How I implement IPM

Details of a holistic IPM strategy with low pesticide input in a German farm

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My farm

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PEDO-CLIMATIC CONTEXT

Soil:
- slate weathered soil
- brown soil

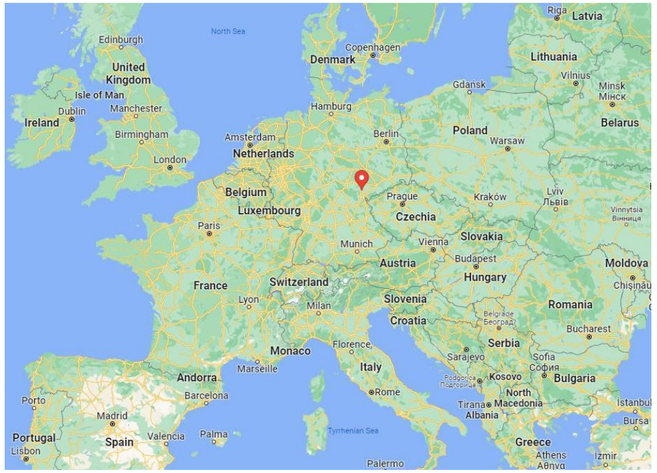
Climate:
- long-term annual mean 7.1°C; 635 mm precipitation
- pre-summer drought (May / June)

MAIN PESTS

Insects: - cabbage-stem flea beetle (*Psylliodes chrysocephala*)
- pea moth (*Cydia nigricana*)

Weeds: - catchweed (*Galium aparine*)
- cornflower (*Centaurea cyanus*)
- cutleaf geranium (*Geranium dissectum*)
- hemp-nettle (*Galeopsis*)

Diseases: are a minor issue



AGRONOMICAL CONTEXT

- 1.600 ha arable land
- Crop-rotation:
- Peas, winter barley, winter oilseed-rape, winter wheat, cover crops, maize

+ hemp, linen, spelt, alfalfa, cup-plant (*Silphium perfoliatum*)

SOCIO-ENVIRONMENTAL CONTEXT

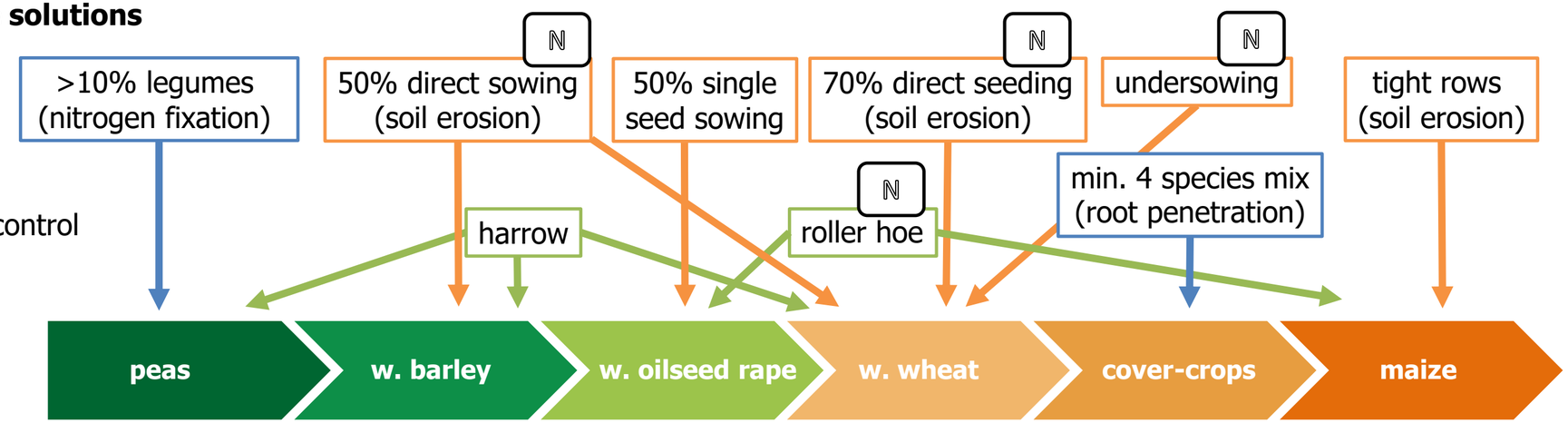
- Assurance: EMAS certified
- Regional AECM (KULAP Thuringia-measures against soil erosi
- FFH (flora-fauna-habitat)
- red areas (for Nitrogen reduction)

OBJECTIVES AND MOTIVATIONS OF THE FARMER

- To find alternative methods / solutions of plant protection to reduce chemical plant protection to the necessary minimum.
- Environmentally friendly plant production, animal welfare and sustainable energy production.
- Production of healthy food, renewable raw materials and renewable energies in ecologically intact agricultural landscapes.

My strategy

Alternative solutions



Chemicals and biocontrol

Insecticides and other pesticides*

night application of insecticides (protecting of beneficials)

Trichogramma brassicae (against corn borer)

Fungicides*

lactic acid bacteria (biostimulants)

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Herbicides*

~~**Solution**~~
mechanical: difficult timing
chemical: lack of active subsances

~~**Solution**~~
high water protiction requirements
perhaps hoe and row sprayer

liquid fertilizer (reduced herbicides)

*In green = low risk PPPs
* In blue = biocontrol agents
*In orange = synergistic effect

Legend N **New solution** ~~**Solution**~~ **Abandoned solution** **Non systematic solution**

Key measures

- **no early sowing to hamper the development of pests**
- **wide spacing between seeds**
- **high share of organic fertilisers**
- **mineral N as Ammonium**
- **increasing mechanical weed control**
- **high portion of legumes in crop rotation**
- **stable, diverse crop-rotation (use positive effects of crop-rotation)**
- **no cereals self-succession**
- **permanent soil cover (cover crops, undersowing)**
- **modern precision sprayer for more and better effectiveness (25 cm distance between nozzles)**
- **mostly no-till system**

My results

Evolution trend on the farm

Pest control

Very good	Medium	To improve
- *Cydia nigricana*	- *Septoria tritici*	- grasses
- *Aphidoidea*	- *Ostrinia nubilalis*	- weeds
- *Gastropoda*	- *Ramularia*	
- *Erysiphaceae*	- *Drechslera teres*	
- *Pucciniales*		

Evolution of use of pesticides

Very good	Medium	To improve
- seed coating	- fungicides	- herbicides (mechanical weeding)
- bio-stimulants	- insecticides	

Sustainability indicators

Very good	Medium	To improve
↘ of environmentally harmful products	↗ energy costs	↗ use of greening (intercropping, cover-crops)
↘ workload	↗ work distribution over the year	↗ expenses
↘ costs for pesticides	↗ work time requirements	↗ mechanisation load
↘ use of dangerous or toxic products (for user, consumer)	↘ use of synthetic fertilizers	↘ gross income with own consumption
↗ use of landscape effects	↗ satisfaction of the farmer and staff	= machine utilization
↘ use of fossil energies	= complexity of the farming system overload	↗ use of renewable energy

Key conclusions

Agronomic challenges:
- breaking of work peaks though use of no-till instead of ploughing
Weeds are controlled by mechanical weeding and by maintaining a rotation, which includes summer crops.
The alternate of winter and summer crops disrupts the cycle of specialised weeds.

Ecological challenges:
- keep soil-health (soil-life), humus content and fertility at a high level
- protection of surface and groundwater

Economic challenges:
- risk spreading through diverse crop rotation
- better machine utilization due to fewer work peaks

Social challenges:
- labour recruitment
- increase of salaries comparable with industry-level
- maintain acceptance of consumers

Legend

In green = positive trend
In red = negative trend
In black = comparable

= Comparable

↗ Increase
↘ Decrease

↗↗ Significant increase
↘↘ Significant decrease

Environmental indicators
Social indicators
Economical indicators

Our feedback

Regenerative agriculture has potential (permanent soil cover)
Promotion of soil structure, soil fauna and organic matter

There is no recipe for farming. We can learn from nature and should think in terms of cropping systems. Crop rotation is most important and the first step in the system. If possible, with permanent soil cover. Learn to be patient.

"Sometimes less is more"

Farmer: René Kolbe (Germany)

- As a farmer I respect nature
- further exploring the potential of regenerative agriculture
- don't aim for maximum returns
- increase plant and soil health through diverse crop rotations
- crop rotation effects enable reduced tillage
- PPP savings of up to 50% achieved through exploitation of holistic concept
- maintain animal husbandry for nutrient cycles
- increases in product quality is possible

Integrated pest management is holistically used on the arable farm presented here. By combining measures such as a diverse crop rotation, conservation tillage, permanent soil cover of fields and the use of biological plant protection products and mechanical weed control, the farmer is able to drastically reduce the use of chemical pesticides.

Hub-coach: Dr. Thomas Rottstock (Germany)

Opportunities for further development of IPM:

- acquisition of a band sprayer for e.g. rapeseed
- sowing of cover-crops into grain fields with a drone
- increase of mechanical weeding
- Possibility of investment in robotics
- deepen the approach of regenerative agriculture
- permanent soil cover (improvement of soil structure, increase of organic matter including soil fauna)

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