Farmer and land owner choices over drainage systems – profit maximisation and environment

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OUTLINE

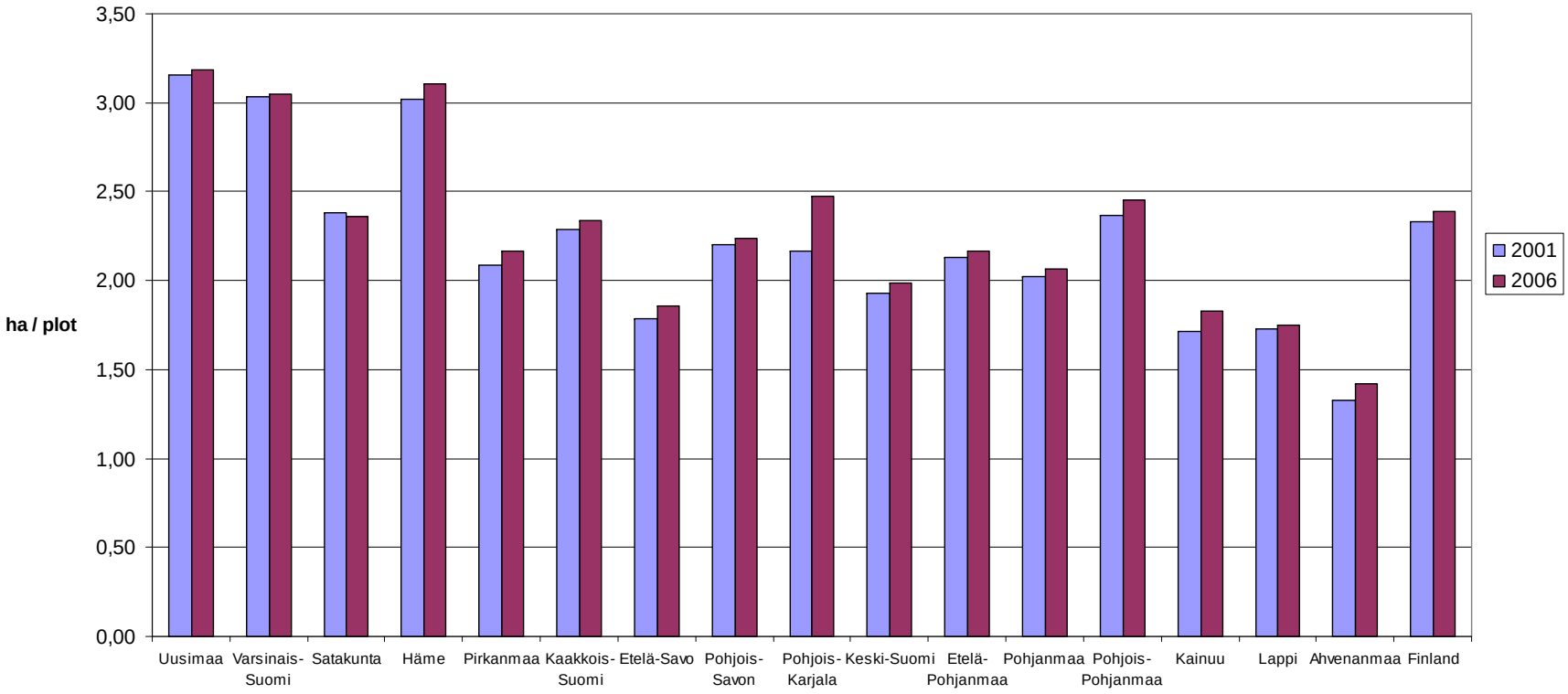
- **Introduction**
- **Problems related to base parcel structure**
- **Data and method**
- **Results**

Introduction

- From the farmer's perspective, drainage systems could be divided into two categories:
  - systems above the surface
  - subsurface systems
- Subsurface systems are preferred and subsidised because of the related advances on arable works.
- Negative effects caused by open ditch and resulting unfavourable parcel structure are well documented (Suomela 1950, Klemola et al. 2002)
- The subsurface drainage systems are one of the most efficient methods when the parcel size is increased.
- There exists no certain maximum parcel size to reach for
- It might be argued that there is no such a maximum parcel size. However, farmers do voluntarily split the large base parcels into smaller parcels. Risk aversion??

Introduction

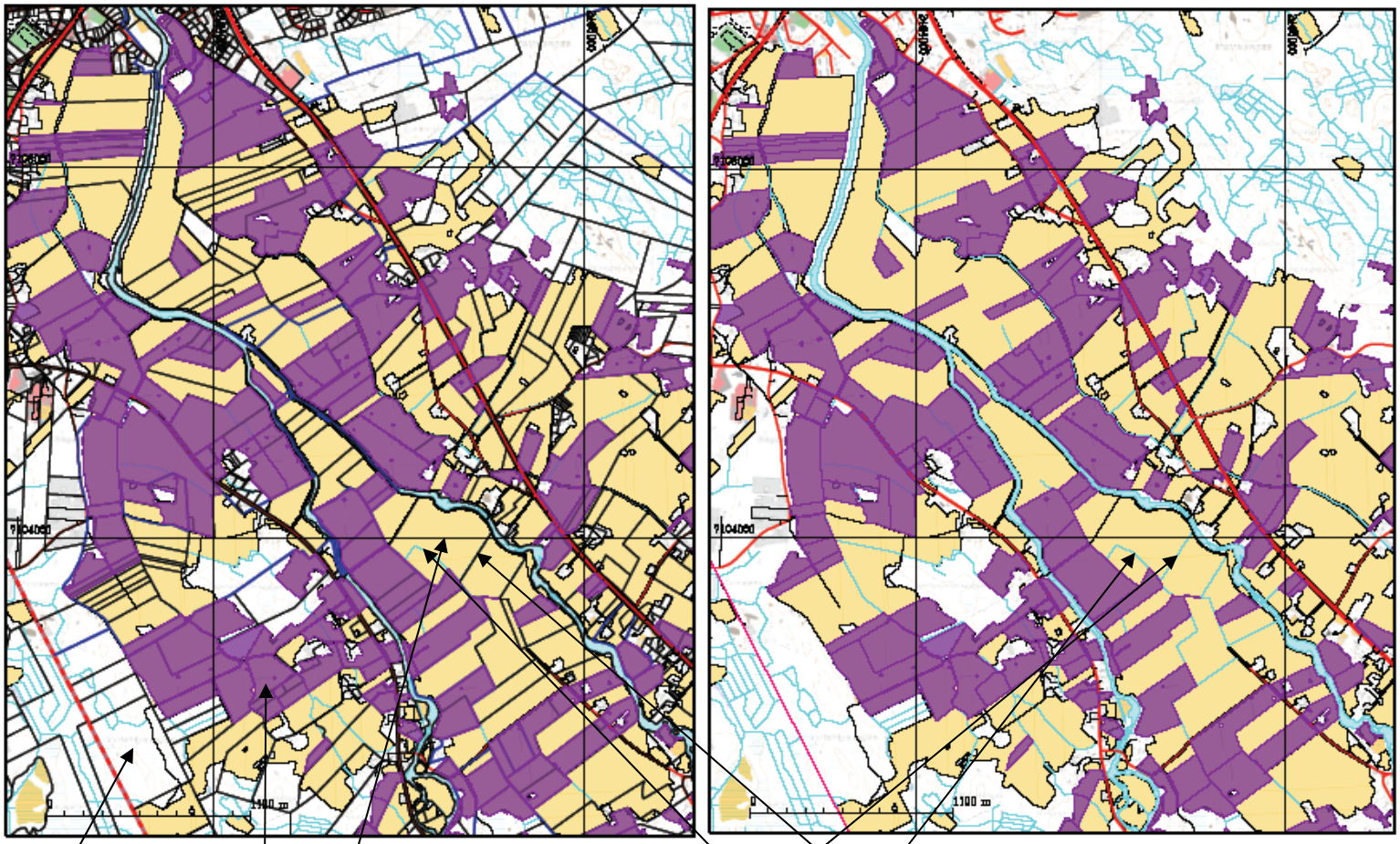
The base parcel size in Finnish counties



Introduction

with the property borders

and without them



Forest

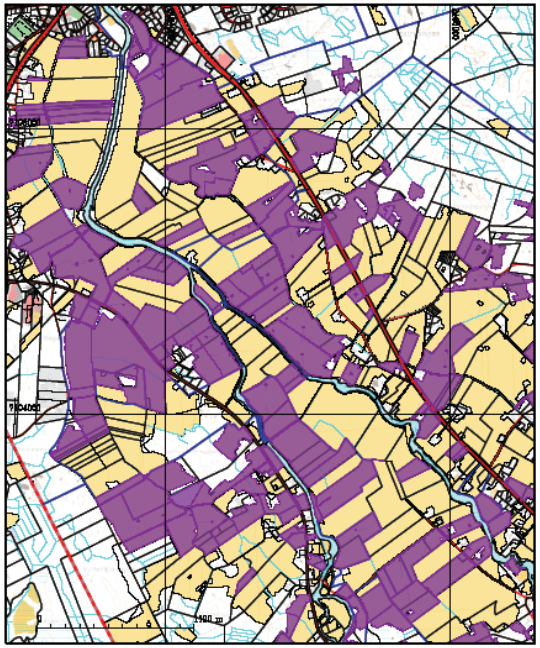
farmed by owner

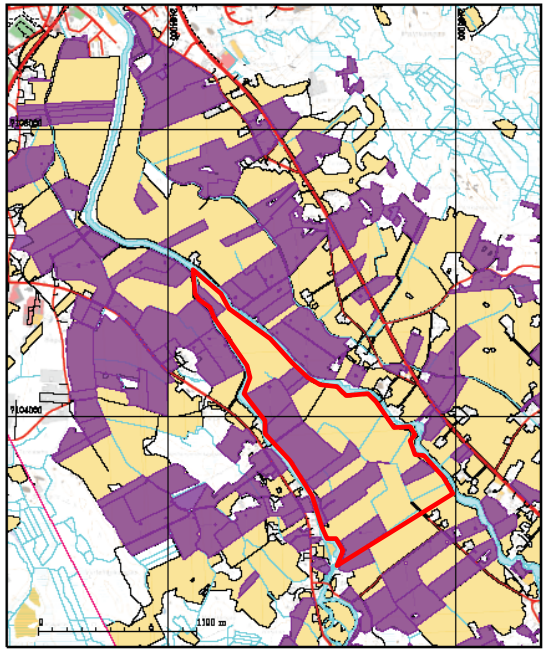
leased base parcels

Property border and waterway are the same

Property border and waterway are not the same

Problem





Larger field plots are needed to improve the agricultural productivity

Conditions for larger united field area are:

- **Co-operation between land owners**
- **Improvements in drainage systems**

Question:

How large base plots are needed for efficient farming?

Data

- **The plot size:**
  - **About 1,000 farmers and their economically driven decisions in splitting continuous base parcels between two or more crops are studied.**
  - **82,000 individual decisions.**

- **The reallocation of disorganised parcels:**
  - **A questionnaire was sent to 6,000 land owners**
  - **Is the reallocation of disorganised parcel structures needed?**
  - **Possible answers had a five steps Likert scale.**

Method

$$\pi(p_1,\ldots,p_N,w_1,\ldots,w_M,k_1,\ldots,k_S)=\max_x\left\{\sum_{i=1}^{I}p_i y_i-\sum_{j=1}^{J}w_j x_j : T(x,y,k),p>0,w>0\right\}$$

- where ***yi*** **is the output *i* and *xj* is the input *j* for *i*=1,2,…*I,* and *j*=1,2,… *J*.**
  The technology constraint *T(.)* gives mappings between outputs *y* and inputs *x* which are conditional on the amount of fixed inputs *Ks* , for *s*=1,2,…*S*.

- **The set of fixed inputs could be augmented by the parcel characteristics.**

- **The actual profits where not estimated BUT**
- **The probability that the farmer split a field into two or more agricultural parcels was modelled by logistic regression.**

The effect of land owner status to the land owner's opinion about land consolidation is studied by using the chi-square test.

Results

Most of the tested variables did not have any effect on splitting decision.

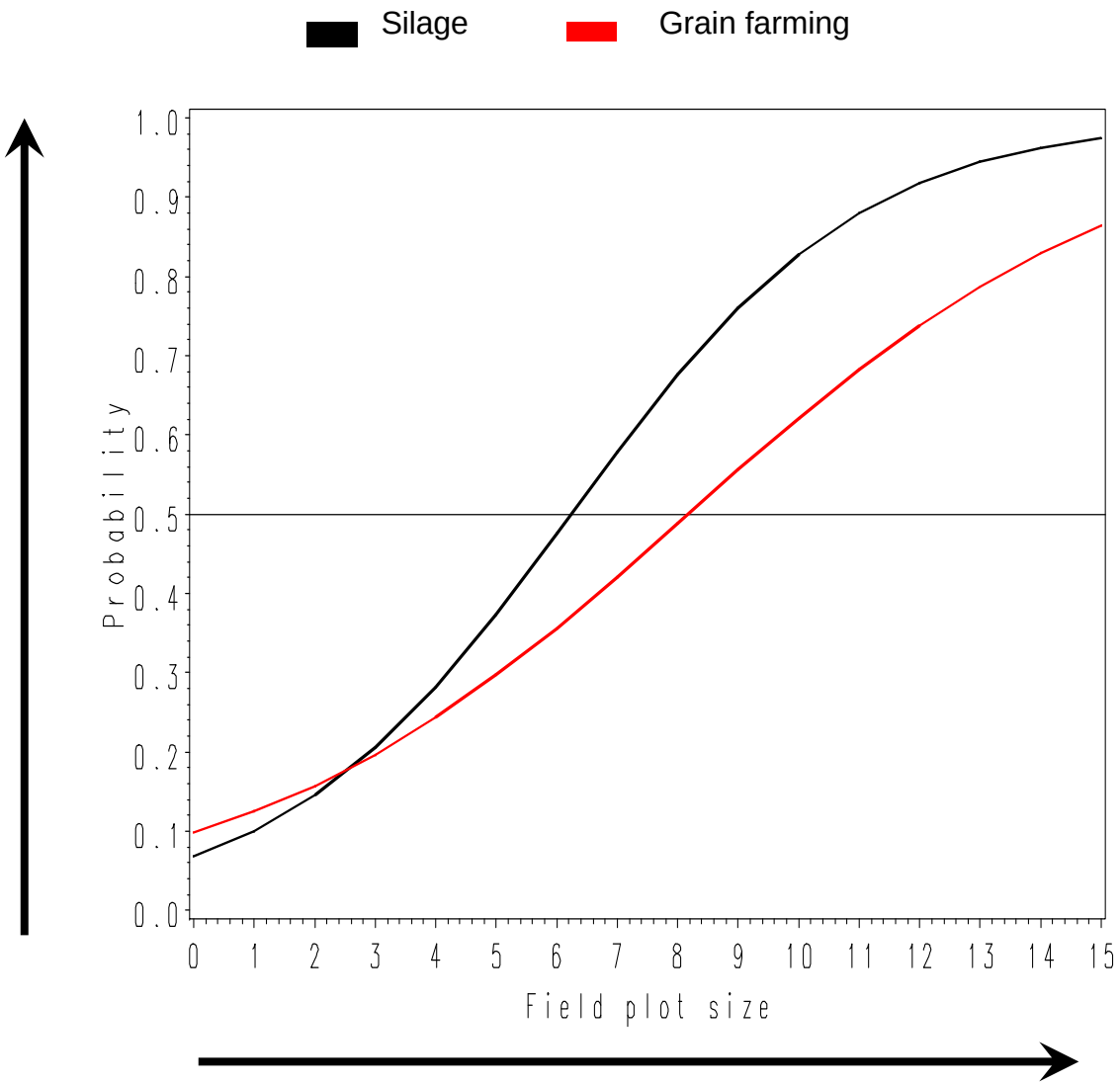
- **The farmer's status**
- **The distance from the compound**

Results

Some variables had a significant effect:

- **The farm size**
- **The production line**
- **The size of the base parcel**

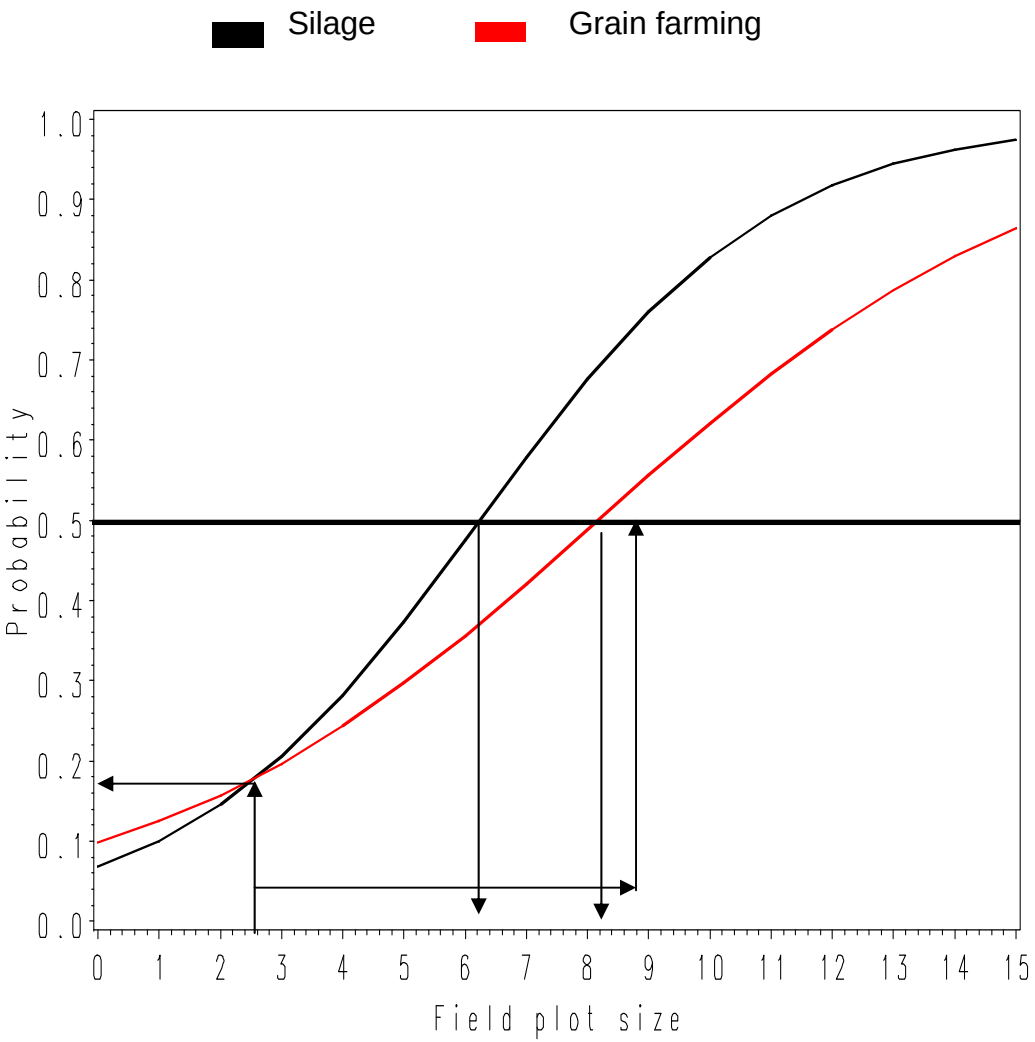
Results



The size of the base parcel

and farmer's choice (probability) to divide it into two or more agricultural parcels, i.e. for two or more crops are correlated.

Results



With the current field plot size the plots are "typically" farmed as one plot.

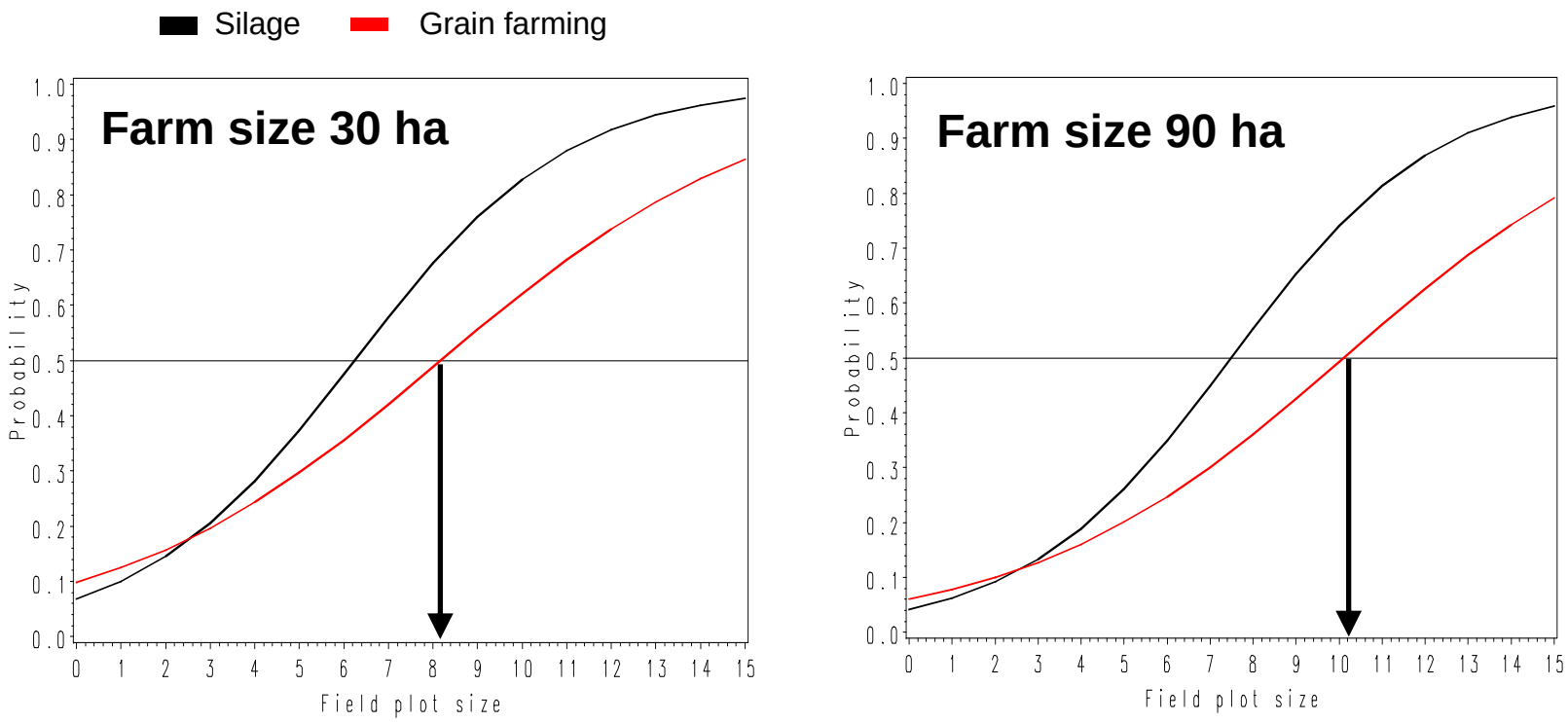
However, the probability to split increased, when the base plot size increased.

The targeted plot size under current technology is:

6 ha on silage farming

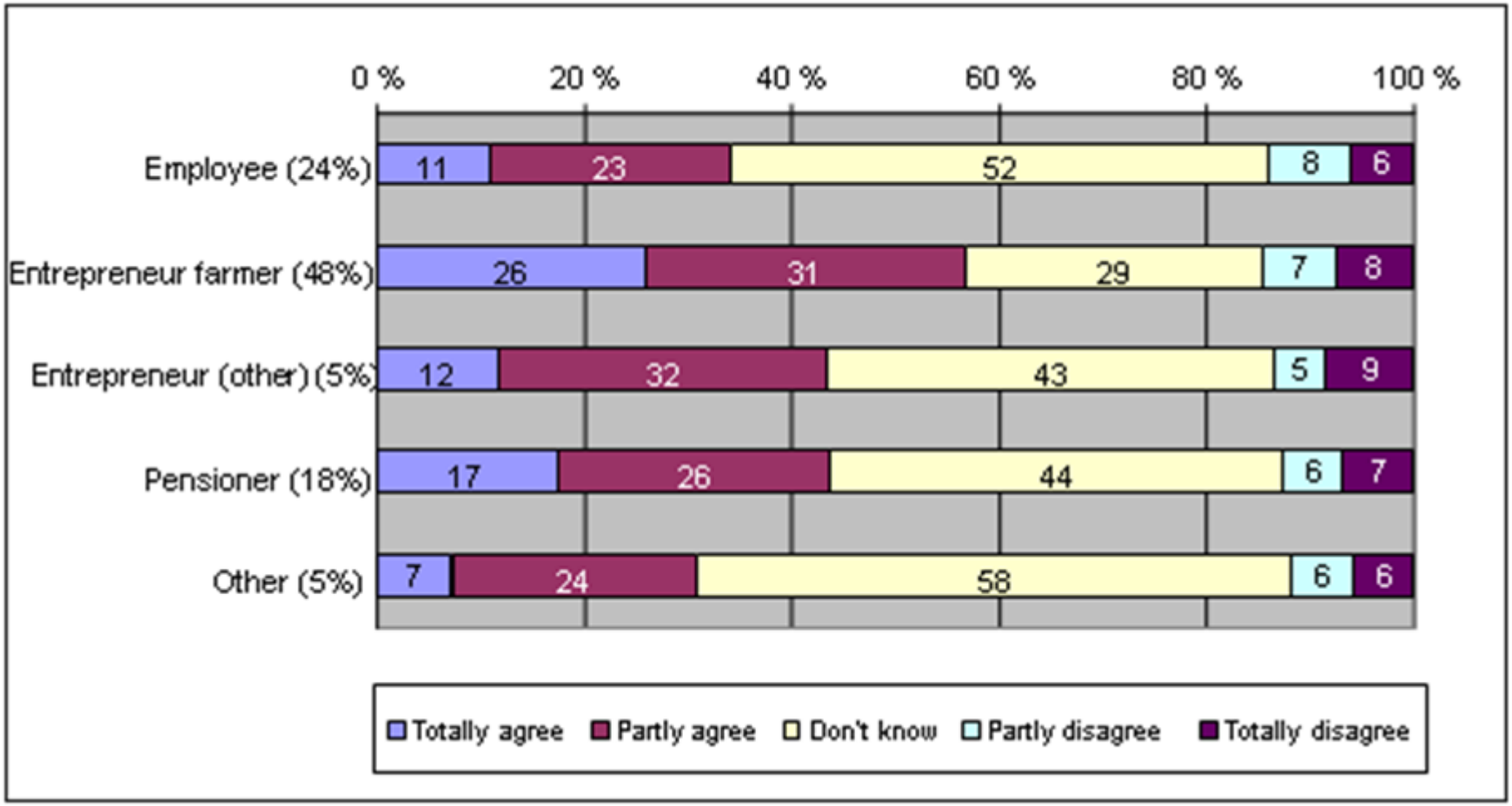
8 ha on grain farming

Results



Structural development increases the targeted plot size.

Results



The reallocation of disorganised parcel structures is needed?

Conclusion

The current base parcel size of 2.39 ha is far from the targeted plot size, which was found to be approximately from 6 to 8 ha.

Thank you for your attention.