



HOLISTIC RESOURCE MANAGEMENT FOR
CLIMATE RESILIENCE OF FARMING

Farm Analysis Report EKOFARMA PROBIO s.r.o., Czech Republic ClimateFarming

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Introduction:

The Farm Analysis Report is based on Step 1 (Farm Survey) and Step 2 (Farm Vulnerability) of the ClimateFarming Cycle. It should consist of:

Step 1: Farm Survey and Soil- and Site-Assessment

see Annex 1 and 2

Farm Survey of the partner farm EKO FARMA PROBIO s.r.o.

See Annex 1

Soil- and Site-Assessment of the partner farm EKO FARMA PROBIO s.r.o.

See Annex 2

Farm Objectives of the partner farm EKO FARMA PROBIO s.r.o.

Qualitative Farm Objectives

1. Economic Objectives:

- EKO FARMA PROBIO s.r.o. want to increase its net income annually by implementing climate friendly approaches

2. Ecological Objectives

- Be as environmentally friendly as possible (low GHG-emissions; beneficial for biodiversity; no/minimal negative impacts on water and air quality)

3. Social Objectives

- Improve facilities at the farm to accommodate more people for demonstrational events or weekend workshops. The demand is higher than actual capacity
- b. Help to improve quality of live in the rural area of Velké Hostěrádky (clean underground water, no erosion events)

4. Other Objectives

- Ensure stable production of crops for mills of sister company PROBIO

Quantitative Farm Objectives

1. Economic Objectives

- The five-year average net margin should be at least 120,000 € annually

Time-horizon: This objective should be achieved every year

2. Ecological Objectives

- No erosion events

Time-horizon: This objective should be achieved in 2024 after an implementation of field optimization

- b. Finish agroforestry project

Time-horizon: This objective should be achieved in 2024

3. Social Objectives

- Help to improve quality of live in the rural area of Velké Hostěrádky
 - Provide employment in the scope of the farm - new tractor driver/farm hand - the oldest tractor driver is 73 years old

1. Time-horizon: This objective should be achieved in following years



Step 2 of the ClimateFraming Cycle

SWOT-Analysis results of the partner farm EKOFARMA PROBIO s.r.o.

Strengths

- Advanced environmental protection methods
- Appealing farm environment to some
- Decent degree of mechanisation and capacity
- Well connected (other farmers, associations, advisory services etc.)
- High level of animal welfare
- Well established crop raw products retail to PROBIO
- Post harvest and sufficient storage capacity
- High crop quality due to arid environment
- All the fields are very close to the farm and bordering with conventional agriculture is minimal

Weaknesses

- High workload during peak season - elderly farm staff
- Moderate soil qualities
- Utilisation of organic nitrogen
- Sometimes lower yields
- High perennial weed pressure
- High dependence on arable crops

Opportunities

- Increasing share of environmentally concerned consumers
- Leading farm of the farm cluster in Velké Hostěrádky, big chance to cooperate with other farmers to grow more for PROBIO mills
- Demonstrational farm of Czech ministry of Agriculture - can serve as knowledge base platform for cooperating farmers of PROBIO mills
- Introduction of more drought adapted crops
- Longer vegetation period
- Production of seeds for cover crop mixtures
- Better utilisation of organic nitrogen after termination of alfalfa leys using Treffler system - shallow tillage
- On going Demeter certification - the farm holds a status/label - "In conversion to Demeter"

Threats

- Low yields
- Low prices for raw products
- Volatile organic market
- Complicated decision making on the farm level - too many actors
- Extreme weather conditions

BONUS: TOWS-Analysis

Strengths/Opportunities

- Cattle production - more manure and better utilisation of alfalfa which currently being mulched
- Agritourism potential - direct marketing of farm products. Other enterprises on the farm that can sell their products - vegetables and processed vegetable/fruit products along with farm products - mill products. The direct sale should be straightforward and easy to maintain - for example self-service booths.



- On-farm processing of crop products - dehusking of spelt to reduce the transportation costs to the mills

Strengths/Threats

- Build rainwater harvesting
- Leader in organic farming within farm cluster
- Longer vegetation period

Weaknesses/Opportunities

- Not easy communication within the farm cluster, potential to market as a group
- Demeter standard, extra workload to fulfil the requirements of the standard
- Utilisation of alfalfa - better management through using it as feed to cows

Weaknesses/Threats

- Arid environment
- Elderly staff
- Unclear future structure
- A lot of winter crops - danger of soil borne diseases
- Heavily dependent on soil cultivation

Climate Impact Exploration and/or Regional Climate Projections and Interpretation

Past Climate Events

- Uneven distribution of rain since 2018
- Wet autumn in 2020 - a lot of autumn sowing had to be postponed to spring
- Annual erosion events until 2008

Increasing variability of yields

- Higher dependency on timely rainfall due to lack of soil water
- Increasing frequency of spring droughts
- Variety availability - good availability for winter wheat, worse in naked oats, which are easy to market, but low yields

Future Climate Impact

Temperature

- Higher temperatures in spring
 - Could enable earlier sowing of heat-adapted crops (e.g. chickpea)
 - Will most likely have a negative impact on peas

Hot Days

- Hot days during sensible growing phase
 - Could reduce yields and qualities in crops
- Increasing heat stress for livestock
 - Could make additional weather protection necessary
- Increasing heat stress during work
 - Could lower productivity; probably shift in working hours necessary

Dry periods

- Dry periods in spring
 - limit crop choice (summer crops are hard to establish)
 - reduced mineralisation → worse plant development



- less annual weeds, but more perennial weeds
- Lower yields in arable crop production if crop rotation are not adapted
- Lower forage yields (silage and hay)
- Worse development of legume stands cause less N-fixation → worse development of following crop, some pulses will be not possible to grow
- Overall economic performance of the farm is endangered

Precipitation

- Wet periods
 - Limited field accessibility could increase weed pressure
 - Bad for autumn sowing
 - Probably higher energy costs for drying
 - More soil compaction
- Heavy precipitation
 - Many fields with slopes → High risk concerning water erosion

Frost

- Earlier sowing of crops susceptible to frost could entail risk
- Lack of frost (winter) could negatively impact soil conditions
- Lack of frost (winter) could negatively impact winter crops dependent on vernalization
- Lack of frost will have an effect on soil cultivation - ploughing will be more difficult, since the frost won't break up the soil lumps

Hail, Wind and Storm

- More severe and frequent storms/hail events could cause higher maintenance cost on infrastructure
- More severe and frequent storms/hail events could damage the crops

Prioritisation of adaptation needs

- Vulnerability towards drought and dry conditions
- Improvement of soils and nutrient availability
- Improvement of income through expansion of direct marketing
- Decrease the chance of soil erosion
- New employment opportunities
- Improve farm management and processes to reduce transportation costs

Comments:

SWOT-Analysis

The group decision room method was applied in order to collect aspects for the SWOT-Analysis

- Explanation: In order to collect many different opinions and perspectives about the current situation of the farm without a hierarchical order or the influence of opinion leaders, all farm members had to conduct a first SWOT analysis on their own. This includes writing strengths, weaknesses, opportunities and threats on separate pieces of paper and collect all written bullet points according to the individual categories. Afterwards, the analyst writes down the bullet points in random order, so that a SWOT matrix is produced. The individual categories were discussed afterwards.

Bonus: TOWS-Analysis



Co-funded by
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The TOWS-Analysis (see ClimateFarming Trainer Handbook) was applied for EKOFARMA PROBIO s.r.o. due to the complexity of the farm (various production branches) and the various aspects which were identified in the SWOT-Analysis and the complexity of the farm. The goal was to make prioritisation of adaptation needs easier.



ClimateFarming

Farm Survey

Documentation form

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Contact

Name	EKOFARMA PROBIO s.r.o.
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1. General farm information 🌱

Total farm area [ha]	371
Production branches	Mixed-farm: <ul style="list-style-type: none">• arable crop production• pigs' feedlot

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<https://www.asociaceampi.cz/>

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EKOFARMA PROBIO s.r.o. - Velké Hostěrádky 224, 674 91, Velké Hostěrádky

Certifications (EU-organic, other organic, etc.)	x yes <input type="checkbox"/> no if yes, please specify: Demeter in conversion
Marketing / sales channels	<ul style="list-style-type: none"> • arable crops: conventional selling channels (organic bulk buyer), hay direct marketing • pigs: direct marketing of live pigs and retail to organic butcher of live pigs
Other on-farm establishments	<ul style="list-style-type: none"> • in process agroforestry

Farm location within region	Located in a small village (~500 inhabitants); about 40 minutes away south of Brno.
Main soil type & texture	Most of the soil are slightly clayey loam (Lt2)

Wind (direction, peak velocities)	-
Precipitation [mm] (mean, min, max, per season, peaks)	450 mm/y (theoretically); since 2020 ≤ 550 mm/y - but uneven distribution
Temperature [°C] (mean, min, max, per season)	10 - 11 °C
Average amount of days < 0°C per year	30 d/y
Experienced/ historic extreme weather events	X yes <input type="checkbox"/> no if yes, please specify: 2020 - wet autumn
Vulnerable sites within farm	85 % of land is threatened by erosion according to Czech law.

1.1. Farm overview

Farm areas	Own property [ha]/ leased [ha]	Total [ha]	Number of fields	Remarks
Arable land	Owned: 125 ha / leased: 246 ha	371	28	Production of cereals and pulses. Everything is grown in narrow row spacing due to erosion threat. Emphasis on introduction of cover crops. Alfalfa leys for 2 years within one crop rotation.

Cropping

Culture(s)/ Rotation	Area [ha]	Yield [t/ha]	Marketing/ Use
Culture(s)/ Rotation	Area [ha]	Yield [t/ha]	Marketing/ Use
Arable crops			
Spring barley	8,15	4	Sold to a processor (PROBIO) for pot barley
Buckwheat	64,88	total 20 t	Sold to a processor (PROBIO) for groats and flour
Crimson clover	34,65	0,6	Seed production
Einkorn	11,10	2	Sold to a processor (PROBIO)
Oats (naked)	48,22	2	Sold to a processor (PROBIO) for flake production

Peas	29,80	2	Sold to a processor (PROBIO)
Sorghum	0,43	-	Failed
Winterspelt	69,79	3	Sold to a processor (PROBIO)
Winter wheat	45,27	3 - 4	Sold to a processor (PROBIO)
Fallow	1,35	-	-
Fodder legumes			
Alfalfa	103,13	-	Fertility ley

Animals in 2023

Species	Amount	Husbandry system	Output	Marketing/ Use
Pigs feedlot	456	8 indoor/outdoor pens	456	Sold to an organic butcher (90%) 10% sold to locals.
Sheep (Oxford down)	14	Lawn mowers	appx. 15 lambs	Lambs for a grill
Ram	1	Lawn mower	Insemination	Being a ram

Source of animal feed:	Forage is produced on-farm; pigs are fed the leftovers from PROBIO mills.
If applicable, grazing system:	Extensive sheep pasture within the farm side. The farm side has 4 ha..

1.2. Ownership structure & decision making 🌱

Legal owners	13 legal owners, but 3 owners have the
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	majority of shares - 89%, 2 of the owners are executive directors
Lease agreements, generation changes or farm transfers	Not relevant for this farm structure.
Other involved parties for decision making	None.

1.3. Workforce, facilities and machinery 🌱

Staff per production branch	<ul style="list-style-type: none"> • 2 tractor drivers full-time • 1 apprentice part time • 1 farm manager • 1 farm assistant • Part time helpers during peak season
Training and education of persons involved at the farm	M.Sc. Rural development - farm manager
Special knowledge and skills	Post harvest site - drying and storing large quantities of produce - appx. 500 - 600 tons.
Additional workforce	Two newcomers experimenting with small scale vegetable production in the scope on one field of Hof Tolle
Facilities	<ul style="list-style-type: none"> • Administrative building: Office and a room for an apprentice • Basic workshop for repairing machinery • Seed storage hall • Grain storage, straw and hay storage, pigs feedlot, manure and compost side • Machinery hall: None • Meeting room for about 80 people
Machinery	<ul style="list-style-type: none"> • 2x Mouldboard Ploughs, 2x tine harrows, weed tine harrow, 2x disc cultivators (one equipped with a seeder), seedbed compactor, disc drill, Treffler

	<p>system - TGA and TF, 2 drum mowers, a tedder, a rake, loader wagon, 3x John Deere tractors (8300, 7810, 6520), Zetor 7745, Forklift loader Merlo 38.10, 2x grain trailers, power harrow, muck spreader, sprayer.</p> <ul style="list-style-type: none"> ● 90% of field work is conducted with own machinery, excluding harvesting
Agricultural contractors	Dependence on external service providers for forage (silage/hay/straw) production and harvesting.

1.4. Economic background 🌱

Economic situation	Cost-covering with high shares for re-investment; in extreme years partly financed by off-farm income
Average farm investment sum (5-year period)	250 000 €
Planned/ necessary expenditures	Spelt dehulling technology, new tractor/autonomous tractor, muck spreader.
Relative contribution of branches to income	<ul style="list-style-type: none"> ● Arable production: 85% ● Animal production: 15%

1.5. Climate change ★

Farm climate balance	<input type="checkbox"/> available <input checked="" type="checkbox"/> planned <input type="checkbox"/> neither
Observed climatic changes	<p>Drought and heat events aggravated and constitute the main challenges</p> <ul style="list-style-type: none"> ● Extended spring drought ● Early heat waves (April/May) ● Probably elongated growing period (till November/December)
Climate mitigation measures	<ul style="list-style-type: none"> ● Agroforestry ● Increasing the organic matter

	content in soils - 1 000 tons of inputs - cow manure/compost (purchased)
Climate adaptation measures	<ul style="list-style-type: none"> • Smaller plots to minimize the erosion impact • Further income diversification? • Intensifying cover + summer cover crops • Two main crops a year - buckwheat as a second crop



1.6. Formulation of goals and priorities

How important are...	Very Important	Important	Positive side effect	Not important
Economic performance	X			
Providing a livelihood for yourself/ family/ employees	X			
Diverse product range			X	
Self-sufficiency		X		
Higher yields	X			
Local/ heritage varieties				X
Processing	X			
Biodiversity	X			
Biotope connectivity		X		
Promoting beneficial insects/ animals	X			
Wind protection	X			
Improving soil health/ soil quality	X			
Preventing soil compaction	X			

Improving water balance (on landscape level)	X			
Preventing nutrient leaching		X		
Reducing greenhouse gas emissions / climate mitigation			X	
Carbon storage		X		
Climate adaptation	X			
Shade for animals	X			
Fodder quality		X		
Scenery/ landscape design		X		
Independence from external inputs		X		
Other: Have fun	X			


2. Site Assessment

2.1. General information 🌱

Site name	
Lot number / Site ID	
Site location	
GPS coordinates	
Site area [ha]	
Land manager	
Current land use 	
Vegetation/ crops 	

Distance from main production facilities [km]	
Means of transport & time needed	
Relevance of site within farm	
Reasonable intervals for management/ observations	
Reasons for choosing this site	
Zonation short explanation: (Please attach sketch with GPS coordinates of zones)	

Per zone:

GPS coordinates/ Zone map:	
Characterize zone: 	Zone ID:

Sample IDs:

2.2. Management history

Previous farm manager(s)	
Crops /-rotations	
Amendments, incl. crop residues	
Tillage regime	
Machinery use	
Other practices	

2.3. Protection status

Any/ which protection status?	
Influence on farming decisions	

2.4. Climate/weather

Wind (direction, peak velocities)	
Precipitation [mm] (mean, min, max, per season, peaks)	
Temperature [°C] (mean, min, max, per season)	
Average hours of sunlight per year	
Average amount of days < 0°C	
Local climate projections	
Experienced/ historic extreme weather events	
Personal estimation of future climatic tendencies	

Vulnerable sites within farm	
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2.5. Topography & terrain 🌱 (★)

Altitude [m a.s.l.]	
Slope inclination, exposition	
Sunlight, shade, rain	
Surface runoff, erosion areas	

2.6. Landscape elements, compaction, drainage & surrounding vegetation 🌱 (★)

Waterlogging / Infiltration	
Compacted areas	
Drainage structures	
Water table [m]	

Trees, shrubs, other perennials	
Wetland areas, ponds	
Depressions, hills	
Power lines, pipes, underground cables	

★ Phenological indicators	
★ Species composition	
★ Plant communities	
★ Growth rate, yield	






2.7. Existing cultures 🌱 (★)

Field journal	<input type="checkbox"/> yes <input type="checkbox"/> no
Diseases, pests	
Root or harvest residues	
Height & uniformity of cultures	
Yield	
Deficiencies, excess	
★ Phenological development stages	
★ Grasses: tillering rates	
★ Brix level of leafsap	
★ Micro-, macronutrients of leafsap	
★ Indicator plants: <ul style="list-style-type: none"> - nitrogen - water - compaction - salt 	

2.8. Issues & optimisation 🌱


Microclimate (e.g. late frosts)	
Weeds or pests	
Erosion (water/ wind)	
Water balance/ management	
Biodiversity	
Wildlife	
Others	

3. Soil Assessment

Date:
Authors:
Weather:     
Air temperature: _____ °C

3.1. Visual Soil Assessment and Extended Spade Test




3.1.1. Surface analysis

<input type="checkbox"/> wheel tracks <input type="checkbox"/> wind erosion <input type="checkbox"/> water erosion (rills/gullies) <input type="checkbox"/> surface ponding <input type="checkbox"/> crusting <input type="checkbox"/> cracks 
Ground cover: <input type="checkbox"/> <30% <input type="checkbox"/> 30-70% <input type="checkbox"/> >70%

Organic matter, root and harvest residues

<input type="checkbox"/> none <input type="checkbox"/> little <input type="checkbox"/> moderate <input type="checkbox"/> many
Describe: _____

3.1.3. Soil structure assessment

Horizon	Score	Notes
Surface (0-2) cm		
Topsoil (0-15 cm)		
Subsoil (15-30 cm)		

3.1.4. Root assessment:

Horizon	Score	Notes
Topsoil (0-15 cm)		
Subsoil (15-30 cm)		

3.1.6. Aggregate stability test / Slaking test

Horizon	# stable aggregates	# completely slaked aggregates	% stable aggregates	Notes
Topsoil (0-15 cm)				
Subsoil (15-30 cm)				

3.1.7. Assessment Score

Soil structure index

$$= \left(\frac{\quad \times \quad}{2} \right) + \left(\frac{\text{soil score}_{\text{subsoil}} \times \text{aggregate stability}_{\text{subsoil}}}{2} \right)$$

Zone ID	Horizon	Root score	Soil structure score	% stable aggregates	Overall soil structure index
	Surface (0-1 cm)				
	Topsoil (0-15 cm)				
	Subsoil (15-30 cm)				
	Total (=Topsoil + Subsoil)				

3.2. Root indicators

- **White root tips:** none few moderate many all



- **Soil attached to roots:** none little moderate a lot

- **Smell:** pleasant/earthy foul/putrid/rotten eggs fungal/ fresh forest soil like the plantation (e.g. carrots) no smell (also not earthy) other, describe:

- **Root nodules on legumes (per plant):** none few moderate many on every root

→ **nodule colour on the inside:** reddish/pink greyish green or brown other, describe: _____

- **Root orientation/ root barriers (mechanical/ chemical)::**

- **Root depth:** most roots: _____ cm, deepest root: _____ cm


- **Visible Mycorrhizae:** none few moderate many

Space for additional notes:

Remember to:

- draw a map of zones within every field
- take pictures of the soil pits with a measuring tape
- take soil samples and note sample IDs

 **Time needed to assess this zone:** _____

 **If you are doing the base case scenario, you are done with the Soil Assessment. Well done!**

 **For best-case scenario, continue:**

3.3. Soil texture (Soil Ribbon Test) ★

Coarse: sand loamy sand clayey sand

Medium: sandy loam* silt or silt loam loam

Fine: sandy clay loam silty clay loam clay loam

sandy clay silty clay clay

*moderately coarse

3.4. Other Soil indicators ★

- **Carbonate testing:** no bubbling only audible slight bubbling strong bubbling

- **Moisture:** dry slightly moist moist very moist wet

- **Smell:** pleasant/earthy foul/putrid/rotten eggs fungal/ fresh forest soil like the plantation (e.g. carrots) no smell (also not earthy) other, describe:

- **Colour:** dark brown light brown grey/blue/greenish white reddish/orange
 other, describe:

- **Mottles:** none gray/blue/greenish orange/red; **if present, how many?**
_____ %

- **Soil pit:** describe and sketch:

depth of A-horizon: _____ cm

- **Compaction:** yes no; if yes, at which depth: _____ cm/ _____ cm/ _____ cm

- **Soil depth:** _____ cm, **Bedrock depth:** _____ cm,

Groundwater depth: _____ cm

- Volumetric stone content: %

Space for additional notes:

3.5. Earthworms ★

Earthworm number in 20cm x 20cm x 20cm of soil:


3.6. Infiltration test ★

Infiltration time #1:

Infiltration time #2:

Infiltration time #3:

Infiltration rate:

 Time needed to assess this zone (base+best-case scenario): +
..... min.