DETERMINANTS OF ENVIRONMENTAL RESPONSIBILITY OF AGRICULTURAL HOLDINGS

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Abstract

Environmental responsibility as a part of Corporate Social Responsibility is important especially in agricultural holdings because they manage the soil and the landscape. The aim of the paper is to examine whether the agricultural holdings consider the measures for improvement of the environment important and what are the determinants of their environmentally responsible behaviour. 133 representatives of large Czech agricultural holdings ranked four ecological factors according to their importance and were asked whether they implemented measures to protect the environment. To examine the determinants of environmental responsibility, a regression model, contingency tables, ANOVA and t-test were used.

Companies implemented on average 6 measures to protect the environment. The most important was careful handling of resources. Almost 83% of agricultural holdings took measures for energy savings and 2/3 protected ground water and soil. The number of measures taken increased with size. The average number of implemented activities was equal among different legal forms of the holdings, but different in various regions. The environmental responsibility of the company did not depend on the age of the manager, but on the education and sex (companies represented by university educated and men implemented more measures).

Key words: agricultural holdings, corporate social responsibility, environment

JEL Code: Q19, J43, J24

Introduction

Corporate social responsibility (CSR) is a concept describing a situation when an organization voluntarily integrates social and environmental concerns in their operations and interactions with the stakeholders. It was formalized by Carroll (1992) in the pyramid of four responsibilities: economic responsibilities are the base because firm must be profitable in the

long term. Then there are legal responsibilities as set rules must be obeyed. Ethical and philanthropic responsibilities are above all those levels, and at the top of the pyramid are social responsibilities.

CSR is linked to the stakeholder theory which views the exchange and the division of various resources between a corporation and its stakeholders as a necessary condition for success (Yuan and Cao, 2022). Socially responsible companies should therefore behave responsibly to the stakeholders (the consumers, the workers, local community etc.) and to the environment. The goal of CSR is to create sustainable, but at the same time profitable business. "It is assumed that the entities in sustainable agriculture are able to increase productivity in the long term thanks to environmental responsibility, while respecting the biological principle as well as the principle of sustainability" (Svitacova, 2021).

CSR and relation to environment are important especially in agricultural enterprises because they manage the soil and shape the landscape. Farmers have the responsibility for managing natural resources and play important role in sustainability of agriculture. "The practices adopted frequently determine levels of environmental degradation, as well as associated social and health risks." (Greenland et al., 2018).

However, Čerkasov et al. (2016) found that the activities of Czech farms in environmental area do not exceed legal framework and many of them emerge only from nature of agricultural production.

Environmental responsibility is one of the most important responsibilities from the point of view of the local inhabitants. Results of the structural model analysis performed by Rela et al. (2020) revealed that there is a direct, significant, and positive relationship between CSR and community well-being. However, from the point of view of the farmers, environmental responsibility is one of many others, competing responsibilities as found out by Gill (2012) on a case study of three Australian dairy family farmers. How Lithuanian farmers were aware of environmental responsibility in terms of eco-efficiency and cleaner production was examined by Vilke et al. (2021). It was found out that this aspect was important during purchasing of farm equipment and machinery. The patterns of farmers' environmental responsibility varied according to the characteristics of farms (size, years in operation, type of farming) and farmers (age, gender, education).

Important role in environmental responsibility adoption is played by the chief executive officers (CEOs) as found out by Huang, Cheng and Lee (2021) on a case study in Taiwan. Environmental leadership of the CEO affects the development of environmental corporate social responsibility adoption. On the other hand, employees can show environmentally

responsible behaviour only within the organizations. There was "an insignificant relationship between organizational CSR activities and employees' responsible behaviour towards the environment and society" found in the research of Pan et al. (2022). Presented research examines the implementation of CSR in environmental area from the point of view of the managers of the agricultural holdings.

1 Data and Methods

The aim of the paper is to examine whether the agricultural holdings consider the measures for improvement of the environment important and what are the determinants of their environmentally responsible behaviour.

1.1 Data

A survey among 133 representatives of large Czech agricultural holdings took place in 2018 by method of face to face or telephone interviews. Sample contained agricultural holdings from 13 regions of the Czech Republic (with exception of the capital city) farming in the municipalities with less than 2000 inhabitants. The most of them were from Středočeský, Jihočeský and Vysočina regions. Majority of holdings were joint-stock companies (42.9%) or cooperatives (37.6%); the rest were limited liability companies. The holdings employed 48 employees on average and farmed on 1282 ha of arable land (total agricultural land was 1565 ha). Majority of respondents were men (82.0%) and in age between 51 to 60 years (43.6%) that corresponds to the demographic characteristics of Czech farmers. Two-thirds of the managers had a university education and one-third obtained a high school diploma.

1.2 Methods

First, the managers ranked four ecological factors according to perceived importance: careful handling of resources, impacts of the farming on the environment, waste recycling and having an environmental certificate.

Consequently, the managers were asked whether they implemented any of the listed measures to protect the environment in the last 5 years: moisture retention in the landscape, delineation of retention areas, implementation of measures to protect groundwater and soil, utilization or reclamation of unnecessary agricultural areas (brownfields), measures to reduce or treat wastewater, measures to reduce air emissions, reduction of emissions and greenhouse gases, noise reduction measures, implementation of sustainable modes of transport

(electromobility), energy saving measures, planting bushes or landscaping in the village or its surroundings. The more measures were implemented the more environmentally responsible the company was.

Each measure was given a point and the total number of points was an explained variable (y) in two linear regression models (1). The explanatory variable (x) was the size of the holdings in terms of the acreage (first model) or the number of employees (second model). β_0 was a constant and β_1 was a parameter for explanatory variable x.

$$y = \beta_0 + \beta_1 x + \varepsilon \qquad (1)$$

Consequently, it was tested in contingency tables which measure depend on the size. The agricultural holdings were divided into 4 groups: ≤ 1000 ha, > 1000 ha and ≤ 2000 ha, > 2000 ha and ≤ 3000 and > 3000 ha; and according to whether they implemented particular measure. (Answers "I do not know" were omitted, so only 120 observations were used.) The empirical frequencies (n_{ij}) were gained by this approach. They were compared to theoretical frequencies (n_{ij}') calculated as (2).

$$n_{ij}' = \frac{n_{i*}n_{*j}}{n}, \qquad (2)$$

where n_{*j} and n_{*j} are marginal frequencies (sums of rows and columns of contingency table). Then a $\chi2$ independency test was applied (null hypothesis H_0: independence, alternative hypothesis H_1: dependence). If the p-value was lower than chosen level of statistical significance 0.05, H_0 was rejected and the signs were dependent – i.e. implementation of particular measure depended on the size of agricultural holding.

Whether the number of implemented measures differ based on the characteristics of the firm (legal form, region) and manager (age, education, sex) was tested by analysis of variance - ANOVA (3 and more variables) or t-test (2 variables). ANOVA assumes under the null hypothesis that average number of implemented measures in all groups is similar (H_0: $\mu_1 = \mu_2$ = ... μ_k). Alternative hypothesis is H_1: non H_0. If the p-value of the F-test was lower than chosen level of statistical significance 0.05, H_0 was rejected and the number of implemented measures differed according to particular determinant.

Similarly, null hypothesis of t-test states that the means are equal (H_0: $\mu_1 = \mu_2$). Alternative hypothesis is H1: $\mu_1 \neq \mu_2$. If the p-value of the t-test was lower than chosen level of statistical significance 0.05, H_0 was rejected and there was a difference in average number of implemented measures according to that determinant.

2   Results

According to the managers of agricultural holdings, the most important ecological factors for your business operation were careful handling of resources (materials, energy, land, water, animals, etc.) and possible impacts of farming on the environment. On the other hand, waste recycling and having an environmental certificate were placed on the third and fourth place. Almost all companies considered ownership of certificates and other documentation focusing on environmental protection and their practical implementation as the least important of all activities. How many companies ranked each factor on each place can be seen from Tab. 1.

Tab. 1: Importance of ecological factors

Ecological factor	1st place	2nd place	3rd place	4th place
Careful handling of resources	116	17	0	0
Impacts of farming on the environment	17	111	5	0
Waste recycling	0	5	121	7
Environmental certificates	0	0	7	126

Source: own elaboration

Share of agricultural holdings that implemented particular practical measure to protect the environment is displayed at Fig. 1. Almost 83.0 % of them implemented certain measures to safe energy (and also costs) and 2/3 protected ground water and soil (that is mostly the obligation by law). Over 62,0% of agricultural holdings took measures to reduce air emissions. On the other hand, sustainable transport concerned less than 1.0 % of agricultural holdings. One company implemented on average 6 measures. Only 6 companies did not implement any of the 13 listed activities in the area of environmental protection.

It was found out that number of taken measures (number of points) statistically significantly depends on the size. Estimated regression lines had equation $y = 4.9633 + 0.0006x$ (x = acreage) and $y = 4.7584 + 0.0233x$ (x = number of employees). If the size of agricultural holding increases by 1 ha (or by 1 employee), the number of taken measures increases by 0.0006 (or by 0.02). If the agricultural holding is larger (in terms of agricultural land) by 1 %, then the number of activities on average increases by 0.15 % and when the number of employees increases by 1%, there are by 0.19% more ecological measures taken. Both models and all parameters are statistically significant, but the intensity of the dependence is low in case of the acreage.

Fig. 1: Implementation of environmental measures
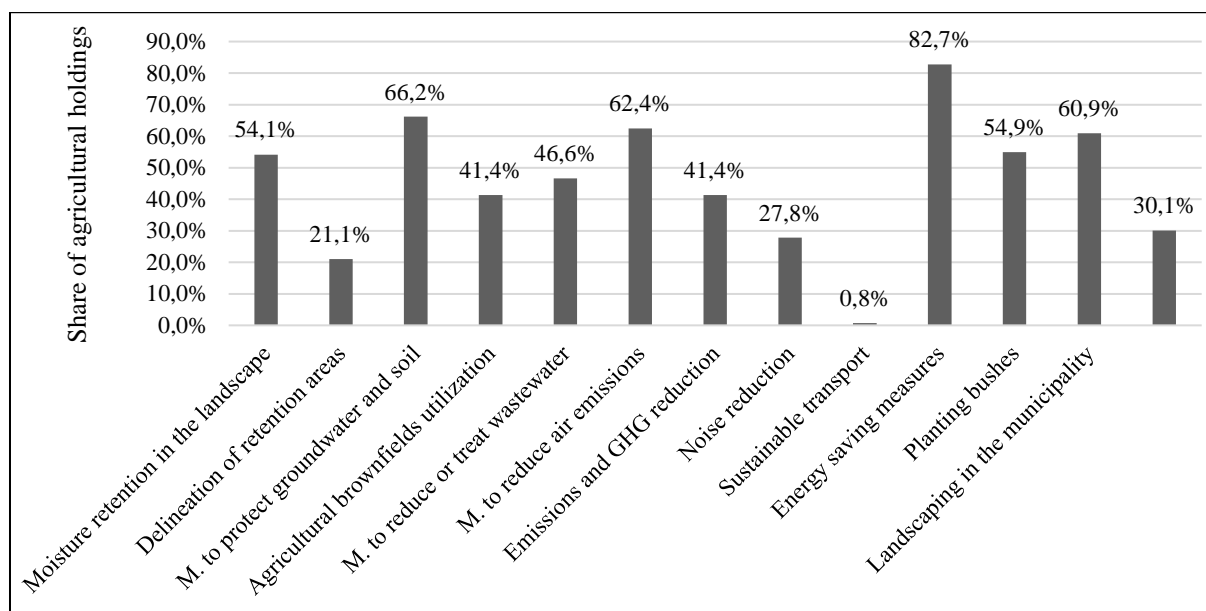
Source: own elaboration

Testing in contingency tables revealed that the average number of implemented activities was equal regardless the legal form. Limited liability, join-stock companies and agricultural cooperatives did not differ in their level of environmental responsibility. The number of activities is different in various regions, but it could not be tested as there is not enough observations for each region. In Zlínský region and Moravskoslezský region there was the highest number of activities implemented. Each company in the first mentioned region took 8 ecological measures and 7 in Moravskoslezský region.

Regarding the characteristics of the manager, based on ANOVA testing it was found that the environmental responsibility did not depend on their age. Managers of all ages are equally responsible in this area. On the other hand, the education and the sex were important determinants as revealed by t-tests. Managers with only high school degree implemented statistically significantly less measures than those with university degree. Also, agricultural holdings managed by women implemented less ecological measures.

Environmental problems occurred only in few agricultural holdings in the last five years. One agricultural holding admitted that there was an increased concentration of pollutants in the soil measured at its agricultural land. Similarly, damage of landscape features was also case of one agricultural holding. Two agricultural holdings admitted that they did not maintain the retention tanks that got clogged.

More pronounced problem was with soil erosion (due to non-compliance with agrotechnical principles, inappropriate composition of crops, etc.) – it concerned 14 firms, in 3 it was a repeated problem. 14 agricultural holdings admitted that there was an abandoned unused agricultural area (brownfields) that need reconstruction or decontamination at their land.

3 Discussion

The managers of agricultural holdings declared that careful handling of resources was important for them and that they (in almost 83% of cases) implemented measures to achieve energy savings. However, this could have been done also for the sake of cost reduction. Čerkasov et al. (2021) found out based on the structured interviews with representatives of small and medium agricultural firms in the Czech Republic that the manifestations of social responsibility often belong to economic and social areas. Activities in environmental area did not exceed legal framework and many of them emerged from nature of agricultural production.

Despite that 111 farmers (83,5%) placed impact of farming on the environment, only 2/3 of them implemented measures to protect the groundwater and soil and 63% reduced the emissions. Hence, there are still reserves in environmental responsibility among the agricultural holdings. Besides, the information about the taken measures is collected only from the managers of the agricultural holdings and the real situation might be different or might be differently perceived from the point of view of the local stakeholders.

According to the research of Vilke et al. (2021), the patterns of farmers' environmental responsibility varied according to the characteristics of farms (size, years in operation, type of farming) and farmers (age, gender, education). We found out that size of the agricultural holding is an important determinant. The larger is the acreage or the more employees the company have, the more environmental measures are implemented. Other determinants were the education and sex of the manager. According to the expectation, companies lead by the university-educated managers implemented more measures in the environmental area. Surprisingly, men implemented more measures, but there were only 24 of them, so the sample is rather small to draw a conclusion.

Government policies towards promoting and supporting particular methods also play important role in the adoption of environmentally responsible practices by farmers. As found out by Greenland (2018) in the case study of Australian farmers, the farmers are often reluctant to adopt new practices due to perceived costs and other barriers. Greenland (2018) recommended the development of effective education and communication programs.

Conclusion

The aim of the paper was to examine whether the agricultural holdings consider the measures for improvement of the environment as important and what are the determinants of their environmentally responsible behaviour. 133 managers of agricultural holdings were surveyed. To examine the determinants of environmental responsibility, a regression model, contingency tables, ANOVA and t-test were used.

Despite that they stated that careful handling of resources was important for them, agricultural holdings still have reserves in environmental responsibility, they implemented on average only 6 from 13 measures. Despite that majority of them proclaimed the importance of careful handling of resources and minimising the impacts of farming on the environment, not all of them actually implemented the measures to achieve those targets.

Limitation of our research is that the importance of ecological factors is declared by the managers of agricultural holdings themselves. The real behaviour of the firms might be different or differently perceived by local stakeholders. So the challenge for future research is to examine the social responsibility of agricultural holdings from the point of view of the local stakeholders.

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