Adaption strategies to challenges in EU crop production

Case Studies from Germany

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Commercial partners:

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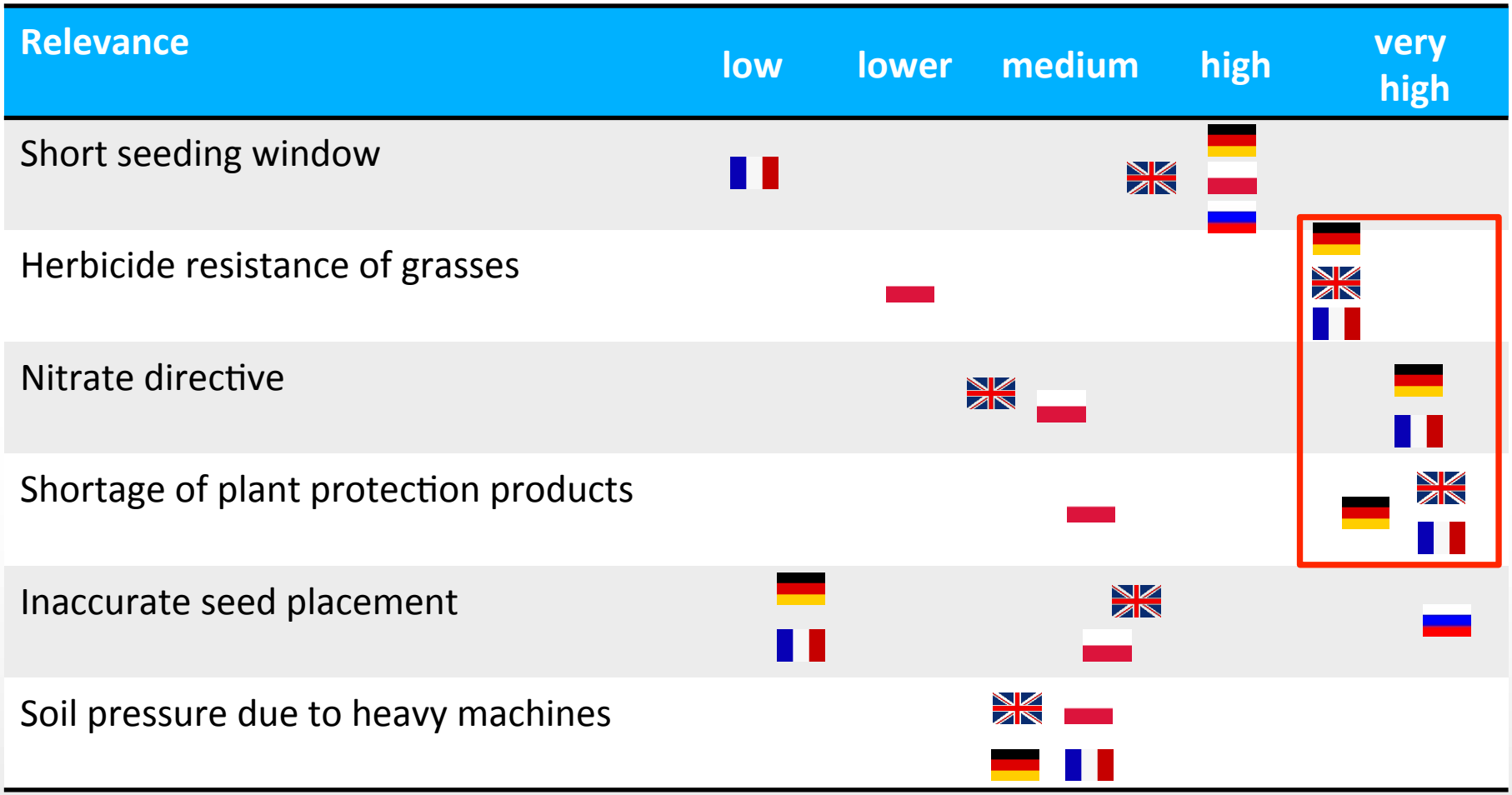
Outline

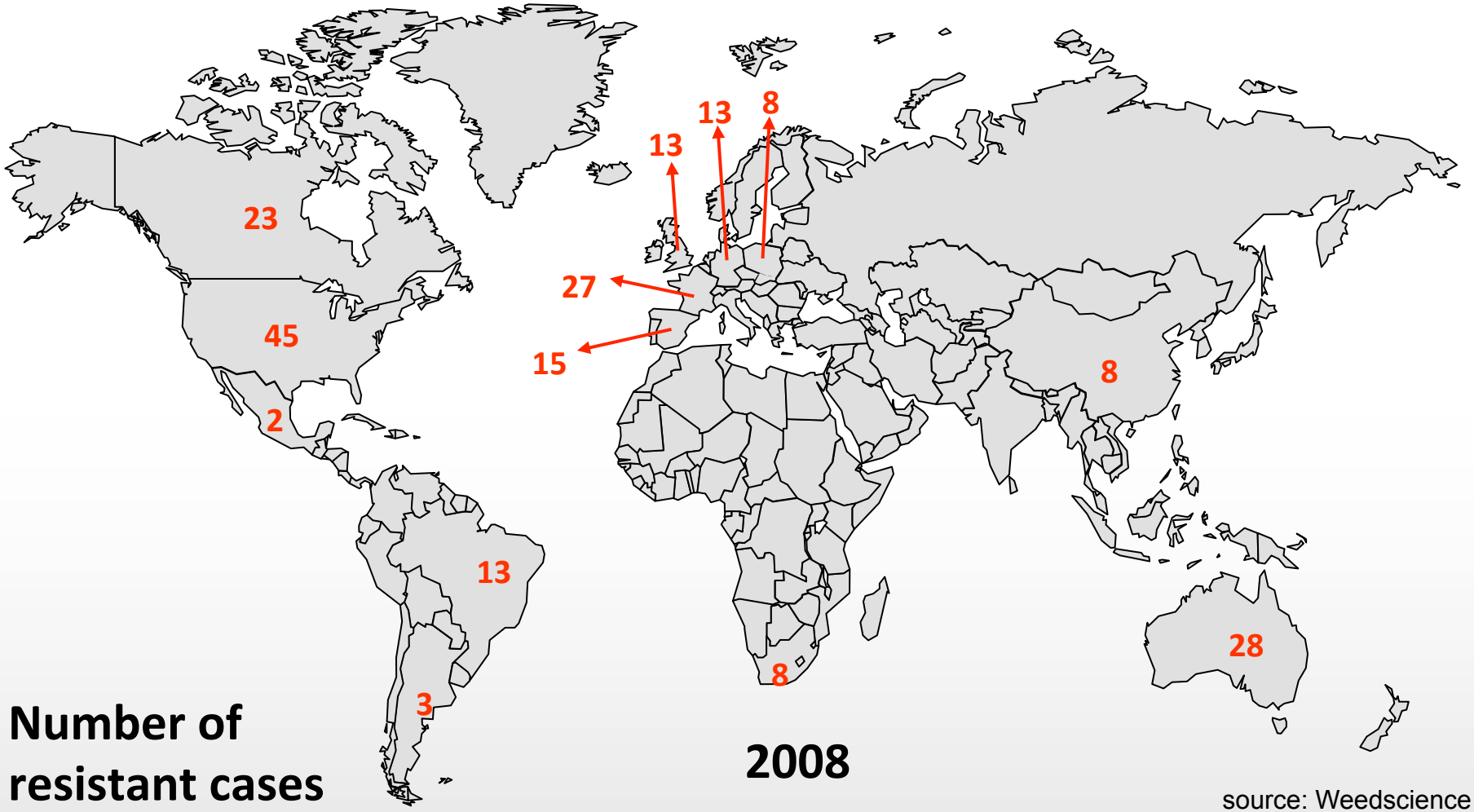
1. Challenges for German arable farmers
2. Case Studies on farmers adoption strategies
    a) Saxony-Anhalt
    b) Schleswig Holstein
3. Conclusion

“Pain Points” for farmers in different countries

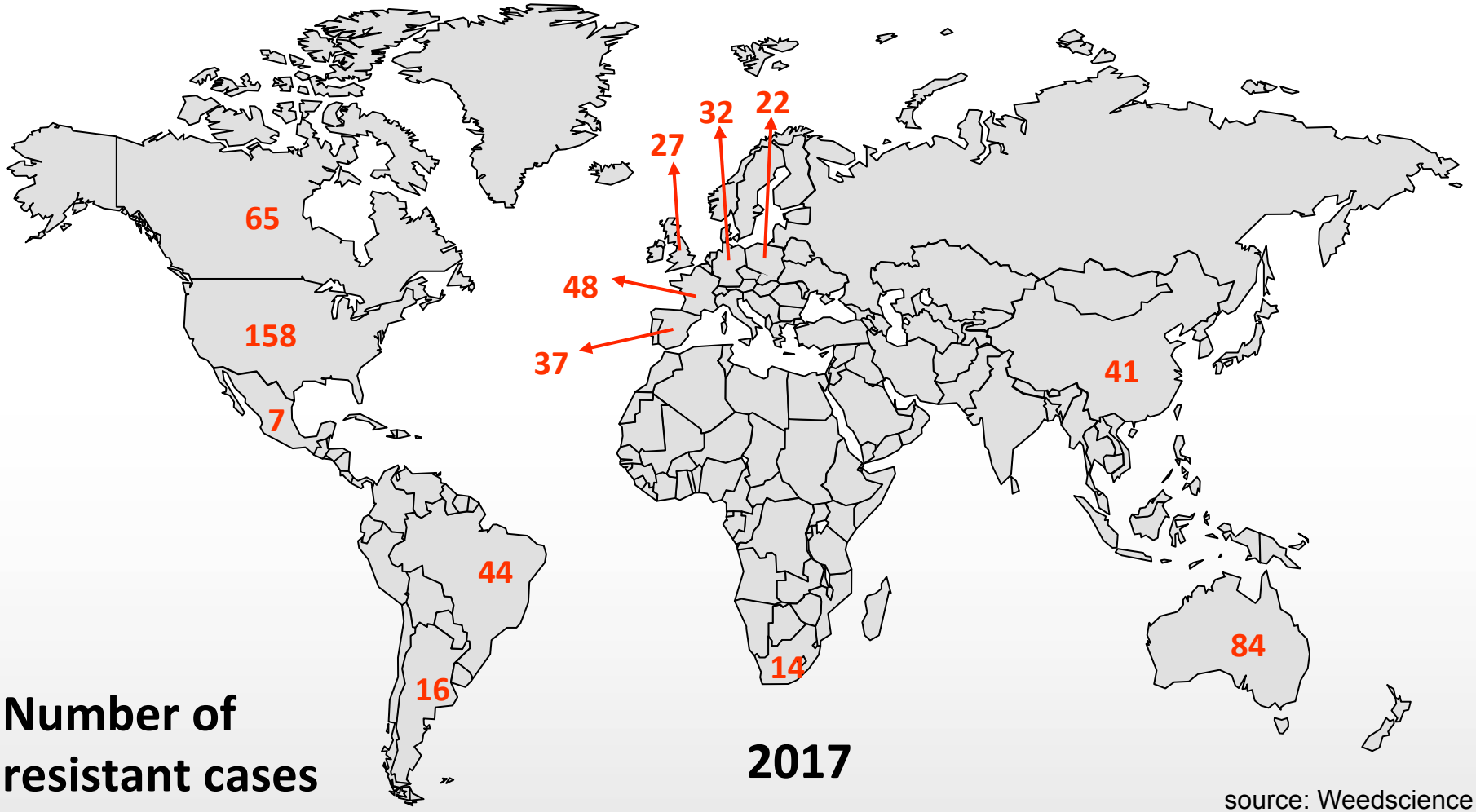


Source: agri benchmark (2014)

Resistance is a global issue…



… and it is growing



source: Weedscience

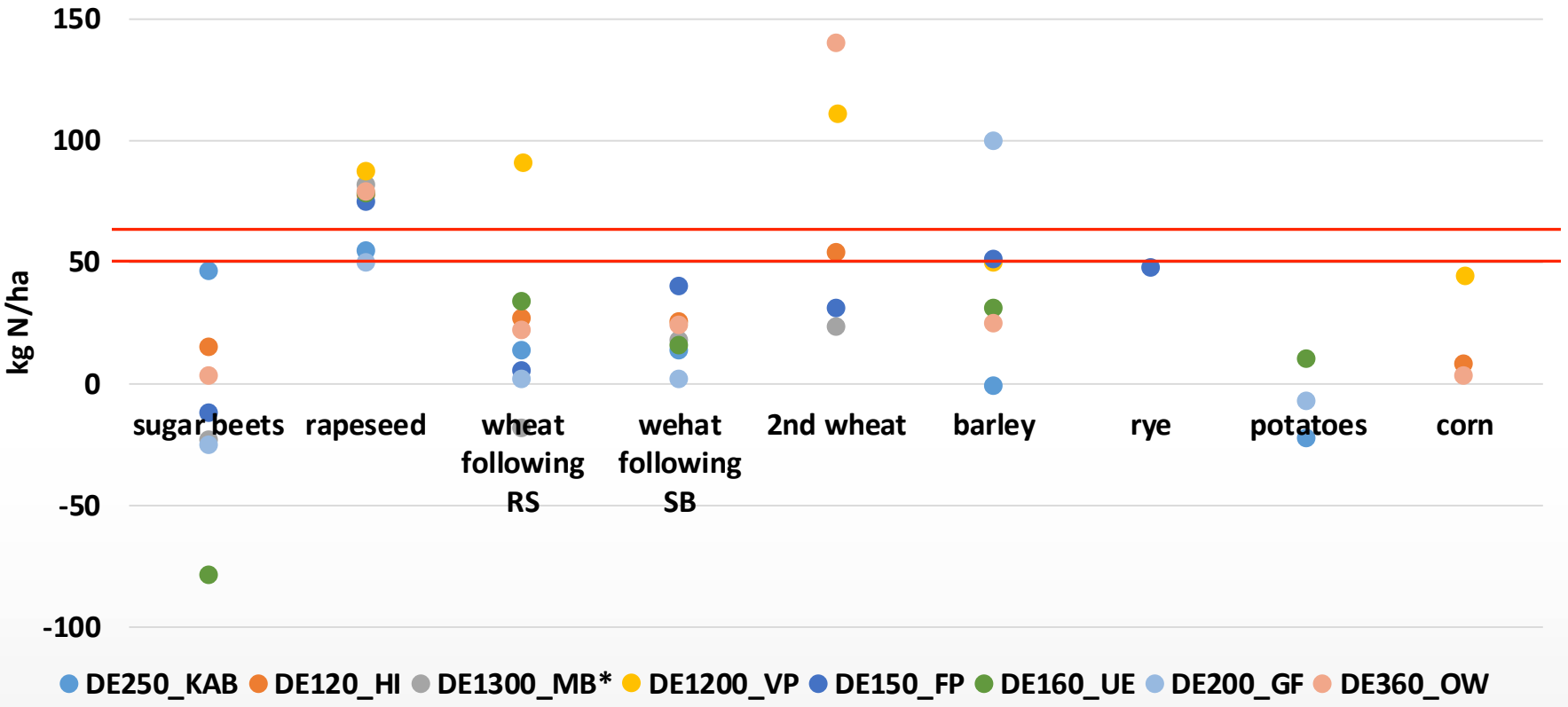
Drivers of the challenges in plant protection

- **Political drivers**
  - Increasing standards for the approval process
  - Hazard based Cut of criteria in approval process → no exposure risk assessment
  - Comparative assessment & substitution for plant protection products
- **Low level of innovations from the industry:**
  - Shorter lifetime of the products
  - Increasing investments due to higher standards in the approval process
  - Decreasing number of new patents
- **Agronomic drivers**
  - Narrow rotations and mainly winter crops
  - Decreasing intensity in tillage (more no till)
  - Early seeding / short time window for mechanical weeding

The new German fertilizer ordinance

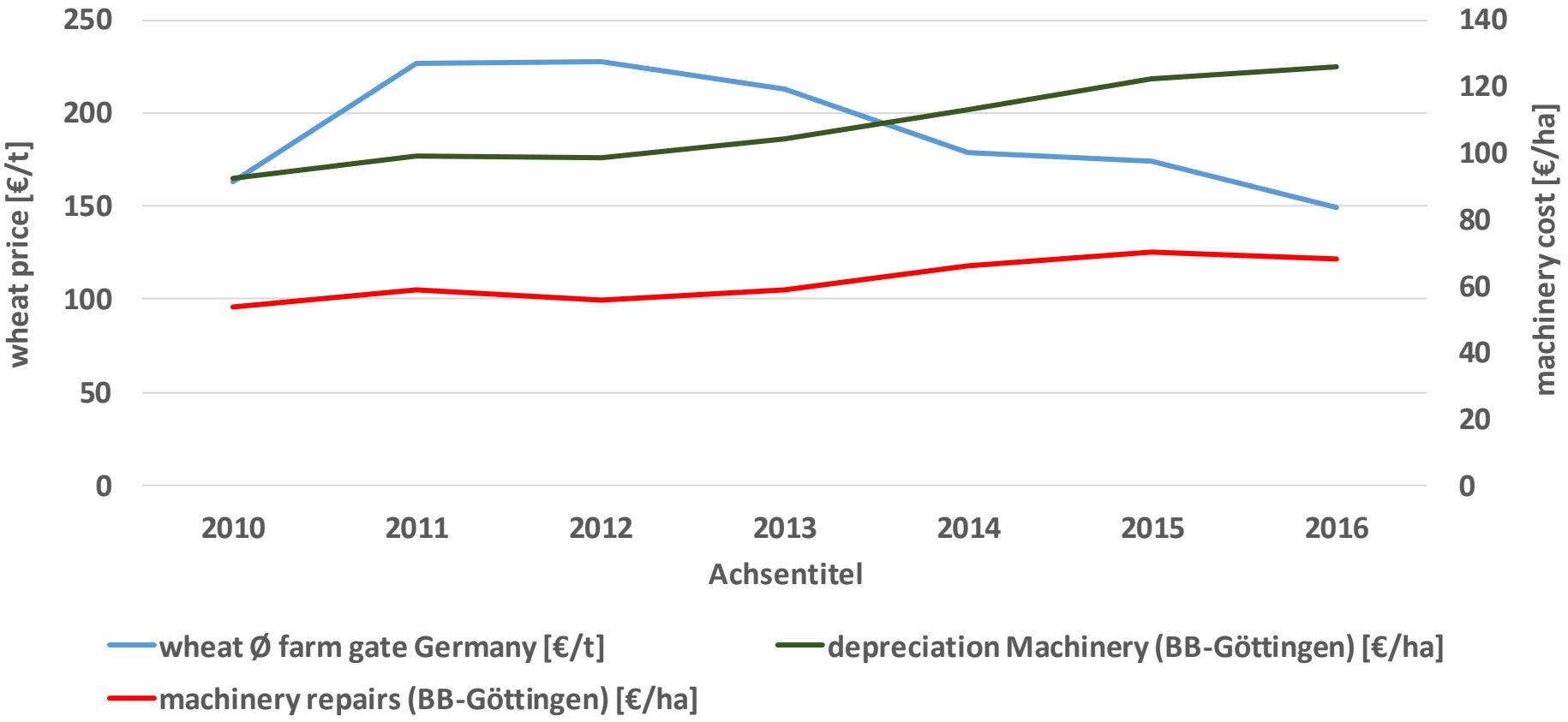
- **Maximum N-surplus:**
  - N-surplus in nutrient balance: 60 kg/ha until 2020, as of 2021: 50 kg/ha
  - P_2O_5-Surplus: 20 kg/ha until 2023, as of 2024: 10 kg/ha
- **Introduction of fertilizer planning with given plant requirements**
  - Rapeseed: 200 kg N; wheat: 230 kg N; …
  - Mark up depending on yield level
  - Consideration of nitrogen from organic fertilizers previous year, Nmin (0-90 cm)
  - Options to adapt to poor development states of plants
- **Lower N-losses for manure application**
  - Pig manure: from 40% to 30% and 25% as of 2020
  - Cattle slurry: from 30% to 25% as of 2020
- **Urea application: As of 2020 only in combination with urease inhibitors**

Nitrogen Balances of our typical farms



- Rapeseed: Almost impossible to comply with the balance, 2nd wheat is also an issue
- Summer crops (corn, potatoes, sugar beets) relieve the balance

Decreasing prices but increasing cost



- **Strong decrease in commodity prices (-35 %) since 2012**
- **Strong increase in machinery cost (+30 %) since 2012**

Outline

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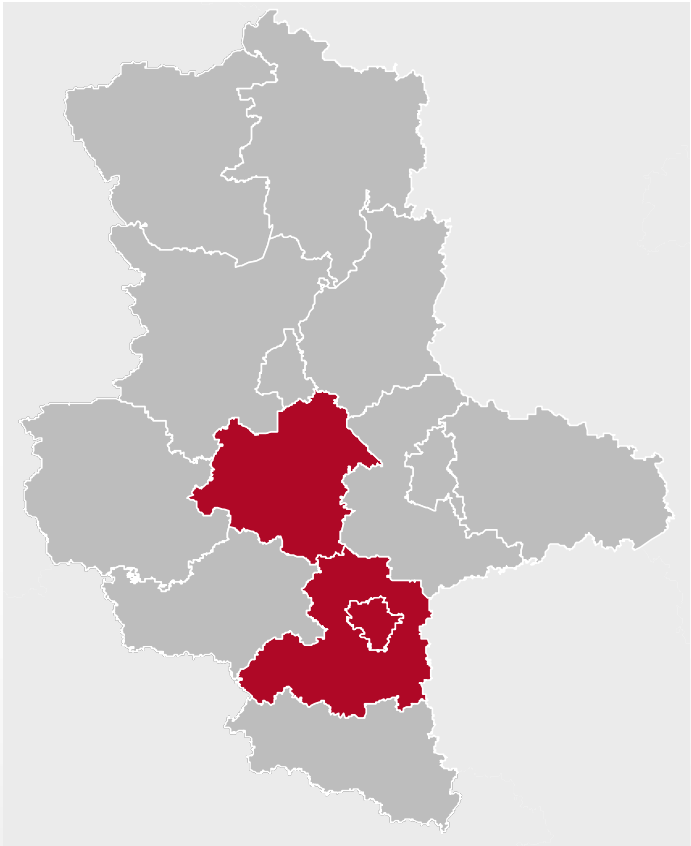
Background information for the case studies

- Starting point: Presentation and discussion at annual *agri benchmark* workshop with German advisors (February 2017)
- Case studies in two regions: a) Schleswig Holstein b) Saxony-Anhalt
- Focus group discussions with regional advisors and farmers (spring 2017)
- Price Assumptions based on historical price relations (2014-2016)
    - Wheat: 160 €/t
    - rapeseed: 340 €/t
    - barley: 140 €/t
    - beans: 160 €/t
    - peas: 180 €/t
    - corn: 160 €/t
    - Nutrients: 0,8 €/kg N; 0,6 €/kgP_2O_5; 0,6 €/kgK_2O

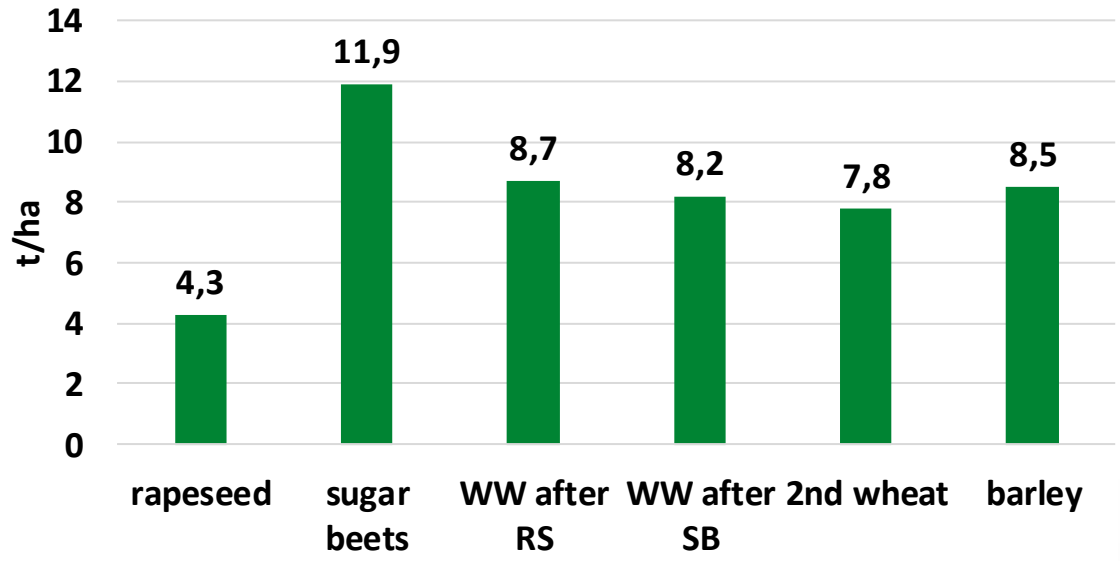
Case study Saxony-Anhalt

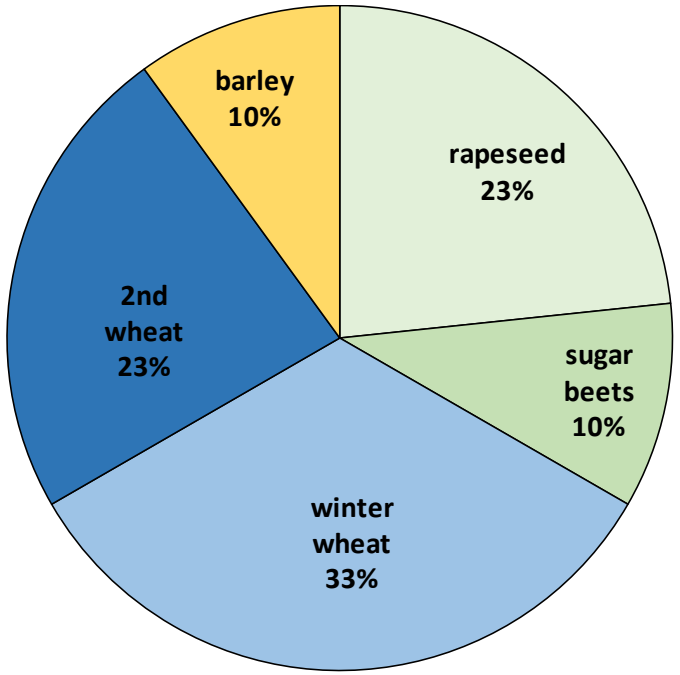
- **Natural conditions**
  - loess soils (20 % clay content, 2 % carbon)
  - Average Temperature: 8.8 °C
  - Precipitation: 530 mm (40 % July – October)
  - Field work days:
    - Harvest August: 15 days
    - Days deep tillage Sep. – Oct.: 33 days
- **Farm characteristics**
  - 450 ha arable land (23% rapeseed; 56 % wheat)
  - Key Machines:
    - Combine: 325 kW, 9 m, 3,5 ha/h
    - Seeding: 175 kW, 6 m, 4,5 ha/h

Location of the typical farm



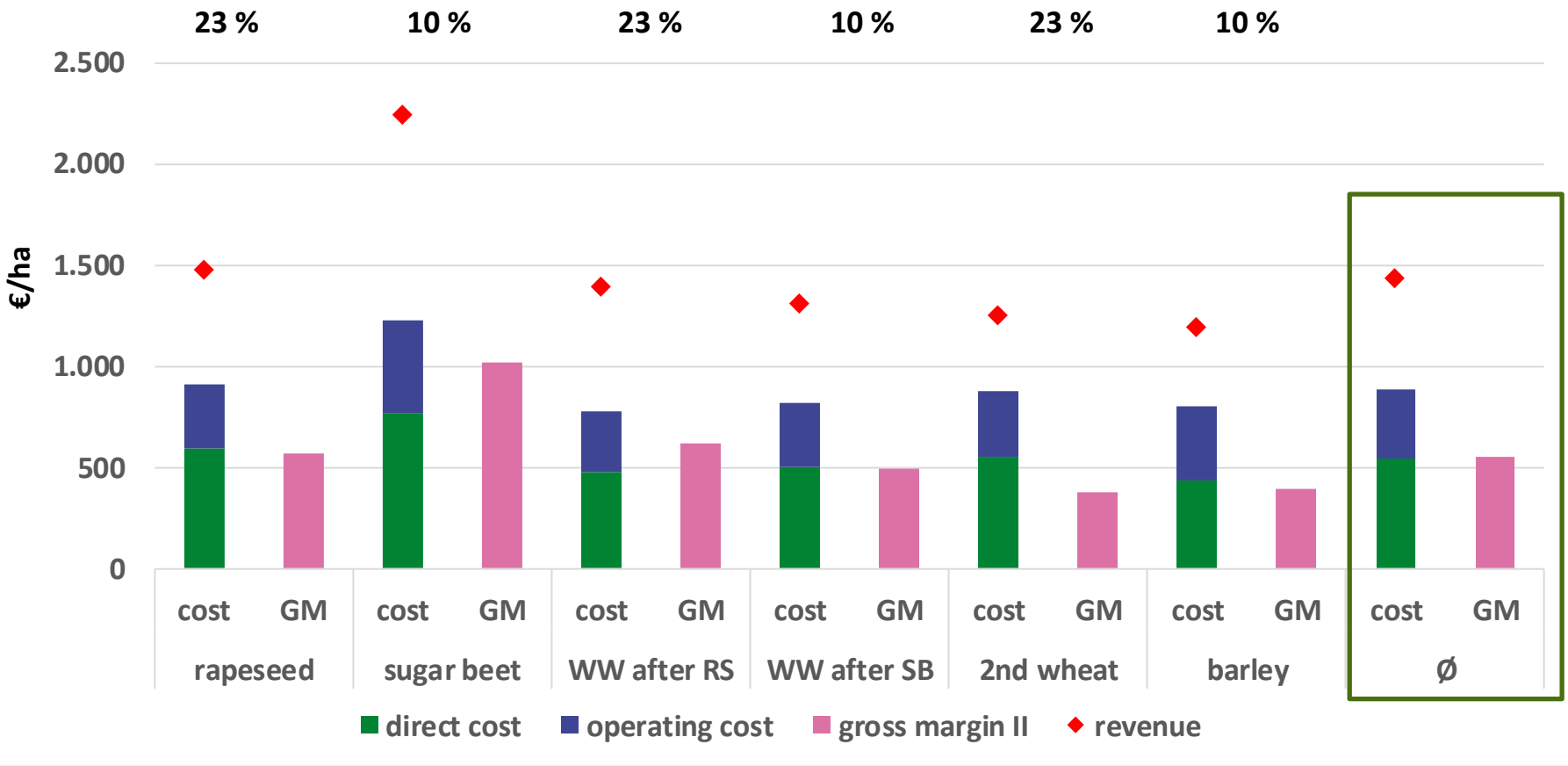
Crop rotation of the typical farm Saxony-Anhalt





- Winter crops are dominating the rotation (90 %)
- 2nd wheat has a 0.9 t/ha yield discount compared to wheat after rapeseed

Economic performance of the current rotation (€/ha)

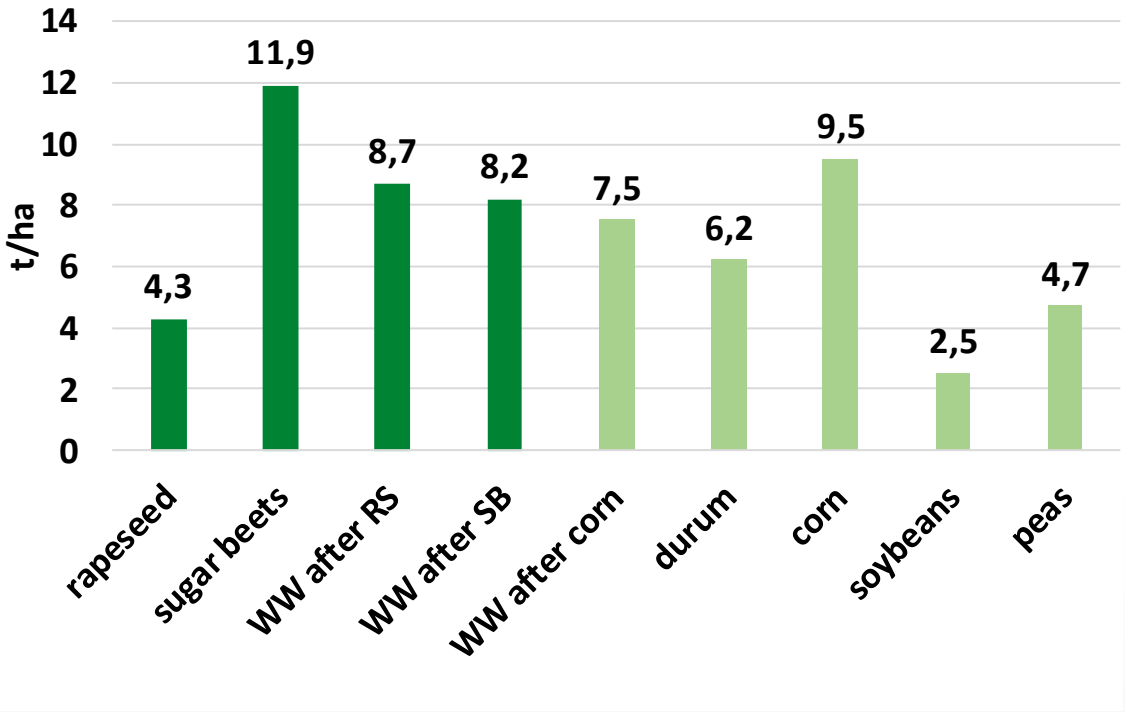


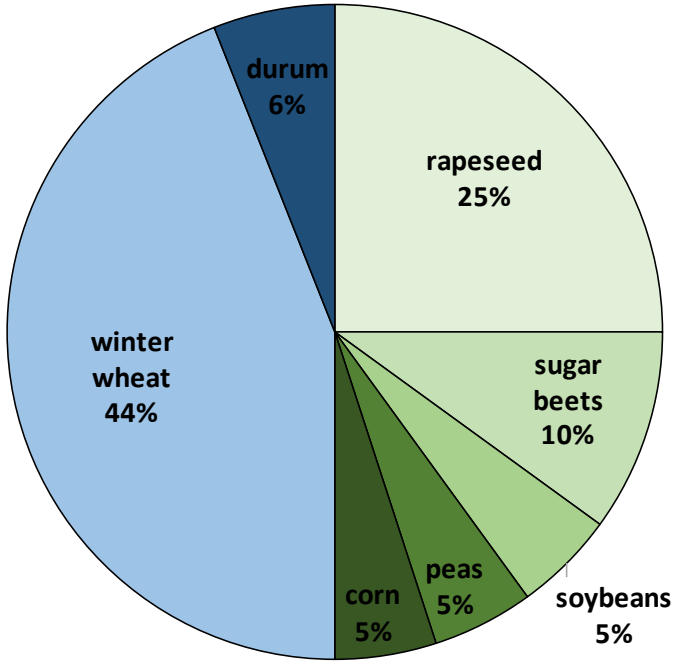
- 240 €/ha lower Gross Margin II for 2nd wheat (-0.8 t wheat; + 40 €/ha pesticides; + 30 € N/ha)
- Barley slightly better than 2nd wheat

Motivation of the new cropping strategy

- **Summer crops to reduce the nitrogen balance (corn, beans, peas)**
- **Remove the 2nd wheat due to poor performance**
- **Increase the share of leaf crops to 50 %**
  - Options for more effective herbicides
    (e.g. other kinds of Sulfonylharnstoffe as Maister)
  - Reduced nitrogen input for the following crop
  - Break the infection cycles of pests
  - Increase the time span to control volunteer rapeseed and weeds
- **Increase summer crops to 30 %**
  - Lower grass pressure in the spring (spray with Glyphosate or tillage)
  - Reduce herbicides applications and thereby reduce selection pressure on weeds

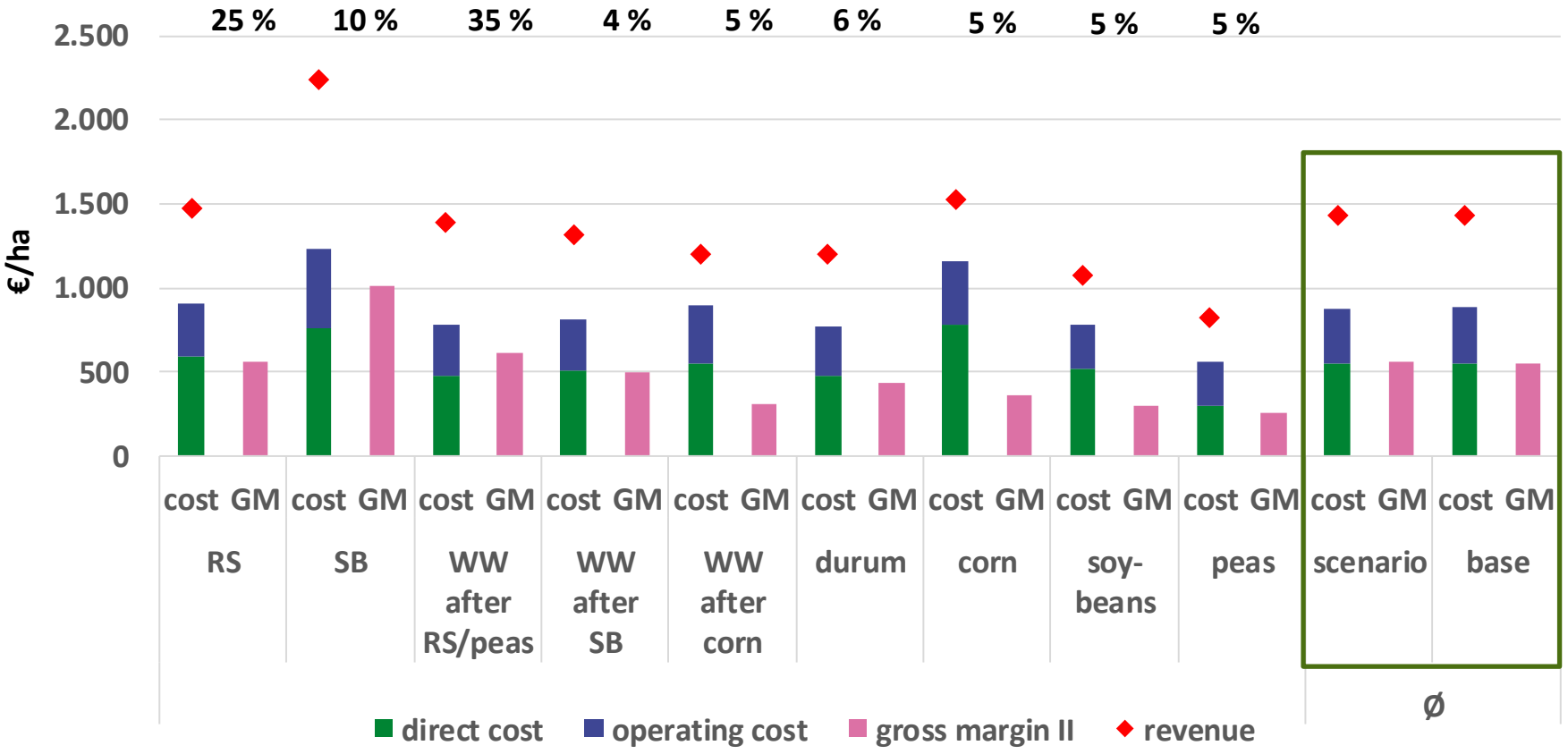
The adopted crop rotation Saxony-Anhalt





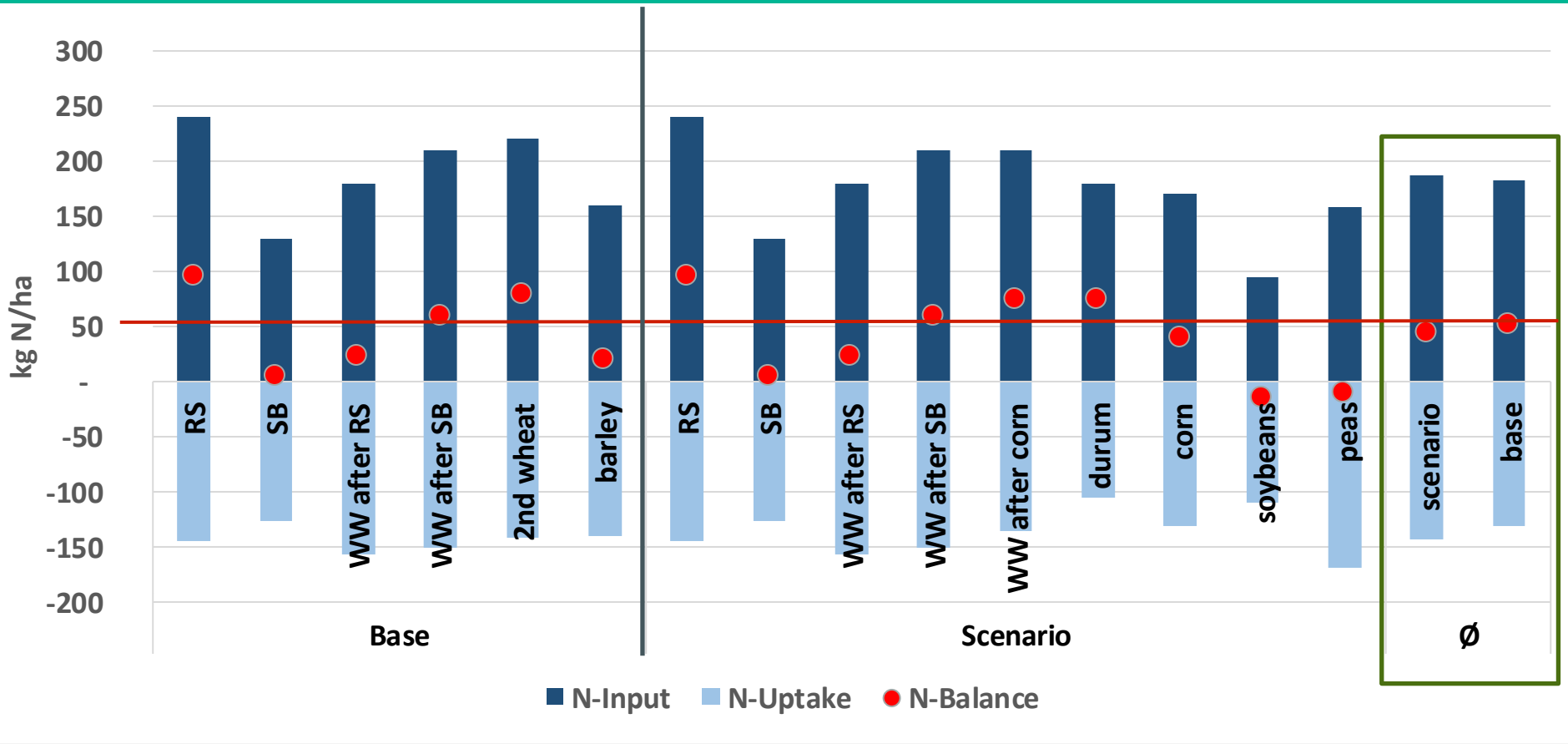
- Strong yield variation in soybeans; high drying cost in corn
- Max. 10% share of soybeans and corn due to yield risks and lack of drying capacities

Economic performance of the new rotation (€/ha)



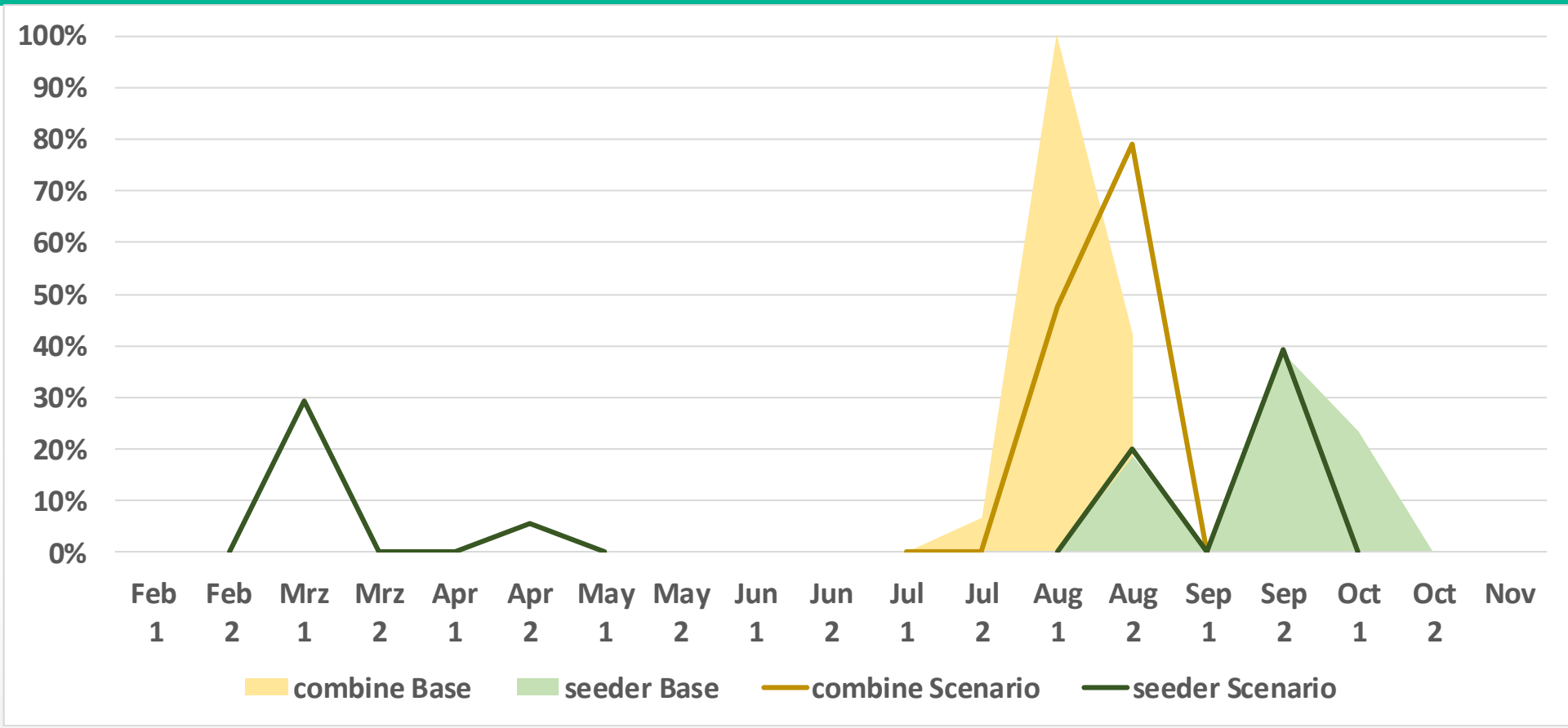
- Almost no change in average gross margin II due to (a) wheat after leaf crops; (b) substitution of barley by wheat
- Durum with a similar gross margin as WW after sugar beets

Comparison of nitrogen balances



- Slight decrease with summer crops from 55 to 44 kg N/ha due to: (a) legumes; (b) decreased share of 2nd wheat

Impact on machine capacity utilization
Examples: Combine and Seeder



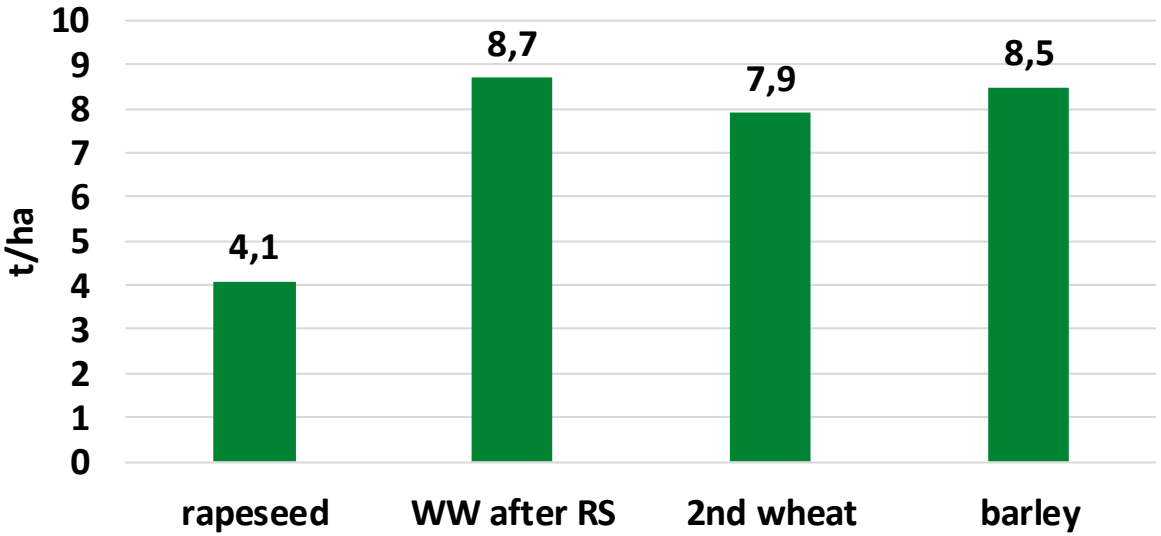
- **The workload peak in beginning of August can be reduce slightly**
- **Additional 85 ha can be farmed with the same equipment**

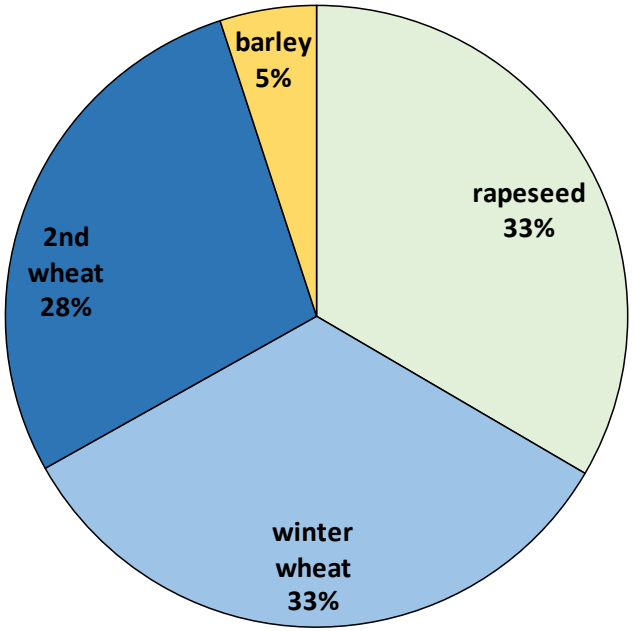
Case Study Schleswig-Holstein

- **Natural conditions**
  - Heavy soils (20 % clay, 2 % humus)
  - Average Temperature: 8.4 °C
  - Precipitation: 710 mm (40 % July – October)
  - Field work days:
    - Harvest August: 11 days
    - Days deep tillage Sep. – Oct.: **11 days**
- **Farm characteristics**
  - 360 ha arable land (33 % RS; 62 % WW)
  - Heavy issues with black grass
  - Key Machines:
    - Combine: 325 kW, 9 m, 3,0 ha/h
    - Seeding: 175 kW, 3 m, 2,5 ha/h

Location of the typical farm

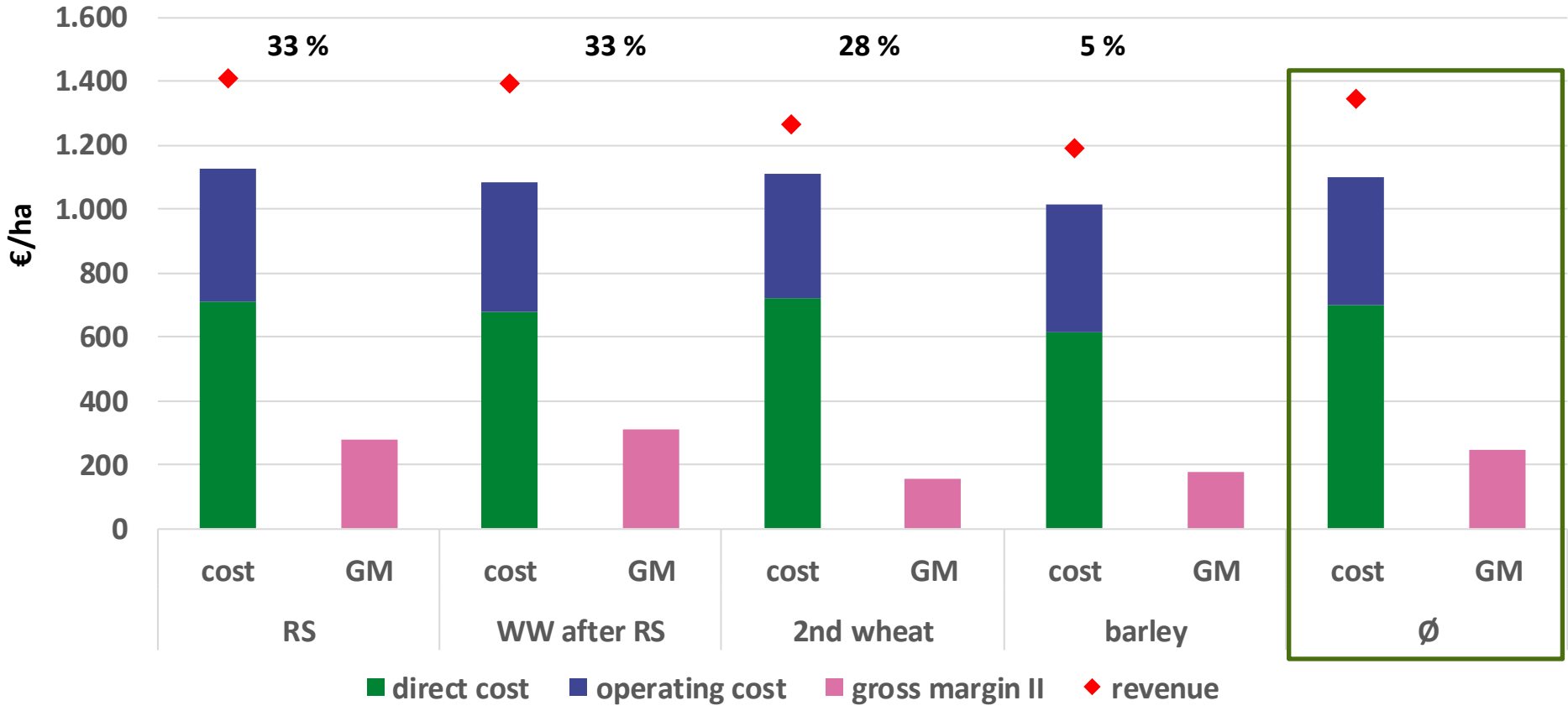
Crop rotation of the typical farm Schleswig-Holstein





- 2nd wheat has a 0.8 t/ha yield penalty
- Very tight rotation with two crops on 95 % of the rotation

Economic performance of the current rotation (€/ha)



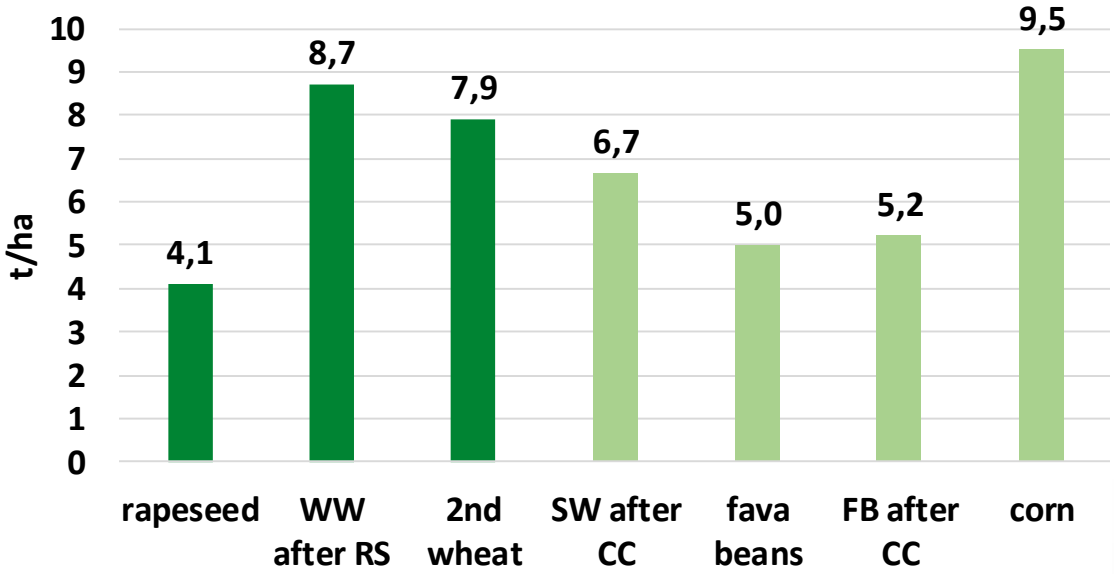
- - 170 €/ha gross margin II reduction of second wheat (- 0.8 t/ha; +45 €/ha direct cost)
- Ø gross margin: 300 €/ha lower than Saxony-Anhalt (pesticide and operating cost)

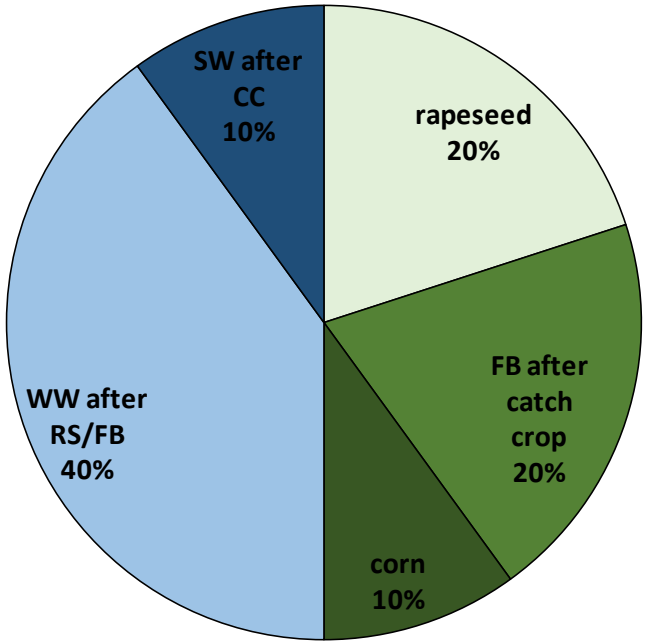
Motivation of the new cropping strategy

- **Introduce summer crops to reduce the nitrogen surplus (corn, beans, peas)**
- **Remove the 2nd wheat due to poor performance and high pesticide input**
- **Increase the share of leaf crops to 50 %**
  - Options for or more effective herbicides
    (e.g. other kinds of Sulfonylharnstoffe as Maister)
  - Reduced nitrogen input for the following crop
  - Break the infection cycles of pests
  - Increase the time span to control volunteer rapeseed and weeds
- **Increase summer crops to 30 % to save available herbicides**
  - Lower grass pressure in the spring (spray with Glyphosate or tillage)
  - Save available herbicides due to less applications
- **Introduce cover crops before summer crops to mitigate nitrogen leaching during autumn**
- **Max. share of rapeseed 20 % due to high insecticide and disease pressure (clubroot)**
- **Glyphosate application before seeding and minimal soil interruption during seeding**

Stale seedbed preparation and Disc Seeding (Summer Wheat)

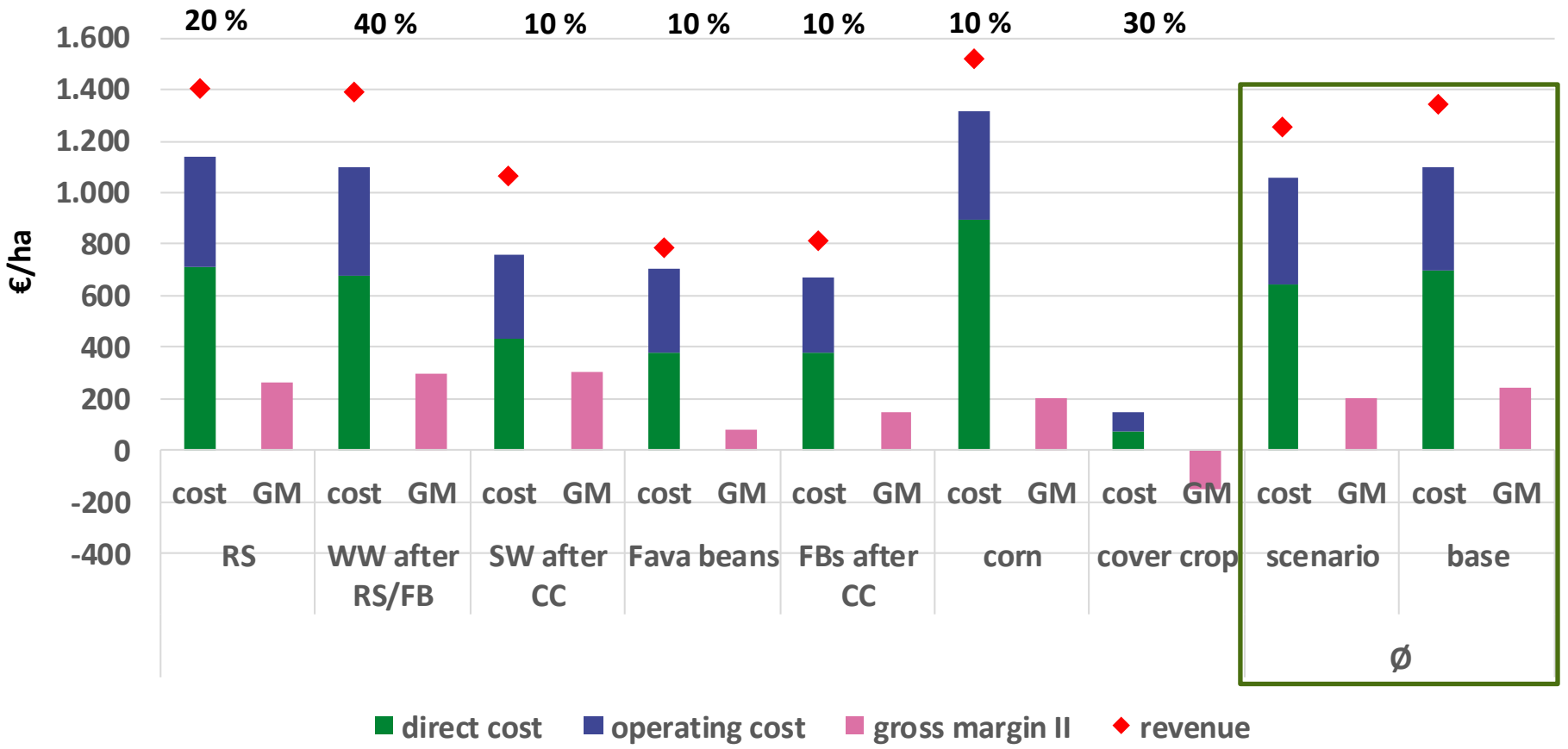
The adopted crop rotation Schleswig-Holstein





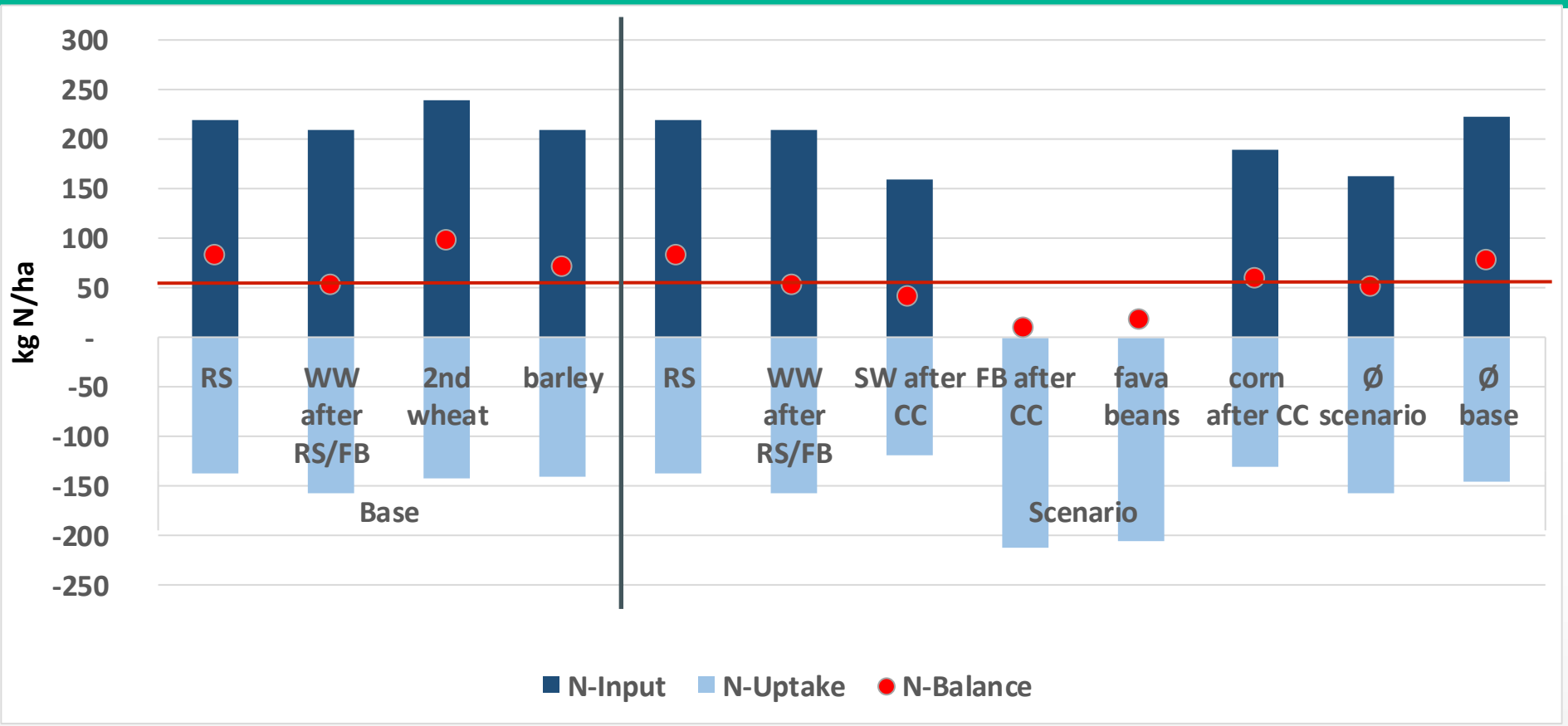
- Cover crops lead to a slight yield increase but need to be proper seeded
- Max. 10 % share of corn due to limited field work days in autumn

Economic performance of the new rotation (€/ha)



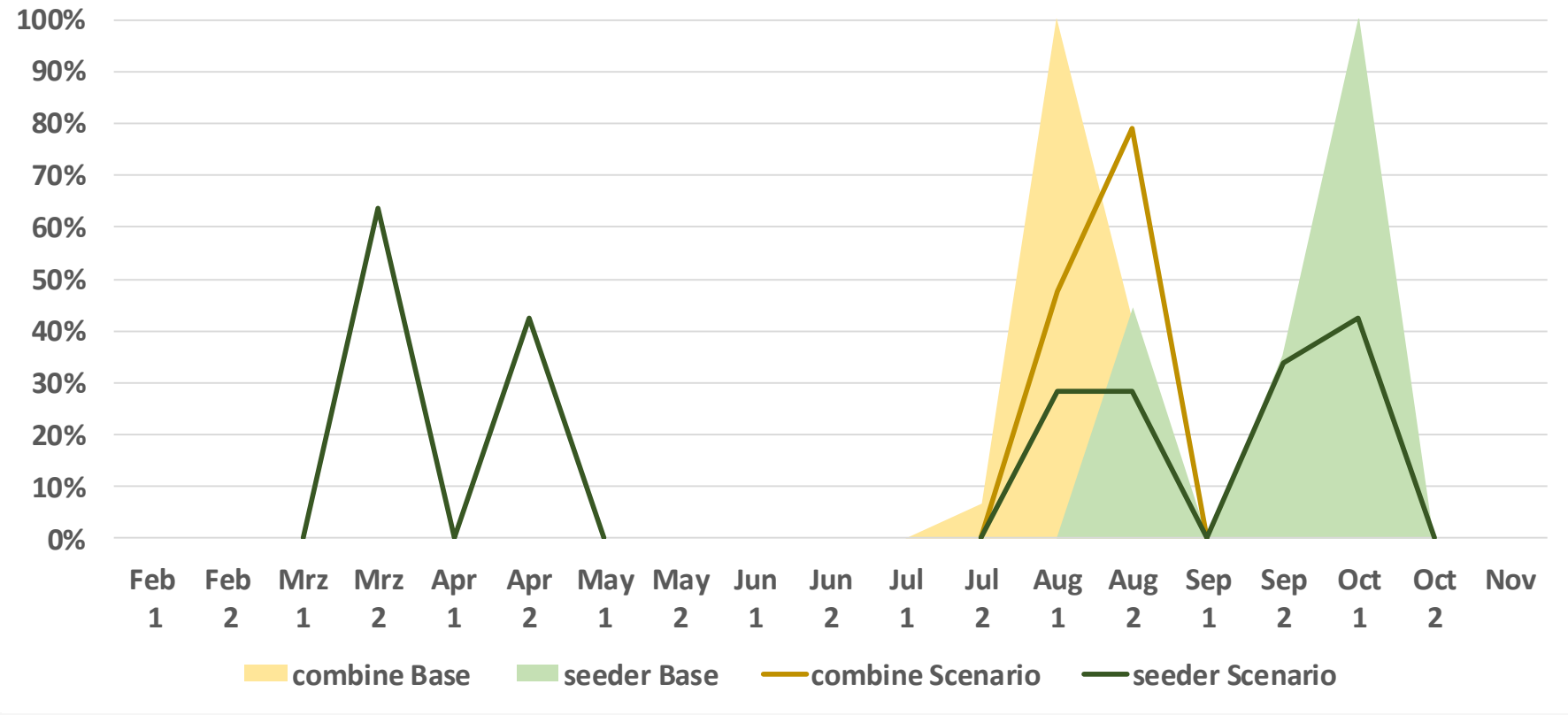
- Decrease in gross margin II of -40 €/ha to reduce resistant pressure
- Corn seems very promising but no experiences and high weather risks

Comparison of nitrogen balances



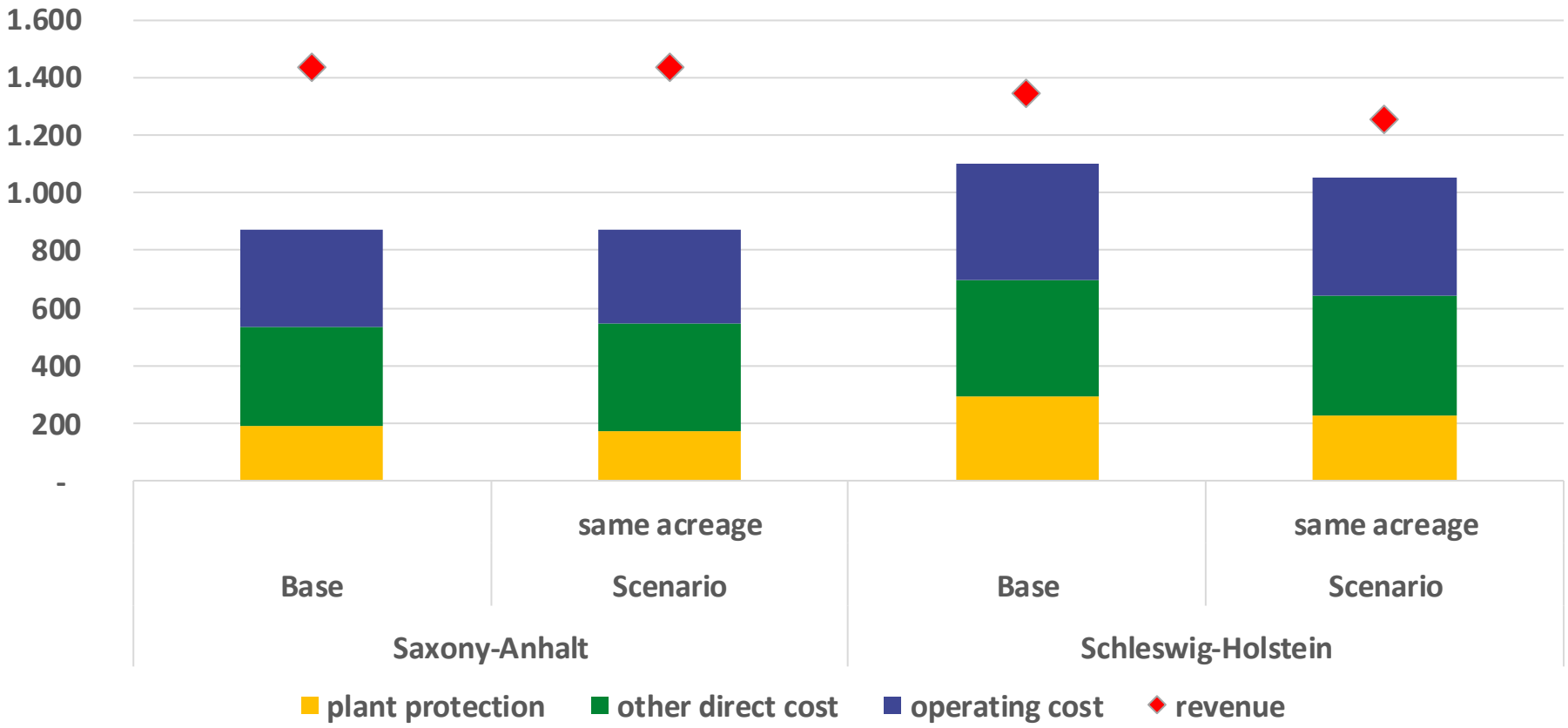
- Above 70 kg N/ha with the current rotation (due to rapeseed and winter wheat)
- Decrease to 50 kg N/ha due to legumes, lower share of rapeseed and no 2nd wheat

Impact on machine capacity utilization



- **The workload peak in beginning of August can be reduce drastically**
- **Additional 40 ha can be farmed with the same equipment**

Comparison of the two case studies

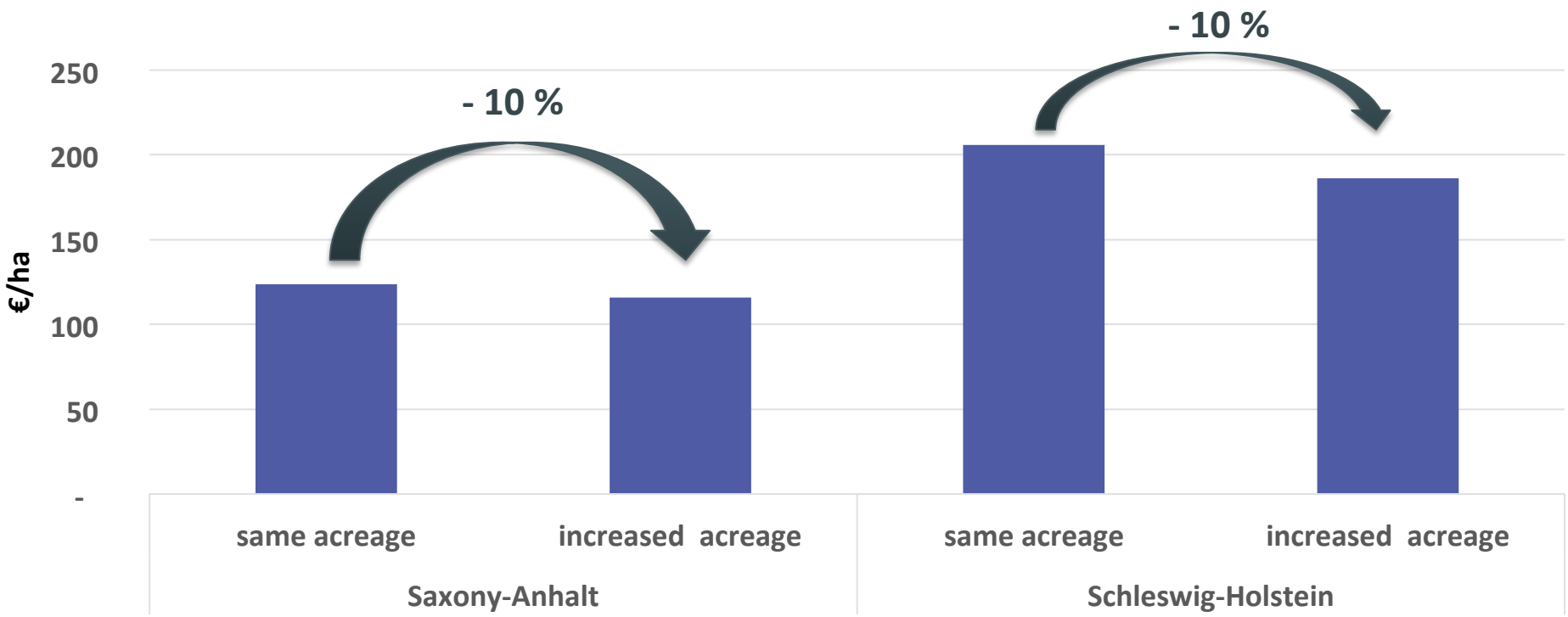


- Decrease in pesticide cost: -13 €/ha in SA; -70 €/ha in SH
- Gross margins: almost no change in SA vs. - 40 €/ha in SH

Impact better machinery utilization on fixed cost

- As corn is harvested by contractor (missing corn header) the utilization of the combine decreases in the summer crop rotation.
- Due to better distribution of the combine capacity during the year more acreage farmers could farm more acreage with the same equipment.
  - Saxony-Anhalt: + 85 ha (+11 %)
  - Schleswig-Holstein: + 40 ha (+19 %)
- Reduced machinery fixed cost if equipment can be used on more acreage.

Impact of increased acreage on fixed cost (€/ha)



- Cost savings range from -14 €/ha in Sachsen-Anhalt; -22 €/ha in Schleswig-Holstein
- Higher effect in SH as weather constraints are tighter

Conclusions

1. German crop production systems face serious challenges – two case studies indicate that there are viable options available to manage them economically.
2. Longer rotations with more summer and leave crops seem to be feasible – of course in some cases (peas, beans) with higher risks.
3. High economic potential for soybeans because it's a high value crop with currently rather low yields (lack of varieties, know how etc.).
4. Corn is also a very attractive alternative but faced with high drying cost
   → Is wet storage as silage an alternative?
5. More research is needed :
   a) On-farm research to verify some of the assumptions (yields and inputs for new crops, feasibility of corn for grain in SH, rotational effects etc.)
   b) Research on soybean crop management and soybean breeding
6. Exchange of experts and results with EU neighbours

Thank you for your interest in agri benchmark

jointly managed by: THÜNEN & global networks

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Comment UK

Ben Lang

agri benchmark Cash Crop Conference 2017

Berlin, Germany

14 June 2017

Rural Business Unit, Department of Land Economy

Context

Currency and prices:

- Sterling has devalued against the US dollar by 12 per cent in the last 12 months
  - Equivalent increase in crop prices and
  - Fertiliser, crop protection and energy costs
  - Price inflation including machinery

Brexit:

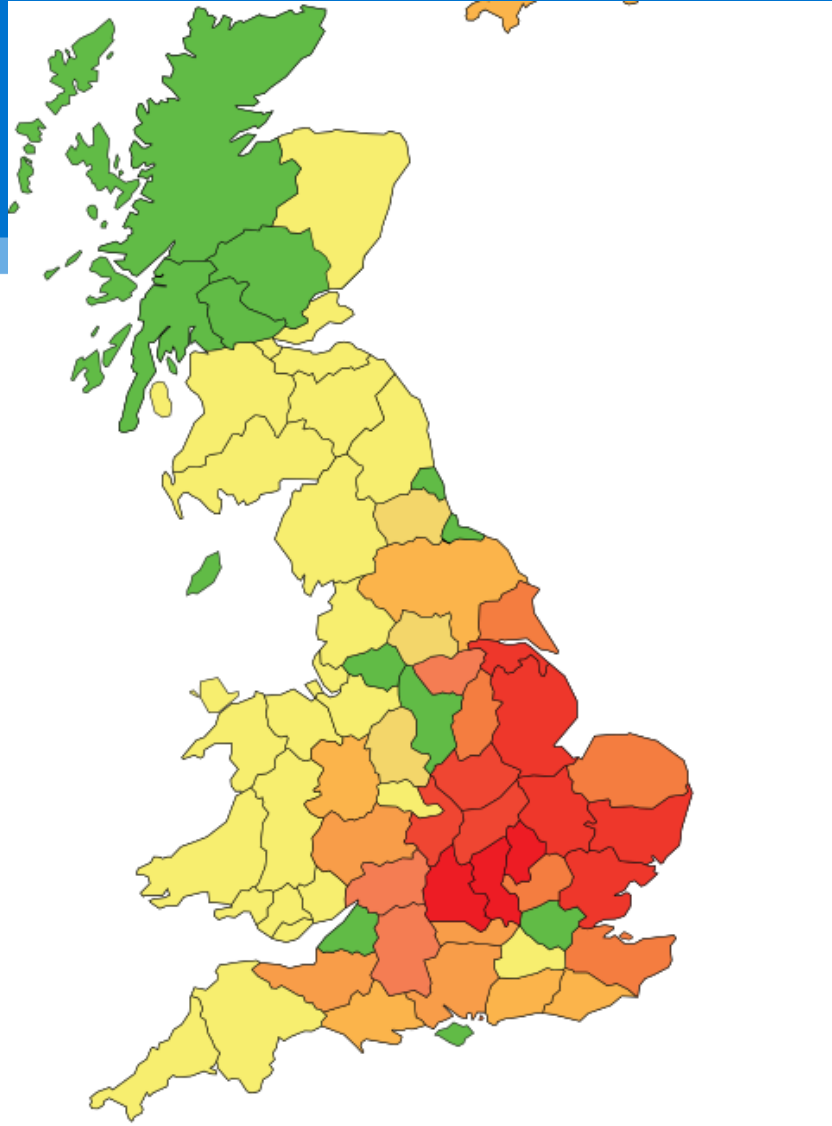
- Business uncertainty
  - Farmers advise us that they are delaying business investment (and associated borrowing)

UK Blackgrass incidence

Blackgrass favours moist soils with a relatively high clay content

Resistant blackgrass is now found throughout the crop production area of the UK (>16,000 farms) in 34 counties

A series of wet years increased blackgrass populations until 2004



Key: Incidence of spraying for black-grass

Lowest Highest

Source: Bayer CropScience

Potential yield loss due to blackgrass

Blackgrass plant population (plants per square metre)	Yield reduction (per cent)	Yield reduction (tonnes per hectare)
8 to 12	2 to 5	0.15 to 0.3
12 to 25		0.4 to 0.8
100+		1 to 2
300+	37	2.7

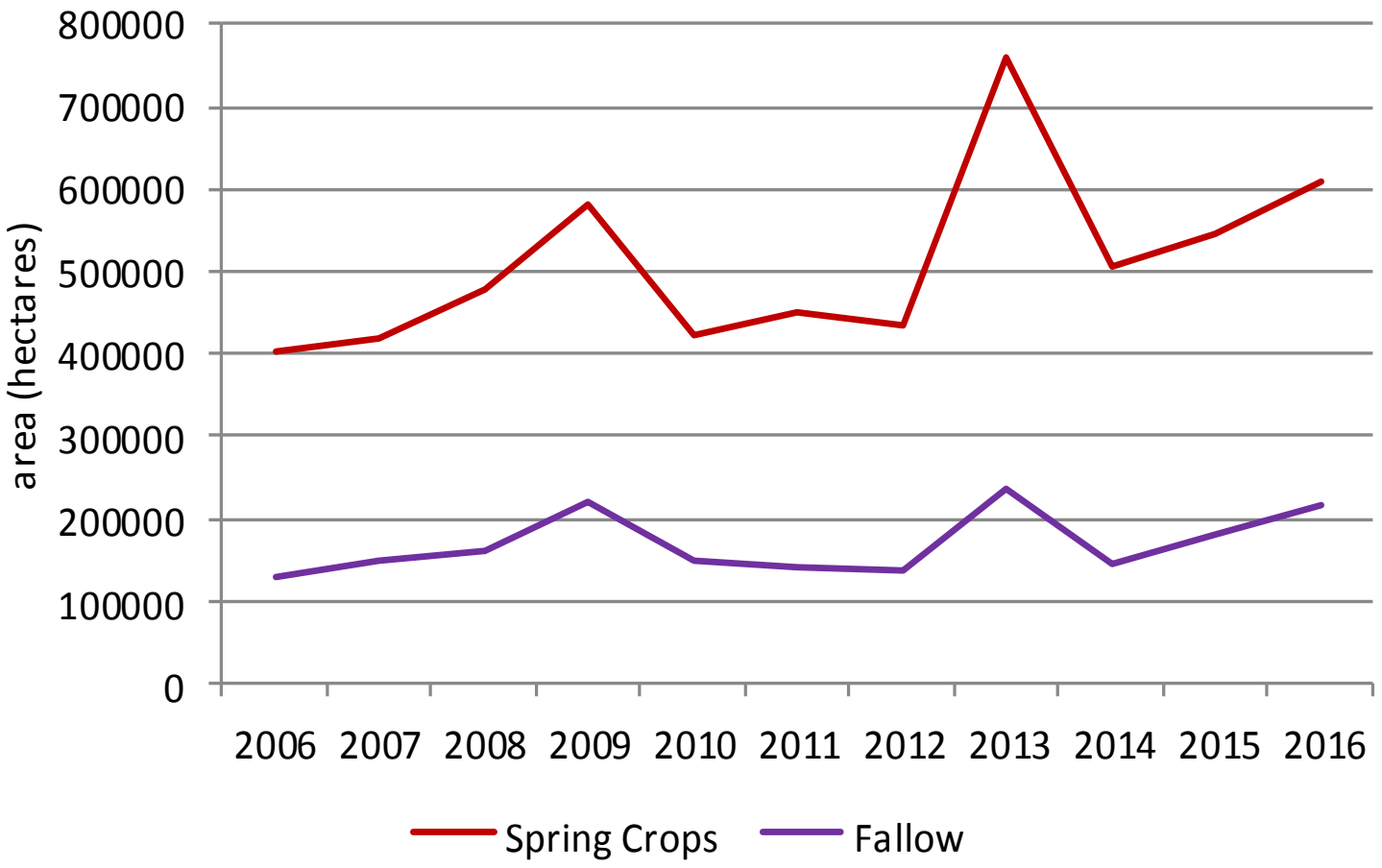
Source: Rothamstead

Control methods and seed reservoir reduction

method	Number of experiments	Mean per cent reduction of seed reservoir
Ploughing (1)	25	69
Delayed autumn drilling (2)	19	31
Higher seed rates (3)	16	26
Competitive cultivars (4)	5	22
Spring cropping	5	88
Fallow /grass leys		70 to 80 per year
Combination 1,2,3 & 4 and herbicide	Potential	99

Source: AHDB

England: Spring Crop Areas, 2006 to 2016



Source: Defra June Survey

Cabbage Stem Flea Beetle: county data

	Yield Tonnes per hectare	Gross margin £ per hectare	area sprayed %	Crop lost %
East Riding of Yorkshire	4.4	717	67	5
North Yorkshire	4.3	755	100	1
Lincolnshire	4.2	695	76	4
Northumberland	4.2	653	75	<1
Suffolk	4.1	511	91	-
Warwickshire	3.9	560	78	-
Norfolk	3.6	491	100	<1
Kent	3.5	485	75	<1
Cambridgeshire	3.3	452	94	7
Essex	3.2	538	100	11