Use of livestock quality estimates for improved product allocation planning to meat processing locations

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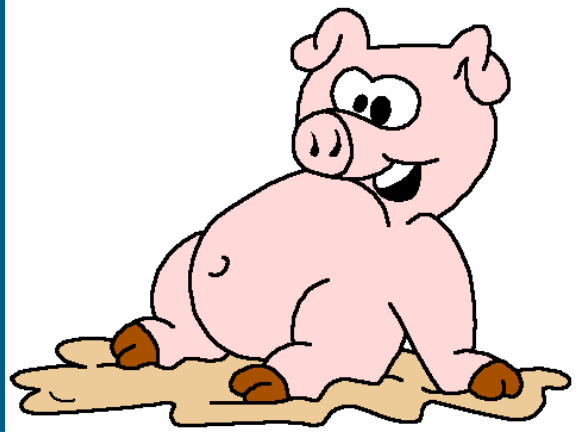

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SIXTH FRAMEWORK PROGRAMME

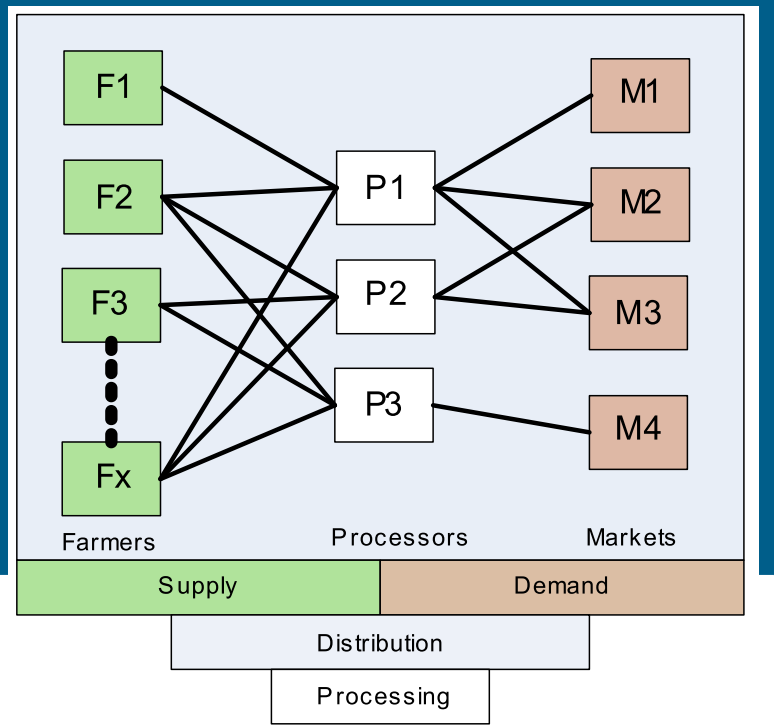
- PORK CHAINS

Presentation overview

- Problem description
- Supply strategies
- Supply plan evaluation criteria
- Results
- Conclusion and further research

Problem description

- Differences in farmer production systems lead to variation in meat quality features
- Market segments differ in
  - demand for quality features
  - demand for logistics services
  - market constraints
- These combined features affect location specific yield of animal batches



Problem description

- A meat company owning multiple slaughterhouses transports animals to the nearest processing location without using quality information in supply planning.
- Use of quality information in supply planning might improve overall profitability

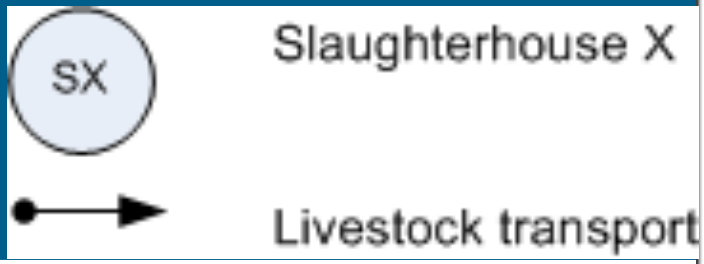
Problem description

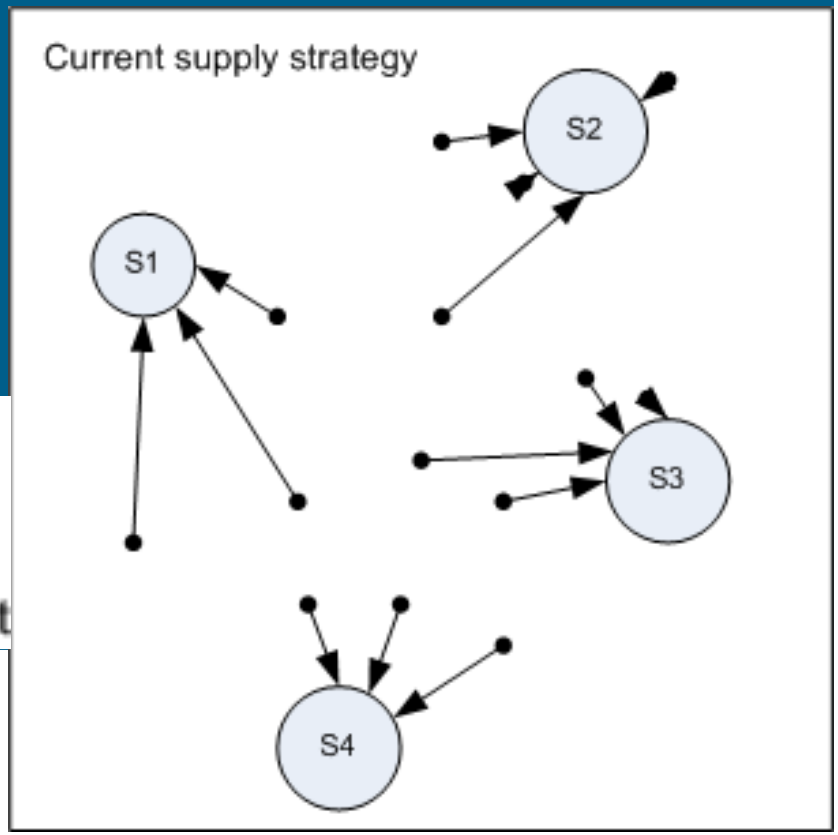
- 5 slaughterhouses
- Carcasses sorted into 12 different classes
- Location-specific value of different classes
- Farmers differ in
  - Geographic location
  - # of animals they deliver
  - Quality features of animals they deliver

Basic scenario: current supply strategy

Allocation based on:

- Animals required at slaughterhouse
- Optimum based on
  - Transport costs
    km x € 0.0074 x #

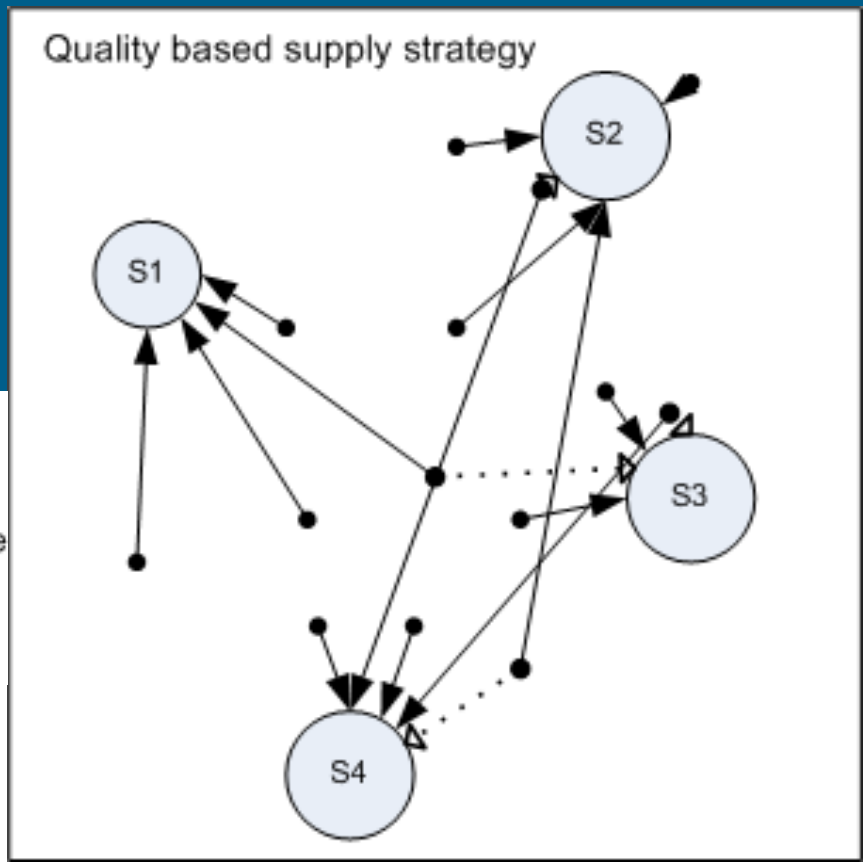




Advanced scenario: quality based supply strategy

Allocation based on:

- Animals required at slaughterhouse
- Optimum based on
  - transport costs
    km x € 0.0074 x #
  - carcass yield
    specific value x #



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Supply plan evaluation criteria

- Allocation plan for 1 day, 49 livestock batches
- Quality a farmer will deliver predicted based on historical data
- MILP model optimized allocation plan for both supply strategies

KPI: ‘net value’ of allocation plan

- carcass yield (specific value x #)
  minus
- transport costs (km x € 0.0074 x #)

Supply plan evaluation criteria

- Scenario 1: basic supply strategy

$$\min \sum_i \sum_j \left\{ X_{ij} \times a_i \times d_{ij} \right\}$$

- Scenario 2: quality based allocation strategy

$$\max \left\{ \sum_i \sum_j \sum_k \sum_l \left\{ X_{ij} \times a_i \times p_{jk} \times q_{ikl} \times m_{il} \right\} - \sum_i \sum_j \left\{ X_{ij} \times a_i \times d_{ij} \right\} \right\}$$

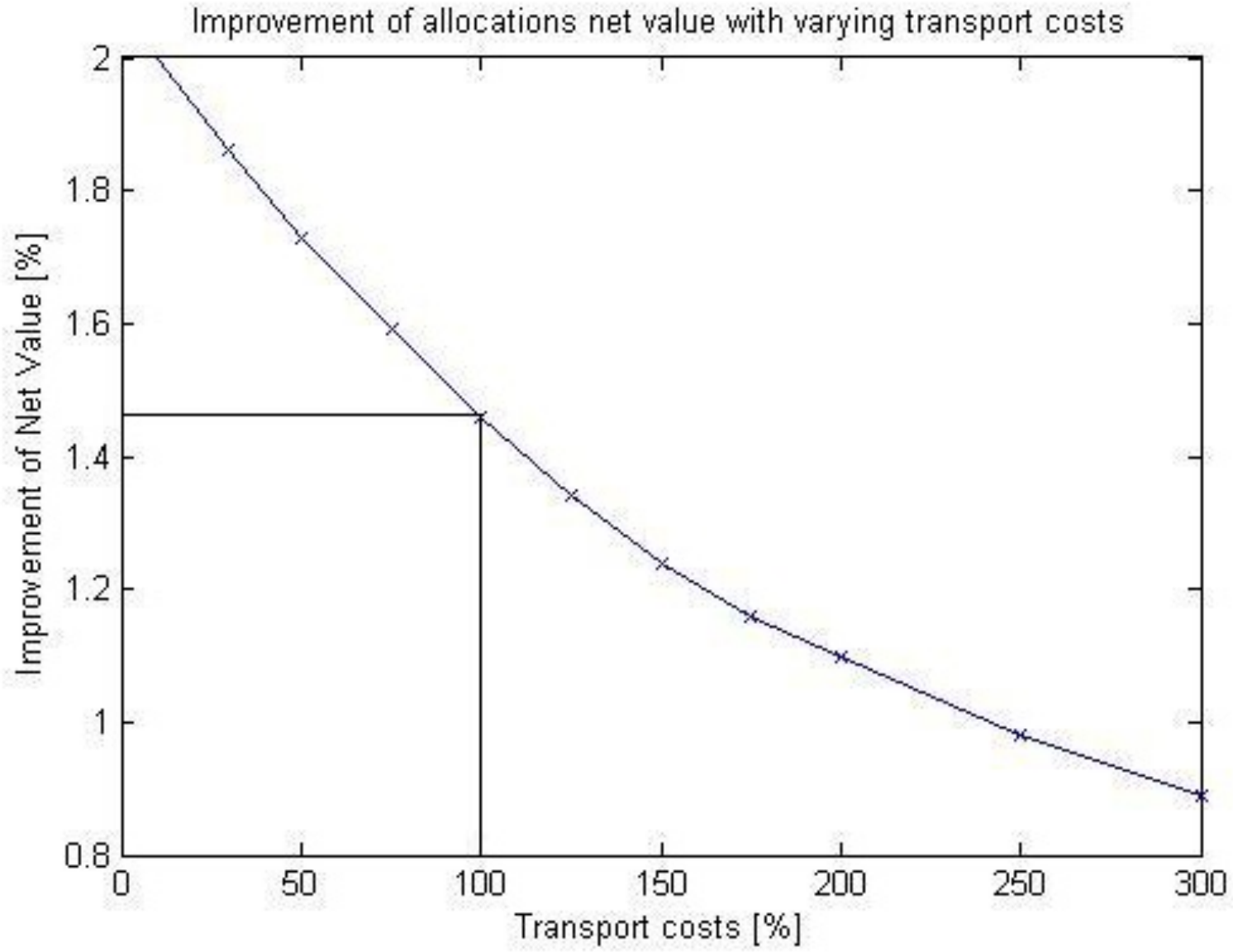
- Net value of allocation plan

$$\left\{ \sum_i \sum_j \sum_k \sum_l \left\{ X_{ij} \times a_i \times p_{jk} \times q_{ikl} \times m_{il} \right\} - \sum_i \sum_j \left\{ X_{ij} \times a_i \times d_{ij} \right\} \right\}$$

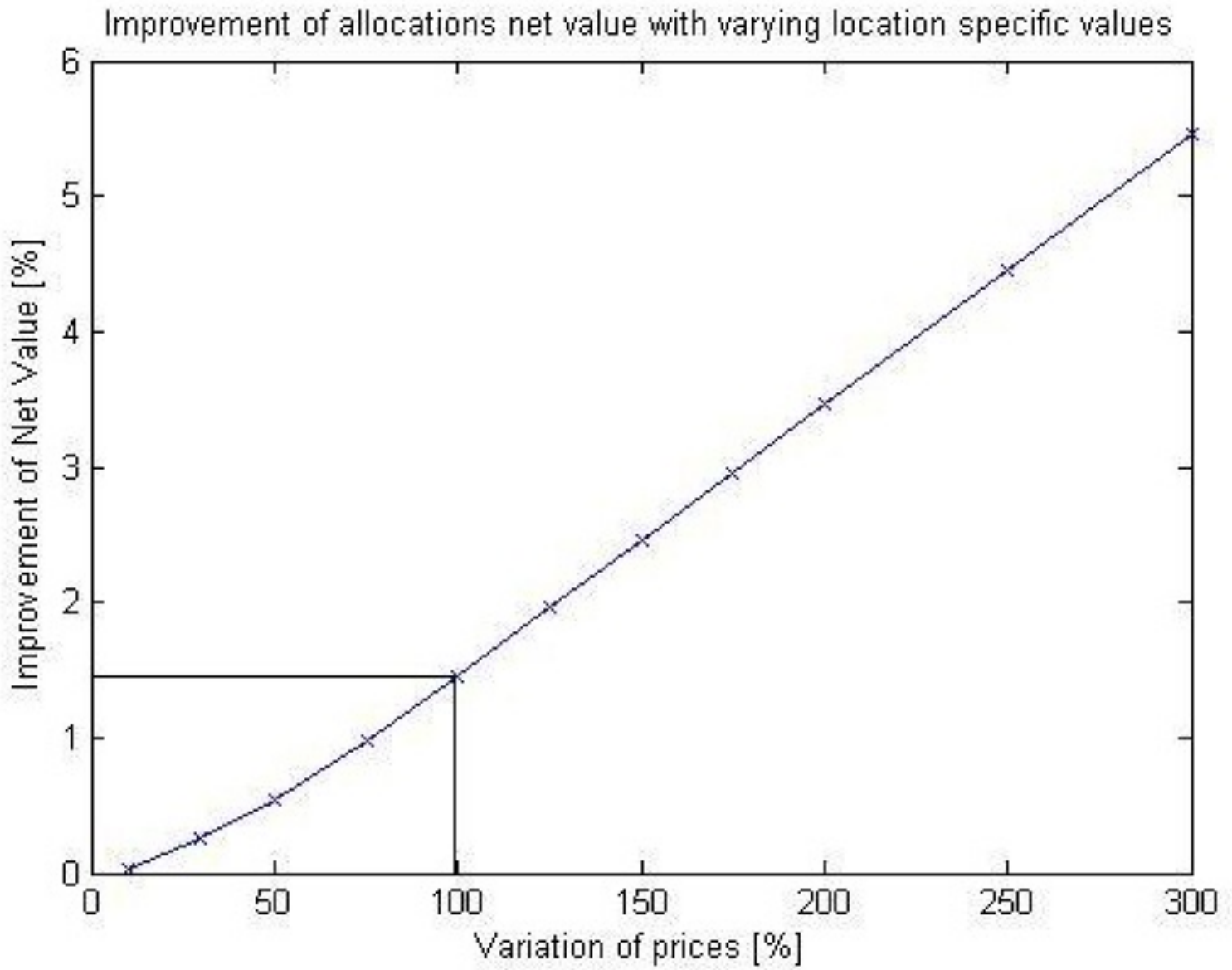
Results

Supply strategy	*Transport costs*	*Carcass value*	*Net value of allocation plan*
Current supply strategy	€ 6055	€ 516499	€ 510444
Quality based supply strategy	€ 8824 + 45.7 %	€ 526720 + 1.98 %	€ 517896 + 1.46 %

Results: sensitivity analysis



Results: sensitivity analysis



Conclusion and further research

Conclusion

Use of quality information in slaughterhouse supply planning has the potential to improve profitability of meat processors

Further research is suggested to:

- Analyze larger dataset
- Include more operational variables, e.g.
  - Combined livestock transports
  - Include market – farmer constraints
- Evaluate use of quality information in other areas of pork supply chains

Questions, remarks and recommendations

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