The iSAGE decision support system (DSS)

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European sheep & goat sector

- Low incomes
- High production costs
- Subsidies
- Low level of innovation
European sheep & goat sector

Low incomes

High production costs

Subsidies

Low level of innovation

Shortage of decision support tools
WP4 – Task 4.4
Produce user friendly tools that can be provided to industry

**Objective:** Develop a *decision support tool* that will optimise sheep and goat production and will incorporate the recommended changes
Model-driven, web-based, decision support system for sustainable small ruminant farming

Features

- Future what-if scenarios
- Different production systems
- Important farm aspects
- Simple and comprehensible reports focused on:
  - Profitability
  - Productivity
- Human readable advice
- Create/compare different scenarios

Impacts & Benefits

- Visualization of impact of choices
- Action plan on efficient farm management
- Production and profitability optimisation
Production and farming systems

• Meat sheep production system
  • Intensive
  • Extensive

• Dairy sheep and goat production systems
  • Intensive
  • Extensive
Potential users

• Sheep and goat farmers
• Consultants
  ✓ Veterinarians
  ✓ Animal scientists
  ✓ Co-operatives
• Companies
  ✓ Dairies
  ✓ Machinery construction companies
  ✓ Feed companies
Methodology

Input parameters

• Flock size
• Production (*targeted meat or milk, animal weight*)
• Grazing (*yes / no, area grazed, grazing time & distance, pasture availability*)
• Feeding (*amounts & nutritional values of feeds*)
• Income from subsidies
• Costs (*detailed breakdown of variable costs*)
• Farm prices (*products & feeds*)
Methodology

Data collection – Defaults values & acceptable ranges

• Meat sheep production system
  ✓ UK
    o Agriculture and Horticulture Development Board (AHDB)
    o National Sheep Association (NSA)
  ✓ Spain - Oviaragón – Pastores Grupo Cooperativo

• Dairy sheep production system
  ✓ France - Institut de l’ elevage (idele)
  ✓ Greece – Laboratory of Animal Husbandry, AUTH

• Dairy goat production system
  ✓ Greece - Laboratory of Animal Husbandry, AUTH
Methodology

Projectional model

Energy & protein requirements of different categories of sheep and goats

Algorithm

Assessment of nutritional management and impact on production and farm economics
Methodology

Estimates - Outputs

- Simulations of scenarios - Reports on profitability & productivity
- Farm income, variable costs and gross margin
- Production estimates

Meat sheep farms
- Live weight
- Carcass weight

Dairy sheep & goat farms
- Live weight
- Milk production

- Pasture availability at the end of the year
- Useful farm statistics (e.g. ram to ewe ratio, stocking rate)
- Other advanced outputs
Methodology

Estimates – Advanced outputs

- Potential intake of animals
- Pasture intake
- Total feed intake
- Metabolisable energy (ME) & protein (MP) requirements
- ME, DUP, ERDP, MCP & MP intake
- Energy and protein balance
- Outputs based on energy and protein balance
Methodology

Cloud-based app

• Input of data to designated web forms
• Check for correctness
• Comparison with theoretical min and max limits
• Central collection and storage on a cloud server
• Processing with a model algorithm
• Guide for farm management decisions
How does it work?
1\textsuperscript{st} Step: Login
2\textsuperscript{nd} Step: My farms

![My farms table]

<table>
<thead>
<tr>
<th>NAME</th>
<th>TYPE</th>
<th>LOCATION</th>
<th>ANIMALS</th>
<th>EWES</th>
<th>GROSS MARGIN/ANIMAL</th>
<th>GROSS MARGIN</th>
<th>INCOME</th>
<th>COSTS</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK meat sheep farm</td>
<td>Sheep</td>
<td>Yorkshire, United Kingdom</td>
<td>1100</td>
<td>500</td>
<td>40 €</td>
<td>20000 €</td>
<td>70000 €</td>
<td>50000 €</td>
<td>view</td>
</tr>
<tr>
<td>Spanish meat sheep farm</td>
<td>Sheep</td>
<td>Monnells</td>
<td>2000</td>
<td>800</td>
<td>60 €</td>
<td>50000 €</td>
<td>110000 €</td>
<td>60000 €</td>
<td>view</td>
</tr>
<tr>
<td>French dairy sheep farm</td>
<td>Sheep</td>
<td>Bordeaux, France</td>
<td>500</td>
<td>370</td>
<td>97 €</td>
<td>120000 €</td>
<td>200000 €</td>
<td>80000 €</td>
<td>view</td>
</tr>
<tr>
<td>Greek dairy goat farm</td>
<td>Goat</td>
<td>Xrisopetra, Kilkis</td>
<td>265</td>
<td>200</td>
<td>70 €</td>
<td>14000 €</td>
<td>46000 €</td>
<td>32000 €</td>
<td>view</td>
</tr>
<tr>
<td>Greek dairy sheep farm</td>
<td>Sheep</td>
<td>Vasilika, Thessaloniki</td>
<td>265</td>
<td>200</td>
<td>100 €</td>
<td>20000 €</td>
<td>60000 €</td>
<td>40000 €</td>
<td>view</td>
</tr>
</tbody>
</table>

[+] CREATE NEW FARM
3rd Step: Create farm

Farm Identity Information
Please insert the identifying data for the farm.

Model Type

Farm name

Farmer full name

Address

Telephone

email

Geographical Location (Google Maps)

Description
3rd Step: Create farm
4th Step: My farm

UK meat sheep farm

Animal type: SHEEP
Produces: MEAT
Country Model: UK

Scenarios

Average meat sheep farm management (default values)

This scenario describes the management of an average lowland meat sheep farm in Yorkshire, United Kingdom. The flock consists of 500 ewes, 10 rams, 500 finishing lambs and 100 replacement lambs.

<table>
<thead>
<tr>
<th>NUMBER OF SHEEP</th>
<th>EWES</th>
<th>GROSS MARGIN PER EWE</th>
<th>GROSS_MARGIN</th>
<th>INCOME</th>
<th>COSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.135</td>
<td>500</td>
<td>39,32</td>
<td>20,644</td>
<td>74,581</td>
<td>53,937</td>
</tr>
</tbody>
</table>
5th Step: Create scenario - Input data

This is a lowland meat sheep farm in Yorkshire, United Kingdom with 500 ewes.

1. Flock characteristics
   - How many animals do you have and sell?
   - Number of lambs reared for breeding (replacement)
     - 100 animals
   - Number of lambs reared for finishing
     - 500 animals
   - Number of ewes
     - 500 animals
   - Number of lambs bought for breeding (replacement)
     - 0 animals
   - Number of lambs bought for finishing
     - 0 animals
   - Number of barren ewes
     - 25 animals
5th Step: Create scenario - Input data

1. Flock characteristics

How many animals do you have and sell?

- Number of lambs reared for breeding (replacement): 100 animals
- Number of lambs bought for breeding (replacement): 0 animals
- Number of lambs reared for finishing: 500 animals
- Number of lambs bought for finishing: 0 animals
- Number of ewes: 500 animals
- Number of barren ewes: 25 animals
- Number of rams: 10 animals
- Number of adult sheep slaughtered: 95 animals
- Number of lambs sold for breeding: 0 animals
- Number of lambs sold for finishing: 120 animals
- Number of adult sheep sold: 0 animals
5th Step: Create scenario - Input data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average ewe weight</td>
<td>70 kg</td>
</tr>
<tr>
<td>Fat in milk</td>
<td>9 %</td>
</tr>
<tr>
<td>Average milk production</td>
<td>1.35 kg/day</td>
</tr>
<tr>
<td>Protein in milk</td>
<td>4.9 %</td>
</tr>
<tr>
<td>Duration of lactation period / age at weaning</td>
<td>4 months</td>
</tr>
<tr>
<td>Birth weight</td>
<td>4 kg</td>
</tr>
<tr>
<td>Age at first mating</td>
<td>8 months</td>
</tr>
<tr>
<td>Weight at weaning</td>
<td>32 kg</td>
</tr>
<tr>
<td>Lamb carcass weight sold</td>
<td>20 kg</td>
</tr>
<tr>
<td>Dressing percentage</td>
<td>47 %</td>
</tr>
<tr>
<td>Lamb age at slaughter</td>
<td>8 months</td>
</tr>
<tr>
<td>Wool production</td>
<td>3 kg/year</td>
</tr>
</tbody>
</table>
5th Step: Create scenario - Input data

3. Grazing

Which of your animals graze pasture at any time of the year and how much pasture is there?

- Replacement lambs
- Ewes during lactation period
- Ewes during last month before birth
- Rams
- Finishing lambs
- Ewes during dry period excluding last month before birth
- Barren ewes

Area grazed:

- 50 hectares

Grazing time:

- 7 hours/day

Grazing distance:

- 0 km/day

Annual pasture available:

- 8500 kgDM/hectare
5th Step: Create scenario - Input data

4. Feeds
What and how much do you feed your animals?

4.0 Concentrate fed per day

How much concentrate do you feed to each of your animals daily?

- Concentrate fed to replacement lambs per day
  - 0.02 kg/animal/day

- Concentrate fed to ewes per day during lactation period
  - 0.1 kg/animal/day

- Concentrate fed to ewes per day during last month before birth
  - 0.6 kg/animal/day

- Concentrate fed to rams per day
  - 0 kg/animal/day

- Concentrate fed to finishing lambs per day
  - 0.01 kg/animal/day

- Concentrate fed to ewes per day during dry period excluding last month before birth
  - 0 kg/animal/day

- Concentrate fed to barren ewes per day
  - 0 kg/animal/day
5th Step: Create scenario - Input data

5. Income and costs
What are your income and costs

- 5.0 Subsidy
  How much money do you get from subsidies?
  - Direct payments last year: 13006 €/farm
  - Coupled subsidies paid per animal per year: 0 €/animal

- 5.1 Cost of labour
  How much money do you spend each year for labour?
  - Hired workers used: 1 people
  - Family labour used (unpaid): 2 people
  - Hours of work per hired worker: 240 hours/month
  - Cost of labour: 10 €/hour/person
5th Step: Create scenario - Input data
6th Step: Report page

**Scenario results**

<table>
<thead>
<tr>
<th>Lambs</th>
<th>Energy Balance</th>
<th>Protein Balance</th>
<th>Weight Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement lambs</td>
<td>-0.27 MJ</td>
<td>44.13 g</td>
<td>-1.64 kg</td>
</tr>
<tr>
<td>Finishing lambs</td>
<td>1.34 MJ</td>
<td>39.12 g</td>
<td>3.50 kg</td>
</tr>
</tbody>
</table>

Estimated carcass weight change of finishing lambs considering energy and protein balance: 1.67 kg

<table>
<thead>
<tr>
<th>Adult animals</th>
<th>Energy Balance</th>
<th>Protein Balance</th>
<th>Weight Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewes during lactation period</td>
<td>-2.80 MJ</td>
<td>24.59 g</td>
<td>-8.39 kg</td>
</tr>
<tr>
<td>Ewes during dry period</td>
<td>6.68 MJ</td>
<td>87.37 g</td>
<td>10.50 kg</td>
</tr>
<tr>
<td>Ewes during last month before birth</td>
<td>1.81 MJ</td>
<td>44.38 g</td>
<td>0.97 kg</td>
</tr>
<tr>
<td>Barren ewes</td>
<td>7.14 MJ</td>
<td>89.67 g</td>
<td>10.50 kg</td>
</tr>
<tr>
<td>Rams</td>
<td>7.67 MJ</td>
<td>120.11 g</td>
<td>12.60 kg</td>
</tr>
</tbody>
</table>

**Gross margin**

- Gross margin: **20,644,27 €/year**
- Gross margin per ewe: **39,32 €/year**
- Gross margin excluding subsidies: **7,644,27 €/year**
- Gross margin per ewe excluding subsidies: **14,56 €/year**
6th Step: Report page

<table>
<thead>
<tr>
<th>Income from meat</th>
<th>49,766,57 €/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income from live animal sales</td>
<td>10,800 €/year</td>
</tr>
<tr>
<td>Income from subsidies</td>
<td>13,000 €/year</td>
</tr>
<tr>
<td>Income from wool sales</td>
<td>994,50 €/year</td>
</tr>
<tr>
<td>Income</td>
<td>74,581,7 €/year</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feed costs</th>
<th>10,111,80 €/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seasonal labour cost</td>
<td>900 €/year</td>
</tr>
<tr>
<td>Total costs of labour</td>
<td>29,700 €/year</td>
</tr>
<tr>
<td>Cost of renting</td>
<td>0 €/year</td>
</tr>
<tr>
<td>Farm running costs</td>
<td>1,500 €/year</td>
</tr>
<tr>
<td>Farm utility costs</td>
<td>4,390 €/year</td>
</tr>
<tr>
<td>Veterinary costs</td>
<td>7,335 €/year</td>
</tr>
<tr>
<td>Grazing land costs</td>
<td>0 €/year</td>
</tr>
<tr>
<td>Costs</td>
<td>53,936,80 €/year</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Costs per animal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed costs per replacement lamb</td>
</tr>
<tr>
<td>Feed costs per finishing lamb</td>
</tr>
<tr>
<td>Feed costs per ewe</td>
</tr>
<tr>
<td>Feed costs per barren ewe</td>
</tr>
<tr>
<td>Feed costs per ram</td>
</tr>
<tr>
<td>Variable costs per replacement lamb</td>
</tr>
<tr>
<td>Variable costs per finishing lamb</td>
</tr>
<tr>
<td>Variable costs per ewe</td>
</tr>
<tr>
<td>Variable costs per barren ewe</td>
</tr>
<tr>
<td>Variable costs per ram</td>
</tr>
</tbody>
</table>
Basic simulated scenarios

- Flock size optimisation
- Production optimisation
- Pricing: Lower meat/milk prices & higher feed prices
- Extensification of the production system
- Different feeding strategies

**Goal**  
Remain sustainable
Next steps

- Testing and feedback from sector/industry
- Improvements on the system
- Obtain defaults and ranges from other countries to create customised models
Thank you!