



**Doctoral school of
management and
business administration**

THESIS

Zoltán Szabó

**Evaluation of environmental impacts of crop production, with particular
focus on biodiversity**

External impacts of an intensive farm and an ecofarm

Thesis of Ph.D. dissertation

Supervisor:

Zsuzsanna Marjainé Szerényi
department chair

Budapest, 2010

Department of Environmental Economics and Technology

THESIS

Zoltán Szabó

**Evaluation of environmental impacts of crop production, with particular
focus on biodiversity**

External impacts of an intensive farm and an ecofarm

Thesis of Ph.D. dissertation

Supervisor:

Zsuzsanna Marjainé Szerényi
department chair

© Zoltán Szabó

Table of contents

I. RESEARCH BACKGROUND.....	4
II. THEORETICAL OUTLINE: CRITICAL ANALYSIS OF ENVIRONMENTAL VALUATION METHODS APPLICABLE FOR ASSESSING THE IMPACTS ON BIODIVERSITY	6
III. METHODS	10
1. <i>Qualitative assessment</i>	10
2. <i>Deliberative Monetary Valuation</i>	10
3. <i>Contingent valuation</i>	11
4. <i>Choice experiment</i>	11
5. <i>Impact Pathway Approach</i>	12
6. <i>Costs-based assessment</i>	12
III. FINDINGS OF THE DISSERTATION.....	14
IV. MAIN REFERENCES	19
V. THE AUTHOR’S RELEVANT PUBLICATIONS	22

I. Research background

Our dissertation has been inspired principally by our hypothesis formulated in the field of environmental economics that we intended to test in the field of agriculture. Our hypothesis is that based on the evaluation of environmental impacts and/or externalities, a policy can be elaborated leading us closer to a social optimum reflecting environmental considerations. The corresponding hypothesis regarding agriculture is to evaluate the environmental impacts of agriculture, and devise agricultural subsidies (economic incentives) according to these values. Thus agricultural policy will result in improved environmental quality and a higher level of well-being.

Our main objective is to evaluate the external environmental impacts of crop production. We are not stating that it is possible to evaluate and accurately estimate the total economic value of the environmental impacts, the externalities of agriculture, but we are positive that better results than the currently available knowledge can be obtained. There are fields with respect to environmental impacts of agriculture where a significantly larger part of the externalities can be evaluated by the application of new methods and further development of the existing ones. This research is an opportunity not just to evaluate crop production per se, but more specifically, the impacts of the typical technologies as well.

This dissertation moves forward in that respect that on our chosen site (Middle-Mezőföld, Hungary) we intend to evaluate as many impacts as possible (soil, water and air pollution, impacts on human health, biodiversity, landscape) at the same time, thus forming a socially coherent system of the performance assessment of crop production. To the best of our knowledge hardly any attempts have been made to apply this holistic approach, and even when applied, not all impacts have been taken into consideration (see Pretty et al., 2000; Tegtmeier and Duffy, 2004; Hartridge and Pearce, 2001.). Most of the studies resorted to estimating some of the externalities (soil erosion, pesticide use etc.) only. In this respect, Pretty et al. (2000) may have been the most prominent one. The authors, however, did not evaluate the external impacts themselves; they resorted to those that give rise to financial costs. It is Hartridge and Pearce (2001) who come closest to what we pursue in this dissertation. When estimating costs, Hartridge and Pearce based their assessment on willingness-to-pay studies, while both Pretty et al. (2000) and Tegtmeier and Duffy (2004) used treatment and prevention costs arising for third parties (restoring the state of the environment). Although Hartridge and Pearce (2001) extended the scope of their assessment

to positive externalities, they stopped short of moving beyond use values. Non use values were – decidedly –left out from the assessment.

We believe that agricultural subsidies, especially agri-environmental schemes, suffer from a lack of solid economic foundations; the current structure of agricultural subsidies and their set of objectives often lack any economic rationality (Baylis et al., 2008; Warren, Lawson and Belcher, 2008; Katona-Kovács, 2007). The economic theoretical foundations of establishing policies striving for a thorough social welfare balance are weak. It is advocated that, in this respect, environmental aspects will need to be better backed up.

Of course, policies can be underpinned several ways. The method described in this dissertation is just one of them. But we believe that this method has so far been relatively undeveloped and inadequately covered in scientific publications.

II. Theoretical outline: Critical analysis of environmental valuation methods applicable for assessing the impacts on biodiversity

There are various methods for valuing environmental goods in monetary terms. Considering the valuation of the outputs of multifunctional agriculture, Randall (2002) unequivocally underscores stated preference methods. One of the most prominent methods of valuation on a hypothetical market is contingent valuation (CV). The **second aim** of this dissertation **is to advance the methodology of valuing the impacts on biodiversity**. In our view, due to its complexity as well as the methodological problems, the issue of biodiversity constitutes the greatest challenge in the analysis of environmental impacts. It is emphasized that we do not pursue a thorough critique of CV as there already exists an extensive literature (see e.g. Clark et. al., 2000; Gowdy and Erickson, 2005; Kahneman and Knetsch, 1992; Sagoff, 1998; Blamey and Common, 1999). CV is assessed in relation to biodiversity only.

Lexicographic preference orderings may be a possible implication of ecocentric attitudes. The refusal to trade-off natural resources is logically consistent with the notion that nature has intrinsic value irrespective of its utility function to humanity. It is not only ethical commitments which may be a source of lexicographic preferences. Blamey and Common (1999) points out that it is known in psychology that when dealing with information-processing difficulties or with uncertainty as to the consequence of choice, people may adopt a rule-of-thumb strategy consistent with lexicographic preference orderings.

Biodiversity is a complex concept. In most instances the subject is characterised by deficient knowledge. To many individuals the characteristics and properties of biodiversity as a good are unclear. It is worth considering the argument of Christie et al. (2006, p.305.) whereby ‘if one is unaware of the characteristics of a good, then it is unlikely that one has well-developed preferences for it which can be uncovered in a stated preference survey’.

A general difficulty of CV surveys is respondents protesting against some aspects of the valuation task (Szabó, 2008a, 2008b). One of the manifestations of protesting in a hypothetical valuation survey is when an individual chooses a zero WTP to express unwillingness to trade-off the right of species to exist against the prospect of money (Spash és Hanley, 1995). Spash (2006) presents reasons which could lead to protest responses, including dislike of the payment vehicle and institution and lack of information. Macmillan et al. (2002, p.51) argues that ‘oversimplified information could generate protest or perhaps flippant responses’. Clark et. al. (2000) emphasises that some respondents, in order to

terminate the interview quickly, may opt for a quick escape strategy such as ‘yea-saying’ or protesting. Besides these issues, protesting may arise when the respondent already contributes financially or demands alternative approaches (Spash, 2006). Blamey and Common (1999) argue that responsibility consideration may lead to protest responses as CV questions may implicitly suggest that the respondent has some responsibility to protect the environment, thereby justifying financial contribution. Individuals, however, may believe that financial contributions are the responsibility of those who caused the problems in the first place. Using a typology of consumer psychology Fischer and Hanley (2007) suggest that there may be a link between impulsive behaviour and protest responses. The authors found that most protest responses were cognitively controlled, thus signalling a rejection of some aspects of the survey. We stress the methodological importance of general exclusions of protest responses in stated preference surveys. Researchers exclude protest responses from the analysis on the grounds of being illegitimate choices (see Blamey and Common, 1999; Spash and Hanley, 1995; Spash, 2006; Gelso and Peterson, 2005). Spash (2006, p.608.) argues that this practice results in a ‘systematic exclusion of respondents’ opinion’ and ‘censoring biases CV samples’. We are of the opinion that by excluding protest responses from the analysis of results, reality, modelled by stated preference surveys, is tailored and restricted to standard economic models. By eliminating protest responses practitioners reduce the sample to contain only those individuals who conform to the methodological requirements of Stated Preference surveys.

There are several indications of individuals having to form values (preferences) during the survey concerning the valuation of biodiversity rather than simply relying on and eliciting existing preferences (see Macmillan, Hanley and Lienhoop, 2006.). Spash (2007, p.693.) notes that ‘assumptions that preferences are pre-existing, stable, and complete across all choice sets, and can therefore merely be called upon, no longer seem tenable’. The notion of the prevalence of unformed or poorly-formed preferences for non-marketed public goods seems to be well-established in the literature (see Vatn and Bromley, 1994; Spash and Hanley, 1995; Sagoff, 1998; Lienhoop and MacMillan, 2007), yet we believe it does not receive adequate attention.

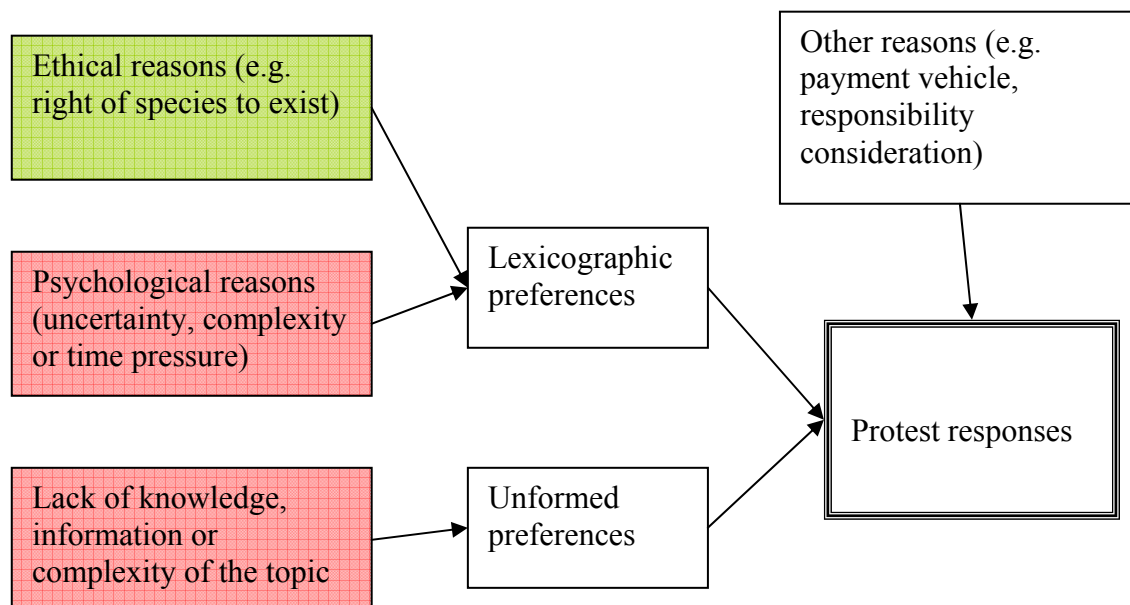
We argue that the problems of valuing a change in biodiversity by contingent valuation method are mainly due to the following two reasons:

- prevalence of lexicographic preference orderings;
- lack of a priori well-formed (unformed) preferences.

Lexicographic preference orderings are closely linked to ecocentric attitudes and intrinsic value of nature. In addition to ethical considerations, lexicographic answers may serve as a decision-making heuristic when facing uncertainty, complexity or time pressure (psychological reasons). The sources of unformed preferences can be traced back to a lack of knowledge, understanding and information as well as the complexity of the valuation scenario.

Any of the above two ‘unwanted’ factors may result in protest responses in a CV survey. Protesting based on ethical considerations only is considered to be legitimate. The remaining reasons should be regarded as methodological shortcomings. Hence protesting, as a manifestation of the following two reasons are deemed illegitimate: lexicographic preference orderings based on psychological reasons, and unformed preferences as a result of lack of knowledge, information or complexity of the topic. Figure 1 shows legitimate and illegitimate reasons for protesting in the field of valuation of change in biodiversity.

Figure 1 Structure of legitimate and illegitimate reasons for protesting in the field of valuation of a change in biodiversity



Note: Illegitimate reasons are marked with squared background, legitimate reason with dotted one.

It is important to avoid the methodological causes of protest responses. Therefore, we suggest reducing the influence of unwanted (methodological) factors by reducing the rate of protest responses. This will consequently increase the validity and acceptability of valuation of the impacts on biodiversity. Naturally, aiming for total elimination of protest responses would be

a mistake, as some such responses are in fact the result of legitimate lexicographic preferences based on ethical considerations.

III. Methods

The methods selected for the evaluation of impacts were applied with a view to ensuring a holistic approach, thus providing a more complete picture of the external environmental impacts. Method selection was determined by the topic, i.e. it was primarily influenced by the research subject's characteristic features and by the prevailing practice as shown by the relevant literature.

1. Qualitative assessment

In our view application of plural methods in the case of valuing the impacts on biodiversity are justified on grounds that, besides anthropocentric worldview, large portions of the general public may be characterised by ecocentric value orientation (see Glasser, 1999). From the perspective of ecocentrism it is only qualitative assessment or ranking that may be acceptable. Overall, 12 deliberative forums were held in Middle-Mezőföld, with a total of more than 100 participants. The first three deliberative forums were held with farmers, with the aim of discussing direct ecosystem services. Out of the three groups, two comprised farmers applying intensive agricultural technology and one that of ecological agricultural technology. Eight deliberative forums were held with local residents. The deliberative forums with local residents had a double aim; on the one hand a qualitative valuation of indirect ecosystem services, on the other a monetary valuation in the second session with the help of a contingent valuation survey. One deliberative forum was held with hunters to evaluate indirect ecosystem services.

2. Deliberative Monetary Valuation

For tackling unformed preferences and protest responses limited possible approaches have been available in the literature. One of the few attempts is deliberative valuation. This vaguely defined method has not been applied in Hungary, and experience on the international field is also rather limited (see Macmillan et al., 2002; Spash, 2007, 2008; Álvarez-Farizo et al., 2007; Sagoff, 1998, Getzner et al., 2005).

The Deliberative Monetary Valuation (DMV) combines stated preference methods with deliberative techniques known from political sciences. Deliberative Monetary Valuation, in our interpretation, is a two-session method, where the aim of the first session is discussing the good in question and deliberation, and the second session is about monetary valuation. Deliberation takes place in a small-group setting, and the time elapsed between the two

sessions (one or two weeks) allows for participants to think, seek additional information and form preferences. According to Spash, Stagl and Getzner (2005) the recognised inadequacies in the economic model of human behaviour have brought DMV to the fore.

It is important to emphasise that in the empirical studies reviewed by Spash (2008) a monetary valuation questionnaire was conducted during the first session of the deliberative process (see Macmillan et al., 2002; Kenyon and Hanley, 2005; MacMillan, Hanley and Lienhoop, 2006; Urama and Hodge 2006; Lienhoop and MacMillan, 2007a, 2007b; Alvarez-Farizo and Hanley, 2006). We believe researchers thus missed the opportunity for participants to acquire knowledge and information regarding the good. Relatively early in the process, participants realised the aim of the studies (having to make a choice, i.e. monetary valuation), and thus the process could not serve entirely to introduce the good (biodiversity) and the formation of preferences. Therefore, we believe the above studies missed the opportunity to decrease the uncertainty of participants in the deliberative process regarding the good, as the time period between the two sessions of DMV could have been used for preference formation. Spash (2008) regards the social value, which is based on asking for a small group to make a decision about what an individual should pay for the good, as *fair price*. The theoretical foundations of this non-aggregated form of value are laid down by Sagoff (1998), who differentiates consumer and citizen preferences. Getzner (2005, p.31) sees justification behind the dichotomy of consumer vs. citizen as citizens do not maximise their individual utility in order to seek personal advantages only but include broader societal arguments in their decisions as well. Households (respondents) act differently in the case of marketed goods and public goods. It is noted, that our interpretation of fair price is different from WTP only in the sense that it respects social equity. *Social fair price* is based on consensus seeking group decision-making.

3. Contingent valuation

To test the impacts of deliberative forums on the valuation of the impacts on biodiversity, using the same questionnaire, a contingent valuation survey was also conducted on a sample of 152 respondents. The primary objective of the contingent valuation survey was to increase the sample size of residents of Middle-Mezőföld. Deliberative Monetary Valuation can inherently be applied on small samples only.

4. Choice experiment

In Middle-Mezőföld a choice experiment survey was also conducted on a sample of 366 respondents. The use of choice experiment method is justified on the grounds that, as opposed

to contingent valuation, it is able to deal with several goods (attributes) in one survey. The primary objective of this survey was to assess the impacts of crop production on groundwater and landscape. The survey shed some light on willingness-to-pay of the local population in the case of both goods. Besides, the choice experiment complements the valuations of the impacts on biodiversity. Biodiversity, as a separate attribute, is incorporated in the choice experiment survey in order to avoid double counting at the aggregation of external cost estimations (see embedding or part-whole bias).

As qualitative ranking, during the deliberative forums, proved to be viable, for the sake of a larger sample size, this ranking was also used in the choice experiment questionnaire.

5. Impact Pathway Approach

The Impact Pathway Approach allows for estimating the impact of air pollutants in monetary terms (ExternE, 2005). In the case of crop production, the estimated costs of air pollution cover the fields of fossil fuel use, electricity use and artificial fertiliser use and production. The monetary unit costs applied in the calculations are taken from Methodex policy toolbox (2007). The principal steps can be grouped as follows (ExternE, 2005):

1. Emission. Specification of the relevant technologies and pollutants.
2. Dispersion models. Calculation of increased pollutant concentrations in all affected regions.
3. Dose-response function (exposure-response function): calculation of the dose from the increased concentration, followed by calculation of impacts (damage in physical units) from this dose, using a dose-response function.
4. Cost assessment. Economic valuation of impacts.

Valuation of the impact of pesticide use on health was also carried out by Impact Pathway Approach. There is no doubt that valuation of the impact of pesticide use is seriously burdened with uncertainties. This can be traced back to each pesticide having different dose-response functions. Therefore, uncertainties need to be constantly kept in mind.

6. Costs-based assessment

Not having a suitable method available, an attempt was made to carry out an estimation of external cost of soil destruction based on literature data analysis.

Five empirical investigations (qualitative valuation, deliberative monetary valuation, contingent valuation, choice experiment, impact-pathway analysis) served as a foundation for our research work. The table shows the methods applied for each environmental element and receptor. Applying these methods our project investigated two farms in Hungary’s Middle-Mezőföld region as a kind of case study.

Structure of methods applied

Receptors	Methods
Soil destruction (silting up)	Costs-based assessment
Groundwater load (nitrate)	Choice Experiment
Air pollution	Impact-Pathway Analysis
Pesticide use (health)	Impact-Pathway Analysis
Impact on biodiversity	Qualitative valuation, Ranking, Deliberative Monetary Valuation, Contingent Valuation, Choice Experiment
Landscape impact	Choice Experiment

III. Findings of the dissertation

Two main goals have been set for this thesis: on the one hand, a technology-specific combined evaluation of all external environmental impacts of arable crop production (soil, water and air pollution, human health, biodiversity, landscape) at the level of individual farms, and on the other, improvement of the valuation methodology used for assessing the impacts on biodiversity.

1. Outlining research gaps in the literature

Having reviewed the pertinent literature, this paper provides a critical overview of the rather small number of research projects which attempted to evaluate the overall environmental impact of agriculture. We found that none of these studies aimed at an all-encompassing valuation of such impacts by taking into consideration the agricultural technologies applied and by using individual farm data as a basis for the analysis.

2. Context of valuation of impacts on biodiversity

Due to the methodological challenge it presents, special emphasis was put on the valuation of impacts on biodiversity. Value systems and ethical attitudes play a particularly important role in the evaluation of biodiversity. Differences arising from anthropocentric and eco-centric value orientations were analyzed (i.e. whether nature has an intrinsic value or not), followed by an assessment of the possible appearance and role of consequentialist and deontological (certain acts are not permissible, regardless of their consequences) ethics in cost-benefit analyses. The task of taking into account use values and non-use values (see: total economic value) involves particularly serious problems. Accordingly, the impacts that do not manifest themselves in monetary form must receive special attention.

3. Assessing deficiencies of contingent valuation method with respect to biodiversity

Contingent valuation is the most widely used method for the monetary valuation of nature's goods on a hypothetical market. We pointed out some deficiencies of this method and attempted to elaborate and apply methods which enhance the validity and acceptability of valuations to be carried out with respect to changes occurring in complex and unfamiliar public goods such as biodiversity. As part of this work, lexicographic preferences, lack of

awareness and knowledge, as well as protest responses were discussed in detail, and finally the issue of unformed preferences was reached and explored.

4. Method for improving the validity of valuing the impacts on biodiversity

Based on the above analyses we concluded that the rate of illegitimate protest responses must be minimized. Furthermore, the context of valuations (isolated environment and small-sized groups setting offering a closer representation of societal situations) and the role of attitudes were also reviewed. In the end we focussed our attention on deliberative valuation methods. The *Deliberative Monetary Valuation (DMV)* method combines stated preference assessments with deliberative techniques. In our interpretation, DMV is a two-session approach where the aim of the first session is to discuss the issue of the good concerned in small group deliberation, while the second session is about monetary valuation; thus, in theory, it provides an opportunity for preference formation. In our research work we did not follow the practice reflected by pertinent literature because those studies had already introduced monetary valuation in the first session, whereby, we believe, they missed the possibility of addressing unformed preferences.

5. Qualitative assessments of changes in biodiversity and ecosystem services

On account of the need to consider the role of ethics, we applied multiple methods for the valuation of impacts on biodiversity. As shown by our survey, a considerable portion of the population (some one fourth or one third part) is thinking along the lines of deontological ethics; thus, qualitative assessments may be more acceptable to them. During the fairly large number (12) of deliberative forums, we found several examples that demonstrated the emotional attachment of participants to nature. Ecosystem services (which are underpinned by biodiversity) were discussed by following a deliberative guideline. The topic proved to be interesting for the participants: they readily talked about it and typically had a characteristic opinion on it. During all deliberative forums (i.e. those held with the participation of local residents, farmers and hunters), the economic aspects of the issue emerged (plant cultivation benefits and damages), indirect use values (e.g. bird watching) and also non-use values (disappearance of certain species). Farmers were able to establish priorities and rank indirect ecosystem services, even though the priority orders established by the different groups diverged from one another. Our survey revealed that in Middle-Mezőföld nearly three-quarters of the respondents (N = 325) considered improving the cleanliness of settlements more important than that of biodiversity (28.6 %), while the betterment of the situation of arts

was hardly preferred at all (5.6 %) to the increase of diversity of species and habitats (94.4 %). Similarly, only a few respondents (40.8 %) regarded the expansion of possibilities for sports and physical exercise as more important than the improvement of biodiversity (59.2 %).

6. Reducing the rate of protest responses

Our research found that **Deliberative Monetary Valuation** significantly reduced the **rate of protest responses** (cut it **by more than half**). As a consequence, it is a key feature of DMV that it can contribute to lowering the rate of illegitimate protest responses, **whereby the validity of monetary valuations concerning impacts on biodiversity can be enhanced**.

7. Estimation of fair price for changes in biodiversity

Participation in deliberative forums led to significantly different *fair price* results. Among deliberative forum participants the mean of the calculated fair price of a modest improvement in biodiversity (Switch from conventional to environment friendly crop production program) was HUF 6273/year/person, while among those who only completed the contingent valuation questionnaire this value was HUF 4330/year/person. Even without aggregation we managed to achieve a valuation of the impact on biodiversity, according to which the social fair price of a modest (10 to 20 per cent) improvement in biodiversity among deliberative forum participants (N=78) equalled 15 % of the price of bread.

8. Consensus-seeking collective valuation (of biodiversity)

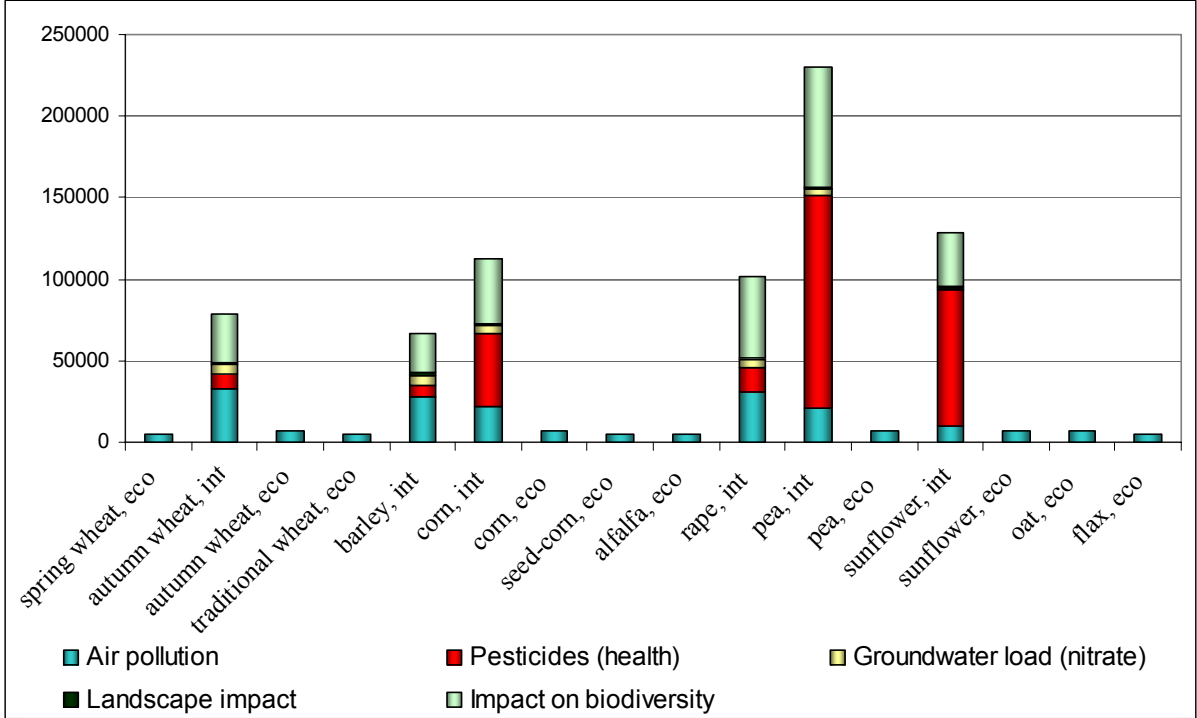
We also attempted to arrive at a *social fair price* through group consensus decision-making (it is possible that this can be considered as a new value category in view of the group decision-making and consensus seeking). In the majority of cases, however, consensus-seeking collective valuation was not achieved, which may have been a consequence of preference formation (solidification) by the second session of the deliberations.

9. Estimating external environmental costs of crop production at two farms

On an indicative basis, we elaborated estimates for the valuation of all external environmental impacts in the case of two farms in Middle-Mezőföld, which apply different agricultural technologies. We found that the selection of the plant cultivation technology resulted in marked differences in the combined valuation of impact on biodiversity, air pollution, pesticide use, impact on landscape, groundwater pollution and soil destruction (silting up).

External costs of the intensive agricultural technology were up to an order of magnitude higher than those of the organic farming technology. Impact on biodiversity, effects of pesticides on human health and air pollution constituted the three largest elements of external costs, whereas no external costs could be detected for soil destruction and agro-biodiversity. Aggregate external costs for one hectare of agricultural land came to HUF 5 to 7 thousand in the case of the organic farm, while such costs reached HUF 65 to 230 thousand in the case of the intensive farm (at 2009 prices; see Figure 2). **As regards the overall magnitude of externalities, it can be estimated that in the year under review the organic farm caused external costs equalling 5 % of the average procurement price of crops grown, whereas the farm applying intensive agricultural technologies caused external environmental costs coming close to 50 % of the average procurement price.** It is to be emphasized that **these results comprise rather great uncertainties**; thus our primary aim was to test the methodology and to lay the foundations for future research projects.

Figure 1 Estimated external costs of the two farms, broken down by plant cultures (HUF/ha; at 2009 prices)



Note: eco- ecological farm, int - farm applying intensive agricultural technologies

10. Minimum estimates of external costs of crop production on the two farms

In order to allow for the uncertainties, minimum estimates were also prepared. Even in this case, the selection of plant cultivation technologies proved to be a decisive factor for the results. Projected to one hectare of land, the minimum external costs of crop production on the organic farm were HUF 4 to 6 thousand, whereas on the intensive farm they reached HUF 21 to 36 thousand per crop (at 2009 prices).

11. Guideline for the refinement of agricultural policies

Valuations of the external impacts of the organic farm and the farm applying intensive agricultural technologies may be indicative for a future larger-scale (national, European) application of the methods here used. It is worth considering that the valuation of environmental impacts (externalities), especially in the case of non-tradable outputs, may also be based on the methodology here presented. This could make it possible to measure and/or interpret the justification and efficiency of agricultural subsidies not only for products but also for non tradable outputs (multifunctional agriculture). When the justification underpinning monetary valuation is questionable (if the ecocentric value system is taken as a starting platform instead of the anthropocentric value system), then in the case of biodiversity it may probably be necessary to consider the qualitative methods for the above valuations. As a consequence, the valuation will not be consistent because qualitative values will be included next to monetary values. Nevertheless, we believe that even so, the results obtained may serve as a guideline for the refinement of agricultural policies. Our results seem to confirm that environmentally-friendly farming technologies do bring benefits to society.

IV. Main references

- Álvarez-Farizo, B.; Hanley, N.; Barberán, R.; Lázaro, A. 2007, *Choice modeling at the “market stall”: Individual versus collective interest in environmental valuation*, *Ecological Economics* 60 (2007) 743 – 751
- Baylis, K; Peplow, S.; Rausser, G.; Simon, L., 2008, *Agri-environmental policies in the EU and United States: A comparison*. *Ecological Economics* 65 (2008) 753-764.
- Blamey, R. K. and Common, M. S., 1999, *Valuation and ethics in environmental economics*. In *Handbook of Environmental and Resource Economics*, ed. Jeroen van den Bergh. Cheltenham, UK: Edward Elgar, 1999, pp. 809-823.
- Christie, M.; Hanley, N.; Warren, J.; Murphy, K.; Wright, R.; Hyde, T., 2006, *Valuing the diversity of biodiversity*. *Ecological Economics*, Vol. 58, Issue 2, 15 June 2006, p.304-317
- Clark, J., Burgess, J., Harrison, C.M., 2000. *I struggled with this money business: respondents’ perspectives on contingent valuation*. *Ecological Economics* 33, 45-62.
- Cooper, P., Poe, G. L. and Bateman I. J., 2004. *The Structure of Motivation for Contingent Values: A Case Study of Lake Water Quality*. *Ecological Economics* 50 (1) 69-82.
- ExternE, 2005, *Externalities of Energy – Methodology 2005 Update*. EUR 21951 EN. Office for Official Publications of the European Communities, Luxembourg, 2005.
- Fischer, A. and Hanley, N., 2007, *Analysing decision behaviour in stated preference surveys: A consumer psychological approach*. *Ecological Economics* 61 (2007) 303-314.
- Gelso, B. R. and Peterson, J. M., 2005, *The influence of ethical attitudes on the demand for environmental recreation: incorporating lexicographic preferences*. *Ecological Economics* 53 (2005) 35– 45.
- Getzner, M., 2005, *A framework for valuing nature: regional biodiversity*. In Getzner, M., Spash, C. L. and Stagl, S. (Eds.), 2005, *Alternatives for Environmental Valuation*. Routledge. p.23-50.
- Getzner, M., Spash, C. L. and Stagl, S. (Eds.), 2005, *Alternatives for Environmental Valuation*. Routledge, London. pp.298.
- Glasser, H., 1999, *Ethical Perspectives and Environmental Policy Analysis*. In *Handbook of Environmental and Resource Economics*, ed. Jeroen van den Bergh. Cheltenham, UK: Edward Elgar, 1999, pp.981-1000.
- Glebe, T.W., 2007, *The Environmental Impact of European Farming: How Legitimate Are Agri-Environmental Payments?* *Review of Agricultural Economics* 29 (1), pp. 87-102.
- Gowdy, J. and Erickson, J. D., 2005, *The approach of ecological economics*. *Cambridge Journal of Economics* 2005, 29, 207–222.

Hartridge, O. and Pearce, D., 2001, *Is UK Agriculture Sustainable? Environmentally Adjusted Economic Accounts for UK Agriculture*. CSERGE-Economics. University College London. pp. 35. www.cserge.ucl.ac.uk/AGNNP.FINALFINAL.pdf

Huylenbroeck, G. Van; Vandermeulen, V.; Mettepenningen, E. and Verspecht, A., 2007, *Multifunctionality of Agriculture: A Review of Definitions, Evidence and Instruments*. Living Reviews in Landscape Research, 1, (2007), 3.

Kahneman, D. and Knetsch, J. L., 1992. *Valuing public goods: The purchase of moral satisfaction*. Journal of Environmental Economics and Management, vol. 22(1), pages 57-70.

Katona-Kovács J., 2007, *Analysis of Agri-Environmental Measures in Hungary – A Regional perspective*. In Studies in Agricultural Economics No. 107. Budapest, 2007, 79-96. pp.111.

Kotchen, M. J. and Reiling, S. D., 2000, *Environmental attitudes, motivations, and contingent valuation of non-use values: a case study involving endangered species*. Ecological Economics 32 (2000) 93-107.

Macmillan, D. C.; Loma P.; Hanley, N. and Alvarez-Farizo, B., 2002. *Valuing the Non-Market Benefits of Wild Goose Conservation: A Comparison of Interview and Group-Based Approaches*. Ecological Economics 43 (1): 49-59.

Macmillan, D. C.; Hanley, N. and Lienhoop, N., 2006, *Contingent Valuation: Environmental Polling or Preference Engine?* Ecological Economics 60 (1): 299-307.

Marjainé Szerényi Zs., 2005a, *A feltételes értékelés alkalmazhatósága Magyarországon*, Akadémiai Kiadó. pp.192.

MethodEx Policy Toolbox, 2007, [BeTa-MethodEx](#). In MethodEx, 2007, *Methods and data on environmental and health externalities: harmonising and sharing of operational estimates*. Final Technical Report: Methods. pp.299.

Nunes, P. A. L. D.; van den Bergh J. C. J. M. and Nijkamp, P., 2003, *The ecological economics of biodiversity: Methods and policy applications*. Edward Elgar, Cheltenham, U.K. pp. 165.

Pretty, J.N.; Brett, C.; Gee, D.; Hine, R.E.; Mason, C.F.; Morison, J.I.L.; Raven, H.; Rayment, M.D.; van der Bijl, G., 2000, *An assessment of the total external costs of UK agriculture*. Agricultural Systems 65 (2000) 113-136.

Randall, A., 2002, *Valuing the outputs of multifunctional agriculture*. European Review of Agricultural Economics, Vol. 29 (3) (2002) pp. 289-307.

Sagoff, M., 1998, *Aggregation and deliberation in valuing environmental public goods: a look beyond contingent pricing*. Ecological Economics 24 (2–3), 213–230.

Shortle, J. S. and Abler, D. G., 1999, *Agriculture and the environment*. In J. van den Bergh (ed.) Handbook of Environmental and Resource Economics. Edward Elgar, Cheltenham. p. 159-176.

Spash, C. L., 2006, *Non-Economic Motivation for Contingent Values: Rights and Attitudinal Beliefs in the Willingness To Pay for Environmental Improvements*. Land Economics, November 2006, 82 (4): 602-622.

Spash, C. L., 2007, *Deliberative monetary valuation (DMV): Issues in combining economic and political processes to value environmental change*. Ecological Economics 63 (2007) 690-699.

Spash, C. L., 2008, *Deliberative Monetary Valuation and the Evidence for a New Value Theory*. Land Economics, August 2008, 84 (3): 469-488.

Spash, C. L. and Hanley, N., 1995, *Preferences, Information and Biodiversity Preservation*, Ecological Economics 12 (1995) 191-208.

Spash, C. L., Stagl, S. and Getzner, M., 2005, *Exploring alternatives for environmental valuation*. In Getzner, M., Spash, C. L., Stagl, S. (Eds.), 2005, *Alternatives for Environmental Valuation*. Routledge, London. p.1-20.

Spash, C. L.; Urama, K.; Burton, R.; Kenyon, W.; Shannon, P.; Hill, G.; 2006, *Motives behind willingness to pay for improving biodiversity in a water ecosystem: Economics, ethics and social psychology*. Ecological Economics (2006), doi:10.1016/j.ecolecon.2006.09.013.

Tegtmeier, E. M. and Duffy, M. D., 2004, *External costs of agricultural production in the United States*. Journal of Agricultural Sustainability, Vol. 2., No. 1., p.1-20.

Vatn, A. and Bromley D. W., 1994, *Választások árak és védőbeszéd nélkül*. In Pataki György és Takács-Sánta András (szerk.), 2005, *Természet és gazdaság*. Typotex kiadó. pp. 557.

Warren, J.; Lawson, C. and Belcher, K., 2008, *The Agri-Environment*. Cambridge University Press. pp. 224.

Wilson, M.A. and Howarth, R.B., 2002, *Discourse-based valuation of ecosystem services: establishing fair outcomes through group deliberation*. Ecological Economics 41 (3), 2002, 431-443., p. 437.

V. The author's relevant publications

1. Papers in English

Szabó Z., (article in press), *Reducing protest responses by Deliberative Monetary Valuation: Improving the validity of biodiversity valuation*. *Ecological Economics* (2011), doi:10.1016/j.ecolecon.2011.09.025 <http://dx.doi.org/10.1016/j.ecolecon.2011.09.025>

2. Conference publications in English

Szabó Z., 2009, *Increasing the validity of valuing biodiversity: Reducing protest responses by Deliberative Monetary Valuation*. Proceedings of the [8th International Conference of the European Society for Ecological Economics](#), 29.06-02.07.2009, Ljubljana, Slovenia.

Szabó Z., 2008, *Valuation of Biodiversity: Deliberative Monetary Valuation combined with qualitative assessments in the field of agriculture*. In Sustainability and Corporate Responsibility Accounting – measuring and managing business benefits. EMAN-EU 2008 Conference Proceedings, Budapest, 2008. Corvinus University Budapest, Aula. pp.167. p.101-106. http://eman2008.uni-corvinus.hu/fileadmin/user_upload/hu/tanszekek/gazdalkodastudomanyi/t_kornyezetgazdasag/eman/eman-2008.pdf

3. Research reports in English

Szabó, Z. and Pál, J., 2007, *Agriculture Case Study in Hungary: Crops*. In Methods and data on environmental and health externalities: harmonising and sharing of operational estimates. Final Technical Report: Case Studies. MethodEx, FP6 Programme, European Commission, pp.299. p. 469-527. http://www.methodex.org/methodex_deliverable_12b.pdf

Szabó, Z. and Pál, J., 2007, *Agriculture Case Study in Hungary: Animal farming*. In Methods and data on environmental and health externalities: harmonising and sharing of operational estimates. Final Technical Report: Case Studies. MethodEx, FP6 Programme, European Commission, pp.299. p.528-568. http://methodex.org/methodex_deliverable_12b.pdf

4. Presentations in English

Szabó, Z., 2011, *Qualitative assessment of biodiversity improvements and relevant ecosystem services: A case study in Hungary*. Presentation at the 9th international conference of the European Society for Ecological Economics (ESEE), 14-17 June 2011, Istanbul

Szabó, Z., 2011, *Evaluation of environmental impacts of crop production: External impacts of an intensive farm and an ecofarm*. Presentation at 10th conference of Applied Environmental Economics (envecon), 4th March 2011, London

Ryan, A. and Szabó, Z., 2010, *A Psychological Investigation of a Choice Experiment Valuing a Biodiversity Proposal*. Presentation at 11th international conference of the International Society for Ecological Economics (ISEE), 22–25/08/2010, Oldenburg and Bremen, Germany

Szabó, Z., 2010, *Increasing the validity of valuing biodiversity: Reducing protest responses by Deliberative Monetary Valuation*. Presentation at the 12th International BIOECON Conference, Venice, Italy, September 27-28, 2010

Szabó, Z., 2009, *Increasing the validity of valuing biodiversity: Reducing protest responses by Deliberative Monetary Valuation*. Proceedings of the [8th International Conference of the European Society for Ecological Economics](#), 29.06-02.07.2009, Ljubljana, Slovenia.

Szabó, Z., 2008b, *Valuation of Biodiversity: Deliberative Monetary Valuation combined with qualitative assessments in the field of agriculture*. 11th Annual EMAN Conference, October 6-7, 2008 Budapest

5. Presentations in Hungarian

Szabó Z., 2008c, *A mezőgazdasági termelés (növénytermesztés) egyes környezeti hatásainak értékelése, különös tekintettel a biodiverzitásra*. II. Országos Környezetgazdaságtani Ph.D. Konferencia, Budapest.