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Characteristics of environmentally conscious production behaviour in agricultural waste management

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Abstract

When measuring environmentally conscious behaviour and determining its variables, focus often lies only on consumers, but environmental conservation requires not only the consumers' but also the producers' input. After defining environmentally conscious behaviour, I utilized the market research method to determine how participating in agri-environmental programs and subsidies affects producers' environmental consciousness and waste management behaviour. The research result indicates that participation in agri-environmental programs develops producers' environmental sensitivity, and improves their environmentally conscious behaviour, and this even holds true for waste management, which is not directly not subsidized by the programs.

Keywords

Environmentally conscious behaviour, agri-environmental program, survey, agricultural waste management

Introduction

For individual and organizational investigations defining environmentally consciousness is an essential task Both parties encounter the same difficulty in that those factors examined are characterized by a subtle system, of which the manifestation is influenced by the given researchers' perceptions (Nemcsicsné Zsóka, 2005). The investigated factors in the theoretical approach for environmental consciousness result in different models (e.g. Ajzen-Fishbein, 1980; Hines et al, 1986; Ajzen, 1991), which were subsequently systematized by Kollmuss and Agyeman (2002) which created three factor groups: demographic features, internal factors for the individual and external (economic, political) factors which are independent from the individual.

Stern (1997) defines environmentally conscious behaviour from two approaches. Based on one of them, environmentally conscious behaviour manifests itself in terms of how large the given behaviour type's effect is on the state of the environment. Here the individual does not have a definite role in evolving the behaviour, because the environmental effect may occur in an indirect way. The other approach, called will-oriented determination, defines environmentally conscious behaviour from the point of view of an active person, and does not concern itself with whether any change occurred in the state of the environment (Stern, 2000).

Researching environmentally conscious behaviour at the level of the individual first became a relevant research field within the framework of 1970s consumer society of which the principal contribution was showing that environmental consciousness was closely linked to a given consumer's behaviour. The investigations chiefly sought to describe consumer characteristics (e.g. Balderjahn, 1988; Schwepker-Cornwell, 1991). Environmental conservation requires not only consumer involvement but assumes and demands environmentally

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conscious behaviour from producers as well. This led to the realization that researching environmentally conscious behaviour also concerned agriculture. One group of researchers compared the farming practices of ecological and conventional farmers (e.g. Harris et al. 1980), while others analyzed farmers' ethics pertaining to production (e.g. Dahlberg, 1986) and Beus and Dunlap (1994, in: Mészáros, 2006). BEUS and Dunlap (1994, in: Mészáros, 2006) examined producers' farm practices using a developed behaviour index in relation to the paradigms in industrial and environmentally sound agriculture, and found that their opinions and values towards production mesh with their investigated behaviour.

Reviewing and analyzing the literature encouraged me to define environmentally conscious behaviour in terms of my investigations. I began with Stern's (2000) approach toward will-oriented definition, because to my mind, it expresses the definition of environmentally conscious behaviour well, revealing that the essence of environmentally conscious behaviour is in fact consciousness, meaning it depends to a great extent on the psychographic and behavioural characteristics of the individual. Stern's definition focused mainly on the consumer so I had to adapt it to the producers' level. Thus when formulating the concept, I relied on two relevant additional statements.

On the one hand, according to Velk (2000) most environmental problems may be attributed to behavioural, social and cultural reasons, meaning one's *environmentally* conscious behaviour is not determined by the nature of the activity one is performing. The other statement, which helped in arriving at the concept of environmentally conscious behaviour for producers, relates to profit maximalization, which may be considered as similar for both producers and consumers. The consumer always endeavours to get the best deal. The less valuable product is sacrificed for the more valuable to ensure the best profit. For producers the rule of economic logic also holds true, meaning that generally the producer (entrepreneur) aims to maximize profit (Koppányi, 1996) and private farmers tend to maximize gross profit. In this regard Roszik (2004) can be referred to, stating that environmental sustainability can only be achieved if the farmer can perform an activity in a profitable and safe way. Otherwise the farmer would become bankrupt, causing environmental sustainability in farming to fade away.

In the survey I considered *environmentally conscious production behaviour as being conscious human behaviour, which is based on factual and real environmental information and knowledge, occurring in decisions made based on the individual's environmental values related to farming activity. Its aim is to reduce overextending the environment by ensuring the livelihood of farmers.*

The definition includes the concept of Stern's (2000) will-oriented approach, as it strengthens the role of psychographic and behavioural features toward achieving the behaviour. At the same time, the definition makes it clear that the behaviour's objective is to reduce environmental damage, meaning the objective is also important, not just the willingness. The concept concerns the economic objective of the production activity, which is important as environmentally conscious behaviour cannot be developed by significantly curtailing the individual's economic interests.

Objectives

Environmental and nature conservation are dependent on co-operation with agriculture, but in turn agricultural performance depends mainly on environmental and natural resource conditions (Ángyán, 1995). It is thus relevant to develop environmentally conscious production behaviour, of which the significance is reflected in environmental and agrarian policy. According to Katonáné Kovács – Szabó (2007), the subsidy system for agri-environmental measures tends to strengthen environmental and social aspects of sustainable development rather than its economic side. The stricter the farming guidelines are, the more important the environmental and social dimensions.

In 2002 when the National Agri-Environmental Program (NAEP) first appeared in the subsidy system it meant a significant initial breakthrough pertaining to the Hungarian agri-environment (Katonáné Kovács, 2006). In Hungary, environmentally sound agricultural practices have been nationally subsidized. Because of this, land size and the number of farmers participating in agri-environmental programs have been increasing. Implementing agri-environmental rules governing everyday farming practices means farmers also become better informed regarding subsidies and the environment, which may enhance the environment's role in agriculture.

Based on the relevant literature, the hypothesis stemming from the analysis was that the National Agri-environmental Program started in 2002, and in 2004 was then integrated with the National Rural Development Plan, and Agri-Environmental Measures, which has had a measurable impact on the farmers' environmentally conscious behaviour. Thus the investigation's principal objective is to determine to what extent certain factors such as agri-environmental measures impact on farmers' environmentally conscious production behaviour.

Basically, the analysis does not concentrate on the farmers' knowledge of agri-environmental legal aspects and their practice, but on the effect environmental awareness has on poorly regulated agri-environmental actions. For this reason, I investigated the environmentally conscious behaviour of agricultural producers in the field of *waste management*, as it is not directly subsidized by the program, and thus adequately reflects producers' environmental values and behaviour.

Method

How to analyze behaviour patterns and their causal effects was adopted from consumer market research methodology. Gordon and Langmaid (1988) state that the **qualitative** method is suitable for examining an individual's behaviour. This is based on small-sized samples and the results are complemented with interviews. However, the **quantitative** method is based on statistics, numerical surveys, and allows for comparison between samples. Moreover, the quantitative method enables the test to be repeated as it is less dependent on the tester's approach.

The qualitative method is more likely better when it comes to interpreting the results, meaning the non-statistical results, however, would render it infeasible. Furthermore, qualitative method results may be less quantified and proving the results might only be able to be accomplished indirectly. Of course the subject of this paper falls under the category of

agricultural economics where quantitative proof is essential. For this reason the quantitative method is the chosen methodology for this paper which is combined with qualitative research elements.

Between April-July 2006, a questionnaire-based survey was used to conduct personal interviews among farmers in Hajdu-Bihar County with the help of consultants from Hajdu-Bihar County's Regional Chamber of Agriculture.

Using relevant reference literature and the objectives, necessary measurable variables were determined. My investigations used the following variables:

- environmental knowledge (declarative and procedural)²,
- environmental attitudes (importance and inconvenience)³,
- environmental responsibility,
- perceived efficiency⁴,
- demographical (school, living place, age) characteristics and
- economic (organic farming, participation in agri-environmental programs, farm size, production profile) factors as well as
- environmental behaviour (as a dependent variable).

As typical with qualitative research, the questionnaire contained questions that did not exclusively deal with the variables' raw results but also with their deeper interpretations. These were useful in filtering data and in evaluating results. Filtering was necessary in order to diminish the distorting impact stemming from the difference between intentions and actual behaviour.

The questionnaire data were coded and the database was developed and analyzed with the help of Microsoft SPSS 13.0 for Windows. Statistical methods were chosen in terms of the analysis objectives and the variables' measurement level.

Ketskemény and Izsó's (2005) recommendations were considered when selecting the appropriate method for measuring the data level. Non-parametric methods were used to examine the difference among ordinal independent variables (Kruskal-Wallis, Mann-Whitney and Wilcoxon test), and to compare frequencies a Chi² test was carried out. To investigate connections among independent variables correlation analysis was utilized. Nominal independent variables were only used for making segments, and thus only their frequency had to be determined. For analyzing relationships between dependent and independent variables, variance analysis (Anova and Turkey tests) and partial correlation were conducted. The reliability of statistical analysis was accepted by a probability level of 5% (P=5%).

When developing the sample, private farmers using land in Hajdu-Bihar County were viewed as the representative population. In joint ventures it is customary to separate strategic and operative management, and this is especially true for those having the biggest production size. Though the strategic manager's view basically influences the enterprise's operative

² Declarative knowledge means the knowledge of the operation of ecological systems (Schahn, 1993). Procedural knowledge is the understanding of access opportunities of the desirable environmental condition (Kaiser and Fuhrer, 2003).

³ When studying environmental attitudes, a lot of relevant literature focuses on the importance of behaviour and on accepting inconvenience in accordance with environmental conservation (Laroche et al, 2001, McCarty and Shrum, 1994).

⁴ The individual's own evaluation relating to his environmental friendly activity from the aspect of environmental conservation (Kinneer et al, 1974).

management, one can hardly expect him or her to deal with the whole production process in its smallest details. Given that waste management behaviour was being investigated on an operative level, in the case of a joint venture it would have been difficult to select the appropriate interviewee.

Table 1

Structure of the examined sample on the basis of land size of farms

Land size categories (ha)	Distribution of the basic population (%)	Number of farms in the sample
< 5 ha	17.59	18
5 - 9.99 ha	11.41	11
10 - 19.99 ha	14.59	15
20 - 49.99 ha	21.06	21
50 - 99.99 ha	15.52	15
100 - 199.99 ha	12.04	12
200 - 299.99 ha	6.64	7
300 - 499.99 ha	1.15	1
Altogether	100.00	100

Source: author's own calculation on the basis of HCSO, 2003

Given that the population contains numerous elements (52,235 private farms) and our financial resources were limited, we were not able to conduct an analysis of a large-sized sample. In line with Kotler's (1998) recommendations, probable sampling was used. Among the available criteria for studying the basic population, land use seemed the most appropriate tool for obtaining a representative sample. Therefore, the structure of the sample land was completed in line with categories based on data from the Hungarian Central Statistical Office (HCSO) (*Table 1*), after which stratified random sampling was conducted within the farming groups belonging to the given category. The element number of the sample was 100 farms.

Results

For questions gauging waste management behaviour, different types of waste were stipulated and the probable methods of handling the type of waste were added to each of them. The farmers were asked to identify how they handled different waste types. If they chose an environmentally sound method, they got 1 point, but if the method was not environmental friendly, they got 0 points. The answers were aggregated one by one. In order to differentiate between stated and real behaviour, filter questions were included in the questionnaire, and the answers given to these questions enhanced the accuracy for individual points. For example, if the farmer could not name the dangerous waste management firm where he disposes of his waste, he did not receive any points for disposing of dangerous waste even if he stated that he had actually done so.

In the questionnaire not every waste item was valid for every farmer, and thus invalid waste items were ignored. After developing the final points, the individual's waste management score was presented in a percentage form, showing what percentage of the given waste products were disposed of in an environmentally sound way. The answers were evaluated by developing a ratio scale.

After aggregating the frequency of the answers, interesting results emerged (Figure 1). More than one third of the farmers interviewed dispose of up to 25% of given waste products in an environmentally friendly manner. However, it is pertinent to mention that 17% of this production group dispose of none of their waste products using an environmentally sound method. Farmers disposing of at least 76% of their waste products in an environmentally friendly way constitute only 5% in the sample. The highest waste management value is 88%, meaning none of the farmers can be considered as environmentally conscious when it comes to disposing of waste products.

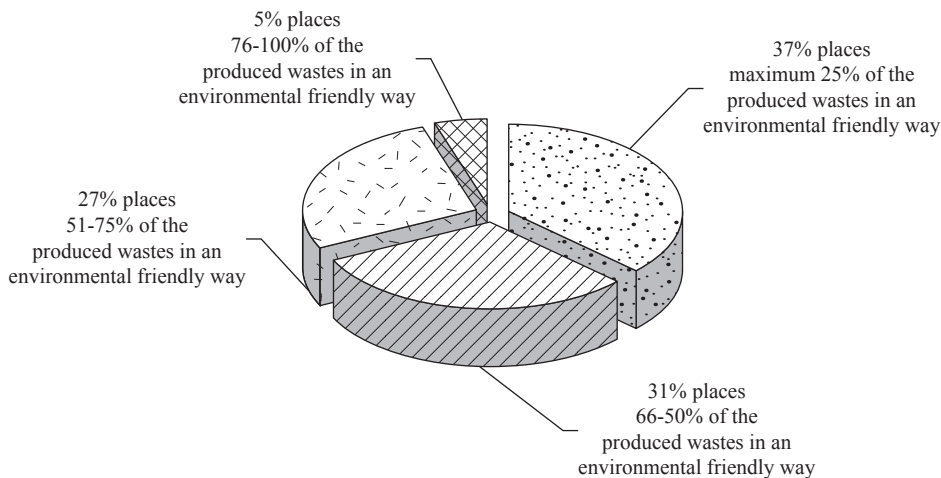


Figure 1: **Environmental friendly waste management of farmers in the sample**

Source: Author's own calculation

The results highlight the fact that there are serious deficiencies when it comes to agricultural waste management. This is hardly surprising as environmentally friendly waste management entails environmental conservation, which is hard to monitor, and there is no direct subsidy to facilitate the process. Moreover, in Hungarian society environmental consciousness has not reached a level where the majority of producers and consumers willingly obey environmental conservation rules.

When one probes the answers regarding certain types of waste materials, one sees that disposal of packaging for plant protection chemicals and disposal of animal carcasses are the cause of numerous environmental and conservation problems.

Only 46% of interviewed farmers dispose of packaging for plant protection chemicals in an environmentally friendly way. These farmers follow the regulations and return packaging to the vendor where it is handled in an appropriate manner. Those belonging to this farming group represent enough packaging to make disposal registration worthwhile.

The Chi² test's results reveal a significant difference between the answers of smaller and bigger farm operations at a probability level of 5% (P=5%). Small-size operations (size not exceeding 5 European Size Unit (ESU)) tend to burn the excess packaging on their farms, this despite the fact that it is considered as dangerous waste and burning plastics is basically frowned on. Moreover, despite the inherent risk, smaller farm operations tend to dispose of

plant protection material packaging with communal waste material. Obviously this is because the packaging entails such a small quantity that producers consider it easier to personally dispose of the redundant packaging instead of taking it to the appropriate disposal site. This is based on the environmentally friendly and professional packaging disposal practiced by larger farm operations.

It is also noteworthy that studied organic farmers, despite reaching markedly better results for several examined independent variables, are not more environmentally conscious than other farmers when it comes to waste management.

By segmenting the aggregated points of waste management according to participation in agri-environmental measures, the middle values of the given sub-samples were compared using variance analysis. There is a significant difference between the different farming groups at a probability level of $\alpha=0,05$ (Figure 2). Private farmers participating in the National Rural Development Plan (NRDP), and Agri-Environmental Measures (AEM), naturally obtained higher points for waste management than those who were not involved in either agri-environmental program. Participation in NAEP also improves waste management behaviour. The results of the survey prove that participation in agri-environmental programs provides an environmental education for concerned producers even though environmental friendly waste management is not directly subsidized by the programs. However, subsidy payments do cover official local monitoring costs related to administrative control of waste management.

There was a definite correlation between farm size and waste management behaviour. At the level of $\alpha=5$, there is a definite difference between the smallest (below 1 ESU size) and the other private farms. This result illustrates that the smallest farms are less environmentally conscious when it comes to waste management, and this is due to fewer waste products and to a lack of enforcement and consequences relating to their behaviour.

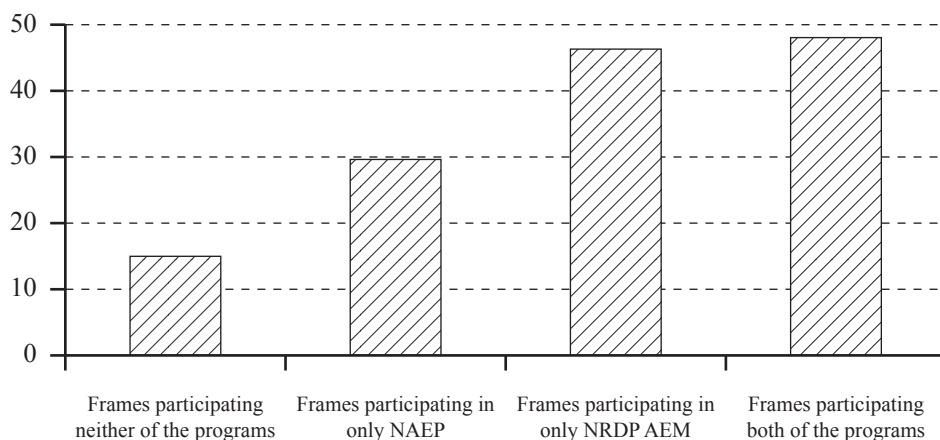


Figure 2: **The level of waste management segmented on the basis of participation in agri-environmental measures**

Source: Own calculation

Only place of residence seems to be an explanatory variable among the examined

demographic factors. Already at the level of P=1% one sees that those farmers whose farming and place of residence are the same are much more inclined toward environmentally friendly methods. This result is hardly a surprise as farmers residing on their farms obviously wish to maintain a clean environment in their place of residence.

Other than demographic and economic factors, a major part of my analysis entailed discovering what variables influence farmers' environmentally conscious behaviour (waste management) and to what extent. The statistical analysis revealed that waste management behaviour is, in terms of demographic factors, influenced by place of residence. Among economic factors participation in agri-environmental measures and farm size plays a role.

Partial correlation analysis was systematically applied for every independent variable to determine which independent variables correlate with waste management behaviour. Table 2 shows the results.

The results show that primarily economic factors such as farm size and participation in agri-environmental measures show a weak-medium, but still significant correlation with waste management behaviour. Both of the examined independent variables indicate significant correlation with waste management in a near equal ratio. Among the demographic factors, the previously mentioned place of residence reveals a similar correlation. Besides demographic and economic factors, only perceived efficiency has a correlation with waste management behaviour. Moreover, this correlation is even weaker than with demographic and economic factors.

Table 2

The correlation of the examined independent variables with the waste management behaviour (on the basis of the correlation co-efficient)

Independent variables	Waste management behaviour
Declarative knowledge	0.028
Procedural knowledge	0.046
Importance of environment	0.142
Inconvenience for environment	0.004
Perceived efficiency	*0.265
Environmental responsibility	0.049
Participation in agri-environmental measures	**0.341
Farm size (ESU)	**0.315
Place of residence	**0.319

* at the level of significant alpha 0.05

** at the level of significant alpha 0.01

Source: author's own calculation

It doesn't come as a surprise that, contrary to other consumption research, certain economic factors take precedence over psychological variables relating to personality as the other research focused on agricultural production as an economic activity and strove to investigate the environmentally friendly aspects and the relevant correlating factors. Clearly when formulating the production activity, it is not the farmers' personal traits but necessary profit-orientated decisions that usually prevail.

This result is complemented by other results to questions in the questionnaires. One of these questions dealt with the most important reasons behind environmentally sound agriculture (one had to select and rank three of the prefixed question choices). The results (*Figure 3*) show that farmers choose to take part in the program to receive the direct subsidy, and environmental conservation considerations do not prevail among the most frequent answers.

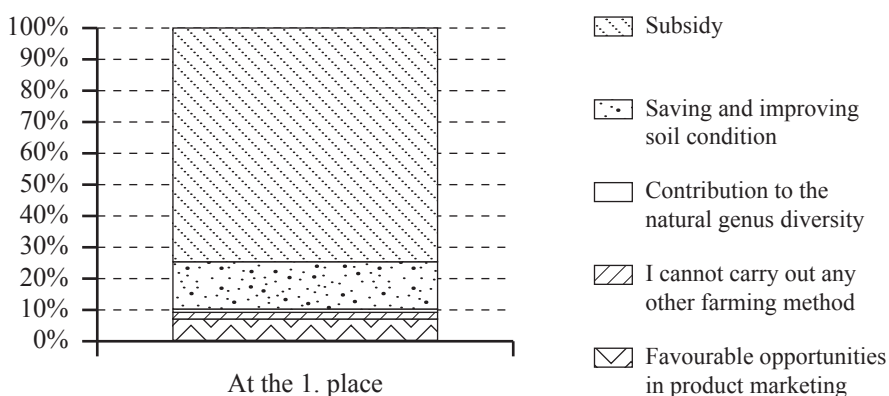


Figure 3: **Reasons for environmentally sound agricultural production – according to the opinion of the private farmers in the sample**

Source: own calculation

Conclusions

Based on the investigative results for environmentally conscious waste management, environmentally friendly waste disposal is a low priority for the interviewed agricultural producers. However, cost factors prevail over environmentalism when it comes to disposing of waste products. The producers tend to be especially lax when disposing of packaging and dead animals. In fact, even organic farmers are not shown to be more environmentally conscious than conventional farmers, and this despite their greater environmental knowledge and their greater sense of responsibility toward the environment.

For farmers environmentally conscious waste management behaviour is mainly motivated by economic factors such as participation in agri-environmental measures, and farm size. Although they are not directly subsidized, in terms of waste management behaviour agri-environmental programs have a positive impact on the farmers' environmental behaviour as they clearly serve to environmentally educate them. Naturally, for farmers the subsidy payment is an important consideration as those participating in the agri-environmental program strive to obey every law in order not to jeopardize their subsidy payment. Farm size also plays a positive role concerning environmental friendly behaviour as large farms are easier to monitor and thus they are more inclined to obey environmental conservation rules.

Among demographic features, place of residence clearly and positively contributes to environmentally conscious waste management because when farmers actually reside on their farms they tend to be more dedicated to environmental conservation.

Among consumers psychological variables have a greater impact on their behaviour than among farmers where non-demographical factors dominate environmentally conscious behaviour, with only perceived efficiency having a clearcut influence over waste management. This means that those farmers who are aware of how their environmentally friendly behaviour contributes to environmental conservation, actually do much more in concrete terms for the environment.

From the results it may be concluded that the hypothesis for examining environmentally conscious behaviour is true. Participation in agri-environmental programs has a clearcut positive effect on the examined behaviour. The results indicate that the formation of environmentally conscious agriculture requires extended participation in agri-environmental programs and financial subsidization, because the findings show that among farmers environmentally conscious behaviour is not particularly ingrained and one shouldn't expect this to change without definite incentives.

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