

# A MULTICRITERIA DECISION ANALYSIS MODEL FOR THE SELECTION OF WELFARE STRATEGIES IN DAIRY GOAT FARMS

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This study makes use of multi-criteria decision making methods to support a farm manager selecting animal welfare strategies.

Model building followed a socio-technical approach, involving social aspects of decision conferencing and technical components of a multi-criteria evaluation model, using the MACBETH approach.

The model allowed for a transparent analysis and selection of welfare improving strategies in real on-farm conditions, and may be useful to select strategies in other contexts.

## Introduction

To define strategies to improve on-farm animal welfare, managers need to consider several aspects that represent the views of distinct stakeholders: veterinarians want to maximize animal health, stockpersons worry about management practices and farmers mostly have profit as the major concern. Hence, multi-criteria decision aiding methods are needed to account for all perspectives.

## Materials and methods

Model-building followed a socio-technical approach, and was structured in four intertwined groups of activities (structuring, constructing, developing sensibility and robustness analyses, and elaboration of recommendations). An additive evaluation model was built to evaluate farm welfare strategies, with the model developed representing the views of the farm manager, in a set of decision conferences. We used the Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH), and the M-MACBETH decision support system to build the evaluation model.

## Results and Discussion

### Decision context

Welfare problems in a dairy goat farm (2000 goats): 1) 12% overweight; 2) 30% severely lame, and 3) 30% asymmetric udders.

### Key concerns and evaluation criteria for strategy selection

Selecting Animal Welfare Strategies	Animal Welfare	Profit	Farm image	Milk Quality	Farm routine	Time to present results to farm owner
	Body condition Lameness Udder conformation	Revenues: milk production & animal genetics Costs: treatments, mortality & culling Costs with strategy implementation				
			Impact on human resources Impact on animal's management			

Each key concern was operationalized into evaluation criteria. E.g.:  
**Animal Welfare** → Three criteria with quantitative performance levels, 1) % of overweighted goats, 2) % severely lame goats, and 3) % asymmetric udders

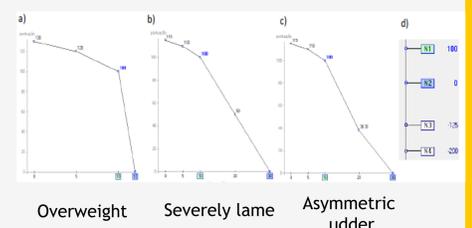
### Strategies in analysis

We identified 10 strategies, that considered different control measures: e.g.: 1) claw trimming, 2) apply disinfectant in the milking, 3) feed change.

The distinctive characteristic of MACBETH is that it **only requires a qualitative evaluation of differences in attractiveness**, being a very intuitive approach.

### Converting performance into value

We assessed judgments about differences in attractiveness between the different performance levels of each criterion. This creates a function value that allows to assess the added value of varying different (quantitative/qualitative) performance levels.



Function values of the evaluation criteria from the Animal Welfare key concern

### Weighting the criteria

Based upon the judgments from the farm manager, we weighted the different criteria with M-MACBETH assisting in the process of building weights. Both value functions and weights were validated by the farm manager. The criterion with a higher weight was profit (30.81), followed by time (25.58), and the three criteria of animal welfare (totalized 36.04).

### What to do?



Change feed formulation

Claw trim the goats



Improve data collection with treatment costs due to pregnancy toxemia, before introducing changes in goats feeding.

### Global evaluation of strategies

The best strategy was the one that addressed overweight and severely lame goats. Seven strategies were shown to generate positive value to the farm. All the strategies that included disinfection of the udder were poorly scored.

Options	Global
Feed change and claw trimming	123.46
Feed and management change, claw trimming	119.38
Good level	100.00
Feed change	99.28
Feed and management change	98.75
Claw trimming	89.71
Introduce no strategy	28.49
Claw trimming & Udder disinfection	15.75
Neutral level	0.00
Udder disinfection	-5.12
Introduce all strategies	-122.52
Claw trimming, udder disinfection and culling	-151.72
Udder disinfection, hire new milker and culling	-169.32

### Robustness analysis

The analysis showed that when there is imprecision in measurement (for instance in profit), the ranking of the two best strategies may change.

## Main references

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