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Version 2

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Michaela Arndorfer[1], Katalin Balázs[3], Jean-Philippe Choisis[5,] Peter Dennis[6], Wenche Dramstad[7], Wendy Fjellstad[7], Jürgen K. Friedel[1], Tiziano Gomiero[8], Rob H.G. Jongman[4], Max Kainz[9], Gerardo Moreno[10], Maurizio Paoletti[8], László Podmaniczky[3], Jean-Pierre Sarthou[5], Siyka Stoyanova[2], Susanne Riedel[11], Sebastian Wolfrum[9]

[1](BOKU) Division of Organic Farming, University of Natural Resources & Life Sciences, Vienna, Austria; [2](IPGR)Institute of Plant Genetic Resources "K.Malkov", Bulgaria; [3](SIU) Szent Istvan University, Institute of Environmental & Landscape Management, (SZIE-KTI), Gödöllö, Hungary; [4](ALTERRA) Alterra, Wageningen UR, The Netherlands; [5](INRA) UMR Dynafor, INRA-ENSAT AGRO, Toulouse, France; [6](ABER) Institute of Biological, Environmental and Rural Sciences, Aberystwyth University, UK; [7](NFLI) Norwegian Forest and Landscape Institute, Ås, Norway; [8](UP) Department of Biology, Padova University, Italy; [9](TUM) Chair for Organic Agriculture, Centre of Life and Food Science, Weihenstephan, Technical University of Munich, Germany; [10](UEX) Forestry School, University of Extremadura, Plasencia, Spain; [11](FDEA-ART) Federal Department of Economic Affairs, Research Station ART, Zurich, Switzerland.

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1. Introduction

Indicator development in BioBio was accompanied by a consultation process involving stakeholders at various stages of the project. Apart from the regular meetings of the BioBio Stakeholder Advisory Board (SAB), implemented and reported under WP7, each BioBio case study under WP3 was responsible for engaging regional stakeholders in consultations on biodiversity indicators.

Participants for the regional stakeholder groups were invited from the following target groups:

- administrations and public authorities of agriculture and/or the environment at local, regional and/or national level
- farmers' representatives
- organic farming associations
- NGOs (nature conservation)
- representatives of consumers and retailers
- In each case study region, two stakeholder meetings were organized (Table 1):
- Meeting No. 1 took place in the first half of the year 2010 before the field testing of candidate indicators.
- Meeting No. 2 was organised at the turn of 2011/2012 when preliminary results from data analysis became available. From this workshop, WP3 partners reported stakeholder feedback on 12 key questions which forms the core of the present report D3.5.

Table 1   Overview of local stakeholder meetings convened in BioBio case study regions

Partner Code	Partner	CS Code	Meeting No. 1	Meeting No. 2	No. stakeholders	Venue
5	BOKU, Austria	A_ARA	18 February 2010	7 December 2011	4 + 3 [1]	BOKU University, Vienna
13	INRA, France	F_ARA	24 June 2010	16 March 2012	15	Saint-André, Haute-Garonne
7	TUM, Germany	D_MIX	15 December 2010	20 January 2012	6	TUM, Freising
11	IPGR, Bulgaria	B_GRA	04 May 2010	15 December 2011	8	Agricultural and Stockbreeding Experimental Station, Smolian
2	SIU, Hungary	H_GRA	26 March 2010	17 January 2012	3+4 [2]	Gödöllö
4	NFLI, Norway	N_GRA	26 May 2010	24 January 2012	12	Vingelen, Tolga Kommune
1	ART, Switzerland	C_GRA	09 April 2010	7 December 2011	6	Hotel Metzgern, Stalden
3	ABER, UK	W_GRA	17 January 2011	22 December 2011	5	IBERS, Aberystwyth University
				6 January 2012	2 + 1 [3]	National Trust, Hafod y Llan, Nantgwynant
8	UEX, Spain	E_DEH E_OLI	2 preliminary meetings:	22 December 2011	13	Forestry School, UEX Plasencia, Spain
			November 2012			
			21 May 2011			
6	ALTERRA, The Netherlands	L_HOR	individual meetings with stakeholder	8 March 2012	4	CLM, Culemborg (Netherlands)
9	UP, Italy	I_VIN	25 May 2010	16 December 2011	11	Dept. Biology, UNIPD

1) Written feedback from 3 stakeholders was collected in a questionnaire.
2) 3 stakeholders, 4 research experts participating
3) One stakeholder was consulted by email.

2. Case Study Austria (A_ARA)

Four stakeholders participated in the workshop on December 7, 2011. Feedback from other representatives who could not attend the workshop was retrieved in written or oral form, after they had been provided with workshop material (BioBio indicator list, results of analysis etc.).

2nd Stakeholder Workshop:	7 December 2011, BOKU, Vienna	
Administration & Public Authorities		
Ingeborg Fiala	Federal Ministry for Agriculture, Forestry, Environment and Water Management	
Thomas Rech	Federal Ministry for Agriculture, Forestry, Environment and Water Management	
Peter Mayrhofer	Provincial Government of Lower Austria, Rural Development	
Farmers		
Waltraud Müller	Bio-Austria, Organic Farmers' Organisation	
Elisabeth Schübl	Chamber of Agriculture, Extension Service Agri-environment programmes	
NGOs	No participants in 2nd stakeholder meeting.	
Others		
Julia Kelemen-Finan	BOKU, Institute of Landscape Development, Recreation and Conservation Planning. Formerly working for NGO 'Distelverein'.	
Thomas Frank	BOKU, Department of Zoology	

1. Are you interested in indicators for biodiversity? Why / why not?

- Assessment of biodiversity is a basis for its conservation and restoration (Administration)
- We hope that just a few indicators (indirect indicators/ management indicators) suffice to draw conclusions about biodiversity. (Administration)
- They are useful for evaluation purposes, in particular of agri-environmental programs. (Administration)
- Biodiversity indicators are important because conservation of biodiversity is an imperative of our era (Scientist)
- To me, as an extensionist for organic farming and nature conservation, they are an important instrument for recording the state of the art and for the evaluation of results. (Farmers' Organisation)
- Biodiversity indicators are important because biodiversity services from agriculture should be measurable and perceptible. Basically, different stakeholders put forward legitimate and divergent demands towards agriculture that partly contradict each other (e.g. erosion control,

groundwater protection, climate change, energy production ....). Aims or projected aims need to be designed in a way as to achieve these objectives. (Farmers' Organisation)

2. Do you see a specific need for such indicators for organic / low-input farming systems?

- Yes, there is a need. (Administration)
- Specific indiators are necessary only in comparison to conventional agriculture. (Administration)
- There is a need if it turns out that different factors, in organic and conventional farming respectively, influence biodiversity (Science)
- Yes, for two reasons:
  1. to better communicate ecological services from organic farming
  2. to indicate potentials for improvement (Farmers' Organisation)
- To inform consumers: projecting the consequences of consumers' choices (Scientist)
- Yes, because in Austria the agri-environment scheme for organic farming is in juxtaposition to another scheme targeting conventional farms. It is confronted with claims as to be less effective in promoting farmland biodiversity. (Farmers' Organisation)

3. What could such indicators be used for?

- Advancing knowledge. Monitoring. Management of biodiversity. (Administration)
- For future agri-environment programmes. (Administration)
- For assessing the effectivity of agri-environment measures. (Administration)
- To be applied in the implementation of biodiversity conservation (e.g. the evaluation of agri-environment measures). (Scientist)
- To measure biodiversity services from ecological compensation areas of agri-environment schemes. It is important that the field of application for an indicator is defined. There will not be an 'allround'-indicator. (Farmers' Organisation)

4. What are the major characteristics of the indicators to be used (scientifically solid, easy to measure, easily understood, attractive for a larger public, low cost)?

- It should be a meaningful indicator that is simple and cheap to measure. At this point, communication is not yet a topic. Therefore, the communicative properties are not yet in the forefront. (Administration)
- It should be an aggregated measure that integrates as many aspects of biodiversity as possible and, at the same time, it should be easy to measure. (Administration)
- Indicators should be an instrument for governance in agricultural policy: which measures are efficient? It would be good if the indicators were easy to measure because of the need for continuous monitoring of developments, spanning several years. (Administration)
- Easy to measure or to determine. Cheap. Attractive for public relations activities. (Scientist)
- Easy to understand for organic farmers. Meaningful and scientifically sound. Easy to grasp for consumers. (Farmers' Organisation)
- scientifically solid, 2. easy to communicate (Scientist)
- Scientifically solid, easy to measure, easy to understand. (Farmers' Organisation)

5. What do you think about the indicators which were retained to be tested in the BioBio project?

– The retained list of indicators is interesting. (Administration)
– *Refering to the chart indicating the projected number of 10 basic biodiversity indicators:* The 4 species indicators are probably not feasible, except for vegetation. 3 Management indicators are probably not sufficient. 3 Habitat indicators are feasible. (Administration)
– The choice of indicators is OK. Probably, there should be more differentiation in crops on the plot level. (Administration)
– (Direct) biodiversity indicators and the energy indicator are important. (Scientist)
– Cannot be judged at this stage. Will become evident in the practical implementation. (Farmers' Organisation)
– Fields of application depend on the objectives and the financial means. Species indicators are expensive. (Scientist)

6. Which indicators look more relevant and comprehensive for you?

– 1. Habitat indicators: diversity and richness
  2. Management parameters: nitrogen input, probably also pesticide applications and energy input. (Administration)
– Nitrogen and energy input (Administration)
– Vegetation and 3 faunistic groups. Habitat diversity. Energy and nitrogen input. (Scientist)
– D11.3 (Mowing timing), D2.2 (average stocking rate), D12.1 (grazing intensity), D7.2 (Agri-environment support related to nature conservation) (Farmers' Organisation)
– B2 (Plant species diversity), C3 (Habitat diversity), C4 (Crop species diversity), C16 (patch size, with limitations: patch width is more significant than patch size). Several farm management indicators because they are easy to measure, meaningful and easy to communicate; distinct combinations of indicators need to be combined depending on the production systems. (Scientist)
– The species indicators are most relevant, particularly bees and spiders. Justification: with regard to the most important qualities of an indicator and the correlations presented in the workshop. Bees are important biodiversity indicators, because their importance as pollinators is evident to farmers. (Farmers' Organisation)

7. Why develop farming biodiversity survey?

– They provide a basis for recommendations to improve biodiversity. They help identify specific measures to be promoted. (Administration)
– There is a need for schemes to justify financial support for agriculture. (Administration)
– Surveys provide evidence for the effect of agri-environment measures. (Administration)
– Conservation of biodiversity. Saving resources (e.g. extensive management practices, reduce transport costs and distances ==> promotion of regional supply chains) (Scientist)
– Evaluation of the effectiveness of agri-environment measures, of organic farming, of nature conservation programs etc. comparison [of organic farming] to conventional farming and intensive management practices (Farmers' Organisation)
– For evaluating the effectiveness of agri-environment measures. To make ecological services visible. For scientific purposes. (Scientist)

8. Who should pay it?

- European Union and national governments within the framework of the Common Agricultural Policy. (Administration)
- Budget for evaluating regional agricultural policies at the Federal Ministry of Agriculture. (Administration)
- National and regional governments. Producers of escalating resource consumption. (Scientist)
- Administrations for agriculture, environment or tourism. (Farmers' Organisation)

9. How do we include these results in existing policies (AEM), biodiversity action plans, agricultural policy assessment, etc.?

- They can be used in the ex-ante evaluation. It depends on the design of agri-environment programs and the EU directives, whether they will be of importance for the on-going programs. (Administration)
- Yes, if they are easy to administer (data collection, auditing) (Administration)
- Yes, but data have to be available until May 2012 latest to be taken into account, when shaping the next period of the Austrian agri-environment program. (Administration)
- It should be an aim. But indicators must be carefully selected and must fulfill the requirements mentioned under point 4. (Scientist)
- Yes, definitely. (Farmers' Organisation)

10. Can our indicators be used in national programs?

- Biodiversity is not only bound to farmed land, but is also influenced by other forms of land use. Important negative influences are also climate change, land fragmentation and sealing of the soil surface. (Administration)
- For example in climate protection reporting. (Administration)
- Potential fields of application e.g. in Natura 2000 sites: assessment of organisms (e.g. flagship species, emblematic species) and long-term monitoring of the distribution of these species. Indicators could also be applied in monitoring schemes engaging amateurs. (Scientist)
- It depends on the field of applicability (e.g. in national monitoring). Notably, if they provide the basis for official regulations, indicators must be scientifically robust. (Farmers' Organisation)

11. Do you suggest other applications of the indicators?

- Climate protection, unless it is covered by the new agri-environment program. (Administration)
- Nature conservation. NGOs. (Administration)
- They are important for scientific purposes to indicate the causes of biodiversity loss and waste of resources. (Scientist)
- Probably for urban and rural planning. Environmental assessment of infrastructure projects etc. (Farmers' Organisation)
- No. In my opinion, the field of application should be considered in the design phase of an indicator system and not the other way round. (Farmers' Organisation)

12. Could you be a user of these indicators?

– Yes, but it depends on the width of [its potential] application and the [design of the] agri-environment program. (Administration)
– Basically yes, but they need to be adapted to specific objectives. (Administration)
– Definitely yes, for scientific purposes. (Scientist)
– Yes, for the promotion of organic farming. (Farmers' Organisation)
– Yes, with regard to the evaluation of agri-environment programs and the design or adaptation of measures. (Farmers' Organisation)

3. Case Study France (F_ARA)

2nd Stakeholder Workshop	16 March 2012, St-André, Haute-Garonne
Farmers	4 farmers
Administration & Public Authorities	
2 participants	Regional and departmental Chamber of agriculture : in charge of organic agriculture (1), biodiversity (1)
1 participant	Regional Environmental Agency, spiders specialist (1)
2 participants	INRA (two PhD students)
NGOs	Arbres & Paysages 32 (Trees and Landscapes in Gers department)
	SOLAGRO
	CREN Midi-Pyrénées (Regional Protective Agency of Natural Areas)
	GABB 32 (Biodynamic and Organic Farmers Group of Gers)
	PNRPA (Regional Natural Park of Ariège Pyrénées)
Others	
1 participant	Private consultancy, bees specialist (1)

The 2nd stakeholder workshop was attended by 15 participants. Written feedback to stakeholder key questions could only be obtained from 4 stakeholders: Regional and Departmental Chamber of agriculture (2 persons), Regional Environmental Agency, Private consultant. Answers of several questions have been gathered and summarized because most of them were much too long and very often redundant from one question to other. Of course, all the information and ideas have been taken into account.

Biodiversity indicators : why? (Questions 1 + 2 + 3 + 7 + 11)

- They allow to simplify assessment and survey of natural and agricultural areas and their evolution (quality, effects of practices)
- Benefits for agricultural production (amenities + and -) and society
- Useful for the implementation of agri-environmental schemes
- Useful for distinguishing organic and conventional practices
- Understanding the positive or negative effects of agriculture practices on biodiversity (level of intensification and conservation of semi-natural habitats)

- Indeed agricultural areas suffer a deficit of scientific and naturalist knowledge → useful to improve knowledge on bio-ecological and geographical traits of species,

What about characteristics of indicators? (Questions 4 + 5 + 6)

- Scientific relevance
- Easiness of use for non-scientific users
- Low cost
- BioBio indicators are relevant, mainly habitats – bees – earthworms
- Strong need to have taxonomy specialists
- Need to develop the life-trait approach in interpreting bioindicators data

How to implement biodiversity indicators in public policies? (Questions 8 + 9 + 10)

- Public funds: Europe: Feader (Fonds européen agricole pour le développement rural); France : MEEDDAT (ministries), ONEMA, ADEME...) should finance such measures : AEM, national or regional programs (Programmes régionaux d'agriculture durable). Farmers should not participate to this financing.
- Cross-compliance should be set up on conservation of diverse semi-natural habitats (fallows, hedges, scrubs, ponds...)

Could you be a user of these indicators? (Question 12)

Yes (for all)

How to improve our set of indicators? (supplementary questions)

- Remove the bias from hand-netting in the bees collection. Strongly influenced by surveyor's skill.
- Take into account predictive species for the different habitats. Lighten the methodology at the farm level / BioBio (too long, too heavy).
- Add other indicators such as butterflies, grass orthoptera
- Characterize the habitats with phytosociological approach

4. Case Study Germany (D_MIX)

2nd Stakeholder Workshop	20 January 2012, TUM Freising
Farmers	
Georg Gerl	Helmholtz Zentrum München - German Research Center for Environmental Health (HMGU Scheyern)
Administration & Public Authorities	
Jutta Kotzi	LfL Bayern - Bavarian State Research Center for Agriculture
NGOs	
Katharina Schertler	Bioland (Organic farmers association)
Michael Rittershofer	Tagwerk (Organic Food Seller Organisation)
Mathias Luy	LBV - Landesbund fur Vogelschutz in Bayern e.V.(Bird Conservation Society of Bavaria)
Others	
Max Kainz	TUM BioBio team
Norman Siebrecht	TUM BioBio team
Sebastian Wolfrum	TUM BioBio team

1. Are you interested in indicators for biodiversity? Why / why not?

Generally there is a high interest in biodiversity indicators for NGOs and Administration especially if they are practically relevant, cheap to access and easy to use. The interest in these indicators is due to the high pressures agriculture puts on biodiversity and the possible role of indicators as a tool for assessing and resolving these problems. Farmers are only interested in biodiversity indicators if there is a need for them because of administrative rules or because a clear (monetary) advantage can be achieved.

2. Do you see a specific need for such indicators for organic / low-input farming systems?

No, not really. Both, conventional and organic systems can be intensive and need such indicators. The question is whether there are different mechanisms influencing biodiversity?

3. What could such indicators be used for?

Indicators could be used as a basis for consultation, as a tool to control access and efficiency of subsidies (GAP; AES), as a general monitoring tool for biodiversity of farmland and as tools to quantify biodiversity benefits of specific farming practices.

4. What are the major characteristics of the indicators to be used (scientifically solid, easy to measure, easily understood, attractive for a larger public, low cost)?

Indicators should be based on well-known, scientifically proven mechanisms and effects, easy and cheap to measure (maybe by farmers themselves), informative and relevant for the farmer concerning economic benefits, neither too detailed nor too broad.

5. What do you think about the indicators which were retained to be tested in the BioBio project?

– Generally, these indicators seem reasonable but there is no information on scope and possible fields of usage for the indicators yet.
– Low sample size of one year measures, especially of arthropods, are very critical because they depend on lots of side factors (timing of sample weather etc.)
– Landscape influences are not accessed but should to be accounted for.

6. Which indicators look more relevant and comprehensive for you?

Most relevant seem to be easily accessible indicators. All species data need too much effort to collect everywhere and anytime. Therefore, indirect indicators with clear correlation to species seem most comprehensive for a regular and broad scale application.

7. Why develop farming biodiversity survey?

A standardized survey would be good for comparison of farms especially on European/national levels.

8. Who should pay it?

No idea, but not the farmers.

9. How do we include these results in existing policies (AEM), biodiversity action plans, agricultural policy assessment, etc.

Due to the high cost and effort for species indicators, it will be difficult to integrate these indicators over continuous areas and on a yearly basis. However, to access efficiency of AEMs more detailed information than planned by the EU should be accessed. Simplified indicators or indirect measures combined with irregular control/calibration against randomly accessed species data might be a solution.

10. Can our indicators be used in national programs?

This depends on the final definition of the indicators. Most important for this issue is to know about the scope, validity and reliability of these indicators.

11. Do you suggest other applications of the indicators?

Indicators could be used for educational purpose and to raise awareness of farmers for biodiversity.

12. Could you be a user of these indicators?

Yes, if the indicators are easy to use, relevant and affordable for the specific purpose of the stakeholders.

5. Case Study Bulgaria (B_GRA)

2nd Stakeholder Workshop	15 December 2011, Agricultural and Stockbreeding Experimental Station, Smolian
Farmers (Group A)	
Tzonka Odjakova	Agricultural and Stockbreeding Experimental Station - Smolian
Ivan Mehandjiski	Agricultural and Stockbreeding Experimental Station - Smolian
Liubomir Mladenov	Mugla village, Society of sheep breeders
Administration & Public Authorities (Group B)	
Stanimira Boyadzhieva	Ministry of Agriculture and Food
Veselka Vasileva	Ministry of Agriculture and Food
Neli Valeva	Ministry of Agriculture and Food
NGOs (Group C)	
Simeon Marin	Green Balkans – Nature conservation NGO
Ognian Todorov	Green Balkans – Nature conservation NGO
Others (Group D)	
Siyka Stoyanova	IPGR; the research team of the project BioBio
Yana Guteva	IPGR; the research team of the project BioBio
Siyka Angelova	IPGR; the research team of the project BioBio
Maria Sbeva	IPGR; the research team of the project BioBio

1. Are you interested in indicators for biodiversity? Why / why not?

- Yes. In relation to implementation of international conventions and national plan of action for sustainable protection of biodiversity. (Group C)
- Yes. The system for measurement of indicators for biodiversity could be a practical tool for illustrating the interaction between agricultural practice and nature/biodiversity. (Groups C and D)
- Yes. Indicators for biodiversity could be implemented by farmers for direct bio-control in their farms (Groups A and B)
- No, if the costs are very high. (Group A)

2. Do you see a specific need for such indicators for organic / low-input farming systems?

Detection of indicators for biodiversity in low-input farming could assist the implementation of 'good agricultural practices' (Groups B and D)

Indicator system should be used obligatory in NATURA 2000 areas (Groups C and D)

3. What could such indicators be used for?

The expectations for use of indicators are:

- indicators to bring into force biodiversity protecting activities and implementation of agro-ecological measures (Group B and C)
- support for bio-production in farms (Group A)
- support for certified market of local dairy products and meat produced in protected areas (Group A and D)

4. What are the major characteristics of the indicators to be used (scientifically solid, easy to measure, easily understood, attractive for a larger public, low cost)?

- Easy to measure, easy to understand and low cost (Group A)
- Scientifically solid because of the need for validation and comparison of measurements (Groups B, C and D).

5. What do you think about the indicators which were retained to be tested in the BioBio project?

Really not all possible indicators could be tested. The main opinion is that the indicators selected for tests in the BioBio project cover the practical approaches.

6. Which indicators look more relevant and comprehensive for you?

! These comments are not specified per groups

In the Bulgarian case study 'semi-natural pastures and meadows in Bulgaria (low-input farming)':

- Agro-environmental indicators (UAA; pasture area; stocking rate; grazing period)
- Consumption of resources (energy consumption; nitrogen balance; concentrate fodder)
- Diversity indicators (diversity of livestock; diversity of crops/plant species; habitat diversity; diversity of species in grasslands

7. Why develop farming biodiversity survey?

- Protection of biodiversity in HNV areas (NATURA 2000) (Group C)
- Monitoring and prediction of undesired shifts of biodiversity as a result of farming activities (Group D)
- Control of sustainable farming activity and sustainable environment (protected resources for livestock and all organisms in their reproductive area) (Groups B, C and D)

8. Who should pay it?

- The Ministry of Agriculture and/or the Ministry of Environment and Waters (Group A)
- The payment could be realized as a form of support for biodiversity protective activities in farming areas (Groups C and D)

9. How do we include these results in existing policies (AEM), biodiversity action plans, agricultural policy assessment, etc.

- AEM (Agri-environment Measures) - the rate of support for environmentally protective agriculture could relate to a set of indicators (Group C)
- Implementation of Biodiversity action plan to be determined on the basis of the indicator system (Group C)
- Local policy for agriculture in protected areas on the basis of monitoring using the indicator system for biodiversity in farming areas (Group D)

10. Can our indicators be used in national programs?

Yes:

- In national programs for sustainable agriculture (Groups B and D)
- In national programs for protection of biodiversity in farming areas (Groups A and D

11. Do you suggest other applications of the indicators?
   ! These comments are not specified per groups

Evaluation of restored farming areas previously endangered by human activity:

- The re-utilized fields (incl. industrial areas)
- The abandoned fields
- All areas for non-agriculture in time of transition to agriculture use
- The surrounding/adjoined areas to farming areas

12. Could you be a user of these indicators?

Yes. The use of an indicator system should commit to practical benefits (market for certified production from places with high biodiversity; ecotourism, sustainable tourism and gourmet) (Groups A, B and C)

6. Case Study Hungary (H_GRA)

2nd Stakeholder Workshop	17 January 2012, Gödöllő
Farmers	Hungarian BioBio farmers
Administration	Ministry of Rural Development
& Public Authorities	Hungarian National Rural Network
Research experts	Animal Ecology Research Group of the Hungarian Academy of Sciences
	Hungarian Natural History Museum
	Institute of Biology and Ecology, University of Debrecen
	Dept. of Landscape Ecology, Szent István University

NB. With regard to the short deadline of organising the stakeholder workshop we had not managed to have anyone to represent an NGO.

1. Are you interested in indicators for biodiversity? Why / why not?

Farmers: Already during the field surveys BioBio HGRA farmers asked with much interest if there would be this kind of survey every year from now on because they, especially organic farmers, would be interested to see any trends of results. Indicators for organic farmers are important for measuring the environmental performance of their activities. They are proud of having high species diversity in their areas as it means for them that they are managing their land well without harm to nature. They are also interested to test and see if any of their usual practices (or any prescription in support schemes) are in fact not supporting biodiversity in reality. Non-organic farmers, instead of their personal interest in biodiversity issues, were rather only motivated in the BioBio project by the small reward we paid them for allowing us to survey their fields and their farming practices and for participating at stakeholder workshops.

Administration & Public Authorities: They are interested for two reasons: biodiversity indicators, if able to signal significant linkages between farming activities and biodiversity change, can assist scheme operators in revising and adjusting farming prescriptions of existing environment oriented agricultural support programmes aimed at nature conservation (e.g. agri-environmental schemes) to be more precise and efficient. Also these indicators might assist the elaboration of new agri-environmental management prescriptions or even the development of absolutely new measures. In both cases, biodiversity indicators ultimately serve to spend public money efficiently for sustaining agricultural ecosystems.

Research experts: To *improve the knowledge on the ecology* of terrestrial habitats through zoological sampling and *of agricultural landscapes* in particular is a very important research objective. Agricultural habitats cover about two thirds of Hungary and harbour rich flora and fauna. However, arable and grassland management intensity might have considerable effects on the biodiversity of the managed fields. Biodiversity *conservation efforts need well-established research results*

and sound scientific background. Appropriate indicators are very essential to assess management (or any kind of) effects on biodiversity.

2. Do you see a specific need for such indicators for organic / low-input farming systems?

Farmers: According to non-organic farmers there is no specific need for such indicators. They already feel that compulsory data provision is a heavy burden (e.g. keeping management conditions of lease contracts of national park directorates, keeping farming records for agri-environmental scheme participation). Some organic farmers think that it is important to see how good their farming is from a biodiversity point. There is the example of one organic farmer to whom the BioBio field research activities have already provided new pieces of information that have changed his way of thinking about the use of his areas. Indicators therefore by their pure information character might even help changing famers' perceptions to use their land in more landscape and biodiversity friendly ways.

Administration & Public Authorities: Yes. Currently organic farming is hallmarked primarily by the healthy nature of its products but there is relatively little information available on the effects of these farming systems on biodiversity. It is also not clear how much low input systems (which do not aim for the specific organic label) differ from organic ones in terms of biodiversity effects because due to lack of quantifying biodiversity advantages and disadvantages it was not possible so far to identify quantitative differences between these two farming types.

Research experts: In the last decades, the demand to counteract the loss of farmland biodiversity and ecosystem degradation has resulted in the introduction of environmentally friendly, low input agricultural management methods, such as agri-environment schemes and organic farming. Appropriate indicators are needed to assess the benefits of these low input farming systems on biodiversity in order to be able to identify factors to be improved among management practices. The benefits of low input farming systems have been proven in several former studies, however, most of these focused only on the managed arable crop or grassland, and neglected the management effects on the flora and fauna living on the rest of the farm area (non productive areas). Therefore indicators, which assess the benefits of these areas at the whole farm level are still needed. Studies on farmland birds, plants and invertebrates in Central and Eastern European grasslands and arable fields show that the relationship between population declines and agricultural change has been driven by *different mechanisms* compared to Western Europe. The management of such low-input and organic systems *should not be directly extrapolated from Western Europe*, but should be based on domestic surveys and studies.

3. What could such indicators be used for?

Farmers: For measuring the individual performance of the farms, signalling who uses his areas in a sustainable, nature-friendly way and to what extent. Could be used as additional information on contribution to biodiversity conservation of farm products or as a kind of quality brand/ certification schemes to gain market advantage.

Administration & Public Authorities: Biodiversity indicators can be used for identifying the conservation value and the importance of extensive farming systems

Through evaluating and quantifying advantages of extensive farming systems from the point of view of nature conservation, biodiversity indicators are a good possibility for devising novel types of certification schemes based on the promotion of biodiversity promotion, besides existing organic certification schemes.

Research experts: Both *biotic and abiotic indicators* can be used to detect certain *effects of a treatment and of different habitat features*. Appropriate biotic indicators in an agricultural system are supposed to represent local and/or landscape scale conditions, e.g. physical (ploughing, trampling) and chemical (fertiliser and pesticide use) effects at local field level and effects of landscape composition and configuration at landscape level. Furthermore, indicators might be used to measure *intra- and interspecific interactions among the elements of communities in the agricultural habitats*, e.g. to measure vegetation effects on the zoological taxa. These indicators could provide *good early-warning signals for environmental change*.

4. What are the major characteristics of the indicators to be used (scientifically solid, easy to measure, easily understood, attractive for a larger public, low cost)?

Farmers: not relevant

Administration & Public Authorities: Indicators should be appropriate for use in long-term monitoring schemes, be robust enough to signal linkages between biodiversity change and farming methods to a significant degree. Besides their deep scientific basis, indicators should be easily interpretable by farmers, easy to be standardised and low cost. Surveying should not require deep scientific knowledge.

Research experts: Money and time always count. A well-used indicator is *easy and fast to measure* or sample. Samples are easily handled or in the case of biotic indicators (e.g. zoological indicators) easy to identify. Measurement/sampling does *not need special former knowledge* on the given indicator. It does not depend on several background effects (e.g. sampling does not need special weather conditions), which makes the measurements/sampling and the *interpretation* of the findings easier. *Costs* of measurement/sampling and of laboratory work are cheap. It is *widely* used. Therefore, comparison of results at international level is also possible.

5. What do you think about the indicators which were retained to be tested in the BioBio project?

Farmers: They are considered very abstract, difficult to understand even for most educated farmers. Understanding the indicators and the message of the results in all cases requires help.

Administration & Public Authorities: Zoological indicators are probably able to react in a shorter time frame to changes in farming methods than botanical ones.

Research experts: Earthworms (*Lumbricidae*), spiders (*Araneae*) and bees (*Apoidea*) were used as indicators of low-input farming practices on farmland biodiversity. Their ecology is relatively well known and all three taxa have key roles in promoting ecosystem services, like soil decomposition, biological pest control and pollination. Furthermore, earthworms, spiders and bees have distinct habitat requirements, and thus can indicate both above- and below-ground effects of farmland management. However, these three taxa are relatively difficult to collect and to identify, but nevertheless species-rich.

6. Which indicators look more relevant and comprehensive for you?

Farmers: Those which are related to landscape and species diversity as these are more understandable.

Administration & Public Authorities: Indicators related to species and landscape.

Research experts: Based on our research experiences, of the three zoological taxa, spiders seemed to be the most appropriate indicator in a whole farm approach based on the results of the Hungarian case studies, since they responded to the habitat type and habitat composition successfully, due to their moderate dispersal power (compared to bees). Bees and spiders were both sensitive to the local vegetation structure and/or composition, while management effects were only rarely detected.

7. Why develop farming biodiversity survey?

Farmers: They do not see why to develop farming biodiversity survey. No idea.

Administration & Public Authorities: To collect long-term experiences to select farming practices that serve biodiversity conservation objectives. To advance the scientific basis for the development of agri-environment programmes, to improve environmental efficiency of such measures in order to be able to justify public money being spent. See more under answers for Question 1.

Research experts: The negative effects of intensive agriculture on biodiversity at the local and landscape scales are already well studied. Declining population trends of several plant, invertebrate and vertebrate taxa have been attributed to the multiplied use of inorganic fertilisers and pesticides and the increased land use worldwide. However, most of the studies focused on only the managed arable crop or grassland, and neglected the management effects on the flora and fauna living on the rest of the farm area. The approach of BioBio enabled us to investigate the habitats, which are not directly managed by farmers but which are influenced by farming practices and are important for most taxa living in agricultural landscapes within the farm, e.g. linear habitat features, forest patches and wetlands. Furthermore, regarding certain agricultural habitats, such as arable and other crop types, the lack of information on management effects on biodiversity is obvious, and no solid conclusion can be drawn. There is an urgent need for research, since more than half of Hungary is covered by arable land; therefore, the conservation of farmland birds largely depends on management practices there.

8. Who should pay it?

Farmers: There is no interest for the farmer to pay for it. These costs have to be borne by the state or the payment programme.

Administration & Public Authorities: If indicators aim to serve the more efficient operation of payment schemes (e.g. agri-environment measures) then surveys should be paid by the state from public money as the surveys serve public objectives. Especially, the budget of rural development programmes have considerable sums (e.g. in technical support budget) for covering costs of such activities.

If indicators aim to serve purely scientific interest then national budget for research financing should be a resource.

Use of private money (e.g. from famers) can only be justified if the stakeholders (farmers) have direct benefits from these surveys. A good example to raise direct interest of farmers (and also of biodiversity as well) if a new certification scheme that serves biodiversity conservation objectives is elaborated.

Research experts: Scientific research such as studying agricultural environment is considerably important both for human well-being and from a conservation biology point of view. Therefore, costs should be funded by state financial resources. However, the agricultural ministry, leading e.g. most of the agri-environment programmes, does not support farmland biodiversity research, nor does it consider conservation biology knowledge in a systematic manner.

9. How do we include these results in existing policies (AEM), biodiversity action plans, agricultural policy assessment, etc.

Farmers: not relevant

Administration & Public Authorities: The experiences gained with BioBio indicators will definitely be used in the agri-environmental monitoring system that is just about to start in Hungary.

Research experts: The scientific publication of some results of the Hungarian zoological samplings is already in progress in an international journal. However, beside scientific publications, national reports and communication with farmers and policy stakeholders is basically important to present the message of the project. There is a demand to develop a database for AEM studies, because these archives could be a good resource for meta-analyses which provides formal and quantitative synthesis of collection of studies. These syntheses could be used by authorities and stakeholders to develop/improve the AEM policies.

10. Can our indicators be used in national programs?

Farmers: Yes, but no idea how they could be used.

Administration & Public Authorities: Same answer as for Question 9.

Research experts: The application of earthworms, spiders and bees is possible in national programs in certain agricultural and natural habitats, however, considering the relatively high costs and time-consuming sampling and identification procedure, well designed and optimised sampling is recommended. Besides, especially earthworms and bees are more habitat dependent due to their soil and flower resource requirements, while spiders are broadly distributed in mostly each habitat type.

11. Do you suggest other applications of the indicators?

Farmers: No idea.

Administration & Public Authorities: Same answer as for Question 9.

Research experts: Yes, see answer to the Question 10. Instead of complete indicator taxa, it could be more efficient to find one particular indicator species (from a taxon which is considered as good indicator for AEM studies) and monitor them regularly (similarly to Natura 2000 programme).

12. Could you be a user of these indicators?

Farmers: organic/ agri-environmental / innovative farmer: Not in a direct way, if biodiversity surveys are not carried out regularly. However, comparisons with other farm's results might be interesting.

Administration & Public Authorities: Same answer as for Question 9.

Research experts: Yes, in the case of efficient knowledge on the ecology and taxonomy of the respective taxa.

7. Case study Norway (N_GRA)

2nd Stakeholder Workshop	24 January 2012, Vingelen, Tolga Kommune
Farmers	
Ingulf Os	Organic farmer, Os
Bente Kristiansen	Organic farmer, Os
Aksel Haagaas	Organic farmer, Tynset
Aashild Westgaard	Conventional farmer, Vingelen
Per Volden	Organic farmer, Os
Ola Trøeng	Conventional farmer, Vingelen
Roar Moen	Conventional farmer, Tylldalen
Administration & Public Authorities	
Per M. Langøien	Os Kommune, Agricultural Authority
Gunnbjørn Trøan	Tolga kommune, Agricultural Authority
Hilde Aanes	Alvdal/Tynset kommune, Agricultural Authority
Kristin Bryhn	Hedmark County Governor's Office, Agricultural Authority
NGOs	
Helge Christie	Oikos – Organic Norway
Others	
Wendy Fjellstad (wef)	BIOBIO member
Wenche Dramstad (wed)	BIOBIO member
Sebastian Eiter (see)	BIOBIO member

1. Are you interested in indicators for biodiversity? Why / why not?

- Yes, biodiversity indicators are interesting. To do with good agronomy.
- Yes, I believe that biodiversity is important
- One farmer had a shock-experience in USA – agro-chemicals in the drinking water - the authorities came and filled the wells with cement to stop people drinking from them. After that he started studying again and has worked to «convert» his neighbours. Some were converted – others aren't interested at all.
- Another farmer points out that many are just struggling to get along – they might see that things aren't right, but can't do anything about it because economics underlies everything. Should people put up with a poor economy because they believe in protecting the environment or should they live in the world we live in?

2. Do you see a specific need for such indicators for organic / low-input farming systems?

- No – not especially just there.
- Indicators are especially important when it comes to the outfields – for promoting the importance of using outfield resources.

3. What could such indicators be used for and why should they be used?

- Maybe indicators can be the motivation we «need» to change the way agriculture is practiced?
- Public information – satisfy curiosity – find out about connections in nature.
- Maybe they can be used in marketing – e.g. to give a premium to products with good indicator scores. All Norwegian lamb is almost organic because they just use the common grazing lands – could be sold in Europe as a quality product.
- At the moment, economics steers everything – most sheep farmers have other jobs, so they can afford to be organic – but farmers with bigger farms, who rely on farming for their income – they can't survive. The politicians don't seem to be paying attention, and they go on about food being expensive. Maybe the indicators could help shift focus from the purely economic.
- Big predators mentioned again (relevance somewhat unclear).

4. **What are the major characteristics of the indicators to be used (scientifically solid, easy to measure, easily understood, attractive for a larger public, low cost)?**

– Should be easy to understand. Good that stakeholders are deciding what should be included.
– Have to be able to trust the indicators.
– Should have a short response time – pick up changes quickly.
– They are bound to be scientifically solid anyway – the way the BioBio team are working!
– It's hard to communicate these complicated issues – it's important that the indicators simplify things - this is also what the politicians need!

5. **What do you think about the indicators which were retained to be tested in the BioBio project?**

– A lot of this makes very good sense – in spite of it coming from researchers! It's easy to understand and seems logical and reasonable.
– Fungi should have been included as indicators. Symbiosis between fungi and green plants is important. Fungi can tell you about all sorts of habitats – and they are found all over Europe – also in drier countries (examples from Tenerife)
– Soil compaction is important – measure soil density.
– Earthworms aren't easy – you can be organic but if you drive a big muck-spreader you might not have any worms. Or you can operate conventionally and use artificial fertiliser and have lots of worms. Soil pH is really important and soil compaction.

6. **Which indicators look more relevant and comprehensive for you?**

– Habitat richness and management indicators seem particularly important – but you need the control, to check how these actually relate to species.
– The management indicators seem most important – they are the ones that people steer and that can be changed by politics – the others are measured on the ground and you can't do so much to change them.

7. **Who should pay for indicator recording?**

– The State should pay.
– Partly the State/partly producers
– Would have to be covered in the annual "Agricultural Agreement" – where the State and farmer's organisations agree on payments to agriculture.
– The management indicators could be included in the reporting that the farmers do anyway – the State can pay – the farmers contribute with their time filling in the forms.
– Maybe it doesn't have to be covered by the Agricultural Agreement – what about the Directorate dealing with security issues? Ultimately this all relates to food security.
– Why should farmers - who actually have biodiversity - carry the costs of proving that? That would mean an even lower return on our products. The consumers should at least share the cost.

8. **How do we include these results in existing policies (AEM), biodiversity action plans, agricultural policy assessment, etc.**

    The question was specified for the case study: Do you think the indicators can/should be used in evaluating the effectiveness of agri-environmental schemes such as the Regional Environmental Programmes (RMP) or SMIL?

–   The farmers say no.
–   "It is sufficient that the agri-environmental subsidies are useful for the farmers" – not much of a vote for documenting the environmental effectiveness of subsidies.

9. **Can our indicators be used in national monitoring programmes for biodiversity?**

Yes

10. **Do you suggest other applications of the indicators?**

–   A mark of product quality, but… (not a straightforward issue)
–   Measure the indicators every fifth year and show the politicians the results so policies can be designed based on evidence rather than opinions and guessing.

11. **Could you be a user of these indicators?**

Maybe they could be used in marketing of local products (although that's profit-thinking again…)

8. Case Study Switzerland (C_GRA)

2nd Stakeholder Workshop	7 December 2011, Hotel Metzgern, Stalden
Farmers	
Administration & Public Authorities	
Barbara Steiner	Federal Office for Agriculture
NGOs	
Peter Althaus	IP Suisse
Alexandra Cropt	Swiss farmers' association
Urs Klemm	Consumer' organisation
Barbara Oppliger	Consumers' organisation
Lukas Pfiffner	FIBL
Others	
Felix Herzog	FDEA-ART BioBio team
Manuel Schneider	FDEA-ART BioBio team
Gisela Lüscher	FDEA-ART BioBio team
Luisa Last	FDEA-ART BioBio team
Susanne Riedel	FDEA-ART BioBio team

1. Are you interested in indicators for biodiversity? Why / why not?

- Yes. Trend to regional products is continuing. Consciousness for biodiversity is growing, but knowledge concerning biodiversity among consumers is still low. Interesting for decision maker in politics, environmental NGOs., ecological programs…
- Producers which want to use biodiversity as selling point should create a label, but new labels are not demanded, would need a high communication input.
- Interested. Such indicators could be useful to measure biodiversity in a uniform way, on national as well as on European level. It is also a measure for the actual situation
- Not interested. Other project already existing which looks at this kind of indicators.
- Biodiversity is one of the most important criteria for the evaluation of ecological measures in the context of sustainability

2. Do you see a specific need for such indicators for organic / low-input farming systems?

- It is assumed that organic farming and extensification promote biodiversity. If in this project it is shown that this is not automatically the case, biodiversity should be formulated as a separate mandate and in this case indicators would be needed to monitor these measures.
- The Swiss Bio label "bud" is very known throughout Switzerland, there is no need for a new label in organic farming.
- These indicators should also be useful for conventional farming systems as IP Suisse. They should not be restricted to extensive or organic farming systems.
- Only limited. Reason for this is the farm level. Biodiversity is not measurable for only one farm, rather for a restricted landscape level.
- No, it is important to assess biodiversity independent from farming systems. This should contribute to a competitive situation in this area.

3. What could such indicators be used for?

- Impact monitoring, marketing, label (???), awareness rising e.g. at schools, decision maker in politics, supermarkets…
- They could be used in different domains of the agricultural sector:
- Agricultural services in the matter of biodiverstity within the Swiss biodiversity strategy
- Contributions to biodiversity in the agricultural policy framework 2014-2017
- Labels
- Ecological network
- Regional nature park
- They need to present an additional benefit for agricultural production and translate the numerous efforts established in Switzerland
- On an agro-political level these indicators could be used to show that Switzerland has or has not a leading position concerning biodiversity. Additionally these figures show that farming systems according to ÖLN are better than organic farming systems, at least for Switzerland.
- As expenditures for a sustainable production they are often claimed as an additional cost factor. It seems important that clear criteria for their evaluation should be available.

4. What are the major characteristics of the indicators to be used (scientifically solid, easy to measure, easily understood, attractive for a larger public, low cost)?

- Depending on the application:
  for the larger public: Flag-ship-species
  for politics: easy (cheap) to measure
  for biodiversity: scientifically strong
- Comprehensible for farmers and consumers, easy to measure, cheap, good scientific basis, to be extrapolated for other farming systems, translation of an additional benefit for agricultural production.
- Easy to collect and to control.
- Long-term applicability, possibility to get an overview covering a large area.

5. What do you think about the indicators which were retained to be tested in the BioBio project?

- Suited for research, for decision-makers, adjusting regulations, for the larger public rather too complicated.
- A solid basis to measure and compare farm biodiversity with regard to valorizing the agricultural production.
- The problem is always the reference parameter: per hectare or per farm? This is confusing and not quite clean, because system borders are strongly changed like this.
- It is a pity that you don't provide more concrete recommendations for the farmers on how to enhance biodiversity on his farm.
- Indicators have to be evaluated individually. Following problems are open:

  - Reference to a natural environment. The existing investigations only compare farms, but not in relation to a natural environment.

  - Quantitative aspects: as the results show, the number of species grows with the area of the farm and the included compensation area. This can result in classifying a farm to high biodiversity, if on a big monoculture farm a biotope area can be found. Quantification necessary.

  - investigations of different indicators are time-consuming so they cannot be carried out covering a large area. Risk of compiling precise punctual values that are imprecise or even wrong in the overall context.

  - Question of the objective: evaluating biodiversity that is present on the area of a farm or impact of management system on biodiversity? Seems reasonable to concentrate on the first question and to approach the impact of management systems within a sustainability assessment.

  - Management factors should rather be integrated in an overall sustainability assessment. Same questions for genetic diversity as for species diversity.

6. Which indicators look more relevant and comprehensive for you?

- Correlation of species to habitat biodiversity.
- Indicator on cultivated species. This could also include farm animals.
- Indicator on diversity of habitats is also interesting.
- Most important are relations of management to species diversity. From this concrete measures can be taken. Habitats are preexisting.
- Hierarchy of indicators is rather the question. If the objective is a large-scale assessment of biodiversity within a region and of the single farms, the hierarchy could be as follows:
- Assessment of habitat density, surface ratio and network via aerial pictures.
- Rough collecting of species data at several locations.
- Detailed collection via species identification and genetic diversity on a reasonable percentage of the rough collection.

7. Why develop farming biodiversity survey?

- Targeted promotion of biodiversity via financial incentives, politics down to a local level (communities).
- Labels, evaluation of agricultural services within the Swiss biodiversity strategy,…
- Point system of IP-Suisse (already existing), direct payments.
- Improvement right/precise results, possibility to evaluate and promote the development of biodiversity on a large-scale, cost-benefit ratio.

8. Who should pay it?

- The confederation, assigned to promote biodiversity. Producers, partly, if they can raise their income by applying this.
- Depending on the finality of the application. If indicators are used e.g. within the Swiss biodiversity strategy, measures have to be paid by the confederation, not within the agricultural budget.
- The confederation or more precisely the Office for the environment (FOEN). The FOEN should dispose of such indicators in order to fill the biodiversity strategy with concrete objectives and contents.
- Large-scale investigations could be integrated into regional planning programs and financed over corresponding budgets.
- Investigations on farm level could be financed like organic or IP products.

9. How do we include these results in existing policies (AEM), biodiversity action plans, agricultural policy assessment, etc.

- I hope so.
- Yes.
- Yes. These indicators show where Switzerland is situated in an international context. But be careful with comparisons. It is not acceptable to compare an olive grove with Swiss agriculture.
- On a strategic level long-term biodiversity monitoring can build the basis for the development of farming systems that promote biodiversity.

Prerequisite:

- Cost efficient and simple research method
- Regional approach
- Including external impacts of the farm concerning biodiversity (eg. Elimination of virgin forest for the production of imported soy forage).

10. Can our indicators be used in national programs?

- Hopefully. It would be reasonable if they are significant.
- Yes.
- Rather no, because many regions are not comparable to conditions in Switzerland.
- Depending on the research objective. According to experience they have to be adapted, but it is worth looking for synergies.

11. Do you suggest other applications of the indicators?

- As described above, possibly for creation of a new label.
- Also applicable for conventional farms.
- Promotion of biodiversity through evaluation of indicator measurements and deducted measures
- Conciliator function in the competition of different farming systems
- Advertising point to promote sustainable buyer behaviour.

12. Could you be a user of these indicators?

- I don't think so.
- Not directly.
- Possible. But we have to discuss this with our project partner Schweizer Vogelwarte.
- The consumer organisations are open for the discussion concerning information for consumers regarding conscious shopping. A direct usufruct for the organisation not perceptible.

9. Case Study Wales (W_GRA)

Several local SAB members could not attend because it was a very busy time in preparation for Christmas markets or preparation for feed and maintenance of livestock over the Christmas break. An additional meeting was held in N. Wales with Arwyn Owen and Buddug Jones in the first week of January.

2nd Stakeholder Workshop	22 December 2011, IBERS, Aberystwyth University
	6 January 2012, National Trust, Hafod y Llan, Nantgwynant
Simon Lloyd-Williams	Farmer (Organic management system – Soil Association registered)
Monica Lloyd-Williams	NGO – RSPB Education
Kathleen Carroll (Substitute for Ken Stebbings)	Public Authority – Rural Affairs, Welsh Assembly Government
Alun Lloyd Davies (AD)	Public Authority – Countryside Council for Wales, Land Use & Management Advisor and Cambrian Mountains Ecosystems Service PO.
Susan Fowler	NGO – Director of Organic Centre Wales
Arwyn Owen	Farmer and NGO (Farm Manager National Trust, Hafod y Llan organic livestock production)
Buddug Jones (BJ)	Public Authority – Countryside Council for Wales (Common Land and Agriculture Advisor). Buddug Jones consulted with colleagues at CCW to obtain an Agency rather than individual 'view' (Hilary Miller - Team Leader, Senior Landuse & Management Advisor; Adrian Fowles - Senior Invertebrate Ecologist).
Email consultation with	
Peter Segger (PS)	Representative for organic food marketing

1. Are you interested in indicators for biodiversity? Why / why not?

Unanimous agreement "yes" for three reasons: a. policy making in the agri-environment sector, b. for farmers to monitor progress of their management to conserve and enhance biodiversity and c. as an early warning of adverse farming practices.

The focus of most farms is integrated land use and without clear indicators it is impossible to measure how successfully or otherwise a farm is achieving this goal of biodiversity and landscape conservation.

– They are a measure that can be given for delivery of biodiversity and would be beneficial to a whole list of various land use and management approaches (AD).

- Indicators enable changes in biodiversity to be measured and are valuable in evaluating the effectiveness of agri-environment schemes. It is good to see agricultural biodiversity indicators included that assess levels of genetic diversity in crops and husbandry animals. Agricultural biodiversity is a subset of biodiversity and its components are important for food security (ecosystem service). It is also good that farm management indicators are included under D in the 'Status of indicator selection…' table – understanding the links between 'traditional' farm management knowledge/techniques and agricultural biodiversity/Biodiversity is important (BJ).
- Low-intensity farming is probably the aim of most conservationists and has been the subject of a fair bit of research over the years across Europe. Perhaps this project is needed to reinforce that view at EU level, though it's sad if the message hasn't got across already (AF).
- Yes, observing and recording wildlife data from my, and any sustainable farm is one key indicator of the farm's resilience and sustainability. Others being soil, water, air, animals and energy factors. These together form one part of the overall indicator of sustainable development, others being the social and cultural indicators of any farm. We, together with the leading organic and low input farms and businesses in Europe and beyond, have worked for the past 3 years to find a form for this work. 'The Sustainability Flower' is the result and this we are now trying to develop. At home here, we do record several wildlife and environmental factors and all our work is to set this out as a " journey" to a better, more resilient and sustainable future. We need all the help we can get and express our enthusiasm for any project which can encourage us (PS).

2. Do you see a specific need for such indicators for organic / low-input farming systems?

This was considered to be useful in terms of justification within agri-environment policy but in practical terms there was no more need for biodiversity monitoring using indicators in these sectors than for any other type of agriculture. Some suggested it was important to demonstrate the effects of different farming systems on biodiversity which by implication would require adoption of standard methods to assess biodiversity indicators across all farming sectors.

Yes, especially those that can help highlight benefits of organic/low-input farming to ecosystem services (BJ).

3. What could such indicators be used for?

Assessment of progress towards biodiversity targets at the farm level and as an early warning of adverse effects of new farming practices/crops. Ability to link research projects using standardised methods and data sharing. Standard methods that can be used in the wider countryside by schools and NGO volunteers and compared with farm results. Use in policy development (decision making affecting farming types) and marketing of produce from farms.

- Used to provide baselines and to assess change over time.
- To act as a key outcome of biodiversity gain in various farming methods and to inform ecological services delivery (AD).
- Value-for-money suggests that agri-environment (AE) schemes should really be benefiting species that have declined from agricultural land through changing practices and are not just being replaced by species that are already ubiquitous in the managed countryside; if the only increase in earthworm diversity was related to species associated with manure heaps it

wouldn't have great implications for overall biodiversity value. This may be acceptable from the point of view of 'ecosystem services' but is still impoverished in the context of what those habitats are capable of supporting. And you can't know what those habitats are capable of supporting without a broader distributional context (AF).

– To highlight benefits of organic/low-input farming to ecosystem services (BJ).

4. What are the major characteristics of the indicators to be used (scientifically solid, easy to measure, easily understood, attractive for a larger public, low cost)?

Must certainly be scientifically robust and reliable. All these attributes were considered important and ability to measure indicators at any time within the general sampling period (reference to unrealistic constraints on sampling of wild bees with current method).

– Arwyn Owen suggested that it depended at what level they are to be used. If they are to be used as common indicators in the context of EU support programmes, then they need to be easy to measure and understand.
– All of these and they need to be reliable and dynamic indicators for Climate Change. (AD)
– All of the above but also their reliability and practicability, i.e., if they are affected by weather/climatic conditions, for example, bees, or if surveying becomes inaccurate/impossible in very wet conditions (BJ).

5. What do you think about the indicators which were retained to be tested in the BioBio project?

The current short-list was distributed. Sue Fowler, Kathleen Carroll and Alun Lloyd Davies did not feel that there was adequate time to absorb and comment upon this complex list. General agreement that none alone were perfect but that all appeared to be valuable.

– Arwyn Owen considered that they all had merit but varying degrees of practical application. The linkages are also important to consider.
– Not cost effective, expensive and time consuming (AD).
– Potentially costly and some may be unreliable, i.e. climate (e.g. high rainfall) in uplands may influence monitoring results as well as ability to carry out surveys. One way around this may be to adopt a participative approach and use indicators that, with some training, farmers can monitor. The Swiss have used this approach in the past, though I'm not sure how successful this has been (BJ).
– The invert indicators chosen represent the major trophic guilds (with the exception of phytophages). Each of them will involve high costs and be dependent on scarce expertise even in the UK. (AD).

6. Which indicators look more relevant and comprehensive for you?

Easiest to recognise and relate to direct measures of plant and animal species. It was also felt that habitat mapping and measures would be the easiest and most relevant for farmers to learn and apply. Those that give the quickest indication of changes/ responses also viewed as important (the time lag for the availability of IRENA indicators was considered a disadvantage).

The indicators for genetic diversity, habitat diversity and farm management are comprehensive, relevant and probably achievable. The indicators for species diversity are comprehensive and relevant but are probably less practical. Need to cooperate with the Government.

If there was unlimited cash and expertise then earthworms, spiders and aculeates could give an indication of biodiversity richness in most situations - although the latter in particular will be very sparse on upland Welsh sheep farms. But our upland farms are a world away from the richness of the Extramadura or the Rhodope Mountains and there are other groups, such as the Orthoptera and butterflies that might be far better and more readily interpretable indicators (AF).

7. Why develop farming biodiversity survey?

Farmer interest, knowledge of environmental changes and development of baseline for agri-environment schemes.

Biodiversity is important and key outcome of National Ecosystem Framework and without a survey, any monitoring data is fragmented and less relevant at a pan European level. The survey needs to link biodiversity to management units, Glastir monitoring and outcome monitoring.

8. Who should pay for it?

The components of Biodiversity are 'Public Goods' and should be Government funded. The main purpose is to inform national environmental policy and to fulfil international obligations for the conservation of biodiversity. Should be an integral part of European support frameworks. Glastir monitoring is already under development and this information needs to feed into this work (contact James Skates (WG)).

9. How do we include these results in existing policies (AEM), biodiversity action plans, agricultural policy assessment, etc.

Hard political lobbying is required, directly and via interested Agencies and NGOs.

Consult with those who are primarily engaged with existing policies to identify crossover and possible benefits WG (AEM) and CCW Monitoring Team (David Allen) and by demonstrating to WG/WBP/CCW their value to biodiversity monitoring of Glastir, BAP sites and statutory sites.

10. Can our indicators be used in national programs?

General agreement "yes". There was a particular comment from policy representatives that there is also an urgent need for such indicators at the national level to fulfil the monitoring provision for Glas tir (2012 agri-environment scheme). Liaise with WG/Glastir, Organic Centre Wales, WBP (ecosystems groups) and CCW Monitoring Team (David Allen, Dylan Lloyd).

11. Do you suggest other applications of the indicators?

Felt that they could be proposed for more general biodiversity surveys in the countryside and for target setting in farming. Could form the basis of academic study/ application in respect of biodiversity. As indicators of agrobiodiversity and in assessing Wales' contribution to the conservation of genetic resources in agriculture.

12. Could you be a user of these indicators?

Farmers, farmer policy and CCW agreed yes, CCW if the indicators provide reliable, additional evidence on biodiversity change. National Trust already monitoring habitats and species at Hafod y Llan and Arwyn Owen is always looking to compare data and more importantly capture relevant additional data.

10. Case Studies Spain (E_DEH & E_OLI)

2nd Stakeholder Workshop	22 December 2011, Forestry School, UEX, Plasencia, Spain
Farmers	
Antonio Cerro	Dehesa Farm Manager
Luis Gonzalo-Fernández	Dehesa Farm Manager
Antonio Gamonal	Spanish Association of Breeders
Enrique Vega	Farmer (Dehesa and Olive plantation)
Teógenes Martín	Farmer (Dehesa and Olive plantation)
Felipe Delgado Cid	Farmer (Dehesa)
Angel Muñoz-Montero	Farmer (Olive plantation)
Administration & Public Authorities (APAs)	
Marco A. Sánchez-Moreiro	Regional Bureau of Veterinary, Regional Government (Extremadura)
Emilio García Tejeda	Regional Bureau of Agriculture, Regional Government (Extremadura)
NGOs	
Laura García-Reina	Global Nature Fund, Spain
Javier Prieta	Spanish Association of Ornithology, SEO-Birdlife
Others	
Rafael Vázquez	AGROFOREX, Private Company
Felipe Delgado Cid	Technician on Management of Natural Resources and Landscape Planning

The discussion was animated by Gerardo Moreno and Fernando Pulido, scientists of BioBio team in the University of Extremadura, Spain. The work session lasted from 11 to 17 h.

In the following pages stakeholders' opinions are synthesized. It is necessary to point out that in many cases stakeholders emphasized the difficulty to give reliable responses because information (results presented) is still very

tentative.

1. Are you interested in indicators for biodiversity? Why / why not?

All stakeholders expressed interest on a simple and reliable tool for biodiversity assessment at farm level, because everybody understands the need of preserving biodiversity, and because a wide evaluation of biodiversity (different types of agricultural systems and practices) would help to adapt management practices for diversity conservation, and to design agrarian and environmental policies to support the farmer for biodiversity conservation.

Besides, NGOs argue the need of this type of indicators to assess biodiversity changes in farms/on territory managed under Land Stewardship Contracts signed between landowners (single or assembly of private farmers) and NGOs. APAs highlight the usefulness of indicators to demonstrate to society the great biodiversity treasured within subsidized agricultural systems. Farmers interpret indicators also as useful to assess the health of the agricultural systems and to evaluate the productive potential of the farm.

Finally, farmers indicated several concerns: (i) they doubt about the viability of implementing this assessment at farm level because of the high costs; (ii) indicators could be used only in the case the biodiversity assessment brings an economical benefit to farmers; (iii) they would prefer more related-to-productivity indicators and/or indicators more directly affected by practices; (iv) not all species are welcome in their farms (e.g., protected species involve limitations on the daily activities).

2. Do you see a specific need for such indicators for organic / low-input farming systems?

This question has a difficult response given that most stakeholders know a very limited variety of farming systems. Anyway, two contrasted answers were given:

Common indicators for every type of farming would be more practical, because:

    a)   it would be easier to generate protocols of measures and to have a sound technical basis and staff for biodiversity measurement;

    b)   The comparison of systems and practices in terms of biodiversity conservation would be direct, and in such a way, the sustainability of different types of farming can be compared;

At the same time, stakeholders think that indicators should contemplate the specificities of each type of agriculture and eco-region. For instance, in semi-dry areas (e.g. dehesas) the state of water in ponds and streams is crucial for livestock; hence indicators should include an aquatic taxon.

3. What could such indicators be used for?

Responses were partially pointed out in the question 1. Here, several utilities detected for indicators of biodiversity are listed (mostly shared by different kinds of stakeholders):

− To facilitate the diagnosis of the state of the farms.

− To compare the consequences in terms of biodiversity of the different farming systems and farming practices.

− For a better planning of practices and inputs and to correct farming practices through specific measures.

− To show how farmers are conserving biodiversity and to encourage them to take biodiversity as an advantage to increase productivity.

− For an overall evaluation of different semi-natural habitats within and/or in-between farms.

− For monitoring the result of the application of Land Stewardship Contracts (NGOs).

− To certify the public benefit of the farms (APAs).

− To articulate specific supports for farmers: agri-environment measures and other agrarian and environmental policies (NGOs and APAs).

− To obtain subsidies for specific farming systems/practices or for the conservation of specific farm element (non-productive, semi-natural …) (Farmers).

4. What are the major characteristics of the indicators to be used (scientifically solid, easy to measure, easily understood, attractive for a larger public, low cost)?

By order of preference, these are the main characteristics for indicators demanded by stakeholders:

1. Easy to measure.

2. Scientifically solid.

3. Ecological relevance. Good relation between indirect indicators and presence of species.

4. Economical (productivity) relevance.

5. Low cost.

6. Easily understood by farmers

7. Understandable for society who pays. If indicators are attractive for a large public, measures would be better accepted by society.

5. What do you think about the indicators which were retained to be tested in the BioBio project?

Indicators seem very comprehensive and sound, including many different approximations, and the set of indicators could constitute a very good tool for the assessment of biodiversity within farms. Anyway, the list is still very large, and the reduction to a shorter list is not easy.

However, farmers argue that the criteria for the selection of indicators seem more academic than practical. They propose more specific indicators of the state of the farm in terms of soil

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degradation, health of the system, ... Besides, they think that for Spanish case studies other taxa would be more interesting; e.g. coleoptera in dehesas (Carabidae for excrement recycling, Curculionidae as pests ...).

NGOS point at the need of differentiation among natural species and other introduced, potentially invasive ones. They also detect the lack of some indicators of landscape-scale taxa (e.g., birds using mosaic of habitats).

6. Which indicators look more relevant and comprehensive for you?

All of them seem reasonable and explicative. Among those better correlated, simpler and cheaper should be proposed. Overall, indicators of species diversity and habitat diversity were the best qualified.

For species diversity indicators: Plants and bees could be rather redundant. Spider (predator) seems the strongest indicator (higher in the food chain) but by contrast is not easily understood in relation to their role in the farm. Besides species richness, abundance is also very important.

The order of appreciation of the different indicators is the following:

- Genetic: Number and amount of different breeds per species > Number and amount of different varieties per species (Cultivar diversity)
- Species: Bees > Earthworms > Plants > Spiders
- Habitat: Habitat diversity > Habitat richness > Share of farmland with shrubs > Tree cover or density > Share of semi-natural habitats
- Farm Management: Average Stocking Rate per ha forage area > Pesticide use > Area without use of mineral N-fertiliser

7. Why develop farming biodiversity survey?

- For diagnosis purpose, assessing the environmental quality and trends of the farms.
- To compare habitats (productive versus semi-natural or non-productive ...) and farming systems.
- To evaluate the efficiency of the best farming practices, and possibly, to adapt management practices to correct negative effects.
- To implement CAP programmes and measures.
- To visualize the importance of farms for the maintenance of overall biodiversity.

8. Who should pay it?

Although managed mostly by private landowners, at their expense, biodiversity is a public good; hence administration (or nature conservation funds ...) should pay:

- either the assessment of biodiversity using proposed indicators.
- or the conservation of biodiversity within farms. In this case, farmers would be willing to pay if it means the right to a biodiversity conservation bonus.

Anyway, in this moment, all the farmers detect other priorities, given the deep crisis of the Spanish agriculture. Only if biodiversity assessment helps to improve the short-time profitability of the farms, the application of these indicators will be a success.

9. How do we include these results in existing policies (AEM), biodiversity action plans, agricultural policy assessment, etc.

AEM are not very popular in Spain because they usually have very little funds associated. Specific programs or measures should be implemented.

- Grant for creation or maintenance of semi-natural or non-productive areas within the farms (Biodiversity action plans).
- A premium for the participation in a program of biodiversity evolution under different farming systems and practices (agricultural policy assessment).
- Cross-compliance rules (farmers do not agree with this proposal).

The CAP post-2013 should include a more explicit measure for the promotion of biodiversity in the farms at the same level as CO_2 capture. Spanish stakeholders propose something in the line of Territorial Farming Contract.

10. Can our indicators be used in national programs?

Indicators could be adopted by the Spanish Strategy for Sustainable Use and Conservation of Biodiversity (Ministry of Agriculture, Environment and Rural Development).

Also in the National Plan of Conservation of Native Breeds and in the National Plan for the Control of Food Safety.

11. Do you suggest other applications of the indicators?

- Possibly qualification of farms for obtaining environmental labels and food safety labels for marketing purposes.
- Mapping biodiversity at the European level.
- To promote the adoption of organic and low-input farming.

12. Could you be a user of these indicators?

Farmers and NGOs think they could be potential users of the indicators.

A large diffusion program would be needed for different stakeholders and the large public.

11. Case Study The Netherlands (L_HOR)

2ⁿᵈ Stakeholder Workshop	8 March 2012, Office CLM in Culemborg (Netherlands)
Farmers	
Maaike Raaijmakers	• BioNext (Organic farmer organisation)
Henk Kloen Adriaan Guldemond Joost Lommen	CLM - Centrum Landbouw en Milieu (Advisory Bureau on sustainable farming)
Administration & Public Authorities (APAs)	
NGOs	
Others	
Rob Jongman	ALTERRA

The meeting started with a short introduction of the participants, although most did know each other from other meetings.

All three organisations are heavily interested in indicators for biodiversity; Alterra from a more scientific point of view, both other organisations from a purely application point of view.

We started with a presentation on the preliminary results of the BioBio project. This was signalled as important and interesting as there is no European wide overview of the biological diversity in organic farming systems. The presentation showed the diversity between the different systems in Europe. We could show that the farms in the Dutch case study are very diverse and do show the most intense part of farming in Europe.

We discussed the area that we selected in cooperation with BioNext in the beginning of the study, eastern Gelderland, eastern Brabant and we explained that we excluded farms in urban setting (e.g. The walled garden, Wageningen) and mixed farms. In the Netherlands we have selected 10 organic farms and 4 conventional farms. It was highlighted that finding conventional farms was rather difficult due to the original focus on organic farming. We discussed the different levels of farming indicators (genetic, species, habitat and management).

Both organisations are interested in indicators for biodiversity. They are curious to see the results of BioBio and the criteria on which "best indicators" are chosen.

CLM and BioNext valued very much the effort and the results on the field data as this is something that they do not have and are not able to collect.

CLM is also collecting data on biodiversity in farming with their "Gaia Biodiversity Yardstick". It is an internet tool for on farm biodiversity that quantifies on-farm biodiversity through an internet questionnaire that takes the farmer 20 minutes work. It is based on six themes: (1) crop and animals, (2) general management applied with biodiversity benefits, (3) productive areas under nature management, (4) non-productive elements (5) management of nature reserves and

(6) the farmyard. Aggregated results are expressed in a radar diagram or as bar chart. The first edition is online; it can be used and has already been applied. The yardstick can be used by both organic and conventional farms, the type of farming is included in the data. (http://www.gaia-biodiversity-yardstick.eu).

We discussed also the upscaling that Alterra is working on from case studies to European level sampling. According to the Dutch stakeholders the time effort needed for a real European approach would be a real problem as it will not be clear who is covering the costs and how this can be organised.

We discussed the linking of the two approaches as the main problem of applying the BioBio approach at a wider scale for Europe would be the costs of the data collection. A combination of both approaches, in which the BioBio approach could be used as the approach for scientific underpinning of the GAIA yardstick seems much more attractive also for the work that farmers could do for it.

Taking this further the participants in the meeting agreed that exploring cooperation further might be a good way forward. The present yardstick has been developed with Leiden University and with industry (CONO and SuikerUnie). This means there is interest for measuring biodiversity, but in requires more exploration especially in cost efficiency.

The meeting agreed that it might be good if as a start CLM asks the farmers who participated in the BioBio project if they are willing to fill in the yardstick and to combine global results of Biobio with analysis of the Gaia yardstick.

The prototype of the GAIA yardstick is developed for the Netherlands, using species groups and management practices that are typical for a relatively intensive type of dairy, arable and vegetable farming in Northwest Europe. The prototype can therefore be readily applied in the Netherlands. Minor additions will make it applicable in other countries like Germany, Denmark and Belgium. It might therefore be good to link up with at least the central European and western European case studies in BioBio.

We will stay in contact and share the results of BioBio with them. We agreed to invite them for the final meeting in Switzerland.

Rob will also contact a Post Doc in Portugal working on HNV farming systems to see if she can work further in this direction.

Key questions to stakeholders

1. Are you interested in indicators for biodiversity? Why / why not?

Yes both organisations are interested as they represent sustainable farming and both of them are working on its implementation.

2. Do you see a specific need for such indicators for organic / low-input farming systems?

We see need for such indicators for organic farming as well as for conventional farming.

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3. What could such indicators be used for?

They should be used for improving the position of farmers on the market and help to sell healthy and sustainable products.

4. What are the major characteristics of the indicators to be used (scientifically solid, easy to measure, easily understood, attractive for a larger public, low cost)?

- Easy to measure as there is a time and cost constraint.
- Attractive to sell the farm products.
- Scientifically sound, but not necessarily measured in the field by species measuring. Clever solutions are wanted (see 1).

5. What do you think about the indicators which were retained to be tested in the BioBio project?

Birds and butterflies are important additional indicators but we understand that it is difficult to measure them in a project and link them to individual farms.

6. Which indicators look more relevant and comprehensive for you?

All are relevant, but looking at the cost, indirect ways to measure them should be developed.

7. Why develop farming biodiversity survey?

It helps farmers to make their products unique and helps to market them.

8. Who should pay it?

At present, the Dutch pilot is a combination of government and industry. That is a good combination.

9. How do we include these results in existing policies (AEM), biodiversity action plans, agricultural policy assessment, etc.

By selling easy methods to farmers, governments and industry.

10. Can our indicators be used in national programs?

They are too much pre-operational, but they could be used in a supporting programme.

11. Do you suggest other applications of the indicators?

See question 10.

12. Could you be a user of these indicators?

Yes, see question 10 and the relation with the GAIA yardstick.

12. Case Study Italy (I_VIN)

10 people took part in the meeting, 6 men and 4 women. The presentation was also sent to another farmer, who was unable to attend the meeting due to some unforeseen circumstances. However, he completed the questionnaire from home. Therefore there were 11 people in total i.e. 7 males and 4 females, responding to the questionnaire. The meeting was led by Dr. Tiziano Gomiero, and supervised by Prof. Maurizio G. Paoletti. With the consent from the participants, the discussion was recorded for the analysis.

2nd Stakeholder Workshop	16 December 2011, Dept. Biology, UNIPD
Farmers	
2	Organic farmers – vineyards and wine production
1	Organic farmer - vegetables
Technicians	
1	Field management consultant for organic farmers
Administration & Public Authorities	
1	Representative of the research unit of the Veneto Regional Agriculture Agency (Veneto Agricoltura)
NGOs	
1	Italian League for Birds Protection (LIPU)
1	Association for Latin America – Fair Trade
Others	
2	Representatives of concerned consumer groups
1	Chef using organic products
1	Soil scientist from the Faculty of Agriculture
Total No.: 11	

1. Are you interested in indicators for biodiversity? Why / why not?

All the participants expressed strong concern on the biodiversity issues. They stressed that there is a need to find ways and methods to monitor the effects of farming on biodiversity. However, each participant had slightly different reasons.

Farmers and the consultant: for them indicators for biodiversity (I. for B.) could be a useful tool to monitor the health of the soil, as well as to promote the organic production in the market. For organic farmers biodiversity can be considered "a product" on its own.

The Representative of VA stressed the importance of monitoring the environmental effects of different management practices.

Concerned consumers stated that it is important to have more information about the environmental performance of the farms from which they buy organic products (they wish to know whether their concerned consumption really has an impact on the farming practices via farmers adopting practices that preserve the biodiversity).

NGOs stated that I. for B. can be useful in monitoring the impact of farming practices on biodiversity conservation.

2. Do you see a specific need for such indicators for organic / low-input farming systems?

Participants agreed that I. for B. can help to improve management in view of enhancing the environmental quality. I. for B. should be made compulsory for the conventional agriculture as well.

For farmers, I. for B. can provide a benchmark against which monitor agro-ecosystem and crop health.

NGOs pointed out that I. for B. can be useful as a tool to compare organic and conventional farming methods.

3. What could such indicators be used for?

Participants agreed that I. for B. can help to monitor the health of the agro-ecosystem and in turn, to provide information on how to improve management and to reduce the environmental impact of agricultural practice.

For farmers they could help to monitor pests insurgence, as well as crops health.

4. What are the major characteristics of the indicators to be used (scientifically solid, easy to measure, easily understood, attractive for a larger public, low cost)?

Participants agreed that all the mentioned characteristics are important.

Farmers and the technician pointed out that they should be easy to be identified and to be put into correlation with the agro-ecosystem health, as well as being used to compare different systems and farming practices.

Along with the soil scientists which strongly supported the need for solid and effective indicators, NGOs and consumers also stated that they should be scientifically solid in order to guarantee the

consumers and at the same time made easy so as to be understood, that is, able to serve as a mean of communication. (Trust issue is very important to them. Recently, it has been reported that an estimated 10% of the products labelled as organic in Italy, were falsely labelled. It was discovered that people working for well-established national certification bodies, were also involved in this activity).

It was recognised that solidity may clash against simplicity, in this case solidity was maintained to be preferable. NGOs and consumers stated that scientists should make an effort to simplify (more comprehensible) the communication with laypeople. It has been pointed out that this is an issue on both sides which should be worked and aimed at. It has been also stressed that experts should be able to improve their communications skills in order to supply consumers with comprehensible information.

5. What do you think about the indicators which were retained to be tested in the BioBio project?

Participants stated that they can be a starting point and back further works in this sense. Anyway they feel that the number of taxa is rather limited and it is not clear what kind of information they (and the relative results) can supply, for example: are we able to know the total biodiversity from them? What can be said about the health of the agro-ecosystem?

Farmers and the consultant pointed out that taxa seem comprehensible but more taxa and other indicators are needed and they have to be accounted per habitat as well. It is import to know in which habitat they have been found in order to improve management and protect/preserve ecological structures.

The Representative of VA stressed the importance to define the goals and objectives, e.g. what have we to measure? Who has to use the indicators? These indicators tough, can be a starting point from which to develop the idea of I. for B., integrating the new finding with what is already known and other work under way.

Concerned consumers stated that the number of taxa is rather limited and some seem quite costly.

NGOs stated that I. for B. are a starting point and cannot be exhaustive. The representative of the Italian League for Birds Protection stated that they took part in some biodiversity monitoring exercises and felt that many more indicators were needed e.g. nesting birds and their feeding behaviour can supply important information about the structure and functioning of the agro-ecosystem, and there are already some studies supported this finding.

6. Which indicators look more relevant and comprehensive for you?

For this question the answers differed somehow among the participants.

Farmers and the consultant said that all the indicators presented seems fine. However, for some of them, it was not clear how they could be related to farm biodiversity (final results of the projects?). The soil has been indicated as the key element to the farm, so it is important to develop indicators so as to monitor the soil health.

The Representative of VA said that the fauna taxa used can be an important starting point.

Concerned consumers stated that all indicators are useful as they provide information for different characteristics. Concerning biodiversity, fauna and flora seem more important. However, it is important to have indicators that can provide information about trends towards the health and sustainability of the agro-ecosystem.

For NGOs those concerning flora and fauna are more useful to understand the effect of field management.

7. Why develop farming biodiversity survey?

Here the participants agreed on the following issues: monitoring the health of the agro-ecosystem and its impact on the environment. This is important, in turn, in order to monitor both the long term sustainability of the productivity (production side) and the quality of the products (consumption side). Externalities caused by agricultural practice should accounted for as well.

8. Who should pay it?

Participants seem to agree that the payment for indicators for biodiversity should come from institutional bodies, both national or European level. However, farmers may contribute once they perceive benefits from the investment.

Farmers: farmers may also be willing to participate if they see benefits for improving management practices and work towards more sustainable production. It has been pointed out that the present situation (biodiversity reduction) is also due to the pressure exerted by agrochemical corporations, seed industries, as well as consumers not taking this issue seriously. So they all should contribute to the organic farmers' effort to restore and maintain the biodiversity in their farms.

The consultant stated that the monitoring should be supported by the competent institutions and universities.

The Representative of VA said that it depends on the objectives e.g. farmers self-monitoring system vs. checking the performance of the CAP policy towards biodiversity. However, some measures are already in place aiming at checking the effects of the rural policy (which include soil health and biodiversity).

Concerned consumers stated that institutions should take care of that. However, they may be willing to contribute (in form of higher price) if they can be guaranteed that the products are of benefits to the environment.

NGOs stated that the support should come from CAP or other institutions (at European or National level) .

9. How do we include these results in existing policies (AEM), biodiversity action plans, agricultural policy assessment, etc.

Participants seem to agree that it is important that institutions, at different level take care of the issues towards different policies. It is felt that more information should be provided to both farmers and consumers.

Farmers and the consultant stated that more information should be provided by the institution to the farmers (to increase their awareness of the issue) as well as to the consumers to make them value production which aims at preserving the biodiversity and the environmental health.

The Representative of VA said it is important to analyse both pros and cons and then try to add new indicators to existing ones, so as to broaden their use.

Concerned consumers were not sure about that, as they do not know much about agriculture policy. Anyway, they would like these issues be taken seriously by regional agriculture policy to order to improve the local environment and consumer health.

NGOs stated that is it not easy to answer, however it is important to make results comparable in different geographical areas and biomes (within comparable characteristics).

10. Can our indicators be used in national programs?

Participants agreed that the indicators can be integrated to those already used but care should be taken, from time to time, to consider the different objectives and geographical characteristics.

Farmers and the consultant: yes, if they are effective, or selecting those more effective in view to the different objectives.

The Representative of VA agreed with farmers stressing the need to relate indicators to objectives.

NGOs along with Concerned consumers stated that they can be integrated to those used in national programmes (the more the better). Nevertheless, care should be taken so as to fit the indicators to the different geographical characteristics, e.g. northern vs. southern Italy, mountains vs. coasts. We may not be able to use the same indicators in all different places.

11. Do you suggest other applications of the indicators?

Participants pointed out that they can be useful in environmental education to raise public awareness and in conservation programmes.

Farmers and the consultant: are these I. of B. aiming at monitoring climate change also? That will be important. For them, it is important to focus on the soil, as it is the foundation of agriculture itself.

NGOs stated that some of them can be used in urban context as well.

12. Could you be a user of these indicators?

Farmers and the consultant: Yes.

The Representative of VA: Yes.

Concerned consumers: Not directly but they can help us to have more information about the environmental performance of the agro-ecosystem from which we buy our products.

NGOs: Yes (the Italian League for Birds Protection stated that they are already collaborating with institutions in projects for environmental monitoring).

13. Conclusion

Biodiversity indicators have been affirmed to be important for the evaluation of agri-environmental programs, for new policy development and for the marketing of produce from farms. Stakeholders propose regular monitoring intervals, so policies can be designed based on proven findings.

The complete BioBio indicator set of 26 indicators is generally accepted by the national stakeholder groups, although species and habitat indicators are addressed most frequently and seem more attractive and reliable to them than the indirect farm management indicators and the indicators for genetic diversity. Some stakeholders prefer faunistic indicators over botanical indicators because they expect fauna species to react more swiftly to changes in farming practices. Stakeholders even ask for additional species indicators. This stands in direct contrast to the requirement that the indicator set should be low priced. Furthermore, indicators should be scientifically sound, easy to apply and comprehensible for farmers and the larger public.

Hardly any stakeholder saw a need for specific biodiversity indicators for organic farming. Instead, there is a demand for indicator systems for both organic and conventional farming methods. A possible application, however, could be the investigation of effects of different farming systems (such as organic farming) on biodiversity.

Funding for implementing an indicator measurement and monitoring scheme is expected to come from national governments or from the European Union, depending on the purpose of the scheme. Both agricultural and environmental departments are mentioned. Farmers should only be paying if they can get a direct profit out of the application.