Why don’t Polish farmers participate in the agricultural production insurance scheme? An analysis based on expected utility approach.

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**Key message 1: a risky environment**

- Increasing frequency of adverse events (floods, droughts, spring frosts) – climate changes
- Liberalization of international trade (mainly price risk, but not only)
- Changes in CAP

Increasing risk = increasing fluctuation of farm income
Key message 2: a risky environment = a need of risk management in agriculture

Strategies to cope with risk

<table>
<thead>
<tr>
<th>Farm/household/community</th>
<th>Market</th>
<th>Government</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Reduction</td>
<td>Technological choice</td>
<td>Training on risk management</td>
</tr>
<tr>
<td>Risk Mitigation</td>
<td>Diversification in production, Crop sharing</td>
<td>Futures and options, Insurance, Vertical integration, Production/marketing Contracts, Spread sales, Diversified financial investment, Off-farm work</td>
</tr>
<tr>
<td>Risk Coping</td>
<td>Borrowing from neighbours/family, Intra-community charity</td>
<td>Selling financial assets, Saving/borrowing from banks, Off-farm income</td>
</tr>
</tbody>
</table>

Key message 3: creating an effective insurance marker requires fulfilling certain conditions

- number and size of the objects should be sufficient to calculate probable losses,
- the occurrence of the loss has to be incidental and should not be intended by the insured one,
- possible occurrences have to be severe in terms of their consequences, and the losses should be measurable.
Key message 4. Insurances of agricultural production are usually supported by government.

- In Poland – obligatory and subsidised insurances of crops and animals before 1991.
- Since 1990 only insurance of the buildings and farmer’s liability are mandatory.
- No more subsidies to insurances of agricultural production.
Current situation

• 2005- introduction a new legal act
• Farmers (receiving direct payments from EU) are obliged to insure:
  – at least a half of area under crops
  – at one risk factor
  – penalty fee (2 euro per ha)
  – subsidies: 50% (65% from 2016) of insurance premium, but the insurance rate max 6% of insured sum
## Current situation

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of contracts</th>
<th>Agricultural area under insurance [ha]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>crops insurance</td>
<td>animal insurance</td>
</tr>
<tr>
<td>2006</td>
<td>10 738</td>
<td>318</td>
</tr>
<tr>
<td>2007</td>
<td>28 412</td>
<td>416</td>
</tr>
<tr>
<td>2008</td>
<td>87 150</td>
<td>220</td>
</tr>
<tr>
<td>2009</td>
<td>144 080</td>
<td>248</td>
</tr>
<tr>
<td>2010</td>
<td>150 833</td>
<td>279</td>
</tr>
<tr>
<td>2011</td>
<td>138 425</td>
<td>290</td>
</tr>
<tr>
<td>2012</td>
<td>135 707</td>
<td>292</td>
</tr>
<tr>
<td>2013</td>
<td><strong>151 101</strong></td>
<td><strong>307</strong></td>
</tr>
</tbody>
</table>

Number of farms taking UE direct payments: ~1.5 mln

14.6 mln ha
Expected utility theory

\[ EV = p_A x_1 + p_B x_2 \]

\[ EU(A) = \sum_{x \in X} P_A (x) U(x) \]
Expected utility theory

\[ U(x_1) \]
\[ U(x_2) \]
\[ U(E(X)) \]
\[ EU(X) = U(CE(X)) \]
\[ U(x_1) \]

\[ EU(A) = \sum_{x \in X} P_A (x) U(x) \]

\[ x \text{ (value of output)} \]

\[ EV = p_A x_1 + p_B x_2 \)

risk-neutral decision maker

risk-averse decision maker

CE - certainty equivalent

risk premium = risk costs
Expected utility theory

\[ CE(X) = EV(X) - RP; \quad RP \text{ – risk premium} \]

\[ RP = EV(X) - CE(X) \]

Under some assumptions \( RP \) can be calculated as approximation [Anderson and Dillon 1992, Hardaker 2000, Berg 2008]:

\[ RP = \sim 0,5 R_a \text{Var}(X) \]

where: \( R_a \) - absolute risk aversion

\( \text{Var}(X) \) - variance
Problem of risk aversion elicitation

\[ R_a = - \frac{U(X)''}{U(X)'}; \]

\[ R_r = R_a X \]

Andrson, Dillon 1992:
\[ R_r = 0.5 - \text{very low or no aversion} \]
\[ R_r = 1 - \text{average (normal) aversion} \]
\[ R_r = 2 - \text{rather clear aversion} \]
\[ R_r = 3 - \text{strong aversion very strong} \]
\[ R_r = 4 - \text{(extremely) aversion} \]
General assumptions of the simulations:

• Source of data: „average farm” in FADN type „field crops” (~29 ha of UAA, ~ 62% cereals in structure of sowing area)

• Argument of utility function: value of farm production

• 4 levels of farmers’ risk aversion

• 3 levels of insurance rate:
  • 3% (subsidised)
  • 6% (subsidised)
  • 10% (commercial)

• All parameters presented on farm level
Results of simulations

**Insurance rate: 3%**

- Risk aversion: Very low or no aversion
- Average (normal) aversion
- Rather clear aversion
- Strong aversion
- Very strong (extremely) aversion

**Insurance rate: 6%**

- Risk aversion: Very low or no aversion
- Average (normal) aversion
- Rather clear aversion
- Strong aversion
- Very strong (extremely) aversion

**Insurance rate: 10%**

- Risk aversion: Very low or no aversion
- Average (normal) aversion
- Rather clear aversion
- Strong aversion
- Very strong (extremely) aversion

### Risk aversion

0 200 400 600 800 1000 1200 1400 1600

### Euro per farm

0 200 400 600 800 1000 1200 1400 1600

### Risk premium

- Blue line

### Insurance premium

- Red line
Results of simulations – no direct payments

- **Insurance rate: 3%**
  - Risk aversion:
    - Very low or no aversion
    - Average (normal) aversion
    - Rather clear aversion
    - Strong aversion
    - Very strong (extremely) aversion
  - Insurance premium (red line)
  - Risk premium (blue line)

- **Insurance rate: 6%**
  - Risk aversion:
    - Very low or no aversion
    - Average (normal) aversion
    - Rather clear aversion
    - Strong aversion
    - Very strong (extremely) aversion
  - Insurance premium (red line)
  - Risk premium (blue line)

- **Insurance rate: 10%**
  - Risk aversion:
    - Very low or no aversion
    - Average (normal) aversion
    - Rather clear aversion
    - Strong aversion
    - Very strong (extremely) aversion
  - Insurance premium (red line)
  - Risk premium (blue line)
Conclusions

• introduction of insurance scheme of agricultural production in Poland in 2005 did not cause massive participation of farmers in the insurance market,

• the main reason of low rate of farmers’ participation in the system seems to be too high cost of insurance premiums, particularly if the risk of drought is taken into account,
Conclusions

• the simulations showed that even in the case of decision-maker with moderate risk aversion the insurance premium was higher than value of the risk premium (maximum accepted cost of risk in terms of EUT),

• the utility of „keeping risk” seems to be higher than transfer it by insurance market in majority of analyzed cases,
Conclusions

• In terms of EUT low rate of farmers participation in agricultural insurance scheme seems to be enhanced by existence of EU direct payments (reduction of variability of farms income).