachment of milking units
• Cluster removal after vacuum cessation
• Post-dipping
Milking parlor critical points

Maintenance

• Vacuum level in the manometer → Daily monitoring

• Vacuum level, pulsation rate, pulsation ration in the milking units → Monitoring twice per year
  – Authorized technicians
  – Designated equipment

• Cluster replacement after 2,500-5,000 milkings/milking unit
Milking parlor critical points

Cleaning

• Externally & internally after every milking
• External → clusters & milking room using high-pressure water
• Internal →
  – Water temperature 70-80°C
  – Alkaline detergents every time to remove milk residues
  – Acid detergents once/week if the water is not hard, otherwise 2-3 times/week
  – Cleaning duration 30 – 90 min
Animal health & welfare SOPs

Vaccination protocols

• Enterotoxemia
  – Ewes/does → 1 month prior to parturition
  – Lambs/kids → at the age of 3 weeks

• Contagious agalactia
  – Ewes/does → 2 months prior to parturition
  – Lambs/kids → at the age of 2 months

• Enzootic abortion
  – One month prior to first mating

• Paratuberculosis
  – At the age of 2-3 weeks to 6 months
Animal health & welfare SOPs

Welfare indicators

- BCS
- Water availability
- Fleece cleanliness
- Panting
- Stocking density
- Hoof overgrowth

- Body & skin lesions
- Lameness
- Fecal soiling
- Ocular discharge
- Mastitis

Assessment & scoring according to AWIN guidelines
Biosecurity SOPs

External biosecurity

• Disinfection of vehicles’ wheels when entering farm premises
• Use of gloves, clean clothing and footwear by employees and visitors
• Low animal purchasing frequency & number of source herds
• Disinfection of animal transportation vehicles
• Quarantine for at least 3 weeks
• Proper handling of dead animals (gloves, immediate removal, storage & disposal)
• Vermin control with mechanical & chemical measures
Biosecurity SOPs

Internal biosecurity

• Separate housing of animals of different age groups
• From younger to older animals
• Separation of sick animals → hospital pen
• Record keeping of diagnoses, treatments & deaths
• Frequent evaluation of animal health status
• Efficient cleaning & disinfection
Milk production recording

• Milk yield recording
  – Volumetric milk meters
  – Monthly recording after weaning (suggested for five months)
  – ICAR guidelines

• Milk quality recording
  – Monthly collection of individual milk samples (at least for 3 months in early lactation) from the milk meters
  – Transportation to the laboratory at 4°C
  – Analysis for fat, protein, lactose, SNF content
Udder morphology assessment

- Udder depth
- Udder attachment
- Degree of separation of udder halves
- Teat placement

Assessment & scoring according to ICAR (2018) & Casu et al. (2006)
Nine-point (1-9) linear scale
Farm economic performance assessment

- Decision support tools
- ProudFarm project software
  - Expected daily net income vs feeding costs
  - Input data → daily milk yield and feeding costs
  - Output data → daily net income
- Happy Goats web-based application
  - Annual farm economic performance vs management practices
  - Input data → flock size, production, feeding, grazing, farm prices & costs
  - Output data → annual income, variable costs, gross margin
Conclusions

• **Customized SOPs** for small ruminant farmers
• Farm management *efficiency & sustainability*
• Next steps
  – Integration of protocols in an online interactive platform
  – Education of farmers
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