Institute for European Environmental Policy

6 July 2014

RESULT-BASED AGRI-ENVIRONMENT MEASURES: MARKET-BASED INSTRUMENTS, INCENTIVES OR REWARDS?
THE CASE OF BADEN-WÜRTTEMBERG

By:

Daniela Russi
Hélène Margue
Clunie Keenleyside

Funded by

invaluable
Valuations, Markets and Policies for Biodiversity & Ecosystem Services

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With a contribution from

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SEVENTH FRAMEWORK PROGRAMME

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The report should be cited as follows:

Russi D., Margue H., Keenleyside C. (2014). Result-Based Agri-Environment Measures: Market-Based Instruments, Incentives or Rewards? The case of Baden-Württemberg. A case-study report prepared by IEEP with funding from the Invaluable project.

Corresponding author: Daniela Russi

Acknowledgements:

This work was supported by the ERA-Net BiodivERsA (2011 call for research proposals), with the French funder Agence Nationale de la Recherche (ANR) [grant ANR-11-EBID-0003]. The drafting of this article also benefitted from the research carried out thanks to the FP7 project Operas [grant N. 308393].

We gratefully thank Dr. Oppermann (IFAB), Dr. Wildmann (MLR), Ms Lütteken (DG Agriculture) for their support, information and a revision of a first draft of this article; all our interviewees at the Regional Council of Tübingen, the District Offices of Tübingen and Reutlingen, the Landesbauernverband, Bioland, and the desk officer at DG Agriculture responsible for Lower Saxony for the information provided; Dr Lapeyre (IDDRI) for his revision of this article.

We are also very grateful to the 24 interviewed farmers for their time and collaboration.

Finally, many thanks to Ms. Underwood and Ms. Menadue (IEEP), and the project "Biodiversity protection through results based remuneration of ecological achievement", - ENV.B.2/ETU/2013/0046, financed by DG Agriculture, for the information provided on other RB-AEMs in the EU.

Institute for European Environmental Policy
London Office
11 Belgrave Road
IEEP Offices, Floor 3
London, SW1V 1RB
Tel: +44 (0) 20 7799 2244
Fax: +44 (0) 20 7799 2600

Brussels Office
Quai au Foin, 55
Hooikaai 55
B- 1000 Brussels
Tel: +32 (0) 2738 7482
Fax: +32 (0) 2732 4004

Table of Contents

List of Tables

List of Figures

Executive Summary

The introduction of result-based agri-environment measures is increasingly seen as an interesting way to improve the conditionality and efficiency of the Common Agricultural Policy. They differ from classical action-based agri-environment measures in that they remunerate farmers that can demonstrate to have obtained a certain environmental outcome, whereas action-based agri-environment measures link the payment to the respect of a set of established rules.

We have analysed MEKA-B4, the oldest CAP result-based agri-environment measures, which was introduced in 2000 in the German region of Baden-Württemberg to preserve species-rich grassland. In order to do so, we carried out 14 semi-structured face-to-face interviews with key institutional actors and 24 face-to-face interviews with participating and non-participating farmers.

We have found that the payment seems to cover the opportunity costs of some categories of farmers (e.g. part-time farmers, less productive fields, hay producers, farmers with few animals), but not those of intensive cattle raisers and biogas producers. Also, it may be increasingly not sufficient in the long run to ensure a wide participation, due to the changing market conditions (e.g. fluctuating and decreasing price for hay; incentives to produce biogas).

For this reason, we argue that MEKA-B4 can be considered a Payment for Ecosystem Services (PES), but only if a broad definition is adopted, as the measure does not fully compensate for the opportunity costs of all potentially involved farmers. MEKA-B4 rather acts as an incentive or reward, i.e. it compensates management strategies that are dependent mainly on intrinsic (ethical) motivations, and in some cases also partly on extrinsic motivations (i.e. the payment).

Increasing the payment would encourage more farmers to enrol and could help to ensure a wide uptake in the long term. Differentiated payments can also be an option to increase the uptake of the measure and involve farmers that need extrinsic motivations, while ensuring high cost-efficiency.

As regards additionality, farmers' have different views, but the involved authorities and experts think that MEKA-B4 plays an important role in avoiding abandonment or intensification of species-rich grasslands.

Finally, result-based measures as MEKA-B4 play an important role as tools for environmental education and have contributed considerably to raise awareness on the importance of species-rich grassland.

1 RESULT-BASED AGRI-ENVIRONMENT SCHEMES IN THE EUROPEAN UNION

The EU Common Agricultural Policy (CAP) is a key European policy and absorbs more than 40% of the European budget, thereby representing the largest single budget item. About 20% of the CAP budget is dedicated to the 88 Rural Development Programmes (RDP)[1], which are prepared by the EU Member States (MS) or regions (in the case of federal countries like Germany, Spain, Italy and the UK) and aim to support the agricultural and forestry sector, while improving its environmental sustainability.

Agri-environment measures must be included in the RDPs, with the aim of encouraging farmers to "employ methods of land use compatible with the need to preserve the natural environment and landscape and protect and improve natural resources"[2]. They are designed and implemented by national or regional governments, which are given the high degree of freedom that is needed to address specific environmental objectives and adapt agri-environment schemes to local conditions. The EAFRD co-finances the agri-environment measure (at a rate of 55%, rising to 85% in economically lagging areas of the EU[3]).

Agri-environment schemes normally offer farmers five-year contracts with annual payments per hectare. The latter are calculated for each measure on the basis of the additional costs related to environmental management and the income foregone resulting from the difference in agricultural management practices compared to a reference situation. If necessary, an additional 20% can be added to the payment to cover farmers' transaction costs. However, transaction costs are very rarely taken into account when calculating the premiums of the agri-environment measures.

Agri-environment schemes are intended a key role in improving the environmental impact of agriculture, by encouraging, among other things, an improvement in soil quality, a more efficient use of water, a higher degree of agricultural biodiversity and a reduction in the use of polluting inputs like fertilisers and pesticides. However, the effectiveness and cost-efficiency of many action-based agri-environment measures is increasingly questioned with a range of motivations (Burton and Schwarz, 2013).

First of all, the environmental effectiveness and additionality of agri-environment measures are called into question. For example, Kleijn *et al.* (2006) measured the level of biodiversity on a random sample of 202 pairs of similar fields in five EU countries, one with an agri-environment measure and the other one conventionally managed. They come to the conclusion that the effect of agri-environment measures on biodiversity in the analysed countries was marginal to moderately positive, but uncommon and endangered species rarely benefit from agri-environment measures.

Assessing the environmental impact of agri-environment measures is not easy, because of the high costs related to monitoring activities, the lack of baseline data and methodological

[1] http://ec.europa.eu/budget/library/biblio/publications/2012/budget_folder/186978_2011_4429_EU_BUDGET_2012_EN_V2.pdf
[2] EC Regulation 1698/2005 Recital 31
[3] EC Regulation 1698/2005 Article 70 (3)b

difficulties. In a recent assessment of CAP-funded agri-environment measures, the European Court of Auditors (2011) claimed that 1) in many cases the environmental objectives of agri-environment measures are not stated in a clearly enough way to allow to be checked against results; 2) most agri-environment measures grant payments through horizontal sub-measures on the whole area of the rural development programme, without targeting the payment according to local specific conditions; 3) there is little information on the environmental impacts of agri-environment measures (very few monitoring programs).

Secondly, cost-efficiency of agri-environment measures is also questioned because they may lead farmers to select the parcels with lower yields (i.e. lower opportunity costs) or the easiest and cheapest management activities, irrespectively of the ecological characteristics (Quillérou and Fraser, 2010). This phenomenon is called 'adverse selection', and results in a less favourable relation between invested (public) money and environmental outcomes than if fields and management activities were selected in order to maximise environmental benefits.

An increasingly high number of experts suggest that a way to increase both environmental effectiveness and cost-efficiency of agri-environment measures may be to link the payment to the provision of the desired environmental outcome and not to the prescribed management activities, as is the case of most agri-environment measures. The great majority of agri-environment measures are action-based, i.e. they remunerate farmers for respecting a set of requirements established in the RDP, e.g. limitations in the use of fertilizers or biocides and specific dates for mowing the grassland.

Result-based agri-environment measures are more and more seen as a way to improve effectiveness because they allow a more direct control of their impact (farmers are paid only if they provide the desired environmental outcome). Also, if a result-based agri-environment measure does not reach the established environmental objectives, this becomes immediately evident as not enough farmers qualify for the payment. In this case, the design characteristics can be modified to target the payment in a more effective way and obtain the desired results (Burton and Schwartz, 2013).

In addition, result-based agri-environment measures are less subjected to the risk of adverse selection, as farmers are encouraged to choose the land to enrol in order to maximise the environmental benefits (and hence the payment they receive from it) (Sabatier *et al.*, 2012; Burton and Schwartz, 2013).

According to their proponents, result-based agri-environment measures allow greater flexibility, and thereby encourage innovation (Matzdorf and Lorenz, 2010). Increasing flexibility can also result in higher cost-efficiency, as result-based agri-environment measures allow farmers to adapt their management activities to the features of the land, the weather conditions and other specific characteristics (Sabatier *et al.*, 2012). In addition, flexibility and autonomy tend to increase intrinsic motivations towards conservation (Muradian, 2013).

Finally, another advantage of a result-based approach is that it may contribute to spreading environmental awareness and increasing the motivation of farmers towards environmental protection (Oppermann and Gujer, 2003).

The current interest in result-based agri-environment measures is partly fostered by the current economic crisis, and the resulting need to improve the cost-efficiency of increasingly scarce public spending. The European Court of Auditors (2011) recommended in the above-mentioned report that agri-environment measures should be better targeted in order to improve cost-efficiency. In addition, some scholars note that a result-based approach is coherent with the neo-liberal idea of market-based instruments as a way to improve effectiveness and cost-efficiency of environmental policies (Burton and Schwartz, 2013; Potter and Tilzey, 2005).

There are already a few result-based agri-environment measures in Europe (see Schwarz *et al.*, 2008, and Burton and Schwartz, 2013, for a literature review). In general, most of result-based agri-environment measures implemented so far aim at the conservation of plant species, rather than animal species. In fact, the latter seem to present more difficulties, firstly because animals are not observable in the field all the time, as they move, and, secondly, because animal population also depend on the conditions of neighbouring fields (Sabatier *et al.*, 2012).

Most result-based agri-environment measures implemented so far aim to preserve biodiversity in species-rich grassland and link the payment to the auto-declared presence of defined wildflower species, used as proxies for biodiversity. Such measures are currently in place in Baden-Württemberg (Matzdorf and Lorenz, 2010; Oppermann and Gujer, 2003[4]), lower Saxony[5], Brandenburg (Matzdorf *et al.*, 2008[6]), Thuringia[7], Rhineland-Palatinate (MULEWF 2010[8]), France (De Sainte Marie, 2010[9]) and Ireland (DAFM, 2014). In Doberan, Mecklenburg- Western Pomerania a trial was carried out the context of a university study (Höft, 2012). A result-based agri-environment scheme to preserve the ecological quality of meadows is also established in Switzerland (Oppermann and Gujer, 2003).

However, there are some result-based agri-environment measures aiming at the conservation of key animal species, for example birds in Schleswig-Holstein, Germany (Stapelholmer Naturschutzvereine, 2007), breeding waders in the Netherlands (Verhulst *et al.*, 2007)[10] and carnivores in North Sweden (Zabel and Holm-Müller, 2008; Zabel and Zoe, 2009).

Finally, there a few some result-based agri-environment measures aimed at improving water quality. Finally, there are a few RB-AEMs focussing on water quality, such as those aiming at reducing nitrogen surplus in three German Länder (Techen and Osterburg, 2011).

[4] See also http://www.mlr.baden-wuerttemberg.de/mlr/bro/Broschuere%20MEKA%20III.pdf.
[5] See also http://www.umwelt.niedersachsen.de/download/7418
[6] See http://www.mil.brandenburg.de/media_fast/4055/Honorierung%20von%20artenreichem%20Gr%C3%BCnland%20Faltblatt.pdf.
[7] See http://www.thueringen.de/imperia/md/content/thueringenagrar/tmlnu_frank/kulap_L4-broschuere.pdf
[8] See http://www.luwg.rlp.de/Aufgaben/Naturschutz/Arten-und-Biotopschutz/PAULa-Beratung-Vertragsnaturschutz/Kennarten-Programme
[9] See also http://www.alpine-ecological-network.org/information-services/measure-catalogue/good-practice-en/massnahme-im-regionalen-naturpark-201emassif-des-bauges201c-frankreich
[10] This scheme is no longer an EU agri-environment measure, but it is run by a farmer cooperative.

Most of the mentioned measures have been carried out for a short period (Schwarz *et al*., 2008) and this is one of the reasons why no clear-cut analysis on their effectiveness has been carried out so far, together with the high costs that an assessment of the effectiveness would imply. However, according to Burton and Schwartz (2013), the studies that have been published so far on result-based agri-environment measures so far show a generally positive environmental outcome and a good acceptance by farmers.

This report analyses MEKA-B4, the first result-based agri-environment measure co-financed by the CAP, which was introduced in 2000 in Baden-Württemberg (BW) with the objective of maintaining the level of biodiversity in species-rich grassland. It grants farmers with an additional payment, on top of the payment associated with the action-based measures, if they declare that 4 out of a list of 28 key species/ taxa of wildflowers can be found in their field (Oppermann and Briemle, 2002; Matzdorf and Lorenz, 2010). The result-based agri-environment measure in Baden-Württemberg was chosen as a case-study to explore advantages, limitations and potential for diffusion of result-based agri-environment measures aimed at improving biodiversity in European species-rich grassland. It is a particularly interesting case because it has been in place for thirteen years, and this longer time of functioning, with respect to other European result-based agri-environment measures, allows a better insight on the results, the costs and the perception of all categories of involved stakeholders. This study refers to the programming period of 2007-2013.

2 PAYMENT FOR ECOSYSTEM SERVICES AND RESULT-BASED AGRI-ENVIRONMENT MEASURES

Payment for Ecosystem Services (PES) is a type of market-based instrument that is increasingly used to finance nature conservation. It remunerates land owners or managers for the ecosystem services they provide to some specific category of stakeholders or to the society as a whole. Ecosystem services are defined as the benefits humans derives from the environment (MA 2005).

PES programmes can be directly financed by 1) the beneficiary of the ecosystem services (private schemes); 2) public bodies, when benefits are enjoyed by a broad category of social actors (public schemes); 3) NGOs, foundations or similar entities[11] (hybrid schemes). The third category is an hybrid kind of PES because participation is voluntary for both providers and buyers (such as in private schemes), but buyers are not necessarily the direct beneficiaries of the ecosystem services, and act in behalf of a large group of stakeholders or the society as a whole (such as in public schemes).

The payment offered by PES programmes can be established through monetary valuation of ecosystem services, negotiation among stakeholders or reverse auctions. In most cases, the price is determined through a negotiation process based on the opportunity costs.

PES experiences have already been carried out in different countries (mostly Southern countries), mainly for CO_2 storage in forests, water quality and quantity regulation in watersheds and landscape protection (see Wunder, 2005; Landell-Mills and Porras, 2002; Wunder *et al.*, 2008; Kosoy *et al.*, 2007; and Schomers and Matzdorf, 2013, for literature reviews on PES examples).

Result-based agri-environment measures can be considered examples of Payment for Ecosystem Services (PES), as they remunerate farmers for the ecosystem services they provide (Osbeck et al, 2013). They ensure higher conditionality than action-based agri-environment measures, because link the payment to the attainment of a desired environmental outcome.

The more well-known definition of PES is that proposed by Wunder (2005, p.3) and adopted by neoclassical economists, which states that a PES is: "*a voluntary transaction where a well-defined ES (or a land-use likely to secure that service) is being 'bought' by a (minimum one) ES buyer from a (minimum one) ES provider if and only if the ES provider secures ES provision (conditionality)*". Additionality is also a key element of PES in the neoclassical economic definition, as from an economic point of view in order to be efficient PES should

[11] A very well-known example of private PES is that financed by the Vittel mineral water company in France to preserve the quality of its bottled water, which was being jeopardised by the nitrates and pesticides associated with the intensification of agricultural and cattle raising activities in the nearby farms (Perrot-Maître, 2006). An example of a public PES is the Payment for Hydrological Environmental Services programme in Mexico, which finances the hydrological ecosystem services provided by forests, and in particular, the protection of watersheds and aquifer recharge. It is financed through part of the federal taxes on water (Muñoz-Piña et al., 2008). An example of a hybrid kind of PES is that implemented in Nicaragua with funding from the Global Environmental Facility, a network of 178 countries, international institutions, NGOs and private companies. The program finances the conservation of biodiversity and carbon sequestration near the city of Rio Blanco and Matiguás (Pagiola et al., 2007).

remunerate only the activities that wold not be carried out without it (Wunder et al., 2008; Engel et al., 2008).

However, some researchers noticed that if we adopt this strict definition, few experiences that define themselves as PES could be considered PES (Muradian *et al.*, 2010; Muradian *et al.*, 2013; Muradian 2013). In fact, for many ecosystem services it is difficult to ensure full conditionality because 1) monitoring the provision of ecosystem services may be very costly; 2) in many cases the link between management activities and provision of ecosystem services is subjected to high scientific uncertainty (e.g. there is no scientific certainty about the relationship between forest conservation and maintenance of the quality and quantity of surface and underground water, see Wunder et al., 2008; Muñoz-Piña et al., 2008); and 3) monitoring and sanctioning often implies high transaction (and in some cases also political) costs.

In addition, full additionality is often difficult to ensure. Assessing additionality is a difficult task, because it requires comparing the situation following the incentive with a hypothetical 'business-as-usual' scenario without the payment (Wunder, 2008). In general, this kind of activity is very costly and also subjected to considerable methodological challenges, scientific uncertainties and lack of data. This is because analysing additionality in an exhaustive and scientifically robust way would imply either comparing the present situation with the same area before the incentive or an area with similar characteristics but without the incentive (as it was done e.g. by Kleijn *et al.*, 2006). In this kind of assessment, the effect of the incentive should be separated from all other factors that may have had an impact on the environmental parameters under analysis (e.g. the economic growth rate, changes in the demand and in the prices on the market, other incentives, local conditions, institutional and political factors)[12].

For these reasons, an alternative, wider definition of PES has been proposed by ecological economists Muradian *et al.* (2010, p. 1205): "*a transfer of resources between social actors, which aims to create incentives to align individual and/or collective land use decisions with the social interest in the management of natural resource*s".

Muradian and Riva (2012) distinguish between three types of monetary transfers aiming at improving the delivery of ecosystem services: markets, incentives and rewards. The first ones are characterised by high additionality (i.e. the behavioural change is directly caused by the payment and would not be carried out without it) and high commoditisation (the ecosystem services is clearly identified as a tradable commodity). Rewards aim to recompense a positive behaviour already in place, and therefore are characterised by low additionality and low commoditization (the ecosystem services are not traded and the payment is not based on a clearly defined ecosystem service). Their objective is to provide social recognition to those already providing a service to society, and to encourage positive behaviours. The payment associated with rewards is in general not proportional to the effort and may not cover the opportunity costs, in contrast to what happens with markets. The motivation for the conservation of the ecosystem services is 'extrinsic' in the case of

[12] Also, it has been argued that remunerating only the agents with a negative impact on ecosystem services would be unfair towards those that already have decided to make an effort towards environmental sustainability. In addition, pursuing additionality in a strict sense could create a perverse incentive for the degradation of natural systems, in order to be remunerated in exchange for the adoption of more sustainable management practices (see Salzman, 2005; Mayrand and Paquin, 2004, Engel et al., 2008).

markets, as it depends on an external driver (i.e. the payment). On the contrary, the motivation is 'intrinsic' for rewards, which recompense behaviours mostly driven by ethical motivations[13]. Incentives are between these two poles: their level of commoditisation is lower than that of markets, but higher than in the case of rewards. They are in general targeted at behaviours that are caused by a combination of intrinsic and extrinsic motivations. Additionality can be (but not necessarily is) high for incentives, as they may encourage a behavioural change that would not have occurred without the payment.

Among these three kinds of monetary instruments to conserve or enhance ecosystem services, only the first one can be considered PES if the neoclassical economists' definition is adopted, whereas ecological economists' definition allows also incentives and rewards to be considered PES. According to Muradian (2013), in most cases PES cannot be considered pure market-based instruments, because of a range of factors. In general, the ecological functions that underpin the ecosystem services are characterised by an intrinsic complexity, and for this reason the link between land use, ecological functions, delivery of ecosystem services and human welfare is often uncertain. Uncertainty also characterises the impact of a change in the ecosystem services on human welfare, and therefore the value that is attributed to it. Complexity and uncertainty result in imperfect and asymmetric information and in a high degree of site specificity. All these elements undermine the effectiveness of markets to manage the ecosystem services, because they often results in opportunistic behaviour (including free riding) and a difficult (or even impossible) commoditisation of the ecosystem services. Also, setting up markets for ecosystem services usually require high transaction costs.

In the remaining of this report, the result-based agri-environment measure in place in BW to maintain species-rich grassland is analysed as an example of this kind of approach, and the degree to which it can be considered a market instrument, an incentive or a reward is discussed. The degree of conditionality and additionality is also analysed, as well as the kind of motivation of the involved farmers, in order to contribute to the ongoing discussion at the EU level on the opportunity of using this approach more widely when designing CAP-funded agri-environment measures.

[13] For a distinction between intrinsic and extrinsic motivations see Ryan and Deci, 2000.

3 OBJECTIVES AND RESEARCH QUESTIONS

There is currently a heated debate on the opportunity of increasing the number of result-based agri-environment measures in the EU, because of the higher conditionality and higher effectiveness that they may allow (see section 1, and Moxey and White, in press). Despite this debate, only a very limited number of result-based measures have been implemented in the EU so far, most of them aiming to maintain biodiversity in grassland. In order to explore their potential and discuss the opportunity of employing this kind of approaches more widely, it is important to analyse the few ones that have been put in place so far.

This paper aims to explore MEKA-B4, the first agri-environment measure introduced in the EU, in order to contribute to the debate as whether similar schemes can be increasingly applied in Europe. In particular, it aims to get insight on the following research questions:

- Is MEKA-B4 to be considered a pure market-based instrument, an incentive or a reward, according to the categorisation proposed by Muradian and Riva (2012)?
- What is the level of additionality of MEKA-B4?
- Why do farmers decide to participate or not participate in the measure? What are the perceptions of the different categories of involved stakeholders on the measure?
- What is the opinion of the involved stakeholders on the trade-off of risk *versus* flexibility in the context of MEKA-B4?
- What can be said about the transaction costs for farmers and institutions of MEKA-B4?
- Does MEKA-B4 also play an educational role?

In order to answer to these questions, section 4 will explain the methodology used for this case-study; section 5 will provide information on the history and the characteristics of the measure; section 6 will present the results; section 7 will discuss the main issues related to the design and implementation of the measure; and section 8 will provide some conclusions.

4 METHODOLOGY

In order to answer the research questions stated above, a three-step methodology was developed. First of all, a literature review was performed, including peer-reviewed articles, grey literature and statistical data, on result-based agri-environment measures in general and that carried out in BW in particular. The managing authority of the BW Rural Development Programme, i.e. the MLR (Ministerium für Ländlichen Raum und Verbraucherschutz[14]), provided data regarding the participation rate of farmers in MEKA-B4 and the area of agricultural land covered by the measure. For more general data about agriculture in BW, STALA, the BW statistical institute, was a most valuable source.

The second step consisted of 14 semi-structured face-to-face in-depth interviews with relevant institutional actors, including the managing authorities in BW, farmer organisations, one of the two biodiversity experts who elaborated the list of wildflowers and two desk officers of DG Agriculture[15] (see Table 1). The interviews were carried out between March and May 2013.

[14] Ministry for Rural Area and Consumer Protection.

[15] One of the two interviewed desk officers was responsible for the approval of the Rural Development Program in Lower Saxony, where another result-based agri-environment measure is in place (see section 1).

Table 1. Interviewees and their role in MEKA-B4

Institution	Number of Interviewees	Geographical scope	Role in MEKA-B4
Ministry for Rural Area and Consumer Protection (Ministerium für Ländlichen Raum und Verbraucherschutz, MLR)	5	BW	- Development of the Rural Development Program
Regional Council (Regierungspräsidium) of Tübingen	2	Regierungsbezirk[16] Tübingen	- Coordination and supervision of the implementation of the agri-environment measures - Counselling for the District Offices
District Offices (Landratsämter) of Tübingen and Reutlingen	1 1	Landkreis[17] Tübingen Landkreis Reutlingen	- Control on the ground of the implementation of the agri-environment measures - Counselling for farmers
Landesbauernverband (LBV) Bioland	1 1	BW	- Farmer organisations: representation of the interests of the farmers
Institute for Agroecology and Biodiversity (IFAB)	1	BW - Europe	- Involvement in the design of MEKA-B4 and in the selection of the wildflowers for the key species catalogue
Desk officer of DG Agriculture for BW Desk officer of DG Agriculture for Lower Saxony	1 1	BW Lower Saxony	- Approval of the Rural Development Programmes

Source: own elaboration

The third step entailed a face-to-face interview survey of 24 participating and non-participating farmers in MEKA-B4 (17 and 7 farmers, respectively), carried out in March and April 2013. The questionnaire included closed and open-ended questions, and each interview thued between one and two hours. The contact details of farmers were provided by the District Offices of Tübingen and Reutlingen, after authorization by the MLR. It is obviously not a representative sample, because of the limited number of interviews and the lack of publicly available data on farmers' characteristics; yet, it is deemed sufficient to provide useful insight into the reasons behind the farmers' choice to participate or not in MEKA-B4. Table 2 shows the main characteristics of the interviewed farmers.

[16] "Regierungsbezirk" means "administrative region". There are four Regierungsbezirke in BW, one of which is that of Tübingen.

[17] "Landkreise" means "district". Each Regierungsbezirk is subdivided in several Landkreise. There are 35 Landkreise in Baden-Württemberg.

Table 2 Personal and farm data from participating and non-participating farmers

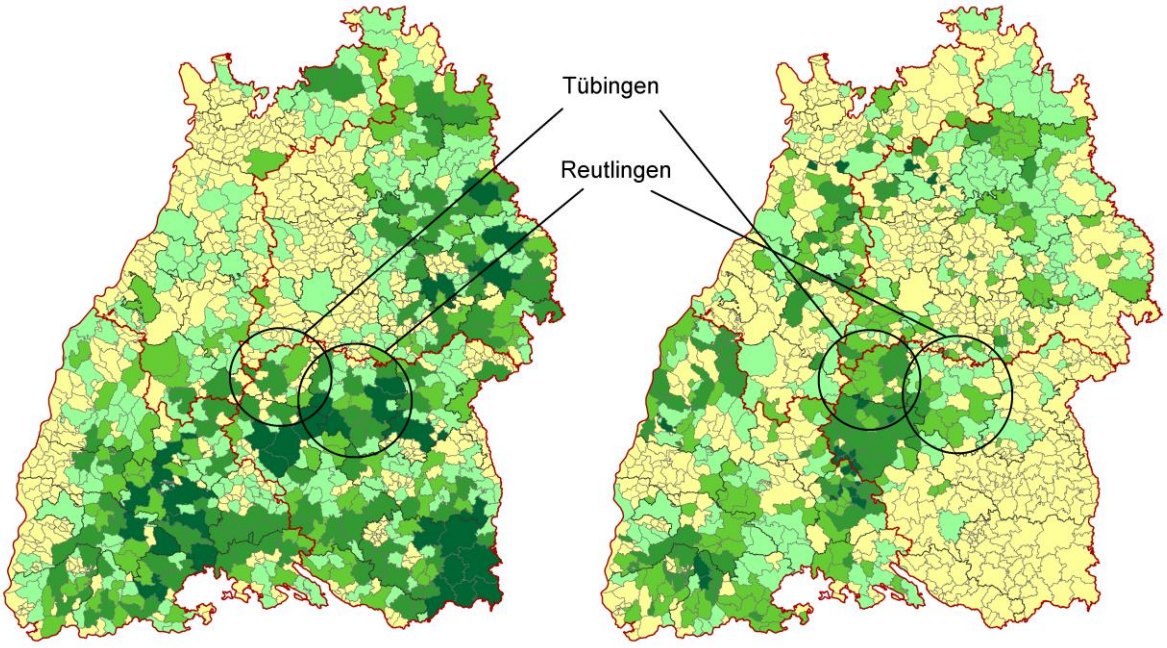
	Farmers with a MEKA-B4 contract (n=17)	Farmers without a MEKA-B4 contract (n=7)
Age group		
40-49	7	5
50-59	7	2
60-69	2	
70-79	1	
Education		
Master farmer	3	5
Technician	2	2
Vocational school	5	
Elementary school	2	
Engineering diploma in agricultural sciences	1	
Other education not related to agriculture	4	
Full time/part-time occupation		
Full time farmers	7	7
Part-time farmers	10	0
Conventional/organic		
Conventional farms	11	7
Organic farms	6	0
Share of grassland in used agricultural area (%)		
>0-25	1	0
>25-50	5	4
>50-75	5	3
>75-100	6	0
Share of grassland covered by MEKA-B4 over total farm grassland (%)		
>0-15	2	
>15-25	0	
>25-50	5	
>50-75	4	
>75-90	3	
>90-100	3	
Animal husbandry		
Total	12	7
Suckler cows	1	
Dairy cattle	2	6
Fattening cattle		4
Not specified cattle or others	2	2
Goats	2	0
Sheep	4	0
Horses	2	0
Pigs	2	0
Chicken	4	0

Source: own elaboration based on the responses to the interviews

Due to limited time and budget, the field work has been carried out in only two districts, namely Tübingen and Reutlingen. These areas have been chosen because of their large

extent of species-rich grassland and the high number of farmers participating in MEKA-B4 (see Figure 1).

Figure 1 Species-rich grassland in BW



Distribution of species-rich grassland in BW (ha). The municipalities in yellow have less than 10 ha of species-rich grassland. The intensity of the green of the other municipalities indicates the extension of areas with species-rich grassland, going from between 10 and 25 ha in the municipalities in the lightest green to more than 100 ha in those in the darkest green.

Share of grassland covered by MEKA-B4 in each municipality (%). The municipalities in yellow have less than 5% of their grassland covered by MEKA-B4, those in the lightest green between 5 and 10% and those in the darkest green more than 50%.

Source: maps provided by MLR

Table 3 shows key information about the districts of Tübingen and Reutlingen

Table 3. Key data about the two Baden-Württemberg study areas (year 2010)

Characteristics	Baden-Württemberg	Tübingen	Reutlingen
Agricultural land (ha)	1,409,988	20,093	42,679
Share of agricultural land that is grassland (%)	37.7	31.9	52.4
Total number of farms	44,512	419	1,058
Average farm size (ha)	31.7	48	40.3
Full-time farmers (% of total farms)	37.5	25.9	26.5
Part-time occupation farers (% of total farms)	62.5	74.1	73.5
Number of organic farms (2007 data)	2,896	40	66
Cattle density (livestock units/100 ha of agricultural land)	52.4	22.1	47.4

Source: STALA Baden-Württemberg, 2013

5 THE RESULT-BASED AGRI-ENVIRONMENT MEASURE IN BADEN-WÜRTTEMBERG

The result-based measure for the conservation of biodiversity in species-rich grassland in BW is part of one of the first agri-environment programs in the EU (Oppermann and Gujer, 2003), which is known as MEKA (**M**arkt**e**ntlastungs-und **K**ulturlandschafts**a**usgleich).

MEKA was launched as a pilot project in 1992to compensate farmers for maintaining extensive land management strategies where still in place, or for adopting more extensive practices in case of intensive management. It comprises seven categories of environmental land management measures[18], each of which includes different measures. Farmers can opt for as many measures as they wish, with a cap of €40,000 per year per farm unit (Glemser, 2011). An annual payment per hectare is associated to each of the measure and is calculated on the basis of the incurred costs and the income foregone (including the opportunity costs) with respect to a reference situation. One of the objectives of MEKA is to conserve permanent grassland, which had been in decline for decades (from 648.800 ha in 1979 – the first year of data availability – to 591,100 ha in 1992[19]).

The MEKA result-based agri-environment measure is called MEKA-B4 "Extensive Bewirtschaftung artenreicher Grünland-Vegetation" ("Management of species-rich grassland"), and is included in the category MEKA-B, which is targeted to grassland management activities (see Table 4). MEKA-B4 can be granted either alone or combined with other MEKA agri-environment measures.

Table 4 Agri-environment measures in MEKA B

B	Maintenance and fosterage of cultural landscape	Premium
B1	Extensive grassland management	€50/ha
B2	Extensive grassland management with a limited number of cattle	€100/ha
B3	Management of steeply sloping meadows	€120/ha
B4	Management of species-rich grassland	€60/ha

Source: MLR, 2012

While MEKA-B1 and MEKA-B2 are whole-farm measures, i.e. they apply to all grassland areas owned by the applicant, MEKA-B3 and MEKA-B4 are paid in addition to MEKA-B1 or MEKA-B2 on individual surfaces with characteristic species or steep grassland. Only a few farmers request only MEKA-B4 without MEKA-B1 and/or MEKA-B2. MEKA-B4 can also be combined with the incentives promoting organic farmers and agricultural practices withouth chemical fertilisers and pesticides.

MEKA-B4 was established in 2000 in the occasion of the first revision of MEKA (Glemser, 2011) – by that year permanent grassland in BW had further decreased from 591,100 ha in

[18] The seven categories of MEKA measures are: A) Environmentally friendly farm management; B) Maintenance and fosterage of cultural landscape; C) Maintenance of particularly endangered types of landscape management; D) Avoidance of chemical-synthetic products; E) Extensive and environmentally-friendly crop production practices; F) Application of biological and/or mechanical methods for crop protection; G) Preservation of protected biotopes.

[19] Data from the Statistical Institute of Baden Wurttemberg (http://www.statistik.baden-wuerttemberg.de/Landwirtschaft/Landesdaten/LRt0702.asp)

1992 (the year of the first MEKA pilot project[20]) to 573,300 ha. The motivation for the establishment of a result-based measure was the fact that MLR realised that the action-based measure aiming to maintain species-rich grassland, which had been introduced before[21], was not as effective and efficient as hoped. The measure established a fixed number of cuts and mowing dates, which did not consider annual and site-specific variations of the growth of vegetation and different weather conditions in different years (a prolonged good weather period is essential for the production of hay). More flexibility was needed to allow management practices to be adapted to specific local conditions (Oppermann and Gujer, 2003).

MEKA-B4 was originated by a proposal of Bronner et al. (1997), who suggested to use key species and proposed a first list of species. The MLR asked an expert in grassland biodiversity, Dr. Briemle (LAZBW[22]), to elaborate, together with Dr. Oppermann, an ecologist expert in agricultural biodiversity and agri-environment schemes, a methodology to assess species-richness. The methodology was then tested and discussed by MLR and LAZBW in Aulendorf, during four meetings with representatives of agricultural unions and nature conservation organisations (Briemle and Oppermann, 2003).

As a result, a list of 28 key species / taxa of wildflowers[23] was elaborated, which can be found in south-western Germany, are easily recognizable, and can be used as a proxy for the species richness of grassland. Farmers entering the voluntary five-year MEKA-B4 contracts qualify for the annual payment if they can prove that at least 4 species / taxa from the list can be found in each third of a transect taken diagonally across the grassland parcel[24, 25].

The subsequent negative evaluation of the delivery head of 60 € / ha is therefore not entirely correct. You have to see the combination, since B1 and B2 already extensive Bewirtschftung is balanced with yield decreases.

As mentioned before, the EC Regulation on Rural Development[26] establishes that the premiums for agri-environment measures be calculated on the basis of the incurred costs and the income foregone (including the opportunity costs) with respect to a reference

[20]The decreasing trend continued steadily until 2010, when it reached 531,799 ha, but was therefore reverted and in 2013 permanent grassland in BW was 538,100ha.

[21] The measure was an action-based one, and it rewarded the participating farmers for only cutting the grass once or twice per year (instead of three to five times, as it is normally done for intensively managed grassland) (MLR, 1992).

[22] Landwirtschaftliches Zentrum für Rinderhaltung, Grünlandwirtschaft, Milchwirtschaft, Wild und Fischerei Baden-Württemberg (LAZBW) - formerly Staatliche Lehr- und Versuchsanstalt Aulendorf, an institute under the MLR.

[23] The list is divided into four categories, one for each type of grassland habitat: a) dry meadow, b) humid meadow, c) wet meadow and d) mountainous meadow (MLR, 2001; Briemle and Oppermann, 2003).

[24] MEKA-B4 is also subjected to the same rules about record keeping and grassland protection as all the other MEKA B action-based measures, i.e. the obligation to keep record of the application of fertilisers (quantity, place and date) and the use of the grassland; the prohibition of using pesticides on a large scale, the prohibition to plough the grassland. However, it can still be considered a result-oriented measure because these minimal rules do not concern key management activities, such as mowing dates or fertiliser use.

[25] The site has to be crossed along the longest transect. By doing so, the distance should notionally be divided into three parts of the same length. On each of these 3 parts, four species must be identified within an area defined by sideward-outstretched arms while walking along the transect (80 to 90 cm to each side of the transect line). The four species must not be the same in the whole transect, the species can differ from one transect part to the other.

[26] EC Council Regulation No 1698/2005 Article 39(4).

situation. The reference situation for MEKA-B4 is established as intensive grassland management with three cuts per year (the first two for silage[27] and the third one for hay). Extensification is considered to result in two cuts per year with a later first cut, in order to allow the wildflowers sufficient time to flower and set seed. Income foregone is calculated as reduced yield (due to a reduction from three to two cuts per year) and a 20% reduction in the nutrient content of the fodder[28] due to late mowing. As regards costs, the premium calculation takes into account that despite the reduced number of cuts, the extensive grassland management can require more field work than intensive management, as farmers are more dependent on the weather and have to turn the cut grass more frequently in the field to dry it sufficiently to produce hay. Silage does not require such dry grass, is less dependent on suitable weather and can be produced at the time the grass is cut or shortly afterwards. Finally, a reduction in the input costs is included in the calculations (i.e. a 25% decrease in the use of fertilisers and reduced use of machinery). Even though the Rural Development Regulation allows the managing authorities to include transaction costs in the calculation of the payment, the BW Ministry of Agriculture (like most managing authorities) decided not to do so, because of the potentially difficult calculation of such costs.

This calculation procedure resulted in a premium of €50/ha until 2009 and €60/ha afterwards (as an adaptation to market changes[29]) (see Table 5 for the calculation of the latest premium). The details of the calculation are not made publicly available by MLR.

Table 5 Calculation of the premium of MEKA-B4 (€/ha)

	Reference situation	Extensive management	Difference between the reference situation and extensive management
Revenue	770	611	159
Expenditures	384	286	98
Total (revenues - expenditures)	**386**	**325**	**61**

Source: MLR, 2011

The annual payment request is based on farmers' self-declaration, but all payments are subject to risk-based control checks[30] by the agricultural district offices and penalties are applied if false claims are made. The penalty consists of returning to the authorities all the payments received for MEKA-B4 since the signature of the five-year contract. Between 6% and 16% of the area under MEKA between 2009 and 2012 has been subjected to controls.

[27] Silage is used to process and store grass or other green fodder for ruminants. It requires compacting and storing the fodder in airtight conditions (generally in silos), without drying it before, and submitting it to a fermentation process. Fermentation allows storing the fodder harvested during the summer months, when grassland is abundant, to be used as a fodder during winter months or also to produce biogas.

[28] The reduced nutrient content is calculated by multiplying the reduction in the energy content by the market price of the barley used for animal feeding (the exact figures used for calculation are not publicly available).

[29] The EU DG Agriculture desk officer responsible for BW explained during her interview that the increase in 2009 from 50 to 60€/ha was motivated by the management authority with the sharp decrease in the hay price, which increased the income forgone of extensive grassland management with respect to silage.

[30] Risk indicators have been selected and are used to identify farms that are prone to not fulfil the requirements.

The infringement rate of MEKA-B4 is very low (between 0.9% and 1.4% of the 4,200 controlled parcels between 2008 and 2010)[31] (Glemser 2011).

Also the increasing opportunity costs related to extensive grassland management may have played an important role (see below).

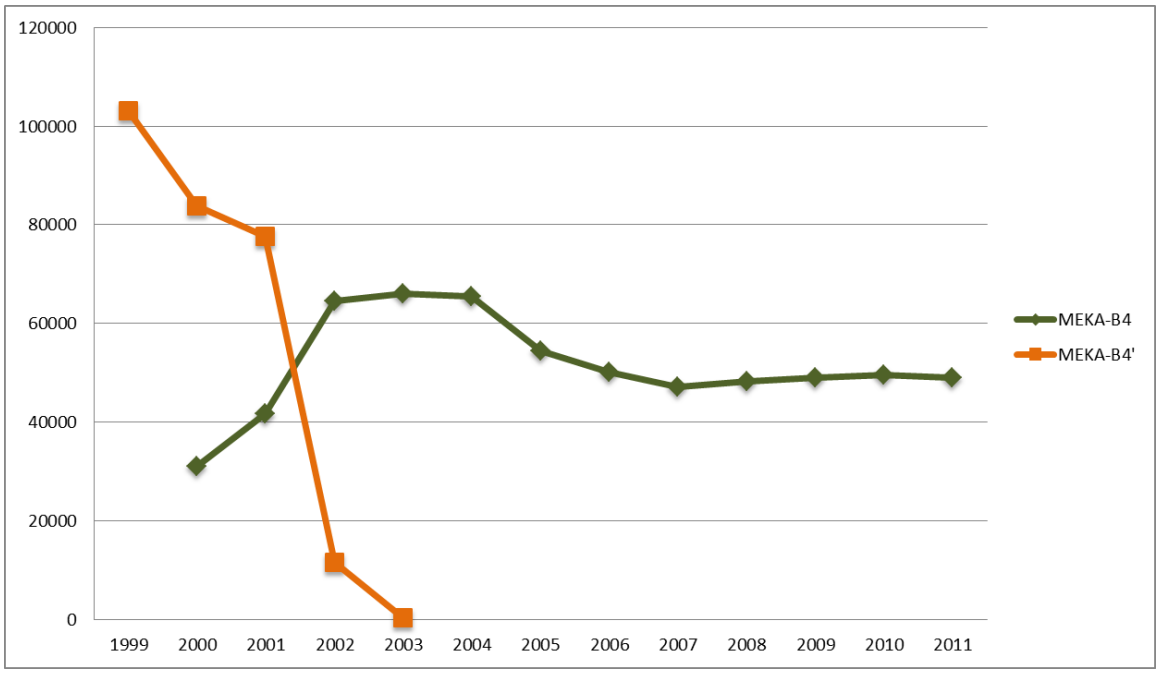
Figure 2 shows the evolution of the meadow area covered by MEKA-B4. The blue line represents the area covered by MEKA-B4, whereas the red line represents the action-based forerunner of MEKA-B4, the action-based measure aimed at promoting the extensive use of grassland ("extensive Grünlandnutzung"). Since not all MEKA-B4' five-year contracts expired in 2000, when MEKA-B4 was introduced, the two measures run in parallel for four years, and former MEKA-B4' applicants gradually switched to MEKA-B4 contracts as their MEKA-B4' contracts expired.

The area covered by MEKA-B4 has decreased from 66,112 ha in 2003 to 47,133 ha in 2007, then it increased up to 49,650 ha in 2010 and afterwards it decreased again until 42,860 in 2012 (this represent a share of approximately 12% in 2003 and 8% in 2012 of the total grassland in BW[32]). According to the mid-term evaluation of the performance BW Rural Development Programme between 2007 and 2013 (Institut für Ländliche Strukturforschung, 2010) and an interview with key personnel at the MLR, one of the reasons for this decline is that a certain number of participating farmers noticed that they had overestimated the species-richness of their meadows, and, as a consequence, decided not to renew the contract after the first five-year period. Also the increasing opportunity costs related to extensive grassland management may have played an important role (see below).

[31] 5% of the farmers participating in MEKA are controlled each year. 1% are chosen randomly and 4% are chosen using a risk criterion (each farm gets a risk score, based on the outcome of the previous years).

[32] Figure on grassland extension in BW by the Statistical Office of BW.

Figure 2. Area covered by MEKA-B4 and its antecedent in BW (ha)



Source: own elaboration with public data received from MLR

MEKA-B4 has met the target of 5,000 participating farmers set by the Rural Development Programme (RDP) for the period 2007-2013 until 2012, when participation decreased to 4,838 farmers. However, during the same period the measure has never reached the target related to the area covered (65,000 ha).

6 Results

6.1 Opportunity costs

There is no explicit MEKA-B4 rule imposing a certain type of use for the grass (i.e. hay, silage or biogas). However, conservation of wildflowers requires harvesting the grass later than it is normally done in intensively-managed grassland, in order to allow them to bloom and seed before the grass is cut. This late first cut results in fodder with lower protein and higher lignin content, which is suitable neither for silage nor for biogas[33]. The only possible use for a late first cut is therefore hay, which is normally used as fodder for horses, young cattle and smaller animals (e.g. rabbits). In fact, in modern cattle husbandry only protein-rich fodder is used, and hay often is only used occasionally and as a secondary fodder.

For this reason, the type of farmers that are more likely to enrol in MEKA-B4 and preserve species-rich grassland are those who need hay for their horses (or have an established network of clients interested in buying hay) and do not need protein-rich fodder because they do not carry out intensive cattle husbandry, but an extensive suckler cow husbandry. Examples are part-time farmers, who have already a job in another sector – typically in the automotive industry - and are not interested in maximising the income obtained from their grassland. Also, farmers with nutrient-poor land, steep slopes and colder weather (e.g. the Swabian Jura - Schwäbische Alb in German) are more likely to enrol in MEKA-B4[34]. This is because the opportunity costs of this category of stakeholders are low and also their choices are influenced by other motivations than maximisation of profit (e.g. environmental awareness, reduced time availability, poor soil quality).

On the contrary, all our farmers and institutional interviewees were consistent in stating that MEKA-B4 is significantly too low to cover the opportunity costs of intensive cattle farmers. As a term of comparison, it is interesting to observe that the payment of MEKA-B4 is in general lower than that of similar schemes in other German Länder. For example, in Lower Saxony there is a two-layer payment, one of 150€/ha granted to farmers who declare to have at least 4 wildflower species out of a catalogue of 31, and one, available only in areas with a high degree of biodiversity, of additional 105€/ha for farmers with at least 6 species (see Groth 2008 and 2008b, 2009 and the webpage of the programme[35]). However, notwithstanding the higher payment, the uptake in Lower Saxony is much lower than that in BW (according to the mid-term review, the uptake is 1,362 ha for the basic payment and 447 ha for the additional one, i.e. respectively 0.19 and 0.06% of the entire pasture area). This may be due to the fact that even though the payment in Lower Saxony is higher than that in BW, it is still not enough to compensate for the opportunity costs of many farmers,

[33] For the second cut, there is more flexibility of use. Because the wildflowers have already seeded before the first mowing, the second-growth grass can be cut at a younger, protein-rich stage, and it can be used for silage and biogas. Farmers value this second cut flexibility, which was not allowed at the beginning of MEKA-B4, when silage was entirely prohibited. Matzdorf and Lorenz (2010), who carried out interviews in 2006 to explore the farmers' perception of MEKA-B4, report that all their interviewed farmers had criticized this management restriction regarding silage use. The administration became aware of the dissatisfaction and cancelled the 'no silage' rule already during the second 5-year period.

[34] Interview with the Regional Council of Tübingen.

[35] http://www.ml.niedersachsen.de/%20portal/live.php?navigation_id=1546&article_id=5315&_psmand=7.http://www.ml.niedersachsen.de/

which are on average higher than in BW due to the prevalence of good soil quality, intensively managed farms and large fields (Lower Saxony is the most important meat producer in Germany)[36]. The result-based agri-environment measure in Thuringia (which is similar to the BW one: in order to qualify for the payment, the farmers need to have in their field four species out of catalogue of wildflowers) pays up to 110€/ha[37]. In Rhineland-Palatinate, the premium is 190€/ha for at least four indicator species and 225€/ha for at least eight indicator species[38]. While it is true that MEKA-B4 can be applied on top of other existing measures, and thus contribute to a higher total payment, the level of conditionality to wildflower conservation remains lower, since only part of the total payment directly rewards the latter.

Finally, our interviews underlined that an emerging factor is increasingly influencing the opportunity costs of extensive grassland management: the public subsidies for biogas, as established by the German Renewable Energy Law, published in 2000 and reformed in 2004, 2009 and 2012[39], which establishes a feed-in tariff for biogas guaranteed for twenty years, see Hogg et al., 2014[40]. The law has resulted in a considerable expansion of the land used to produce energy crops in Germany, which has increased sharply over recent years, up to 2.16 Mha in 2012 (12% of the German agricultural land[41]), out of which 1.16 Mha were used for biogas[42]. In BW, the number of biogas installations increased from 283 in 2004 to 858 in 2013 (MLR data[43]). The amount of biogas produced in BW rose from 27,707 kWh in 2004 to 295,798 kWh in 2013 (STALA Baden-Württemberg)[44].

Most farmers and almost all interviewed institutional representatives[45] mentioned that over recent years many farmers in BW have started to use part of their grass for biogas production rather than using it as fodder, and that this is (and will increasingly be) a reason for farmers not to apply for MEKA-B4 (four out of the seven non-participating interviewed farmers use part of their grassland for biogas). According to our interviews to both farmers and institutional actors, biogas production is turning increasingly attractive to farmers because of the high subsidies. Other reasons include the stability of the biogas price, as

[36] Interview with the desk officer of Lower Saxony.

[37] See http://www.thueringen.de/imperia/md/content/thueringenagrar/tmlnu_frank/kulap_L4-broschuere.pdf

[38] See http://www.luwg.rlp.de/Aufgaben/Naturschutz/Arten-und-Biotopschutz/PAULa-Beratung-Vertragsnaturschutz/Kennarten-Programme

[39] German Renewable Energy Sources Act (EEG): Erneuerbare-Energien-Gesetz vom 25. Oktober 2008 (BGBl. I S. 2074), das zuletzt durch Artikel 5 des Gesetzes vom 20. Dezember 2012 (BGBl. I S. 2730) geändert worden ist.

[40] It is interesting to note that the 2009 version of the law introduced a bonus of 2 cents on biogas produced with at least 50% of grass (on top of the feed-in tariff established for biogas). The last version of the law (2012) does not include the grass bonus, but the farmers who signed the contract between 2009 and 2012 will benefit from it for 20 years.

[41] The total German agricultural land was 18.6 Mha in 2012 (data from the Federal Statistical Office, www https://www.destatis.de

[42] Data from the Fachagentur Nachwachsende Rohstoffe (the German Agency for Renewable Resources), see http://mediathek.fnr.de/grafiken/daten-und-faktwen/anbau.html.

[43] Data from the Ministry of Agriculture of BW, see http://www.landwirtschaft-mlr.baden-wuerttemberg.de.

[44] There are not statistics available on the land use for biogas production, as the land use data only show the area dedicated to different types of crop, which may or may not be used to produce biogas.

[45] Biogas is considered to be one of the reasons for the decrease of farmers' participation in MEKA-B4 by the interviewees representing MLR, the District Offices of Tübingen and Reutlingen, and the Regional Council of Tübingen, as well as by the EU DG Agriculture desk officer responsible for BW.

opposed to the significantly fluctuating price of hay (the feed-in tariffs are guaranteed for 20 years), and the reduced requirement for work and dependence on weather with respect to extensively managed grassland. In fact, hay requires at least three days of dry weather, when the mowed grass needs to be moved several times in order to ensure that it dries correctly, whereas for the production of biogas the grass is cut and stored in only one day.

This results in an interesting conflict between the objectives of different environmental policies, those aiming at maintaining grassland biodiversity and those aiming at climate mitigation, which calls for a discussion on the trade-offs entailed in policies addressing agricultural land use. As a matter of fact, the German subsidies to produce biogas have been criticised for some years already as a factor encouraging the conversion of grassland to arable land and thereby influencing land prices and land use (see Delzeit et al., 2011; DBFZ, 2010; Kretschmer et al., 2011; Federal Environment Agency, 2013; interview to the EU DG Environment desk officer responsible for BW).

It is interesting to note that also the mid-term evaluation indicates as possible reasons for the notable decrease in the area covered by MEKA-B4 over recent years (together with the availability of other CAP-financed measures, like for example measure MEKA-G1 “Extensive use of valuable habitats”) the increased prices for agricultural products and the increased demand for biomass for energy generation. Both factors increased the economic competitiveness of arable land and intensive grassland management compared to extensive managed grassland, i.e. MEKA-B4 can less and less cover the opportunity costs of intensive land use and biogas generation.

6.2 Additionality

As mentioned before, the additionality of CAP-funded agri-environment measures, i.e. the degree to which they finance activities that would have not been carried out without the payment, is often questioned. Additionality results in environmental effectiveness, which can be defined as the attainment of a positive environmental impact.

As explained in section 2, assessing additionality is a difficult task, because it requires comparing the provision of the ecosystem services after the payment with a theoretical business-as-usual scenario, which entails considerable methodological difficulties and costs (Wunder, 2008). An indication of the degree of additionality of agri-environment measures could also be obtained by a statistically representative survey to farmers, investigating the changes in management activities that can be attributed to the measure (and trying to avoid strategic answers), which would also be a very expensive activity. For this reason, additionality is not properly assessed for most agri-environment measures (see e.g. the report of the European Court of Auditors, 2011).

None of these kinds of assessments has been carried out for MEKA-B4 so far. The mid-term evaluation claims that the wild flower indicator list has proven to be a robust and feasible way to categorize the grassland areas and that additionality of MEKA-B4 is considered to be high by the MLR, due to the risk of abandonment and intensification of species-rich grassland in the region. However, an assessment of additionality by comparing the level of biodiversity in Baden-Württemberg to similar areas without a result-based measure has not been carried out yet, due to the high costs that it would entail.

Due to time and budget constraints, our research does not aim to evaluate the additionality of MEKA-B4 through a statistically representative analysis, but our interviews may

contribute nonetheless to give some insight on this matter. We assessed additionality by asking farmers 1) whether they changed their management strategies when they enrolled in MEKA-B4 and 2) whether they would change them if MEKA-B4 were suspended.

As regards the first question, six out of the seventeen interviewed farmers participating in MEKA-B4 (i.e. 35% of our sample) did change their management strategies when they enrolled in the measure. This is a slightly lower proportion than the 48% of the farmers interviewed by Matzdorf and Lorenz (2010) that introduced changes in their management strategies because of MEKA-B4 (n=90). The changes in management activities include mowing the grass later to enable the spread of the flowers' seeds (two farmers), and using less or a different type of fertilizer[46] (four farmers), as shown in Table 6. The other eleven farmers said that they had always managed the grassland in an extensive way, which naturally enabled the conservation of wild flower.

Table 6 Types of change in management practices (n=17)

Change in management practice	Number of farmers
Mowing the grass later	2
Using less fertilizer	3
Using a different type of fertilizer	1
No change	11

Source: own elaboration

The second question is particularly relevant when discussing additionality, because the main objective of MEKA-B4 is not so much to change management practices, as to encourage the maintenance of already existing extensive management practices. For this reason, additionality requires understanding whether farmers would move their management strategies towards more intensive grassland management (i.e. silage or biogas) if the payment were suspended.

Our interviews show that only four out of the seventeen interviewed farmers would change their management strategies if MEKA-B4 were suspended, and that two of them are not sure about what they would do. In the latter case, the choice would depend on the general profitability of the farm and the premiums and conditions of other MEKA schemes[47]. Table 7 shows what types of change the interviewed farmers would carry out.

These results might however underestimate the total impact of a potential interruption of MEKA-B4. In fact, this scheme encourages farmers to fine-tune their extensive grassland management in order to favour conservation of wildflower species. A suspension of the payment would therefore reduce the incentive to take biodiversity into account when establishing grassland management strategies, even without major management changes such as moving from hay production to silage or starting to produce biogas. For example, the use of fertilizers could be slightly increased, resulting in a loss of biodiversity, or grassland could be mown earlier to increase productivity, preventing the wildflowers to bloom and spread their seeds. These management changes may have a notable cumulative

[46] The need for a reduced use of fertilisers in order to maintain species-rich grassland is due to the fact that high nitrogen levels in the soil favour fast growing agricultural grass varieties which grow vigorously and quickly, outgrowing the wildflowers which are unable to compete for light and space.

[47] All farmers who would consider changing their management strategy are conventional and not organic farmers.

impact on biodiversity, and further research is needed to explore the significance of this possible change.

Table 7. Potential changes in management strategies following the suspension of MEKA-B4 (n=17)

Type of management change	Number of answers
Using more fertilizer, but maintaining hay production	1
Using more fertilizer and carrying out more silage	1
Intensify farming, and possibly producing biogas	1
Intensify farming (no additional clarification)	1
Not sure	2
No change in management strategies	11

Source: own elaboration

Finally, it is worthwhile mentioning that all experts and interviewees from the management authorities (MLR, District Offices of Tübingen and Reutlingen, regional council of Tübingen) as well as the interviewed representatives of farmer organisations claimed that, even though no biodiversity monitoring has taken place so far, they believe that MEKA-B4 has a positive impact on the conservation of species-rich grassland in BW, as it avoid land abandonment and intensification.

6.3 The farmers' motivations

Our research also aimed to explore the motivations of farmers participating in MEKA-B4. In particular, our objective was to investigate whether the measure is to be considered more as an incentive or a reward, in the definition proposed by Muradian (2013), or, in other words, whether intrinsic motivations can explain the choice of farmers to maintain extensive farming practices of if the extrinsic motivation represented by MEKA-B4 plays a crucial role in the conservation of wildflower biodiversity.

Intrinsic motivations to carry out extensive grassland management and conserve biodiversity were explored using a Likert scale,[48] i.e. by asking farmers to give a score between 0 and 5 to the statement "*I think environmental protection should be a priority for agricultural policy*", and asking them to illustrate their answer. The results are shown in Table 8.

[48] The Likert scale is a methodology that is used to explore attitudes in a qualitative way. It was proposed by psychologist Likert (1932) and it usually consist in a scale from 0 to 5, which corresponds to different degree of agreement with a certain statement (e.g. strongly agree, agree, neutral, disagree, strongly disagree).

Table 8. Attitudes towards environmental protection (n=17 for participating farmers and n=7 for non-participating farmers)

Score given to the statement: "*I think environmental protection should be a priority for agricultural policy*" (scale: 0-5)	**Participating farmers**	**Non-participating farmers**
5[49]	10	
4.5	1	
4	4	1
3	2	5
2	-	-
1	-	-
0	-	1

Source: own elaboration

As shown in Table 8, 65% of our interviewed participating farmers (those giving a score of 5 or 4.5) think that environmental protection should be a priority for agricultural policies. In general, farmers giving a score of 4 or 3 tend to agree on the fact that environmental protection should be taken into account in agricultural policy, but not as a priority, because the most important objective should be to ensure the economic sustainability of farming activities. The farmer giving 0 as a score argued that the European agricultural policy should aim to support the agricultural sector, and that this will also automatically lead to environmental sustainability, because it is in farmers' interest to choose management strategies that are sustainable in the long term.

This outcome confirms the results obtained by Matzdorf and Lorenz (2010), who observe that participating farmers had already a positive attitude towards nature conservation before enrolling in MEKA-B4.

In addition, an open question was asked on the reasons to enrol or not enrol in MEKA-B4. The answers to this question show that the contribution of intrinsic and extrinsic motivations to the farmers' management strategy differs across the different categories of farmers.

Part-time farmers, i.e. farmers who have other sources of income apart from that they get from their land, represent the majority of farmers in BW (62% of the farmer population in 2010[50]). Ten of our interviewed farmers belong to this category. In general, they tend to be less dependent on their agricultural income than full-time farmers and for this reason they are more likely to maintain species-rich grassland, as they are ready to accept a lower production rate and the resulting lower profits. Four of the part-time farmers in our sample gave 5 as a score to the previously stated management on the importance of environmental

[49] One of the farmers assigning 5 to the statement specified that this is only to be referred to grassland management, because for arable land it is too difficult to prioritise environmental protection, due to the need to use pesticides against weed (he gave 3 as a score when referring to arable land). We included him among the categories of farmers giving 5 as a score because during the entire interview he showed high commitment towards environmental protection.

[50] Statistics from the Statistic Bureau of BW (Statistisches Landesamt Baden-Württemberg, see http://www.statistik.baden-wuerttemberg.de).

policy, three gave 4 and two gave 3. Six of them said that they did not change their management practices when entering MEKA-B4 and only two said that they would change them if MEKA-B4 were cancelled. Their motivation is thus mainly intrinsic, and additionality for this category of farmers is thus rather low, and MEKA-B4 tends to act for them as a reward of activities that would have been carried out anyway.

Another category of farmers is represented by owners or managers of land that is not suitable for intensive farming. At least three of the participating farmers we have interviewed belong to this category. In many cases, they have no choice but producing hay, because the grassland is steeply sloped or it is so narrow that machinery cannot be employed to produce silage, the soil is not fertile enough and/or the weather is not suitable to get nutrient-rich and abundant fodder. The opportunity costs for this category of farmer is low, and therefore MEKA-B4's premium represents an interesting incentive to carry out this category of management. However, this does not necessarily mean that additionality is low for this category of farmers. In fact, in some cases the payment may play an important role in avoiding land abandonment (and the consequent loss of the species-rich grassland by natural succession to scrub and woodland) by compensating for the lower income due to the lower production rate and the need for time-intensive tasks. In fact, two out of the three interviewed farmers with unfavourable conditions told us that they would change their management practices without MEKA-B4 and one said that he would not do so only because he has already invested approximately €250,000 in machinery to improve the quality of hay by drying it. Also, the three farmers said that they have changed their management activities when enrolling in MEKA-B4 by cutting the grass later and applying less fertilisers[51]. So all in all, this category of farmers is motivated by a mixture of intrinsic and extrinsic motivations, and MEKA-B4 seems to act as an incentive for these farmers, and not only as a reward, providing the external motivation needed for them to conserve wildflower biodiversity.

Four of the participating farmers in our sample are full-time farmers[52] and did not state to have soil with unfavourable conditions. In general, MEKA-B4 only covers a small percentage of their farm (between 2% and 35%), so extensive grassland management only represents a small part of their livings[53]. Only two of these farmers have cattle on their farm. Only one said that he would intensify his management without MEKA-B4 and only one said that he changed his management practices when he enrolled in MEKA-B4 (he started using less fertilisers). For this category of farmers, additionality seems to be low, and participating in MEKA-B4 seems to be economically sustainable only because it is carried out on a reduced share of their land.

As regards dairy farmers and other farmers with intensive livestock systems (e.g. bull beef, pigs, sheep), as explained before, their opportunity costs are only partly covered by the payment, as they need high amounts of protein-rich fodder (i.e. silage), and in many cases they have no use for big quantities of hay. Therefore, in many cases intensive cattle breeders often choose not to enrol in MEKA-B4 or to enrol only with a reduced grassland

[51] Out of these three farmers, one is a part-time farmer.

[52] In addition, one of the farmers belonging to this category says that he has an additional small source of income, so he is almost full-time. MEKA-B4 covers 54% of its land.

[53] On average, the land under MEKA-B4 of this category of farmers is 17%. As opposed to that, the share of land under MEKA-B4 of part-time farmers and farmers with unfavourable land conditions in our sample is respectively 42% and 39%.

area. This is confirmed by our sample: among our seventeen participating interviewees, only five have cattle livestock[54]. MEKA-B4 only covers on average 32% of their land and they all produce silage. For two of them MEKA-B4 seems to play an important role as an extrinsic motivation: one states that it would change his management strategies without it, and another one that this will depend on the other economic conditions (e.g. other subsidies, market prices) and the consequent overall economic sustainability of his present management activities. The other three would not change their strategies if MEKA-B4 were suspended, and therefore for them the premium is more a reward than an incentive (obviously, these opinions may change, once the measure is suspended).

All our non-participating interviewees carry out cattle husbandry in their land, and for them MEKA B-4 does not represent a sufficient motivation to convert to extensive grassland management. For example, a non-participant dairy cattle farmer explained as follows the reasons for him not to participate in the measure: *"B4 does not fit in our farm structure. What would we do with all the hay? We have dairy cattle, this means we need to mow the meadows early to get energy rich fodder, we need silage".* In their case, the payment would need to be much higher than €60/ha to represent enough external motivation to make them change their farm management strategies.

6.4 Flexibility versus risk

Improved land management flexibility is frequently identified as one of the advantages of result-based agri-environment measures. In particular, it is often claimed that flexibility favours innovation (Matzdorf and Lorenz, 2010; Sabatier et al., 2012).

However, in reality, MEKA-B4 does not enable a great degree of flexibility, because in order to maintain species-rich grassland a late cut is needed, which is not compatible with silage and biogas production. Innovation is not so relevant in the context of MEKA-B4, as its objective is the conservation of already existing species-rich grassland (in fact, converting intensively-managed pasture into species-rich grassland would be difficult and require a long time). To protect species-rich grassland, what is needed is maintenance of traditional management strategies and the development of major innovative practices. In fact, when MEKA-B4 was introduced in BW in 2000, most of the enrolled farmers already had the equipment to produce hay and carried out extensive management strategies that ensured a high level of biodiversity in their grassland.

However, with MEKA-B4 farmers are encouraged to fine-tune their management strategy to optimise the conservation of species-richness, which before was more a by-product of extensive farming than a specific goal (for the fine-tuning of management strategies see more in detail Oppermann and Gujer, 2003). While mowing dates and amount of fertilisers are fixed in result-based schemes, farmers enrolled in MEKA-B4 can choose the optimal mowing date in order to adapt to regional climate differences and yearly fluctuations, as well as the amount and type of fertiliser that ensures the best balance between wildflower conservation and grassland productivity. For this reason, MEKA-B4 does encourage some minor degree of innovation, and, according to the managing authorities and some of the interviewed enrolled farmers, it also requires more experience and knowledge about

[54] It is also interesting to note that the five participating farmers that have cattle livestock only have part of their grassland under MEKA B4 and use part of their grassland to produce silage.

wildflower and extensive grassland management than action-based measures. For this reason MEKA-B4 also acts as an educational tool for farmers (see section 6.6).

As regard risks, in result-based measures the transferral of the responsibility from the management authorities to the farmers as regards the attainment of the desired environmental objectives increases the risk for the latter not to comply with the contract (and consequently to be subjected to sanctions), due to factors beyond their control (e.g. weather conditions) or insufficient knowledge about the link between management strategies and the desired outcome[55]. Interestingly, according to the interviewed EU DG Agriculture desk officer responsible for BW, the potential higher risk for farmers and therefore the higher risk of sanctions is the main reason for the reduced diffusion of result-based measures.

However, when asked about the risk of not finding the required four species in their field, fifteen of the seventeen interviewed participant farmers explained that they consider the risk as very low, as long as they keep managing their meadows in an extensive way. The possible impact of adverse weather was mentioned by four non-participant farmers and one participant farmer, but it is mostly considered as having far less impact than the farmers' own land management strategies. Non-participating farmers appeared more concerned than participating ones about the possible impact of weather on biodiversity. This might be due to their limited experience with (and therefore limited knowledge about) species-rich grassland.

As a comparison, Matzdorf and Lorenz (2010) found a similar result, and their interviews show that the issue of financial risk for farmers did not appear as relevant as they expected. Except for unusual weather circumstances, the interviewed farmers did not mention any other factor they are unable to control. Also, according to their study, the potential risk does not have a clear negative effect on the willingness to participate in MEKA-B4.

The low concern of farmers about risk of failure is confirmed by the error rate found in the MEKA-B4's yearly controls (see section 5).

6.5 Transaction costs

According to three interviewees involved in the design and implementation of MEKA-B4, the transaction costs for the administrative authorities have not been higher for the design of MEKA-B4 than for the action-based MEKA measures. This was partly due to the fact that the two biodiversity experts in charge for the selection of the indicator species (one of which was interviewed in occasion of this research) had previously accumulated a deep knowledge of the region and its botanical characteristics.

Regarding the implementation of the paying agency's controls, for both types of measures the documentation needs to be verified and field-checks need to be carried out. The only additional requirement of MEKA-B4 is that field inspections need to be carried out between mid-May and mid-June, when most flowers blossom. In addition, flowers that do not blossom during this period (e.g. cuckooflower - *Cardamine pratensis*) also need to be taken into account by looking for their remains. This can be challenging because these are more difficult to detect and risk being overlooked. On the other hand, checking the requirements

[55] Obviously, the risk is related to the number of key species in the fields and their abundance (i.e. number of individuals for each species)

of action-based measures about the number of cuts per year may be time-intensive, as it requires several checks in the field.

Transaction costs for farmers can be categorised into three categories: the costs related to the wildflower inventory on the grassland, those resulting from the participation in extension services[56] and those related to the required documentation.

The first category of costs is highest when farmers sign the five-year contract, as at this moment they need to ensure that at least four of the indicator species can be found in their field. These transaction costs can significantly differ across farmers. When asked about how much time they need to check for wildflower species, two out of seventeen farmers claim that they were already sure that their grassland is species-rich before signing the contract, and therefore they did not need to carry out a specific assessment. The other farmers needed between two hours and four days, depending on the extent of grassland to inspect and their botanical knowledge. Once the first assessment is done, farmers do not carry out the detailed inspections again until the signature of a new five-year contract. In fact, at that point they only need to ensure, while working at their field, that no major change has occurred.

Two farmers mentioned the desire to get professional assistance (i.e. extension services) from the agricultural district offices while checking for the wildflowers in their land. Extension services that result in additional transaction costs for farmers and for managing authorities are e.g. assisted grassland inspections, where the farmer can learn from an agricultural advisor how to recognize the indicator species. Approximately one third of the interviewed farmers enrolled in MEKA-B4 participated in such a grassland inspection at least once. Regarding the explanation of the rules of MEKA-B4 to the farmers, this does not result in significant additional transaction costs, as all agri-environment measures are presented together during an evening meeting once per year.

Farmers generally perceive transaction costs related to paperwork as very low. The reason for that is that the MEKA-B4 application procedure simply consists in ticking a box in the agri-environment application form. The procedure is more laborious for farmers that do not have homogeneous species-rich grassland, as they need to indicate for which part of their parcel they apply for the MEKA-B4 payment. Other related paperwork consists in noting the mowing dates and the fertiliser management. But since this paperwork is not exclusively demanded for the MEKA-B4 measure and most farmers apply other measures beside the result-based one, this is not specific of the latter. Only one of the interviewed farmers complained about the paperwork, but he referred to MEKA in general and not to MEKA-B4.

Finally, the transaction costs for both farmers and managing authorities related to the authorization process that is needed in action-based measure to change the mowing dates are avoided in result-based measures[57].

All in all, the transaction costs related to MEKA-B4 are thus low, and do not represent a major obstacle to the design and uptake of the measure.

[56] Extension services are information activities provided by the district offices, including flyers, guided grassland inspections, individual advice.

[57] When a fixed mowing date is adopted, like in action-based measures, farmers need to apply to the managing authorities for a special permission to change the mowing date (e.g. in case of longer winters than usual).

6.6 Result-based agri-environment measures as an educational and awareness raising tool

Our interviews with participating farmers showed that the flexibility about the first mowing date and fertilizer management has an important role in increasing farmers´ awareness about the impact of their management strategies on the environment, and more specifically on biodiversity. In fact, to avoid failure, farmers need to understand the cause-effect relationship between their management activities and biodiversity conservation. According to our interviews, the farmers' general understanding of this relationship has been improved by MEKA-B4, and in fact only four of our participating interviewees stated that they have not learned about wildflowers and the related management strategies through MEKA-B4. Out of the thirteen farmers who stated to have learned thanks to the involvement in MEKA-B4, six explicitly said that they become more aware of the consequences of their management strategies on wildflowers. In this sense, MEKA-B4 provides a high degree of additionality. A farmer put this idea in this way: *"I have become more sensitive on what I am doing. If B4 manages to raise awareness, it can already be regarded as a successful measure."* Also, eight farmers also stated that one of the consequences of their enrolment in MEKA-B4, and the related extension services they have received, is the improvement of their botanical knowledge. Thanks to MEKA-B4, farmers became more aware of what grows on their grassland and more appreciative of the species composition. Considering that since the beginning of the measure in 2000, about 10,000 farmers have applied for it, the positive impact on farmers' knowledge is to be considered significant[58]. In this regard, it is interesting to note that our institutional interviewees at the MLR and at Bioland (a farmer organisation) claimed that one of the main objectives of MEKA-B4 is the environmental education of farmers.

When questioned about the reason why they are asked to have at least four wildflower species in their field, ten out of seventeen farmers demonstrated a correct understanding of the wildflower species being a proxy for biodiversity (because the presence of these species is evidence of extensive management). These findings contradict to a certain extent Matzdorf and Lorentz (2010), who found a lack of understanding in farmers about the function of the wildflower species as indicators of biodiversity.

Another important function of MEKA-B4 is to make not only farmers, but also society as a whole more aware of the importance of biodiversity. MEKA-B4 can contribute to show the potentially positive role of farmers in the conservation of nature and biodiversity. Matzdorf and Lorenz (2010) claim as well that result-based incentives have the potential to make the ecosystem services that farmers provide to society more manifest. They even suggest that result-based incentives could contribute an improved legitimacy for the financial support of agri-environment measures. Societal appreciation is an important factor for farmers, and can play a role in their motivation[59].

Thirteen farmers (out of the twenty-four we interviewed) confirmed this idea, as they claimed that there is not enough social recognition of the importance of species-rich grassland, and that there is still potential to raise society's awareness about this matter.

[58] Data provided by the MLR.

[59] Information by the ecologist expert in agricultural biodiversity and agri-environment schemes who was interviewed for this study.

An important role also played the meadow championships carried out since the year 2005 which reward farmers with the most beautiful species-rich meadows[60] (Keenleyside and Oppermann, 2009; Oppermann et al. 2012). Initiatives taken by independent organizations such as the NGO "Verein Blumenwiesen-Alb e.V." also play a role in this sense. For example the latter has introduced further competitions aiming at awareness raising on species-rich meadows, which are important in motivating farmers and spreading awareness of the importance of species-rich grassland and organises regularly activities[61].

[60] The reward consists in weekend trips, wellness and cultural activity coupons, dinners and/or books as well as a certificate.

[61] For example, a photo contest on species-rich grassland was organised in 2008, which raised a broad public interest and had more than 100 participants. Two flower queens have so far been elected (one for the years 2008 to 2010 and one for 2010 to 2013), whose role is to help raise awareness on the importance of species-rich grasslands at various public events. In 2010, the Verein Blumenwiesen-Alb organized a writing contest on species-rich grassland and in 2012 a drawing contest (76 participants) and in 2012 a drawing contest, more information see http://www.blumenwiesen-alb.de/wp.

7 DISCUSSION

The results of our field work show that in the spectrum of monetary transfers aimed at improving the management of natural resources that has been proposed by Muradian and Riva (2012), MEKA-B4 cannot be considered a proper market-based instrument. In fact, In fact, by itself the payment is too low to be enough to motivate the farmers to change their management practices (i.e. it is too low to represent a sufficient extrinsic motivation, if intrinsic motivations are lacking). it does not cover the full opportunity costs of all categories of farmers that may be potentially involved in the programme. As such, MEKA-B4 is more to be placed among the categories of rewards or incentives, depending on the categories of the enrolled farmers.

For some of our interviewees, motivation for the maintenance of extensive grassland management is mainly intrinsic, and is linked to personal convictions and ethical motivations - this category of farmers tends to show high environmental awareness and a strong motivation towards environmental protection. Therefore, MEKA-B4 acts as recognition of their effort, and their important role in the conservation of biodiversity, more than a proper incentive. This is the case of most part-time farmers we have interviewed (but not all). Additionality seems to be relatively low for them (six out of ten of this category of interviewees declared they would not change their management strategy if MEKA-B4 were suspended, and two said they would, the others being unsure).

However, when discussing additionality, it is important to keep in mind possible future developments. If the opportunity costs of extensive grassland management continue to increase in the future, as they have done in recent years due to the increasing prices of agricultural commodities, the high incentives to biogas and the decreasing and fluctuating price of hay, the pressure towards more intensive grassland management could increasingly outweigh the moral motivations, especially when ownership passes to younger generations. For this reason, according to the expert we have interviewed at the IFAB, young farmers are less likely to be involved in MEKA-B4 in the future if the payment is not increased. This is also confirmed by some of our interviews with participating farmers, which showed that some of them, even if the environmental motivation is strong, may decide to adopt more intensive management strategies if extensive grassland management is not economically sustainable anymore for them. This issue needs to be further explored, as our sample does not include young farmers (i.e. farmers below 40 years old).

In some other cases, MEKA-B4's incentive component already plays a key role in avoiding land abandonment and intensification. This is the case for example of some of the farmers with land with difficult conditions, like upland farmers. They have low opportunity costs, but since their land is at risk of abandonment, additionality of MEKA-B4 may be high for them, as the premium may ensure the economic sustainability of their farming practices. However, a much more representative sample would be needed to draw more definitive conclusion on this matter.

As pointed out by Muradian (2013), incentives work well when there is a combination of extrinsic and intrinsic motivations to conservation. Farmers who are willing to maximise the income from their land through intensive cattle husbandry or biogas production and are not very interested in environmental conservation will not decide to modify their management practices because of an incentive, but only because of a proper market-based instrument

that can provide a strong extrinsic motivation by covering all their opportunity costs. Our interviewees, including the institutional actors and the participating and non-participating farmers, agree that MEKA-B4's premium is not enough to cover the opportunity costs of this category of farmer and encourage them to change their management practices towards a less intensive use of the grassland and the conservation of wildflowers. Increasing the MEKA-B4's premium rate is an option suggested by some of our institutional interviewees[62] and some of the interviewed farmers[63], and could be justified by arguing that the opportunity costs of extensive management (the income forgone, as defined in the Regulation) has increased over recent years due to changes in market prices (especially as regards hay) and the increasing economic attractiveness of biogas production.

An increased payment would be also justified and allowed by the German National Framework, which establishes a payment of 150€/ha if the result-based measure is not combined with others and 70€/ha if combined (Annex 1 of the Rural Development Regulation) and allows the regional managing authorities to establish the payment at a 30% lower or higher level than that, depending on regional specificities (e.g. gross margins, cost incurred, yields). The MEKA-B4 premium is significantly lower than this range, the reason being that when designing the measure a low premium was considered to be enough because MEKA-B4 is generally combined with other MEKA measures.

However, an increased payment could be easily justified because of the increasing opportunity cost related to conservation of the species-rich grassland, due to the growing economic attractiveness of the biogas option and the decreasing price of hay. Also, a higher premium could help to meet the targets set in the BW Rural Development Programme, which were not met at the time of the last mid-term evaluation in terms of area covered (see section 3). These targets may be even increased in the next programming periods, as a high share of grassland in BW is not yet covered by MEKA-B4 (see Figure 1).

Increasing the payment would improve the effectiveness of the measure by extending the land covered by MEKA-B4. However, this option would also result in a decrease in cost efficiency by overcompensating farmers with low opportunity costs. However, on the other side, it should also be kept in mind that if species-rich meadows are loss, restoring them would require very substantial investment, and that increasing the payment now would avoid those future costs.

A way to overcome the loss in cost efficiency, while increasing the area covered by MEKA-B4 could be to set up reverse auctions[64], which are permitted in the EU under Council

[62] Among our institutional interviewees, those representing Bioland and the Regional Council of Tübingen suggested that the MEKA-B4's premium could be raised to encourage more farmers to apply. In addition, Dr. Gerhard Bronner (LNV) also stated to be in favour of substantially increasing the payment in an interview published in 2003 (Oppermann and Gujer, 2003). According to his opinion, an increased payment would improve the additionality ok MEKA-B4, and encourage the owners of species-poor meadows to improve the wildflower biodiversity of their grassland. LNV is a consortium of associations that supports nature conservation in BW, see http://lnv-bw.de.

[63] Seven of the interviewed participating farmers complained about the low payment and claimed that this should be raised, and three said that the payment is low, but it is acceptable to them because they see it as extra money, as they get most of their income from other sources (e.g. intensively managed land or a part-time job). As regards the non-participating interviewees, they all think that the MEKA-B4 premium is not enough for them to manage their grassland extensively.

[64] A reverse auction is an auction where many sellers compete to offer a good/service to a buyer, as opposite as classical auctions, where many buyers compete for a good/service sold by one seller (see Ferraro, 2008).

Regulation (EC) No. 1698/2005. Examples of this kind of programmes can be found in Australia (Connor *et al.* 2008) and the US (Claassen *et al,* 2008). Pilot auction schemes have been carried out by universities in Northeim (Lower Saxony, Germany)[65] and in Steinburg (Schleswig-Holstein)[66] (Klimek et al., 2008, Groth 2008b, Groth, 2009), but in general the potential of reverse auctions is still to be explored in Europe.

Reverse auctions can reduce the asymmetry of information, and are useful when the ecosystem service buyers (in this case, the managing authorities) are not fully aware of the opportunity costs associated with the provision of the required ecosystem services. Information asymmetry leads to the risk of setting a higher price than needed, with the consequence that fewer ecosystem services are obtained than theoretically possible. Reverse auctions force the providers of ecosystem services to compete among themselves, lowering the price of ecosystem services to a level close to their opportunity costs, and thus take into account the spatial heterogeneity of farm specific costs and location conditions. As a disadvantage, they present higher transaction costs and administrative difficulties. Perhaps more importantly, they are characterised by a higher degree of uncertainty, because the participants' offers may be determined by many factors difficult to anticipate, e.g. risk aversion, strategic behaviour, and information availability (Ferraro, 2008; Klimek et al., 2008).

This is a particularly concerning issue, as there is only a small area of species-rich meadows left in BW, and the authorities cannot afford the risk of reduced participation in the scheme (farmers are accustomed to the scheme being repeated from one programming period to the next, and may not actively engage in a more complicated procedure such as an auction). In addition, auctions are in general linked to short-term management strategies, whereas agri-environmental schemes are perceived as likely to be renewed in the future. This is particularly important, as land management strategies of farmers require a long term-perspective[67].

An alternative could be to introduce differentiated payments aiming at reflecting the average opportunity costs of different kinds of land, e.g. less productive land, land likely to be used for cattle farming, etc. Differentiated payments could also be introduced on the basis of the level of biodiversity, rather than according to the opportunity costs.

As of today, the BD managing authorities are planning to adopt this latter option. A draft RDP for BW for the new programming period (2015-2020) has already been submitted to DG Agriculture (but not approved yet), which include a simplified system of differentiated payments, similar to that in place in Lower Saxony (see section 6.2). The draft includes two payment layers, one for grassland with at least four wildflower species and another payment for grassland with at least six species. MEKA-B4 payment will not be considered as

[65] The pilot auctions implemented in Northeim allowed farmers to bid for three pre-defined levels of grassland plant diversity (EG1 required farmers to have at least eight forb species; EG2 eight forb species plus at least two indicator species, out of a catalogue of 40, and EG3 eight forb species plus two species indicating rare grassland communities). The initiative was a research project, and the payment was obtained by third party funding (56,000€ in total, for two auction rounds). The project was successful and farmer participation was high. 65 farmers submitted a bid over the two auctions, which high variability in the price offered by farmers, which presumably indicates very different opportunity costs and site conditions.

[66] The pilot scheme in Steinburg was carried out in 2011, and only involved 15 farmers and 179 ha, see also http://www.sn-sh.de/index.php?id=1112.

[67] Interview with the grassland biodiversity expert.

a top-up measure to other MEKA measures granted to the farm as a whole, but it will be a stand-alone measure for individual parcels. Farms with species-richness in only in a certain number of parcels will receive the same MEKA-B4 payment as farmers that will have applied for a grassland measure for the entire farm (e.g. for organic farming or for extensive grassland farming with livestock density limits) and apply for MEKA-B4 only for some parcels. The payment granted under MEKA-B4 for species richness can then be higher than that for total farm grassland measure, and in this case it will replace the latter[68].

When asked about their opinion on differentiated payments, almost all interviewed farmers[69] declared themselves they were against this, because it would be too complicated and risky for the farmers. In general, aiming to adjust the payment of MEKA-B4 to the opportunity costs of different kinds of land through differentiated payment would improve cost-efficiency, but would also increase transaction costs both for the managing authorities (due to the need to design a more sophisticated system and possibly for the increased effort required by controls) and for the farmers (due to the need to look for an increased number of wildflowers). However, differentiated payments are a good option to increase effectiveness without reducing cost-effectiveness.

[68] Personal communication of the desk officer responsible for BW at DG Agriculture and of the MRL.

[69] This question was not included in the first version of the questionnaire, and for this reason it was not asked to the first four interviewed participating farmers. Among those who answered the question, all but one were against the option of a differentiated payment. As regards the non-participating farmers, they all claimed that a differentiated payment would make the measure too risky and complicated for farmers, and would reduce the uptake.

8 CONCLUSIONS

MEKA-B4 is a good example of a result-based agri-environment measure aimed at maintaining species-rich grassland. It can be considered a Payment for Ecosystem Services programme if a broad definition is adopted, like that proposed by Muradian *et al.* (2010). In fact, in most cases the measure acts more as a reward or an incentive than as a proper market-based instrument, as the payment is too low to provide enough extrinsic motivate on to influence the management strategies of all potentially interested farmers, if they are not already interested in environmental protection. All enrolled farmers we have interviewed seem to be motivated by intrinsic motivations only (in cases when there seems to be no additionality) or by a mixture of intrinsic and extrinsic motivations (when additionality is high).

However, its conditionality is arguably high, as the payment is granted only to farmers with a number of wildflower species above the established threshold of four species, which experts consider a good proxy for the overall biodiversity of species-rich grassland. The controls performed so far have shown that the rate of noncompliance tends to be extremely low.

The additionality of MEKA-B4 may differ, depending on the farmer categories (part-time farmers, farmers with less productive land, farmers with horses and farmers with cattle), and in general it is linked to the extent to which MEKA-B4 can cover the opportunity costs of the different categories of farmers. Interestingly enough, participation in MEKA-B4 over recent years has been decreasing, and many of our institutional and farmer interviewees have identified as one of the reasons for that the increasing economic attractiveness (and lower work intensity) of more intensive grass production for biogas, together with the changing market conditions (e.g. the decreasing and fluctuating price of hay). This may call for increasing the premium, in order to cover the opportunity costs of a larger share of farmers and improve the uptake of the measure. Other alternatives may be to introduce differentiated payments, in order to take account of the spatial differentiation of opportunity costs.

Also noteworthy is the fact that MEKA-B4 plays an important educational role. With a result-based measure, farmers learn about the importance of maintaining biodiversity in their field and how to optimise their management strategies to ensure the conservation of wildflowers. This contributes to increasing their intrinsic motivations towards biodiversity conservation, and in some cases may encourage them to maintain extensive grassland management in (part of) their land even if MEKA-B4 were suspended in the future.

Finally, our interviews have shown that the risk associated with the MEKA result-based measure is significantly low for farmers, provided that they adopt extensive management strategies (i.e. late cuts and reduced use of fertilisers). The risk of non-compliance because of factors outside the farmer's control, like for example weather conditions, which our interview with the DG Agriculture desk officer underlined as one of the main reasons for the reduced use of result-based schemes in the EU, should not be considered a barrier to the more widespread use of such schemes.

In general, the MEKA-B4 experience shows that result-based measures are a good option to protect species-rich grassland. In fact, result-based measures aiming to improve grassland biodiversity can be based on indicators that are relatively stable over time and mainly

sensitive to factors that can be influenced by farmers (grass cutting dates, fertilizer type and amount). This may prove more difficult in schemes aiming at protecting e.g. wildlife - as animals can move from field to field - or water quality - as this can be influenced by different categories of actors and factors outside the farmers' control (Sabatier *et al.*, 2012).

All in all, our results suggest that result-based agri-environment measures could be usefully extended in the EU, especially those targeting species-rich grassland, because, even though their additionality mostly depends on the level of the payment, in general they are able to ensure high conditionality and improve farmers' motivations and environmental awareness.

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