

Non-market evaluation of landscape function of agriculture in the PLA White Carpathians

Netrční evaluace krajinotvorné funkce zemědělství v CHKO Bílé Karpaty

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Abstract: This paper describes research to quantify, in monetary terms, the landscape amenity benefits of agriculture in the Protected Landscape Area White Carpathians. Within the case study of the PLA, we measured benefits to three groups: local residents, visitors, and the general public. The benefit measurement technique used in the main part of the study was the Contingent Valuation Method (CVM). This allowed the estimation of both use and non-use (existence and bequest value). The emphasis in this paper is the derivation of information, which is essential for the design, and evaluation of compensation programs targeted to landscape amenity protection. Primarily, the need for this arises because of the existence of genuine concern for the provision of landscape amenity services by agriculture. It is also useful and of interest to evaluate and compare the perceptions of agricultural landscape amenity benefits as held by different affected groups of people.

Key words: External benefits, agricultural landscape, contingent valuation, agricultural non-market goods

Abstrakt: Příspěvek je zpracován na základě výsledků grantového výzkumu GA ČR zaměřeného na netrční evaluaci krajinotvorných přínosů zemědělství v CHKO Bílé Karpaty. Metodou kontingentního hodnocení (CVM) byly kvantifikovány přínosy pro tři skupiny cílové populace: obyvatelé CHKO, návštěvníky a obecnou veřejnost. Aplikace této metody umožnila odhad užitných i neuzitných složek komplexní ekonomické hodnoty krajinotvorných výstupů zemědělství. Zvláštní pozornost je věnována možnostem využití netrčního hodnocení pro potřeby tvorby a evaluace podpůrných programů ochrany kulturní krajiny. Tato potřeba je vyvolána prokazatelným zájmem veřejnosti o krajinotvorné přínosy zemědělství. Dále je provedena komparace jejich hodnoty mezi vymezenými skupinami ovlivněné populace.

Klíčová slova: externí přínosy, zemědělská krajina, kontingentní hodnocení, netrční výstupy zemědělství

In general, the potential for a rural area to provide countryside benefits depends on ecological and geographical factors such as presence of species and habitats, the area's capacity to regenerate and generate new habitat, climatic and geomorphological conditions. Nevertheless, many landscape benefits arise as joint products of certain forms of agricultural production. Thus, the agricultural technology adopted plays a major role in the provision of landscape amenities (Hodge 1991). Due to the fact, that more than half of the total territory of the Czech Republic is used by agriculture (54%), the landscape can change significantly over time as a consequence of economic demands and technological innovation in agriculture.

As in most European countries, the agricultural sector in the Czech Republic is characterised by structural change over time. A move to market orientation relaxed the pressure of intensification on the environment, but

on the other hand, the subsequent changes in agricultural production caused changes in provision of environmental benefits that remained, due to market failure to capture external benefits, unrecognised.

Recent agricultural policy and trade discussions have given increasing attention to "multifunctionality", the notion, that agriculture provides multiple outputs that include public goods (such as landscape amenities) as well as privately traded commodities. A frequent point of contention is also whether payment for the provision of non-commodity outputs¹ distorts trade by giving domestic farmers a competitive advantage over foreign competitors.

Under the current WTO rules, domestic policy measures may be placed in the Green Box if they have no, or at most minimal, trade-distorting effects or effects on production. They must be provided through a publicly funded government programme not involving transfers from

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¹ The policy guidelines proposed in the OECD work on multifunctionality of agriculture (OECD 2001) include landscape, natural habitat and land conservation. OECD does not attempt to establish a comprehensive list for non-commodity outputs.

consumers and must not have the effect of providing price support to producers. There arises a challenge for domestic policy-makers to ensure, that the designed policy is efficient, compatible with free trade requirements and motivated by genuine concern to improve the overall efficiency of rural resource use.

These developments form the background for a future Czech agricultural policy, the primary objective of which is the preservation of a productive agricultural sector in a functioning rural region. In accordance with these goals, the political question arises as to whether or not the agricultural sector should be compensated for the provision of landscape enhancing services.

The supply of non-commodity outputs, such as landscape, generates external environmental benefits for which farmers receive little if any remuneration. Under these conditions, farmers have no stimuli to deliver socially optimal level of landscape enhancing services. A number of policy mechanisms can be used to redress such agri-environmental problems and to reduce imbalances between agricultural policies and environmental objectives. The choice of policy instrument affects not only the cost-effectiveness criterion of policy evaluation but also, and more importantly, the distribution of costs and thus the political acceptability of such policy and compatibility with the WTO rules.

The Pareto improvement requires that no one becomes worse off, hence all losers must be compensated. Changes in rights and duties of agricultural land owners and users regarding the provision of landscape amenities require compensations to those, who lose, usually in terms of other rights or subsidies (Faure, Skogh 2003). One type of an appropriate policy measure targeting the landscape amenity provision is thus a compensation programme in the form of Agri-environmental Management Agreements.

Before asking whether, and to what extent, farmers should be compensated, it is necessary to measure the economic benefits associated with agricultural non-market services. There are, however, difficulties related to their valuation. These services comprise many different components (conservation of the agricultural landscape, natural disaster protection, maintenance of local culture etc.) and the scientific measurement of some items is very difficult (Hodge 1991). This creates the need for evaluation studies aimed at deriving estimates of social benefits from selected non-commodity outputs in various countries. In a cost-benefit analysis, the social benefits should be compared with the estimated cost of supporting preservation by means of public programmes to inform public decision-making with regard to the issue of economic efficiency.

Our study presented in this paper contributes to this discussion by supplying some results from a contingent valuation (CV) survey that investigates consumer surpluses from agricultural landscape-cultivating activities

in the typical extensive rural area of the PLA White Carpathians. In the CV scenario, respondents were proposed to contribute to the special fund of the PLA – exclusively destined to support those agricultural activities contributing to landscape preservation. As an alternative to this scenario, respondents were proposed the landscape resulting from abandonment of the traditional agricultural activity in the White Carpathians Area. Analysing the observed sample responses, then where derived estimates of the expected Willingness To Pay (WTP). While the main objective of the study was to infer the complex economic value of landscape non-commodity output produced by the existing level of provision of agricultural landscape in the PLA White Carpathians, the emphasis in this paper is the derivation of information essential for the design and evaluation of compensation programs targeted to landscape amenity protection. The need for this arises because of:

1. the existence of genuine concern for provision of landscape amenity services by agriculture; and
2. to assist in the evaluation and comparison of landscape amenity benefits of agriculture in the PLA White Carpathians as perceived by different affected groups of people.

MATERIAL AND METHODS

The common valuation frame for the multiple outputs of land proposed by the OECD (2001) is based on the assumption that each individual i 's level of well-being (utility) depends on the levels of consumption of two types of goods: commodity outputs $x_i = (x_{i1}, x_{i2}, \dots, x_{iN})$ bought in the market at prices $p = (p_1, p_2, \dots, p_N)$, and non-commodity outputs $z = (z_1, z_2, \dots, z_M)$ available at zero-price and given quantity/quality:²

$$U_i = (x_{i1}, x_{i2}, \dots, x_{iN}, z_1, z_2, \dots, z_M) = U_i(x_i, z)$$

Each individual is also assumed to allocate income y_i to the different N commodity outputs so as to maximise utility given prices p and exogenous non-commodity outputs z . The levels of commodity outputs x_i are selected by the individual at given market prices, however non-commodity outputs z enter the individual's choice problem as determined by the decisions of others (farmers, land-owners, government, ...) i.e. as externalities. Using the selected utility-maximising bundle of commodity outputs $x^*(p, y_i, z)$ back into the utility function yield the maximum, or indirect utility function:

$$V_i(x_i^*(p, y_i, z), z) = V_i(p, y_i, z)$$

Suppose there is a policy affecting the multiple commodity and non-commodity outputs of land with the policy outcome described in CVM by hypothetical sce-

² It does not imply that it is possible to measure utility in some units, but simply that individuals are able to consistently rank all possible bundles (x, z) according to their preferences.

nario as a change from (p^0, y_i^0, z^0) to (p, y_i, z) . Different individuals may be differently affected by policy depending on the way their utility changes. As each individual's utility change cannot be measured, to apply the welfare criterion of policy evaluation, we can still use an indirect money measure for each utility change. In the case of landscape amenity outputs evaluation in the PLA White Carpathians the measure of the Hicksian compensating variation (CV_i) of income³ was employed. It is defined as:

$$V_i(p, y_i - WTP_i, z) = V_i(p^0, y_i^0, z^0)$$

If an individual is a gainer with the policy, then $CV_i > 0$ and represents the maximum WTP for the policy to go ahead. If an individual is a loser of policy, then $CV_i < 0$ represents the negative WTP or the minimum the individual will require as a compensation for the policy to go ahead. If the algebraic sum of compensating variation is positive, we can conclude that policy gainers are able to fully compensate losers and still remain better off than without it. This is known as the Kaldor compensation test⁴. It can be used also as a proof of genuine concern of policy target.

The central theme of preference techniques, such as CVM (Contingent Valuation Method) employed in this case study, is the evaluation of the total landscape: i.e. one single value for the landscape unit as a whole rather than measurements for a number of components. Preference techniques value the landscape in its entirety: taking into account the whole bundle of varying attributes in a spatial area. The reason for application of the Contingent Valuation Method is the ability to present results as a single statement of total landscape quality, and the possibility of measuring the true value of the landscape to a wide spectrum of "users" (Dunn 1974).

STUDY AREA

The protected area of the White Carpathians (715 km²) is located in the South Eastern part of the Czech Republic along the border of Slovakia. Although from the private viewpoint farming is at the margin of economic performance in this area, it still has an important role from the social perspectives in terms of ratio of actively farmed area over the total territory of the PLA (49%). Maintenance and enhancement of landscape amenities by farmers are considered essential for the environmental protection, quality of life in this region, protection of cultural heritage and prosperity of tourism. It includes activities of farmers such as mowing grassland (important for protection of diversity of species like orchids), care

for rural trail along rivers and brooks, care for pastures, preservation of species through diversified arrangement of groups of trees, and brushwood and maintaining of typical settlements surrounded by fields and orchards. Through these activities, the agricultural sector provides landscape amenity benefits for society, and any proposed agro-environmental compensation program should create incentives for its provision.

DESIGN AND IMPLEMENTATION OF THE STUDY

The logic of CV studies is that of inferring the distribution of economic benefits in a target population from statements of Willingness To Pay (WTP) elicited from a random sample of respondents (see also Hanley, Shogren, White 1997). The information on the expected landscape amenity changes as a result of the "policy-on" situation is complex as it was described above. By using the Information Packs, however, a large amount of information of these expected changes were conveyed to respondents in an easily understandable way and the visualisation of landscape changes was provided. In the CV scenarios, respondents were proposed to choose from two alternatives:

- to contribute to the special fund of the PLA – exclusively destined to support those agricultural activities contributing to landscape preservation as to ensure the conservation of the current cultivated landscape;
- the alternative scenario was associated with the inevitably degraded landscape that will ensue from the abandonment of the agricultural activity.

The CVM survey instrument (questionnaire) was produced after extensive pre-testing. The questionnaire was administered in two forms (face-to-face interviewing and personal collection). Trained researchers carried out all interviews and data collection from March to December 2003. The three target population were general public, residents of the PLA White Carpathians and visitors. Respondents were chosen randomly.

RESULTS OF OPEN-ENDED CONTINGENT VALUATION ANALYSIS

Data set results

The total sample size was 1 441 useful responses from 1 550. Of these, 34% were in person interviews and 64% personal distribution and collection of questionnaires. Some 77.31% respondents were from the general public, 14.37% from residents and 8.33% from visitors. Regarding awareness of the PLA White Carpathians and taking

³ In comparison with Marshallian measure of consumer surplus (the change is evaluated from the original utility level and the original level of the service), using Hicksian compensation surplus measure the individual is evaluating the original level of utility and the new level of the service (delivered as policy outcome).

⁴ It is check on whether the particular policy leads to a potential Pareto improvement.

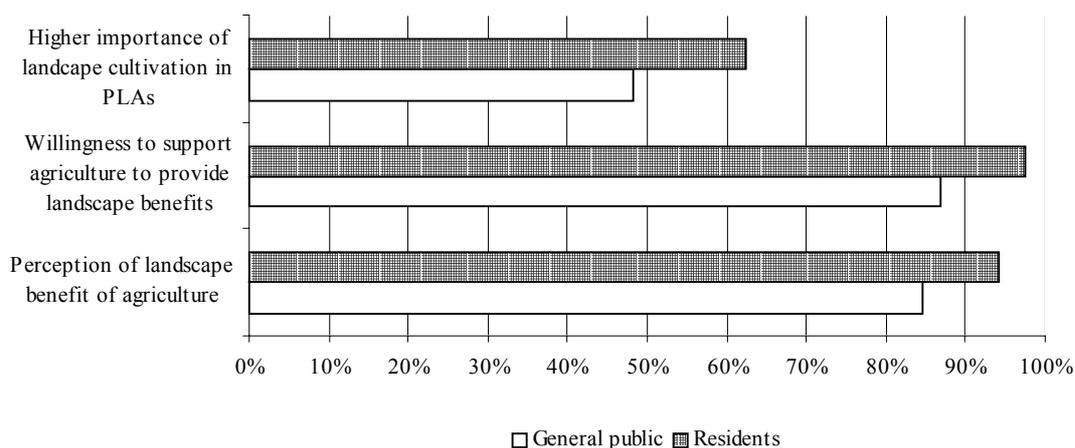


Figure 1. Assessment of the consensus among general public and residents regarding to the perceived importance and the willingness to support agriculture for landscape cultivation

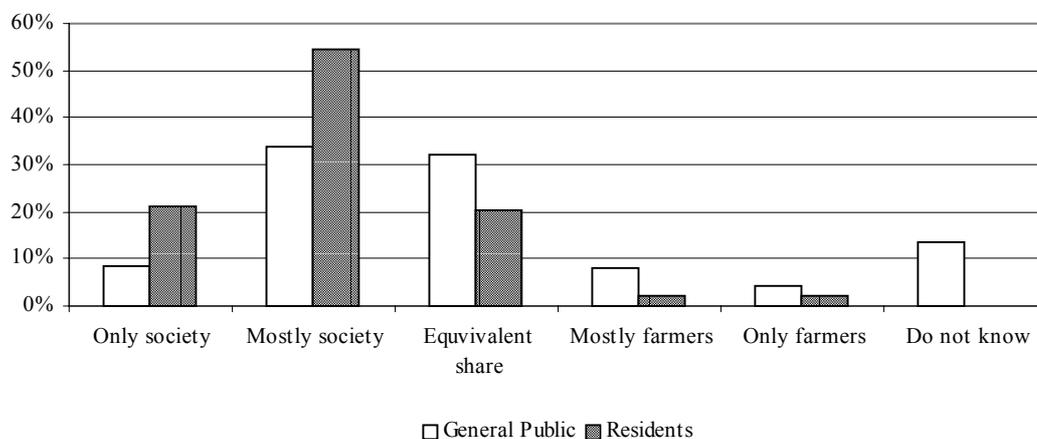


Figure 2. Perception of the reference level of the financial responsibility for the landscape amenity provision

the sample as a whole, 41.77% do not know this landscape, 58.22% of respondents are familiar with the landscape of this area, of which 73.06% (i.e. 42.53% of the total sample) had either visited or lived in area. If residents and visitors are excluded, then these figures change to 54.03%, 45.96%, and 55.85% (25.67%) respectively. The sample median income bracket is 25 000 CZK per month per household with median 4 persons in the household and the median age group is 30–35 years.

Genuine concern results

For the target groups general public and residents, respondents were first asked questions investigating consensus among them regarding the perception of the role of farmers as a providers of the landscape enhancing services, the willingness to support agriculture to provide landscape cultivating services (Figure 1) and the perception of the financial responsibility for landscape amenity provision (Figure 2). The results in the Figure 1 show the

existence of consensus among respondents from both target groups that agriculture plays an important role in the provision of landscape benefits and farmers should be supported to provide landscape enhancing services. This can be, together with WTP results, interpreted as a quantitative proof of the genuine concern for compensation program targeted to landscape amenity protection.

WTP results

A positive reply for the open-ended WTP question is interpreted as a positive change in the indirect utility function. WTP data analysis results, which investigate the values of landscape benefit services of agriculture in the PLA White Carpathians perceived by individuals from different affected groups of population, are summarized and compared in the Table 1.

The problem of how to deal with the negative WTP has been discussed in a series of articles. It is widely accepted that WTP on theoretical backgrounds (see above)

Table 1. WTP data analysis results

Variable	Unit	Gen. publ.	Residents	Visitors	Total
<i>n</i>	Resp.	1 114	207	120	1 441
WTP > 0	%	55.57	53.62	93.33	58.43
WTP = 0	%	36.36	30.43	1.67	32.62
WTP < 0	%	2.06	3.38	0.83	2.15
Protest	%	6.01	12.56	4.17	6.80
<i>n*</i>	Resp.	1 047	181	115	1 312
MEAN (<i>n</i>)	CZK/p/year	268.17	245.83	235.18	262.21
MEAN (<i>n*</i>)	CZK/p/year	285.33	292.45	247.55	287.99
MEAN (WTP)	CZK/p/year	482.62	458.44	251.97	448.75
MEDIAN (<i>n</i>)	CZK/p/year	200	10	150	150
MEDIAN (WTP > 0)	CZK/p/year	300	300	150	300
MODUS (WTP > 0)	CZK/p/year	500	100	500	500
STDEV (<i>n</i>)	CZK/p/year	316.26	511.17	225.69	345.18
TRIMMEAN (95 %)	CZK/p/year	188.39	24.55	162.50	155.14
MIN WTP	CZK/p/year	1	1	5	1
MAX WTP	CZK/p/year	2 000	5 000	1 000	5 000

*n** – shows the total of genuine zeros plus positive WTP bids; 1 • = 31.30 CZK

could be negative. According to Kriström (1995), the correct way of CVM application is to gather information from the respondents that allows for a distinction to be made between zero, negative and protest WTP bids. This was made by inclusion of a follow-up questions in the survey instrument that ask for the respondent's motives for stating a zero bid in order to distinguish the following categories of respondents:

1. Stating WTP > 0
2. Stating WTP = 0 or synonymous reply
 - a. Being indifferent, "true" WTP = 0
 - b. Having negative WTP, WTP < 0
 - c. Defined as a protest bidders

If we have the ambition to measure some sheer value of landscape benefits, it seems relevant to exclude respondents having negative WTP and respondents defined as a protest bidders from the sample, since we do not have information on their preferences for this good. We have only information about their share (see Table 1). This gives an overall protest level of 6.80%. On the other hand, some authors argue that the landscape enhancing services and the measure employed for its supply are not independent. It is thus the payments, provision rules and goods that the respondents are evaluating. If it is the package that is of main concern for the WTP evaluation, these respondents should not be excluded of the analysis. As we can see from the Table 1, including the protest responses and respondents with the negative WTP and treating them as having WTP of zero, reduces the arithmetic mean WTP of the total sample from 288 CZK to 262 CZK. After aggregation of results to the target population, it can represent significant difference in the value of landscape benefits of agriculture.

WTP was compared according to whether the respondent was a member of the general public, resident or visitor (Table 1). This shows that general public of the PLA White Carpathians value the landscape benefits of agriculture more highly than residents and visitors, but that the later two groups still place only slightly lower value on landscape benefit services. However, after protest and negative bids exclusion, the results show that residents perceive the highest value. The most common reason for protest bids of residents (protest level of 12,56 %), but also for the sample as a whole, was that they do not believe, that their money will be used for the stated purpose. It can indicate the need to ensure the transparency of the proposed policy programs.

As is usual in the CVM work, the median and the trimmed mean both lie below the true mean; this is due to the influence on the latter of values in the upper tail of the distribution. The standard deviation is less than twice the mean, which is somewhat lower than is usually the case in CVM. The lowest non-zero bid was 1 CZK and the highest which was 5 000 CZK per person and year.

CONCLUSION

In this paper, it is argued that in case of compensation programs targeted to landscape amenity provision, most economic relations and variables are very difficult to quantify, but they still should be considered to be of practical importance for the policy decision-making process and as a source of information to prove the eligibility to include domestic agro-environmental compensation program in the Green Box. Employment of CVM study for purposes of

policy evaluation was empirically documented on the case study of the PLA White Carpathians. This case study indicates that CVM can provide a useful quantitative but also qualitative information.

Despite of the difficulties associated with Contingent Valuation surveys and aggregation processes, it seems obvious, that there is a positive WTP for the provision of agricultural-landscape cultivating services in the PLA White Carpathians 262.21 CZK per person per year (287.99 CZK when respondents with protest or negative WTP are excluded). As the share of respondents with a positive WTP is 58.3%, the protest level is relatively low 6.8% and the share of negative WTP bidders is only 2.6%, we can conclude, that policy gainers should be able to fully compensate losers and still remain better off than without it. An agro-environmental compensation program targeted to landscape enhancing services thus can pass the Kaldor compensation test. The relevance of the order of magnitude can be expressed by comparing the aggregated WTP with actual levels of agricultural subsidies in the future research.

REFERENCES

- Dunn M.C. (1974). Landscape Evaluation Techniques: An Appraisal and Review of the Literature. Working paper No 4. Centre for Urban and Regional Studies, University of Birmingham, England.
- Faure M., Skogh G. (2003): The Economic Analysis of Environmental Policy and Law-An Introduction. Cheltenham: Edward Elgar.
- Hanley N., Shogren J.F., White B. (1997): Environmental Economics. Macmillan Press, London; ISBN 0 333 58236 5.
- Hodge I. (1991). The provision of public goods in the countryside: How should it should be arranged? In N. Hanley (ed): Farming and the Countryside. CAB International. 179–196; ISBN 0 85198 713 3.
- Kriströmm B. (1995). A Non-parametric Approach to the Estimation of Welfare Measures in Discrete Responses Valuation Studies. Land Economics, 66 (2): 135–139.
- OECD (2001). Multifunctionality: Towards an analytical framework, Paris.

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