# VALORIZATION OF PUBLIC GOODS IN THE ENVIRONMENT OF AGRITOURISM FARMS – AN ATTEMPT AT MODELING

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**Abstract.** The influence of public goods for the economic size of agritourism farms in West Pomerania region. For this purpose, it was used data from the conducted in 2012 survey of 150 agriculture farms (economic variables). The work was calculated coefficients of the two models of linear least squares method crotch (KMNK). All statistical analyzes and modeling done in the program. Statistica version 12.

**Key words:** public goods, agritourism, multifunctional development

## INTRODUCTION

On the ground of neoclassical economy, which deals with the concept of perfect completion, it is the market and the price mechanism that allowed adapting demand and supply, assuring optimal usage of resources both on the microeconomic and macroeconomic level. Nevertheless, the market mechanism does not function properly and it departs from the model of perfect competition. One of the common symptoms of market failure was related to certain kinds of goods, described in economy as public goods (Hofmokl 2009). The theory of public goods is one of the elements of a much broader theory of public choice, which includes economic theory of democracy, advocacy group theory, the theory of public goods or rent-seeking mechanisms [Wilkin 2005]. These theories function in the idea of new institutional economy, which is a successful blend of neoclassical economy

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and institutionalism [Czyżewski 2009, Grzelak 2010]. It is one of the most dynamically developing trends in the contemporary economy, also raising interest in other social sciences, namely, political sciences, sociology and law. The theory of public choice is the economic theory of politics. This relatively new branch of economic sciences relies on using tools and methodological concepts of standard economy to analyse people's behaviour in politics and other fields of public spheres [Wilkin 2005].

Agriculture and rural areas are an open system consisting of three interdependent and interfusing subsystems: social, economic and ecological, which concerns the relation of agriculture with environment. The effects of farming depend on many external factors, but most importantly on environmental terms [Szumski 2007]. The transfers of public funds to agriculture began to take the shape of payment for farmers' services to compensate the environment and landscape, which constitute public goods [Małażewska 2015].

Public goods increasing the value of landscape and the quality of live in rural area should pose as an incentive to set up agritourism farms which base on its value. Therefore, they allow using the working factor better and diversifying the business activity, simultaneously increasing the income of administrative entities such as municipality. Supporting the process of public goods supply constitutes, in this respect, creating lucrative positions in rural areas for highly qualified employees in farming, horticulture, food processing and nutrition-oriented services. It is the source of benefits for private entities operating on the basis of public goods, but it also includes the whole communities generating additional income in different forms (at different stages of income division of the municipality – primary, secondary or final income). At the first attempt, public goods will be treated as free goods, which in this situation are given by nature, and consequently acquired at zero cost for consumers. In this case the consumer refers to agritourism farms using public goods situated in the municipality area where they are located. We certainly deal with alternative cost for the entire community. These goods provide benefits for business entities, which on its basis can acquire additional benefits. Taking into consideration such viewpoints would mean that the costs connected with public goods would be allotted to private entities attaining these economic effects. Thus, those households, which in their activity show more diligence for the environment, e.g. animals' and plants' well-being, preservation of ecosystems, should declare higher income. Eventually, it should be reflected in the higher income generated from agritourism. There is also a question if the market, in its estimates, considers public goods in commercial businesses, and if so, to what extent. Additionally, combining production of goods with public goods, which provide additional (although undervalued) income allows to use allocated production factors in a particular household more effectively. Consequently, an increased productivity of production factors engaged in local business entities, which base on local public goods, should be noticed. On the other hand, in such an attitude it would mean that market can add value to public goods, which according to the theory, is in a large extent restricted and, therefore, we deal with scarcity in providing public goods. Thus, the effectiveness in this case introduced by means of receiving income by agritourism households should not demonstrate a strong relation to public goods (on the assumption of relatively low maintenance costs). Similarly to Tiebout model which is described as incomplete [Oates 2006], we do not take

into consideration the costs of financing public goods. The essence of Charles M. Tie-bout's hypothesis leads us to the assumption that consumers, on account of preferences or the amount of income are active in searching for optimal local community, so the human vigour may cause a great number of consequences for public finances. Charles M. Tiebout assumed that a voter consumer may be interested in choosing local community, which would satisfy their preferences most effectively in case of public goods. The author claimed that a voter consumer wants to make a choice of local community that corresponds best with their preferences on account of public goods offer. On the central level, the preferences of voter consumers are known and the central authorities adjust public offer, but the income and costs of local communities can differ. Because of taking into consideration the differences, a voter consumer dwells where a local government's offer suits their demands. Charles M. Tiebout assumed that consumers possess perfect information in a matter of choosing an optimal local community. In this way, Charles M. Tiebout hypothesis is based on the assumption that preferences towards public local services and the amount of disposable income may differentiate the people. Maintaining the thesis of different incomes and spendings, consumer voters make a choice of the local community, which best satisfies their preferences. So voting with their feet leads to the development of differential local communities.

Referring back to the model, we refer to the situation, that in certain conditions this model ascertains effective allocation of resources regarding to the existence of public goods. Certainly, there is a risk resulting from uneven profits generated by businesses located in municipality due to public goods. Some scientific publications referring back to that considered model (including Esteban and Ray [1999], Khwaja [2004], Singleton [2014] indicate such threats). In this situation, business entities gaining above-average profits will increase the involvement of production factors. It may jeopardize the balance to some extent, and simultaneously the whole mechanism of cost measures of delivery of public goods becomes more complex.

**RESEARCH METHOLOGY**

The work used many research methods, among which were the study of selected literature and statistical methods. A review of scientific literature, which plays a fundamental role in the considerations over multifunctional development of rural area and farmers as suppliers of public goods in agritourism, was the introduction to a few stages of conduct research. The research was based on deductive method using both domestic and foreign literature. Data used in the research was collected in 2012 after interviewing 150 rural farms with agritourism specialisation in Western Pomerania Province and obtained from Provincial Statistical Office in Szczecin. The variables were used to build models:

$X_1$ – Expenditure on fixed assets of wastewater management and water conservation (thousand PLN per 1 km$^2$);

$X_2$ – Expenditure on fixed assets in total water management (thousand PLN per 1 km$^2$);

$X_3$ – The area municipalities (km$^2$);

$X_4$ – Total population municipalities (number of people);

$X_5$ – Density of population (persons per km$^2$);

$X_6$     – Forest cover (%);
$X_7$     – The areas about the qualities of holiday (ha to 1 km$^2$);
$X_8$     – The number of lakes in the municipality category 1 (quantity);
$X_9$     – The number of lakes in the municipality of category 2 (quantity);
$X_{10}$    – The number of lakes in the municipality of category 3 (quantity);
$X_{11}$    – The number of lakes in the municipality of categories 4 and 5 (quantity);
$X_{12}$    – The area of natural areas protected by law (ha per 1 km$^2$);
$X_{13}$    – Number parks (number per 1 km$^2$);
$X_{14}$    – The area of nature reserves (ha per 1 km$^2$);
$X_{15}$    – The number of natural monuments (number per 1 km$^2$);
$X_{16}$    – The area of Natura 2000 sites (ha per 1 km$^2$);
$X_{17}$    – The number of national parks (number per 1 km$^2$);
$X_{18}$    – The share of agricultural land (UAA) in the total area (%);
$X_{19}$    – The share of grassland in the agricultural land (%);
$X_{20}$    – Employment in agriculture (number of people per km$^2$);
$X_{21}$    – Granted accommodation (number of per 1 population of 1,000);
$X_{22}$    – The number of farms in the municipality (quantity);
$X_{23}$    – Farm area (km$^2$);
$X_{24}$    – The period of activity of agritourism (years);
$X_{25}$    – The number of tourists visiting Polish agritourism farms (annual number of people);
$X_{26}$    – The number of beds in farm leading agritourism (number);
$X_{27}$    – The number of foreign tourists visiting an agritourism (annual number of people);
$X_{28}$    – The total number of tourists visiting annually agroturism farms (number);
$X_{29}$    – The number of overnight stays in farm tourism (annual number of people);
$X_{30}$    – Income from crop production (PLN);
$X_{31}$    – The level of area payments (PLN per km$^2$);
$X_{32}$    – The value of subsidies area LFA (thousand PLN per 1 ha);
$X_{33}$    – The number of lakes including categories 1 to 5 (quantity);
$X_{34}$    – Income from agritourism farm (PLN);
$X_{35}$    – Subsidies from the RDP in 2007–2013 (PLN);
$X_{36}$    – Income per capita GDP (PLN);
$X_{45}$    – Age of farm owners (years);
$X_{46}$    – Gender farm owners (0 – man, 1 – woman);
$X_{47}$    – Education farmers (1 – basic, 2 – professional, 3 – average, 4 – higher).

Coefficients of the two models of linear least squares method crotch (KMNK) was calculated in paper. In this method was determined by linear form:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_t x_t$$

where: $Y$ – dependent variable;
          $x_1, x_2, …, x_t$ – explanatory variables;
          $\beta_1, \beta_2, …, \beta_t$ – model coefficients;

so that the sum of squared deviations resulting linear function of the actual value $y_i$ as small as possible:

$$\sum_{i=1}^{N}\left(y_i - (\beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + ... + \beta_t x_{ti})\right)^2 \rightarrow \min$$

the explanatory variables in the model chosen (enter or removed) were iteratively in the following steps of the method. The introduction or removal of variables from the model is determined by the critical value for F-statistic or critical values for *p* [http://www.statsoft.pl/textbook/stathome.html, accessed April 2015].

## RESULTS

The analysis of stepwise regression proved the average relation ($R^2 = 0.32$) between public goods present in particular municipalities and a level of income of agritourism households (Table 1). Among those factors, which have shown a positive effect (coefficient $\beta > 0$) on the level of income of agritourism households are: a number of lakes in cleanliness standards 1–3 situated in municipality ($X_{33}$) (the numbers were combined due to a small number of lakes of different standards) and the area of unique tourist values ($X_7$). These factors increase the level of income generated by agritourism households. A small number of lakes with relatively high cleanliness standards had a huge influence. Correction ratio (coefficient $\beta < 0$) was a total municipality area ($X_3$), in relation to the resources characterising environmental values, but also economic (the number of people working in farming). Therefore, lowering the shares of public goods and highly valued natural resources in a particular location restricted the level of profits.

According to the underlying estimation of the size of agritourism farm income represented by the following linear model:

$$Y = 44{,}320.9 - 60.0410 x_{i3} + 832.958 x_{i7} + 91.829 x_{i20} + 231.672 x_{i33}$$

where $i$ – index of the municipality.

The presented model indicates that municipalities with a larger area and wider diversity of businesses, as well as the kinds of public goods showed weaker correlation of income with goods.

Interestingly, from the point of view of correlations between agritourism households income and public goods is the role that was allotted to the number of people working in farming. A greater number of people working in this segment of the economy increased the income generated in agritourism household. It can be indirectly connected with public goods supplied by farmers, which were not taken into account directly in the analysis. It can be assigned to the concept of multifunctional agriculture, which provides additional income for businesses conducting ventures connected with farming. At the same time it points

Table 1.   Model 1. Estimation KMNK, used variables 1–36
The dependent variable (Y): The average income of an agritourism

| Independent variable | Factor $B$ | Standard error | t-Student | value $p$ |
|---|---|---|---|---|
| Constant | 44 320.9 | 7 723.16 | 5.739 | 2.59e-06[c] |
| $X_3$ | −60.041 | 23.3350 | −2.573 | 0.0151[a] |
| $X_7$ | 832.958 | 108.521 | 2.638 | 0.0012[b] |
| $X_{20}$ | 91.829 | 31.7188 | 2.895 | 0.0069[c] |
| $X_{33}$ | 231.672 | 107.896 | 2.147 | 0.0397[a] |
| The arithmetic mean of the dependent variable | 25 152.17 | standard deviation of the dependent variable | | 18 961.18 |
| The sum of squared residuals | 8.48e+09 | standard error of residues | | 16 538.84 |
| The coefficient of determination $R$-squared | 0.326135 | adjusted $R$-squared | | 0.239184 |
| Statistic $F$ (4, 31) | 3.750813 | value $p$ for F-test | | 0.013335 |
| Logarithm credibility | −398.0750 | Akaike's information criterion | | 806.1500 |
| Bayes's and Schwarz's criterion | 814.0676 | Hannan's and Quinn's criterion | | 808.9135 |

Notes:  [a] $p$ <0.05, [b] $p$ <0.01, [c] $p$ <0.001 – adopted statistical significance coefficients in the model, indicated by the beta factors statistically significant different from zero at the significance level $\alpha = 0.05$.
Source:    Own calculations.

at dependencies between the development of agritourism and agriculture. In this case there is inevitably a combination of incomes generated from institutional system, between typical farming businesses and agritourism. Financial support realised under the common agricultural policy becomes a joint link. Multifunctionality suggests that farming may realise highly appreciated non-productive functions, which may not be produced by other segments of the economy. Agriculture in many regions of Europe shaped the landscape and significant areas, which may constitute the source of public goods supply. A crucially important feature is the natural character of resources (especially area) related to farming. Therefore, according to Whitby [2000], farming in its nature is multifunctional. However, the level of socio-economic development causes the specific gradation of farming value in the system of social needs.  An important aspect which is taken into consideration is the biological character as well as the multitude of both intended and unintended additional products, taking the resemblance of public goods [OECD 2003]. The leverage of resources, through considering non-productive agricultural functions, leads to lowering the pressure of intensity of its implementation and consequently decreases the negative external effects. The leverage results in forming additional sources of generating income including the government grants.

Referring back to the location theory is partly agreeable with the concept of reversed circles by Thunen and the role of peripherals according to new economic geography raising the importance of immobility of factors of production. So it presents the possibility of

differentiating income and profits stemming from the immobility of factors connected to a particular location, on which the demand is out-of on site. Low value model considering selected factors indicates the greater role of other phenomena connected with managing resources in agritourism households on economic results of those businesses. Assumingly, on one hand the market does not value the public goods, on the other, though; these goods are not the only ones that are taken into consideration when generating economic benefits. It is in the accordance with the previous assumptions one the basis of theoretical clues indicating that such a relation might not have a strong bond. Referring to the Tiebout model, thereby, the potential benefits of agritourism households generate, can be measured by means of the number of tourists per one agritourism household. Then we omit a frequently raised issue of social preferences, because they are characterised by the number of visitors in the community per year. In this situation it can be noticed a higher level of coordinates characterising public goods present in particular territorial entities.

The relation between the number of lodgings in agritourism households and other factors characterising public goods and the communities tries to determine whether the amount of public goods influences the attractiveness of the community from the tourists' viewpoint. This is the correlation, which shows more directly relations between the public goods and agritourism effects. A whole range of factors characterising the management efficiency and allocation of resources in agritourism household contributes to the economic outturn. It has been estimated that there is a correlation between these values (Table 2). The correlation presented in the form of equation describing the number of lodgings in agritourism households proved the expectations in case of higher level of relevance (coefficient $R^2 = 0.43$, on a higher level than in the previous model version). However, it is not a satisfying level. The density of population was the correction factor ($X_5$), whose increase influenced agritourism movement negatively. Together with the previously presented assumptions it constitutes the constraint for the development of agritourism limiting the access to certain public goods. However, with a higher level of afforestation ($X_6$) and the substantial proportion of agricultural area ($X_{18}$), where the first one refers directly to the occurrence of public goods, and the second one, though, must be allocated to the open areas, which appeared in other research, strengthened the increase of number of tourists in agritourism households.

According to the uderlying estimation of the size of the number of overnight stays in farm engaged in agro-tourism is expressed by the following linear model:

$$y = -6.16848 - 0.502908x_{i5} + 0,734532x_{i6} + 0,984118x_{i18}$$

where $i$ – the index of the municipality.

The number of lodgings correlated with the density of population ($X_{55}$), the afforestation of the community ($X_6$) and the size of arable areas ($X_{18}$) in municipality area. The first measure shows a negative correlation as expected. Lower population density is accompanied by the increased number of lodgings in agritourism households. A higher level of afforestation, together with a higher share of arable areas (contrary to the fact

Table 2.   Model 2. Estimation KMNK, used variables 1–36
The dependent variable ($Y$): The number of overnight stays ($Y$)

| Independent variable | Factor $B$ | Standard error | t-Student | value $p$ |
|---|---|---|---|---|
| Constant | −6.16848 | 23.9641 | −0.2574 | 0.03985[a] |
| $X_5$ | −0.502908 | 0.168284 | −2.988 | 0.0054[b] |
| $X_6$ | 0.734532 | 0.323743 | 2.269 | 0.0302[b] |
| $X_{18}$ | 0.984118 | 0.263507 | 3.735 | 0.0007[c] |
| The arithmetic mean of the dependent variable | 46.16667 | standard deviation of the dependent variable | | 26.62169 |
| The sum of squared residuals | 14,149.24 | standard error of residues | | 21.02769 |
| The coefficient of determination $R$-squared | 0.429581 | adjusted $R$-squared | | 0.376104 |
| Statistic $F$ (4, 31) | 8.033041 | value $p$ for F-test | | 0.000395 |
| Logarithm credibility | −158.6119 | Akaike's information criterion | | 325.2239 |
| Bayes's and Schwarz's criterion | 331.5580 | Hannan's and Quinn's criterion | | 327.4346 |

Notes: Evaluation of the statistical significance of the coefficient of the independent variable:
[a]$p$ <0.05, [b]$p$ <0.01, [c]$p$ <0.001.
Source:    Own calculations.

that agriculture is usually the main beneficent of the soil) are factors which increase the touristic attractiveness of the area. In case of the second factor, it must be related to the occurrence of open areas and the attractive landscapes shaped by households. An average matching coefficient indicates a considerable diversity and the occurrence of additional conditions not related to the evaluated public goods.

## CONCLUSIONS

The valorisation of public goods and proving their influence on the level of income generated by agritourism households may occur indirectly. Institutional system related to the economic policy associated with secondary distribution of national income, and here understood as common agricultural policy, is the intervening process.  Thus, it is not the market that directly pays for the occurrence of public goods. Institutional system, having made a social contract, triggers the flow of funds which are a payment for delivering public goods. They constitute the mechanism by means of which the level of income is raised and public goods are included in economic calculation. It is crucial, as this area plays a more important role as a result of changes in public demand.  As it has been indicated in the research, agritourism has a wider range of supporters, and with its preferences for a balanced growth of rural area, it affirms the possibility to use the areas dominated by farming. Developed mechanism of funds transferred into agriculture, and in this case, to

agritourism is the answer to the demand voiced by at least the part of society. On the other hand, there appears the danger of ineffective allocation of the funds owing to political rent-seeking. It results in the way of supply of the goods and services, which is justifiable when market mechanism does not assure proper allocation of resources. The phenomenon of political rent-seeking is the effect of regulations or direct budget transfers. It results in weakening social consensus and the lack of effectiveness according to Pareto. Such a viewpoint introduces a new context in relation to choices made by business entities.

## ACKNOWLEDGEMENT

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## WALORYZACJA DÓBR PUBLICZNYCH W OTOCZENIU GOSPODARSTW AGROTURYSTYCZNYCH – PRÓBA MODELOWANIA

**Streszczenie.** W pracy dokonano próby waloryzacji dóbr publicznych w otoczeniu badanych gospodarstw agroturystycznych Pomorza Zachodniego. Do tego celu posłużono się danymi z przeprowadzonych w 2012 roku badań ankietowych wśród 150 gospodarstw

agroturystycznych (zmienne ekonomiczne). W pracy obliczono współczynniki dwóch modeli liniowych krokową metodą najmniejszych kwadratów (KMNK). Wszystkie analizy statystyczne oraz modelowanie wykonano w programie. Statistica wersja 12.

**Słowa kluczowe:** dobra publiczne, agroturystyka, wielofunkcyjny rozwój