How I implement IPM on my farm

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

KUJAWSKO-POMORSKI AGRICULTURAL ADVISORY CENTRE in Minikowo

Jarosław Tarnicki
Voivodeship Kujawsko-Pomorskie, County Lipnowski

PEDO-CLIMATIC CONTEXT

Clay sand up to 30 cm, clay and loam below, rusty, loamy and sandy soils with a high level of groundwater.
Frequent droughts in the spring-summer period with torrential rains fall during the growing season

AGRONOMICAL CONTEXT

CROPS: beetroot, winter rape, cereals (bristle and regular wheat, rye, triticale) grown without ploughing, peas, catch crops
CROP ROTATION: sugar beet->wheat->winter rape->wheat->pea->wheat (or rye/triticale)->sugar beet
CATCH/COVER CROPS: winter catch crop for beetroot, straw left in the field, after rape, oats and phacelia as a catch crop before wheat; phacelia, lupins and oats before peas

ANIMAL PRODUCTION: pigs 1000 head per year
FARM SIZE: 100ha

MAIN PESTS

CEREAL: aphids, homoptera, heteroptera
RAPE: rape beetle, beetles turnip gall weevil
SUGAR BEET: aphid and cabbage moth

MAIN DISEASES

CEREALS fusariosis, powdery mildew, rhinchosporiosis of cerealsand septoria
OILSEED RAPE sclererotinia (cottony rot)
SUGAR BEET Cercospora Leaf Spot
PEA Fusarium wilt, Legume root rot

MAIN WEEDS

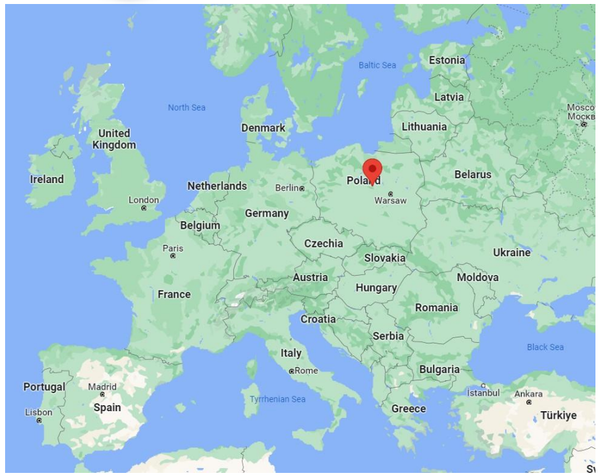
CEREALS: common windgrass, comon poppy, red-root amaranth, cornflower, field chamomile,
RAPE: cornflower and field chamomile
SUGAR BEET: lambsquarters, volunteer rape, field chamomile, monocots
PEAS: monocots and field chamomile

SOCIO-ENVIRONMENTAL CONTEXT

The use of "Greening", the farm area includes ecological focus areas (EFA), maintenance of meadows, buffer strips at least two meters from ponds and ditches.
Use of insect biocontrol agents.
A generational farm, independently run.

OBJECTIVES AND MOTIVATIONS OF THE FARMER

Innovation and development of the farm's potential, use of cereal mixtures, research and identifying the most effective crop varieties. Also keen to strengthen farm profitability, reduce PPP doses (30-50%) by using better and better adjuvants, share knowledge and experience with other farmers, test new machines and technological solutions, gain certification for quality systems and strive for agriculture 4.0 and carbon agriculture



My strategy

Alternative solutions

ℕ Attracting beneficial insects and pollinators with molasses, ℕ chitosan as a biostimulator

Agronomical

ℕ Sowing mixtures of cereal varieties (bony + non-bony), sowing other species adapted to soil conditions, no-tillage cultivation of cereals, foliar nutrients with microelements (B, Mn, Mg and calcium) in appropriate development stages, only night PPP treatments (after 10 pm), use of own slurry, modern precise GPS equipment, soil always covered with plants.

Genetics

Selection of resistant varieties adapted to the prevailing soil and climatic conditions

Physical control

Yellow dishes, various types of sticky boards before the first treatment, field inspection of crops every 1-3 days depending on the conditions, mechanical weeding with a harrow weeder

SUGAR BEET	WHEAT no till, straw not harvested	WINTER RAPE (catch crop oat, phacelia)	WHEAT winter catch crop, no till, unharvested straw	PEA	RYE/ TRITICALE winter catch crop	WHEAT winter catch crop, no till, unharvested straw

Chemicals and biocontrol

Insecticides and other pesticides*

Fungicides*

Herbicides*

*In green = low risk PPPs
* In blue = biocontrol agents

Only used after confirming the severity of the infestation and with economic justification

Rotation of active substances, dose reduction by using modern equipment, adjuvants, taking into account insect development cycles.

Does not use 1st and 2nd category PPPs

Key measures

- **Selection of varieties resistant to drought stress, strong solar radiation, diseases and with potential for high yield on poorer soils (COBORU research and German DLG recommendations)**
- **Determination of the nitrogen content in the soil before the first doses of N fertilizer are applied**
- **Selection of PPPs so that they do not overlap (5-6 years of rotation), as few sulfonureas used as possible and adjuvants always used**
- **Everything precisely applied using GPS**

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

My results

Comparison with standards

Pests control

Very good	Medium	To improve
insect and weed control.resistance of cultivars to temperature and fungal diseases	development of mineral fertilization, mapping of soils and their structure	buffer zones (midfield flower strips, woodlots)

Evolution of use of pesticides

Very good	Medium	To improve
lower use of all PPP, precise application of PPP,water acidification	effectiveness of the usedadjuvants	the effectiveness of the PPP, whichcan be used at low temperatures

Legend

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

Sustainability indicators

Very good

- ↘↘ Use of dangerous or toxic products for the user (and the consumer)
- ↘ Use of chemical fertilizers
- = Establishment of grass cover or multi-annual crops
- ↘ Use of dangerous or toxic products for the user (and the consumer)
- ↗ Complexity"of the cropping system
- = Drudgery of work
- ↗ Level of overall satisfaction of the farmer and his/her entourage
- ↘ Pesticides costs
- ↗ Real gross product with self-consumption
- ↗ Actual mechanization load

Medium

- ↘ Use of fossil energy
- ↗ Use of conservation biological control [landscaping]
- ↗ Equipment usage time
- = Distribution of work over the year
- ↘ Workload
- ↗ Energy costs
- ↘ Standardized operating expenses
- ↗ Semi-net margin

To improve

- ↗↗ Use of sustainable energy

Legend

= Comparable
↗ Increase
↘ Decrease
↗↗ Significant increase
↘↘ Significant decrease

Environmental indicators
Social indicators
Economical indicators

Key conclusions

- **Analysis of soil, its structureand profile, selection of varieties resistant to drought, diseases, heat stress and appropriate crop rotation and the use of catch crops.**
- **Management of fertilization and PPP including pest monitoring analyses, and the use of adjuvants alongside with water acidification in order to reduce the dose of PPP used.**
- **Rethinking whether the use of PPP is necessary and economically justified.**

Our feedback

“ We are moving forward all the time, testing things, counting all the costs, using catch crops, using farming 4.0. PPPs that can be used at lower temperatures are missing.

Farmer: Jarosław Tarnicki (Poland)

It is important not to overinvest. It is good to use modern machines, crop rotation, increase efficiency, reduce production costs and reduce the impact of PPP on the environment.

Acceptance of certain diseases that do not affect the yield. Daily monitoring, selection of better and better varieties
Integrated Production and carbon farming are the next challenges.

Limitations: Costs of purchasing modern equipment

“ A great example of how specialist knowledge and a constant drive to improve applied practices translate into production results. The willingness to share knowledge and experience greatly facilitates the transfer of knowledge and proven solutions.

Hub coach: Josip Zubac (Poland)

Challenges to be overcome in future:

- Adaptation of quality systems like "Integrated Production”
- carbon farming
- more precise field mapping,
- testing promising biological methods of pest control
- increasing the share of midfield biodiversity belts
- greater use of renewable energy

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339