Factors preventing investments in renewable energy in rural areas

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Introduction

Agriculture has the largest potential of renewable energy resources of all sectors of the economy (especially in the field of solar, wind and biomass energy), which can play a key role in meeting the energy needs of agri-food systems in both developed and developing countries. However, the use of renewable energy by farmers is negligible. Agriculture is still mostly based on conventional energy - it "feels the effects of climate change, while directly or indirectly contributing significantly to these unfavorable changes."The aim of the study was to present the most important barriers to the implementation of renewable energy in tourism enterprises operating in rural areas. The considerations were based on the available literature on the subject and our own research conducted using the survey method among 218 tourism industry entities operating in the countryside. Based on them, it can be concluded that still few entities operating in the rural tourism industry have a RES installation. The greatest perceived barrier discouraging investment in them are high costs and a long payback period.

Literature Review

Agriculture uses a very large amount of energy - it is a significant energy consumer. Energy is needed at all stages of the agri-food industry chain, both directly (for production, processing and transport) and indirectly (for the production of fertilizers, machinery). It is estimated that agri-food systems account for approximately 30% of total energy consumption worldwide. Energy use in food systems varies significantly between developing and developed countries. In the latter, approximately 25% of total energy is used in the agricultural production stage (crops, animal husbandry and fishing), 45% in food processing and distribution and 30% in retail trade, food preparation and cooking.The possibilities of using renewable energy in agriculture are many and versatile. Solar energy can be used for passive heating, e.g. of greenhouses, as solar heating for hot water systems or - in the case of photovoltaics - it can be a source of electricity for lighting, charging batteries, pumping water, etc. Similar use as electricity from photovoltaics, has energy from the wind. Heat pumps can be used both for heating and cooling purposes, as well as for the management of waste heat, e.g. from cooling agricultural products (milk, meat, fruit, vegetables), or ventilation air discharged from facilities where it must be provided. appropriate humidity (e.g. livestock buildings). The heat recovered using a heat pump can be used to: heat process water (water for irrigation, water used in production processes), heat and dry air in dryers, direct heating of production facilities (e.g. greenhouses, foil tunnels), etc.Biomass has the widest use on farms, because its combustion or composting allows you to obtain heat, electricity and gas, which can basically meet all the energy needs of these entities. Thanks to large biomass resources in virtually every region and favorable natural conditions, rural areas, without prejudice to food production, can become a significant producer of energy raw materials and energy and become energy self-sufficient.In practice, however, as research shows, photovoltaic installations and solar collectors are most common on farms. Heat pumps, biomass boilers, agricultural biogas plants, and small wind farms constitute only a few percent of all renewable energy installations. The key problem related to the development of green energy in Polish agriculture is limited knowledge about the level of RES development in this sector and the factors that determine it. The high costs of this type of investment and the low level of subsidies and subsidies, difficulties in obtaining subsidies and formal and legal problems also play an important role.

Methodology

Two non-parametric tests were used for the research: Mann Whitney U test and Kruskal-Wallis ANOVA test. The research was conducted at a significance level of 0.05.

Over 200 (218) respondents took part in the study, they were people who running a business in the field of tourist services dealing with accommodation or meals (restaurants and other catering establishments, accommodation facilities and short-term accommodation places). These facilities were located in rural areas. The aim of the research was to diagnose whether respondents intend to invest in renewable energy sources in the future and what are the barriers that block the decision to start such investments in rural areas. The characteristics of the group were presented in table 1.

Results

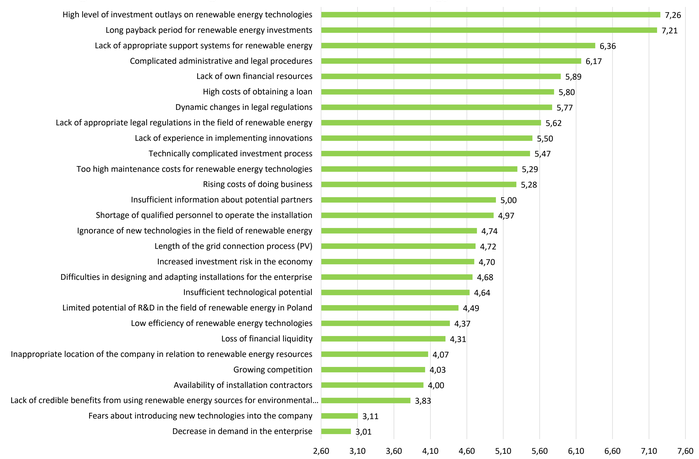
Table 1 Characteristic of the group

	N	%
Range of activities:		
Hotels and similar accommodations	46	21%
Tourist accommodation facilities and short-term accommodation places	91	42%
Other accommodation	16	7%
Restaurants and other permanent catering establishments	59	27%
Preparing and delivering food to external recipients (catering)	6	3%
Type of activity		
Food service	65	30%
Accommodation	153	70%
Company size		
Up to 9 employees	201	92%
from 10 to 49 employees	16	7%
from 50 do 249 employees	1	1%
Ownership of the premises (owned/leased)		
Leased	25	11%
Own	193	89%
Willingness to invest in renewable energy in the next 3 years		
Yes	69	32%
No	149	68%
How many years has the company been operating on the market?		

$\bar{x} = 14, Me = 12, Mo = 9, Min = 1, Max = 73, Std.dev = 9{,}5, Vz = 69\%$

It was checked what barriers were most frequently indicated by respondents in the case of investments in renewable energy in tourism in rural areas. It was also checked whether the assessment of the importance of these barriers depends on the ownership of the premises, the type of activity, the size of the company, the time of activity on the market, and on whether they intend to invest in renewable energy technologies in the next 3 years.

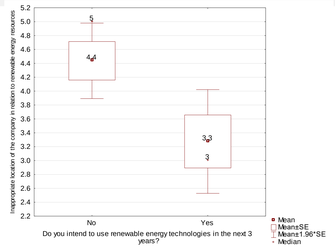
Figure 1 Ranking of factors limiting investments in renewable energy



Willingness to invest in renewable energy in the next 3 years

It was checked whether the willingness to invest in renewable energy is related to the assessment of barriers to investment in renewable energy. The research shows that the willingness to invest only influences the assessment of the inappropriate location of the company in relation to renewable energy resources, $p<\alpha$ ($p=0.0229$). People who do not intend to invest in renewable energy in the next three years rate the inappropriate location of the company in relation to renewable energy resources much higher.

Figure 2 Willingness to invest in renewable energy in the next 3 years vs. location of the company



Results

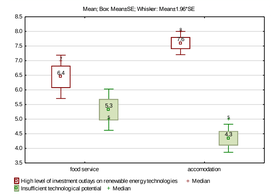


Figure 2 Type of ctivity vs. barriers to investment in RES

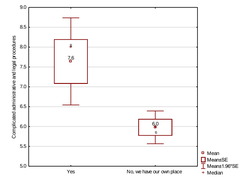


Figure 3 Ownershipof the premises vs. barriers to investment in RES

It was checked whether the type of activity was related to the assessment of barriers to investment in renewable energy sources. The analyzes conducted show that differences in assessment occur in the case of high investment outlays on renewable energy technology, $p<\alpha$ ($p=0.0087$) and in the case of insufficient technological potential, $p<\alpha$ ($p=0.0482$). High investment outlays in renewable energy technology were a much bigger problem for companies operating in the accommodation sector than for those working in the catering sector, and insufficient technological potential was a bigger problem for those operating in the catering sector.

Ownership of the premises

Whether the surveyed person had his or her own premises or leased them influenced the assessment of complicated administrative and legal procedures $p<\alpha$ ($p=0.0048$). People who have their own premises see this issue as a much bigger problem. The average barrier score was 7.6 points (while the median was as much as 8).

Figure 3 Range of activities vs. barriers to investment in RES

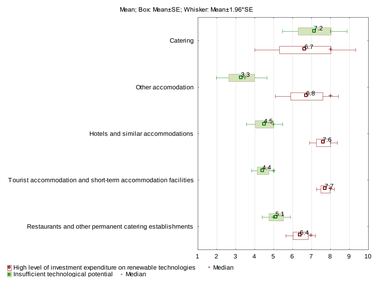
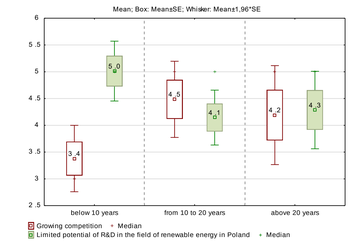


Figure 3 Range of activities vs. how long company has been operating on the market



Range of activities

The size of the company influenced concerns about the high level of investment expenditure on renewable energy sources $p<\alpha$ ($p=0.0403$) and insufficient technological potential $p<\alpha$ ($p=0.0416$). People dealing with tourist accommodation and short-term accommodation facilities (7.7) and those working in hotels and similar accommodations (7.6) are most concerned about the high level of investment expenditure. However, when it comes to concerns about insufficient technological potential, people working in catering are most concerned.

How long the company has been operating on the market

It was also checked whether the time of operation of companies on the market has an impact on the assessment of barriers to investment in renewable energy. The research shows that the company's presence on the market influenced the assessment of growing competition $p<\alpha$ ($p=0.0450$) and the assessment of the limited potential of the R&D sphere in the field of renewable energy $p<\alpha$ ($p=0.0435$). Companies that have been operating on the market for longer than 10 years are afraid of growing competition, and companies that have been operating on the market for less than 10 years are afraid of the limited R&D potential in the field of renewable energy.

Main conclusions

Renewable energy can become one of the most important factors in the development of rural areas, reducing energy supply deficits and thus stabilizing the conditions for conducting agricultural and business activities. It can also be a source of additional income for rural residents. Wind, solar and biomass energy can be harvested virtually indefinitely, reducing emissions of harmful substances and providing farmers with a long-term source of income. However, the analyzes conducted show that among 218 respondents running a tourism business in rural areas, only every third would like to invest in renewable energy sources. The barriers most frequently indicated by entrepreneurs that discourage investing in renewable energy are: high level of investment outlays on renewable energy technology (average rating 7.26 out of 10) and long payback period (average rating 7.21 out of 10). The respondents indicated in third place the lack of appropriate support systems for renewable energy sources (6.36) and the complicated administrative and legal procedures necessary to comply with them (6.17). Research has also shown that in the case of some barriers, their assessment is influenced by the type of enterprise activity, whether they have their own premises, the size of the enterprise, the scope of activity and how long the company has been operating on the market. However, in most cases, the assessments of individual barriers do not differ significantly, so entrepreneurs operating in tourism in rural areas have similar concerns about investments in renewable energy.

The researchis the result of the research project "Determinants of ability to innovation absorption in the tourism industry in relation to renewable energy" supervised by prof. Lukasz Nawrot and financed by the National Science Centre, Poland (decision no. DEC-2012/05/B/HS4/00953).
The research leading to these results has received funding from the project "Cluster for innovative energy" in the frame of the program "HORIZON-MSCA-2022-SE-01" under the Grant agreement number 101129820