Accounting risk in farm investment calculations: application to dairy farm investment

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Outline

• Introduction to the topic
• CAP investment support schemes
• Few words about investment calculations
• Proposed risk-accounting investment calculation method
• Application to a dairy farm investment
  – Insurance perspective
Introduction

• Continuous investments are needed in agriculture
  – To improve productivity
  – Retain the viability of production
  – To improve animal welfare
• Agricultural investments require a lot of capital
  – Interest on capital is low
• Investors face multiple risks
  – Output prices
  – Input prices
  – Yield
  – etc.
CAP investment support schemes

• Are based on a one-time grant financing a share of the investment and/or on subsidised interest rates
  – Relaxing budget constraints
  – Reducing the downside risk by reducing the actual investment cost

• RD investment support promotes investments that otherwise would not have been undertaken (the principle of additionally), because the cost is too high and/or the farmer has limited access to credit.

• However, uncertain returns on investment are often a greater obstacle to investment than the lack of financial resources (Lefebvre et al., 2014)
Current CAP investment support schemes

• In the 2014–2020 RD programme, most of the investment support is allocated to “Investments in physical assets” (Article 17) with following targets:
  – Total investments (private and public) in agricultural physical assets is EUR 16.8 billion in 2014–2020
  – Number of farm holdings supported by Investments in physical assets in agriculture programme is 334,400 farms (European Commission, 2016)
  – The value of eligible investments varies widely between types of investments and countries
Problems related to direct support

• It is well recognized that area-based subsidies (direct payments) partly capitalize into land values and rents (Feichtinger and Salhofer, 2011)

• It is possible that the same phenomenon follows with subsidised agricultural investments (but not studied)
Investment calculations

- Problem: Lack of simple, understandable risk accounting calculations
  - Net present value methods ignore risk
  - Often sensitivity analysis is made with different price assumptions, but a real risk assessment is missing
- Use of real options theory is not widespread among farm investments
- Deviations are basically understood, but their determination may sound gibberish in practical use
Proposed risk-accounting investment calculation method

• The three values (min, median, max) are used to construct a PERT (Program Evaluation and Review Technique) distribution, which is a special form of Beta probability distribution
  – The PERT distribution was originally developed for the US Navy Special Projects Office in 1957 to support the US Navy's Polaris nuclear submarine project (Malcolm et al., 1959)
  – In this complex project, the details and durations of all activities were not known, but the project management required an estimate of the project finishing time.
  – For each subproject, the most optimistic, most likely and most pessimistic time required to accomplish each activity were estimated. Timing deviations of the subprojects formed the probability for the entire duration of the project.
Application to a dairy farm investment

• In the method, three descriptive values form the distributions of input and output variables of the net present value calculation
  – Pessimistic value, median and optimistic value
• The values may be based on historical data or expectations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minimum</th>
<th>Median</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average milk yield of the herd, kg</td>
<td>8,009</td>
<td>8,837</td>
<td>9,591</td>
</tr>
<tr>
<td>Milk price, €/kg</td>
<td>0.346</td>
<td>0.395</td>
<td>0.459</td>
</tr>
<tr>
<td>Grass silage price, €/kg</td>
<td>0.105</td>
<td>0.141</td>
<td>0.155</td>
</tr>
<tr>
<td>Barley price, €/kg</td>
<td>0.096</td>
<td>0.136</td>
<td>0.187</td>
</tr>
<tr>
<td>Rapeseed meal price, €/kg</td>
<td>0.180</td>
<td>0.320</td>
<td>0.423</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Correlations matrix</th>
<th>Milk</th>
<th>Grass silage</th>
<th>Feed barley</th>
<th>Rapeseed meal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grass silage</td>
<td>0.65</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed barley</td>
<td>0.82</td>
<td>0.59</td>
<td>1.00</td>
<td></td>
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<tr>
<td>Rapeseed meal</td>
<td>0.86</td>
<td>0.61</td>
<td>0.90</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Distributions of input and output variables

- In this case, other factors are fixed

Average production

Milk price

Feed grain

Rape seed meal

Grass silage
Simulation results

- Net present value of an animal facility per cow
- Interest rate of 2% and duration of 15 years were used while deriving the net present value
- Monte Carlo simulation with 10,000 draws
Probability distribution of the NPV

- In the case of a median investment cost of €12,000 and the typical subsidy rate of 40%, the subsidy for the investment is €4,800
Investment insurance?

- Expected annual indemnity up to the subsidised level is €146 per year
- The present value of the subsidy being €374 per year
Comparison of one-time and insurance based investment support

• The price difference comes with the possible investment revenues: Direct, single investment aid does not affect the future margins faced by the farmer
  – Margins above the lower line are revenues for farmer
• In other words, the revenue possibilities are higher as less of the revenue is spent on the interest cost
Conclusions

• The key advantage of hypothetical decoupled investment support increases motivation to cost-efficient construction because the subsidy is not dependent on investment cost.

• Margin insurance as an investment subsidy tool could reduce investment risk, but would also require long-term commitments which might be expensive and troublesome to administer.
  – Less attractive investments, because of revenue possibilities would be reduced.

• Administrative burden or costs faced by farmers should not be increased.
  – Therefore, the idea presented in this paper is a simplified discussion opener rather than actual proposal.
  – However, margin insurance could reduce risk, as long as the risks are properly determined!
Thank you!
Support to farm investments in RD Policy 2007–2013

- Farm investment support is an essential component of the productivity and sustainability enhancing strategy within EU Rural Development scheme

<table>
<thead>
<tr>
<th></th>
<th>Modernization of agricultural holdings (measure 121)</th>
<th>Support for adding value to agricultural and forestry products (measure 123)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmed total public expenditure, billion €</td>
<td>18.4</td>
<td>8.7</td>
</tr>
<tr>
<td>EAFRD budgeted contribution, billion €</td>
<td>11.9</td>
<td>5.3</td>
</tr>
<tr>
<td>Percentage of EU Rural Development budget (EAFRD contribution)</td>
<td>12.4%</td>
<td>5.5%</td>
</tr>
<tr>
<td>Actual declared expenditure (Q4 2006 to Q3 2014), billion €</td>
<td>9.6</td>
<td>3.5</td>
</tr>
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</table>

Source: European Commission