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Impact of intensification factors on the economics in dairy sheep

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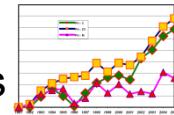
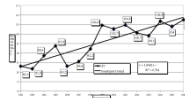
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Background & The aim of the study

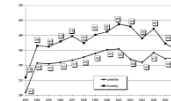
Sheep in Central and Eastern Europe in last decades

= **changes in:** production focus
genetic potential
modernisation
nutrition & professional skills



...

Productivity of breeds and conditions = **extensive**



What about **intensification** to: increase **production**?
improve utilisation of **costs**?
reach **efficiency**?

The aim of the study:

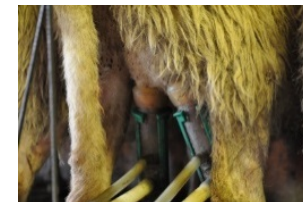
comprehensive **analyse** of some **intensification factors**
on the **economics** of Improved Valachian breed



Material & Methods (1)

Improved Valachian breed
(base system)

- a multi purpose sheep (milk-meat-wool)
- semi-extensive „Carpathian“ system
- pasture in summer; housed in winter
- 40% of milk is processed to cheese
- ewe lambs mated at age 1.5 year; natural mating

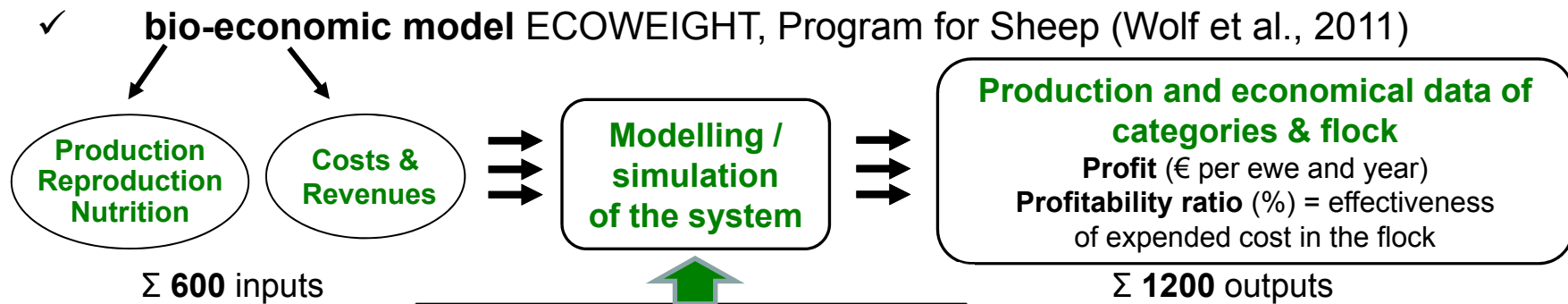


Parameter (unit)	Base system	Intensification factor
Season of lambing	Seasonal (winter)	Out-off seasonal (autumn)
Weaning of lambs	Customary (50d)	Early (5d) & sales
		Early (5d) & rearing
Production level	Population average:	Breeding goal:
milk yield (kg/ewe/150d milking period; /MP in total)	100 (124)	130 (160)
litter size (lambs/lambing)	1.21	1.55
conception rate of ewes (%)	84	95
live weight of ewe and ram (kg)	50 / 75	60 / 85
ADG of lambs till weaning (g/d ♀ and ♂)	0.200 / 0.220	0.290 / 0.330

+25%

Material & Methods (2)

Economic evaluation:



Approaches:

Markov chain

Wood function + RC and LS

van Slyke function (cheese)

growth curve + gender, LS, genotype

nutrient and feed requirement

milk and lamb price on quality



<http://inited.cz>

$$TE = nstgE(LL - 1) + nstg1E = 5(LL - 1) + 3$$

$$y(t) = at^b e^{-ct}$$

$$pmilk = pmilkb + \sum_{i=1}^{nfat+1} F_i + \sum_{i=1}^{nprot+1} P_i$$

$$cheeseY = \frac{(r_{fat} \times fat + r_{cas} \times casprot \times prot) \times \#s}{100 - moich}$$

$$iAE[i] = \begin{cases} \sum_{j=1}^{nstgE} iAE[(i-1) \times nstgE + j] & \text{for } i = 1, \dots, LL-1 \\ \sum_{j=1}^{nstg2E} iAE[(i-1) \times nstgE + j] & \text{for } i = LL \end{cases}$$

$$negE[i][k][t] = adgE \sum_{l=k1}^{k2} \delta_l \times (2.1 + 0.45 \times (wE[1] + adgE \times t))$$



$$pr_i = prbase_i \sum_{j=1}^{nstgE} \sum_{k=1}^{nstgE} k_{ijk} P_{ijk}$$

Results (1)

Impact on the flock production:

1. Out-of seasonal lambing

- Conception rate of ewes -10 p.p.,
- Ewes at first lambing 26% → 30%
- Average milk yield per ewe -17%

2. Early weaning + sale / + rearing of lambs

- Milk yield per milking period +26%

3. Breeding goal

- Ewes at first lambing 26% → 22%
- Average lifetime of ewes 4 → 5 years
- Lamb production 11 kg → 21 kg/ewe/year

Outputs for the „base system“:

```
3.1.2
Relative frequencies of ewes in individual reproductive cycles
-----
Reproductive cycle 1: 0.2601
Reproductive cycle 2: 0.2308
Reproductive cycle 3: 0.1899
Reproductive cycle 4: 0.1399
Reproductive cycle 5: 0.0891
Reproductive cycle 6: 0.0513
Reproductive cycle 7: 0.0265
Reproductive cycle 8: 0.0124
Reproductive
-----
Milk production
-----
Length of lactation (d): 242
Length of milking period (d): 193
Total milk yield until weaning per ewe per reproductive cycle
(kg): 34.828
Milk yield for sale until weaning per ewe per reproduction
cycle (kg): 0.000
Milk available for lambs till weaning per ewe per reproduction
cycle (kg): 34.828
Milk yield in the milking period per ewe lambing on reproduction
cycle i averaged over litter size (kg):
Reproductive cycle 1: 125.888
Reproductive cycle 2: 133.147
Reproductive cycle 3: 137.499
Reproductive cycle 4: 135.726
Reproductive cycle 5: 128.036
Reproductive cycle 6: 121.804
Reproductive cycle 7: 113.132
Reproductive cycle 8: 107.463
Reproductive
-----
Total milk yield in the milking period per ewe
(kg): 124.474
```

```
Lambs died till weaning as proportion of lambs born alive (lambs alive at
24 hours after birth) for all litter sizes i (i=1,...,clt)
( ): 0.030 0.021 0.032
Birth weight of pure-bred female progeny born in litter size i (i=1,...,clt)
(kg): 3.400 2.800 2.000
Birth weight of pure-bred male progeny born in litter size i (i=1,...,clt)
(kg): 3.700 3.000 2.100
Weaning weight of pure-bred female progeny born in litter size i (i=1,...,clt)
(kg): 4.440 3.640 2.600
Weaning weight of pure-bred male progeny born in litter size i (i=1,...,clt)
(kg): 4.880 4.010 2.930
Birth weight of cross-bred female progeny born in litter size i (i=1,...,clt)
(kg): 3.700 3.000 2.200
Birth weight of cross-bred male progeny born in litter size i (i=1,...,clt)
(kg): 4.100 3.300 2.300
Weaning weight of cross-bred female progeny born in litter size i (i=1,...,clt)
(kg): 4.780 3.870 2.820
Weaning weight of cross-bred male progeny born in litter size i (i=1,...,clt)
(kg): 5.320 4.340 3.060
```

```
for litter size and all lambings within a production cycle.
( ): 0.030 0.041 0.070
Fraction of lambs stillborn or died until 24 hours for the individual classes
for number of dead lambs within each litter size i (i=1,...,clt;j=1,...,i).
Rows are the litter sizes (i=1,...,clt), columns are number of lambs dead within each
litter size (j=1,...,i). The sum in each row must give the numbers in the
foregoing input. Example: The first number in the second row is the probability
that the dead lamb is from a litter with two lambs where one lamb died; the
second number in this row is the probability that the dead lamb is from a litter
with two lambs where both lambs died.
( ):
0.030
0.035 0.006
0.041 0.019 0.010
```

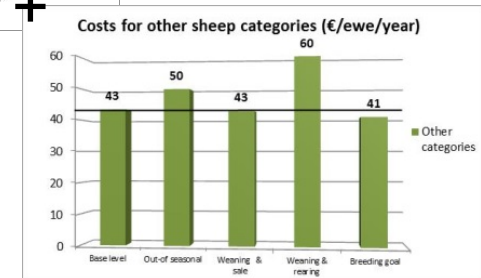
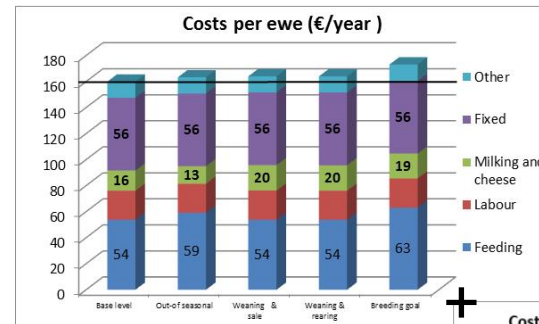
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3.2
Survival and reproduction characteristics of the flock
-----
Percentage of ewes died or culled for different reasons
Ewes died (%): 9.72
Ewes culled for health (%): 26.67
Ewes culled for low production (%): 21.22
Ewes culled for failure to conceive (%): 39.25
Ewes culled for age (%): 2.14
-----
Average lifetime of ewes (number of reproduction cycles): 3.85
```

Results (2)

Impact on the economics:

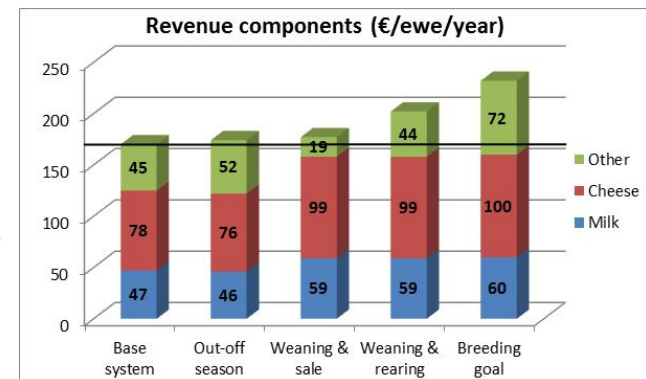
1. Cost

- Costs per ewe and year without dramatic change (+2% to +8%)
- Feeding and fixed costs the most important items (35% for both)
- Costs for other categories +15% (out-off seas.) and +38% (early w.& rearing)
- Total costs per ewe and year +2% to +10%



2. Revenue

- Total revenue per ewe and year +2% to +36%
- Milk and cheese - the most important resources (70% to 90%)
- Lambs = 30%, when higher reproduction and growth intensity



Results (3)

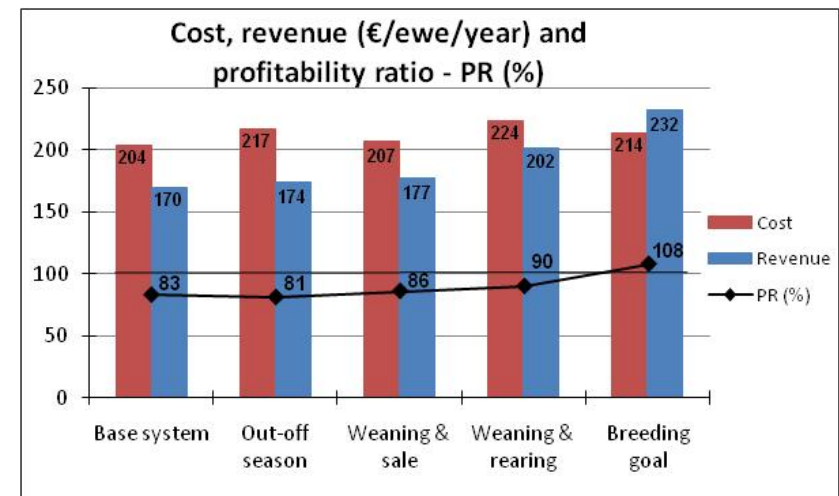
Impact on the economics:

3. Profit and profitability ratio (PR)

- **No subsidies** when profit calculation
- Positive profit for „**breeding goal**“: PR = 108%
- „**Out-off seasonal**“ lambing: PR = 81%
 - ✓ for the whole flock
 - ✓ combination of seasons

→ good premise for PR ≥ 100%

- „**Early weaning of lambs**“ PR 86% and 90%



Conclusions

Intensification factors in semi-extensive system:

Economical and practical
points of view

- ✓ **Positive impact** on the **economics and on the costs utilisation**
 - + existence of **reserves** in the costs effectiveness in „base system“
- ✓ Some aspects for practical application:
 - ✓ consider the **individual farm conditions** (nutrition, biology, technology, labour ...)
 - ✓ more intensive breeding process, central nurseries
 - ✓ grants/support for investment and time for realisation
 - ✓ future: **socio-economic** and **environmental** impact
(i.e. legislative for the emission production)
 - ✓ ...



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Thank you for attention 😊

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