SOLID | Sustainable Organic and Low Input Dairying

Economic perspectives in promoting low-input dairying in Finland

Heikki Lehtonen
Olli Niskanen
Economics and society
Natural Resources Institute Finland (Luke)

SEVENTH FRAMEWORK PROGRAMME

Outline

Promoting clover grasses and implications at the agricultural sector level in Finland

1. Introduction
2. Area of clover grass
3. Partial equilibrium economic sector model
4. Clover grass in economic model
5. Results
6. Conclusions and discussion

1. Introduction

- Promoting clover grasses and implications at the agricultural sector level in Finland
- Clover grasses address two of the objectives:
  - Decreased input use (N-fertilization)
  - Possibility for increased protein content of silage (home grown proteins)

2. Current area of clover grass

- How much clover is currently cultivated?
  - Organic silage production? → available
  - Green manure area? → available
  - Clover in conventional production? → not known

2. Current area of clover grass

- Two alternative approaches in order to estimate this area:
  1. Estimating field area cultivated with legume grasses from legume grass seed consumption with certain assumptions
  2. Approximation of clover share in silage by calcium concentration of silage samples

2. Current area of clover grass:
1. Seed consumption?

- Seed imports and domestic production of certified seeds are recorded by the Finnish Food Safety Authority (EVIRA)
- Different varieties for different purposes:
  - Pastures: white clover
  - Green manure: white sweet-, crimson-, persian clover
  - Silage: red clover, alsike clover, alfalfa…

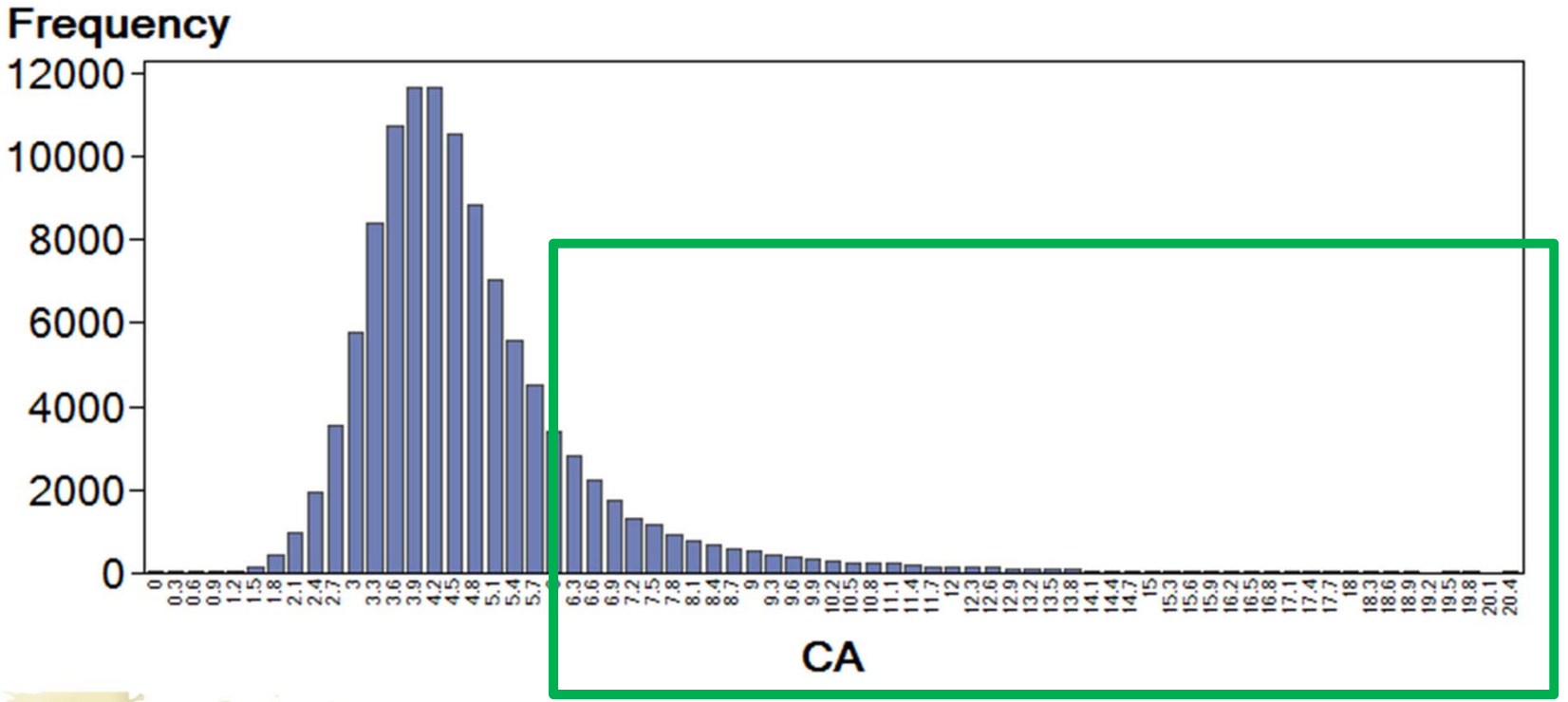
2. Current area of clover grass: 2. Calsium concentration

- Rinne et al. 2010 estimated that Ca-content gives a proxy of silage clover content
- We utilized the method to large data set of Finnish silage analysis
  - The grass silage data is based on farm samples analysed by Valio Ltd. and consists of over 100 000 samples

Rinne M., Nykänen A., Kemppainen, J. Nyholm L. & Nousiainen, J. 2010 Proportion of red clover in forage can be estimated based on calcium concentration. http://www.slu.se/PageFiles/24783/NFSC_Proceedings_100617.pdf

2. Current area of clover grass

- 11 % of the samples have Ca –content over 6,6 g/kg dm, which would equal >25 % clover content of the dry matter



2. Current area of grass cultivation

(1000 Hectares)	2008	2009	2010	2011	2012
Conventional grass silage	379	353	336	348	380
Conventional clover-grass silage	32	42	52	55	35
Organic clover-grass silage	35	43	46	48	49
Total clover-grass silage	67	85	98	103	84

2. Intensity

- In conventional (intensive) production manure nitrogen limits clover cultivation
- Organic farms have more extensive production in terms of livestock per hectare

2014	Hectares	LU	Ha/LU
Conventional production	644626	590401	1.09
Conventional animal with organic crop production	50241	43846	1.15
Organic animal and crop production	52822	37348	1.41

3. Partial equilibrium economic sector modelling

- Current situation is equilibrium: consumers and producers have found a utility maximising consumption and production levels
  - All changes to equilibrium need economic incentives or policy actions
  - Equilibrium is changed if prices or policies are changed
  - There are some lags in adjustments of production, exports, and imports
  - However they change consistently already in 1-3 years if price or policy shocks
  - Consumption is relatively inelastic to price changes
- Exogenous EU level prices affect domestic prices
  - Domestic prices of agricultural commodities follow EU prices, but are not identical
  - Significant differences between member states do realise: producer prices of milk
  - Input prices follow closely EU level prices

The role of economic modelling in this study

- The DREMFIA sector model*) has been validated to replicate the observed price and production development of the main agricultural commodities 1995-2013
- The model was used to evaluate to what extent clover grass cultivation could be promoted using support payment per ha, as well as reducing cost per ha, under different prices of agricultural products and inorganic nitrogen

*) A recent example in Lehtonen, H. 2013. Sector-level economic modeling as a tool in evaluating greenhouse gas mitigation options. Acta Agriculturae Scandinavica, Section A – Animal Science, Vol. 62, No. 4, 326-335. http://dx.doi.org/10.1080/09064702.2013.797011.

4. Clover grass in economic model

- Baseline 1: Business as usual
  - Milk price appr. 35 c/litre 2015-2020-2030
    - Not anymore 42-44 c /litre as 2011-2014
  - Other prices: past averages (averages from the last 5 years are close to OECD FAO Outlook prices 2015-)
- Baseline 2: High price scenario
  - 20% higher crop prices
  - 10% higher meat prices
  - 5% higher producer prices of milk 37 c/litre

4. Clover grass in economic model

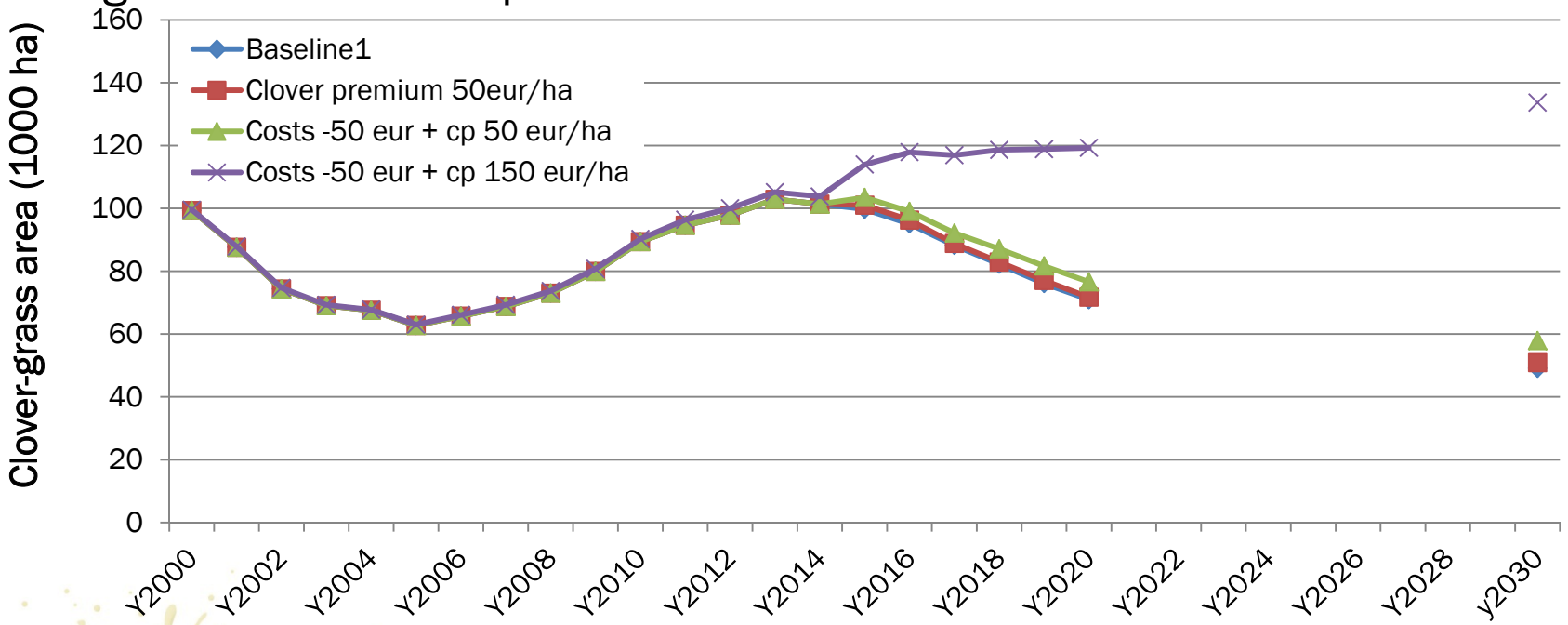
- Clover grass is assumed to be fed for **dairy cows** (no upper limit, but not during dry period), **fattening bulls** and **suckler cows**
- The cost level (labour and miscellaneous costs) of clover grass have been slightly modified to replicate the ”real” level of clover grass area and feeding use
- Real prices of feeds 2016-2030 from OECD-FAO Agricultural Outlook

4. Clover grass in economic model

- Clover grass in feeding imply an increase in feed intake per cow (Kuoppala et al. 2009; Dewhurst 2003) of 5-10%
- Slightly higher protein content than grass silage
  - Estimated 15 % higher (Luke Feed tables)
- Yield estimated to be 75 % from the yield of intensive grass silage yield - A conservative estimate based on 3-year rotation
    - Clover grass yields are clearly lower than the intensive hay grass yields at the first year (due to low N fertilisation)
    - There is little difference between clover grass and hay yields in the second year
    - Clover grass yields somewhat lower again at the 3rd year
- Cost of cultivation per ha 14 % lower than in intensive hay grasses
  - Less fertiliser and harvesting costs of clover grass
  - Higher cost per kg DM
  - Advantage is lower cost per hectare, which can be attractive only if area is not restricting and area based supports remain

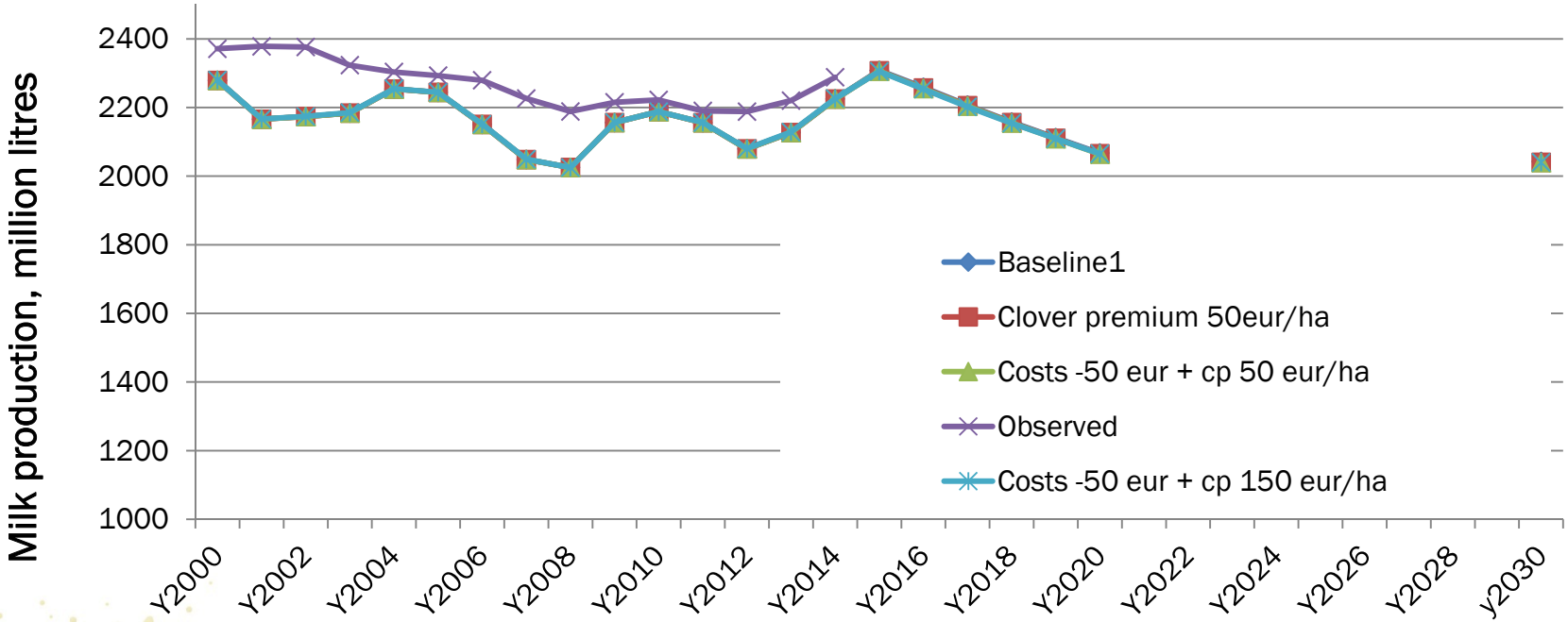
5. Results: Clover area with baseline1

- Low milk prices and conservative feed prices lead to decreasing clover grass area 2015-2030
- Only high clover premium with cost reductions would increase the clover grass area – small premiums and cost reductions have little effect



Milk production with baseline1

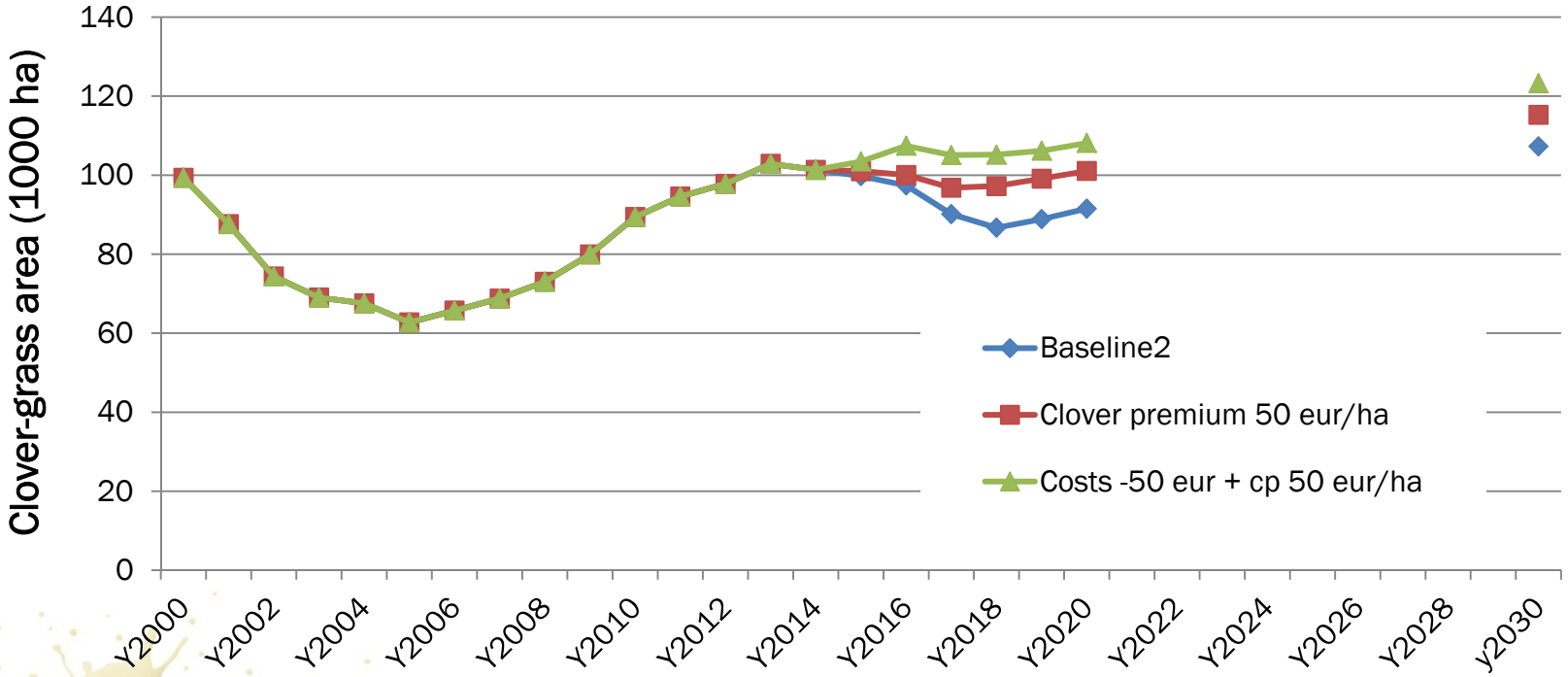
- Low milk prices cause decreasing milk production
- Small premiums or cost reductions have no effect



Addition of clover grass option to the model resulted in less milk production in early 2000 compared to the observed, but close to ”correct” production 2009-2015

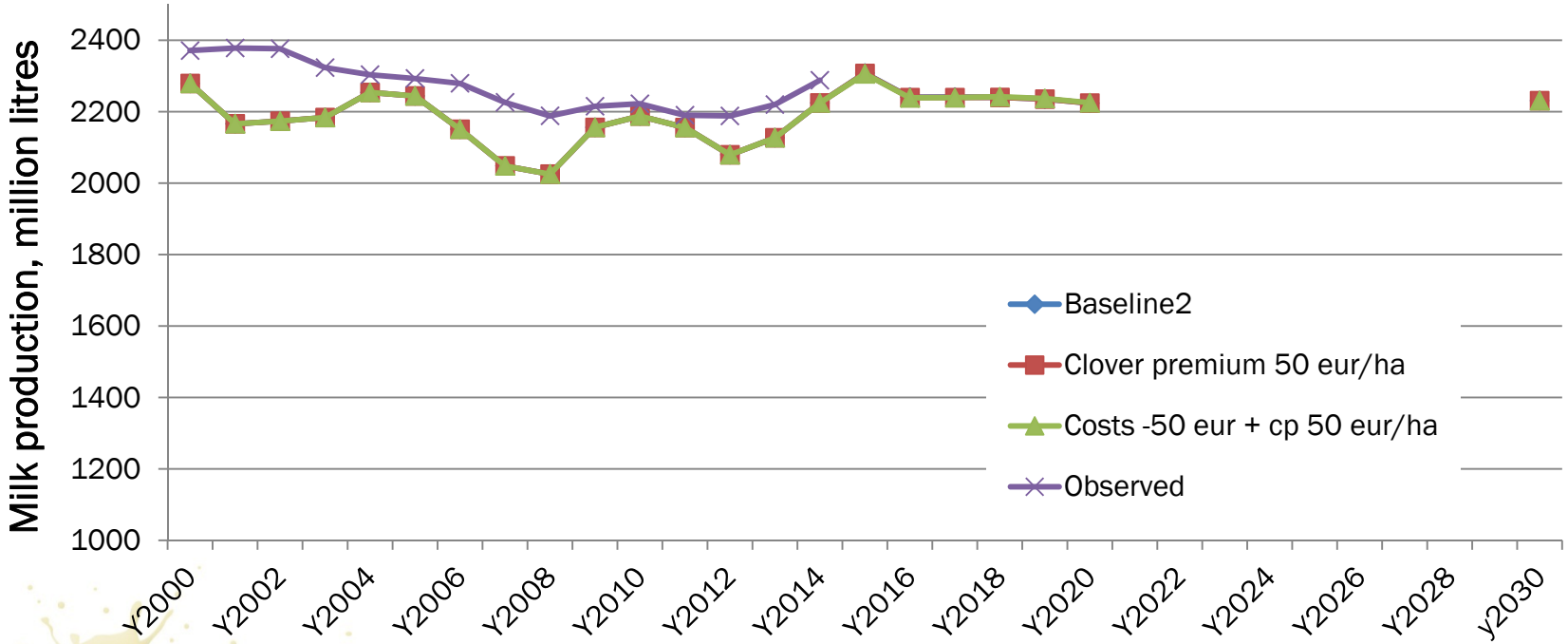
Clover area with baseline2

- Higher milk and feed prices increase clover cultivation – now small cost reductions and clover premium payments have some effect on the clover grass area



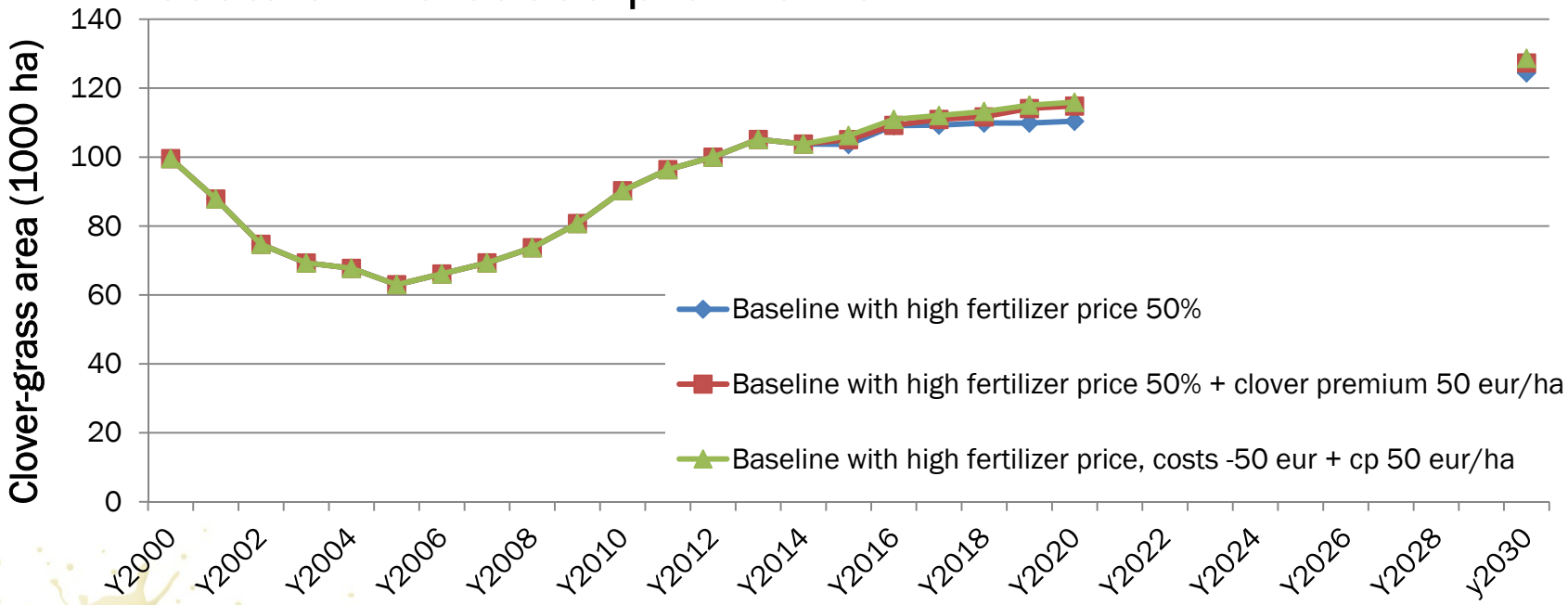
Milk production with baseline2

- Higher prices can maintain milk production
  - Milk prices and slightly improved productivity growth are sufficient to cover feed costs – stable milk production



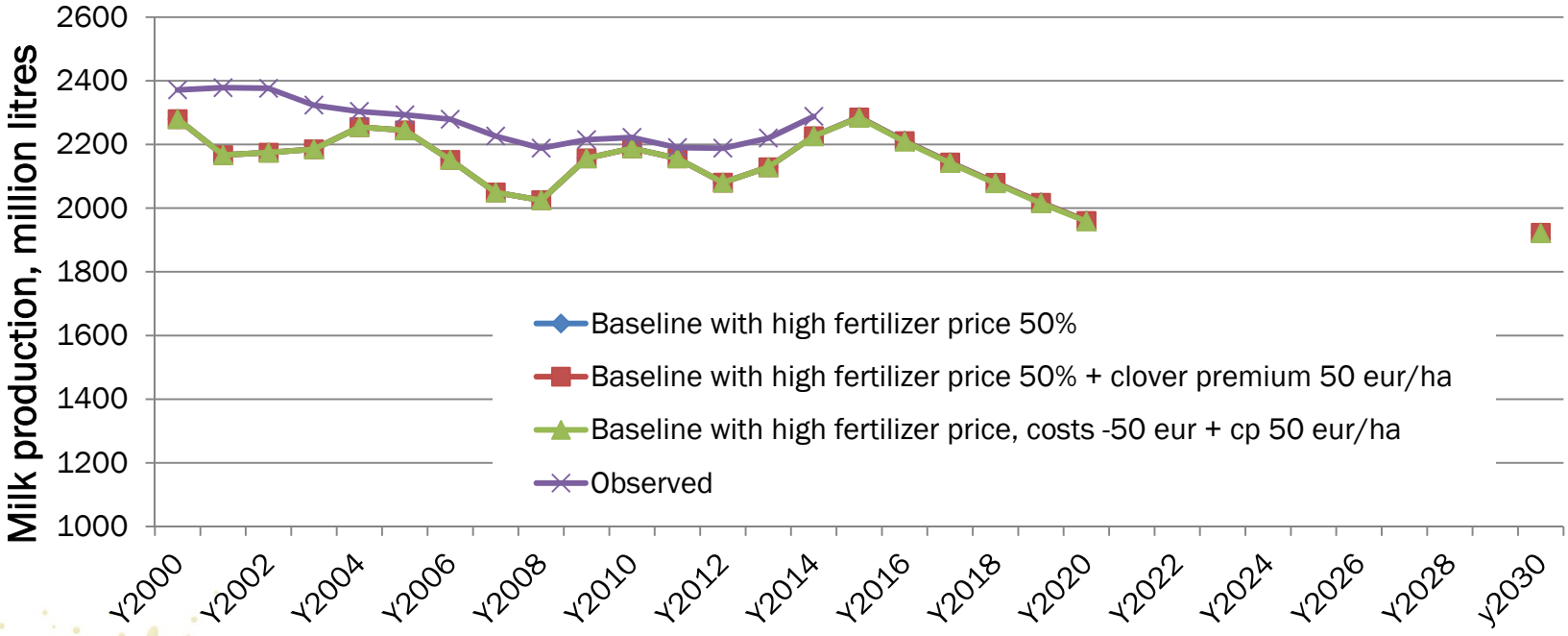
Baseline1 with 50% higher fertilizer prices

- Fertilizer price dominates
  - Effects on clover grass area much higher than reduced costs or increased premiums



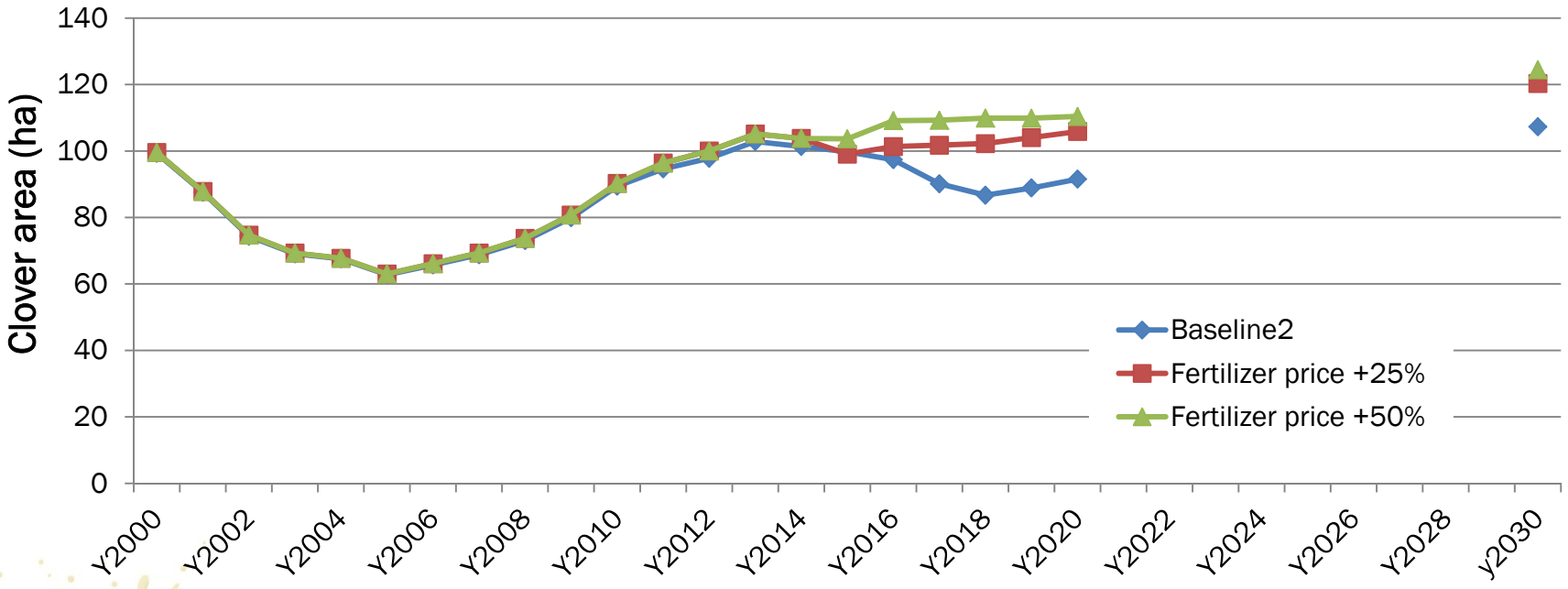
Baseline 1: Milk production with 50% higher fertilizer price

- Fertilizer price increase would be a significant challenge to dairy farms: overall production would decrease heavily



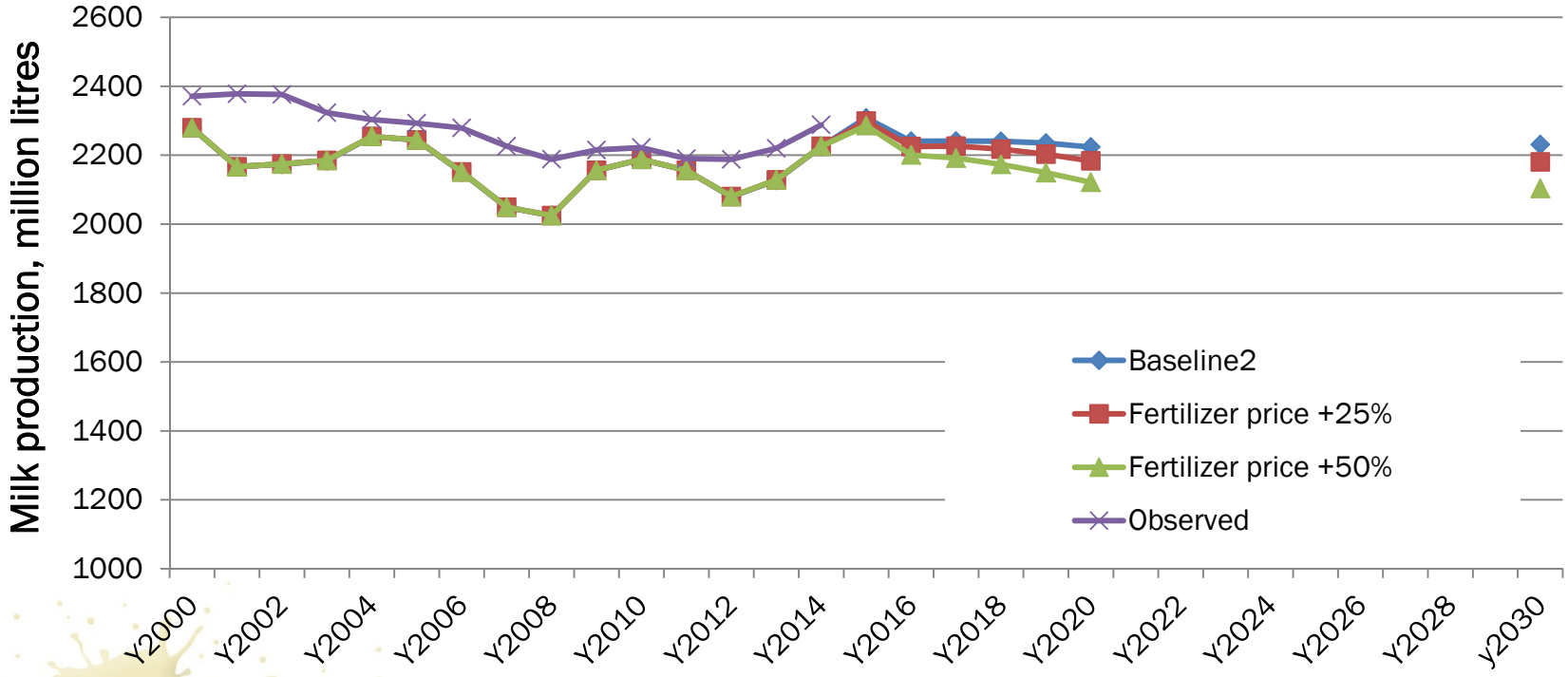
Baseline2 with 50% higher fertilizer prices

- High fertilizer price (or tax) would increase clover area from baseline 2 levels – with no clover premium or cost reductions



Baseline 2: Milk production with higher fertilizer prices

- High fertilizer prices reduce milk production, even with higher milk price



Take home messages

1. Small cost reductions in clover grass cultivation, or clover grass premiums, **may or may not** increase clover cultivation
   - Their effectiveness is <u>uncertain</u> and subject to prices
2. N tax is effective, but is not a suitable policy action in current financial situation of farms (a milk crisis in Finland 2015)
3. However, the results suggest that even 25% higher N price lead to significantly higher clover grass area – with no cost reductions or extra premiums!
   - What happens to energy prices and following nitrogen prices?
4. To increase clover cultivation, **price ratios** should be adjusted!
5. We have not yet analysed the possibility of increasing clover grass yield – **How much more clover grass yield could be attained at low costs?**
   - A topic for further discussion and analysis!

Thank you for attention!

olli.niskanen@luke.fi