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

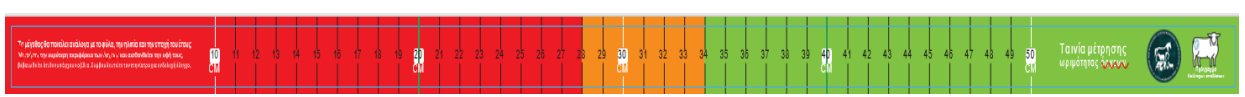
Assessment of males and females

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

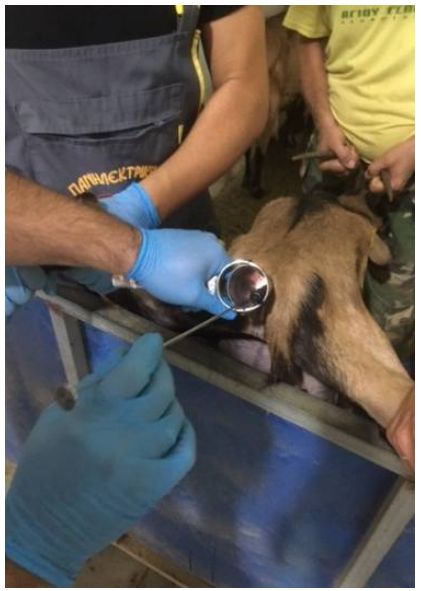
Females

- 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

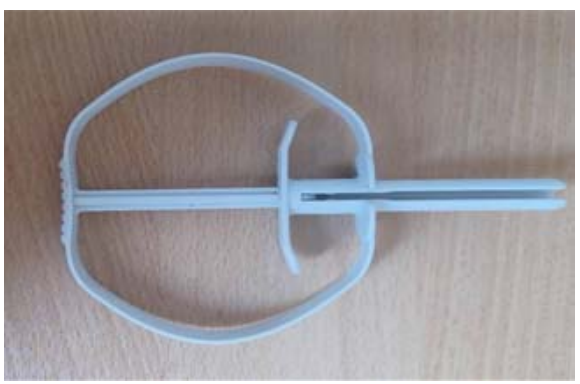


- Selection of the best females
  - Age → 1st – 3rd lactation period
  - BCS → 2.5-3.5
  - Health
  - Productivity, udder morphology & SCC
- Estrus synchronization → intravaginal fluogestone acetate sponges or CIDR devices
- Insemination 50-55 hours after removal of sponges
- Proper animal handling following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

Reproduction management SOPs

Natural mating

- Estrus synchronization → 1 / 10 male to female ratio
- Melatonin implants → 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

Activity	Temperature (° C)	Time (min)
Pasteurization	55	80
Thawing	40	45-60
Warming	45	15-30

Brix (%)	Colostrum quality
<20	Poor
20-24	Borderline
25-29	Good
>30	Very good

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 & 1st month of gestation
  - nutritional management of respective lactation stage
- 2nd – 4th month of gestation
  - requirements for maintenance & pregnancy
- 5th 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 → 1.5-2 kg
  - Concentrate feed → 1-1.5 kg
  - Straw → 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

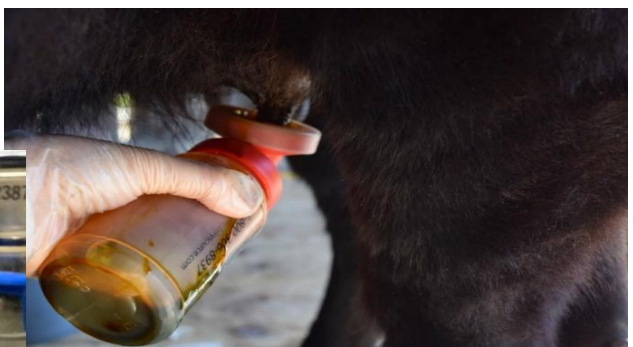
Frequent collection of feed samples and chemical analysis

Males

- Nutritional requirements mainly for maintenance
- 2 months prior to mating → increase of concentrate feed to 1kg/animal/day
  - Energy demands
  - Semen quality

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^{o} 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

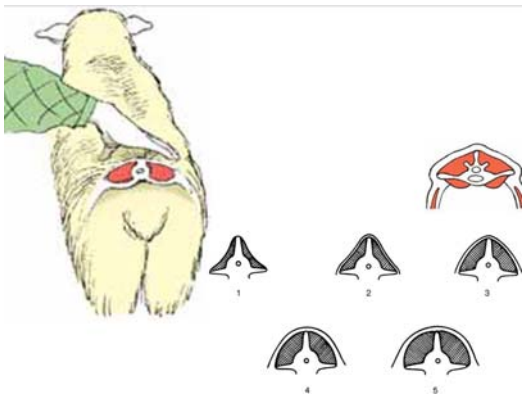
Vaccination protocols

- 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

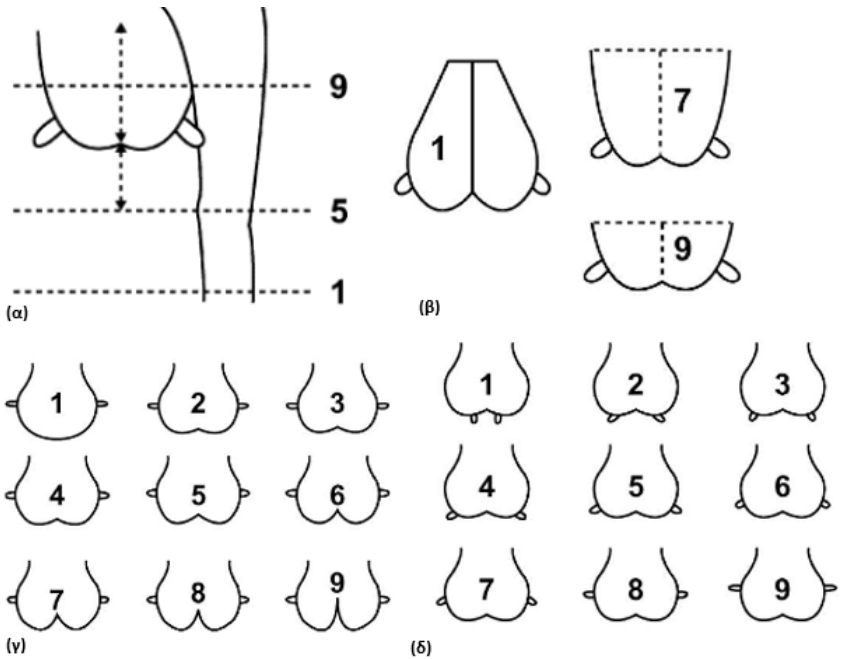
Milk production recording

- 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^{o} C
  - Analysis for fat, protein, lactose, SNF content

Udder morphology assessment

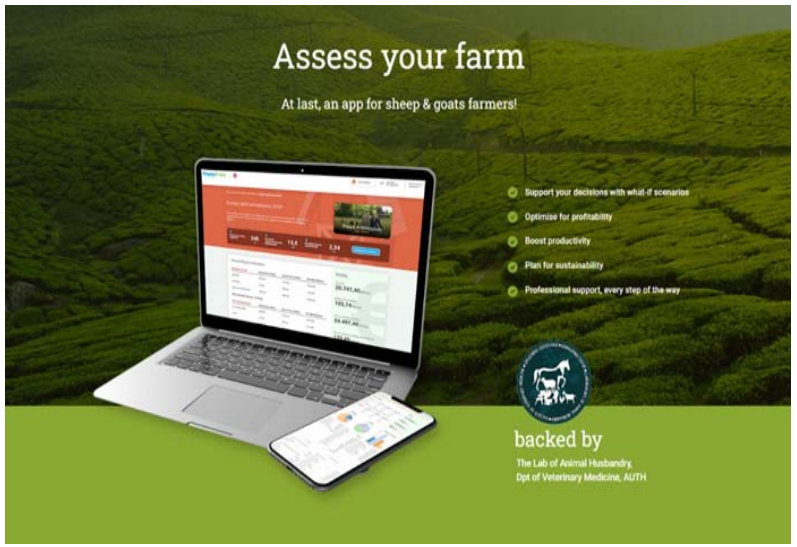
- Udder depth
- Udder attachment
- Degree of separation of udder halves
- Teat placement

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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