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Result-oriented Measures for Biodiversity in Mountain Farming. A Policy Handbook

Matthias Stolze, Rebekka Frick, Otto Schmid, Sibylle Stöckl, Daniel Bogner, Véronique Chevillat, Monika Dubbert, Philippe P. Fleury, Sophia Neuner, Heike Nitsch, et al.

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Result-oriented Measures for Biodiversity in Mountain Farming

A Policy Handbook

MERIT
MERIT BASED INCOME FROM SUSTAINABLE LAND MANAGEMENT IN MOUNTAIN FARMING.

RURAGRI ERA-NET

Result-oriented Measures for Biodiversity in Mountain Farming

A Policy Handbook

Matthias Stolze, Rebekka Frick, Otto Schmid, Sibylle Stöckli, Daniel Bogner, Véronique Chevillat, Monika Dubbert, Phillippe Fleury, Sophia Neuner, Heike Nitsch, Michaela Plaikner, Jörg Schramek, Erich Tasser, Audrey Vincent and Alexander Wezel

Impressum

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The handbook is also available for download (free of charge) at shop.fibl.org and at www.umweltbuero-klagenfurt.at/merit/media.php. It is available in English, French, German and Italian. Visitors to the latter site can also find the original documents upon which this policy handbook is based. Printed copies of this volume can also be ordered directly from FiBL at shop.fibl.org.

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Disclaimer
The contents of this report are the sole responsibility of the editors and authors. The publication does not necessarily reflect the EU Commission's views and in no way anticipates their future policy in this area. The information contained herein, including any expression of opinion and any projection or forecast, has been obtained from sources believed by the editors/authors to be reliable but its accuracy or completeness is not guaranteed.

The MERIT Partnership and Funding Institutions

eb&p Umwelbüro GmbH, Klagenfurt, Austria (Project Leader)
eb&p Umweltbüro GmbH provides a connective link between ecology, technology and the economy. The team's strength lies in its knowledge of ecology, agriculture, landscape planning, nature conservation and management.

Participants: Daniel Bogner (Coordinator), Monika Dubbert, Sophia Neuner

Isara, Lyon, France
ISARA Lyon is an engineering school for agricultural, food and environmental sciences that offers professional engineering (MSc degree) and master programmes, and carries out research and extension.

Participants: Phillippe Fleury, Alexander Wezel, Audrey Vincent, Jacques Godet

IfLS, Frankfurt, Germany
The Institute for Rural Development Research (IfLS) is an independent research institute focusing on multidisciplinary research and consulting activities in the area of sustainable development of agriculture and rural regions in Germany and Europe.

Participants: Jörg Schramek, Heike Nitsch

EURAC, Bozen, Italy
The Institute for Alpine Environment (EURAC Bozen/Bolzano) performs problem-oriented research on the conflicting priorities of ecology and economy. The multidisciplinary team uses a combination of experimental field research, computer simulations and participative approaches.

Participants: Erich Tasser, Michaela Plaikner

FiBL, Frick, Switzerland
The Research Institute of Organic Farming (FiBL) is an independent, non-profit research institute with the aim of advancing cutting-edge science in the field of organic and sustainable agriculture. FiBL covers the entire food chain. FiBL's strengths are close collaboration with farmers and fast knowledge flow from research to farm practice.

Participants: Matthias Stolze, Otto Schmid, Sibylle Stöckli, Rebekka Frick, Véronique Chevillat, Richard Bircher, Sophia Rudin

IRSNC, Slovenia
The Institute of the Republic of Slovenia for Nature Conservation (IRSNC) participated in the MERIT project in the role of an observer.

Participants: Nika Debeljak Sabec, Martin Vernik

Daniel Bogner (to the left) talking to a farmer.

Preface

"An investment in knowledge pays the best interest."

Benjamin Franklin, American politician and scientist, 1706-1790

Biodiversity touches us emotionally when we see a colourful meadow with flowers and butterflies or when we hear grasshoppers chirping. This emotional impact is one reason why society might choose to preserve and enhance biological diversity. Agri-environmental schemes are an instrument to preserve biodiversity. The MERIT research project was designed to find out how a result-orientated approach to agri-environmental schemes can work. A result-oriented approach differs from the action-oriented approach largely employed within agri-environmental schemes: it implies a different way of thinking and needs to closely involve farmers, whose main motivation is to produce food for a living.

For me, this approach opens up a very good opportunity to use public money more effectively, increase flexibility for farmers and motivate them to engage in biodiversity measures. Moreover, this approach is an investment in knowledge for the benefit of both biodiversity and food production.

I hope this policy handbook will contribute to the successful adoption of the result-orientated approach.

Further I would like to express my thanks to:

- Those who financed our research activity
- Everybody in the excellent team for being professional, cooperative and friendly
- The 79 pilot farmers and their families who made a huge contribution to our research

Daniel Bogner (MERIT project coordinator)

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About this Handbook

Objectives and Target Group
This handbook is targeted at policy makers from governmental bodies, public authorities, farmers' associations as well as other private or public organizations involved and interested in the development and implementation of agri-environmental policies. It provides information about the implementation of result-oriented agri-environmental measures, a relatively new approach of preserving, enhancing and supporting biodiversity on agricultural areas: here, in the context of meadows and pastures and other habitats and landscape elements in mountain regions in Europe. The handbook provides policy recommendations for the effective design, implementation and governance of such measures that can be adopted by public bodies (governments, other responsible administrative bodies) as well as private organisations (NGOs or food chain managers). All information and recommendations are based on results from the MERIT research project (see below).

The MERIT Research Project
MERIT stands for 'Merit Based Income from Sustainable Land Management in Mountain Farming'. The project has been supported by the European Commission and by national funds within the ERA-Net RURAGRI research framework. The MERIT research project specifically focused on the analysis of implemented result-oriented and action-oriented public support measures to preserve and enhance biodiversity, as well as on the farmers' attitudes towards such measures. It looked at the ways in which these measures are implemented and governed, on the policy framework in which they are embedded in and on their success and their limitations. The recommendations given in the present handbook are based on interviews and discussions with 79 farmers, on national user fora with 78 participants (including advisors and policy makers, farmers, etc.), on the analysis of meadows and pastures on 44 farms, including comprehensive mapping, on a literature review and on a semi-quantitative scenario modelling in which the results were tested by interviewing 52 experts. The research was conducted in five mountainous case study regions in Austria (Carinthia), France (Vercors), Germany (Oberallgäu), Italy (South Tyrol) and Switzerland (Entlebuch, Lucerne).

Structure
This manual starts with an introductory section with a general call for more action to enhance or preserve biodiversity and the health of agroecosystems. We then call for a second action in the way direct payments to farmers are organized. We present the more recent approach of promoting result-oriented, rather than action-oriented approaches and show the advantages and disadvantages of both approaches.
The bulk of the manual contains what we call the 'Eight Golden Rules' - our recommendations for a new and innovative design and implementation of measures for biodiversity. These rules are structured according to the chronological process of introducing a new programme, which involves putting the issue of biodiversity on the political agenda, designing and implementing new programmes and then evaluating and adapting them.

The following icons are used to describe the different actors addressed primarily (highlighted in golden colour):

Farmers, farmers' associations

Farmers' education, training and advisory services

Administrations

Science

Civil Society

Introduction

Biodiversity – The first call for action

The European Parliament resolution of 2012[1] stated that

"...biodiversity is essential to the existence of human life and the well-being of societies, both directly and indirectly through the ecosystem services it provides..."

and

"...biodiversity loss is currently reducing global GDP by 3 % each year."

The Alps are a 'hot spot' of biodiversity in Europe and home to more than 4500 plant species, more than a third of the flora recorded in Europe west of Urals. Almost 400 of these plants are endemic to the Alps[2]. Biodiversity plays an essential role for the functioning of ecosystems as well as for the provision of many ecosystem services including food production, water retention and purification, air quality, scenic beauty, etc. The exceptional biodiversity of the Alpine area is not just the result of natural processes. The variety of agricultural management in the Alpine region (carried out over millennia) has resulted in a multitude of habitats with a high diversity of plants and animals. Alpine agriculture as a whole, and especially extensively managed hay meadows and pastures, contribute to a biological diversity and diversity of habitats which would not exist if these areas were not cultivated. Yet, the level of biodiversity in Alpine areas – as well as in most other parts of the world - has been decreasing rapidly in recent decades. One driver – amongst others – is the intensification of agricultural production through the use of more external inputs and higher stocking densities. Another driver is the abandonment of marginal meadows and pastures which leads to the expansion of forests and shrubs. Given the importance of biodiversity for society at large, there is an urgent need for taking action against such intensification and land abandonment.

Agri-environmental measures – The second call for action

In European agricultural policy, voluntary agri-environmental measures that provide direct financial support have been in place for a long time and have played some role in preserving, enhancing and restoring biodiversity. However, these agri-environmental measures had only marginal to moderately positive effects on biodiversity and there is much potential for improving the impact they have in safeguarding endangered farmland species[3]. In general these 'action-oriented' agri-environmental measures have slowed down losses of biodiversity but have not succeeded in stopping the decline of endangered species . As such it is important to improve the effectiveness of biodiversity support measures[3,4].

The classic model: action-oriented measures
The classic model – known as 'action-oriented measure' – provides financial incentives to farmers who adopt pre-defined agricultural management practices which are considered to have a positive impact on biodiversity. To receive the agri-environmental payments, the farmers have to undertake these management practices which are defined in a way that is designed to lead to a desired outcome. For example, the encouragement of biodiversity is pursued through practices such as reduced fertilization level, late cutting dates, etc.
The problem of this classic model is that it provides an incentive to the farmer to participate but not necessarily to actually achieve success[5]. There is little evidence that these action-oriented measures induce long-term attitudinal and cultural change among farmers[6]. Furthermore, the effectiveness of action-oriented measures may be low if the defined management practices are not sufficiently well-targeted.

An innovative and more recent approach: result-oriented measures
Result-oriented measures provide an alternative to action-oriented measures. Such measures provide incentives for farmers to achieve a defined result: e.g. the presence of a certain number of species.
A few such measures have already been introduced in Europe (see Figure 1). It is, however, not easy to clearly distinguish result-oriented measures from action-oriented measures because in most cases result-oriented and action-oriented elements are combined. The annex gives a quick overview of European countries that have implemented schemes including result-oriented elements (see Annex 1).

Figure 1: European countries where result-oriented measures exist
(Based on comprehensive list shown in Annex 1 (see p. 58))

Advantages and disadvantages of result-oriented measures

Within MERIT we conducted a literature review about result-oriented measures comparing them to action-oriented measures and we found that they each have various advantages and disadvantages[7]. In the five case study regions, we asked the 79 farmers' opinions about result-oriented measures. We also did a semi-quantitative scenario modelling showing what impact the implementation of result-oriented measures has on different variables. We tested the results of this modelling by interviewing experts (including policy makers, farmers and NGOs). In this section we discuss the advantages and disadvantages of results-oriented measures. These should be taken into account when designing a programme, and the ways of doing so are explained in the Eight Golden Rules (following sections).

Advantages

Effectiveness and efficiency

Result-oriented measures are directly linked to the desired outcome which allows the effective achievement of goals as well as a high transparency with regards to how public money is spent [8]. This was confirmed by the experts we consulted (see Figure 2 and statement below). Many interviewed farmers also confirm that result-oriented measures promote biodiversity more directly and more cost-effectively (see Figure 3).

„Result-oriented measures increase transparency over financial support and credibility within society."

Senior researcher from South Tyrol, Italy

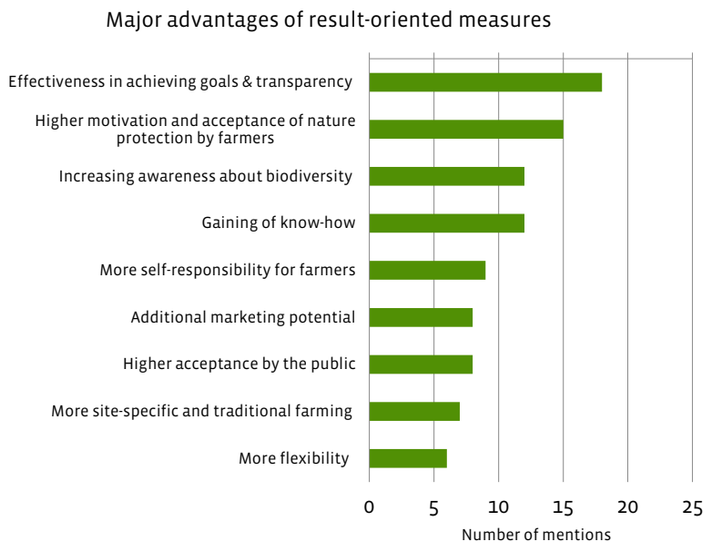

Figure 2: Major advantages of result-oriented measures
(Based on consultation of 52 experts undertaken as part of the scenario modelling, more than 5 mentions)

Motivation to promote biodiversity and awareness about the issue

Farmers become more active participants in nature conservation and take on more responsibility regarding the environmental impact of their management decisions [9,10,11,8,12]. The scenario modelling, the expert consultation and the interviews with farmers all showed that result-oriented measures increase farmers' acceptance of nature protection, motivate them to be engaged with it and lead to more awareness about biodiversity among farmers (see Figure 2 and statement below).

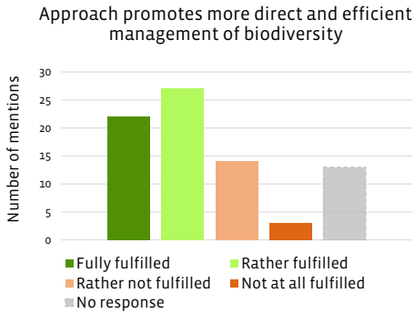

Figure 3: "Does the result-oriented approach promote more direct and efficient management of biodiversity?"
(Question answered by 79 farmers)

„Result-oriented measures have the potential to make participating farmers more engaged with their grassland and its species composition."

Agricultural expert from Upper Allgäu, Germany

Know-how

In interviews with the farmers, we found out that farmers with a good knowledge about wildlife and biodiversity appreciate being involved as responsible wildlife managers and to exchange knowledge and experiences with ecological experts on biodiversity and how it is influenced by their farm management.

Marketing possibilities and acceptance by the public

The outcomes of result-oriented schemes can be more easily understood, as the results can be shown and are not just about the adoption of certain management practices[13]. This can help improve communications and marketing. Various actors stressed that result-oriented measures are more suitable to marketing activities or can be used by farmers when sharing their knowledge with tourists, schools and the public in general and that this can create new income opportunities (see Figure 2).

Flexibility, self-responsibility and site-specificity

Farmers can flexibly choose how they want to achieve the prescribed results. This means that the management practices (e.g. grazing sequences, amount and timing of fertilization, mowing techniques and dates) can be adapted to the site-specific situation and possibilities on the farm. A vast majority of the interviewed farmers perceive result-oriented measures as providing more flexibility (see Figure 4 and statement below). Farmers know the land they manage better than anyone else: result-oriented measures build upon this, letting the farmer decide how to achieve the prescribed results [12,8]. It was also mentioned, that result-oriented measures could lead to a reduction in the number of regulations and restrictions on farm management.

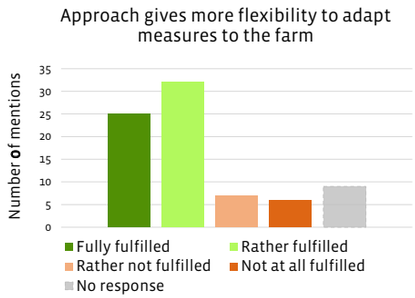

Figure 4: "Do result-oriented measures give more flexibility to adapt measures to the farm?" *(Question answered by 79 farmers)*

„The obligation to meet a certain result, rather than constraints on methods that we as farmers can use changes a lot. They don't lecture us on how we do things, and that is a very good thing."

Farmer from Vercors, France

Other

Some experts think that result-oriented measures promote innovative farms and new forms of collaboration between farmers as well as between farmers and market actors and/or environmental groups. They can organise collectively to offer and deliver biodiversity results as a paid service.

Disadvantages

Costs for administration and control

In its early stages, the introduction of a new programme is accompanied by high administrative costs for setting up the new procedures. In addition the determination of indicators, the need for controls and for providing advice and information to farmers will also increase costs. This was confirmed by the scenario modelling and the expert consultation (see Figure 5). However these costs might decrease in the long term. This will depend on the scheme and, particularly, if experienced and well-trained farmers can do most of the monitoring themselves instead of using relatively costly biodiversity specialists.

Training and education

Farmers need to acquire more knowledge on biodiversity and nature conservation in order to choose what changes in management practice to adopt for achieving the prescribed result [14]. As such more effort needs to be put into education, training and advisory services compared to other agri-environmental schemes (see Figure 5).

Risk for farmers

From the farmers' side a big weakness of result-oriented schemes is their exposure to a greater level of risk compared to action-oriented approaches, as the results are often not entirely within the control of the farm manager. This may be due to weather conditions, pests or the actions of neighbours, climate change or due to uncertainty and/or a lack of knowledge about whether a chosen management practice will lead to the desired result [15,16,12].

Lack of acceptance by farmers

Experts stated that a major disadvantage is the potential rejection of the new approach by farmers (see Figure 5). Acceptance of result-oriented measures may depend greatly on farmers' knowledge, attitudes and capabilities, factors which have to be taken into account.

Goal definition, choice of indicators and measurability

The expert consultation showed that a major disadvantage of result-oriented measures is the difficulties in defining goals and in measuring results (see Figure 5). The identification of suitable indicators is a challenge because not all desired results can be observed directly or measured easily [13]. At the same time, the choice of indicators has important effects on environmental outcomes and associated land management activities.

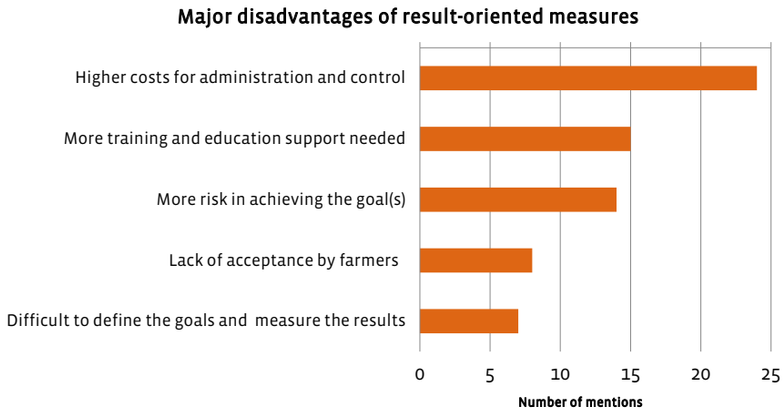

Figure 5: Major disadvantages of result-oriented measures *(Based on consultation of 52 experts undertaken as part of the scenario modelling, more than 5 mentions)*

Other

Depending on the state of the land it may take several years or even decades until the desired goals are achieved [16]. This suggests that result-oriented measures are more suited for preserving or enhancing the state of biodiversity on lands which already have a high level of biodiversity as the required results are more likely to be achieved on such land [9,10]. On land with a low level of biodiversity or of poor ecological quality action-oriented measures may be a more effective way to enhance biodiversity.

Golden Rule
1

Make biodiversity an issue

Successful programmes to support biodiversity must ensure that farmers, policy makers and society understand the important role that biodiversity plays in our natural and agricultural ecosystems.

Firstly, address and involve farmers and their advisors

For result-oriented measures to be successful, it is a precondition that the farmers are committed and engaged to preserve and enhance biodiversity on their farms. Being motivated by the promise of compensation payments is not enough. The farmers also have to be convinced by the overall objective and understand its importance for society but also for their farms. Also, it is crucial to involve agricultural advisors. They are in touch with many farmers in the region and they know their needs and the site-specific conditions of the farms. They have access to many information sources and support-tools, which can help the farmers to find the most appropriate solutions to preserve and enhance income and biodiversity simultaneously.

Make biodiversity tangible and concrete

Among the farmers we interviewed one of the motivations for participating in agri-environmental measures is their desire to preserve the natural environment and natural heritage. Yet, biodiversity, is a theoretical concept which is complex and often difficult to grasp. To put biodiversity on the agenda, the concept and its implications have to be made more concrete. Here, education and training programmes certainly play a crucial role (see Golden Rule 6). It is important to promote a better understanding of the role of biodiversity in the functioning of ecosystems (e.g. for pollination, soil fertility, beneficial insects against pests, etc.) as well as the consequences of biodiversity loss in mountainous areas - for the farmer and for society in general. One way to make biodiversity more tangible is to show biodiversity on the field and let farmers observe it.

> *"It is true: sitting in our air-conditioned tractors, we are more and more disconnected from nature."*
>
> Farmer from Vercors, France

Explain the potential of result-oriented approach for farmers

The introduction of any new measure has the potential to bring about changes and uncertainty among farmers and administrators. This can be reduced through information, training and specific advice. It is crucial to explain that the result-oriented approach for biodiversity gives farmers more flexibility and autonomy. And that public money is likely to be spent more efficiently due to the direct linkage to the desired results.

> *"It is not possible to do ever more for ecology. There is a conflict with food production"*
>
> Farmer from Entlebuch, Switzerland

Use existing and develop new communication channels

To spread information one can make use of approved communication channels: farmer newspapers, education and training programmes (see Golden Rule 6), agricultural advisors, existing networks and the internet. It is helpful to involve those farmers who are already committed to biodiversity or nature conservation. Such farmer-to-farmer approach is promising because there is a higher level of trust and mutual understanding.

Golden Rule 2

Design your programme at the regional level

Effective programmes need to be adapted to regional or even local circumstances. In order to understand these circumstances it is important to design result-oriented programmes at the regional level, to enable flexibility in implementation and to involve the stakeholders.

Choose a participatory design process and involve relevant stakeholders

When designing a new programme, it is important to involve the stakeholders at regional level who later will be affected by it. These will include farmers and farmers' associations, advisors, scientists, administrations, environmental associations, etc. Through their involvement they will view the issue as more important and will take ownership of it. Furthermore, stakeholder involvement provides good information and feedback on the feasibility of a programme, its potential weaknesses and challenges and information about barriers which may affect adoption. For example, this makes it is easier to reconcile biodiversity protection with farmers' interest in making a living from agricultural production. And, the inclusion of environmental groups means that societal interest in preserving biodiversity is better heard.

Participation only works if stakeholders are committed and willing to participate. When looking for participants it is therefore important to identify stakeholders who are willing to contribute. Higher levels of participation, while desirable in theory, also increase the level of costs, efforts and time needed for taking decisions. At the same time such high levels of participation are needed to ensure a long-term success of the programme.

Adapt your programme to regional circumstances and objectives

There are regional differences, which need to be acknowledged. Even in the Alps there are clear differences in the vegetation between the northern and southern sides due to the different climatic and geological conditions. This requires a regional adaptation of objectives and indicators. Soil type, topography and existing farming practices should also be considered. These regional differences do not mean that every region needs to have its own programme but that each region adopts the most effective and necessary actions.

Ensure integration and flexibility in farm management

Ensure that the actions and practices required to reach the objectives can be easily integrated into farm management. Ensure that farmers have flexibility to choose the most appropriate measures. If management practices, such as cutting dates, have to be adopted in order to be eligible for the result-oriented measure, this may deter farmers from participating (see farmer's statement to the right).

> *"After a certain time, the hay becomes straw. In this case, I have to buy additional fodder for the cattle which makes supporting the environmental cause contradictory."*
>
> Farmer from Vercors, France on the restriction of delayed cutting dates

Encourage the connection of habitats through collaboration

To preserve and/or enhance biodiversity you have to consider ecosystems from a landscape and habitat perspective and not only from a farm or plot perspective. Healthy ecosystems are ecosystems which are not isolated and where species can pass from one ecosystem to the other.
Connecting agro-ecosystems requires close cooperation between those farmers who manage adjacent land. You can encourage such cooperation by targeting payments to a network or group of farmers or to community projects where different farmers participate. It is recommendable to assist the farmers in this by providing a platform where interested farmers can meet, offering them trainings, which include biodiversity-related information and organizational assistance. Such ecological interconnectedness projects are widespread in Switzerland (see box to the right).

Ecological interconnectedness projects in Switzerland

Since 2001, under the Federal direct payment regulation farmers in Switzerland can get additional payments for biodiversity rich parcels (such as extensive meadows, hedges, etc.) which are part of a regional ecological interconnectedness project. The goal is to regionally enhance the typical diversity of plants and animals based on a status quo analysis. Municipalities with such projects have to set target goals (also for specific local species) which have to be evaluated every 3-4 years. The definition of key indicator species is very important. After 8 years the project has to be renewed. 90% of payments are funded nationally and 10% through the Cantons. Only farmers in municipalities with such interconnectedness projects, supported by the Canton, are eligible for such payments (ca. 1000 €/ha). This puts pressure on the municipalities to establish such projects. In mountain areas over 90% of the municipalities were participating in 2015, sometimes also contributing extra funding.

Golden Rule
3

Choose indicators which are reliable and appropriate

A good programme requires good indicators. While this is true for every type of support scheme it is especially true for result-oriented measures. Biodiversity is a complex concept. The indicators, which measure the state of biodiversity, have to be adapted to this complexity and reliably represent the objectives. Equally, they have to be comprehensible and implementable for farmers and should be adaptable to individual farms with different levels of ecological quality.

Set clear biodiversity objectives

Biologists define biodiversity as the totality and diversity of genes, species, and ecosystems of a region. As the full scope of biodiversity can hardly be measured we have to focus on specific aspects of biodiversity (e.g. species diversity or habitat quality). First, based on a status-quo analysis one needs to identify the aims of the biodiversity support: preservation and/or enhancement of the current state of biodiversity. Even 'just' preserving the level of biodiversity can require a lot of effort – depending on the local ecological characteristics and environmental influences, such as the intensity of agricultural practices. Based on this, objectives have to be defined which can be measured through a set of appropriate and reliable indicators.

Make sure that your indicators provide reliable information about the enhancement of biodiversity

Indicators must provide reliable information about whether there is an enhancement of biodiversity. There are many different kinds of indicators: Indicators representing the variety and/or number of species, the existence and/or health of specific habitats (which can indirectly provide information about the presence of specific animal or bird species), whole ecosystems and the variety of ecosystems, etc. Ideally, different types of indicators should be combined in order to be able to reflect the different dimensions of biodiversity. However, it is very difficult to find a set of indicators which is scientifically accepted and which is relatively simple to apply.
Below, you find a presentation of the indicator set used for the MERIT project. We got positive feedback from the farmers because of its high practicability: it is easily conveyable, can be applied by the farmer and is not very time-consuming. At the same time it provides a broad biodiversity perspective.
To measure the result we recommend the development of a scoring system where the achievements of the single indicators are translated into points and accumulated. The final level of points would be the criteria on whether the result has been achieved or not. As for the measurement protocol, an exemplary version is displayed in the annex (see Annex 3).

> ***„I'm sceptical about result-oriented measures because I don't know if the indicator flower will actually be blooming on the day when monitoring takes place."***
>
> Farmer from Entlebuch, Switzerland

Criteria for successful indicators

The chosen indicators should fulfil the following criteria:

- Represent the chosen habitat or ecosystem
- Appear regularly and visibly (for plant species this should be during the peak of the blooming period) and be easy to identify
- Not be rare species (except if specifically targeted by the programme)
- Not be species which are very sensitive to external influences such as extreme weather conditions
- Be relevant for the programme's objectives
- Be analytically sound
- Be responsive to dynamic changes

MERIT indicator set

The indicator set which was used for the biodiversity assessments on the farms within the MERIT project consists of four single indicators. In the annex, we exemplarily show how such an assessment looks like in practice (see Annex 2). The four indicators are:

Structuring degree
Trees groups, hedges, single trees, slopes, banks and smaller habitats (i.e. moors, rocks, scree areas) are considered as structural elements. Their value is given by their function: they break up the monotony of an intensive agricultural landscape, act as refuges for small animals and enrich the landscape.

Characteristic species
Characteristic species are species with a distinct concentration of occurrence or abundance in a particular vegetation community. As such these species are valuable for identifying not only vegetation units, but also to a high degree for the identification of site-specific factors (e.g. altitude, geology) and land use or land use intensity. Within MERIT a list of characteristic species for mountain grassland was created (see box on the right).

Flower colours
The flower colour index delivers information on the species richness of a meadow. Meadows with a high index score are more colourful, and therefore also richer in plant species, than those with a low index score. The MERIT investigations of semi-natural habitats on 44 farms confirmed this observation statistically (see Figure 6). The number of plants in a meadow is significantly influenced by land use and site-specific conditions.

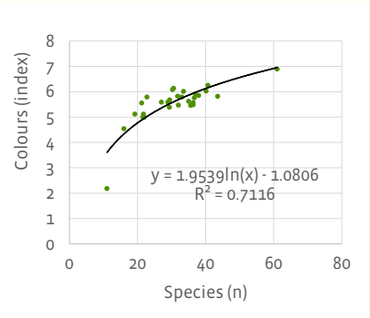

Figure 6: Correlation of flower colour diversity index and plant species on 44 pilot-farms in the MERIT project

Butterfly numbers and diversity
It is not only the plant species richness that contributes to the farm assessment but also the animal diversity. Meadows with a high number and diversity of butterflies have a higher ecological value than those with lower numbers. Butterfly surveys are strongly influenced by weather and season, for this reason they have to be carried out several times over the vegetation period.

Vanessa cardui (Painted lady)

MERIT's indicator list for mountain grassland

The MERIT project has created an indicator list with characteristic species, which is applicable for mountain meadows and pastures in general. Figure 7 exemplarily shows one of these species (Wood cranesbill). The comprehensive list is displayed in the annex (see Annex 3). The list encompasses characteristic species as they are described in the box 'MERIT indicator set' to the left.
When recording the number of appearing indicators, we recommend to use classes such as 'single', 'several', 'common' and 'very common' instead of counting the exact number.
Such a list with wide scope can be very useful but you have to test individually whether the list is applicable in your area or whether you have to find other indicators. This also very much depends on the focus of your programme. On the one hand, you might choose a rather general orientation aiming at covering large areas by addressing ecosystems, which are widely spread. On the other hand, there might be an orientation towards specific rare ecosystems or species which generally are of high importance for biodiversity. The latter approach will definitely require an adaptation of the indicator lists to local circumstances.

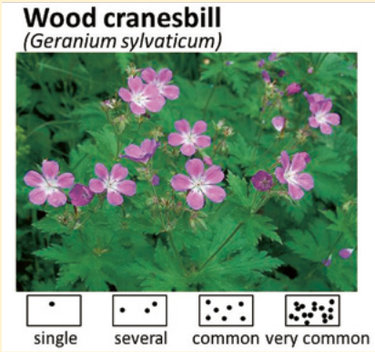

Figure 7: Extract from the MERIT indicator list for mountain grassland
(The comprehensive version is displayed in Annex 3)

Make sure that your indicators enable continuous improvement

There are often variations in the state of biodiversity on individual farms. This implies that the efforts needed to reach a certain result differ from farm to farm. We recommend developing a model which focuses on ecological quality improvements and not achieving only a certain state. In this way you can set incentives for farms with low biodiversity and avoid free-rider effects for farms with high biodiversity – which would result in 'deadweight losses'. Support for farms with low biodiversity is important because there is more potential for enhancement. This however comes with the challenge that it may take several years until specified indicators appear for the first time and this should therefore be considered in the sanctioning approach (see Golden Rule 5).
There are different approaches to acknowledging quality improvements: You can choose an approach of different biodiversity quality levels as described in Golden Rule 5.
Another solution is to have a pure measure in which every farmer agrees on individual objectives with the implementing authority depending on the existing level of biodiversity on the farm and the type of farm activities. This approach has been implemented in an innovative pilot project in Austria, described in the box on the right. Such individual solutions probably involve higher transaction costs for administration, advisory services and monitoring. However, such higher transaction costs may be compensated by a higher effectiveness of the measure because it is more targeted and more accepted by farmers. Furthermore, effective biodiversity support is a valuable long-term investment for society.
To assess whether an approach is appropriate or not, you should take on board those who have to work with it: namely farmers, advisors and controllers.

Result-oriented Nature Protection Plan in Austria

The Result-oriented Nature Protection Plan (ENP) is a pilot project within the Austrian 2014-2020 Agri-environmental Programme (ÖPUL). Experts and farmers assess a chosen plot of high ecological value and together agree on the nature protection objectives. The farmers then decide themselves what measures to take in order to reach the agreed objectives.

The compensation payment consists of a basic premium, which is calculated for each plot. Additionally the farmers receive an allowance (70 €/ha) for documentation, monitoring and on-going exchange with the advisors.
In one specific example, the objective is that *Eriophorum latifolium* (cotton sedge) and *Dactylorhiza majalis* (a marsh orchid) occur sporadically on the chosen plot. 'Sporadically' means that 10 to 30 exemplars of each type should be distributed across the whole plot.
To ensure a basic ecological quality level some control criteria are fixed as well, e.g. not more than five exemplars of *Rumex alpinus* (Alpine dock) should be found on the plot or not more than 20% of the plot should be damaged by trampling.

www.suske.at

Golden Rule
4

Pay attention to the implementation at the administrative level

In designing a new programme there are many issues to be considered. It has to be decided whether the programme should be purely result-oriented or whether it should be combined with action-oriented elements. This is related to the question of how the programme should be embedded within existing policy structures. Further, one needs to specify how, and by whom, the programme will be administrated and how the results at farm-level will be monitored.

Assess whether your programme should be purely or partly result-oriented

The way result-oriented measures are designed varies considerably. In 2015, there are only a few 'pure' result oriented measures, where the result is the only criteria for financial support (see example on the next page). The majority of the existing result-oriented measures are hybrid programmes which means that result-oriented elements are combined with action-oriented elements. One example for a hybrid measure is the Flowering Meadow Measure from France (see example on page 31). There are various possibilities for designing hybrid measures: actions can be a compulsory entry requirement (eligibility criteria), optional, remunerated or not and there can be different levels of payments for different actions. The following advantages and disadvantages of hybrid and pure approach may help in deciding which approach is most appropriate for your programme:

- Pure result-oriented measures are less complex than hybrid measures because only the results (e.g. a certain number of key species appearing) – and no additional restrictions (e.g. cutting date) – have to be monitored. This simplifies the implementation both for farmers and for administrators.
- Hybrid measures may build on existing schemes, which can simplify the initiation phase of a new measure from an administrative point of view.
- For farms with low biodiversity, purely result-oriented measures might not be appropriate; it may take them several years to achieve the prescribed results, especially when the land was previously intensively used. It can therefore be useful to keep action-oriented elements in order to also attract farmers with low biodiversity and reduce risk of not achieving the prescribed results.
- For farmers, action-oriented measures are easier to implement in the sense that they know exactly what to do (prescribed management practices) in order to receive their payments. With a result-oriented measure, farmers decide on the management practices on their own but might not be sure about the effects. To have action-oriented prescriptions as a basis can be helpful.
- On the other hand, farmers who are experienced in preserving biodiversity will prefer to have fewer management prescriptions (see farmer's statement below).

> ***"When a farmer has reached a certain level of biodiversity (in Switzerland this is ecological quality level 2), the restrictions, regarding for example cutting dates, should be given up."***
>
> Farmer from Entlebuch, Switzerland

Result-oriented management of species-rich grassland in Bavaria (Germany)

In 2015, Bavaria introduced a purely result oriented measure based on the national framework and examples from other federal states in Germany. It is called 'Preservation of species-rich grassland on single plots (B40)' and belongs to Bavaria's agri-environment programme KULAP. The main criteria of this measure are:

- Existence of at least 4 indicator species from a list of 34
- Eligible area: permanent grassland (set-aside land and alpine pastures excluded)
- 250 €/ha

The Bavarian Grassland Monitoring Programme provided the basis for developing the indicator list. The selected indicator species represent species-rich grassland but are also relatively widespread in Bavaria and easy to identify. The agricultural administration provides a catalogue with descriptions and photos of the indicator species and guidance for yearly monitoring by the farmer, and offers information and training courses. State personnel check a control sample of participating farmers for compliance.
A similar measure with a minimum of 6 indicator species is offered as contractual nature conservation measure in specific target areas.

www.lfl.bayern.de/iab/kulturlandschaft/025011/index.php

The Flowering Meadows Measure in France[17]

The French measure Prairies Fleuries (French for 'flowering meadows') was established in 2007 and aims to preserve high floral diversity. Farmers commit to ensuring that at least four plant species from a reference list of about twenty are present on their plots. The contract duration is five years.
This is an example of a hybrid measure because the farmers not only have to achieve the prescribed result but they also have to comply with some action requirements: On the chosen plots, fertilization is limited to 125kg nitrogen/ha, of which only 60kg may be mineral nitrogen, and chemical weeding and tillage are not allowed.
The compensation payment consists of the action-oriented basic payment for extensive grassland management (76 €/ha) plus the annual compensation for the result achievement (89 €/ha). The latter was calculated based on an estimate of losses to farmers' earnings and the additional expenses incurred by the changed management regime.
The measure has been successful in that it has raised awareness of biodiversity and given it more value as well as given more responsibility to farmers (see statement below). Further, it has supported continued low-intensity meadow use and it contributed to a positive societal image of meadow flowers, as meadows are seen as a symbol of biodiversity. Yet, farming practices have hardly changed. A study in Vercors revealed that more communication is needed to inform farmers about the merits of the measure and that payments need to be more stable and attractive. The unequal application of the measure in different regions was criticized by some.

"The obligation to meet a certain result, rather than constraints on methods that we as farmers can use changes a lot. They don't lecture us on how we do things, and that is a very good thing."

Farmer from Vercors, France

Keep transaction costs at a reasonable level

Result-oriented measures require considerable efforts for administration and control. This and other factors were confirmed by the scenario modelling as well as by the subsequent expert consultation (see Figure 8). However, result-oriented measures may also help to increase farmers' willingness to implement biodiversity-friendly management practices.

In order to keep transaction costs at a reasonable level consider the following strategies:

- Keep registration procedures simple, both for the public administration as well as for farmers.
- Ensure good training for public administrators. This helps to keep the implementation costs low.
- Consider the costs in a long-term perspective because growing experience can significantly reduce transaction costs.
- Involve farmers in monitoring (see page 34).
- Ensure a high cost-efficiency for the compensation payments (see Golden Rule 5).

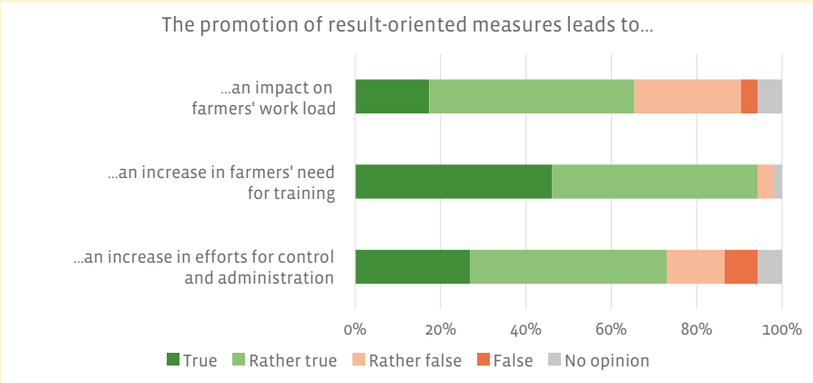

Figure 8: "Does the promotion of result-oriented measures lead to...?"
(Question answered by 52 experts consulted as part of the scenario modelling)

Result-oriented measures can be both publicly or privately organized

The preservation and enhancement of biodiversity can also be governed by private actors such as farmers' associations, regional market initiatives, processors or retailers. One approach is to make use of existing market mechanisms: building on consumers' willingness to pay for the preservation or enhancement of biodiversity and providing the opportunity for farmers to receive a premium price for certified biodiversity-friendly produced products. As result-oriented measures document the enhancement of the quality of biodiversity they are probably more amenable to being communicated and are thus better placed to attract marketing added-value than action-oriented measures (see Golden Rule 7).
There are several food labelling schemes, which claim to contribute directly or indirectly to biodiversity, but most of them are action-oriented. In recent years, few of these labels have placed more emphasis on biodiversity. They follow different approaches such as point systems (e.g. IP Suisse, Bio Suisse and Landwirtschaft für Artenvielfalt) or specific standard requirements (e.g. Bioland, Demeter, Heumilch, Ja Natürlich, Zurück zum Ursprung, etc.). One example of a private result-oriented scheme is the pilot project of an Austrian supermarket chain (see box on the right).

Pilot project – the biodiversity programme of an Austrian supermarket chain

One of the Austrian food retail chains sells organic products with their own label. In 2015 this food chain initiated a pilot project with around 50 organic dairy farms aiming at establishing biodiversity standards in agricultural production. Biodiversity standards on the farm level are based on the diversity of species, the percentage of extensively used land, the diversity of land use and the farmer's knowledge about biodiversity. This does involve offering advisory services for farmers regarding biodiversity and land-use. In the long run farmers should get a higher price for milk if the above mentioned criteria for biodiversity standards are fulfilled.

Frontpage of the project brochure

Involve famers in monitoring

Involving farmers in monitoring may help to keep transaction costs low. Even though self-monitoring by farmers cannot entirely replace official controls by independent controllers, the frequency of official controls could be decreased, thus leading to lower control costs. Self-monitoring also has other very important advantages:

- The self-inspection concept of monitoring by the farmer supports the farmer in taking responsibility for the result-oriented measures.
- By monitoring the effects of changed managements practices and the biodiversity quality on their own land, farmers become experts in farm biodiversity themselves.
- Finally, the government's trust in farmers to do the monitoring properly can motivate farmers to engage more in biodiversity conservation.

On the other hand, it is important that the monitoring mechanisms are reliable while being clear and understandable for farmers, their advisors and public administrators. This includes a good knowledge of the indicators. Also, the monitoring tools should be clear and simple. An example of how a monitoring form could look like is shown in the annex (see Annex 3). Further, the farmers should be supported by advisors when they face problems in doing the monitoring or interpreting the results (see Golden Rule 6).

Austrian monitoring of biodiversity

Since 2007, about 700 farmers in Austria have been monitoring flowers and animals on their meadows. The idea is that farmers improve their understanding of their meadows by watching and counting rare flowers and animals such as grasshoppers or spiders. Farmers are supported by experts who offer instructional training on the plot. The farmer observes the plot every year and enters the data into a simple online-form. Twelve agricultural schools are also taking part in the project. In special teaching units pupils are learning about the interrelations between land management and biodiversity.

www.biodiversitaetsmonitoring.at

„A monitoring system that is simple and gives more autonomy to the farmers would be better."

Farmer from Entlebuch, Switzerland

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5

Payments are a main incentive

Economic interests and preservation of the natural environment and natural heritage are important drivers for farmers to participate in agri-environmental measures. This was confirmed by about 80% of the farmers interviewed in the MERIT project. Payments have to be well-designed in order to induce farmers to change their agricultural practices or to restrain from intensifying or abandoning farming practices that preserve high biodiversity. Farmers should have an involvement in setting the payment levels, as this provides valuable feedback about the attractiveness of payments. This is particularly true for result-oriented measures. Testing of payment levels should be done with different farm types and farm characteristics, covering the level of biodiversity, type and intensity of land use or local ecological circumstances.

Farmers must be compensated for income foregone and additional costs

In the EU, calculation of compensation payments follows the 'income foregone' approach. Generally, income foregone is the balance between gross margin of an average reference activity (e.g. grassland management) within a region without implementing the agri-environmental measure and the gross margin of a standardized activity including the result-oriented measure (e.g. species-rich grassland management). Thus, the compensation payments for farmers participating in result-oriented measures consider the income foregone plus, if necessary, the additional costs which may arise, such as information, learning and training costs (transaction costs). However, the uniform approach of calculating the compensation payments on an average reference and a standardized activity does not take any heterogeneity in soil conditions and farm structures into account. As such, it is difficult to determine a single payment level which fits all farms in a region and fairly compensates farmers for additional costs incurred while avoiding free-riding and deadweight losses. Therefore, it is important to identify the most probable and common management practices and refer to the mean losses experienced.
The baseline for calculating the compensation payment is set by national mandatory requirements for farmers, the statutory management instructions of cross-compliance and the greening measures (see Figure 9). The calculation of compensation payments based on the income foregone approach is explained and illustrated with an example on the next page.

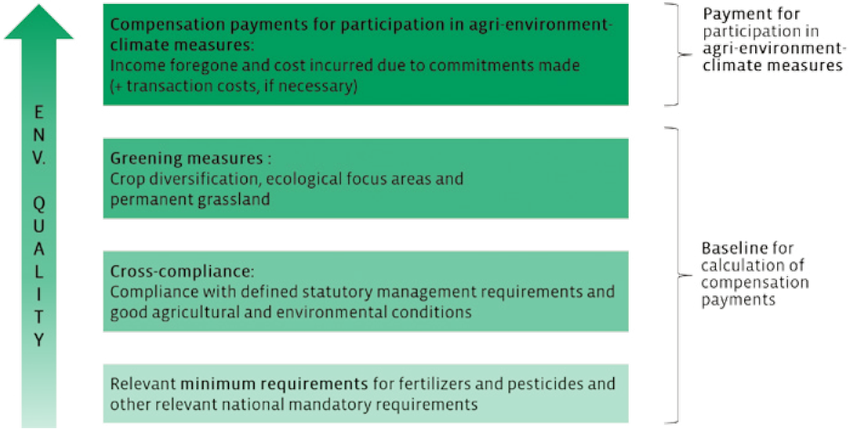

Figure 9: Baseline for calculation of compensation payments

Calculation of compensation payments for result-oriented measures (in €/ha)

Table 1: Example of a calculation of compensation payments for result-oriented measures (in €/ha)

Description	Reference farm activity	Farm activity with result-oriented measure	Balance
Return	**1500**	**1250**	**–250**
Yield loss of 20% (expressed in energy production per ha) to be compensated for by purchase of concentrate feed	1500	1250	–250
Variable Costs	**560**	**515**	**–45**
Fertilizer: 20% fertilizer reduction	350	260	–90
Variable machinery costs: lower costs due to reduced fertilization, lower costs of hay making compared to silage making	150	110	–40
Hired machinery: higher costs for round baler and reseeding	15	145	+130
Other variable costs: lower costs due to savings in silage wrapping and silo varnish	50	5	–45
Gross margin	**940**	**735**	**–205** (Income foregone)
Additional costs			**–41**
Transaction costs: 20% of the income foregone			–41
Income foregone incl. additional costs			**–246**
Actual Payment			**250**

The example is based on the following assumptions:
Farm activity with result-oriented measure:

- Objective: Minimum of 4 species from a list of 20 to 40 indicator species
- Late cutting of grassland, twice for hay making and once for silage
- 20% reduction in fertilizer compared to 3 silage cuttings in the reference farm activity
- Grassland yield reduction of 10% (dry matter)

Reference farm activity without result-oriented measure:

- Cutting of permanent grassland for silage-use 3 times a year

Income forgone: Balance between reference activity without result-oriented measure and standardized activity with result-oriented measure

Other relevant issues for calculating the compensation payments

- Result-oriented measures can be designed for different levels of biodiversity achievement: The higher the level achieved the higher the payment given (accumulative). One example of this can be found in Baden-Württemberg, Germany where a two level system was created based on the presence of four and eight indicator species. Compensation payments for both levels can be calculated according to the example above – and considering different levels of yield losses and fertilization.
- Income from other support schemes for the changed management practices (if any) need to be accounted for.
- Additional labour requirements to achieve the outcome can be included in the payment calculation.
- In the EU, transaction costs can be up to 20% of the compensation payment. Result-oriented measures in Austria (Results-based nature conservation plan; Ergebnisorientierter Naturschutzplan ENP) and France (Flowering Meadows Measure; see also example on the right), for example, included additional costs for information, learning and training in the compensation payments.
- The further developed Flowering Meadows Measure in France (see example on the right) introduced three risk categories depending on the risk of losses incurred by using environment-friendly practices. The calculation of the income foregone is based on the opportunity costs of implementing the result-oriented measure on the farm.

The new grassland and pastoral based measures in France

In 2015, the existing Flowering Meadows Measure (see Golden Rule 4) was further developed by introducing 3 risk categories depending on the risk of loss of environmental friendly practise ranging from low risk potential on marginal areas to high risk potential on highly productive areas.
The compensation payment level depends on the risk category:

Risk 1: Low risk on marginal areas: 57€/ha

Risk 2: Medium risk of livestock intensification: 79€/ha

Risk 3: High risks of disappearance of grasslands in favour of crop production: 115 €/ha

The calculation of the compensation payments for each risk category has been based on the opportunity costs to maintain the management of the farming system as a whole, the costs linked to the maintenance of the favourable practices in the target areas and finally the transaction costs of the measure. Farmers' opportunity costs are higher on highly productive areas and lower on marginal areas.

"Payments in result-oriented measures have to be approximately 15% higher compared to action-oriented measures because of the additional work for observing, documenting and for the higher responsibility."

Farmer from Carinthia, Austria

Long-term contracts acknowledge the temporal factor of enhancing biodiversity quality and motivate farmers as they offer higher planning reliability

Farmers should be encouraged to participate in measures in the long run. This is because ecosystem processes are generally rather slow and it may take years for biodiversity to be restored. On the other hand, in cases where biodiversity is still in a good shape, it is important to maintain this quality in the long run. Contracts should therefore have a duration of at least 6-8 years.
Also for farmers, it is important to know that the measure will run in the long term as they need some security in planning. The risk of administrative changes (budget cuts, policy changes, etc.) should therefore be minimized as far as possible.

> *„One should not only consider the short-term results but also the efforts involved in achieving long-term effects.“*
>
> Representative of the South Tyrol farmers' association, Italy

Choose a sanctioning approach which does not discourage farmers

A strict sanctioning regime would require that farmers don't receive the payments or that they have to pay them back when the results are not achieved. Such an approach can discourage farmers in participating if they are unsure about how and whether they will be able to achieve the required biodiversity quality. However, ways to counteract discouraging farmers are:

- Develop a graduate payment system which allows remunerating partially reached results (e.g. 50% of required indicator species found).
- The presence of indicator species need not be proven each year but for example in three out of five years or in four out of seven years.
- Evaluation of a farm's biodiversity potential by an official biodiversity expert prior to contracting.

> *„The risk of sanctions is always an issue for farmers. A sanction system where a partial attainment of results does not result in the full premium being withdrawn would lower the risk.“*
>
> Advisor from Upper Allgäu, Germany

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6

Farmers‘ knowledge about biodiversity is essential

If farmers are to successfully adopt result-oriented measures, it is important that they understand the importance of their engagement with biodiversity, are informed about the concept of result-oriented measures, are familiar with the best management practices for achieving targeted biodiversity objectives, and that they are capable of monitoring changes in their farm's biodiversity. There is considerable need for knowledge exchanges and mutual learning between farmers and environmentalists.

Design and adapt knowledge exchange according to farmers' existing level of knowledge

The large majority of the farmers interviewed for the MERIT project clearly stated that they need education, training and advice to successfully implement biodiversity measures on their farm. They also mention that from their point of view ecological experts have no knowledge about farming and in certain cases have no concrete knowledge about local flora and fauna. We also found that farmers and experts alike believe that more biodiversity training actually leads to a change towards biodiversity-friendly management practices.
Therefore a broad and innovative approach to knowledge exchange is needed, which has to fulfil the following major requirements:

- Be adapted to the farmers' knowledge level
- Be continuous
- Be very practice oriented
- Include farmers' knowledge about their land, about farming and management and also biodiversity
- Be interactive and stimulate cooperation between farmers and environmentalists and other experts
- Be voluntarily and not a condition of the programme contract

Such an approach involves three major channels of knowledge exchange: Basic education, Advanced training and Advisory services. The emphasis on each varies according to the knowledge content to be transferred (see Figure 10). Knowledge exchange should particularly address the environmental, economic and social situation of the farm and the area in which it is located in order to ensure the success of result-oriented schemes. Farmers may also need additional support if they need to change their actual farming practices to achieve the biodiversity result, during the transition from action-oriented to result-oriented schemes or when facing specific regional environmental conditions.

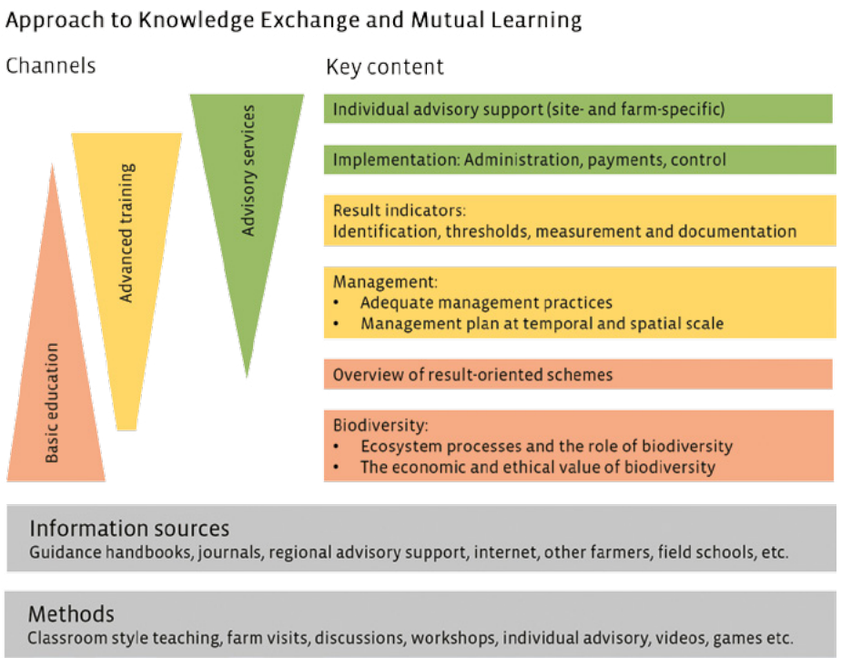


Figure 10: Channels of knowledge exchange with the corresponding key content, information sources and methods
(The colours represent the different channels and the thickness of the arrows indicate which channels are most relevant for the different key elements)

Use of appropriate training methods

Farmer training should be tailored to the varying farmers' knowledge level about biodiversity and their information needs.
The farmers interviewed by the MERIT project proposed different types of training and education about biodiversity. The large majority (68%) preferred farmer field schools. Seminars or workshops were ranked second, followed by coaching and individual advice (see Figure 11). The majority of the interviewed farmers (66%) were willing to invest between half a day and three days for training and education on biodiversity measures.
The continuity of training and advice is important. It should be provided before the implementation and throughout the duration of the programme. Depending on the complexity of the measure, farmers might need several training courses and discussions to learn about the relatively new result-oriented measures. The training should be designed in a stepwise manner, building on the knowledge previously gained.

Different information tools should be used in order to ensure variety and practical orientation: guidance handbooks, concise brochures, videos, games, workshops and field visits where farmers can raise questions. Consequently we highlight the importance of using a participatory teaching method, based on mutual learning.

Figure 11: "What kind of training do you need for better carrying out certain biodiversity measures?"
(Question answered by 79 farmers)

Use of multiple information sources

The farmers interviewed in the MERIT project use journals (72% of farmers) as their main information sources about biodiversity and biodiversity management (see Figure 12). About 35-40% of the farmers use the Internet and consult technical advisors as a source for information and 18% of the farmers highlighted farmer-to-famer knowledge exchange. 67 (out of 79) farmers already got advice on biodiversity and farm management. They stated that the most useful information came from regional and agricultural advisory service, followed by regional and national farmer organizations (see Figure 13).

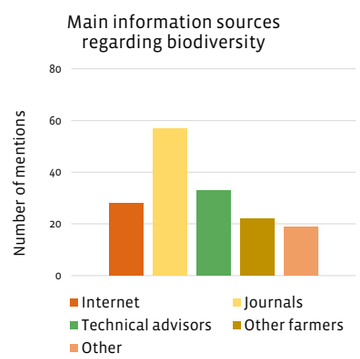


Figure 12: "What is your main source of information regarding biodiversity and farm management?"
(Question answered by 79 farmers)

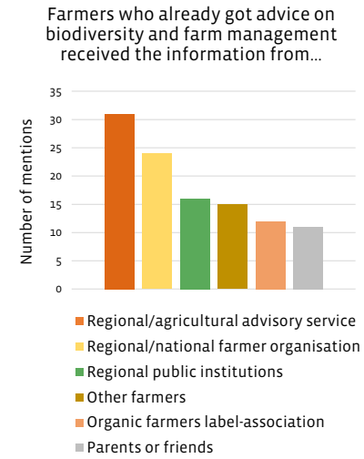


Figure 13: "If you already got advice on biodiversity and farm management: Whom did you receive the most useful information from?"
(Question answered by 79 farmers of which 67 already got advice on biodiversity and farm management)

Raise awareness about the different values of biodiversity in farmers' education

It is important that basic education raises general awareness about the ecological, economic and social value of biodiversity and the role which agricultural production plays in this (see Golden Rule 1). Farmers in particular should understand basic ecosystem processes (e.g. biomass, nitrogen) and the value of biodiversity for ecosystem services such as food, biological control, soil fertility or aesthetics. They should learn about the economic implications of biodiversity measures. In this respect visits to farms that are strong in biodiversity management can help other farmers to understand that biodiversity conservation can be integrated in a farm without jeopardizing food production and to see the benefits of ecosystem services on productivity.

Mutual exchange of knowledge between farmers and ecologists is key to the more widespread implementation of biodiversity preservation measures on farms. On the one hand, it is important that ecologists recognise farmers' knowledge about farm management, local conditions, economic constraints and their experiences in farming in the environment. On the other hand, farmers need to recognise that ecologists' knowledge could help them improve their farm management.
Finally, farmers should also understand the rising, and sometimes conflicting, demands of society for biodiversity and the potential for marketing and improving the image of agriculture. Farmers' associations could play a key role here.

A Swiss organic label organisation trains farmers to become biodiversity advisors

Organic farmers are already making considerable efforts to preserve and enhance biodiversity. They have protected living beings and natural resources by renouncing chemically-based fertilizers and crop protection products. In 2013, the labelling organization Bio Suisse, whose label with a stylized bud (called 'Knospe'), which has a market share in Switzerland of about 60% of the organic market, launched a new project aimed at improving efforts to enhance biodiversity. The project was planned together with the organizations SVS Birdlife and FiBL and is funded by the Coop Fund for Sustainability and Bio Suisse. Its aims are to create and maintain biodiversity-promoting plots and to implement wildlife-friendly management practices by advising 150 farms within three years. A selection of farmers from 16 different regions was trained to become biodiversity advisors. These farmers then took over the advisory services for interested farmers in their respective regions. The registration for such advisory services was voluntary and priority was given to farmers with a considerable backlog with regards to biodiversity. This farmer-to-farmer approach was received very positively and was appreciated by the participating farmers. It encompassed individual advice as well as ten field visits per year which were held all over Switzerland. These field visits were very popular, attracting more than 100 participants per visit in several cases.

Give an overview of result-oriented measures and their characteristics

Basic training should inform farmers about the planned or existing result-oriented measures offered within their regions. It is important that farmers understand the schemes' ecological and socio-economic characteristics and the differences between result-oriented measures and the classic action-oriented ones. Furthermore, basic training should deal with the potential strengths and weaknesses, opportunities and threats of the result-oriented measures and the implementation process. An important feature of result-oriented measures is that they provide a vehicle for farmers to communicate their achievements in enhancing biodiversity directly to consumers and the public. This can be done by adapting product marketing, by offering agro-tourism or farm visits or by organizing meadow competitions (see Golden Rule 7), posters and putting up display boards. This link between result-oriented measures and on-farm marketing and communication should also be covered in the farmers' training.

> *"The knowledge level of young farmers is not sufficient for result-oriented measures: more specific education (e.g. knowledge on key indicator species) should be provided by agricultural schools."*
>
> Farmer from Entlebuch, Switzerland

Training in appropriate management options to reach specific biodiversity objectives

Result-oriented measures leave decisions about how to achieve the desired result to the farmer. This means that farmers need to know which management practices and decisions foster the achievement of specific biodiversity objectives and which are detrimental. The advanced training should study, in detail, a catalogue of management practices, their impact on costs and how they affect biodiversity. This will enable farmers to make informed decisions about the most appropriate management practices for their farm and to develop short and long-term biodiversity management plans. Advanced training can be facilitated by brochures, workshops and farm visits which support farmers in choosing suitable management options for the species that occur on their farms. It should convey information on the ecology and conservation measures for target species. The Swiss Ornithological Institute and FiBL have developed such a guide (see extract on the next page).

Indicator brochure for *Euphydryas aurinia* (Marsh Fritillary)[18]

Conservation measures
Extensive managed meadows and pastures, conservation mowing (staggered mowing, use of a bar mower, late mowing), foster litter meadows and food plants, connecting habitats by herbaceous strips.

Habitat
E. aurinia is a character species of damp heathy grassland.

Food plant (caterpillar)
Devil's bit scabious (*Succisa pratensis*), field scabious (*Knautia arvensis*) and small scabious (*Scabiosa columbaria*).

Characteristics
E. aurinia adults have a chequered pattern of yellowish-brown upperside with orange-brown markings. The underside is light orange to brown with yellow spots. Adult wing span is 3.5- 4.6 cm. The caterpillars measure up to 2.7 cm and are black.

Euphydryas aurinia (Marsh Fritillary)

Life cycle
Eggs are laid in batches on the underside of the leaves in May and June. The turn from pale yellow to dark grey. The young caterpillars group together in protective webs that are spun across the foodplant. In the autumn they make stronger webs, closer to the ground where they will start to hibernate. At the end of April, the caterpillars start to disperse from their communities to pupate and adults emerge about two weeks later.

European status
E. aurinia is regarded as endangered or vulnerable and is declining dramatically in many countries.

Advanced training to develop skills for self-monitoring of result indicators

To make full use of the potential of self-monitoring (see Golden Rule 4), farmers need to be trained in the monitoring system of the relevant regional programme. In the case of the MERIT indicator set (see Golden Rule 3) this would include training in the structuring degree, butterfly numbers and diversity, flower colours and characteristic species. The training programme should include in-field practice, e.g. during an excursion. Support materials should be provided such as brochures, posters, apps and measurement protocols (see Annex 3).

"I have been mowing my meadows for 30 years, but I do not know much about the plant species growing in them – I hope that an advisor will help me to identify the flowers and grasses growing in my meadows."

Farmer from Upper Allgäu, Germany

Provide support on administration of the programme

Farmers need information about the administration of the result-oriented measure they are implementing, with respect to registering, control, payments and sanctions (see Golden Rules 4 and 5). A half day's training should be enough to cover the administration and payment aspects. The documents should contain information that is easily understandable to farmers. Individual advisory support should be available in case of problems with administration and payment. Such support can also be given by those in charge of the administration of the programmes. A specific training programme for administrators of result-oriented schemes is recommended and should be repeated at regular intervals.

Ensure on-farm support by biodiversity advisors to complement basic education and advanced training

Interviews with farmers in the MERIT project showed that advisors are an important source of information (see Figures 12 and 13, pp. 44-45). Experience from several regions has showed that there is a need for individual advice, particularly when a scheme is introduced. Advisors need to facilitate support for biodiversity through farm management and public policy. Thus, they need to have competences in ecology as well as in farm management and farm economics.

„It is important that advisors have a good understanding of agricultural management and practice."

Farmer from Upper Allgäu, Germany

Support measures from Lucerne Canton (Switzerland)[19]

In order to help farmers improve the ecological quality and biodiversity on farms, the cantonal administration pays for the seeds to establish flower-rich meadows and a visit by an advisor, so long as the farmer has followed a training course and follows the requirements. Here is how the scheme works:

- Official request by August
- Examination of the field/parcel in autumn by a specialized regional advisor, checking its suitability and selecting the local species mixture, method of preparing the parcel (ploughing, weed control, type of mowing machine, etc.), administrative issues (e.g. re-classification of the parcel as extensive meadow)
- One day training course, organized by the Canton in spring
- Sowing of seed mixture and follow-up measures, which must be documented by the farmer and sent to the administration by the end of the season

Make farmers' efforts visible to consumers and society

Farmers receive public payments for preserving and enhancing biodiversity on their land. It is important to raise awareness among consumers and society of the contribution that farmers are making to biodiversity. In the case of result-oriented measures the effects can be easily communicated because concrete results, such as the increased number of species, can readily be shown.

> *„Young farmers face the challenge of straddling the sometimes conflicting fields of production, making a living and nature protection. Up to now, this has not been sufficiently valued by society."*
>
> Official at the agricultural administration in Oberallgäu, Germany

Increase transparency on public spending

Introducing result-oriented measures is a logical reaction to the increasing concern about the effectiveness of agri-environmental measures. The new approach of result-oriented measures should be communicated more to the public. One should also communicate the success of the new programme as soon as there is evidence that it is achieving its objectives, e.g. an increase in the number of species etc. (see Golden Rule 8).
As described in Golden Rule 2, biodiversity is a complex concept. It should be made tangible and concrete not only for farmers and policy makers but also for the general public. Flowering meadows competitions are a very good example of how this can be done (see example below).

Flowering Meadows Competition in South Tyrol (Italy)

Flowering meadows competitions are agricultural events where farms' contribution to biodiversity is assessed instead of their productivity. Such competitions have become established in several countries. Generally, the aim of such events is to raise social awareness and appreciation of species-rich meadows. The competitions help draw people's attention to farmers' achievements in preserving and enhancing biodiversity. They often attract media interest and, as such, can be used to strengthen the image of agriculture. Furthermore, such competitions give recognition to those farmers who preserve the cultural landscape and its biodiversity and inspire other farmers to follow this path.
One example is the competition in South Tyrol in Northern Italy. The main organizer is the Institute for Alpine Environment (EURAC). After the success and positive feedback from the first event in 2010, it was held in 2015 for the second time. Its objective is to highlight that the habitats of flora and fauna can only be preserved by adapting farming practices and by considering the individual characteristics of each site.

Frontpage of the brochure of the 2015 edition of South Tyrol's Flowering Meadow Competition

The campaign includes all land-forms important for agriculture, such as meadows (extensively as well as intensively used), apple orchards, vineyards and arable land. In order to participate, farmers have to register their plot in the spring. The areas participating are examined by experts before the first mowing. They are judged by an expert jury according to criteria such as species diversity, geographical position, cultivation form, structural diversity, connectivity and surface size. In winter the winners receive an award at a public event.

Strengthen farmers' capacity to market 'biodiversity-friendly products'

Apart from compensatory payments, participation in result-oriented measures can provide an additional benefit for farmers: the communication of the achieved results can be used as a marketing tool for products or for agro-tourism. Consumers should be informed about the biodiversity impacts of the food they consume. Farmers for their part can benefit from price premiums if they successfully communicate their biodiversity achievements.
Farmers can be supported in their marketing by creating information panels at biodiversity-rich sites, established a 'Biodiversity Grammy' or by setting up a

biodiversity label. Labels or certification schemes run by private initiators (e.g. dairies, tourist organizations) are an important alternative to public schemes (see Golden Rule 4).

> ***„Flowering meadows nowadays provide an additional value when marketing agricultural products"***
>
> Employee at the administration responsible for marketing activities in Carinthia, Austria

Golden Rule
8

Evaluate the success of your programme

Monitoring and evaluation are too often seen as an annoying administrative burden involving the collection of large amounts of data and little knowledge gain. However, monitoring and evaluation improve programmes and provide information on cost-effectiveness and the lessons-learnt. As such, programme managers should think of evaluation as a valuable resource: a source of feedback, a tool for improving performance, an early warning system and a way of systematizing knowledge. Moreover, monitoring and evaluation are needed for accountability and communicating the success of a programme to the public.

Monitoring and evaluation are interrelated. Monitoring is a short term and continuous assessment that aims at providing all stakeholders with early detailed information on the progress or delay of the ongoing activities. It gives an oversight of the implementation of an activity. Its purpose is to determine if the planned outputs, deliveries and schedules are being reached and allows for actions to be taken to correct any deficiencies as quickly as possible. Evaluation is the systematic and objective examination of the relevance, effectiveness, efficiency and impact of activities in the light of specified objectives. The evaluation process assesses at a certain stage/time the outcomes and, whenever possible, the longer term impact.

Ensure comprehensive biodiversity monitoring as basis for an evaluation

Monitoring and evaluation procedures need to be included from the outset of a programme. A comprehensive and appropriate system for capturing and monitoring relevant data has to be established from the beginning as the basis for later evaluation. It is recommended that a clear distinction is made between monitoring at farm-level and monitoring at programme level. Monitoring at farm-level is carried out to assess the success of the individual participating farmers. It includes the self-evaluation carried out by farmers themselves as well as any official controls. Monitoring at programme level is carried out to have sufficient data for evaluating the overall impact of a programme. Compared to the monitoring and evaluation done at the farm level, monitoring and evaluation at the programme level requires specific expert knowledge; it has to be more scientific and comparable at an international scale. Due to the high labour-intensity and costs, an evaluation may only be conducted every five to ten years. The methods and indicators used should be common at international level in order to allow an international comparison. In order not to have two different monitoring schemes – one for the farm level and one for the programme level, one should consider basing the comprehensive monitoring on the existing indicator set. This means to take the data from the farmers' monitoring and from the official controls, to aggregate it and to complement it with more sophisticated measures. The recording of the data can potentially be combined with official controls in order to save time and money, provided that the official controllers have the required expertise.

Use different information sources and tools for evaluating the programme

A successful evaluation will have a clearly defined purpose and scope: It will use different information sources and tools. The type of evaluation and a definition of how the results are to be used, and by whom, is required.
When designing the evaluation scheme one should involve various stakeholders including farmers, policy-makers, environmentalists, administrators and representatives of the public/tax payers. There are two advantages of involving stakeholders in the programme evaluation: first, it gives stakeholders more comprehensive knowledge about the programme; and second, it improves the dissemination and acceptance of the evaluation results. The downside is that some stakeholder groups may invest more resources in contributing to the evaluation than others. This may bias the evaluation results.
When involving stakeholders in evaluations, it is necessary to be aware that stakeholders may judge the strengths, weaknesses, impacts and outcomes of the programme quite differently. The evaluators should make these differences transparent and differentiate clearly between facts and areas more open for interpretation.
It is also important to assess the level of political commitment to any programme and analyse the main actors who have been involved in decision making and implementation. Consider the situation that might had existed if this programme had not been implemented ('counter-factual analysis'). Evaluate if the specific measure was relevant to the original problem (such as loss of biodiversity) and review what factors might have changed [20].

Possible indicators for evaluation are:

- Data on species and habitats
- Farmers' feedback (e.g. collected through advisors)
- Number (and or percentage) of farmers and area under the measures
- Number of participants trained
- Problematic effects on grassland (e.g. appearance of weeds)
- Budget situation of the programme (how much money was used and will be available)

Annex 1: Overview of result-oriented measures in Europe

Table 2: Overview of result-oriented measures in Europe *(Based on European Commission (2015)[21] (adapted), Nitsch et al. (2014)[7], Autonome Provinz Bozen- Südtirol (2007)[22])*

Country	Programme	Type	Land use type	Indicator group
Austria	Results-based nature conservation plan *(Ergebnisorientierter Naturschutzplan (ENP))*	Pure	Grassland and permanent meadows	Plant and animal species
Finland	Golden Eagle conservation scheme	Pure	Grazing of reindeer	Bird species
France	Species rich grassland programme *(Prairies Fleuries: HERBE_07)*	Hybrid	Grassland	Plant species
France	Pastoral management plan *(Gestion pastrale: HERBE_09)*	Hybrid	Mediterranean and mountain pastoral land	State of vegetation
Germany (several states)	Maintenance of species rich grassland through results-based agri-environment schemes according to the national framework	Pure	Permanent grassland	Grassland plant species
Example from Bavaria	Preservation of species-rich grassland on single plots (B40)	Pure	Permanent grassland	Grassland plant species
Germany (Schleswig-Holstein, Municipality of Steinburg)	The programme *Blühendes Steinburg*	Pure	Permanent grassland	Grassland plant species
Germany (Schleswig-Holstein)	Grassland bird protection payments *(Gemeinschaftlicher Wiesenvogelschutz)*	Hybrid	Permanent grassland	Breeding birds
Germany (Nordrhein-Westfalen)	Harrier nest protection in arable fields	Hybrid	Arable fields	Bird species
Germany (Brandenburg, Sachsen-Anhalt, Thuringia)	Measures targeting nitrogen emissions (offered until 2015)	Hybrid	Arable fields	N-surplus
Ireland	Burren Farming for Conservation Programme (BFCP)	Hybrid	Grassland	State of vegetation and water
Italy (South Tyrol)	Landscape conservation *(Umweltprämie, Vorhaben 7)*	Hybrid	Grassland	Grassland plant species
Netherlands	Meadow bird agreement with agri-environment cooperatives	Pure	Grassland	Bird species
Spain	Management of firebreaks *(RAPCA (Red de Áreas Pasto-Cortafuegos de Andalucía))*	Pure	Shepherded grazing	State of vegetation
Sweden	Conservation performance payments	Pure	Grazing of reindeer	Carnivore species
Switzerland	Quality payments (second stage) *(Qualitätsbeiträge)*	Hybrid	Grassland, high-stem fruit trees, hedges and woods, and vineyards	Grassland plant species, shrub and wood species
Switzerland	Ecological interconnectedness projects *(Vernetzungsprojekte)*	Hybrid	Various	Plant and animal species
United Kingdom (Scotland)	Species-Rich Grasslands	Hybrid	Lowland grassland	Habitat indicators
United Kingdom (England)	Countryside Stewardship (and the former Higher Level Stewardship)	Hybrid	Arable land, permanent grassland, and permanent crops	'Indicators of success'

Annex 2: Indicators – A Best Practice Example

For defining the objective(s) of a result-oriented measure, it is necessary to make an assessment of biodiversity at the plot level. Below we present an assessment and the derived objectives of a hypothetical farm.

Biodiversity assessment at farm level

The biodiversity assessment is based on an inventory of single field areas by applying the following parameters (which are also described in Golden Rule 3):

- Phyto-sociological inventory by indicator species (Distribution of vegetation)
- Structuring degree
- Vascular plant richness (Characteristic species)
- Flower colours
- Butterfly numbers and diversity

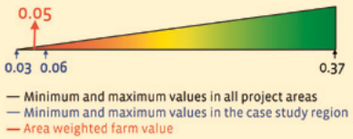
Biodiversity assessment of a hypothetical farm

General farm description

The family enterprise cultivates an area of 80 ha. 20 ha are cultivated fields and the remaining 60 ha are hay meadows or pastures. 10 ha of these pastures are rented in. Although the farm specializes in milk production, its management is still based on an extensive agricultural model (0.65 animal unit per ha). The farm participates in one agri-environmental measure (delayed mowing). The milk is sold without any conservation label.

Phyto-sociological inventory (Distribution of vegetation)

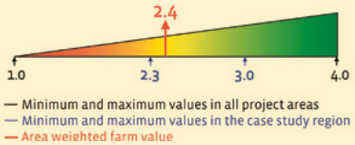
The farm surfaces display a low habitat diversity (0.05 plant communities per ha, see graphic on the right). This low value is due on one hand to the large extension of the agricultural land and on the other hand to a very uniform land use. Intensive meadows consist mainly of sowing meadows (*Lolium* meadows), tall oat grass and yellow oat grass meadows. In small wet meadow areas we find some typical wetland species, such as *Molinea caerulea, Sanguisorba officinalis* and *Geranium pratense*. In the pastures, species-rich calcareous grassland (*Carlino acaulis-Brometum erecti*) was also detected.



Structuring degree

Trees groups, hedges, single trees, slopes, banks and smaller habitats (i.e. moors, rocks, scree areas) will be considered as structural elements. Their value is given by their function: they break up the monotony of intensive cultural landscape, provide refuge for small animals and help to enrich the landscape.

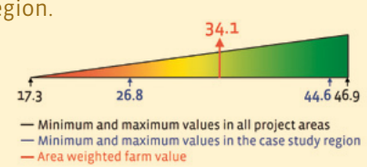
The farm's surfaces can be assessed as structured to richly structured. With a value of 2.4 they lie at the lower end of all the farms studied in the case study region but in the middle average range of all MERIT farms.



Vascular plant richness (Characteristic species)

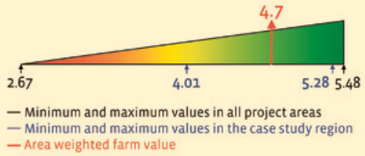
The number of vascular plants in a meadow is significantly influenced by land use and site conditions. Intensively-used hay meadows show a far lower species richness than extensively-used meadows. As such, regimes with higher (or earlier) mowing and which use more fertilizer have negative consequences on the species richness.

The species richness of the farm's wet meadows is also quite low, but many of the species detected here are very rare. We only found a few species (16-25 species) in the intensive hay meadow; in extensive hay meadows the number of species was far higher (36-50 species). With a value of 34.1 the farm is in the middle average range of all ranked farms in the case study region.



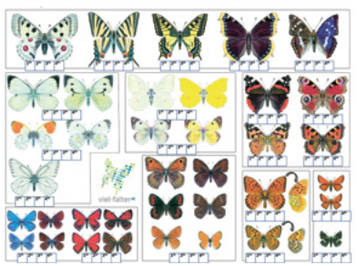
Flower colours

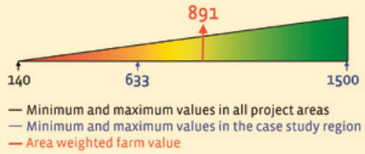
The flower colour index delivers further information on the species richness of a meadow. Meadows with a high index score are more colourful, and therefore also richer in species, than those with a low index score. The studied farm shows an above-average value of 4.7. This means that the areas that are richer in species are also more colourful.



Butterfly numbers and diversity

The diversity of animals is also important. Meadows with many butterflies and a diversity of species have a higher ecological value. Butterfly surveys are deeply influenced by weather and season and for this reason they have to be carried out regularly over one vegetation period. The value shown here is only a snapshot and just gives us an idea about the meadows' quality as butterfly habitat. With 891 butterflies, the farm is in the middle average range of all ranked farms in the case study region.





General evaluation and definition of biodiversity objectives

By accumulating the values of each parameter at the plot level, a general evaluation of biodiversity on the farm level is possible. There are four categories for defining biodiversity and the potential to improve it:

- Biodiversity low, potential for improvement very large
- Biodiversity moderate, potential for improvement large
- Biodiversity high, improvement desirable
- Biodiversity very high, preservation of current status desirable

Based on a general evaluation, plot level biodiversity objectives are agreed with the farmer.

General evaluation of the hypothetical farm

The farm evaluation is based on the aspects and indexes described above (except the butterfly indicator). 25% of the surfaces analyzed (red areas) have a low species richness value. A similar amount, shown in green represent areas with the highest biodiversity value.
The farm surfaces show many different quality levels. In the intensive hay meadows, diversity is moderate: measures to increase biodiversity on these areas (in orange) is desirable. In some extensive hay meadows and pastures, diversity is graded as high or very high, and from the point of view of a result-oriented environmental programme, they would be worthy of financial support.

Biodiversity objectives of the hypothetical farm

Red areas

According to the general evaluation, there are no areas with low biodiversity on this farm.

Orange areas

These are intensive hay meadows, which may be important for milk production. The general status of biodiversity is moderate. The farmer decided to improve biodiversity on two plots with an area of 2 ha. The following objectives were agreed:

Parameter	Status	Objectives	Recommended measures
Structuring degree	On these plots there are not more than 2 structural elements on an area of 50 m x 50 m.	Within one year there should be 4 structural elements on an area of 50 m x 50 m.	Tree lines or bushes along the way will be planted.
Vascular plant richness (Characteristic species)	There are 20 or fewer plant species.	Within five years there should be more than 36 plant species. *Lolium perenne* or *Lolium multiflorum* should become less frequent. *Trisetum flavescens* or *Arrhenatherum elatius* should become common.	The plots must be cut no more than twice and manured only once per year. Reseed with a species-rich and site-appropriate meadow seed mixture.
Flower colours	The flower colour index is between 3.5 and 4.5.	Increase the flower colour index above 4.5.	The plots will be cut not more than twice per year and manured only once per year. Reseed with a species-rich and site-appropriate meadow seed mixture.
Butterfly numbers and diversity	On the intensively-used hay meadows (orange areas), 275 butterflies per ha were counted.	Increase the number of butterflies.	Creation of a new structure at the field boundaries (bushes, dry stone walls, small weed and vegetation strips) and reseed with a species-rich and site-appropriate meadow seed mixture.

Yellow areas

These are traditional, or extensively-used, hay meadows and pastures. They are graded as having high biodiversity, although there are few structural elements. This led the farmer to decide to increase the number of structural elements on 4 ha.

Parameter	Status	Objectives	Recommended measures
Structuring degree	There are 9 or fewer structural elements on an area of 50 m x 50 m.	Within three years there should be more than 9 structural elements on an area of 50 m x 50 m.	Tree lines or bushes along the way will be planted. Shrubs will be allowed to grow.
Vascular plant richness (Characteristic species)	There are more than 46 plant species.	Maintain the number of plant species. The following species should be observed: *Brachypodium pinnatum, Trisetum flavescens* and *Nardus stricta.*	Maintain current cultivation methods.
Flower colours	The flower colour index is between 4.5 and 5.5.	The objective is to maintain the flower colour index.	Maintain current cultivation methods.
Butterfly numbers and diversity	On the chosen plots, 891 butterflies were counted.	The objective is to maintain the number of butterflies.	Maintain current cultivation methods.

Green areas

These are hay meadows and pastures with very high biodiversity where the current management regime should be maintained.

Parameter	Status	Objectives	Recommended measures
Structuring degree	These plots are richly structured.	Maintain the number of structural elements.	No action needed.
Vascular plant richness (Characteristic species)	There are more than 46 plant species.	Maintain the number of plant species. The following species should be observed: *Brachypodium pinnatum, Trisetum flavescens* and *Nardus stricta.*	Maintain current cultivation methods.
Flower colours	The flower colour index is between 4.5 and 5.5.	Maintain the flower colour index.	Maintain current cultivation methods.
Butterfly numbers and diversity	On the chosen plots, 891 butterflies were counted.	Maintain the number of butterflies.	Maintain current cultivation methods.

Annex 3: Measurement Protocol

Form for annual monitoring

General information

Name of participant:	Farm number:	Year:

Monitoring plot

Name:	Number:	Area (in ha):

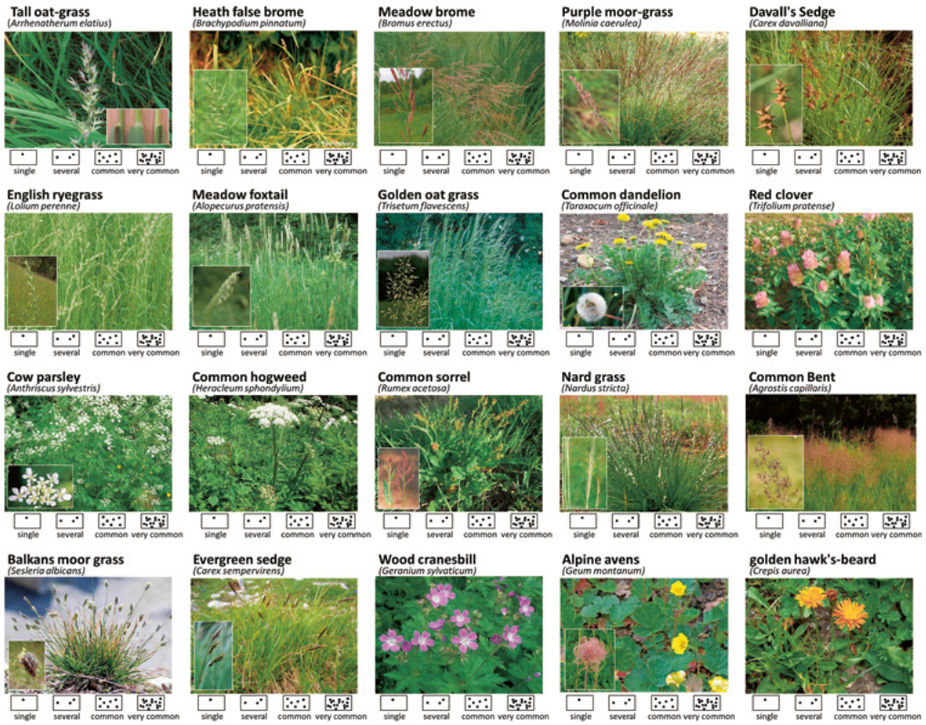
Structuring degree

Mention the number of structures visible on the plot:

Structure elements	Number of structure elements			
	< 2	2 - 9	10 - 20	> 20
Single trees				
Hedgerows				
Cairns/drystone wall				
Trickles/small streams				
Others				

Characteristic species

Fill in the indicator species based on the MERIT indicator list for mountain grassland according to its frequency (single, several, common, very common):



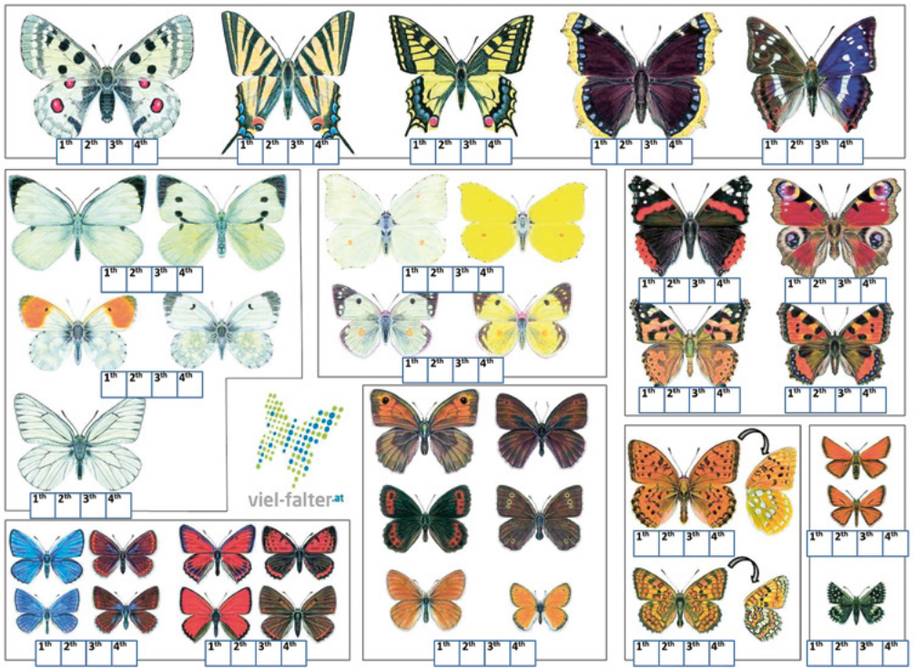
Flower colours

Fill in the flower colour diversity:

Colour	Number of different coloured flowers (plot 4 x 4 m)			
	0	1 - 5	6 - 20	> 20
White				
Yellow				
Orange				
Pink				
Red				
Purple				
Blue				

Butterfly numbers and diversity

Fill in the number of butterflies:



Date of surveys:

1st:	2nd:	3rd:	4th:

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Based on the empirical results of the MERIT project, this policy handbook provides policy recommendations for the effective design, implementation and governance of result-oriented measures for biodiversity with a focus on grassland and other ecologically valuable habitats and landscape elements in Alpine mountain regions. The handbook is aimed at policy-makers and public and private organisations that are involved in designing or implementing agricultural and environmental policies.

The handbook includes:

An introduction to result-oriented measures

An overview of the advantages and disadvantages of result-oriented measures

Specific recommendations for the design, implementation and governance of result-oriented measures for biodiversity in mountain farming

Examples of result-oriented measures that have been implemented

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