

# 'Index-based costs of livestock production' (INCAP.I) in Austria – the 'suckler cow and beef calf production' activity

**K. Heinschink<sup>1</sup>, F. Sinabell<sup>2</sup> and C. Tribl<sup>1</sup>**

<sup>1</sup> Federal Institute of Agricultural Economics, Marxergasse 2, 1030 Vienna, Austria

<sup>2</sup> Austrian Institute of Economic Research, Arsenal Object 20, 1030 Vienna, Austria

Results of a study supported by:

the Austrian Climate and Energy Fund of the Austrian Federal Government,  
Contract B368569 of ACRP 6 ADAPT-CATMILK KR13AC6K11112

and the Austrian Federal Ministry of Agriculture and Forestry, Environment and Water Management (BMLFUW),  
Project 101114 – FACCE Knowledge Hub MACSUR 2



**International Livestock Modelling Conference (LiveM)**  
Potsdam, Germany, 15-16 June 2016

The Climate and Energy Fund of the Austrian  
Federal Government

bm 



# Contents of presentation

---

- **Introduction to the Index-based Costs of Agricultural Production (INCAP)**
- **Example: 'Suckler cow and beef calf production' activity**
- **Summary and discussion**

---

# Introduction to INCAP ,Index-based Costs of Agricultural Production‘

# Introduction to INCAP (1): Motivation for developing INCAP

## ■ Understanding the impact of climate change:

- on society 

- at the farm level in specific regions and production systems 

## ■ Objectives:

- Gain better insight into the costs of climate change arising to farmers
- Develop a data set suitable for
  - modelling
  - communicating the effects of climate change at the micro-economic level

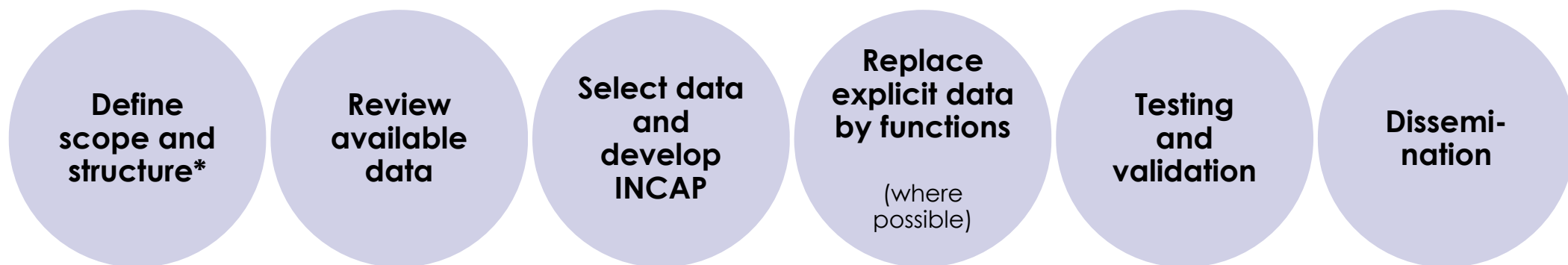
## Introduction to INCAP (2): Scope and tasks involved

### ■ Scope of INCAP:

a multi-purpose cost data set accounting for ...

- all important plant and livestock production activities in Austria
- specific attributes of each activity
- an extended period (from the past into the future)

### ■ Tasks involved:



\* activities, gross margin components, attributes, time, area

## Introduction to INCAP (3): The concept of gross margins

### ■ Concept:

- Revenue – variable costs = gross margin
- Gross margin: amount available for covering fixed costs + income

### ■ Advantages:

- common usage
- farm records
- benchmarking possible
- no/little distortion through fixed costs

### ■ Disadvantages:

- depending on the purpose (analyse the past, plan for the future ...)
- no uniform concept regarding the considered cost items
- detailed data required
- understanding of the underlying system required to allow benchmarking

# Introduction to INCAP (4): Primary data source used: 'Internet Gross Margins'

Startseite Hilfe Sitemap English Login Kontakt

MINISTERIUM FÜR EIN LEBENSWEERTES ÖSTERREICH  
BUNDESANSTALT FÜR AGRARWIRTSCHAFT

Startseite > DATEN UND FAKTEN > IDB Deckungsbeiträge

## IDB Deckungsbeiträge und Kalkulationsdaten

Rechenprogramm, Kalkulationsdaten und Hintergrundinfo zur Kalkulation der Wirtschaftlichkeit landwirtschaftlicher Produktionsverfahren.

Die Anwendung Internet-Deckungsbeiträge ist durch Kooperation mit der [Lfl Bayern](#) entstanden und wird schrittweise erweitert.

**Zu beachten: Bei Arbeitspausen über einer Stunde gehen die bisher gespeicherten Daten verloren!**

Sollten Sie Unstimmigkeiten oder Fehler entdecken, sind wir für Hinweise dankbar. Ansprechpartner ist Ing. Dipl.-Päd. Siegbert Linder (E-Mail: [idb@awi.bmlfuw.gv.at](mailto:idb@awi.bmlfuw.gv.at), Tel.: 01 8773651-7496).

### Marktfruchtbau konventionell

<b>Getreide</b>	<b>Eiweißfrüchte</b>
Winterweizen	Futtererbsen
Sommerweizen	Ackerbohnen
Durum	Sojabohnen
Wintergerste	
Sommergerste	<b>Hackfrüchte</b>
Triticale	Zuckerrüben
Populationsroggen	Speisekartoffeln
Hybridroggen	Stärkekartoffeln
Hafer	
Körnermais	
<b>Ölsaaten</b>	<b>Zwischenfrucht/ Stilllegung</b>
Wintererbsen	Zwischenfruchtbau
Hybridrapen	Brache
Sonnenblumen	

### Tierhaltung konventionell

<b>Rinderhaltung</b>	<b>Schweinehaltung</b>
Milchkuhhaltung	Ferkelerzeugung
Kalbinnenaufzucht	Schweinemast
Stiermast	
Mutterkuh Einstellerproduktion	

### Futterbau/Substraterzeugung konventionell

**Ackerfutterbau**

- Silomais
- Maiskornsilage

**Grünland**

- Grassilage
- Grassilage Hangneigung 25-35%
- Grassilage Hangneigung 35-50%
- Bodenheu
- Bodenheu Hangneigung 25-35%
- Bodenheu Hangneigung 35-50%
- Bodenheu Hangneigung größer 50%

### Marktfruchtbau biologisch

<b>Getreide</b>	<b>Eiweißfrüchte</b>
-----------------	----------------------

### Tierhaltung biologisch

**Rinderhaltung**

## Livestock activities – available:

- Dairy cow and milk production
- Heifer rearing
- Bull fattening
- Suckler cow and beef calf production
- Piglet production
- Pig fattening

## Livestock activities – under development:

- Sheep
- etc.

## Livestock-related activities – available:

- Maize silage
- Grass silage
- Hay

Link to Internet Gross Margins application  
(publicly accessible):

<http://www.awi.bmlfuw.gv.at/idb/default.html>

## Introduction to INCAP (5): Scope and structure

### INCAP

INCAP consists of  
2 activity groups.

#### Plant production activities

(INCAP.p)

#### Livestock activities

(INCAP.l)

←  
Activity groups

Cereals, oilseeds, protein crops, root crops, catch crops, fallow land, silage, hay, vegetables, fruit, wine

Dairy cow and milk prod., heifer rearing, bull fattening, suckler cow +beef calf prod., piglet production, pig fattening

←  
Activity types



# Introduction to INCAP (6): Scope and structure

## Activity

Gross margin components	Attributes	Time	Area
Revenue (e.g. milk, meat)  Variable costs (e.g. replacement, reproduction, feed, health)	Attribute types (e.g. farming system, replacem. type, reproduction type, feed)	Past/Present Future	Austria Provinces Communities
Capture heterogenous management systems	Capture heterogenous management systems	Capture development over time	Allow spatially-explicit analyses

Each activity has at least 3 dimensions.

←  
Dimensions

←  
Differentiation within the dimensions

←  
Purpose

**Example:**  
**„Suckler cow and beef calf production‘ activity**



Fleckvieh suckler cow and calf  
(Source: [Humer \(2014\): Diplomarbeit](#)  
[Kälbersterblichkeit](#), LFZ Raumberg-Gumpenstein)

## Suckler cow activity (1): Activity-attribute-combinations

Activity	<b>'Suckler cow and beef calf production'</b>	
Attribute groups: attribute types	Farming system:	conventional, organic
	Heifer replacement:	reared, bought-in
	Reproduction type:	artificial insemination (AI), bull
	Calf type:	fattening, slaughter
	Forage type:	silage+pasture, hay+pasture, silage+hay+pasture
	Slope:	0-25%, 25-35%, 35-50%
→ large number of activity-attribute combinations	144 <b>unique combinations</b> in a single period  ( <b>and more</b> if further dimensions and/or attributes are added)	

## Suckler cow activity (2): Gross margin calculation scheme

	Component	Remarks
<b>Revenue</b>	Calves Cow Dung and manure	Complementary products
<b>Variable costs</b>	Heifer replacement Concentrate, minerals Forage Health, hygiene Reproduction Litter Water, energy Machinery Other	excluding: <ul style="list-style-type: none"><li>▪ CAP payments</li><li>▪ taxes</li></ul> including: <ul style="list-style-type: none"><li>▪ cow</li><li>▪ calves</li><li>▪ proportion of heifer, if applicable</li><li>▪ proportion of bull, if applicable</li><li>▪ losses (cow, calves, heifers)</li></ul>
<b>Gross margin</b>		<b>in EUR/cow/year</b>

## Suckler cow activity (3): Selected basic information

<b>Reference period</b>	national average of 5 years (2010-2014)	
<b>Calves produced</b>	0.90 calves (393 days calving interval , 2.5% twin births, 5.0% losses)	
<b>Weaning</b>	at 7 months	
<b>Calves sold</b>	if heifers reared: 0.73 calves (0.45 male, 0.28 female)	if heifers bought in: 0.90 calv. (0.45 male, 0.45 female)
<b>Calf weight, fattening</b>	male: 290 kg, female: 270 kg live weight	
<b>Calf weight, slaughter</b>	male: 250 kg, female: 220 kg slaughter weight	
<b>Cow weight, slaughter</b>	319 kg slaughter weight	
<b>Cow replacement rate</b>	if calves sold for fattening: 16.8% ( $\approx$ 5.9 years)	if calves sold for slaughter: 15.9% ( $\approx$ 6.3 years)
<b>Reference period</b>	national average of 5 years (2010-2014)	

# Suckler cow activity (4):

**Revenue** 144 combinations in the reference period (avg. 2014-2014)

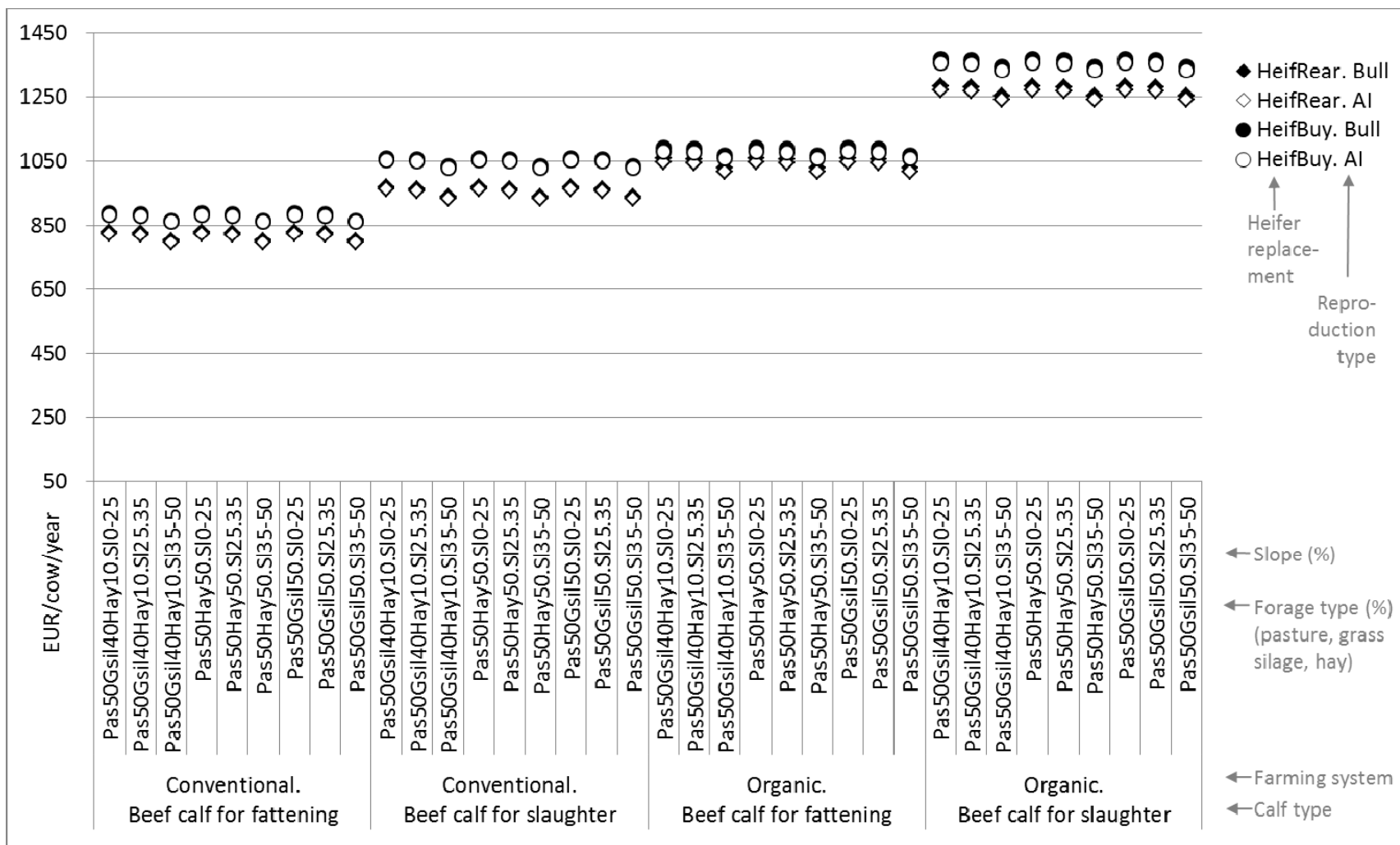
## Revenues

- for 144 suckler cow activity-attribute combinations,
- in Austria,
- in a single period (avg. 2010-2014),
- excl. tax and CAP payments,
- EUR/cow/year

Source: Own figure, 2016

## 3 forage mixes:

- Pasture + Grass silage + Hay (50:40:10)
- Pasture+Hay (50:50)
- Pasture+Grass silage (50:50)



# Suckler cow activity (5):

## Forage costs for 144 combinations in the reference period (avg. 2014-2014)

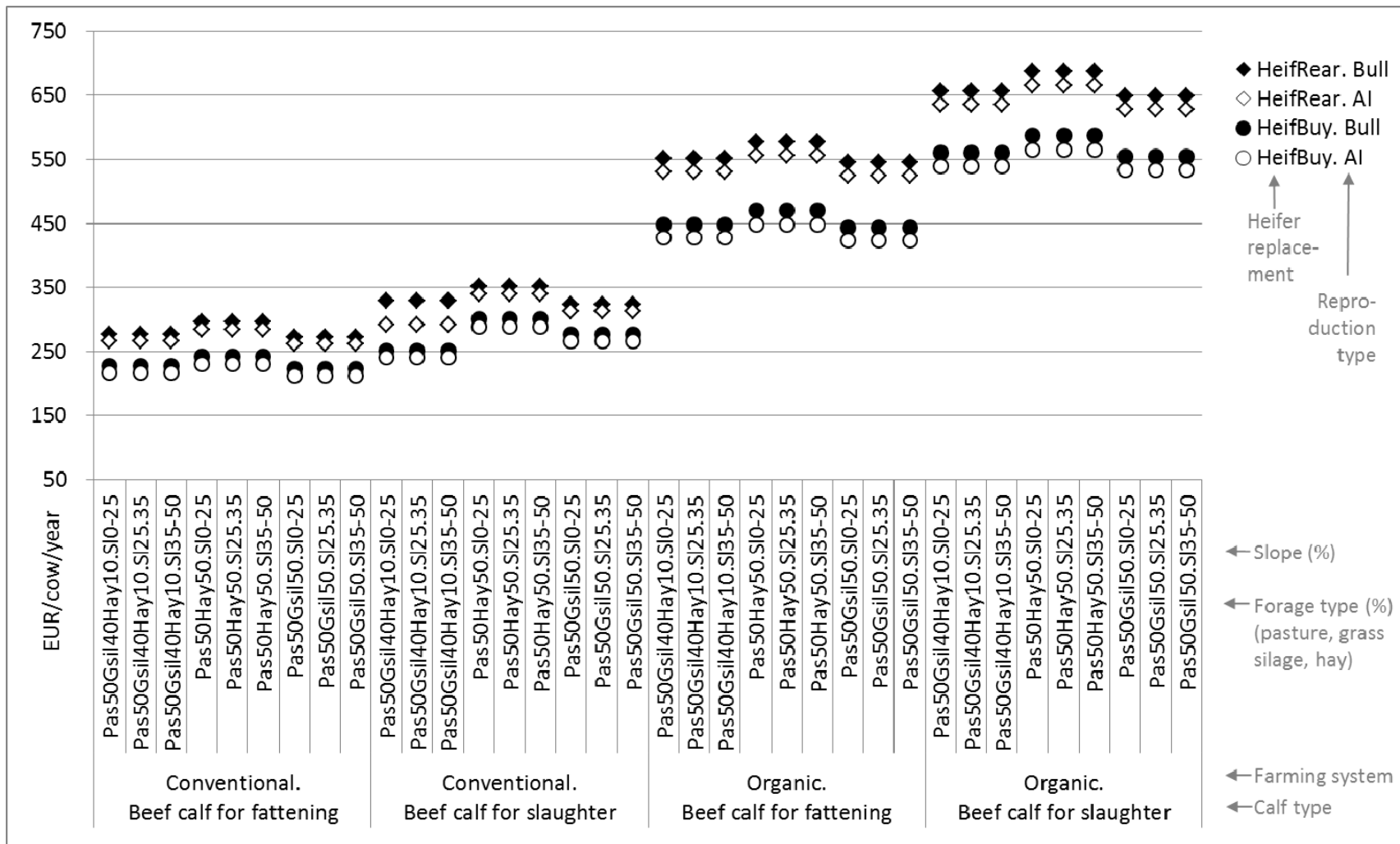
### Forage costs

- for 144 suckler cow activity-attribute combinations,
- in Austria,
- in a single period (avg. 2010-2014),
- excl. tax and CAP payments,
- EUR/cow/year

Source: Own figure, 2016

### 3 forage mixes:

- Pasture + Grass silage + Hay (50:40:10)
- Pasture+Hay (50:50)
- Pasture+Grass silage (50:50)





# Suckler cow activity (6):

## Gross margins for 144 combinations in reference period (avg. 2014-2014)

### Gross margins

- for 144 suckler cow activity-attribute combinations,
- in Austria,
- in a single period (avg. 2010-2014),
- excl. tax and CAP payments,
- EUR/cow/year

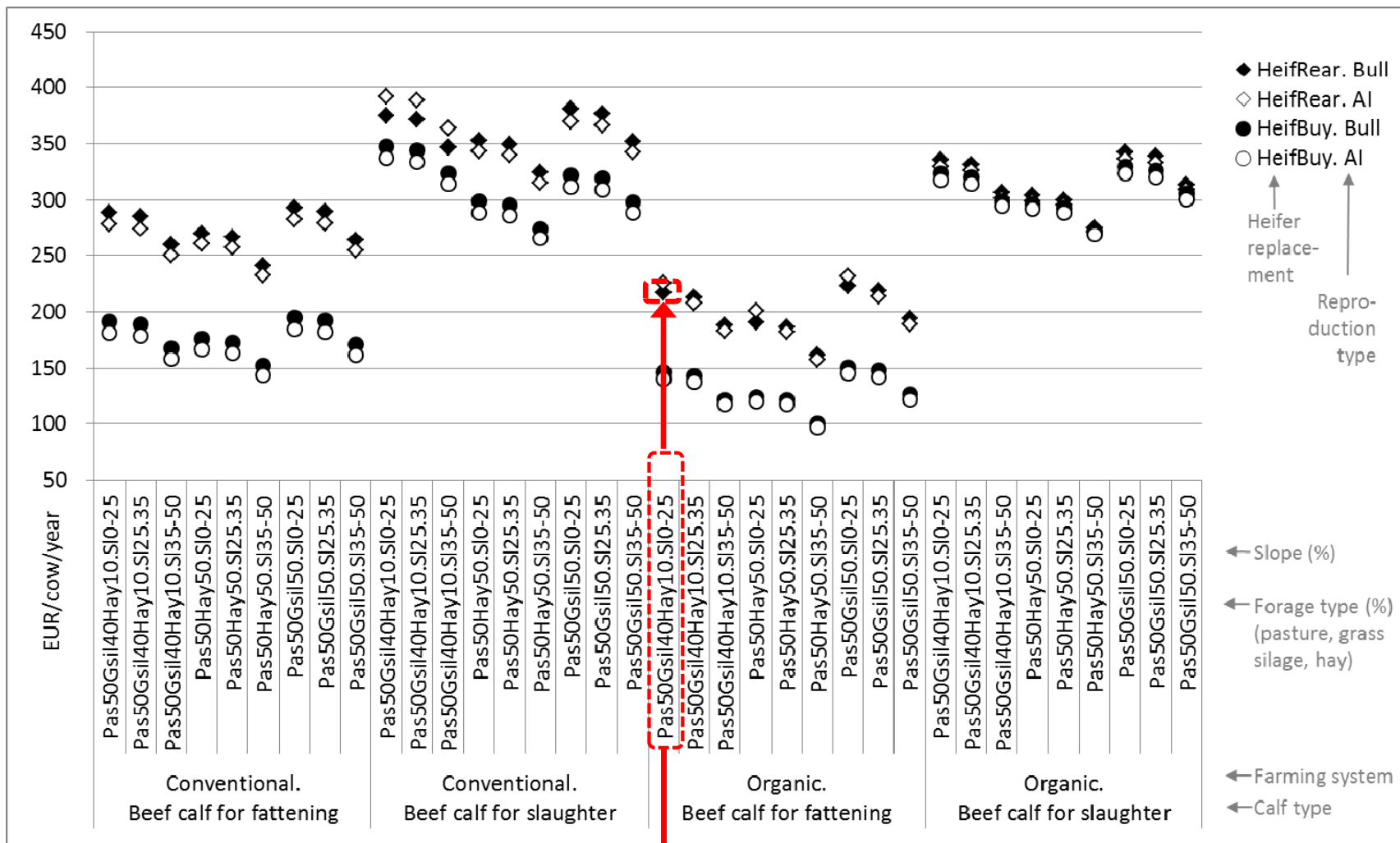
Source: Own figure, 2016

### Payment for organic farming:

EUR 225/ha  
grassland

Source: AMA Merkblatt  
ÖPUL 2015, 25.03.2015

In this example:  
ca. 1ha/cow



See next slide: time series for 1 specific activity-attribute combination



## Suckler cow activity (7): Changing parameters

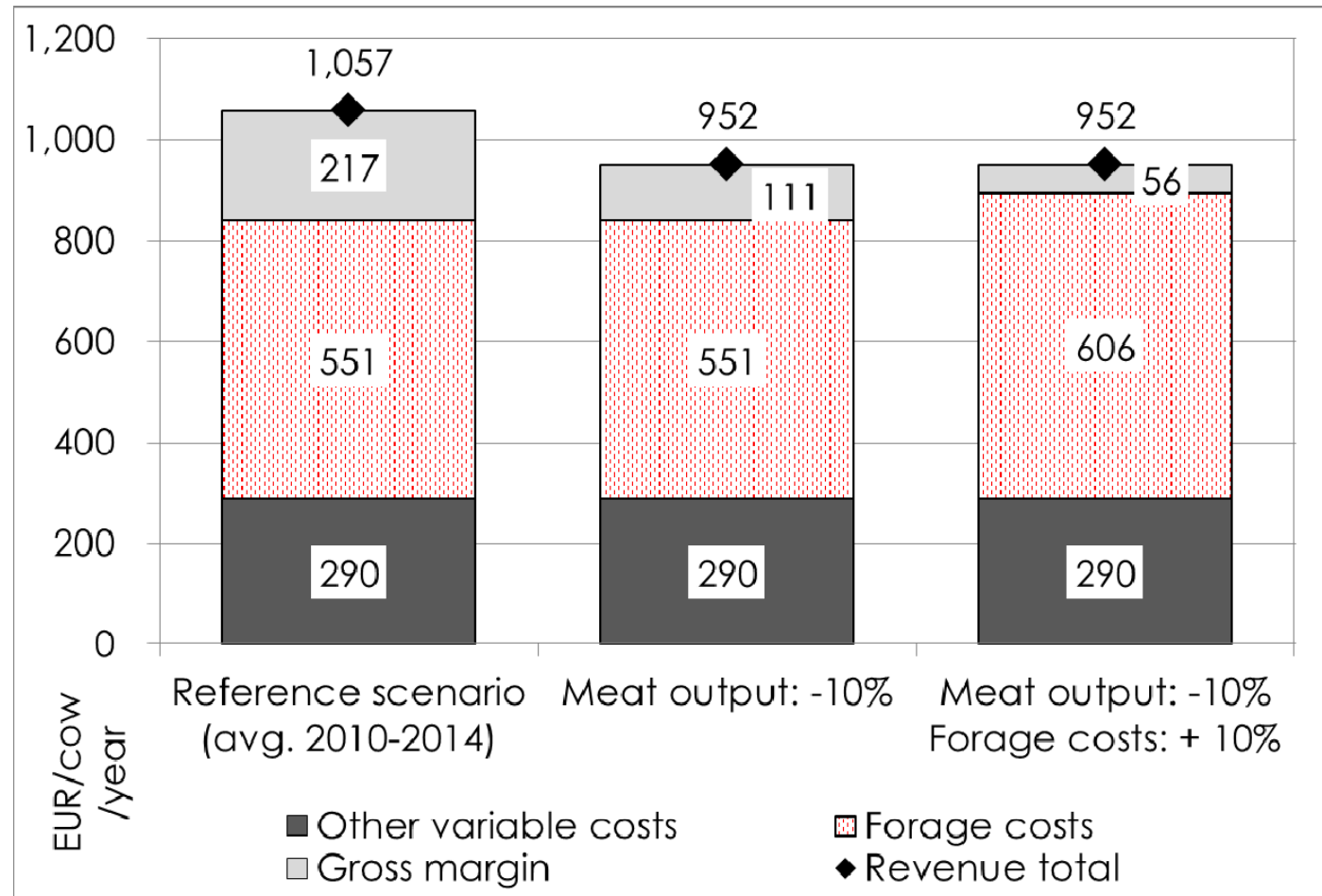
**Activity:**

Suckler cow and beef calf production

**Attributes:**

- farming system: organic
- calf type: for fattening
- heifer replacem.: heifer rearing
- reproduction: bull
- forage type: pasture+grass silage+hay (50:40:10)
- slope: 0-25%
- excluded: CAP payments, tax
- Euro/cow/year

Source: Own figure, 2016



**Suckler cow activity (8):**  
**Time series** for 1 combination in the reference period (avg. 2014-2014)

---

*Indices used are preliminary!*

---

## Summary and discussion

---

## Backup slides

# Example:

## Selected basic data in suckler cow activity

Kennwerte des Produktionsverfahrens

**Hinweis: Die Einheit "Kuh" beinhaltet die Mutterkuh mit den Einstellern und ggf. den anteiligen Deckstier und/oder die anteilige Nachzuchtalbin. Das Ausmästen nach dem Absetzen muss im DB-Stiermast bzw. DB-Kalbinnenmast <sup>?</sup> berechnet werden.**

Umfang der Berechnung: Mutterkuhhaltung  mit Nachzucht  ohne Nachzucht

Gesamt-AKh/Kuh u. Jahr: <sup>?</sup> 25.0

**Kuh**

Gewicht der Mutterkuh: <sup>?</sup> 650.0 kg Zwischenkalbezeit 393 Tage

durchschnittliche Nutzungsdauer der Mutterkühe: 6.0 Laktationen

Bestandsergänzungsquote: <sup>?</sup> 16.8 %

Art der Besamung:  künstliche Besamung  Natursprung

Verhältnis Deckstier zu Mutterkühen: 1 zu 20.0

**Nachzuchtalbin**

Erstkalbealter: 30.0 Monate Verlustquote: 2.0

Zahl der Nachzuchtalbinen: <sup>?</sup> 0.17 je Kuh und Jahr

**Kalb/Einsteller**

Geschlechterverhältnis Kälber: 50.0 % männlich, 50.0 % weiblich

Anteil Zwillingsgeburten: <sup>?</sup> 2.5 % Kälberverlustquote: <sup>?</sup> 5.0

Einsteller/Jungrinder je Kuh und Jahr: erzeugt: 0.9 <sup>?</sup> verkauft: 0.73 <sup>?</sup>

Vermarktung der verkauften Einsteller/Jungrinder: <sup>?</sup>

**Einsteller** Absetzalter: <sup>?</sup> 7.0 Monate

männlich: 100.0 % Einsteller, Ø-Gewicht: 290.0 kg LG

weiblich: 100.0 % Einsteller, Ø-Gewicht: 270.0 kg LG

**Jungrindfleisch** Absetzalter: <sup>?</sup> 11.0 Monate

männlich: 0.0 % Jungrinder, Ø-Gewicht: 250.0 kg SG 60.0 % Schlachtausbeute

weiblich: 0.0 % Jungrinder, Ø-Gewicht: 220.0 kg SG 58.0 % Schlachtausbeute

Gewichtetes Absetzalter: 7.0 Monate

Geburtsgewicht: 40.0 kg

# Dissemination

## How to work with INCAP?

Source: Own figure, 2016

## How to make INCAP available to the public?

- User interface
- Data protection/anonymity
- etc.

### Step 1: Spread-sheet

- Compile and update data
- Specify scenarios and assumptions
- Define model
- Check model file for accuracy and completeness (automated)
- Export model input file as a text file (automated)

### Step 2: GAMS

- Import model input file
- Run model
- Generate results file as a text file (automated)

### Step 3: Spread-sheet

- Import results
- Check imported file for accuracy and completeness (automated)
- Analyse results
- Revise data, scenarios and assumptions
- ...

## Difficulties encountered

- **Few suitable (published) sources available**
- **Data issues:**
  - missing data (e.g. no reliable producer prices for organic crops, no Austria-specific data)
  - data quality (e.g. methodical changes such as change in time series)
- **High level of aggregation in most sources**
  - e.g. regarding production conditions, management variants, areas
- **Differing approaches/breakdown of costs**
  - e.g. variable machinery costs in the Internet Gross Margins (= principal source used for INCAP)
- **Technical issues**

# Validation: Aspects and approach

- **Aspects to be validated:**
  - Activities considered
  - Gross margin components considered and numeric level of costs
  - Attributes considered and numeric level of costs
  - Cost development over time
  - Consider differentiation by area?
  
- **Approach:**
  - Observed data
  - Farm records
  - Functions
  - Planning data
  - Expert opinion
  - Other?



# Scope and structure (2)

## Activity

Each activity has at least 3 dimensions.

**Cost items**

**Attributes**

**Time**

**Area**

←  
**Dimensions**

Seeds/prop. material  
Fertiliser  
Plant protection  
Machinery  
Cleaning  
Drying  
Storage  
Insurance

Attribute types:  
Field size  
Slope  
Farming system  
Tillage system  
Labour type  
Climate type  
Plant prot. intens.

Past/Present  
Future

Austria  
Provinces  
Communities

←  
**Examples**  
for differentiation in the plant prod. data set's (INCAP.p) dimensions

Capture heterogenous production conditions

Capture heterogenous production conditions

Capture development over time

Allow spatially-explicit analyses

←  
**Purpose**

## Scope and structure (3)

*Note the high degree of differentiation.*

**Example:**

### **Combining activities**

*30 plant production activities*

**with some of the attribute groups [no. of attributes] mentioned above:**

field size [2],  
farming system [2],  
tillage system [2],  
labour type [2],  
climate type [2],  
plant protection intensity [3]

**equals a large number of unique activity-attribute combinations.**

*2,880 unique combinations* of plant production activities *in a single period.*

## Example: Beef cattle production, average 2010-2014

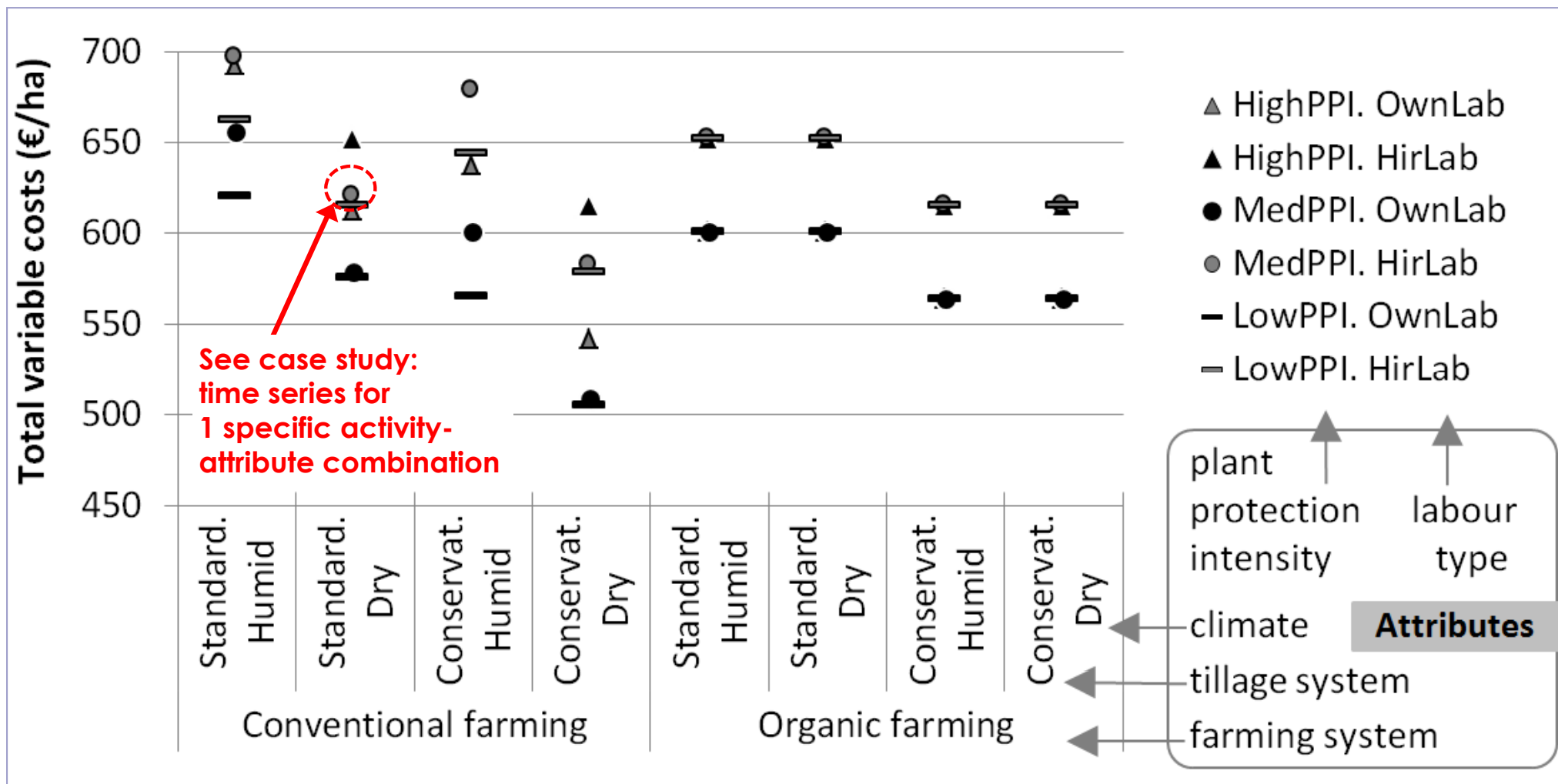
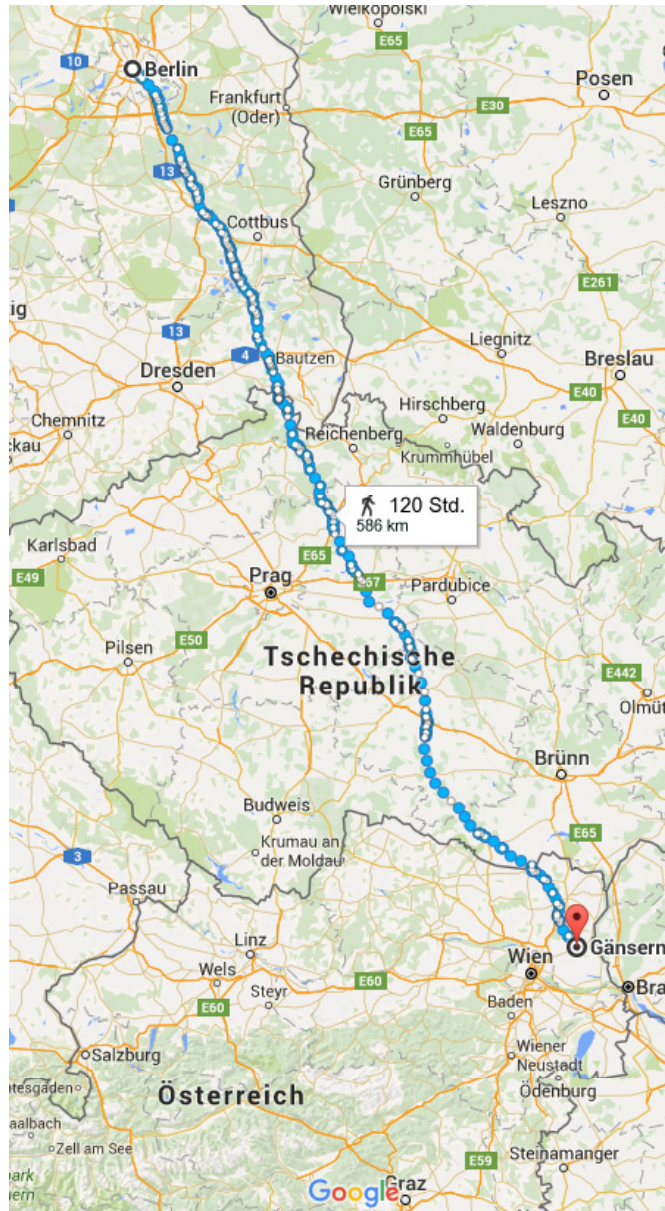


Fig. 1: Variable costs for 48 combinations of quality wheat, no straw recovery, cropland, field size: 2ha, tax excluded) in the reference year (average 2011-2013), €/ha.

Source: Own figure, 2015

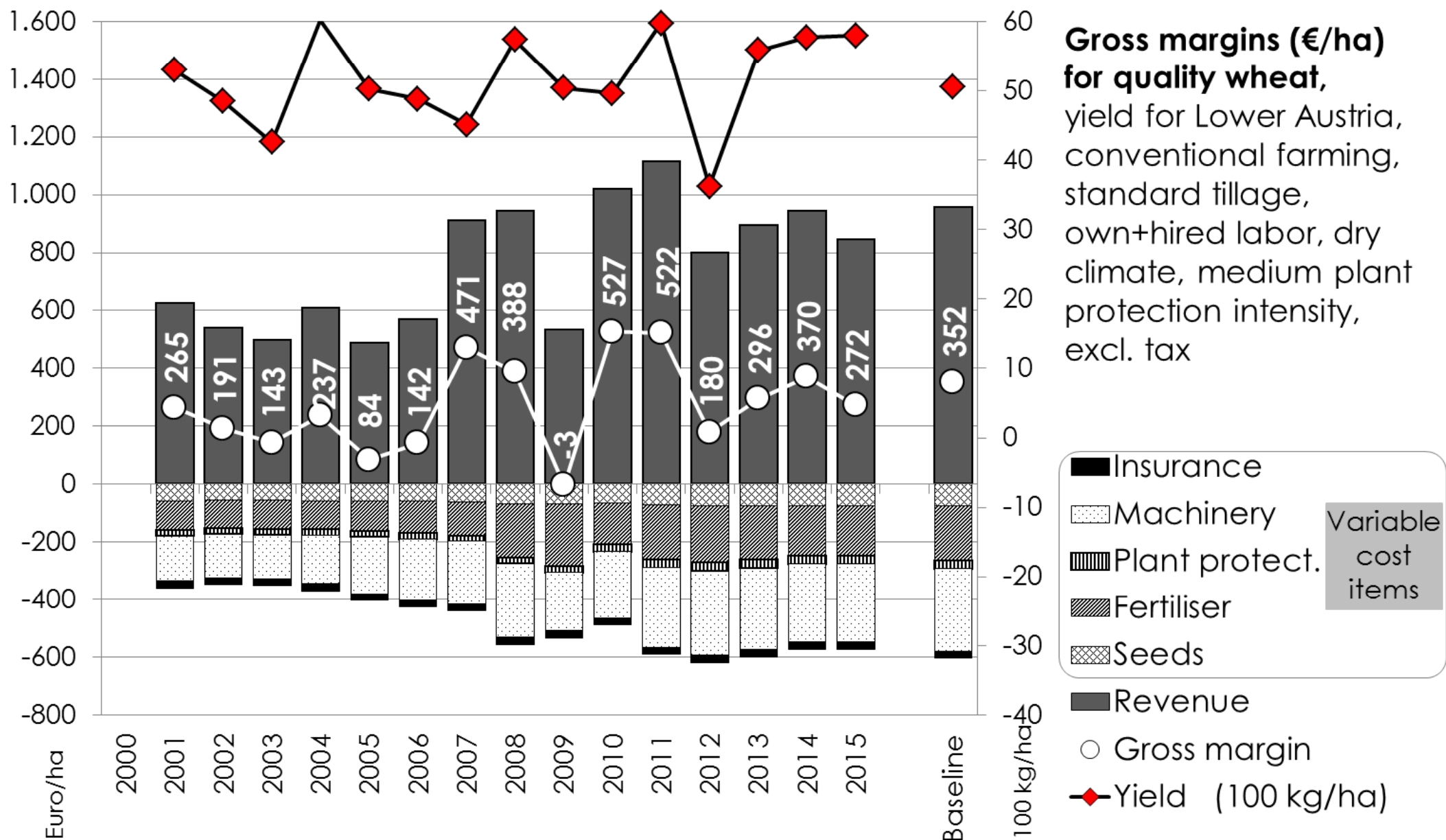
# Case study (1): Gänserndorf, a district in Lower Austria



Source: Google Maps

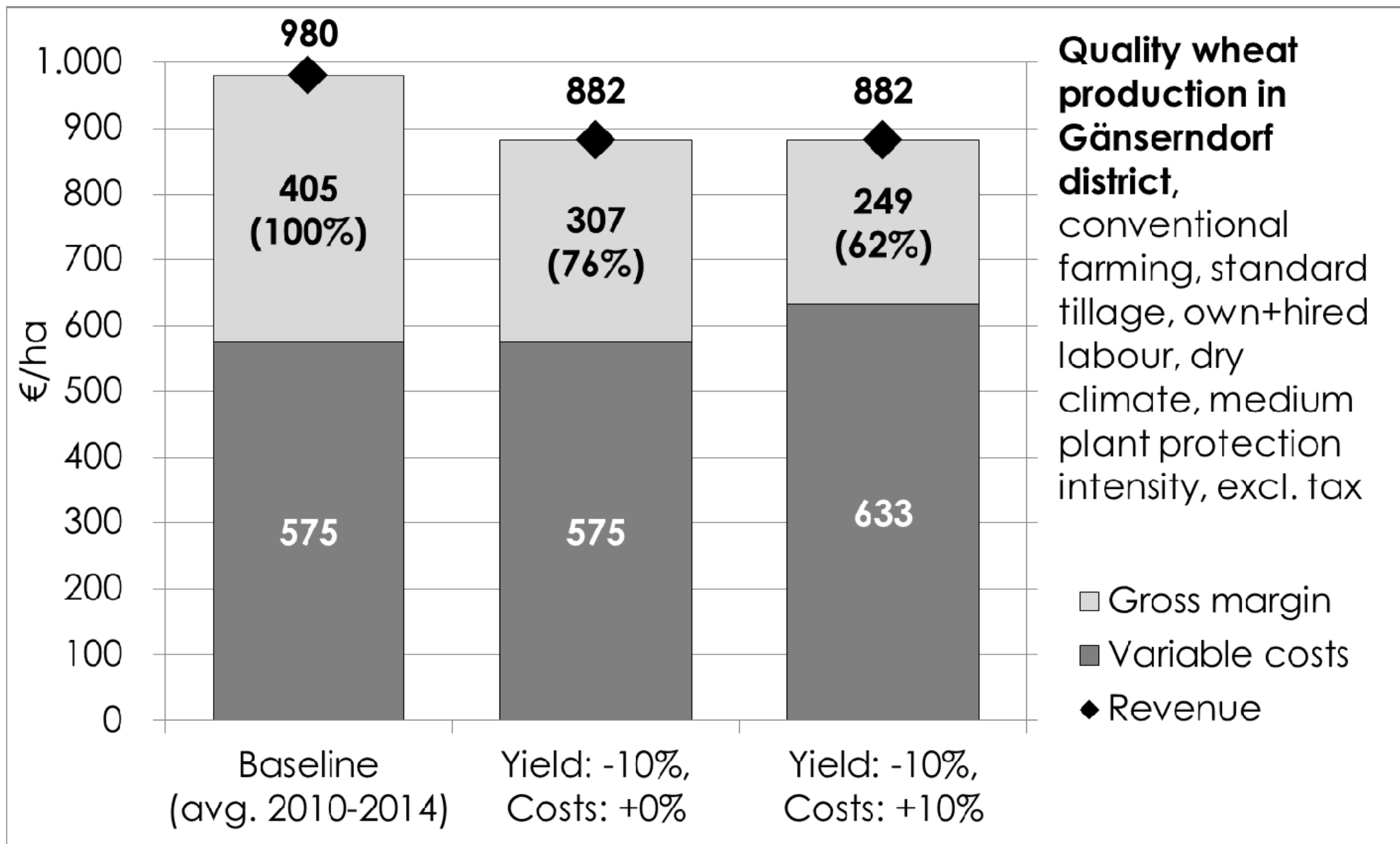
Source: Wikipedia

# Case study (2): INCAP results for quality wheat production



On this slide, Baseline is the average for 2011 to 2013.

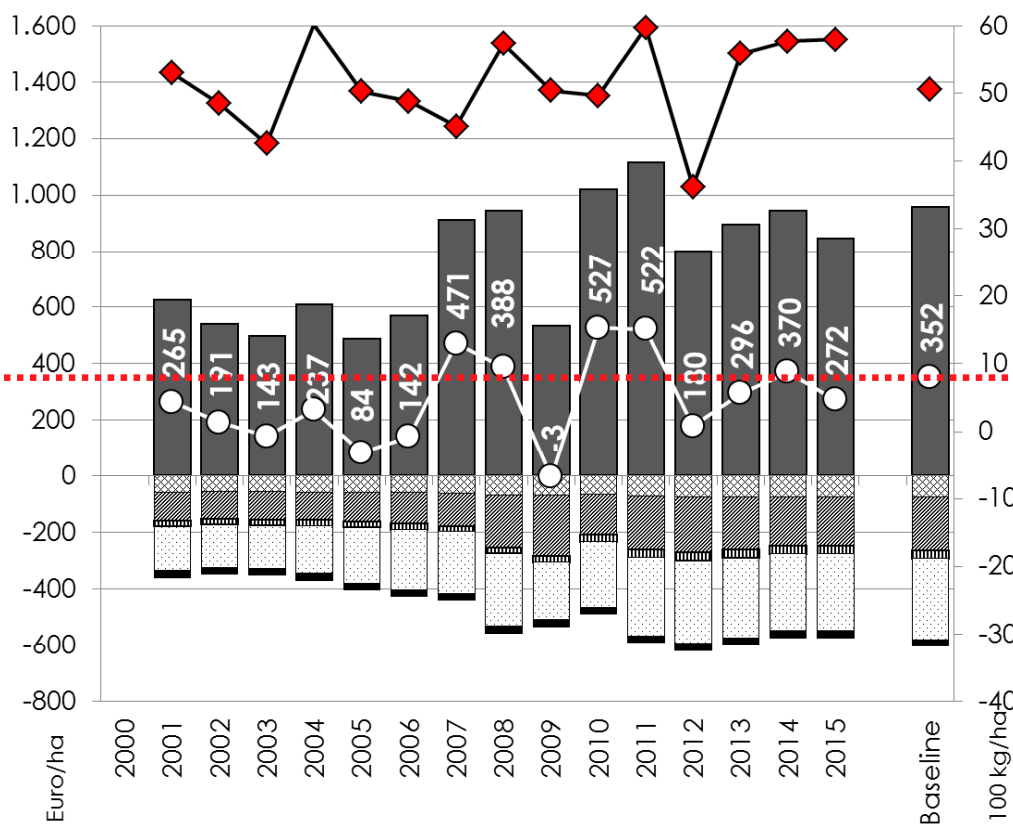
## Case study (3): Changing yield and/or costs



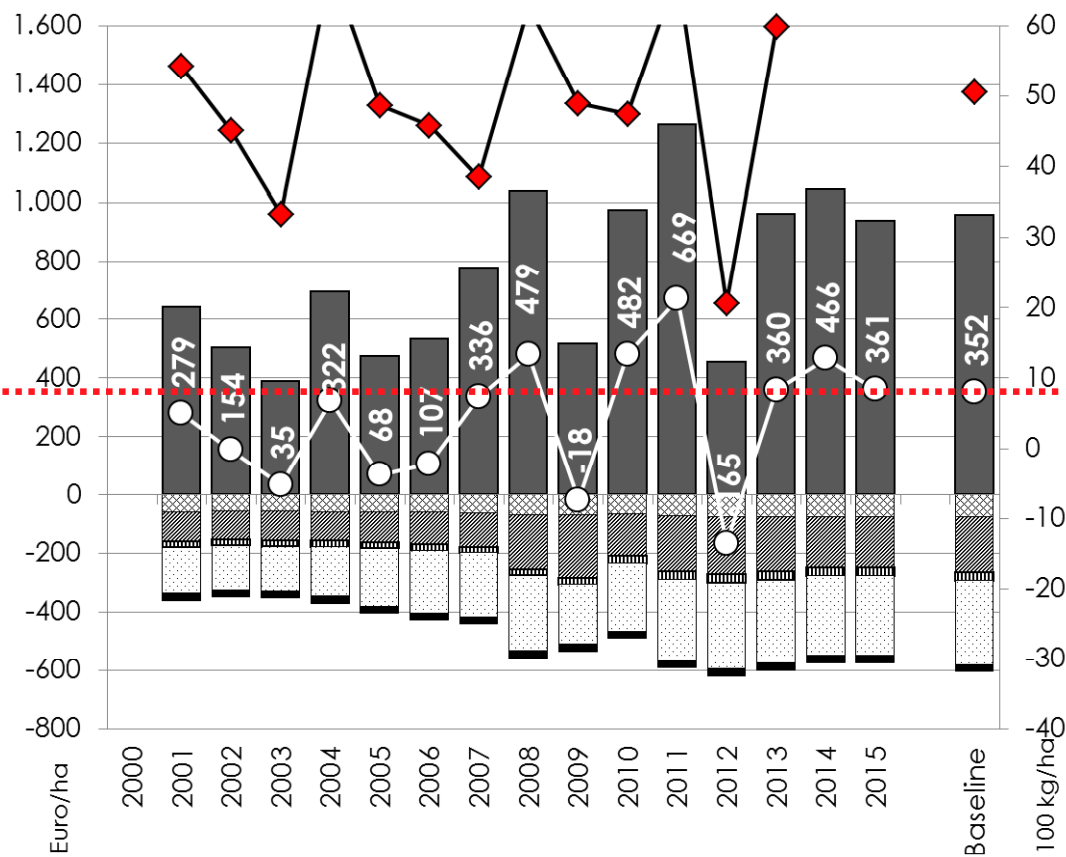


# Case study (5): Comparison

Observed yield



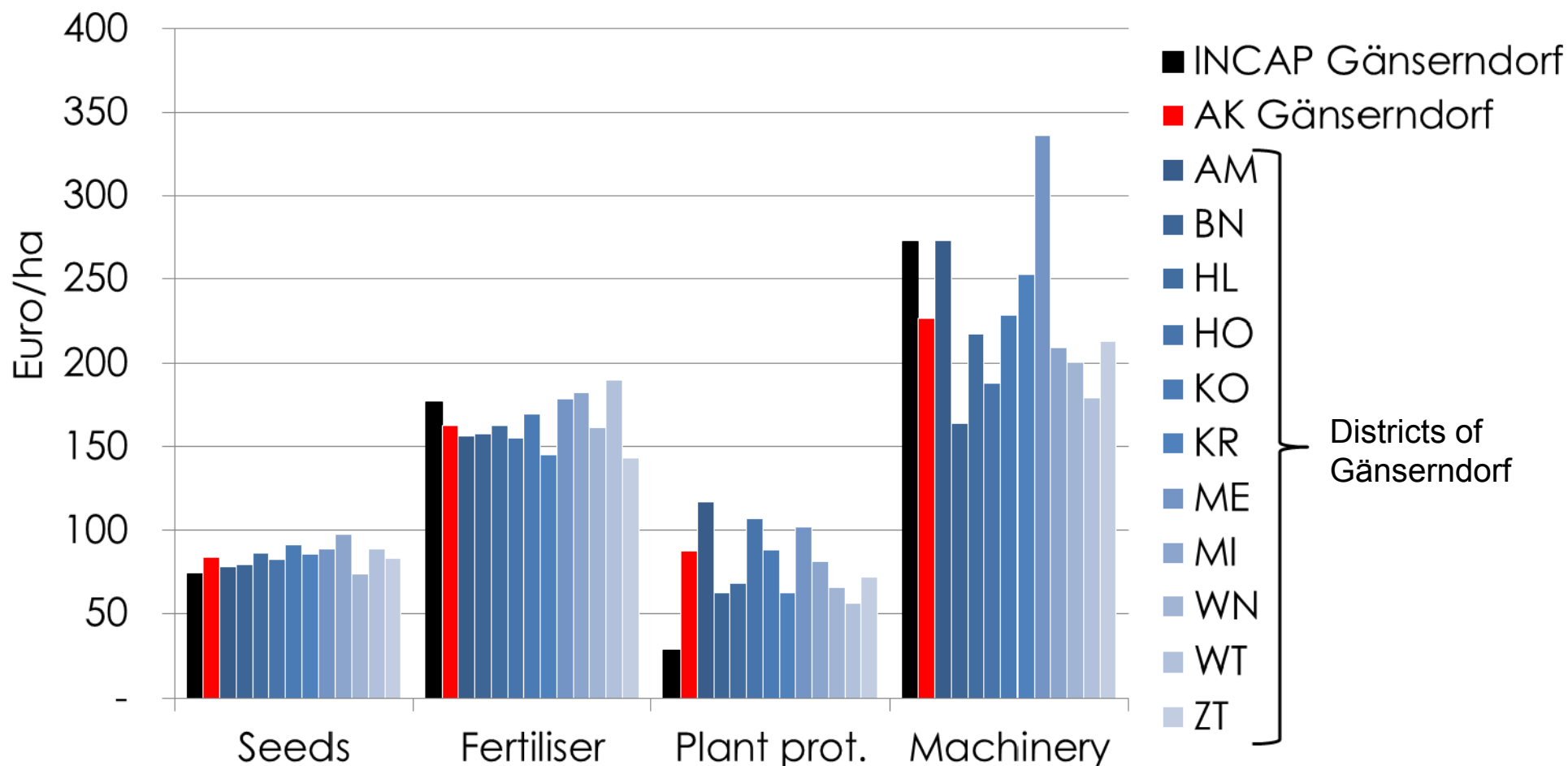
Yield variance (Basis: 2010-2014)



On this slide, Baseline is the average for 2011 to 2013.

## Validation (3): INCAP and working groups results

**Variable costs of quality wheat production in  
Gänserndorf, avg. 2010-2014 - *PRELIMINARY RESULTS***



Source: Records from working groups of the Chamber of Agriculture