IMPROVING THE PROCESSES OF KNOWLEDGE TRANSFER AND MONITORING IN THE FIELD OF ENVIRONMENTAL AND NATURE PROTECTION IN AGRICULTURE

Executive summary

Improving the processes of knowledge transfer and monitoring in the field of environmental and nature protection in agriculture

Project code	V4-2020
Project duration	11/2020 – 10/2023
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The project was funded by the Ministry of Agriculture, Forestry and Food and the Slovenian Research and Innovation Agency in accordance with contract no. 2330-20-000240 within the Research Program »Zagotovimo.si hrano za jutri«.

CONTENT

ABBREVIATIONS

AEMs	Agri-environmental measures
AKIS	Agriculture knowledge and innovation system
CECRA	Certificate for European Consultants in Rural Areas
ES	Eco-schemes
EU	European Union
OF	Organic farming

KEY PROJECT MESSAGES

1 Knowledge transfer measures and programs should be strategically planned.

In line with the methodologies employed in directing agricultural development, the planning of communication and knowledge transfer must align with the principles of intervention logic. While this approach is integrated into the planning processes of the agricultural policies in accordance with EU regulations, its active utilization as a tool to support planning and decision-making in Slovenian agriculture has not been fully internalized. In the context of knowledge transfer within the realm of environmental and nature conservation, as addressed by this project, this implies that **planning improvements should entail a thorough analysis of the current situation and needs**. Based on this analysis, specific goals should be established, serving as the foundation for the selection of knowledge transfer methods, the implementation of programs, and the evaluation of their effectiveness.

Project contributions and key results: We have developed a comprehensive system of indicators to monitor the outcomes and impacts of knowledge transfer measures in agriculture. Furthermore, we conducted pilot testing for the developed monitoring system. In two cases, we applied the innovative and advanced experimental methods for assessing knowledge transfer measures. These methods facilitate a robust quantification of causal relationships between interventions and their respective effects.

2 Gradual introduction of new approaches and methods for knowledge transfer is essential.

The imperative to enhance the execution of knowledge transfer in the field of environmental and nature conservation in agriculture is most pronounced, particularly in the obligatory training for farms engaged in the agri-environmental measures and organic farming. We advocate for the **phased implementation of newer knowledge transfer methods that enable a more complexed and targeted approach to tackle agri-environmental practices and issues**. These methods encompass demonstration activities, participatory workshops, and comprehensive individual advice aimed at formulating sustainable farm production plans. Noteworthy advantages of these advisory forms include group learning, collaborative engagement of diverse stakeholders, collective action, and the empowerment of farmers.

Project contributions and key results: Through the implementation of a randomized controlled experiment, we empirically demonstrated that knowledge transfer in the form of participatory workshops increases farmers' competence and their readiness to adopt climate-friendly practices.

An important aspect of knowledge transfer involves **informing farmers about voluntary measures in agri-environmental policy (AEMs, OF, and ES)**. It is sensible to conduct future research to assess the effectiveness of diverse methods of information dissemination—such as printed materials, personal invitations by mail, and informational lectures—and the communication strategies employed in presenting these measures.

Project contributions and key results: By employing a randomized controlled experiment, we demonstrated that personally addressed information (in our case, a description of the new measure sent by mail) positively influences farmers' decisions to enrol in new measures for biodiversity conservation. Furthermore, our findings indicate that presenting the effects of the measure in either a positive (highlighting benefits) or negative (emphasizing potential losses) manner does not impact farmers' decision-making.

When implementing new knowledge transfer methods, it is important to recognize that **there is no singularly most appropriate or universally suitable approach or method for knowledge transfer** that can cater to the diverse knowledge needs in the agri-environmental field. Various approaches and methods constitute a broader spectrum of advisory support to farmers, and their selection should be guided by the specific goals of knowledge transfer. These objectives ought to be derived from environmental and nature conservation requirements, alongside a comprehensive analysis of users' needs, namely, the farmers.

Project contributions and key results: To facilitate the planning of upcoming knowledge transfer activities in Slovenian agriculture, we have conducted a comparative analysis of different forms (mass, participatory, and individual) of approaches and methods for knowledge transfer in agriculture. Through a manual tailored for agricultural advisors, we systematically delineated their characteristics and supplemented the descriptions with illustrative examples of best practices from both abroad and Slovenia. The manual is organized to aid decision-making regarding the most suitable method in a given context, guiding users through key phases of planning and implementing knowledge transfer activities in agriculture in a step-by-step manner.

3 It is important to boost the competence of agricultural advisors and other professionals in the field of environmental and nature conservation, along with the implementation of participatory knowledge transfer methods.

The Slovenian Agricultural Knowledge and Innovation System (AKIS) has experienced a substantial decline in budgetary allocations for research, development, agricultural advisory services, and professional services in agriculture over the past decade. This decline is most obvious in the domain of the public service of agricultural advisory. Addressing the intricate challenges and necessary transformations in the scope of environmental and nature conservation in agriculture appears unlikely without a systematic increase in funds for research, development, and education. Furthermore, the systematic training of personnel within AKIS with new knowledge becomes imperative for these transformative changes. This entails **modifications to educational programs in secondary schools and higher education institutions, as well as the training of the agricultural advisors** in the field of environmental and nature conservation. Such initiatives could contribute to a better understanding of the importance of introducing agricultural practices that positively impact the state of nature and the environment.

Project contributions and key results: As part of the project, we contributed to the establishment of a group of agricultural advisors specializing in nature conservation. In terms of demonstration and educational activities on farms, we prepared and conceptually justified the possible design of such activities in Slovenia. The proposal for the future legal regulation envisages the inclusion of three basic types of farms to the Agriculture: demonstration farms, training farms, and master farms). Demonstration centers of educational institutions are legally defined in the Act on Scientific Research Activities

THE IMPORTANCE OF KNOWLEDGE TRANSFER IN THE FIELD OF ENVIRONMENTAL AND NATURE CONSERVATION IN AGRICULTURE AND THE CURRENT STATE IN SLOVENIA

Environmental and nature conservation in agriculture require farmers to acquire new knowledge, and the knowledge transfer system needs to gain additional expertise in this domain and incorporate additional approaches to effectively address these evolving needs.

Achieving environmental and nature conservation goals in agriculture and integrating these objectives into the production decisions of agricultural farms is a complex task that demands farm holders to master a comprehensive set of knowledge and technologies (Mattison and Norris, 2005). Sustainable management of natural resources and biodiversity conservation, therefore, necessitates farmers to acquire diverse knowledge, many aspects of which extend beyond the scope of primary agricultural production (Ingram, 2010). **Farmers' understanding and endorsement of environmental goals, coupled with their positive attitude toward environmental conservation, are crucial prerequisites** for the successful adoption of environmentally friendly agricultural technologies, adherence to higher environmental standards (e.g., organic farming), environmentally-oriented market positioning, and participation in environmental instruments of agricultural policy (Rob J. F. Burton et al., 2008; Ahnström et al., 2009; Cullen et al., 2020). In this regard, the strengthening of awareness regarding the importance of enhancing agricultural practices that contribute to environmental and nature conservation plays a particularly significant role.

A better understanding of the process of shaping farmers' attitudes toward nature and environmental conservation is of major importance for the effective implementation of agri-environmental policy goals (Thomas et al., 2020; Wąs et al., 2021). **Knowledge transfer plays a significant role** in this context, facilitating the application of findings from scientific research, innovations, and practical experiences to enhance agricultural practices. This transfer can manifest as vertical one-way or two-way knowledge flow from research institutions through agricultural advisors or the education system to farmers. Alternatively, it can take the form of horizontal, mutual exchange between farmers and other actors.

Governments employ various means to foster the transfer of knowledge and innovations in agriculture, with specialized advisory services traditionally playing a pivotal role (Haug, 1999). Nevertheless, modern knowledge transfer systems and agricultural advisory services face **numerous challenges that require expansion in the areas of covered disciplines, work organization, and knowledge transfer methods** (Faure et al., 2012). An important challenge lies in the evolving needs and expectations of users of advisory services, namely, agricultural farms, which have undergone substantial structural and social changes in Europe in the recent decades. Beyond variations in production orientations, farmers constitute an increasingly heterogeneous group with diverse lifestyles, needs, values, and attitudes, all of which naturally influence their expectations of advisory services (Lobley and Potter, 2004; Schmitzberger et al., 2005; O'Rourke et al., 2012). As societal expectations of agriculture grow and the range of policy goals related to the environment and social aspects expands, the complexity of public policy measures and associated knowledge also intensifies.

Emerging needs necessitate an **expansion of the operational domains and structures of knowledge transfer systems.** These needs encompass not only broadening the competencies of agricultural advisors but also incorporating new disciplines and revitalizing organizational structures (Ingram et al., 2016). Furthermore, there is a demand to explore alternative knowledge transfer methods that are more practical and offer greater flexibility for the inclusion of locally specific and relevant content. As environmental instruments of agricultural policy shift towards being more result-oriented and farmers play a more active role in decision-making concerning the implementation of agri-environmental measures, there is a growing need for advisory support capable of integrating environmental goals into the management of the agricultural farms (Herzon et al., 2018; Šumrada et al., 2021).

Slovenian AKIS faces significant challenges, including insufficient collaboration among stakeholders, a stagnation in budgetary funds, and a slow integration of new topics.

Under the Common Agricultural Policy (CAP) of the European Union, the exchange and transfer of knowledge are encouraged within the **Agricultural Knowledge and Innovation System** (AKIS). This system encompasses a network of institutions engaged in the creation, transfer, integration, and application of knowledge, fostering interactions to synergistically support decision-making, problem-solving, and innovation in agriculture (Knierim et al., 2015; SCAR, 2019).

Slovenian Agricultural Knowledge and Innovation System (AKIS) encompass a diverse structure of institutions and actors, including ministries of various profiles and related bodies, 18 research and educational institutions, and the Chamber of Agriculture and Forestry of Slovenia, which houses all agricultural and forestry institutes and performs the tasks of public agricultural advisory services. Representatives of the private sector include farmers' interest associations, private advisory organizations and companies, as well as non-governmental organizations (Figure 1). Key systemic support instruments for creating and transferring knowledge in the field of nature and environmental conservation are implemented within the framework of Rural development policy, Public agricultural advisory services, and the Network for Rural Development.

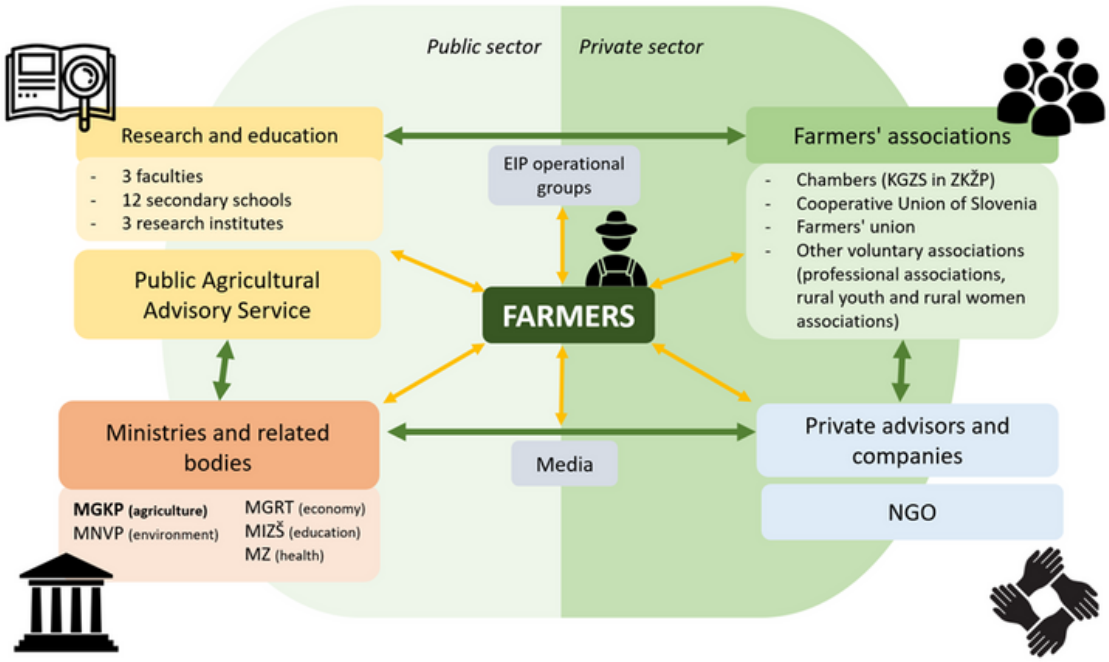

Figure 1: Slovenian Agricultural Knowledge and Innovation System (AKIS) (adapted from Erhart 2014; Horvatič 2020)

Previous evaluations and insights gathered from interviews conducted as part of the project indicate that **collaboration and coordination among AKIS actors are relatively weak.** This is apparent, among other things, in the unclear definition of rules for cooperation and the absence of a coordinating body. However, the challenges are more complex, manifesting in a low readiness for joint action and the acceptance of common decisions. In the domain of environmental and nature conservation, there is a **gradual but slow integration of new institutions**, such as environmental non-governmental and governmental organizations, managers of protected areas, and research institutions, into the Slovenian AKIS, where traditionally agricultural organizations and experts have been predominant. The integration process commenced in the late 90s when Slovenia's agricultural policy began implementing the first measures to promote environmentally friendly farming practices.

There is still a **robust division into "camps"** present, starting within the educational system where programs often lack updates, thereby allowing only a limited exposure and integration of environmental, agricultural, and economic knowledge. Despite recent progress, the Public Agricultural Advisory Service still faces a shortage of specialized advice in the scope of nature and environmental conservation. Regarding the training of agricultural advisors to incorporate modern knowledge transfer methods, notable progress has been made in the recent years. This advancement is linked to the introduction of the European certificate CECRA, designed to educate agricultural advisors in accordance with new approaches and guidelines in the field of agricultural advisory services. These methods are already in practical use and are yielding highly positive results. Over the last decade, the Slovenian AKIS has experienced a stagnation of budgetary funds for research, development, education, advisory services, and professional services in agriculture. This stagnation has been particularly pronounced in the operation of the agricultural advisory service.

Farmers express considerable dissatisfaction with the current implementation of the public training system while their understanding of the objectives of agri-environmental measures is relatively limited.

In Slovenia, only a handful of studies have been conducted so far on the effectiveness and efficiency of the knowledge transfer including in the field of environmental and nature conservation. Concerning farmers' decision-making about participating in agri-environmental measures, these studies suggest that **advisory support and the opinions of agricultural advisors are among the most significant factors influencing farmers' engagement in such measures**. In a comprehensive study from 2019 (Šumrada et al., 2021), which also included an evaluation of knowledge transfer, most interviewed farmers were familiar with or had heard about agri-environmental measures. However, despite this, about one-fifth (20%) of eligible farmers stated that they were not familiar with specific measures for preserving extensive dry grasslands. At the local level, the goals of informing about the content of individual measures have therefore not been fully achieved. According to the qualitative analysis of responses, it was also concluded that the substantive knowledge of these measures is often limited primarily to the requirements and conditions for enrolment. Only a few farmers could describe the importance and objectives of these measures in terms of nature conservation. The results of this study indicate that most efforts so far have been directed towards informing about the requirements of the measures, while **fewer capacities have been devoted to educating about environmental issues and the subsequent purposes and goals of measures.**

The findings from the mentioned research also uncover a shared desire among various actors, including farmers, for improved integration of environmental knowledge into the existing agricultural advisory system and a shift in knowledge transfer approaches. According to farmers, the latter should focus more on innovative methods, such as field visits and demonstrations, and training should be conducted more individually or in smaller groups.

In Slovenia, therefore, there is a recognized **need for reform in knowledge transfer approaches and methods**, especially in the scope of environmental and nature conservation. This necessity has been expressed by farmers, agricultural advisors, and other institutions involved in the Slovenian AKIS (Šumrada et al., 2021). While experiences with alternative (new) methods based on group and individual approaches to knowledge transfer exist and are partially integrated into Slovenian agricultural policy (MKGP, 2020), a primary limitation persists in the scarcity of staff and resources for their broader implementation. It's noteworthy that, in the recent years, the public service of agricultural advisory has significantly expanded its array of digital tools to support advisory work across various domains, such as production planning (Farm manager), strategic planning (SMT Tool), e-learning, and e-advisory (EnaSVET), or feed ration calculation (ZIFO). Over the last two years, advisors have also undergone intensive training in the field of environmental and nature conservation in agriculture, including as part of this project.

TYPOLOGY OF KNOWLEDGE TRANSFER APPROACHES AND METHODS

The selection of an approach (mass, group, and individual) is tied to the objectives underlying the transfer of the knowledge.

In theory and practice, three approaches to knowledge transfer have emerged, differing in the number of participants involved and form of the organization (Table 1):

Mass approaches facilitate the broadest dissemination of information for the resources invested, predominantly utilizing methods aligned with a linear model of knowledge transfer ("top-down") with limited opportunities for interaction among stakeholders.

Group approaches, on the other hand, involve smaller groups of participants and are based on participatory education and training. By fostering discussions among various stakeholders led by trained moderators, this approach allows for the exchange of knowledge and more targeted adaptation of its transfer based on local environments and needs.

The most targeted and in-depth is the **individual approach**, enabling the transfer of complex measures and environmental goals into the management of individual farms. A variety of methods and tools for knowledge transfer are at disposal for implementing these approaches, varying in their reach within the target group, organizational complexity, and implementation costs.

Table 1: Summary of the strengths, weaknesses, and applicability of individual knowledge transfer approaches.

	Mass (more than 25 participants)	**Group** (up to 25 participants)	**Individual** (individual farm)
Advantages	• Broad reach of target recipients • Small financial investment per recipient	• Group collaboration • Empowering farmers • ·Strengthening social capital • Gaining local knowledge	• Comprehensive and detailed treatment of individual farms • Tailored advice for farms
Challenges and weaknesses	• Limited opportunities for active participant involvement • Disregard for farmers' knowledge and experience	• Relatively large organizational and financial investment • Dependence on well-trained moderators or advisors	• Large financial, staff, and time investment • Dependence on well-trained agricultural advisors
Applicability	• Awareness and information dissemination • Transfer of simple and basic skills	• Exchange and search for local, group, and more complex environmental knowledge and solutions	• Implementation of more advanced environmental practices and support for demanding agricultural-environmental measures
Methods	• Lectures, courses • Printed materials	• Study and discussion groups • Participatory demonstration activities	• Individual advice

It's crucial to emphasize that there is no singularly optimal approach or method for knowledge transfer that can address all the diverse needs in the agricultural-environmental domain. Individual approaches (mass, group, and individual) and methods constitute a broader spectrum of advisory support for farmers, and their selection should be guided by the specific objectives of knowledge transfer in each case. These objectives, in turn, need to be derived from environmental and nature conservation requirements and an analysis of the needs of users, namely farmers.

Lectures and courses typically follow a linear and mass-oriented approach, primarily effective for disseminating simple and basic knowledge.

The lectures are structured and formal learning events led by advisors or subject matter experts. Typically, they are one-time events held indoors or online (in the form of **webinars**), and when conducted in a series for the same participants, they're addressed to as **courses.**

This method is widely used in environmental conservation in agriculture, enabling the delivery of diverse content to a wide range of farmers. It's particularly effective for conveying **information on legislative changes, agricultural policies, technological advancements, project outcomes, and specific environmental issues.** As farmers often play a passive role in these lectures, it requires greater effort from organizers and presenters to engage and motivate the attendees. This can be achieved by incorporating presentations of best practices, which can be shown through multimedia content (such as videos), along with short quizzes and tasks to activate listeners and create a more dynamic atmosphere. Encouraging farmer participation through discussions also proves beneficial, while breaking longer lectures into shorter learning units, around 45 minutes each, is a sensible approach.

Demonstration events facilitate experiential and participatory learning.

Demonstration events allow farmers to observe practical demonstrations of nature- and environmentally friendly practices, which they can later apply on their own farms. While knowledge transfer through demonstrations has been ongoing for years, there is a growing significance devoted to **demonstrations employing a group-based approach to knowledge transfer**. These demonstrations, involving multiple stakeholders in the educational process, support experiential and participatory learning, making knowledge transfer more adaptable to farmers' needs and the specifics of individual areas. These activities aim to engage up to 25 farmers, allowing them to participate in discussions, establish direct contact with the demonstrator, and actively gain in-depth knowledge of the practices presented. For larger events, it's advisable to divide participants into smaller groups.

Demonstration events serve various purposes, including raising farmers' awareness about the importance of environmental conservation, generating new knowledge, conducting experiments and research, training in environmentally friendly practices and agri-environmental measures, as well as fostering networking and strengthening social ties among farmers and other stakeholders. Generally, demonstrations are **more effective when focused on a single practice or theme**, while multiple consecutive events might be more suitable for presenting several complex practices.

Alongside traditional live demonstrations, **virtual demonstrations** can be developed, enabling farmers to observe innovations or best practices through videos without being physically present on the farm. Virtual demonstrations are especially valuable for showcasing specific seasonal conditions or locations that are challenging to access. An advanced form of video content involves 3D virtual farms utilizing virtual reality (VR) technology to simulate a farm or agricultural practice, providing viewers with a comprehensive 360° perspective.

Farmer discussion groups are based on a participatory approach, where a smaller group of farmers regularly meets over an extended period to exchange experiences, make comparisons, and collectively explore solutions.

Discussion groups, also referred to as study groups, participatory extension programs, workgroups, or interest groups, operate on the principles of a participatory knowledge transfer model. In these gatherings, a small group of farmers convene regularly over an extended period, meeting either on the farms of the involved members, online or at the premises of the agricultural advisory service. Within these sessions, farmers share their experiences, evaluate the efficacy of their farm management practices, and collectively seek solutions for the challenges they face.

Discussion groups are a well-established method of knowledge transfer in specific agricultural domains, particularly in farm economic management. However, their **utilization in the scope of**

environmental and nature conservation remains relatively uncommon. Despite this, their effectiveness is gaining prominence in the agri-environmental sector (Knook et al., 2020). The literature encompassing various knowledge transfer domains in agriculture, including agri-environmental areas, identifies the following **success factors** of such knowledge transfer methods:

- **Good group organization:** An optimal member ranges from 10 to 20 farmers, with the inclusion of other pertinent actors proving beneficial.
- **A competent moderator** plans the group's content and activities, ideally involving the farmers in the planning process. The moderator selection should consider not only subject matter expertise but also methodological competence, as leading such a group requires significant social and communication skills.
- **Building trust among the group members** occurs over an extended series of sessions, with circle membership ideally remaining relatively stable.
- **Relevant content and group activities:** Farmers ideally implement some of the discussed practices on at least a part of their farmland.
- **Supplementing guided discussions with other knowledge transfer methods,** especially various on-field demonstrations.

Individual advice relies on providing personalized attention and addressing the specific needs and queries of individual farms.

Individual advice may encompass the implementation of agri-environmental measures or adopt a comprehensive approach to the farm, considering both production and environmental aspects. Its goal is **to identify technological and economic options for achieving sustainable farm management**. Through this approach, economic and market solutions aligned with environmental protection goals can be found, reducing the risk of errors in implementing agri-environmental measures.

An ideal process for an individual integrated advice approach that supports nature and environmentally friendly farming generally encompasses three main phases:

1. **Preparation for counselling**: This phase involves initiating contact and preliminary discussions with the farm owner, along with collaborating with relevant experts, nature conservation area managers, and regional branches of related institutions. This phase contributes to formulating an environmental or nature conservation plan for the farm.
2. **Planning**: The agricultural advisor and the farmer conduct a comprehensive review of the farm, leading to the establishment of objectives, measures, and a management plan. It's beneficial to define simple indicators that enable the farm to continuously or conclusively assess whether the plan has led to desired improvements.
3. **Implementation of the outlined plan**: The agricultural advisor aids the farmer in executing measures and monitoring their success, while also recommending involvement in other specialized advice where necessary.

Printed materials and digital tools serve as cost-effective resources for disseminating information, accessing data, and communicating with farmers.

Traditional tools for knowledge transfer encompass various **printed materials**, including leaflets, brochures, posters, bulletins, magazines, manuals, and books. These materials can function as standalone information channels or complement other knowledge transfer methods. The content and design of these printed materials should align with the needs and characteristics of the target audience, delivering a clear message and a call to action. It's beneficial for publications to guide readers on where to access further information independently.

As agriculture undergoes digital transformation, **digital tools** (as depicted in Figure 2) are assuming an increasingly pivotal role. They often serve as cost-effective means for creating and disseminating information. A diverse array of digital tools and methods for knowledge transfer exist, varying in the level of participant engagement and the number of features they offer.

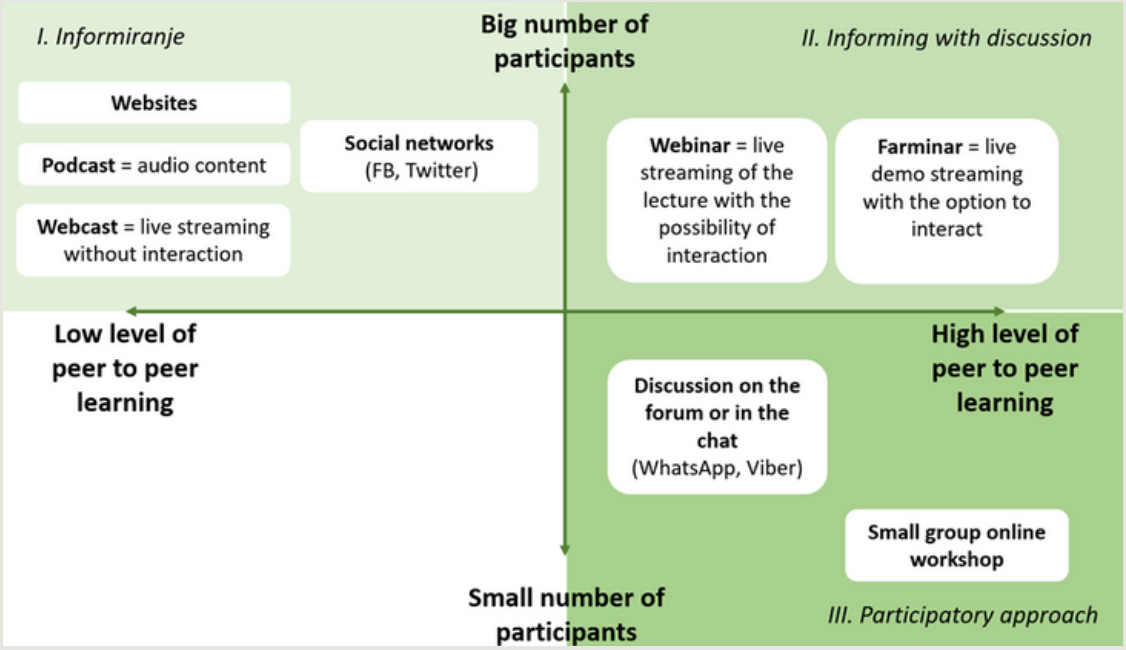

Figure 2: The spectrum of digital knowledge transfer methods is categorized based on the level of engagement and the number of participants (adapted from Nefertiti, 2020). Across all these areas, the e-learning and advisory platform E naSVET KGZS can be utilized.

PLANNING AND IMPLEMENTATION OF KNOWLEDGE TRANSFER REQUIRES A SYSTEMATIC AND MULTI-PHASE APPROACH

When planning the transfer of knowledge, it is important to clearly define the needs of the target group and the environmental problem, and to set goals that are consistent with them.

Successful and effective knowledge transfer requires a systematic and strategic approach to planning and implementation, which takes place in the form of a multi-phase process. The first phase covers **the definition of the baseline situation and needs analysis.** In different environmental areas, agricultural sectors and geographical areas, information, awareness and implementation of environmentally friendly agricultural practices can vary greatly. Before preparing the interventions, it is important to accurately **define the environmental problem** that we want to address within the training program, which requires a good knowledge of it. At the same time, **the selection and analysis of the target group** must also take place in this phase, which includes, among other things, an assessment of how well farmers know each environmental area and where they see the main problems in the introduction of environmentally friendly practices (Birner et al., 2009; Faure et al., 2012)).

A common reason for not integrating environmental protection and nature conservation practices into farm management is insufficient information on the part of farmers. There are also many cases when farmers are aware of the environmental problem or practice, but for certain reasons either do not know how to implement it, or are not interested in including such practices in their management. Which of the causes contributes to a greater extent to the weak interest in environmental protection and nature conservation practices in agriculture is actually less important than the fact that by choosing a different approach and methods of knowledge transfer we contribute to improving the situation.

Based on the identified needs, the **planning phase** follows, where the purposes and goals of knowledge transfer are first determined. Trainings can address a number of **different objectives**:

- **Awareness raising and information:** increasing farmers' awareness of current and new topics, such as protecting nature and the environment, mitigating climate change or digitizing agriculture.

- **Training and implementation of agricultural practices**: equip participants with technological and economic information about new and innovative practices.
- **Creation of new knowledge and the search for solutions**: by actively encouraging the participation of participants through discussion and other forms of exchange of opinions and experiences, various new knowledge is collected and created. At the same time, this type of training and comprehensive individual counseling enables the search for solutions and new opportunities that can be used directly on the farms of the participants.

- **Networking and strengthening social ties:** trainings are a meeting point for people with similar interests from the local area, which is a good opportunity for networking and strengthening social ties.

The organization of trainings includes forming an organizational team, selecting a suitable location and date, and inviting the target group through various communication channels.

A good organizational team and cooperation within it is the key to successful implementation of trainings. In addition to the main coordinator, it is important to include a local organizer in the team. **Local agricultural advisors** can contribute a lot to the successful organization and implementation of the trainings. Due to frequent contacts with farmers, they know the target group and their needs well, so it is important to include them already in the content preparation phase. Their role is also crucial in the organization of trainings, as they know well the established communication channels used by the farmers, and due to their knowledge of the local area, it is recommended that they also take over the selection of the location and the preparation of the space.

If the training deals with new topics and innovative agricultural practices, it is welcome to organize a shorter lecture in the first part. In such a case, **a lecturer** who is an expert in the topic under discussion is also included in the organizational team and can later take on the role of moderator of the discussion. **The moderator of the discussion** must create conditions for the effective transfer of knowledge and experience between the participants, so the selection of this person is crucial. Other **experts of various profiles** can be invited to participate, who can bring a different and fresh perspective to the discussion.

Several different **communication channels** can be used to recruit participants. Among farmers, personal invitations by regular mail, supported by calls or telephone messages from agricultural advisers, have proven to be the most effective. The invitation can also be shared via websites, e-mails, newspapers, social networks, radio and local television. The choice of communication channels depends very much on the target group and the available budget. When preparing the invitation, it is desirable to take into account the characteristics of the target group and its understanding of the topic under consideration. The purpose of the training and what the participants will gain by participating must be clear.

On the basis of the set goals, we outline the implementation of the trainings, while it is important to take into account the appropriate length and content of the trainings

The length of the training is determined by its content and the methods we use. When planning, it is necessary to realistically assess how much content can be included in the outlined time frame. From the perspective of the participants, it is optimal that the program lasts no more than 2 hours. If the training sessions are longer, it makes sense to divide them into shorter time units (up to 90 minutes), between which there is a sufficiently long break and, if possible, a snack or snack. Such informal elements can represent an important opportunity for socializing and networking and for creating a pleasant and relaxed atmosphere. If the topic is complex and extensive, it makes sense to consider conducting a series of consecutive trainings.

For the successful implementation of programmes or knowledge transfer measures based on different approaches and methods, it is important to consider the following factors:

- **Motivating and animating users using various didactic tools:** training can be enriched by watching good practices through video content, advice supported by printed materials (leaflets, brochures and census forms) and including quizzes and various tasks for participants.

- **Encouraging the active participation of participants**: within the framework of the trainings, we provide for the possibility of short discussions, asking interactive questions and collaboration via digital tools (for example Sli.do, Miro or Mentimeter). This is especially important in the case of more classic methods of knowledge transfer (for example, lectures and courses), where there are fewer opportunities for active participation of participants.
- **Participant-friendly design**: when planning, we must realistically assess how much content we can include in the outlined time frame. From the perspective of the participants, it is optimal for the program to last no more than 2 hours, with half of the time devoted to discussion. If the training sessions are longer, it makes sense to divide them into shorter time units (up to 90 minutes), during which we provide a sufficiently long break and, if possible, a snack or snack. Such informal elements can represent an important opportunity for socializing and networking and for creating a pleasant and relaxed atmosphere. If the topic is complex and extensive, it makes sense to consider holding a series of consecutive training sessions, which take place, for example, once a week.
- **Adequate training of the facilitator**: in the analyzed foreign cases, it has been shown as good practice that before starting the training sessions, the advisors receive intensive and in-depth training in the field of understanding the environmental problem and related agricultural practices, as well as various soft skills related to moderation.
- **Call to further action and education**: it is crucial that in the final part of the training, the participants receive a clear message of the essential findings and a call to further action, which further motivates them to the desired behavior.

The final stage in the process of implementing knowledge transfer programmes is evaluation, which is often neglected in practice.

Quality evaluation is an often overlooked step in the knowledge transfer, but it is crucial for improving future events and activities. Well-defined criteria in the initial stages of knowledge transfer planning contribute significantly to the easier implementation of this phase. When evaluating an individual programmewe are interested in, for example, whether we managed to fulfill the program goals, how the activities helped to achieve the goals, whether the program had any other effects and what we can learn for planning future similar activities. When evaluating the above, it is recommended to start from models that offer a clear formula for measuring and analyzing individual levels of the results of the communication programmes (Krikpatric model, Theory of planned behavior, etc.).

METHODOLOGY FOR EVALUATION OF KNOWLEDGE TRANSFER MEASURES

The existing evaluation of knowledge transfer measures within the framework of the CAP is limited to measuring inputs and immediate results, but not impact indicators that would monitor changes in knowledge, values and behavior of the farmers.

Knowledge transfer and advisory support are carried out through various instruments of the Common Agricultural Policy (CAP) of the European Union, which take place within the framework of rural development policy. Compared to more exposed and budgetary measures, such as investment support and agri-environmental measures, **the evaluation of the impact and effectiveness of measures in the field of knowledge transfer is less developed**, which can be attributed to the lesser importance that agricultural policy assigns to this area, as well as the lack of clear frameworks and evaluation methodologies (SCAR, 2019). The methodology for the evaluation of knowledge transfer measures within the framework of the CAP is relatively weak, although evaluation is supposed to be an essential part of the design cycle of this policy (EC, 2022). The indicators for monitoring effects are limited to measuring inputs and immediate results in terms of the number of trainings and participating farmers, but not impact indicators that would monitor changes in farmers' knowledge and values and their projection on the management of agricultural holdings (Erjavec et al., 2018; EC, 2022).

Analyses of the functioning of the knowledge transfer system in Slovenia show that for systematic and analytical in-depth monitoring of this area, **it is necessary to expand both the range and the coverage of indicators of the state and results of action** (Erjavec et al., 2018). Improving the measurement of the success of measures is particularly important from the point of the view of the key priorities of the European Commission for the future CAP, which predict strengthening the targeting and result orientation of the policy instruments (EC, 2017).

At the same time, the effectiveness of different approaches to knowledge transfer and their effect on the adoption of agricultural practices that contribute to the protection of nature and the environment remains **relatively poorly researched in the scientific literature** (Faure et al., 2012; Batáry et al., 2015). This issue is particularly important, as research shows that despite several decades of implementation of agri-environmental measures and other environmental instruments of the CAP, the protection of nature and the environment is not yet rooted in the cultural and social capital of the farmers (Burton and Paragahawewa, 2011), observed changes in value systems however, they were extremely slow and relatively small in relation to the resources invested (Cusworth, 2020; Šumrada et al., 2021).

Evaluation is an important part of the public political process, as it enables gaining experience about what (doesn't) work, under what conditions and why.

Public policy theory advocates a systematic approach to the policy cycle, which defines individual phases in the policy process and builds on a feedback loop, namely from the definition of areas of action, design, legitimation and policy implementation to evaluation and decisions on the continuation of programs (Cairney, 2019). A key part of this cycle is evaluation, which in practice is often very complex. Various approaches and conceptual tools have been developed to facilitate

the planning and implementation of evaluation (Fitzpatrick et al., 2011), among which is **theoretically oriented evaluation** (Chen, 1990; Lipsey, 1993). It is based on the theory of logical models, which explain the logical connection between the used resources, measures, activities and the immediate and long-term effects of the intervention. Evaluation is based on the assessment of causal connections between individual elements of the model and thus provides insight into whether, why and how interventions bring about the desired effect (Fitzpatrick et al., 2011).

Intervention logic is a variant of theory-oriented evaluation and is used to illustrate EU policies co-financed from structural funds (Gaffey, 2013), including the CAP (EC, 2017). For the systematic assessment of the success of these policies, indicators are used on three levels, which enable a comprehensive measurement of the achievement of policy objectives:

The output indicators allow the measurement of the implemented activities and intervention products;

The results indicators for monitoring the direct and immediate consequences or effects of interventions;

The impact indicators for the evaluation of longer-term consequences or impacts of interventions.

The preparation of a new proposal of indicators for knowledge transfer measures included the unification of the output's indicators and the development of indicators and an evaluation methodology to assess the results and impacts of the interventions.

In accordance with the theory of public policy assessment, within the framework of the project, we developed **a framework of indicators and related measuring instruments for the evaluation of the measures to transfer knowledge about the protection of nature and the environment in agriculture.** The framework expands the existing system of indicators within the framework of the Slovenian agricultural policy and CAP, whereby in the project we paid most attention to the development of the indicators of the results and the impact of measures by **involving farmers in the evaluation process.**

The process of developing the indicators took place in several parts. The first part included a review of the existing evaluations, literature and the CAP monitoring and evaluation framework from the previous and current program period. After discussions in the focus groups, a final set of indicators was prepared, which we used to design the survey instruments in the second part of the study. The design of these took place within the framework of four focus groups, in which experts from the field of agrarian economy and politics and agricultural consultancy participated.

In response to the need for a comprehensive evaluation framework, which would also include higher levels of indicators to capture the effects of knowledge transfer, such as norms and behavioral changes, we started from the **Theory of Planned Behavior** (TPB) when designing the survey instruments (Ajzen, 1991). Namely, TPB is often used in research in the field of education (Mark et al., 2011) and to explain the decision-making processes and behavior of farmers (e.g. Rezaei et al., 2019). The theory assumes that an individual's intention to perform a certain behavior can be largely explained by three constructs: attitudes towards the behavior, subjective norms of

the individual and his ability to perform the behavior (Fishbein and Ajzen, 2010). For the purpose of developing indicators, we expanded the TPB constructs with **relevant constructs for evaluating the effects of educational programmes.**

The questionnaire for monitoring the result indicators, in addition to demographic data of the respondent and questions based on the constructs of TPB, which checked the attitude of farmers towards trainings on agri-environmental content, also included questions about farmers' satisfaction with the attended training, which includes satisfaction with the content, organization and execution (Gopal et al., 2021). **The questionnaire for the impact indicators** included TPB constructs in the field of attitudes towards environmental practices, agri-environmental measures and acquisition of knowledge in the environmental field. In addition, we also included a shorter knowledge test in the questionnaire, where, based on ten multiple-choice questions, we evaluated the objective knowledge of farmers about the environmental field, environmental protection and agri-environmental policy. Both questionnaires were designed in the form of statements that could be answered on a seven-point Likert scale ranging from one (strongly disagree) to seven (strongly agree). The final assessment of the value of the indicators was determined as the median of individual responses within one construct. The results thus range from 1 to 7, with 1 indicating poor indicator status and 7 indicating excellent status.

We suggest that the assessment of outcome indicators be carried out after knowledge transfer activities such as lectures, field demonstrations, individual counseling and EIP projects. Annual monitoring would allow for the assessment of the level of satisfaction with the implementation of the measures and their immediate effects.

The impact indicators seek to assess the long-term and wider effects of knowledge transfer activities. The proposed methodology involves conducting a survey with a suitable sample of farms (at least 400) at regular intervals, for example every three years.

The third part of the study for the preparation of the indicators included **the pilot testing of the questionnaires**. The questionnaire for obtaining the result indicators was carried out in December 2021 and January 2022 as part of mandatory training for agricultural holdings, which in 2021 were included in the Agricultural-Environmental-Climate Payments (AEMs) measure and in the Organic Farming (OF) measure. 2,873 training participants answered the questionnaire, of which 2,467 were taken into account in the analysis. The testing of the questionnaire for the purposes of monitoring impact indicators was carried out in the case of biodiversity conservation and took place in the spring of 2022 on the basis of personal surveys in the premises of the Agricultural and Forestry Institutes of Ptuj and Ljubljana. All farmers who submitted a collective application to obtain agricultural subsidies were invited to participate. A total of 306 surveys were completed.

The output indicators point to a limited budget for knowledge transfer measures, a lack of capacities of agricultural advisors in the field under consideration, and an unfavorable situation in the field of choosing knowledge transfer methods.

The budget for knowledge transfer measures in the period 2014–2020 was relatively low and amounted to only 0.82% of the total resources of the Rural Development Program (RDP), which is below the European average (3.63%) (ADE s. a et al. , 2021) and the target value for Slovenia (3.90%) (ENRD, 2016). The allocation of resources reflects the importance of improving the information and education of the farmers in the field of nature and environmental protection in agriculture, as a significant part of these funds (66.40%) was allocated to this area. Nevertheless, **the limited overall budget for knowledge transfer limits its potential reach and effectiveness** (Erjavec et al., 2018).

A review of the output indicators shows that most of these funds are intended for the training of farmers, while there is a deficit in addressing the needs of agricultural advisors. The average ratio of agricultural advisers to agricultural holdings (KMG) is 1 adviser per 170 KMG. In the public counseling systems of other European countries, this ratio is on average lower, at just over 100 KMG per counselor, while private counseling organizations have a ratio of around 50 (Knierim et al., 2017). This indicates a likely considerable burden on counselors in providing adequate support, especially in the case of face-to-face counselling. In addition, there is relatively little in-depth training for advisors on the environmental and nature conservation topics, and their expected knowledge and skills are not standardized. The lack of capacity in this area is also relatively poorly addressed by Slovenian higher education institutions, both within the framework of their study programs and lifelong training programs. In 2020, for example, only five trainings on environmental and nature conservation topics were organized for consultants.

The output (and result) indicators further reveal the weaknesses of the existing knowledge transfer approach in the selection of knowledge transfer methods. In the period 2014-22, training on nature and environment protection took place mainly in the form of lectures and, to a lesser extent, demonstration activities, but did not include other innovative methods of knowledge transfer, such as participatory workshops, study groups and in-depth individual counseling, which can they often enable a more complex and targeted treatment of individual agricultural-environmental practices (Knook et al., 2020). In addition to the absence of the targeted measures to promote such methods, the problem in the past was partly also the lack of capacity to implement such in-depth training and support tools. However, the situation has been improving in the recent years, which the public agricultural advisory service attributes to the intensive introduction of new agricultural advisory methods in accordance with the CECRA system.

The result indicators show general satisfaction with mandatory training for the purposes of the AEMs and OF measures, but highlight an unfavorable situation in the field of content and design of training.

Based on the pilot testing of the result indicators, we can conclude that farmers who are enrolled in the AEMs and OF measures are generally satisfied with the organization and implementation of training for the purposes of implementing these measures and have positive attitudes towards acquiring knowledge in agro-environmental matters. They also expressed a strong intention to continue attending such trainings (Figure 3). Nevertheless, the indicators point to some gaps in the design of these trainings. As already shown by the output indicators, the training participants recognize the lack of inclusion of field visits and deficiencies in the field of content variety, as the content is repeated annually and does not address the specific needs of the training participants.

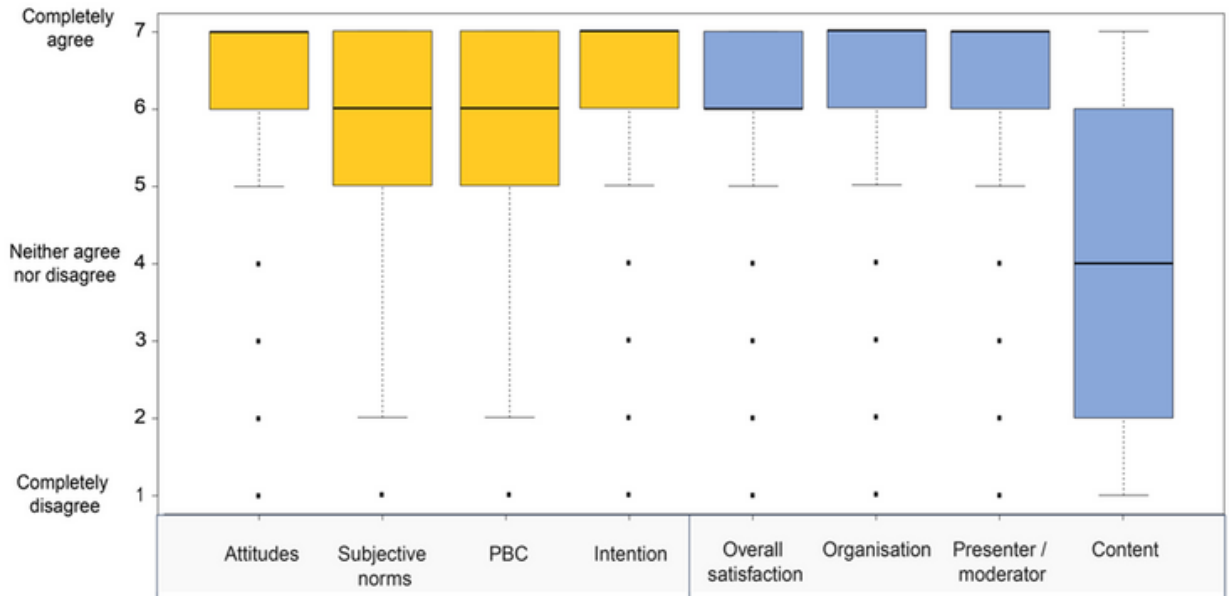

Figure 3: Framework for evaluating the outcome indicators measuring farmers' satisfaction with agri-environment training (n=2,467)

The impact indicators point to the need to strengthen farmers' knowledge about the protection of the environment and nature, as this can significantly contribute to the (currently low) interest in implementing measures and practices aimed at this.

The farmers in our pilot study showed a rather modest level of agri-environmental knowledge, with an average score of 5.3 correct answers out of 10. The farmers were otherwise well-versed in agri-environmental practices and their impact on the environment (74.8% of respondents answered correctly to these questions), but their knowledge about agri-environmental measures and their requirements was relatively poor (41.1%). This finding may partly explain their low intention to participate in agri-environmental measures, as previous research has shown that well-informed farmers are more inclined to engage in such measures (Wąs et al., 2021). Farmers had slightly higher knowledge about biotic diversity and species recognition (46.1% of correct answers), but this result is still relatively poor and indicates the need to inform and train farmers about the importance of local biotic diversity, as this can positively influences the adoption of the agri-environmental practices (Czajkowski et al., 2021).

The farmers generally showed a positive attitude (average score 6 out of 7) and positive subjective norms (6) towards the protection of the environment and nature and the implementation of agri-environmental practices (Figure 4). Previous research shows that a positive attitude is usually associated with a greater likelihood of adopting agri-environmental practices (Tama et al., 2021) and the inclusion of dedicated measures (Brown et al., 2020). However, in our pilot study, these positive attitudes were not reflected in the intention to perform such behaviors. The intention to participate in agri-environmental measures was relatively low (score 2 out of 7). Similarly, there was a relatively low intention to implement voluntary practices to maintain biotic diversity in fields (2) and grasslands (4). Farmers showed a slightly higher, moderate intention to participate in the conservation of landscape features (5) and a high intention to implement other good nature conservation practices (7), such as using pesticides that are more pollinator-friendly and providing habitats for beneficial organisms (e.g. erecting dry walls, ponds, insect hotels and bird nests).

The relatively low interest in engaging in agri-environmental measures and implementing certain agri-environmental practices suggests that farmers' decisions may be influenced by other behavioral factors (Wąs et al., 2021). Some reasons were given in assessing farmers' ability to implement these measures and practices. Indeed, the surveyed farmers identified several constraints, including time and financial constraints and a lack of knowledge and technical skills. The inconsistency of agri-environmental practices with current agricultural practices and farm production targets has also emerged as an important constraint. These findings are in line with previous research showing that farmers often prefer more production-intensive practices (Włodarczyk-Marciniak et al., 2020; Novak et al., 2022), so a positive attitude of farmers towards nature conservation is not enough in itself for adopting usually more extensive practices of nature and environment protection (Wąs et al., 2021).

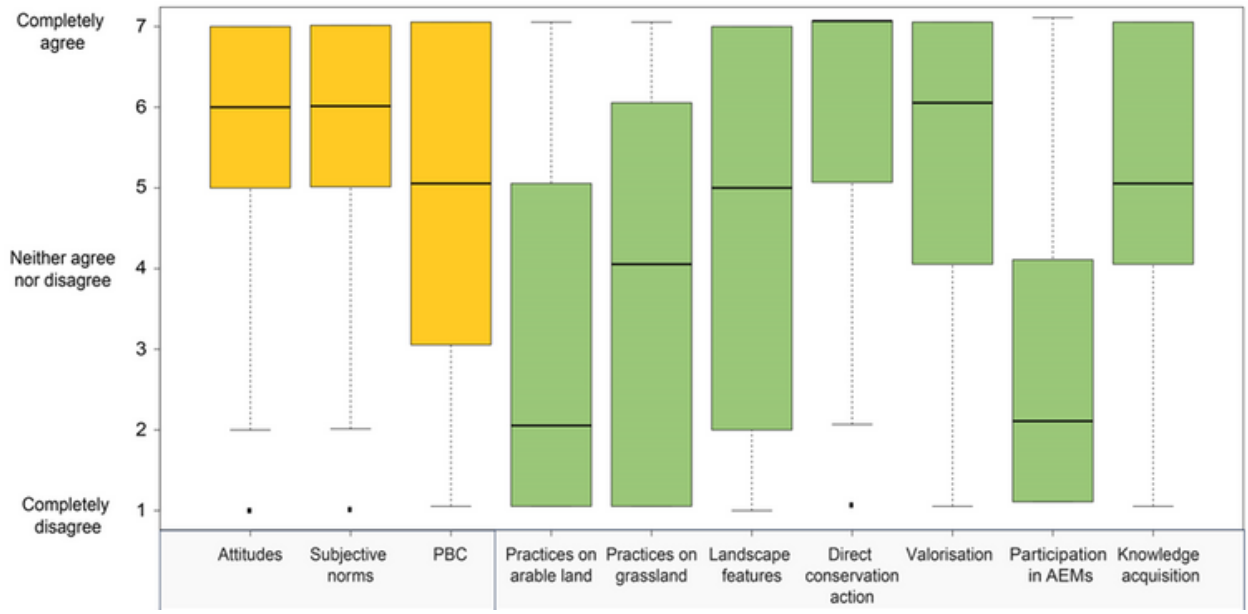

Figure 4: Framework for assessing the impact indicators measuring farmers' agri-environmental knowledge, attitudes and behavioral intentions.

PERFORMANCE AND COST-EFFECTIVENESS ANALYSIS OF SELECTED KNOWLEDGE TRANSFER APPROACHES USING RANDOMIZED CONTROLLED EXPERIMENTS

As part of this study, we carried out two evaluations in the agro-environmental field. The first one was aimed at analyzing the success of participatory methods of knowledge transfer, which represent a relatively innovative approach to working with farmers, especially in the field of environmental education, for the Slovenian as well as the wider European area. The experiment took place on the example of training in the field of mitigating climate change and improving the handling of livestock manure on cattle farms.

The second evaluation was aimed at analyzing the effectiveness of informing farmers about new environmental measures of agricultural policy and different strategies for communicating environmental measures and problems using positive and negative framing. On the basis of prospect theory, we know that the way we present certain information can influence decision-

making, because people generally react more if we feel that we will lose something than if we gain the same thing. In the field of environmentally friendly practices, in past research, this theory was tested mainly in the context of consumer research, where empirical findings show that emphasizing the negative consequences (negative framing) is generally more effective than emphasizing the positive consequences of implementing a certain practice (positive framing) (Ropret Homar and Knežević Cvelbar, 2021). As part of our experiment, we checked the effectiveness of these incentives on the example of an invitation to farmers to enroll in the new Eco-Schemes (ES) in the field of preserving biotic diversity.

The implementation of a randomized controlled experiment allowed the analysis of cause-and-effect relationships between the intervention and the effects on farmers' knowledge and intentions.

As part of the first evaluation, we checked the effectiveness of the participatory workshops on climate-friendly practices for handling livestock manure on cattle farms. The invited 1,875 farms were randomly divided into two groups: experimental and control (Figure 5), a total of 442 farmers responded. We organized 16 workshops for the experimental group, where climate-friendly practices were discussed. The control group did not receive these workshops. Both groups received a similar questionnaire, which was intended to compare the effects of the workshops in terms of acquired knowledge, the impact on farmers' intention to implement the discussed practices and other relevant constructs. All participants later received a handbook on the handling of livestock manure.

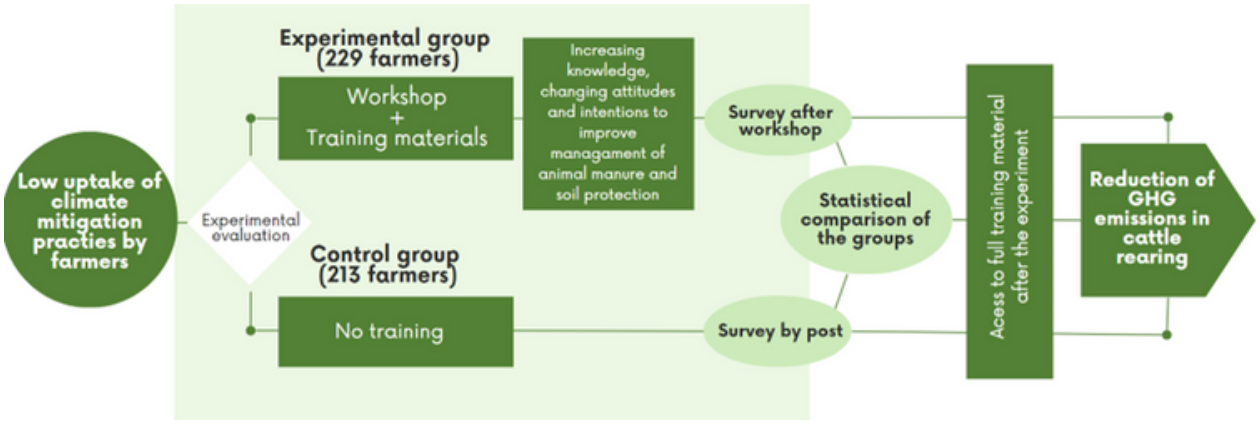

Figure 5: Design of an experiment to evaluate the effectiveness of participatory workshops on climate change mitigation and improved management of livestock farms in autumn 2022.

In the second evaluation, we checked the effectiveness of information by mail and the way information was framed on farmers' decision-making about enrolling in the new scheme for the protection of the Eurasian skylark. We included 4,586 farms in the experiment. We randomly divided them into three groups. The first two groups received a letter with differently framed information about the scheme (positive and negative), while the third group received a neutral presentation of the scheme. We studied the effects of different framing methods on the basis of collective applications for agricultural subsidies from 2023 by comparing the actual enrollment in the scheme and the land areas enrolled in the scheme. We also analyzed the attitudes and intention to enroll based on farmers' answers to the questionnaire that they received alongside the presentation of the scheme. We further expanded the research by including a group of farms (without a letter) that did not receive an introduction letter or a questionnaire, thereby assessing the impact of informing farmers by mail on actual enrollment in the scheme.

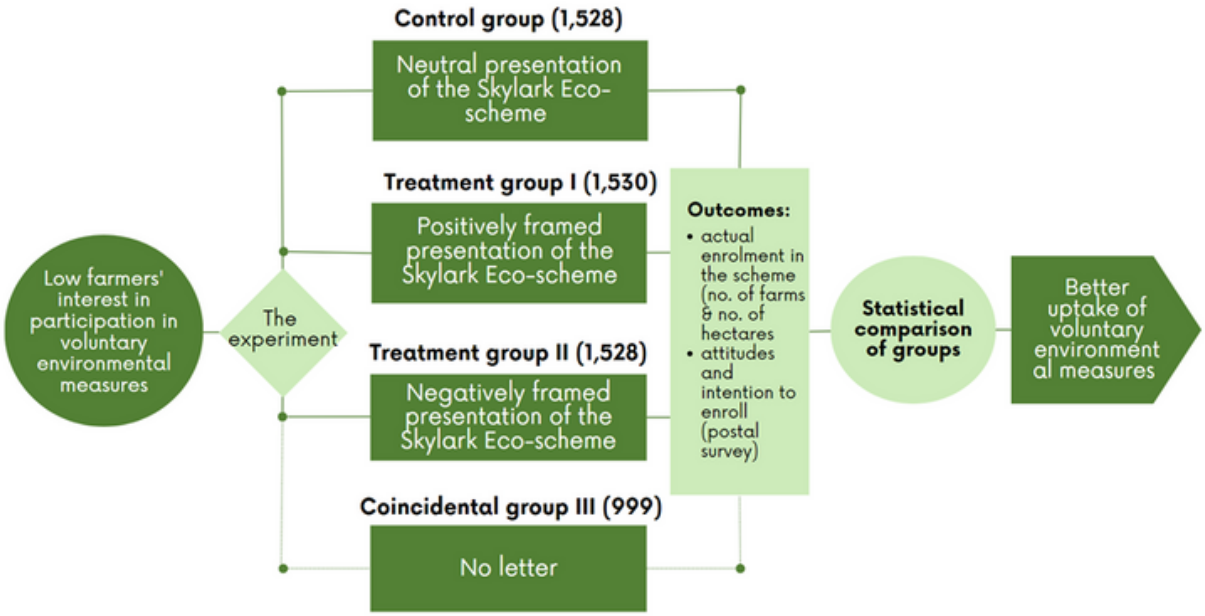

Figure 6: Design of an experiment to assess the effects of differently framed information incentives and farmer information by mail on farmer enrollment in the SOPO scheme for the protection of the Eurasian skylark in 2023.

Participatory workshops had a medium positive effect on participants' knowledge and their intention to implement good agricultural practices for handling livestock manure.

The participative workshops that we conducted as part of the research had a medium positive effect on the intention to implement th agricultural practices for the management of livestock manure in the future, namely the experimental group that participated in the workshops had an average of 19.1% higher intention from the control group. In addition, they had a positive effect on the knowledge of the participants. Participation in the workshops helped to i**ncrease knowledge by an average of 25%**. Given that the workshops lasted only two hours, this can be considered a good result that shows the effectiveness of the participatory approaches to educating farmers about climate change and agricultural practices aimed at mitigating it.

In addition to increasing knowledge and the intention to adopt practices, the participatory workshops also had a statistically significant positive effect on the farmers' attitudes, their beliefs about climate change, personal perception of the remoteness of the effects of climate change (psychological distance), perception of thesocial norms and perception of the obstacles preventing the possibility of adopting the practice , such as lack of knowledge, time, or financial resources (perceived control over behavior).

In the research, farmers' habits had a stronger influence on the intention to implement the discussed practices than participation in the workshop. The finding is consistent with previous studies that attribute habits to a strong influence on the environmentally friendly behavior of individuals (Klöckner, 2013). At the time of the study the surveyed farmers implemented on average less than one of seven practices on their farms, which is consistent with our prediction that most of these practices represent technological innovation for farmers in Slovenia. The most popular practices, implemented on about 20% of farms, were covering manure and slurry storage

and using slurry improvement additives such as biochar. On the other hand, slurry acidification and the use of urease and nitrification inhibitors are the least frequently used practices among respondents.

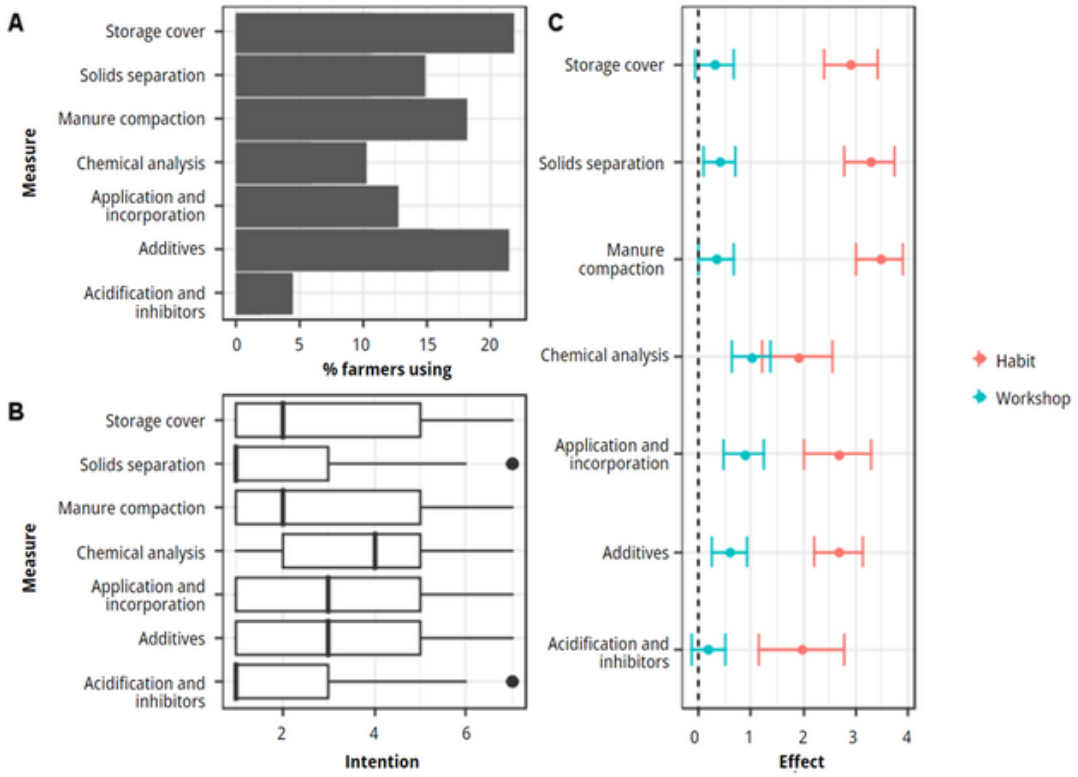

Figure 7: (A) Proportion of farmers (in %) in the experimental and control groups currently implementing selected good practices of livestock manure management. (B) Future intentions of the farmers in both groups to implement these practices (Likert scale 1 to 7) with median and range values shown. (C) Regression estimates of the effect of participation in workshops (workshop) and previous use (habits) on the intention to implement individual practices. Errors are shown with 95% confidence intervals.

Informing using mail is an important and cost-effective approach to encouraging enrollment in new environmental measures.

The results of the experiment show the potential that informing farmers about environmental measures via mail can have on their decision to enroll. The farms that received the letter (regardless of the way the information was framed) decided to enroll in the scheme statistically significantly more often than farms that did not receive the letter. A certain degree of caution is required when interpreting these results, as the farms 'without a letter' were not determined randomly and differed significantly in certain indicators from the farms that received a letter. On average, these were smaller farms, and they were less often enrolled in KOPOP, which, according to the results of the regression analysis, negatively affects enrollment in the scheme for the Eurasian skylark.

However, the results show that relatively small investments in informing farmers, in our case €1.79/farm, can potentially have a significant impact on their decisions. This finding is also supported by similar results from foreign research, where farmers were informed through other channels, such as mobile messages. In these studies, positive impacts were achieved, for example, on the adoption of good crop rotation practices (Carrión-Yaguana et al., 2020) and efficient irrigation water management (Chabé-Ferret et al., 2019). This shows the wider potential and importance of using different communication channels to raise awareness and encourage farmers to adopt environmentally friendly practices.

In the experiment, we did not find statistically significant differences between different ways of communicating (framing) the effects of participation in the scheme. Further research is needed to analyze suitable strategies for communicating with farmers.

The results of the experiment show that the f**raming of information did not have a statistically significant effect on the intended and actual registration in the scheme** for the protection of the Eurasian skylark, nor did it have an effect on the volume of registered land. These results are contrary to the findings of most studies conducted on consumers, which confirm the effectiveness of negative framing[SB1] in promoting environmentally friendly behavior (Ropret Homar and Knežević Cvelbar, 2021).
One of the possible explanations for this discrepancy is that the decision of farmers to enroll in a voluntary scheme is more complex than the usual purchase decision of consumers (Brown et al., 2019), since, in addition to many other factors, it requires adaptation of the way of land cultivation for a longer period of time and can have also greater financial consequences. An additional possible explanation for the discrepancy could be that in consumer research framing was usually presented in the context of advantages or losses for the individual, while in our research we mainly emphasized the potential social benefits or losses that will result from the (non)registration of farms in scheme. A limitation of the research that may explain the lack of perceived influence of framing on the intention to enroll in the scheme may also be the small size of the sample of responses we received by mail, and the relatively low enrollment in the first year of the scheme's implementation, as only 2.0% of the studied farms decided to enroll. That is relatively expected considering that it was the first year of implementation of the measure. Thus, the small sample size may have contributed to our study not having sufficient statistical power to detect subtle effects of framing on intended and actual enrollment.
[SB1]Uokvirjanje nikjer ne vem točno, kako bi prevedel lepše opisno. Isto velja za drugod.

RECOMMENDATIONS FOR THE PLANNING OF AGRI-ENVIRONMENTAL POLICY MEASURES AND TRANSFER INTO PRACTICE

So far, no stable, long-term and coordinated system of demonstration activities in agriculture has been established in Slovenia.

On the basis of the Demonstration Farms in Slovenia consultation (June 1, 2022, Domžale) and the review of the literature, we conclude that, for the time being, it is **difficult to talk about a stable, long-term and mutually coordinated system of organizing demonstration activities in agriculture in Slovenia**, where different actors would participate in testing and presentation innovative agricultural practices. The farmers and other stakeholders who would contribute to the exchange and co-creation of knowledge with the holders of demonstration activities are relatively rarely actively and participatoryly involved in the current implementation of demonstration activities.

In Slovenia, demonstration activities in agriculture as a method of knowledge transfer and counseling are carried out in the framework of training programs for various target groups (mainly farmers, pupils, students and agricultural consultants) (Table 2). Programmes of this type are financed from public sources, among which, in terms of volume, the activities within the

framework of the Public Agricultural Advisory Service program, support from education and agricultural policy, as well as occasional project activities stand out. A significant share of demonstration events also takes place in the form of short courses by commercial providers (e.g. providers of seed material, fertilizers, machines, phytopharmaceuticals).

From the point of view of demonstration systems, there are currently only individual regional systems or networks of this type, for example the Ark Farms network, which connects the breeders of Slovenian indigenous breeds, and informal networks within the framework of the Agricultural Advisory Service, which currently cooperates intensively with farms, where, if necessary, various displays are carried out. These types of networks are usually created as a result of project activities or constant contacts between agricultural consultants and individual farms. The first attempt at a more systematic promotion of demonstration activities took place within the framework of the Cooperation and EIP projects and certain public procurements. Other demonstration activities are carried out casually or depending on the needs of the individual training program.

For the time being, the host farms are involved in the demonstration activities within the framework of usually informal forms of agreements either with the local agricultural advisory service or with other organizers of the demonstration events. From the point of view of ensuring a stable, comprehensive and long-term organization of demonstration activities in Slovenian agriculture, the need for legal regulation and a systemic approach is visible.

Preglednica 2: Obstoječi različni načini in pristopi k izvedbi demonstracijskih aktivnosti v slovenskem kmetijstvu

	Purpose	Scope	Arrangement	Requirements for farms
Master farms	Practical training and development of new personnel on farms	This system is not implemented in practice.	130. and 131. article of ZKme-1	At least one member of the farm has passed the master's exam
Learning farms	Educational activities for preschoolers and schoolchildren	81 farms	Regulation on Supplementary Activities - Article 21	At least secondary vocational education in the field of agriculture or NVQ or master's exam
Teaching or mentoring farms	Practical education and training of pupils and students	UM - Faculty of Agriculture and Life Sciences: 58 farms	Regulations of participating institutions	Not defined
Model farms	Representative farms voluntarily participating in the FADN - potential for demonstration	Approximately 900 farms	European Commission guidelines	Management of FADN bookkeeping
Demo activities in RDP 2014-22	Practical education and training of farmers	In implementation	RDP 2014-20/22: EIP in measure M1.2	Not defined
Demonstration training centers	Ensuring the infrastructure conditions for the transfer of knowledge, research and technologies into economic practice	UL - MRIC: 10 centers UM - FKBV: 2 centers KIS: ablje Center and 4 experimental centers Biotechnical high schools	Arrangements within individual institutions	

Demonstration activities should be carried out within the framework of four systems: demonstration farms, learning farms, master farms and demonstration education centers.

Based on the findings of the project and the exchange with the providers of agricultural consultancy tasks (e.g. within the framework of the Demonstration Farms in Slovenia consultation), we have prepared a proposal to upgrade the current arrangement of demonstration activities in Slovenian agriculture. The conceptual design includes four basic types of farms (Figure 8).

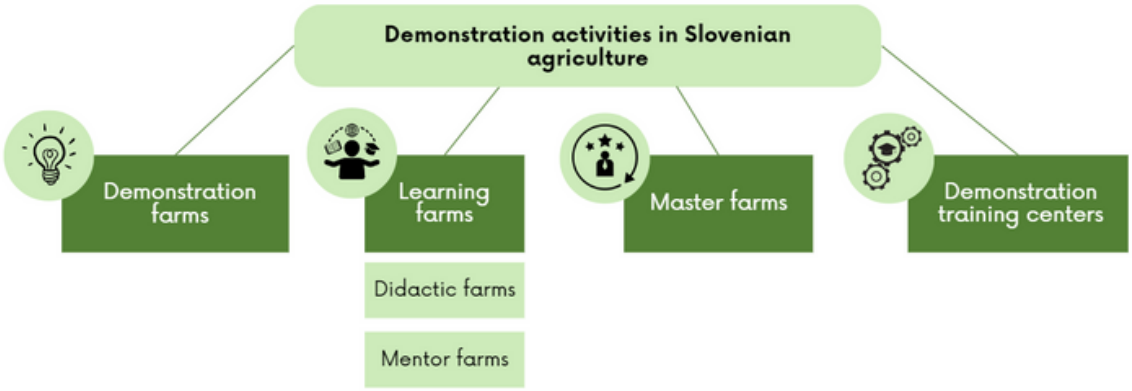

Figure 8: The proposal for organizing demonstration activities includes four types of systems: demonstration farms, learning farms, master farms and demonstration education centers.

In the following, we only present the purposes of the proposed systems, while in the content report (Conceptual design of the network of demonstration farms (DS4)) we further presented the content justification for each and proposed the legal regulation and organization of the system.

Demonstration farms carry out tours, demonstrations, testing or introduction of new technologies, machines and equipment in agriculture, practices, methods and processes of production, preparation or processing of agricultural crops and products and other services related to agriculture. They carry out this activity for other farmers and professional groups working in the field of agriculture (e.g. agricultural consultants). They can perform it independently or in cooperation with a consulting or educational institution.

We divided the **learning farms** into two subgroups:

1. **Didactic farms** provide a place for the implementation of educational activities for preschool and school groups and adults with the aim of demonstrating agricultural, forestry and complementary activities.
2. **Mentor farms** are included in the educational process of secondary schools and study programs of higher education in agriculture and forestry or other areas of biotechnology (eg horticulture, nature conservation). Pupils and students at the mentoring farm undergo practical training related to the contents of agriculture, nutrition or complementary activities on the farm. At the mentoring farms, pupils and students can complete practical training or assignments within the framework of individual subjects (e.g. carrying out a research assignment, inventory of production characteristics, preparation of a farm management plan).

Master farms are intended for the education of personnel in the agricultural and forestry sector with the aim of acquiring specific skills that cannot be acquired within the framework of existing secondary and higher education programmes. The masters in a particular field must demonstrate their expertise through high-quality, independent and demanding professional work. The masters must have appropriate pedagogical and andragogic skills, including newer and more effective work methods for working in groups and for practical training of candidates through work.

Demonstration training centers are intended to transfer knowledge, research and new technologies into economic practice in the field of certain sectors, contents or regions. They are established within the scope of interested research organizations, higher education institutions or biotechnical secondary schools, which independently or in partnership with other organizations provide suitable infrastructure for the implementation of education and training. The activity of the center can be aimed at different target groups, such as school groups, pedagogical work with pupils and students of agricultural majors, farmers, agricultural consultants and consumers.

We established a group of agricultural consultants in the field of nature protection and, in the framework of two meetings, we exchanged experiences, needs and key challenges of knowledge transfer in this field.

As part of the project, we established a group of agricultural advisers in the field of nature protection within the framework of the Public Agricultural Advisory Service and organized two meetings for them. At the first meeting (December 1, 2021), agricultural advisors prepared an overview of their work in the field of biodiversity conservation and the key challenges they face. The key needs they highlighted are:

1. Ignorance of biodiversity at the local level and insufficient understanding of the importance of nature protection and the goals of nature conservation policy,
2. Low competence in the field of nature-friendly agricultural practices, their integration into the production plan of the farm and coordination with the technological and economic goals of the farms,
3. Overcoming the challenges posed to farmers by administrative obligations,
4. Increasing and improving cooperation between research and nature conservation institutions and the agricultural advisory service in finding solutions to challenges in the field.

As part of the second meeting (May 17, 2022), the group took part in a **professional excursion to the Ljubljana Marshes**, where there was a tour of practical tests of the new Eco-schemes measures for the protection of shrike nests and the establishment of patches of unsown ground for the skylark. In addition, the group watched a presentation of practical tests of measures for the restoration of borders and wet meadows in the Iški morost nature reserve.

ATTACHMENTS

Šifra	Naslov	Avtorji
R 1.2	Comparative review and analysis of approaches to the transfer of knowledge about nature and environmental protection in agriculture in Europe and Slovenia (in Slovenian)	Ana Novak, Tanja Šumrada, Luka Juvančič
R 2.3	Evaluation methodology and baseline status of knowledge transfer indicators on environmental and nature protection in agriculture (in Slovenian)	Ana Novak, Tanja Šumrada, Luka Juvančič
R 3.3	Analysis of the performance and cost-effectiveness of selected approaches to the transfer of knowledge about agricultural-environmental content in Slovenia (in Slovenian)	Ana Novak, Tanja Šumrada, Živa Alif, Andrej Šorgo, Luka Juvančič
R 4.4	Conceptual design of a network of demonstration farms (in Slovenian)	Luka Juvančič, Ana Novak, Tanja Šumrada
	Manual for conducting agricultural trainings in the field of nature and environment protection (in Slovenian)	Ana Novak in Tanja Šumrada
	Manual for handling livestock manure on the farm (in Slovenian)	Rok Mihelič, Ana Novak in Tanja Šumrada

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