A multivariate approach to derive economic weights for production and functional traits in dairy cattle

- German and Austrian Simmental population -

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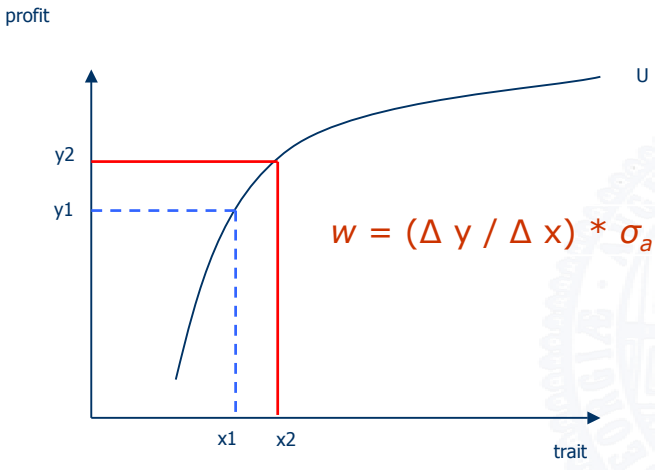
Projects to derive economic weights in Germany, Austria and Switzerland

Mack 1996
Weidele 1996
Reinsch 1993
Heckenberger 1991

Böbner 1994

Miesenberger 1997

Derivation of economic weights (*w*)



$$w = (\Delta y / \Delta x) * \sigma_a$$

U = utility function
x = trait
y = profit
σ_a = standard deviation

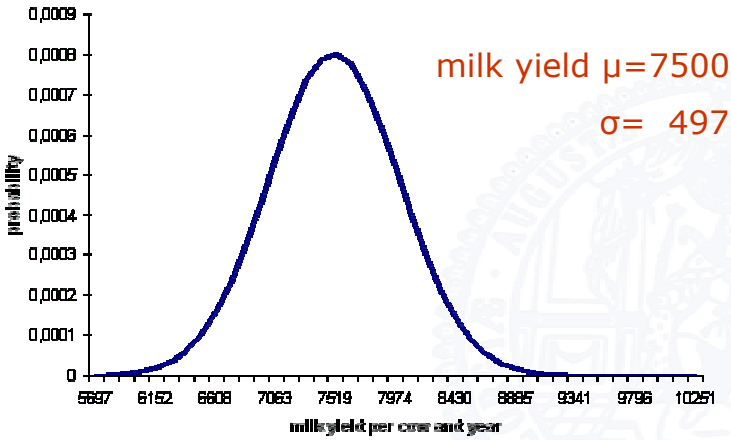
Previous research

- economic weights were derived for a certain situation
- all parameters were set to the population mean

but

- in reality all parameters are variable

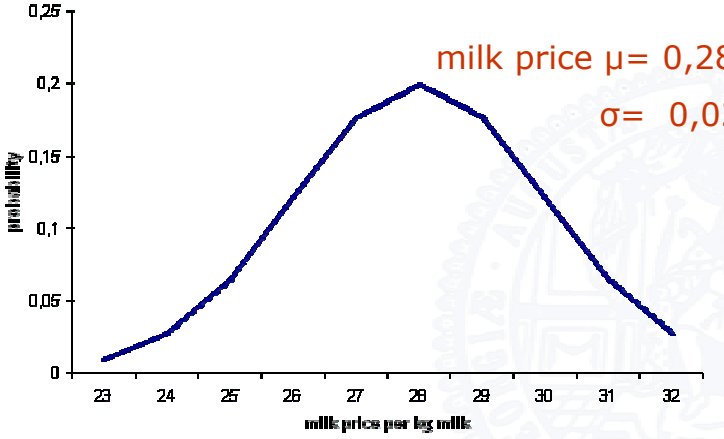
Probability of the distribution of milk yield in the herd



milk yield μ=7500 kg

σ= 497 kg

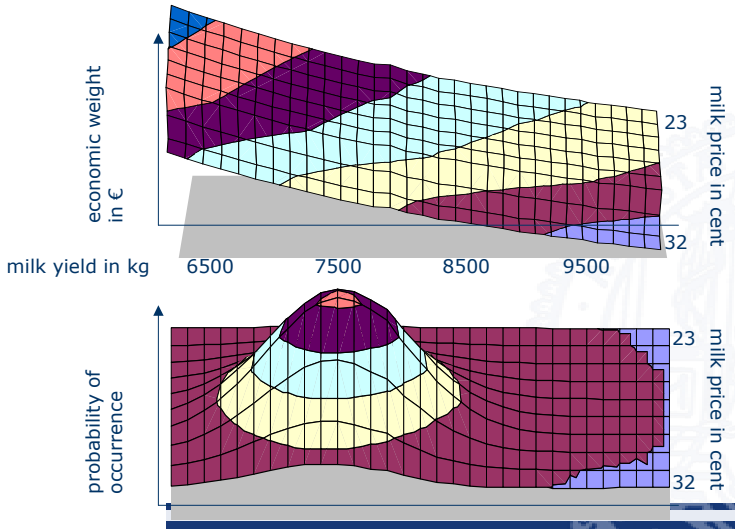
Probability of the distribution of milk price in the herd



milk price μ= 0,28 €

σ= 0,02 €

Economic weights and the probability of occurrence for fat yield (basic situation)



Mean value and variance of the economic weight (*w*)

- mean (*E (w)*)

$$E(w) = \frac{\sum_{i,j} p_{ij} w_{ij}}{\sum_{i,j} p_{ij}}$$

- variance (*Var (w)*)

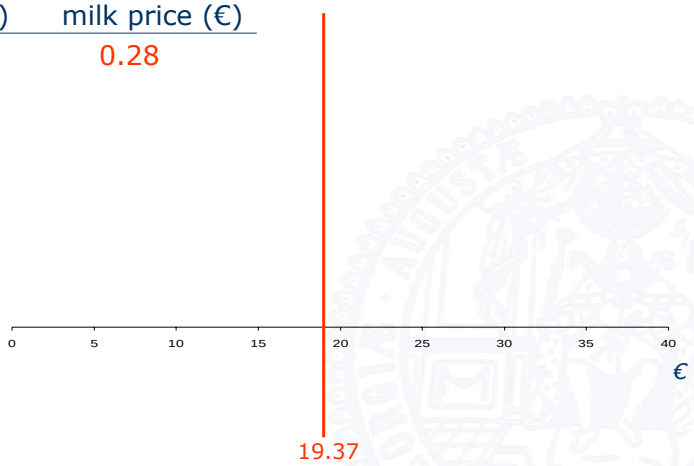
$$Var(w) = \frac{\sum_{i,j} p_{ij} (w_{ij} - E(w))^2}{\sum_{i,j} p_{ij}}$$

p = probability density

w = economic weight

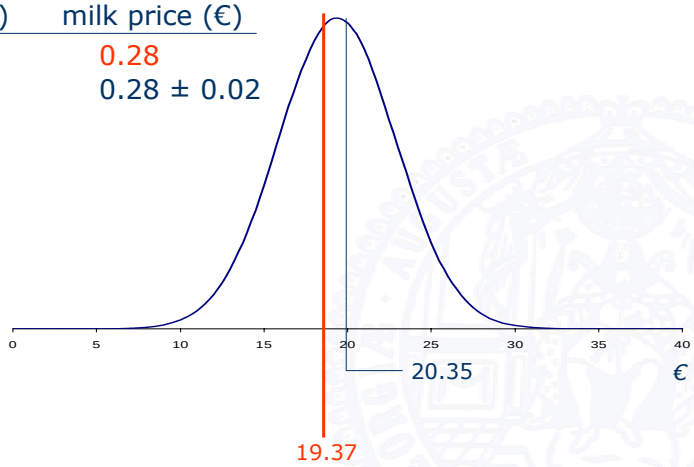
Distribution of the economic weight for fat yield (*in €/s_A*)

performance (kg)	milk price (€)
7500	0.28



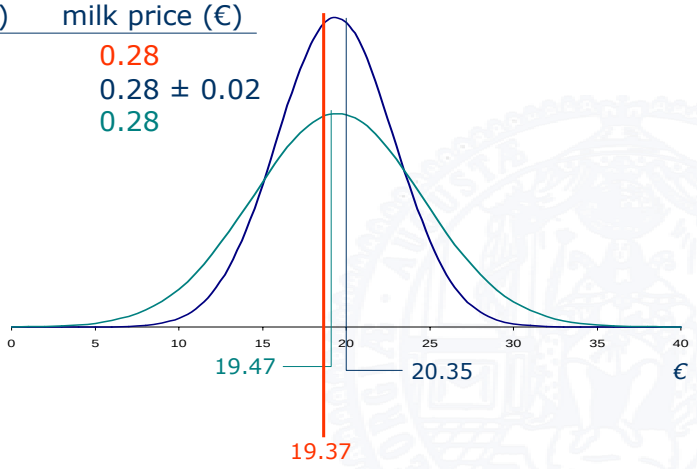
Distribution of the economic weight for fat yield (*in €/s_A*)

performance (kg)	milk price (€)
7500	0.28
7500	0.28 ± 0.02



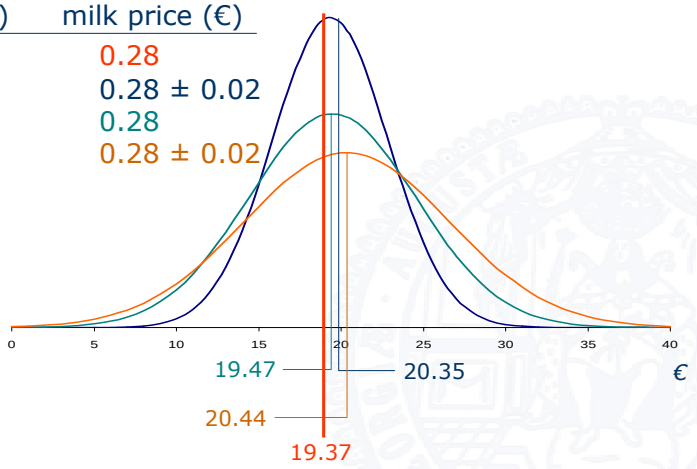
Distribution of the economic weight for fat yield (*in €/s_A*)

performance (kg)	milk price (€)
7500	0.28
7500	0.28 ± 0.02
7500 ± 497	0.28



Distribution of the economic weight for fat yield (*in €/s_A*)

performance (kg)	milk price (€)
7500	0.28
7500	0.28 ± 0.02
7500 ± 497	0.28
7500 ± 497	0.28 ± 0.02



Traits (Simmental dairy cattle, Germany and Austria)

- milk yield
- fat yield
- protein yield

} milk production traits

- longevity
- conception rate
- stillbirth
- calving ease
- persistency
- SCS
- milkability

} functional traits

- net daily gain
- EUROP

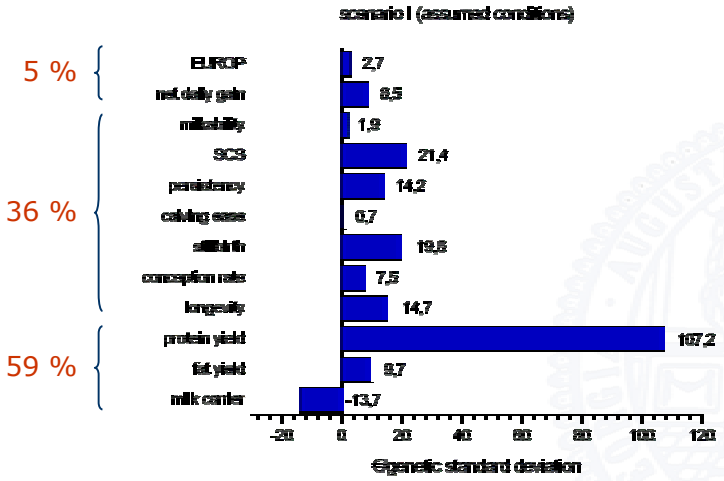
} beef production traits

Milk prices

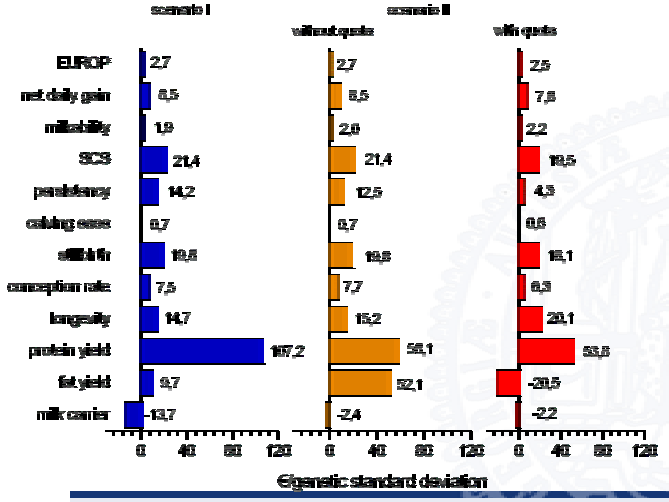
- ***scenario I*** (assumed conditions) (OECD/FAO)
  - without quota limitation
  - 0 €/kg
  - 1 €/kg fat yield
  - 6,7 €/kg protein yield

- ***scenario II*** (current conditions)
  - with/without quota limitation
  - 0,02 €/kg
  - 2,7 €/kg fat yield
  - 4,1 €/kg protein yield

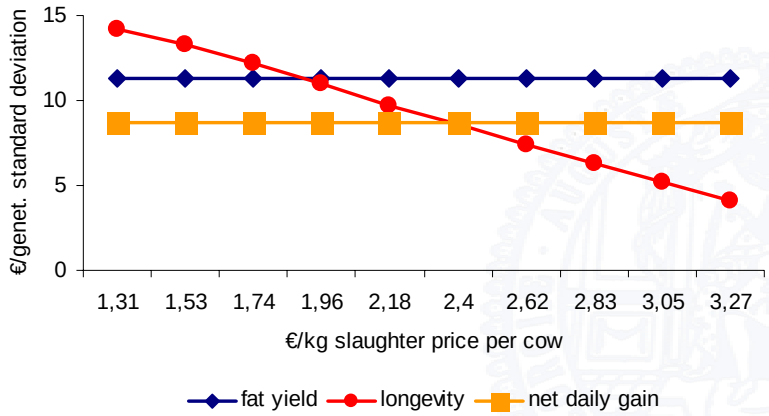
Mean values of the economic weights in **scenario I**



Mean values of the economic weights for all traits in the different scenarios



Mean values of the economic weights by variation of the slaughter price per cow (scenario I)



Conclusions

- We suggest an approach to calculate economic weights taking into account the uncertainty about future conditions
- The most important trait under economic aspects is protein yield
- With a fat to protein price ratio of 1: 6.7 and no quota the trait complexes milk : functional traits : beef are weighted 59 : 36 : 5
- Quota and milk market situation influence the economic weights
- It is imperative to adapt economic weights to the future conditions and market situations

Acknowledgement

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