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Regenerative Agriculture. An innovative approach towards mitigation of climate change through multi-tier learning

The REGINA project (No. 2021-1-HU01-KA220-HED-000027629) was funded by the European Commission. The content of this publication does not necessarily reflect the views of the European Commission.

Call 2021, KA2

KA220-HED – Cooperation Partnerships for Higher Education

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Forestry and Wood Technology School in Postojna (Slovenia)

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Slovensko združenje za
ohranitveno kmetijstvo

SECAD 



National Report

Slovenia

Regenerative agriculture. An innovative approach towards mitigation of climate change through multi-tier learning



Ljubljana, December 2022

Authors:

Slovensko združenje za ohranitveno kmetijstvo

Srednja gozdarska in lesarska šola Postojna



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Chapter 1. Overview of RA uptake and prospects in Slovenia

Introduction

Official data sources:

- Statistical Office of the Republic of Slovenia (SORS), data from the data portal SI-STAT (theme Agriculture, forestry and fishery; field Agriculture and fisheries; <https://pxweb.stat.si/SiStat/en/Podrocja/Index/85/agriculture-forestry-and-fishery>),
- Ministry for Agriculture, Forestry and Food (MAFF),
- Agency for Agricultural Markets and Rural Development (AKTRP),
- Slovenian Environment Agency (SEA),
- Administration of the Republic of Slovenia for Food Safety, Veterinary Sector and Plant Protection (AFSVPP),
- Eurostat (<http://ec.europa.eu/eurostat/data/database>)

The following basic data about Slovenian agriculture are taken from the Report prepared by Slovenian Institute of agriculture (KIS) in 2021 ¹.

In 2020, agriculture in Slovenia together with forestry and fisheries contributed 2.3% to total value added and 6.9% to total employment. Similarly, as in the recent few years, the share of employment in agriculture continues to decrease.

According to the latest data from Farm Structure Survey (2020), the downward trend in the number of agricultural holdings continues, while the utilized agricultural area (UAA) also decreased slightly (Table 2, Figure 2). The average agricultural holding cultivates 7.1 ha of UAA, a quarter more than in 2000. The improvement in the size structure continues as the number of agricultural holdings that cultivated more than 20 ha of UAA has more than doubled compared to 2000 (Figure 3). These agricultural holdings now cultivate more than one-third of the total UAA, an increase of 17 percentage points from 2000.

Livestock holdings raise an average of 9.1 livestock units (LSU) in 2020, which is 3 LSU more than in 2000. The size structure of livestock holdings has also improved compared to 2000. The number of livestock holdings with more than 20 LSU has increased by 27% between 2000 and 2020, and these livestock holdings raise 56% of all LSU (22 percentage points more than in 2000) (Figure 4).

In recent years, a reduction of negative impacts of agriculture on the environment can be noticed. The use of pesticides and mineral fertilizers has become more rational (Figure 6, Table 3). In general, there is also a notable share of legumes in crop rotation (Table 4). The agricultural area under organic

¹ https://www.kis.si/f/docs/Slovensko_kmetijstvo_v_stevilkah_OEK/KIS_Slovensko_kmetijstvo_v_stevilkah_2021_EN_splet_0.pdf

farming is also increasing; in 2020 to approx. 52 thousand ha (10.8% of all UAA), with permanent grassland predominating in the structure (80%) (Table 3).

Domestic production of milk (self-sufficiency rate 134%), cattle meat (107%), and poultry meat (111%) was higher than domestic consumption, and for the first time, maize self-sufficiency exceeded 100 percent (116%) due to a record harvest in 2020.

The economic results of agriculture at the aggregate level: the value of total output (around 1.4 billion EUR), the factor income in 2020 was around 571 million EUR or 7,500 EUR per annual working unit (Figure 7).

By the end of 2020 approximately 977 million EUR had been granted for measures and technical assistance (88% of the program's available resources; 1,107 million EUR). The national envelope for direct payments amounted to 134.3 million EUR. The share of co-financing from the EU budget was 68%.

Most of the payments (66%) were paid for the measures implemented under the subsidy campaign and were related to the annual payments for agri-environment-climate measures, animal welfare and payments to farmers with areas with natural and other constraints.

Slovenia is net value importer for most agri-food products. Trade surpluses (in value) occurred in groups miscellaneous edible preparations, meat preparations, live animals, oilseeds and oleaginous fruits, legumes and vegetable extracts and dairy products (eggs and honey are also included in the group). Most of the agri-food trade was created with the EU member states, where exports to EU member states accounted for 76% of total exports and imports from EU member states accounted for 83% of total imports. As in previous years, the countries of the former Yugoslavia represent important trade partners (13% of total exports, 3% of total imports).

Table 1: Key general statistics for Slovenian agriculture

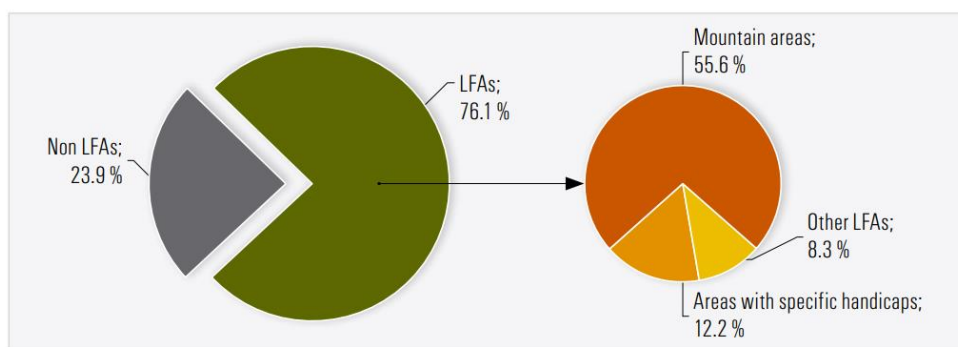
	Ø 2008-12	Ø 2013-17	2018	2019	2020
Agriculture in economy					
Gross value added of agricultural sector (mill. EUR)*	709.2	775.2	1028.9	970.7	940.9
• Share in total value added (%)	2.2	2.3	2.6	2.3	2.3
Employment in the agriculture (000)*	80.0	75.2	73.2	72.8	71.5
• Share in total employment (%)	8.3	7.9	7.2	7.0	6.9
Exports of agri-food products (mill. EUR)**	794.0	1,064.7	1,415.5	1,514.2	1,560.9
• Share in total export of goods (%)	4.1	4.4	4.6	4.5	4.7
Imports of agri-food products (mill. EUR)**	1,753	2,102	2,453	2,562	2,534
• Share in total import of goods (%)	8.4	8.8	8.0	7.5	7.9
Trade balance with agri-food products (mill. EUR)**	-959	-1,037	-1,037	-1,048	-974
Agricultural land use***					
Utilised agricultural area (ha)	476,284	479,411	477,296	479,822	483,863
Arable land (%)	36.4	36.2	36.1	36.3	36.4
Permanent crops (%)	5.6	5.7	5.8	5.8	5.9
Permanent grassland (%)	58.1	58.1	58.1	57.9	57.7
Share of utilised agricultural area in total area (%)	23.5	23.6	23.5	23.7	23.9
Utilised agricultural area per habitant (ha)	0.23	0.23	0.23	0.23	0.23

Source: SORS (National Accounts, External Trade, Crop Production), calculated by AIS

* agriculture, forestry, hunting and fisheries; 2020: provisional data

** commodity groups 01-24 of Combined Nomenclature (CN) of European Union; 2020: provisional data

*** annual statistics of crop production



Source: MAFF (Actual use of agricultural and forest land)

Figure 1: Share of utilised agricultural area in less favoured areas (LFAs); 2020

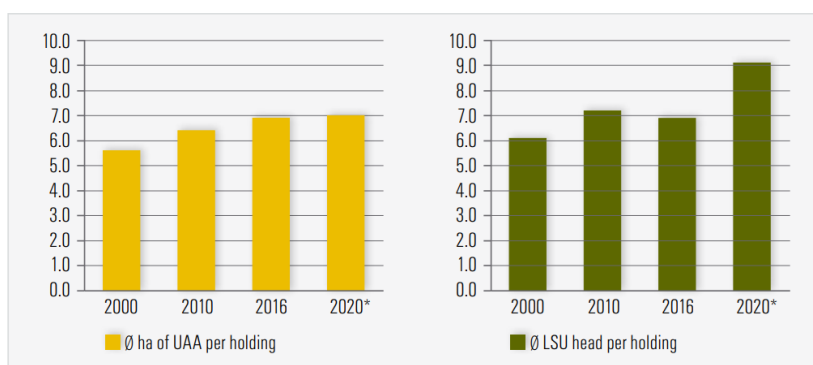
Table 2: Agricultural holdings by land use and number of livestock

	Number of holdings				Ø ha, heads/holding			
	2000	2010	2016	2020*	2000	2010	2016	2020*
Land use on agricultural holdings								
Holdings, total	86,467	74,646	69,902	67,927	5.6	6.4	6.9	7.0
Holdings with arable land	80,858	63,272	66,675	57,561	2.1	2.7	2.6	3.1
Gospodarstva s trajnimi nasadi	58,050	39,400	36,560	33,321	0.5	0.7	0.7	0.8
Holdings with permanent grassland**	74,230	61,949	60,401	58,812	3.8	4.5	4.6	4.6
Livestock on agricultural holdings								
Holdings with livestock (LSU)	77,452	58,648	57,749	44,974	6.1	7.2	6.9	9.1
Holdings with cattle	56,097	36,119	34,087	28,485	8.9	13.1	13.6	16.7
Holdings with pigs	44,623	26,441	23,700	12,198	13.5	14.4	12.1	19.3
Holdings with poultry	58,929	36,240	36,657	27,015	114.2	135.2	132.5	260.7
Holdings with sheep	4,330	6,181	6,243	5,016	22.2	22.3	20.9	22.8
Holdings with goats	4,775	4,214	4,022	3,374	6.2	8.3	8.6	8.1

Source: SORS (Agricultural Holdings), Eurostat (Agricultural Holdings Survey), calculated by KIS

* provisional data

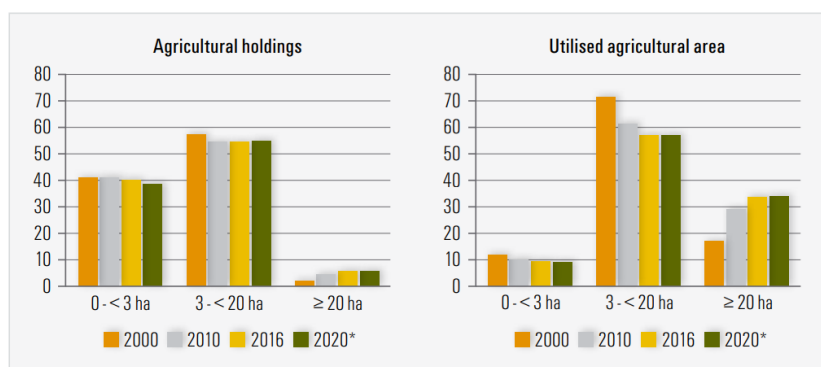
** common grassland is not included



Source: SORS (Agricultural Holdings), calculated by AIS

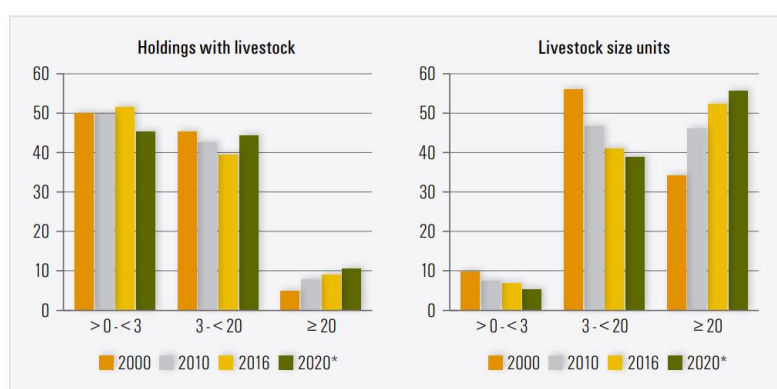
* provisional data

Figure 2: Average household (number of UAA hectares and number of LSU)



Source: SORS (Agricultural Holdings), calculated by AIS
* provisional data

Figure 3: Share of agricultural holdings and utilised agricultural area by size classes of UAA (%)



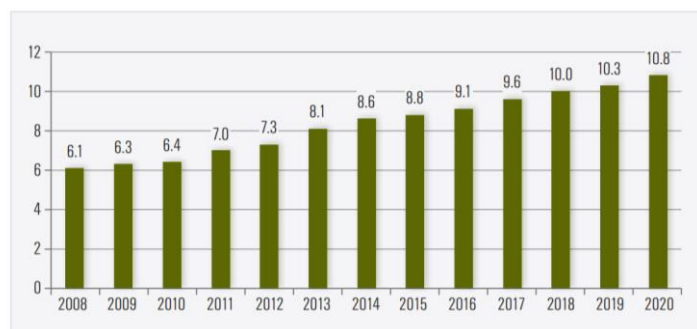
Source: SORS (Agricultural Holdings), calculated by AIS
* provisional data

Figure 4: Share of agricultural holdings with livestock and livestock size units by size classes

Table 3: Agricultural holdings and area with organic farming

	Ø 2008-12	Ø 2013-17	2018	2019	2020
Number of agricultural holdings	2,285	3,383	3,741	3,828	3,689
• with organic farming	1,928	2,718	3,320	3,494	3,358
• in conversion to organic farming	357	665	421	334	331
Utilised agricultural area (ha)	31,433	42,378	47,848	49,638	52,078
• with organic farming	26,650	34,553	41,669	44,455	45,787
• in conversion to organic farming	4,782	7,825	6,179	5,183	6,291
Area with organic farming by land use (ha)					
Arable land	3,206	5,223	6,270	6,520	6,895
of which: vegetables and strawberries	136	244	245	308	319
Orchards	826	1,470	1,962	2,106	2,232
Vineyards	260	483	657	706	766
Olive groves	84	226	259	278	281
Nurseries	-	-	0.0	0.3	0.6
Permanent grassland	27,055	34,975	38,700	40,028	41,903

Source: SORS (Organic Farming), calculated by AIS



Source: SORS (Organic Farming), calculated by AIS

Figure 5: Share of area with organic farming in utilised agricultural area (%)

Table 4: Indicators of arable land utilisation (%)

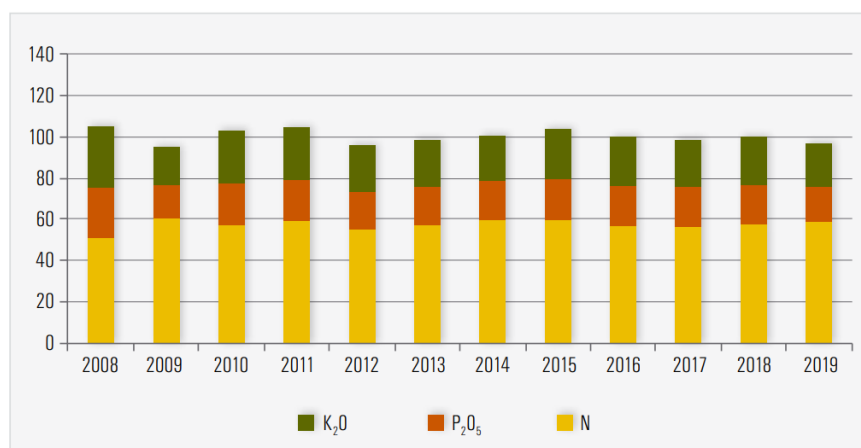
	Ø 2008-12	Ø 2013-17	2018	2019	2020
Soil cover on arable land by green crops*	62.3	61.8	62.2	61.7	61.9
Share of arable land covered by grasses**	20.0	18.6	19.8	18.6	19.7
Share of legumes in crop rotation***	14.9	15.7	16.2	15.0	15.0
Share of maize in crop rotation	38.1	39.0	38.8	39.6	40.0

Source: SORS (Crop Production), calculated by AIS

* soil cover which is based on seeding structure of main crops (stubble crops not taken into account)

** grasses, grass-clover mixtures and clovers on arable land

*** including grass-clover and clover-grass mixtures



Source: SORS (Production Methods in Agriculture), calculated by AIS

Figure 6: Nutrients use per hectare of utilised agricultural area (kg)

Table 5: Emissions from agriculture to environment

	Ø 2008-12	Ø 2013-17	2018	2019
Gross N surplus (kg/ha utilised agricultural area)	50	52	43	43
Net N surplus (kg/ha utilised agricultural area)	16	20	11	11
P surplus (kg/ha utilised agricultural area)	4	3	2	1
Emissions of greenhouse gases (000 t eq CO ₂)	1,675	1,690	1,701	1,718
Emissions of ammonia (000 t)	17.2	16.8	16.9	16.6

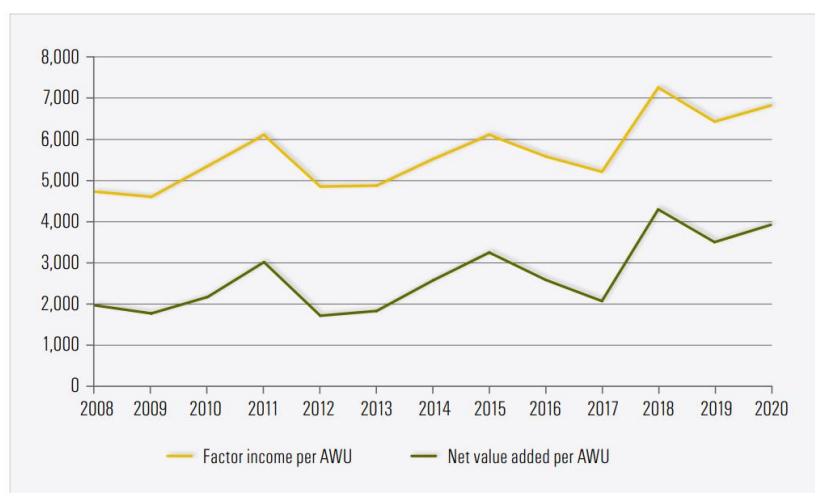
Source: AIS

Table 6: Average yields

	Ø 2008-12	Ø 2013-17	2018	2019	2020
Wheat and spelt (t/ha)	4.8	5.0	4.4	5.2	5.8
Grain maize (t/ha)	7.9	8.0	9.5	9.3	10.8
Rapeseed (t/ha)	2.8	2.7	2.3	2.9	2.6
Potatoes (t/ha)	24.4	24.9	25.9	23.6	30.3
Dessert apples (t/ha)	26.0	22.3	37.2	23.9	30.5
Cows milk (kg/cow)*	5,584	5,746	6,123	6,178	6,356
Eggs (pieces/laying hen)*	256	246	221	233	253

Source: SORS (Crop Production, Animal Production), calculated by AIS

* 2020: provisional data



Source: SORS (Economic Accounts for Agriculture), calculated by AIS

Figure 7: Agricultural incomes per AWU at basic prices (EUR; deflated; constant prices 2015)

Overview of regenerative agriculture and other alternative farming methods uptake

Organic agriculture in Slovenia

In the late 1980s and early 1990s, garden plot holders started an organic gardening movement, and in 1991, people interested in bio-dynamic farming formed a club. The latter developed into the bio-dynamic association AJDA. Very few farmers were involved in these initiatives; the majority of their members were garden plot holders and people not occupied in farming. Nevertheless, their activities were an important contribution to the development of organic farming in Slovenia.

In 1997, the Slovenian Organic Farmers' Association (S.O.F.A.) was founded. This was the first national association of pioneer organic farmers who were producing for the market, and who were therefore interested in the development of a certification system. The association adopted the standards for organic agriculture in Slovenia that were prepared by the Institute for Sustainable Development (ISD), a non-governmental organisation (NGO), specifically for this purpose. These standards were published by the Slovenian Ministry of Agriculture. They were prepared in accordance with the IFOAM Basic Standards and are similar to the standards of Austrian and German organic farmers' associations (Ernte and Bioland). Future development:

- 2000: The private organic logo BIODAR is introduced
- 2001: National rules for organic farming are introduced
- 2005: The government adopts the national organic farming action plan

Key sector institutions in organic agriculture:

- IKC, Institute for control and certification at the University of Maribor²
- ISD, Institute for Sustainable Development³
- KON-CERT, the Institute of Control and Certification in Agriculture and Forestry Maribor⁴
- Union of Slovenian Organic Farmers' Associations (USOFA)⁵

The Government of the Republic Slovenia has adopted an Action Plan for the Development of Organic Farming until 2027. It sets out measures to accelerate the development of organic farming by 2027.

Document provides an analysis of the situation, a SWOT analysis, a presentation of needs, objectives and measures (70 actions) per 8 priority areas (production, processing, knowledge transfer, seed, integration, eco-food in the public procurement system, promotion and marketing, research and development of new technologies, and organic farming in the context of climate change) that will contribute to the further development of organic farming. The document is also one of the important orientations in the preparation of measures under the Common Agricultural Policy Strategic Plan 2023-2027 for Slovenia⁶.

² www.ikc-um.si/ikcum

³ www.itr.si

⁴ www.kon-cert.si

⁵ www.zveza-ekokmet.si/biodar

⁶ https://skp.si/en/wp-content/uploads/2022/09/ANEK-publikacija-julij_2022-ANG-koncna-verzija-WEB.pdf

Conservation Agriculture in Slovenia

Conservation Agriculture (CA) is defined as a sustainable agriculture production system comprising a set of farming practices adapted to the requirements of crops and local conditions of each region, whose farming and soil management techniques protect the soil from erosion and degradation, improve its quality and biodiversity, and contribute to the preservation of the natural resources, water and air, while optimizing yields.

Agronomic practices included in CA are based on three core principles, which must be fulfilled concomitantly:

- Minimum soil disturbance.
- Maintenance of permanent soil covers.
- Cropping system diversity, crop rotations.

Slovensko združenje za ohranitveno kmetijstvo (Slovene Association for Conservation agriculture – SACA⁷, was officially founded in Jan. 2016. The purpose of the association is the introduction and dissemination of conservation and regenerative agriculture into wider practice with the aim of contributing to the sustainable development of agriculture in the Republic of Slovenia, through the following activities:

1. bringing together natural persons involved in agriculture and conservation land use in a broader sense;
2. developing awareness of the importance of sustainable technological practices in agricultural production that maintain and increase soil fertility and overall quality of agro-ecosystem;
3. monitoring, studying, and implementing actions in the area of soil fertility conservation, innovations in this area, and the adoption of new conservation/regenerative agriculture technologies;
4. to inform and educate farmers, professionals, scientists and the rest of the public about the status and achievements in the field of conservation/regenerative agriculture through publications, lectures, meetings, exchange of experiences, field trips, courses and similar activities;
5. cooperation with similar domestic, foreign and international associations and organizations (SACA is a member of European Conservation Agriculture Federation, ECAF⁸);

The goal is also to promote cooperation between research institutions, universities, and individual professionals in individual projects of the society, to participate in the planning of educational programs (curricula) and research activities in this field.

SACA gives initiatives to the Ministry of Agriculture in relation to the measures of the Common Agricultural Policy and in the field of sustainable agriculture through the introduction of CA /RA. In the past two years, SACA was active in the development of Conservation agriculture (CA) programme for the Ministry of agriculture. Our CA programme was included in the draft version of the new Strategic rural development plan for 2023 – 2027 as a standalone action, along with the organic farming action, but was at the end divided into several single regenerative actions which promotes proper soil management and also indirectly supports regenerative-conservation agriculture. The inclusion is voluntary, so the beneficiaries themselves decide which above-standard agricultural practices they will implement on their farms.

⁷ <http://www.szoort.si/>

⁸ <https://ecaf.org/>

CAP Strategic Plan 2023-2027

The Strategic Plan 2023-2027 (hereinafter: SP 2023-2027⁹) contains the key strategic orientations for the implementation of the Common Agricultural Policy (hereinafter: CAP) in the Republic of Slovenia and presents a range of proposed interventions for their effective and efficient implementation in practice. Under SP 2023-2027, Slovenia has a budget of EUR 1.2 billion from the European Agricultural Guarantee Fund (EAGF) and the European Agricultural Fund for Rural Development (EAFRD) for a period of five years.

Payments in areas with natural and other constraints also represent a particularly large and important factor for farm income stability and will hopefully have a positive impact on the conservation of natural resources and also on the population of the rural areas, which account for 80 % of agricultural land in Slovenia.

33 % will be allocated for the protection of the environment and the sustainable management of natural resources, and 10 % of the total funding available for raising the quality of life in rural areas and strengthening economic activity.

The aim is to achieve greater quantities of Slovenian organic products in stores, which will also be promoted through support for the networking of organic producers and food processors. This places a strong emphasis on the production and processing of organic food, on the proper careful handling of PPPs, on antibiotics and on ensuring animal welfare.

⁹ <https://skp.si/skupna-kmetijska-politika-2023-2027>

Interviews with stakeholders

We have conducted interviews with prominent agricultural organizations in Slovenia that are actively involved in promoting regenerative agriculture. The interviewees include:

- I. The President of the Association of Fruit Growers of Slovenia
- II. A representative from the Agricultural Forestry Association of Slovenia, who is also an agricultural consultant
- III. A teacher and project coordinator from Slovenia's largest secondary agricultural school, which is implementing new regenerative practices, and
- IV. A nature conservationist, biologist, and farmer employed at Škocjan Caves Park.

Based on their responses, it appears that the decision-makers share similar perspectives on the subject with only a few subtle variations. We asked them a series of 10 questions and selected the most relevant ones for our analysis.

1. Do you know any member of your association or any farmer in general who carries out regenerative agriculture (RA) in the country?

Some of the respondents know farmers that are practicing RA on their farms in person, but also form media. Also, they already know there is an association for conservation agriculture in Slovenia and there have been some events organized on this thematic. However, some of them don't yet know about this type of farming, but are more familiar with other alternative ways, e.g. biodynamic farming and permaculture and other commonly used terms like organic farming or ecologically sustainable agriculture.

2. What is your opinion on the current feasibility of RA?

Regarding the feasibility of RA, they responded that it could be possible to implement regenerative agriculture, but not all stakeholders are optimistic. One said, RA farming is feasible, since it is a form of agriculture that, in its essence, is extremely close to traditional agricultural practices that were practiced in Slovenia before the beginning of industrialized agriculture. Another view was, that RA is still not developed to the stage, that could be easily adopted by the farmers, agricultural advisors or whole country. The reason is, RA seems to be too complicated, there are too many interpretations and too many variations and different stakeholders who each imagine the conservation treatment of the soil in their own way.

3. Are there significant obstacles to the implementation of the RA and which ones?

The obstacles to the application of RA are perceived as follows:

- it is necessary to acquire new knowledge and gain practical experience for different cultures and soil types,
- costs of purchasing new machinery
- procurement of organic fertilizers and procurement of seeds of appropriate crops
- analysis of soil biological properties - is it accessible in practice?
- the results are likely to appear in the longer term, quantity/quality
- an obstacle is an encountered situation that needs to be resolved step by step
- the habit of using machinery that is too heavy,
- the habit of using chemically synthetic mineral fertilizers,

- the habit of using chemically synthetic agents for plant protection, of course also chemically synthetically treated seeds and hybrids.

The mentioned habits are deeply rooted in Slovenian agriculture. A lot of training and, above all, practical tests about regenerative agriculture will be necessary.

4. Are there significant benefits of implementing RA for the farmers, the environment and the society?

All interviewees stated that there are benefits for farmers as well as for society and the environment.

The benefits for farmers are:

- adapting to climate change,
- protecting nature,
- greater independence from large systems,
- lower fuel consumption per ha,
- simpler machinery,
- benefit future generations on the farm, because the method is supposed to preserve the soil,
- soil conservation,
- climate change mitigation,
- crop quality.

Benefits for society include:

- better, healthier, more nutritious food that does not destroy the environment and nature,
- reduction of greenhouse gases in the atmosphere, as the RA method of farming fixes them in the soil both in plant and animal production,
- preserved cultural landscape,
- different local products enable the development of tourist activities,
- more secure cultivation and supply for the future,
- soil and nature conservation,
- more sustainable self-care,
- new knowledge and experience

Benefits for environment:

- permanent vegetation,
- more oxygen,
- less fog,
- less erosion,
- mitigation of climate change,
- increased biodiversity,
- reduction of greenhouse gases in the atmosphere

5. Under what conditions do you think farmers would go to farming in the manner of regenerative agriculture?

According to the respondents, more awareness is needed for farmers to even realize what RA it is. Above all, it should be emphasized that their grandmothers already farmed in this way, and it is therefore a matter of returning to the roots in a modern way. Education and encouragement of farmers is necessary, also demonstrations of good practices. Connecting RA farms into networks and

joint promotion of their exceptionally high-quality products, which have a positive impact on nature and the climate. It is also necessary to make the consumer aware of what they gain as an individual and as a company by supporting or buying RA produced products and crops.

Summarized, the conditions that would encourage farmers to try or adopt RA farming in Slovenia are:

- incentives for purchasing machinery, fertilizers and seeds
- a recognizable brand
- connecting growers in education and joint performance in sales
- the transition must be made gradually from smaller to larger surfaces,
- education is required,
- farmers must understand the processes in the soil that take place in the RA system, then they will do it on their own initiative.

6. Is your organization ready to support the wider use of RA by farmers? If YES, in what way?

When asked about their willingness to support efforts among farmers to adopt regenerative agriculture practices, the respondents indicated that they would provide support in the form of professionally sound information from credible sources, as well as education and training. E.g. representatives of one organization are ready to participate in projects that will deal with promoting RA, raising awareness among farmers, consumers, institutions,... and connecting farmers and joint promotion. They are also ready to participate in all activities related to the promotion of RA in their area as part of our regular activities.

7. Do you have a rulebook on RA and related farming methods?

All respondents answered, they don't have a rulebook on RA and related farming methods.

8. Do you consider the RA to be a question on which the State should decide on its promotion and promotion? (yes or no)

Regarding **financial support from the government for regenerative agriculture**, the respondents believed that the government should be approached about this issue. Additionally, the CAP Strategic Plan for 2023-2027 has already been developed and accepted by the EU, with elements promoting and supporting environmental sustainability. While these elements can still be strengthened for the period after 2027, the framework has already been established for the next several years.

9. Would your organization, in cooperation with experts, be willing to provide farmers' training on RA?

Regarding RA-related training, some organizations feel that they are capable of providing training to farmers themselves, while others may lack the capacity and suggest that trainers, teachers, and professors from secondary and tertiary agricultural education institutions would be suitable.

10. How do you generally assess the chances of RA spreading in our country?

The respondents state, the possibilities for the spread of RA in our country are exceptional, as we also have the knowledge and skills of RA farming among the older generations. We also already have many examples of good RA farming practices on young start-up farms that are doing wonderful things. All this makes us quite optimistic about the spread of RA in our country.

The chances to spread the RA would greatly increase if Ministry of agriculture would support counseling and financial incentives to farmers. In Slovenia, public agricultural advisory service is

financed for agricultural consultancy, and knowledge transfer in RA will probably be their task in the future. It is necessary to start gradually, and at the same time take care for education.

Conclusions regarding the RA uptake and prospects

The future is bright for regenerative farming in Slovenia.

The main problem of regenerative agriculture, and indeed of the entire agriculture in Slovenia, is the improper management of wild animals, which cause enormous damage and as a result, farmers stop farming. Crop protection is either impossible or too expensive. Farmers who will persist with farming into the future will, it seems, use regenerative and conservation agriculture practices. They will be forced into this type of farming by the higher costs of conventional farming and the requirements of environmental protection (water conservation areas). They will be also encouraged by subsidies.

Chapter 2. The farmers' online survey

Introduction

The survey template for farmers was translated to Slovenian language and as Google forms shared to SACA members who helped in the dissemination of the survey. Also SGLŠ participated in dissemination of survey among their contact list. Altogether 51 answers were gathered.

- Number of respondents: 51
- Duration of survey: 2 months, 25.8.2022 – 25. 10. 2022

Report of results

General information

Question no. 1

'Gender'

Response rate: 51/51

- 40 Male (78.4%)
- 11 Female (21.6%)
- 0 Prefer not to answer (0%)

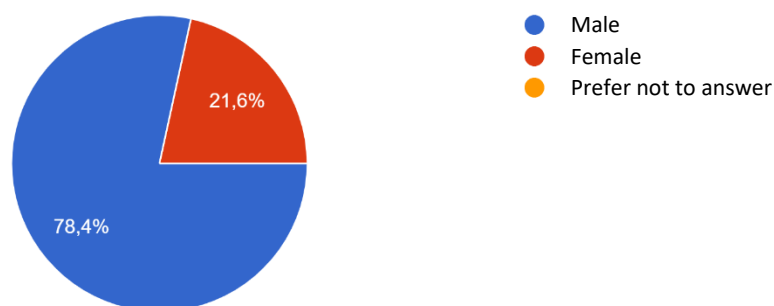


Figure 8: Share of respondents by gender

The majority of respondents are male, what was expected according to gender structure of the farmers in Slovenia, who are also mostly men. But also female respondents were not participating in survey in low numbers, since 21.6% of them were women.

Question no. 2

'Please fill in your age'

Response rate: 51/51

- 2 persons Under 25 years old (3.9%)
- 9 persons 25-35 years old (17.6%)
- 13 persons 36-45 years old (25.5%)
- 13 persons 46-55 years old (25.5%)
- 14 persons Above 55 years old (27.5%)

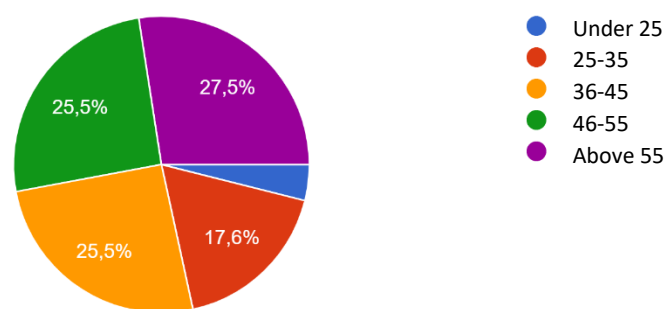


Figure 9: Share of respondents by age

The age structure of respondents was also as expected, since average farmer (owning a farm) in Slovenia is 57 years: 27.5% answers came from persons above 55 years. But of course also younger participated in the survey, the reason is most likely in sharing the survey via email and conducting the on-line survey, that didn't reach the average population, but younger ones.

Question no. 3

'Please add the location of the farm (type in the postal code)'

Response rate: 51/51

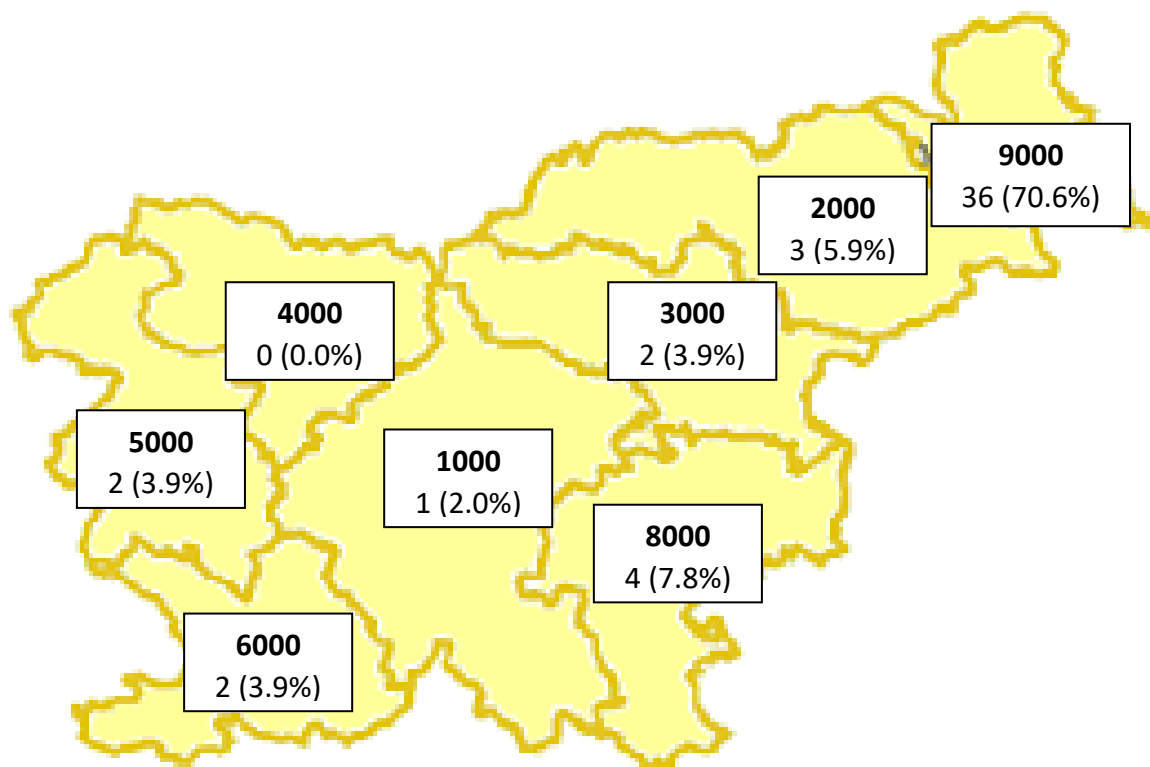


Figure 10: Distribution of responses by postal code number (in bold: postal code number of main city in region, no of responses and % of responses by postal code).

We gathered responses from almost every region of Slovenia. With extremely high number of responses, the north-east region of Slovenia, Pomurje (postal code number starting with 9) stands out of the average. The reason could be members of SZOK from that region were mostly active in sharing the survey among the farmers. At the same time, this region is together with region 2, also the most 'farming' region in Slovenia, where the majority of Slovenians' arable land is cultivated.

Table 7: Table of answers to the question regarding location of the farm

Distribution of postal code numbers in Slovenia								
Region	Central Slovenia	Podravje and Koroška	Posavje	Gorenjska	Goriška	Primorska	Dolenjska	Pomurje
Postal code - Main city	1000 - Ljubljana	2000 - Maribor	3000 - Celje	4000 - Kranj	5000 - Nova Gorica	6000 - Koper	8000 - Novo Mesto	9000 - Murska Sobota
Number of respondents	1	3	2	0	2	2	4	36
% of responses (n all = 51)	2,0%	5,9%	3,9%	0,0%	3,9%	3,9%	7,8%	70,6%
List of answers	1354	2277 2231 2250	3310 3330		5270 5261	6250 6250	8000 8250 8310 8250	9244 9241 9240 9261 9253 9265 9206 9250 9226 9244 9231 9241 9224 9204 9243 9231 9231 9226 9231 9231 9243 9232 9205 9206 9224 9242 9233 9253 9202 9000 9000 9231 9251 9242 9246 9265 9244

Question no. 4

'Please indicate the size of the farm (in hectares)'

Response rate: 51/51

- 21 answers 1-10 ha (41.2%)
- 22 answers 11-50 ha (43.1%)
- 5 answers 50-100 ha (9.8%)
- 3 answers 100-1000 ha (5.9%)
- 0 answers Above 1000 ha

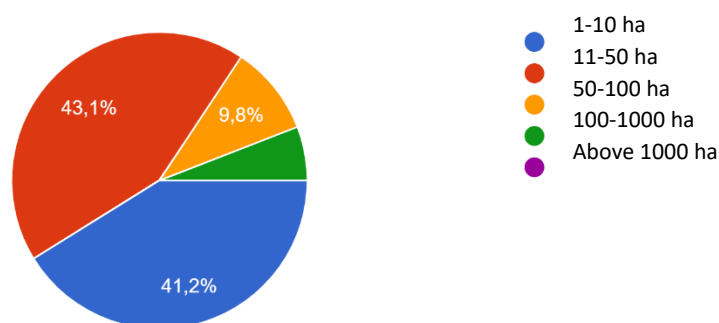


Figure 11: Share of responses according to farm size

The majority of farmers responding to the survey have farms up to 50 ha. According to SURS (<https://www.stat.si/>), in year 2020, the average farm size in Slovenia was 7.0 ha, while 38.4% of farms cultivated less than 3 ha and 54.8% of farms between 3 and 20 ha; and only 5.6% of them more than 20 ha. This statistics is also obvious on Figure 4.

Question no. 5

'Please indicate the number of people working on the farm (permanent staff)'

Response rate: 51/51

- 49 answers Less than 5 (96.1%)
- 1 answer 5-10 (1.9%)
- 1 answer 10-30 (1.9%)
- no answer 30-50 (0.0%)
- no answer 50-100 (0.0%)
- no answer More than 100 (0.0%)

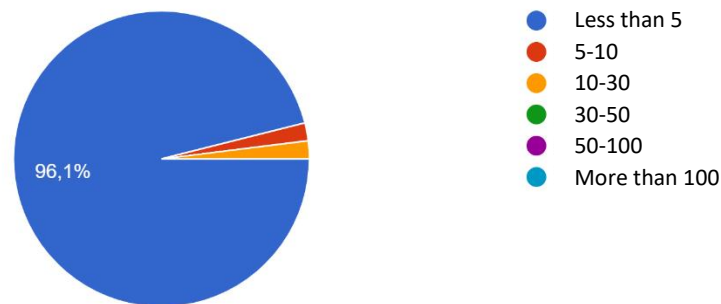


Figure 12: Share of responses about permanent staff working on farm

Since farms in Slovenia are mostly small, there is also not a lot of stuff employed on the farm, if any. We have lot of farmers having up to 20 ha of land and still not being professional farmers but being employed somewhere else and working on farm after job.

Question no. 6

'Main Product of the Farm (in the last 5 years)'

- Arable – crops – 37 answers (72.5%)
- Fruit production – 6 answers (11.8%)
- Vineyard – 3 answers (5.9%)
- Vegetable - 8 answers (15.7%)
- Livestock, dry stock – 11 answers (21.6%)
- Livestock, dairy – 13 answers (25.5%)
- Others:
 - Herbs – 1 answer (2%)
 - Pigs – meat processing – 1 answer (2%)
 - Tourism on farm – 1 answer (2%)
 - Food processing – 1 answer (2%)
 - Pigs – meat production – 1 answer (2%)

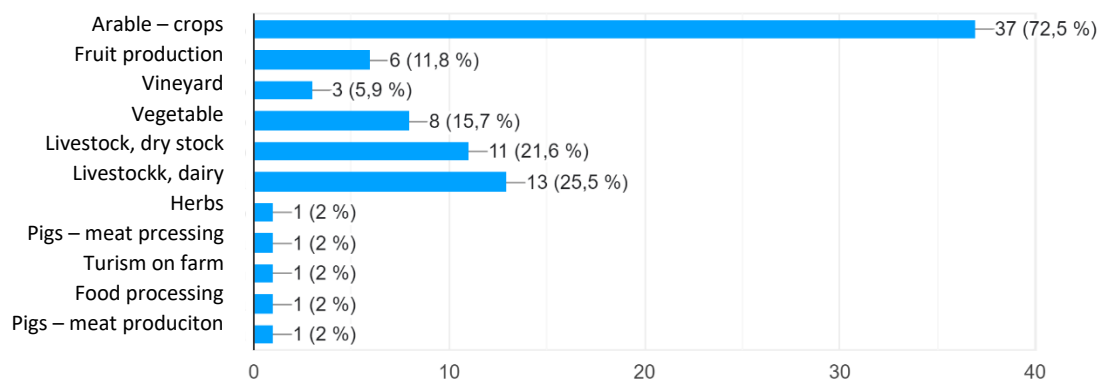


Figure 13: The main products on the farms

Also, the Figure above reflects the average Slovenian farm (especially if we have in mind the answers were mostly from north-east region, having lot of arable land). Farmers there either grow only crops and sell them on the market or raise animals (mostly livestock) and feed them with the crops produced. Fruit production, vineyard and vegetables are not so representative production types in that region.

Question no. 7

'I would consider myself a farmer, who mainly follows...'

Response rate: 51/51

- Conventional farming practices and methods – 19 answers (35.3%)
- Alternative farming practices and methods (organic, regenerative, conservative, etc.) – 14 answers (27.5%)
- Both ways 19 answers (37.3%)

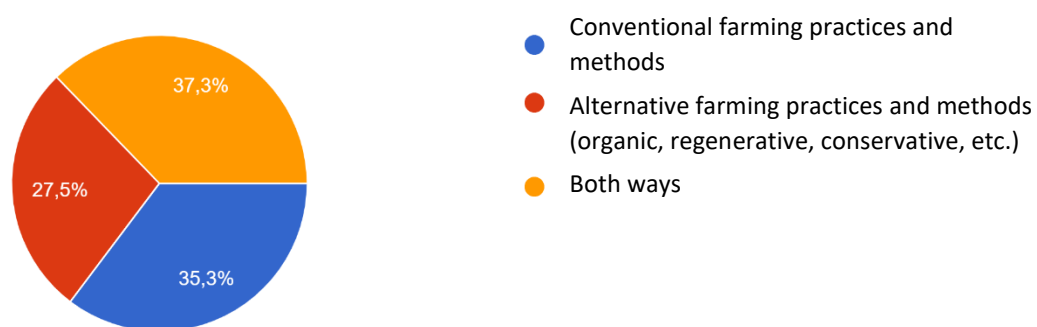


Figure 14: Share of farmers following different farming practices

The answers to these questions were evenly distributed. Average farmer we think still follows the conventional farming practices, but the trend to follow especially conservative soil cultivation is being more and more popular in Slovenia.

Part I: Basic inquiry and knowledge on the project topics

Question no. 8

‘How well do you know the following terms and practices? Are you familiar with the definitions and the meaning? Please mark your understanding on a 1-4 scale, where 1 means “never heard of it” and 4 means “I know a great deal”.’

Table 8: Number of answers about understanding terms and practices, per sub-question

	1	2	3	4
Climate change – what it is, causes and effects		5	25	21
Impact of climate change on food production.		5	23	23
Agriculture is accelerating climate change.	5	14	19	12
Mitigation of climate change	1	10	24	16
Organic farming.	1	13	17	20
Conservation agriculture	2	7	23	19
Regenerative agriculture.	10	12	20	11
Sustainable farm management	2	11	20	19

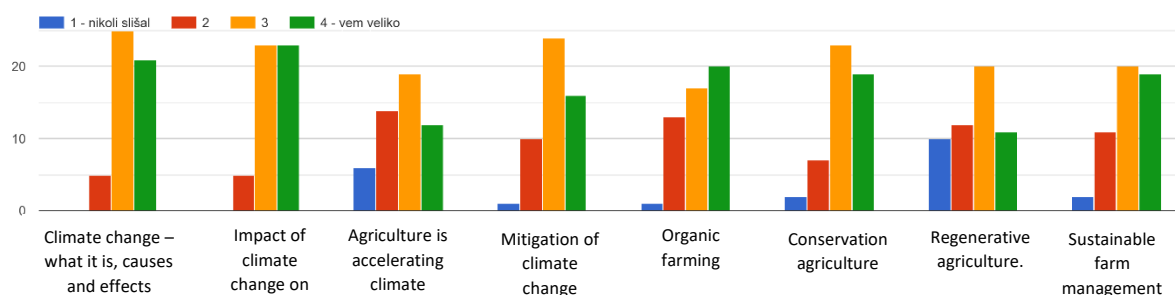


Figure 15: Share of respondents in understanding terms and practices

Farmers seem to be quite aware of the climate change, but still not so sure the agriculture is responsible for accelerating them. Majority of farmers already heard and know the organic farming, conservation agriculture and sustainable farm management, while the term regenerative agriculture seem to be not so common to them.

Question no. 9

'Please mark, to what extent do you agree with the following statements? (On a 1-4 scale, where 1 means "strongly disagree", and 4 means "totally agree").'

Table 9: Number of answers about farmers agreement about the statements, per statement

	1	2	3	4
There is a high need to re-direct agriculture towards new approaches to help to mitigate climate change.	3	10	21	17
Conventional farming methods are not sustainable.	7	19	15	10
New and alternative farming practices can also contribute to raise the average income of farmers.	7	7	23	14
Only Conventional farming methods are able to produce enough food.	14	18	10	9
There is a general knowledge gap among farmers about the alternative ways of farming (e.g. organic, regenerative...).	4	13	22	12
In terms of education, there is enough support for farmers, if they would like to introduce alternative farming practices.	16	17	12	6
There is enough financial support for farmers, if they would like to introduce alternative farming practices (e.g. organic, regenerative..).	20	18	7	6

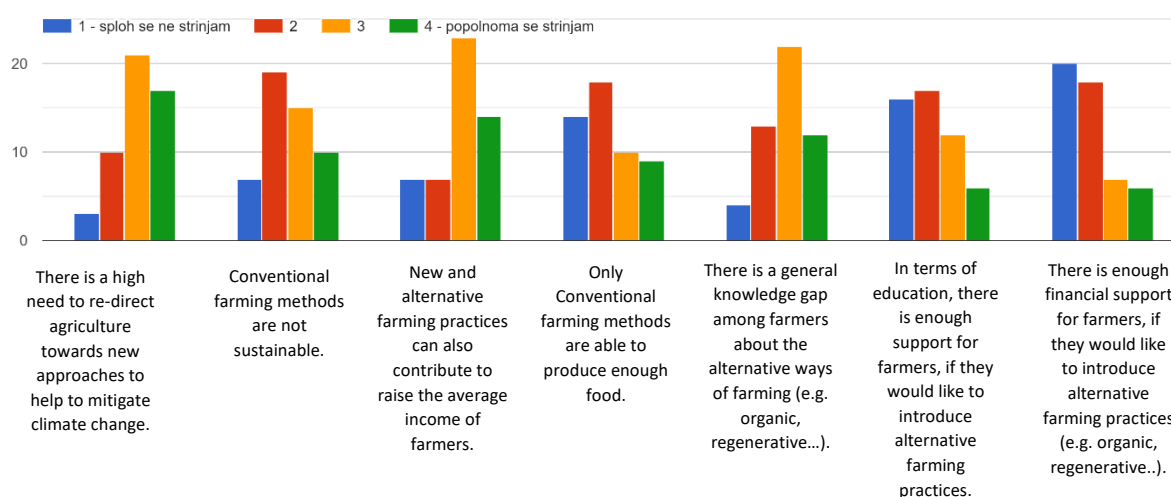


Figure 16: Share of respondents and their agreeing rate with statements

Mostly farmers agree there is need to re-direct agriculture to new approaches, that conventional agriculture is not sustainable and there is knowledge gap about alternative ways. But they are not sure about alternative practices can raise income of farmer or produce enough food. Also, most of them disagree about not being enough support for farmers regarding education or financial support if they would like to introduce alternative farming practices.

Question no. 10

‘How would you rate the general uptake of alternative farming practices, and especially conservation agriculture and regenerative agriculture? (On a 1-10 scale, where 1 means “not at all spread”, and 10 means “very well spread”).’

Table 10: Number of answers to general uptake of alternative farming practices

	1	2	3	4	5	6	7	8	9	10	I don't know	Average rating
In my farm	4	9	2	6	4	4	8	7	3	3	1	5,2
In my country	0	14	13	7	7	5	2	2	0	0	1	3,8
In the EU	2	7	9	6	8	4	5	3	4	0	3	4,7

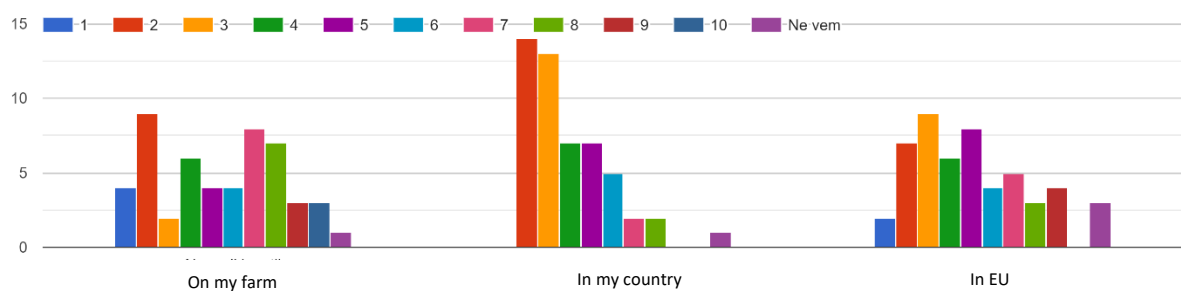


Figure 17: Number of farmers rating the uptake of alternative practices

Farmers answering the survey rated uptake of the alternative farming practices on their farms with average value 5.2, in their country with 3.8 and in the EU with 4.7. This is showing, the respondents have opinion the uptake of alternative farming practices on their farms, as also in EU is higher than in their country.

Question no. 11

‘Please mark, if you know the following techniques, and if you have already implemented it in your farm.’

Table 11: Number of farmers following or implementing the technique on their farm

	I am familiar with the technique	I have already implemented it	I have not implemented it, but planning to do so	I am not familiar with the techniques
Reducing or eliminating mechanical interventions in the soil (tillage)	17	23	6	5
Keeping the upper part of the soil overgrown with vegetation (eg. cover crops)	16	27	5	3
Increasing plant biodiversity	19	24	6	2
Include livestock in farmland to fertilize the soil	25	17	6	3
Increasing organic matter in the soil	15	31	2	3
Implementing habitat conservation techniques e.g Preserving hedgerows, leaving field margins to grow.	20	21	9	1

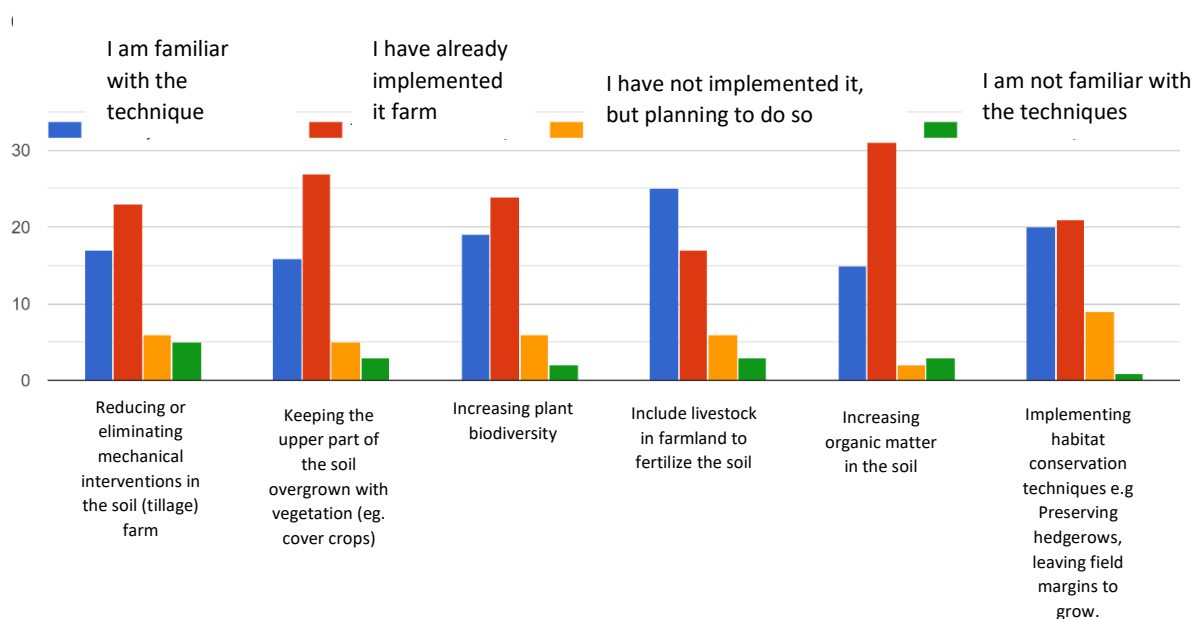


Figure 18: Number of farmers following or implementing the technique on their farm

Farmers answering the survey are quite familiar with different techniques and have already implemented them on their farms. If not yet, some of them are planning to implement the technique in the future. Only few of them aren't yet familiar with techniques.

Question no. 12

'Are you aware of the following benefits of regenerative agriculture?'

- A. Reduction of labour for farming (YES : 27; NO: 24)
- B. Need for substantially less water (YES : 31; NO: 20)
- C. Higher crop quality (YES : 36; NO: 15)
- D. Greater crop stability (YES : 35; NO: 16)
- E. Higher CO2 retention in the soil (YES : 38; NO: 13)
- F. Enriched soil (YES : 43; NO: 8)
- G. Less farm mechanization (YES : 27; NO: 24)
- H. Increased farm revenue (YES : 23; NO: 28)
- I. Less problems with plant diseases (YES : 24; NO: 27)
- J. More beneficial for insects (pollinators) (YES : 37; NO: 14)
- K. The varied appearance of the cultural landscape (YES : 40; NO: 11)

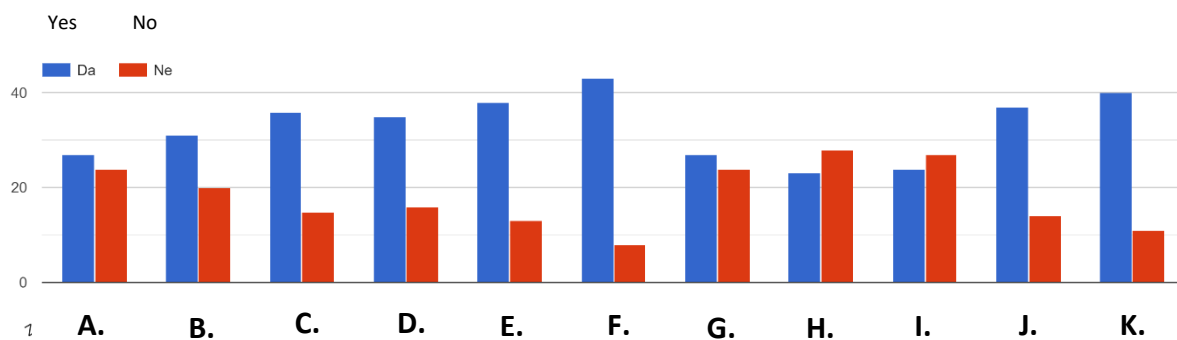


Figure 19: Awareness of farmers regarding benefits of regenerative agriculture

Benefits of regenerative agriculture being the most known by the farmers are higher crop quality, greater crop stability, higher CO2 retention in soil, enriched soil, more beneficial insects and the varied appearance of the cultural landscape. Among them the benefits for soil stand out the most. Less awareness about benefits had claims about less farm mechanization, increased farm revenue and less problems with plant diseases.

Question no. 13

'What do you consider the main obstacles for taking up regenerative agriculture?'

- Lack of know-how
- Lack of financial support from the state
- Suspicion regarding its results
- One needs to completely change what they do currently in farming
- Financial uncertainty regarding the short-term future
- Expensive investments
- Organisational difficulties in achieving year-round coverage of soils

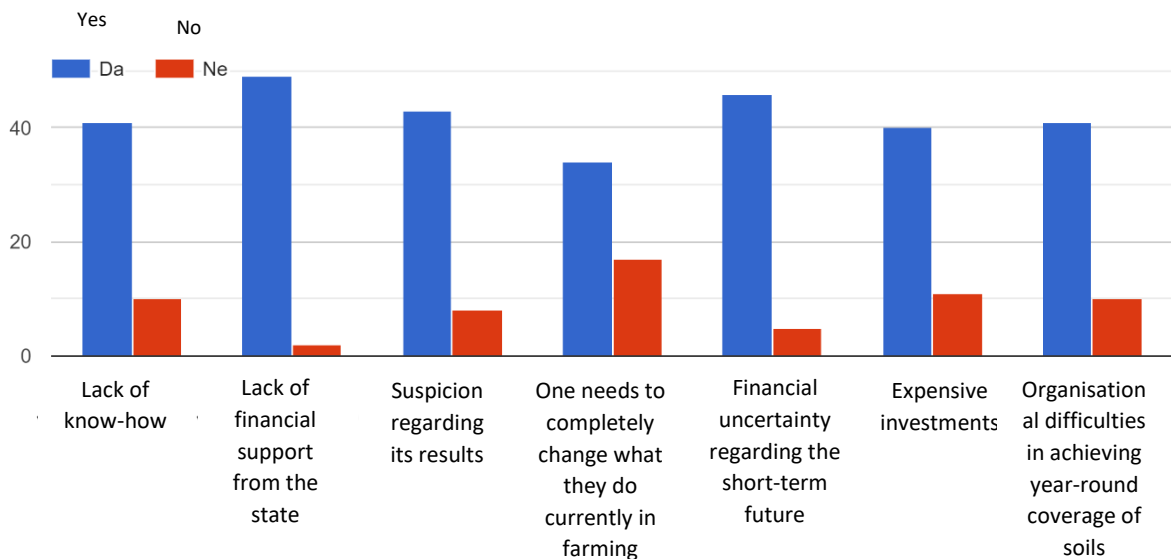


Figure 20: Main obstacles considered for taking up the regenerative agriculture as considered by the farmers

Every listed obstacle seems to be of high importance for the farmers, the two with most rating being lack of financial support from the state and financial uncertainty regarding the short-term future. It seems changing the way of farming or habits is not such big obstacle as others.

Part II: Attitudes towards RA & education-needs

Question no. 14

'Would you like to take up regenerative agriculture farming practices?'

Response rate: 51/51

- Yes, and I am already doing it. (16, 31.4%)
- Yes, in the future. (25, 49%)
- No. (10, 19.6%)

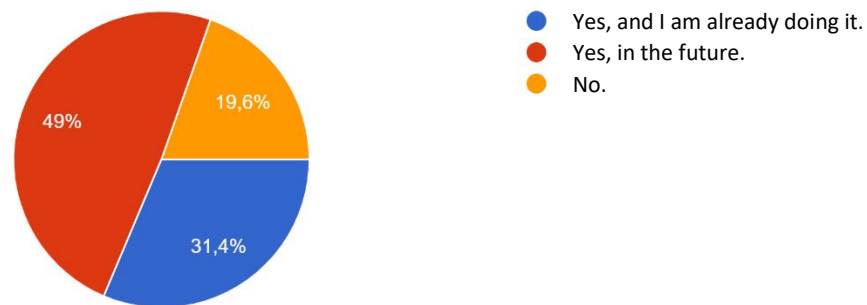


Figure 21: Likelihood of farmers taking up the regenerative agriculture practices

Most farmers (49%) is planning to take up regenerative farming practices in the future.

Question no. 15

'If you have answered "No", what is the reason behind it?'

Response rate: 13/51

- Economic barriers (I could not make enough money out of it) (6, 46.2%)
- Environmental barriers (I do not consider these techniques as environmentally friendly) (1, 7.7%)
- Social barriers (I do not want society to look at me as an alternative farmer) (0, 0.0%)
- Knowledge gaps (I would not know how to start regenerative agriculture practices) (3, 23.1%)
- Lack of interest (I simply do not have the time or interest) (3, 23.1%)



Figure 22: Barriers defined by farmers not willing to take up the regenerative agriculture practices

Among those who are not planning to take the alternative farming practices in the future, the main reason are economic barriers (46.2%), followed by knowledge gaps and lack of interest (both 23.1%).

Question no. 16

'Would you like to receive further information and training on the following topics?'

	Yes, information	Yes, training	No
Regenerative agriculture farming practices (techniques)	26	21	4
Economic benefits of regenerative farming techniques	30	18	3
Environmental benefits of regenerative farming techniques	33	14	4
Obstacles and difficulties of regenerative farming	31	16	4
Financial support possibilities of regenerative/alternative farming practices	28	21	2

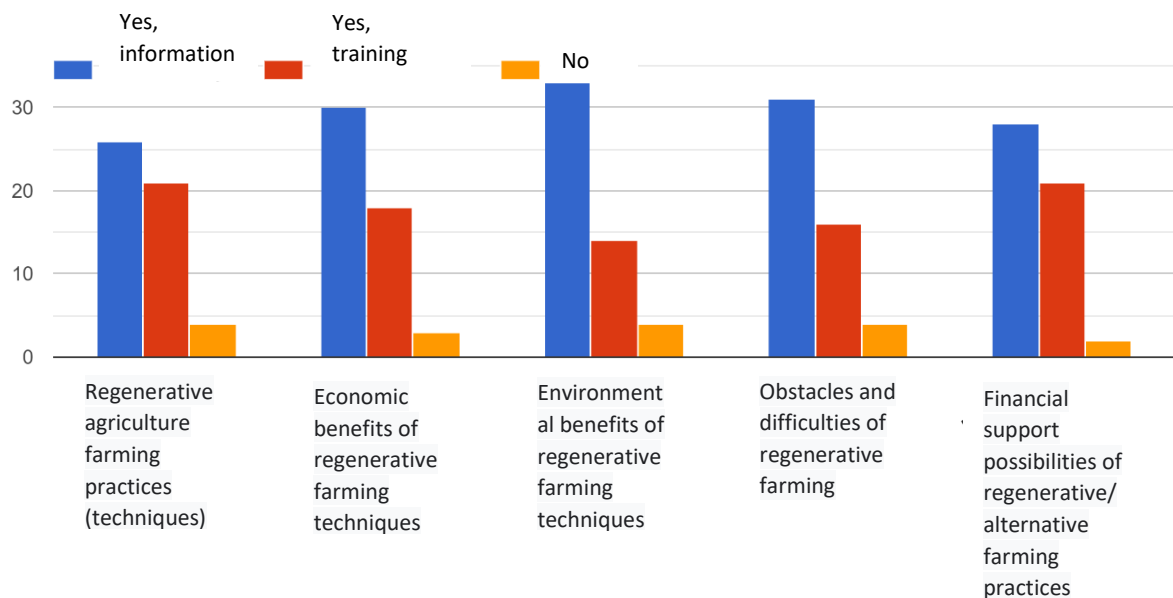


Figure 23: Farmers answers about receiving further information and training

Farmers are interested in receiving information (and also training, but with less percentage than only information) in all topics of regenerative agriculture: practices, economic and environmental benefits, obstacles and financial support possibilities.

Question no. 17

'Which of the following factors could enhance the uptake of regenerative agriculture practices in your farm? Please rate each of the following factors on a 1-4 scale, where 1 means "wouldn't enhance RA at all" and 4 means "would enhance RA a lot"'

	1	2	3	4
More financial support from government or EU	5	5	14	27
More opportunities for training and technical support (e.g. by agronomists)	3	13	15	20
Good practice sharing among farmers, network	5	8	16	22
Knowledge: lectures, workshops, demonstrations, instructions	2	7	19	23

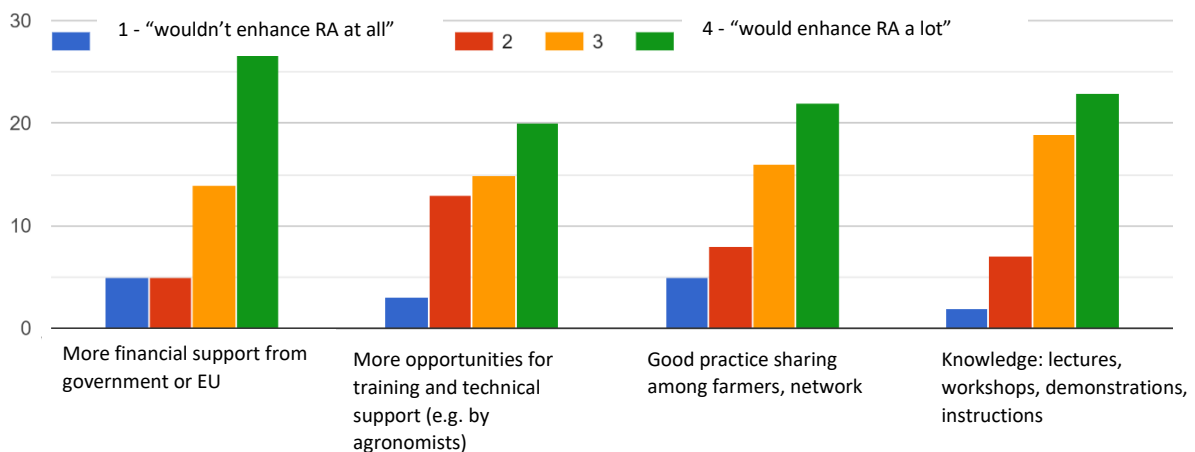


Figure 24: Farmers' opinion about factors that could enhance the uptake of regenerative agriculture practices on their farms

More financial support from government or EU is factor identified by most farmers, that could enhance the uptake of regenerative agriculture practices in farms. Also others factors are important.

Question no. 18

'Please feel free to share any other key aspects in RA as practitioner you feel the the questionnaire left.'

Response rate: 4/51

'In my opinion, the questionnaire did not miss much. It's hard to answer because the right answer is usually somewhere among the ones offered... But of course, the main problem when transitioning to new forms of farming is expensive mechanization and, currently, insufficient knowledge of how to do things so that it will grow enough, at least that's my opinion.'

'If we want to give farmers (EU & SI CAP) the opportunity to survive on the land, to achieve sustainable, nutritionally safe and economically efficient food production, we must change the mentality of soil management and introduce new practices; regenerative and conservation agriculture.'

'Demonstrations.'

'Many years of someone's experience.'

Conclusions

The majority of respondents to online survey were male, with average around 40 years old, from Pomurje region, owing farm up to 50 ha with less than 5 employees, having arable (crop) production and still following the conventional farming practices. Farmers are aware of the climate change, and know about alternative practices, like the organic farming, conservation agriculture and sustainable farm management, while the term regenerative agriculture seem to be not so common to them. They agree there is need to re-direct agriculture to new approaches and that conventional agriculture is not sustainable, but they are not sure about alternative practices can raise income of farmer or produce enough food. Farmers are familiar with different techniques of regenerative agriculture and have either already implemented them on their farms or are planning to implement them in the future. Benefits of regenerative agriculture being the most known by the farmers are higher crop quality, greater crop stability, higher CO₂ retention in soil, enriched soil, more beneficial insects and the varied appearance of the cultural landscape. Two obstacles for taking up regenerative agriculture being identified by farmers as more important are lack of financial support from the state and financial uncertainty regarding the short-term future. Most farmers not yet practicing the regenerative agriculture is planning to take up regenerative farming practices in the future, but if not, economic barriers, knowledge gaps and lack of interest are the main reason not to do this. Farmers are interested in receiving information and training f regenerative agriculture. More financial support from government or EU is factor identified by most farmers, that could enhance the uptake of regenerative agriculture practices in farms.

Chapter 3. The case studies

We have interviewed farmers about their use of regenerative agriculture practices to assess their knowledge of the topic, to learn about their attitudes and to collect good practices that could be used in the future in the training of students. In total, 6 interviews were carried out by the Slovene partners. The location of the case study farms is presented on the following map.

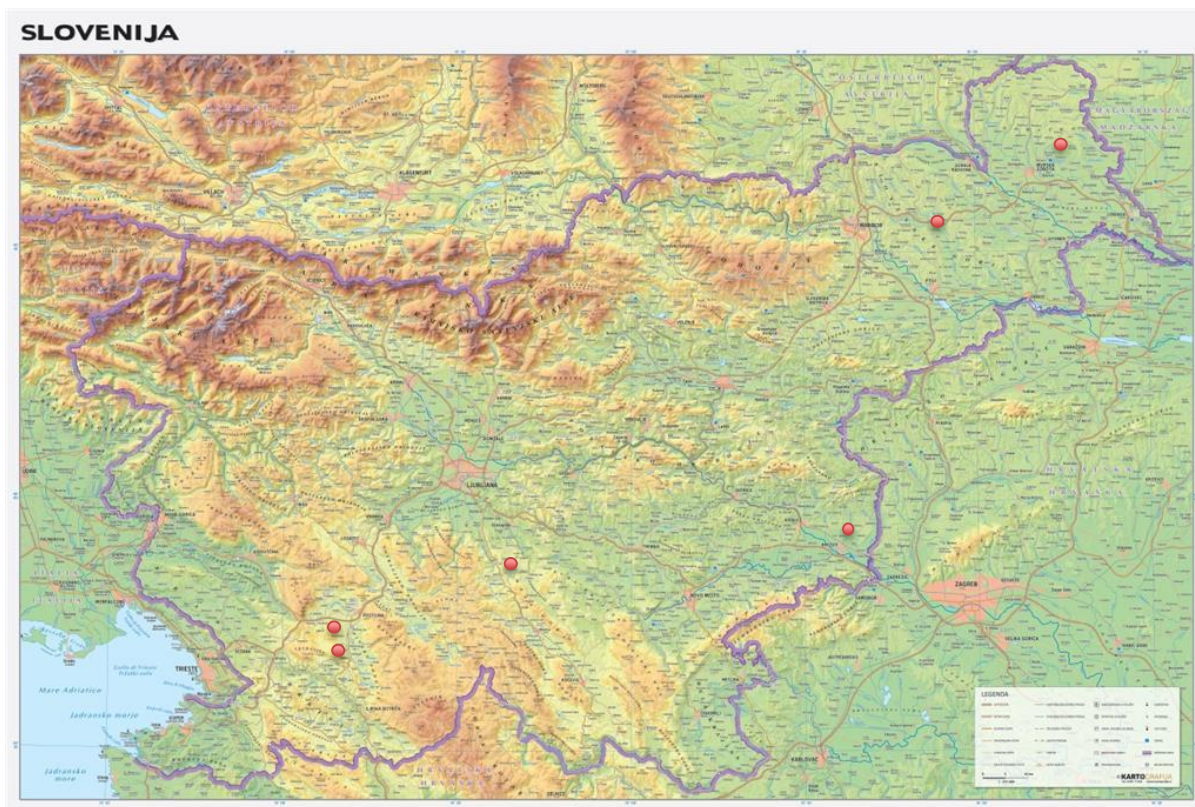


Figure 25: Case studies location on the map of Slovenia (red dots).

The interviews covered the following questions:

- **General information:** Name of the farmer/Holding, name of the respondent, location of the farm, size of the land (given in hectares), number of employees (permanent, seasonal), main activities of the farm (arable crop species, animal species, other activities if any).
- **Regenerative agriculture (RA) practices currently used:** Whether they use the elements of regenerative agriculture, if not yet, do they plan it, if they do then on the whole area; what RA elements they use, which crops are grown in this way and for how they have been applying this practice.
- **Starting regenerative farming and motivation for doing so:** What was the history of RA in the holding, what made them decide to start it; did they receive any education on the subject, if so where, if not where did they get the information; did they receive any financial support to start RA, if so from whom.
- **Results of regenerative agriculture:** benefits, obstacles, difficulties, struggling, satisfaction, intention to continue, intention to change the existing practices.

Farm Žgajnar

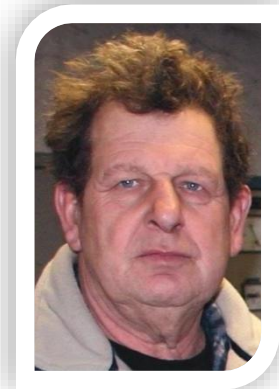
[O kmetiji](#) | [BIO Dobrote - Kmetija Žgajnar](#)

General information:

Name: Tone Žgajnar

Location: Slovenia, Region of Notranjska, near Postojna

Farm size: 316 ha



This farm is primarily engaged in animal husbandry - producing milk, beef, and pork meat. A majority of the fields are planted with cereals, primarily wheat. Since they are an organic farm, they use a crop rotation with a grass clover mixture. The farm has its own milk processing facility and sells products on the local market. More than 70 school kitchens are supplied with dairy products, especially excellent yogurts.



*Figure 26: Cattle for meat and milk production and pigs for meat at Žgajnar's farm.
Source: Photos by the farm owner and web page <https://biodobrote.si>*

The farm has been practicing regenerative agriculture practices for over ten years. Direct sowing without plowing, using grass clover mixtures in a rotation, seeding grasses, and leaving unmown parts of meadows to preserve biodiversity preserve these practices. They also carry out a measure of late mowing, so the grasses produce the seeds. On the fields, they practice green fertilization - green floor.



*Figure 27: Unmown part of meadow on the Žgajnar farm.
Photo: Ana Brdnik Benčan*

At the turn of the century, Anton found a runaway cooperative estate. He knew it could offer many possibilities and that is where he found his true love. He bought an estate, employed workers from the estate and began serious milk production. Ten years later, daughter Tina founded the company BIO DOBROTE d.o.o. and they started more intensive cheese production.

Anton:

“We decided on regenerative agriculture primarily because of the increase in soil fertility, the reduction of humus leaching, and the reduction of production costs.

I did not attend the lectures on regenerative agriculture because I did not notice them. I learned about this type of farming on professional excursions around Slovenia, when we looked at good practices with our association. As I found the practice of regenerative agriculture very useful, I introduced it to my farm.

Financial support for regenerative agriculture does not yet exist.

In the ten years since I started practicing regenerative agriculture, we have seen soil organic matter increase. Since organic farming does not allow the use of herbicides, we constantly battle weeds in the fields, which we have not yet overcome. We will continue with regenerative agriculture on our farm, because we are satisfied, and it is encouraging.”

ŽIPO Lenart d.o.o.

[Domov - Žipo Lenart \(zipo.si\)](http://zipo.si)

General information:

Name: Mitja Krajnc, technical manager

Location: Slovenia, Region of Podravska, near Lenart

Farm size: 860 ha



The farm cultivates 860 ha of land, of which corn, wheat, barley, oilseed rape, soybeans and occasionally other crops are grown on fields. 26 hectares of land are included in the organic method of cultivation. Most of the crops are used for feeding beef cattle and pigs.

They breed around 1,400 cattle and around 3,500 pigs annually. At the same time, the farm also has the status of recognized breeding organization and perform a progeny test (monitoring the growth and slaughter characteristics of the offspring of Slovenian elite bulls).

In addition to primary agricultural production, they are also engaged in the purchase and storage of grain, grain drying, production and processing of various agrobiomass. The farm produces bedding for animals, feed mixtures for calves before and after weaning.

There are 11 regularly employed persons, and another 10 seasonal workers. In addition to the basic agricultural activity, farm performs other supporting activities (purchase of grain, drying of grain, storage of grain, production of bedding for animals and fodder mixtures for calves, processing and production of various agrobiomasses). During the summer and autumn seasons, they hire additional labor for harvesting and all processes related to it.



Figure 28: Farm ŽIPO Lenart with barns for cattle and fodder storage facilities.



Figure 29: Main activities of farm ŽIPO Lenart. Up: Storage and drying of cereals and fodder. Down: Cattle production.
 Source: Photos by the Miha Krajnc and web page [Domov - Žipo Lenart \(zipo.si\)](http://Domov-ŽipoLenart.zipo.si)

Miha Krajnc, CEO of Farm ŽIPO Lenart:

We have been working with regenerative agriculture for eight years, so we have already gained a lot of experience and knowledge. The history of the beginning of regenerative agriculture dates back to 2015, when we acquired the first tools for minimal tillage. We have learned about the success and beneficial effects of conservation tillage from other major successful agrocombinations in Slovenia and abroad. The main motivation was above all the saving of time, work and energy, and at the same time we also learned about the increased content of organic matter on the surfaces where conservation tillage was used, which gave us additional impetus and motivation. Nevertheless, modern practices always offer new and innovative solutions, which is why we also focus on further education and training in this area.

On our farm all arable land is cultivated "without a plow" or without plowing. We use special tools (looseners) with which we loosen the soil to a depth of 20 cm. This saves time, work and energy, as the mentioned tools ensure the processing of a larger field width than a plow.

With the practices of regenerative agriculture, we grow all the crops that grow on our land. These are corn for grain, corn for silage, wheat, barley, oilseed rape, soybeans, spelt, occasionally also flax and sunflowers.

We learned the practice of regenerative agriculture mainly from the experience and advice of major agricultural companies from abroad and Slovenia. After the purchase of mechanization for conservation treatment in 2015, we began to gain the most experience from our own work.

The advantages are primarily lower consumption of work, time and energy. At the same time we make fewer passes over the field with heavy machinery, thereby reducing the negative impact of soil stress. Since we are only loosening the soil, we also influence the increase of organic matter in the soil. With conservation tillage, we maintain the fields, as there are fewer depressions and other surfaces where water could stagnate. The problem, however, is increased pressure from weeds and some pests. That is why we are adjusting the selection of phytopharmaceuticals, and we are still looking for solutions for some problems. For the time being, we do not intend to make any changes to the methods of regenerative agriculture. We are currently satisfied with the current situation.



Figure 30: Machinery used for soil cultivation without plowing at ŽIPO Lenart farm.

Organic farm ŽNIDERŠIČ

[Ekološka kmetija Žnideršič](#) | [Brežice](#) | [Facebook](#)

General information:

Name: Toni Žnideršič

Location: Slovenia, Region of Posavje, near Brežice

Farm size: 80 ha

No. employees: 2 regular and 1 seasonal



The main branch of the farm is the production of milk and meat, as well as the production of cereals. The farm is also engaged in forestry and viticulture. On the farm, all crops are grown using regenerative methods of agriculture, which are being developed in such a way that they will interfere with the soil even less in the coming years. Some areas of the farm have been cultivated in this way for 20 years. Over the years, very positive effects on the soil have been observed, but the soil slowly regenerates and when it reaches a certain level, they can take a step into the next process.



Figure 31: Organic farm Žnideršič from air.

Toni Žnideršič, the owner:

“The beginnings were by sowing greenery directly without plowing. Observing the fields, we realized that it is not a good idea to interfere with the soil in the summer months if we want to ensure good emergence and growth of plants. We also found that there is less weather impact on the soil if there are plant residues on the surface.”



Figure 32: Barley germinated at the field covered by plant debris.

The soil is cultivated without plowing with minimal cultivation (circular harrows and a special loosener with narrow legs) and sowing with the help of a comb. In the fields, they use the sowing of winter crops for greening and also for summer ground cover. In the rotation, they use clover, corn, triticale, barley, wheat, millet, grass clover mixture, the varieties are selected according to the type of field. Given that they are an organic farm, they also fight against weeds with the crop rotation. They would point out that their fields are covered with crops throughout the year, which they use for animal feed. The underground parts, however, serve beneficially for humus and life in the soil. All the organic fertilizers produced on the farm are used on their own land, thereby enriching the soil.



Figure 33: Mechanization for soil cultivation used at the Žnidaričs' farm. Left: circular harrows for soil cultivation. Right: The comb har-row tool for weed control in early stages of cereal growth.

They are looking for new knowledge, practices and they also learn from their own experience. They have been training from various articles and lately also through conversations with members of conservation agriculture.

The economic benefit is in lower production costs and, given the improvement of the quality of the land, also a reduction in the use of fertilizers and phytopharmaceuticals. They only use domestic manure and slurry.

The environmental benefit is increased humus in the soil, less soil erosion. In their case, organic production of quality and also quantitatively satisfactory crops.

Processing is essential with lower costs, lighter tractors and machines, and processing is also multi-stage. Such processing is easier to implement, but it should be very well planned (we must take into account the rotation, soil moisture and the correct setting of the machines).



Figure 34: Cultivation of field after maize harvest.

Obstacles and problems?

The development of mechanization is slow, sometimes not correct, there is not enough expert advice, there are no available varieties on the market, a long process of transition from conventional to conservation. Good observation of arable areas throughout the year is important and also some persistence.



Figure 35: Early spring field cultivation.

They are very satisfied. They are also motivated by the fact that they can go in a new direction of farming with their own knowledge. Changes are always necessary and they will continue to develop new techniques.



Figure 36: Cultivation of cereal stubble in summer.

Source: Photos by the Toni Žnideršič

Farm Štefan Cigüt

[Kmetija Cigut \(kmetija-cigut.si\)](http://kmetija-cigut.si)

General information:

Name: Štefan Cigüt jr.

Location: Slovenia, Region of Pomurje, near Moravske Toplice

Farm size: 380 ha

No. employees: 6 regular and 2 seasonal



The farm is engaged in agriculture (corn, wheat, barley, sunflowers, soybeans, alfalfa, triticale, pumpkins) and livestock production.



Figure 37: Farm Cigüt from air.

They have been using the practice of regenerative agriculture for 10 years. In this way, they grow corn, wheat, barley, sunflowers, soybeans, alfalfa, clover and grass mixture, triticale and pumpkins.

Regenerative agriculture was chosen to increase soil fertility, improve soil structure and increase the proportion of humus in the soil. The main motivation was maintaining the vitality of the soil and a sustainable way of farming.

Štefan attended a training course on regenerative agriculture organized by the Slovenian Association for Conservation Agriculture.

The advantages of regenerative agriculture, which the farm perceives: with permanent coverage with plants or plant residues, the quality of the soil improves, the content of organic matter in the upper layer of the soil is higher.

Štefan Cigüt jr. , the owner:

“With minimal interventions in the soil, we reduce the frequency of passages with machinery, which has a positive effect on less compaction of the soil.

By using the methods of regenerative agriculture, we influence the entire agro-ecosystem. It is important that regenerative agriculture is carried out permanently, for several years.

We are satisfied with the methods and techniques of regenerative agriculture used, or we adapt to the needs of farming.”



Figure 38: Cultivation of cereal stubble and sowing of summer green on the field.



Figure 39: Cultivation of maize stubble after harvest with circular harrows.



*Figure 40: Cattle production at Cigüt farm.
Source: Photos by the farm owner and web page [Obdelava tal \(kmetija-cigut.si\)](http://Obdelava.tal(kmetija-cigut.si))*

Farm Penko

General information:

Name: Matej Penko

Location: Slovenia, Region of Notranjska, near Postojna

Farm size: 53 ha

No. employees: 1 - selfemployed on farm



The farm is engaged in agriculture: cultivation of barley, wheat, alfalfa and grass-clover mixture. The farm is also engaged in cattle breeding.

The farm is partly oriented towards regenerative agriculture, Matej would like to learn more about this agriculture, he has only been practicing it for two years. Matej is a young owner of the farm who attended the secondary agricultural school in Novo mesto, but he believes that he did not get enough knowledge in regenerative agriculture at school.



Figure 41: Barley ready for harvesting at Penko farm.

He practices regenerative agriculture on fields where he uses minimal tillage, green floor, maintains hedges and uses a three-year crop rotation. In this way, he grows barley, grass clover mix, hay and alfalfa. The main motivation for the implementation of regenerative agriculture is the reduction of land cultivation costs, as well as monetary support for maintaining hedges. He started regenerative

agriculture at the encouragement of the agricultural advisory service, which advised him on this method of farming. He also received financial support from the Ministry of Agriculture.



*Figure 42: Direct sowing, without tillage.
Source: Photos by the farm owner.*

He sees the advantages of regenerative agriculture in the lower costs of soil cultivation, since there is no plowing, and in financial support.

The obstacles he faces are mainly heavy soil, too small arable areas and wild animals that destroy the crops in the fields. It solves them in the following ways:

He combined some fields by renting neighboring plots. Fertilize the soil liberally with manure to make it lighter over time.

He will continue with regenerative agriculture, as he is satisfied with this method of farming.

Farm Debeljak

General information:

Name: Nastja Debeljak

Location: Slovenia, Region of Dolenjska, near Velike Lašče

Address: Gornje Retje 1

Farm size: 61 ha

No. employees: 2



Nastja completed secondary agricultural school in Novo mesto and now attends the Faculty of Agriculture - Animal Breeding in Domžale. The farm is engaged in breeding and processing of milk and produces crops. Grows corn, triticale, barley and alfalfa.

The farm practices regenerative agriculture practices, but feels they know too little about it. She wants the agricultural advisory service to organize lectures on the subject of regenerative agriculture.



Figure 43: Farm Debeljak.
Source: Google maps

Practices that have been carried out on the farm for several years are: minimal cultivation of some fields, use of a three-year crop rotation and green floor. Wheat, barley and alfalfa are grown with this practice.

Nastja Debeljak, the owner:

"We started with this practice because of the high costs of production. With regenerative agriculture, we optimized production. We do not have intensive production, but at the same time we do not have high costs (fuel for plowing). I learned about regenerative agriculture on expert excursions to farms that use this practice both in Slovenia and abroad. I also browsed the Internet. We have not received financial support for this type of agricultural practice."



*Figure 44: Alfalfa in the rotation for green floor.
Photo: Nastja Debeljak*

Nastja sees the advantages of regenerative agriculture in preserving humus in the soil and thus more fertile soil. Green floor is a form of nitrogen fertilization that reduces fertilizer use while adding organic matter to the soil.

Obstacles and problems are mainly wild animals that destroy crops. The solution is to fence the fields, but it is expensive.

They will continue with regenerative agriculture, as they are satisfied with the methods. Changes would be introduced only in the case of a reduction in the number of wild animals, which unfortunately is not within their jurisdiction.

Summary of case studies

General information

The interviewed farmers work in Notranjska, Dolenjska, Pomurje, Posavje and Podravska districts. The sizes of land areas fall between 53 to 860 hectares. There are two bigger farms with 860 and 380 hectares, other three farms fall between 53 to 80 hectares. The number of permanent (full-time) employees on holdings is variable from 1 to more than 20 people. The following arable crop species are most common among the respondents: corn, barley, alfalfa, triticale, grass clover mix, barley, wheat. Typical livestock sectors: dairy cattle breeding, beef and pig fattening.

Regenerative Agriculture (RA) practices currently in use

The farmers interviewed all use the elements of regenerative agriculture. Three farmers use it on a part of their farmland, other three use it on the whole area of their farmland. Where it is used only on a part of the area, the principles and recommendations of RA are mainly applied. Overall, all farmers have a different history of integrating the different elements of RA. They used RA practices from 2 to 10 years.

The elements of regenerative agriculture mostly used by the respondents are the following:

- direct seeding without plowing,
- grass clover mix,
- seeding grasses,
- unmown parts of meadows,
- late mowing meadows for self-seeding grasses,
- green floor.
- Working manure residues back into the soil to increase organic matter content and improve soil water holding capacity
- Growing green manure crops
- Growing nitrogen fixing crops
- Use of cover crops
- Application of no-tillage or minimal tillage
- Reducing the number of cultivations passes
- Farmyard manure application
- Use of bacterium fertilisers
- Reducing the amount of fertilisers used
- Crop rotation
- Reduction or absence of chemical crop protection
- Exploiting the beneficial effects of crop combination
- maintain hedges for the biodiversity of birds and other animals

Starting regenerative farming and the motivation leading to it

Among the farmers interviewed, all were motivated to adopt RA because:

- reduction of costs,
- reduction of leaching of humus,
- increase of soil fertility,
- of the high cost of cultivation (fuel for plowing),

- of the subsidies for the bird mowers and margin subsidies
- they optimized production with regenerative agriculture.

One respondent felt that this was the only way to preserve the land and the environment for future generations. For most of them, the main motivation was reduction of costs and government subsidies. The respondents have not received any specific training on RA. Many have learned what they know and use at different forums, by participating in professional excursions at home and abroad or with the help of literature found on the Internet. Financial support is not available in Slovenia today for regenerative agriculture, but they are other subsidies for agricultural practices very similar to regenerative agriculture.

Results of regenerative agriculture

Among the benefits, farmers mainly mention lower costs, subsidies and improved soil conditions (increase of organic matter in the soil). Especially those where it is also possible to apply farmyard manure. Improved soil conditions also bring several other benefits, such as improved yield safety, reduced fertilizer use and lower costs. Environmental awareness, green floor as a form of nitrogen fertilization, preservation of hummus in the soil, more fertile soil is also defined as benefits. The ease of soil cultivation is mentioned by many farmers, as well.

Among the disadvantages, among others, they have mentioned weed management and troubles with heavy soil. All of them mentioned also damage caused by wild animals to the crops. But this problem applies to all of Slovenia, regardless of the type of agriculture.

Overall, the respondents are satisfied with the elements of regenerative agriculture they use, and they wish to continue this method of farming in the future. The need for continuous training, learning and development was also expressed by the farmers.

Chapter 4. Overall conclusions

In 2020, agriculture in Slovenia together with forestry and fisheries contributed 2.3% to total value added and 6.9% to total employment, the share of employment in agriculture is decreasing as also the number of agricultural holdings and the utilized agricultural area (UAA). The average agricultural holding cultivates 7.1 ha of UAA, and the trend is toward to the improvement in the size structure as the number of agricultural holdings that cultivated more than 20 ha of UAA has more than doubled compared to 2000. Livestock holdings raise an average of 9.1 livestock units (LSU) in 2020, also trend is in increasing the number of livestock holdings with more than 20 LSU (by 27% between 2000 and 2020). In recent years, a reduction of negative impacts of agriculture on the environment can be noticed. The use of pesticides and mineral fertilizers has become more rational, there is notable share of legumes in crop rotation, the agricultural area under organic farming is also increasing.

Organic farming is among the most practiced alternative agricultural practices in Slovenia with the agricultural area under organic farming in 2020 being approx. 52 thousand ha (10.8% of all UAA). In 1997, the Slovenian Organic Farmers' Association (S.O.F.A.) was founded. Standards for organic agriculture in Slovenia were prepared in accordance with the IFOAM Basic Standards by the Institute for Sustainable Development (ISD), a non-governmental organisation (NGO), specifically for this purpose and published by the Slovenian Ministry of Agriculture. In 2000, the private organic logo BIODAR is introduced, in 2001 national rules for organic farming are introduced and in 2005 the government adopted the first national organic farming action plan, being also adopted in new action plan until 2027. It sets out measures to accelerate the development of organic farming. Document provides an analysis of the situation, a SWOT analysis, a presentation of needs, objectives and measures (70 actions) per 8 priority areas (production, processing, knowledge transfer, seed, integration, eco-food in the public procurement system, promotion and marketing, research and development of new technologies, and organic farming in the context of climate change) that will contribute to the further development of organic farming.

Conservation and regenerative agriculture in Slovenia do not have such long history as organic agriculture, but this area is fast evolving and getting a lot of attention by farmers, professionals, scientists and the rest of the public in last few years. In 2016, Slovensko združenje za ohranitveno kmetijstvo (Slovene Association for Conservation agriculture – SACA, was officially founded. The purpose of the association is the introduction and dissemination of conservation and regenerative agriculture into wider practice with the aim of contributing to the sustainable development of agriculture in the Republic of Slovenia. SACA is a member of European Conservation Agriculture Federation ECAF. SACA gives initiatives to the Ministry of Agriculture in relation to the measures of the Common Agricultural Policy and in the field of sustainable agriculture through the introduction of CA /RA. In the past two years, SACA was active in the development of Conservation agriculture (CA) programme for the Ministry of agriculture that was included in the draft version of the new Strategic rural development plan for 2023 – 2027 as a standalone action, along with the organic farming action, but was at the end divided into several single regenerative actions which promotes proper soil management and also indirectly supports regenerative-conservation agriculture.

The future perspectives for regenerative agriculture in Slovenia are good, the area gets more and more attention among scientists, agricultural specialists and public and is being more and more practiced by farmers. Farmers who will persist with farming in the future will, likely use regenerative and conservation agriculture practices. They will be forced into this type of farming by the higher costs of

conventional farming and the requirements of environmental protection (water conservation areas). Hopefully, they will be also encouraged by subsidies.

The main obstacles to the application of RA reported by different stakeholders and farmers are gaps in knowledge and practice, higher costs of purchasing new machinery, lack of financial support from the state, and financial uncertainty regarding the short-term future. Most farmers not yet practicing the regenerative agriculture is planning to take up regenerative farming practices in the future, but if not, economic barriers, knowledge gaps, and lack of interest are the main reason not to do this. More financial support from the government or EU is a factor identified by most farmers, that could enhance the uptake of regenerative agriculture practices in farms. From the survey among stakeholders, there are two key conditions that have to be highlighted that **farmers would start or even try RA farming**: (1) knowledge transfer and awareness raising and (2) direct/normative additional supports. These include: incentives for purchasing machinery, fertilizers and seeds, a recognizable brand, connecting growers in education and joint performance in sales, the transition from smaller to larger surfaces, education and understanding the processes in the soil that take place in the RA system.