







GREEN AGRICULTURE

SUSTAINABLE AGRICULTURE MEASURES IMPLEMENTATION IN THE DANUBE REGION – CASE STUDIES

INTRODUCTION

Agriculture faces many challenges as well as requirements related to natural resources, production technologies and methods, food safety, and quality. The society also has high expectations for rural areas. **Agriculture is expected to be productive, competitive and economically attractive, resilient, and environmentally sustainable.** The countryside, which is mostly characterized by agricultural production, is expected to be attractive to non-agricultural population and to various economic activities. Food and the environment are becoming progressively important areas of interest in modern society. Most countries are also increasing their emphasis, especially in the light of current situation and climate change impacts, to ensure an adequate level of self-sufficiency in food products and to ensure food security. Current trends boost

- locally produced food with known and controlled origins,
- short retail chains leaving a smaller environmental footprint,
- providing employment and adequate income for local growers.

Agricultural production is considered as a biggest diffuse Nitrogen pollution source of the water controlled by the Nitrates Directive (91/676/EEC).

For sustainable agriculture production, decoupling of its intensification from water pollution is inevitable.

waterquality.danube-region.eu

KEY DOCUMENTS FOR AGRICULTURE RESHAPING

European Green Deal, approved in 2020, is a group of policy initiatives of the European Commission with the aim to reach climate neutrality in Europe by 2050. Elements of the EU Green Deal are for example Zero Pollution Plan (eliminating pollution), Farm to Fork or EU Biodiversity strategy (preserving biodiversity).

- Zero Pollution Action Plan is for air, water and soil pollution to be reduced to levels no longer considered harmful to health and natural ecosystems, that respect the boundaries with which our planet can cope, thereby creating a toxic-free environment. The EU will reduce its net greenhouse gas emission by at least 55% by 2030, compared to 1990 levels, as agreed in the EU Climate Law. Another objective is improvement of soil quality by reducing nutrient losses and chemical pesticides' use by 50%.
- ▶ EU Biodiversity strategy for 2030 is a comprehensive, ambitious and long-term plan to protect nature and reverse the degradation of ecosystems. The strategy aims to put Europe's biodiversity on a path to recovery by 2030, for the benefit of people, climate and the planet. In the post-COVID-19 context, the strategy aims to build our societies' resilience to future threats such as
 - » the impacts of climate change
 - » forest fires
 - » food insecurity
 - » disease outbreaks including by protecting wildlife and fighting illegal wildlife trade
- Farm to Fork Strategy is at the heart of the European Green Deal aiming to make food systems fair, healthy and environmentally-friendly. Putting our food systems on a sustainable path also brings new opportunities for operators in the food value chain. The Farm2Fork Strategy aims to accelerate our transition to a sustainable food system that should:
 - » have a neutral or positive environmental impact
 - » help to mitigate climate change and adapt to its impacts
 - » reverse the loss of biodiversity
 - » ensure food security, nutrition and public health, making sure that everyone has access to sufficient, safe, nutritious, sustainable food
 - » preserve affordability of food while generating fairer economic returns, fostering competitiveness of the EU supply sector and promoting fair trade.



- - New Common Agricultural Policy (CAP) as a key to securing the future of agriculture and forestry in EU countries, as well as achieving the objectives of the European Green Deal (2023-2027) was adopted in December 2021 and will be applied to the period 2023-2027. The new legislation will seek to ensure a sustainable future for European farmers, provide more targeted support to smaller farms, and allow greater flexibility for EU countries to adapt measures to local conditions. The policy focuses on 10 spe-

cific objectives, linked to common EU goals for social, environmental, and economic sustainability in agriculture and rural areas. Each EU country will design a national CAP strategic plan, combining funding for income support, rural development, and market measures. KNOWLEDGE AND INNOVATION

- Council Directive 91/676/EEC (Nitrates Directive) of 12 December 1991 concerning the protection of FOOD & HEALTH waters against pollution caused by nitrates from agricultural sources requires Member States to apply agricultural action programme measures throughout their whole territory or within discrete Nitrate Vulnerable Zones. Action programme measures are required to promote best practice in the use and storage of fertiliser and manure by 4 key measures:
 - » Limiting inorganic Nitrate fertiliser application to crop requirements.
 - » Limiting organic manure applications.
 - » Seasonal restrictions on the application of slurry, manure sand sludge on sandy and shallow soils.
 - » Maintenance of farm records that encompass cropping, livestock numbers and fertiliser management.

THE NITRATES DIRECTIVE IN A NUTSHELL



Nitrogen is a vital nutrient that helps plants and crops grow, but high concentrations are harmful to people and nature.



Pure, clean water is vital to human health and to natural ecosystems.

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COMPETITIVENESS

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RURAL

THE 10 CAP OBJECTIVES

FAIR INCOME

Excess nitrogen from agricultural sources is one of the main causes of water pollution in Europe.

FOOD VALUE

GENERATIONAL

RENEWAL

CLIMATE CHANGE

LANDSCAPES

ENVIRONMENTAL

The EU wants to reduce water pollution caused by nitrates used in agriculture and sets out steps for EU countries to take



MEASURES FROM NITRATE ACTION PROGRAMME APPLIED IN THE DANUBE REGION

Moscuros	۸т	BC.	μр	67	DE	шп	PO	cı⁄	cı
DI ANNING: DISK ASSESSMENT								51	
Risk map					x				
Field risk assessment					x				
PLANNING: CROPPING AND GRAZING									
Prohibited or required cropping				х	х				
Prohibited and permitted grazing						Х			
Grazing closed periods						х			
PLANNING: NUTRIENT BALANCING									
Farm nutrient balance				Х	Х	Х			
PLANNING: FERTILISER PLANNING									
Fertilisation plan for nitrogen		X	X	X	X	X		X	X
Fertilisation plan for phosphorus Soil sempling			×					X	
Education and training						x	x		
PLANNING: RECORD KEEPING									
Farm records	Х		х		х	Х	х	Х	Х
Field records	х			х	x	х	х	х	х
FERTILISER STORAGE: MANURE STORAGE - PERMANENT									
Processing of livestock manures			х						
Manure, slurry and effluent storage period and capacity	X	X	X	x	x	x	X	х	X
Maximum duration of manure storage in permanent stores					Х				
Export of manure from the farm			X				X		X
Distance between permanent manure stores and surface water		X				X	X		
Distance between permanent manure stores and groundwater sources						X	X		
Distance between permanent manufe stores and other realures		~					×	v	
Design and construction of farmvard buildings and infrastructure	×					^	^		
FERTILISER STORAGE: MANURE STORAGE - TEMPORARY FIELD									
Conditions for field manure heaps	х	х		х		х	х	х	х
Temporary manure heap closed periods						х			
Minimum storage time before storage in temporary heap	х			х				х	
Duration of temporary manure heaps	х			х		х	х	х	х
Minimum time before a site can be used again for a temporary manure heap	Х			х		X	X	Х	Х
Covering temporary manure heaps							Х		Х
Distance between temporary manure heaps and surface water	Х			Х		Х	Х	Х	Х
Distance between temporary manure heaps and groundwater sources							X		
									X
Design and construction of stores for inorganic fertilisers		x							
APPLICATION: CONDITIONS									
Climate and soil conditions that prohibit the use of fertilisers	Х	х	х	х	х	х	х	х	х
Prohibition of fertilisers on sloping land		х	х	х	х	х	х	х	
Prohibition of fertilisers where groundwater is close to surface			х						
Land uses which prohibit fertiliser use			Х			Х			Х
APPLICATION: NUTRIENT OR QUANTITY LIMITS									
Farm limit for nitrogen from organic manures	X	X	X	X	X	X	X	X	X
Field limit for hitrogen from organic manures						X			
Field limit for could introgen	X	X	X	X		X	X	X	X
APPLICATION: TIMING	×			~				~	X
Closed periods when the application of fertilisers is prohibited	х	x	x	x	x	х	х	х	х
Field limit on application amounts at specific times				х	х			х	
APPLICATION: LOCATION									
Distance between the application of inorganic fertilisers and surface water	Х	х	х	х	х	Х	Х	Х	
Distance between the application of inorganic fertilisers and groundwater sources						х		х	
Distance between the application of organic fertilisers and surface water	Х	х	Х	х	х	Х	х	Х	
Distance between the application of organic fertilisers and groundwater sources						Х		Х	
Groundwater monitoring requirements						Х			
APPLICATION: FERTILISERS AND APPLICATION EQUIPMENT AND TECHNIQUES		~~~~~							
Prohibited and permitted application techniques		X	×		×			v	
Promoted and permitted application techniques	× -	v	×		× ×		×	× ×	
Irrigation technique	~						^	x	
LAND MANAGEMENT: LAND COVER AND MANAGEMENT									
Ground cover and land management	х						x	х	
Restrictions on cultivation and tillage activities	x						x		
Conditions that prohibit livestock grazing and feeding activities						х			
Distance between livestock rearing areas and water		х					х		

4

- ► Directive 2000/60/EC (Water Frame
 - Directive 2000/60/EC (Water Framework Directive) of 23 October 2000 is establishing a framework for Community action in the field of water policy, e.g. the protection of inland surface waters, transitional waters, coastal waters and groundwater.
 - Directive 2006/118/EC (Groundwater Directive) of 12 December 2006 is focused on the protection of groundwater against pollution and deterioration. It is daughter directive of the WFD and clarifies criteria for good chemical status and specifications for reversal of pollution trends including limits for pollutants.

The Water Framework Directive distinguishes between basic and supplementary measures. While measures in the Nitrates Directive action plans belong to basic measures, which are obligatory for Member States, supplementary measures are defined in Code of Good Agricultural Practice on a voluntary basis. A typical example of voluntary measures is the agro-environmental measures of the rural development program.

BEST PRACTICE EXAMPLES APPLIED IN DANUBE REGION

ORGANIC FARMING

Organic Farming is an agricultural system that uses ecologically based pest controls and biological fertilizers derived largely from animal and plant wastes and nitrogen-fixing cover crops. Compared with conventional agriculture, organic farming uses fewer pesticides, reduces soil erosion, decreases nitrate leaching into groundwater and surface water, and recycles animal wastes back into the farm. Its objectives are to preserve and enhance biodiversity, establish nutrient cycles on farms, reduce its input and increase soil fertility.

Austria

The organic farming measures in the Austrian Rural Development Programme (RDP) help to preserve and enhance biodiversity; establish nutrient cycles on farms and reduce input, while also increasing soil fertility. National natural resources in Austria (e.g. water bodies, soil, biodiversity) are threatened by the intensification of farming practices. At the same time, consumer awareness regarding sustainable production systems in agriculture is on the increase. As a result, conventional farmers are highly motivated to switch to organic farming. In 2019, the area dedicated to organic farming made up more than a quarter of the total agricultural area in Austria, they present higher plant diversity on grassland than conventional farms.

Bulgaria

Organic agriculture is becoming attractive to many producers due to subsidies from the Rural Development Programs. The share of organic vegetable production – or cereals, or oilseeds, medicinal and aromatic herbs, permanent crops, or pastures meadows is growing. The number of organic beekeepers is gradually increasing, although severe restrictions on grazing on beekeeping, beekeeping equipment and processing are imposed. Certification is increasing interest to local processors, and bio-products are highly sought after in the European market. Moreover, Bulgarian urban and higher income consumers perceive organic products as environmentally friendly and healthier and thus increase the attractive-ness of organic products for many urban' lifestyle' consumers.

	AT	BG	HR	cz	DE	HU	ME	RO	RS	SK	si
Organic agricultural area/ha	533,230	39,138	31,904	488,658	1,034,355	130,609	3,068	288,261	6,340	94, 000	35,101
Organic producers/No	21,843	2,754	1,528	3,934	23,032	1,560	100	15,315	1,073	220	2,682

BEST PRACTICE EXAMPLES APPLIED IN DANUBE REGION

CONSERVATION AGRICULTURE

Conservation Agriculture is based on ecological principles that emulate agro-ecological processes that are central to the normal functioning of natural ecosystems. Conservation agriculture constitutes an alternative productive and profitable systems approach to sustainable production intensification developed globally. It considers five essential principles: crop rotation, reduction of soil disturbances, optimal distribution of residues, green fields throughout the year, and optimized fertility. Crops become more drought tolerant and absorb rainwater more efficiently, which contributes to better nutrient storage and improved soil quality.

Conservation agriculture is considered to be a **"climate-smart"** approach to agriculture around the world, indicating that many rural communities are already successfully making the transition to new forms of locally adapted Conservation agriculture systems that are better suited to cope with climate change. Conservation agriculture holds the promise of sparking agricultural renewal and economic development in rural areas in the developing world where hunger and poverty are most prevalent.

Crop rotation is the key to a more sustainable farming system. It includes the alternation of crops with roots of different depths, with different amounts and quality of crop biomass, with different capacity to suppress weeds, including varieties and hybrids of each crop, to prevent (instead of control) pests, diseases, to restore soil fertility in the whole profile, to use water, especially from deeper layers of soil, more efficiently. A good crop rotation will decrease the dependence on external production inputs. Each crop rotation should provide a non-deficit balance of soil organic matter. In this approach, harnessing sustainability requires paying attention to the ecological processes that underpin land and crop production potentials, soil health, biodiversity below and above ground, ecosystem services and protecting environmental quality.

Moreover, by adopting this type of agriculture, greenhouse gases and CO_2 emissions can be stored, which can be quantified, verified, and transformed into carbon certificates that can bring financial benefits to farmers.

Romania, Moldova

Private initiatives have begun to emerge to remunerate and stimulate those eager to get involved and make a difference for future generations. The number of Romanian farmers are interested in conservation agriculture to have better crops sold on the international markets and alse to get financial benefits from selling carbon certificates from this activity.

Slovakia

As a regenerative agriculture example, the farm in Krakovany of over 650 hectares grows the plants without unnecessary chemicals and use no ploughs to prevent land degradation. Therefore, the land in the area is resistible to droughts and floods.







BEST PRACTICE EXAMPLES APPLIED IN DANUBE REGION

DIGITAL TRANSITION IN AGRICULTURE

Digital technologies have the potential to revolutionise agriculture by helping farmers work more precisely, efficiently and sustainably. Data-driven insights can improve decision-making and practices and help increase environmental performance while making farming jobs more attractive to younger generations. Digital technologies also have the potential to offer consumers greater transparency as to how their food is produced. They offer opportunities to connect producers and consumers in innovative ways.

Serbia

Weather instability due to climate change, especially drought periods lead to digital transition in agriculture. The first digitized farm outside the village of Belegiš in Serbia used the smart device Mobisan – a mobile solar power generator developed for small and medium-sized family farms. The device includes sensors in the soil, a digital weather station and a computer system that wirelessly collects information about microclimate and soil. Automatically, it is able to adjust water and nutrient dosage for the plants, i.e. to protect the soil from excess chemicals. This solution is valuable for 95 % of family farms (under 10 hectares of land) in Serbia.



GREEN LEAF

GREEN LEAF IS A SYMBOL OF EUROPEAN ORGANIC FARMING



The European Union organic logo gives a coherent visual identity to organic products produced in the EU. This makes it easier for consumers to identify organic products and helps farmers to market them across the entire EU. The organic logo can only be used on products that have been certified as organic by an authorised control agency or body, i.e. when they contain at least 95% organic ingredients and additionally, respect further strict conditions for the remaining 5%. The same ingredient cannot be present in organic and non-organic form.

OTHER SUPPORTING TOOLS

EU LEVEL

CORE Organic Cofund is a network of European ministries and research councils (ERA-NET) funding research in organic food and farming systems founded in 2004. The main focus of the ERA-NET is to join forces and fund transnational research projects supporting a focused and coordinated research and innovation effort covering the most important challenges along the organic value chains. The network receives funding from the European Commission under the "Horizon2020" where the applicants can submit project within open calls https://projects.au.dk/coreorganiccofund/about .

Germany

» Boden:ständig is an initiative of the agency for rural development of Bavaria that supports projects of cooperation of farmers and municipalities dealing among others with the prevention of nutrient inputs, reduction of erosion processes and the handling offlash floods, drought and water scarcity

(https://www.stmelf.bayern.de/landentwicklung/113963/index.php).

» Wasserpakt is a cooperation between administration (environment and agriculture) and NGO's. The aim of the Water Pact is to join forces to achieve an improvement in the status of water bodies in accordance with the Water Framework Directive on a voluntary basis, in addition to the legal requirements. On the one hand, the focus is on measures reducing the input of nutrients, above all nitrogen and phosphorus. On the other hand, the Water Pact aims on the improvement of the landscape water balance e.g. by increasing the infiltration and water storage capacity of (agricultural) soils or implementing a climate resilient design of land parcels (https://www.stmelf.bayern.de/wasserpakt).



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