Studia Sieci Uniwersytetów Pogranicza | 2020 | 4
DOI: 10.15290/sup.2020.04.06

Vital Kazlovski
- Yanka Kupala State University of Grodno
- e-mail: kozlovskij_vv@grsu.by
- ORCID: 0000-0002-9194-6170

Uladzimir Ganski
- Institute of Entrepreneurial Activity
- e-mail: ganski@tut.by
- ORCID: 0000-0001-5906-6539

Katsiaryna Andreichyk
- Polotsk State University
- e-mail: k.andreichyk@psu.by
- ORCID: 0000-0001-6333-7207

SUSTAINABLE DEVELOPMENT MODELLING OF REGIONAL AGRITOURISM CLUSTERS (CASE OF BELARUS)

Abstract

- *Goal* – construction of models that describe the social, environmental, and economic sustainability of rural areas in the context of the development of agritourism, which would make it possible to determine the leading factors for their sustainable development.
- *Research methodology* – the research applied the procedures of goal setting, measurement, establishing criteria, forming and choosing alternatives, algorithms, methods of PLS-PM modeling, and methods of qualitative modeling.
- *Score/results* – a systematic solution to the numerous environmental, social, and economic problems of the development of agritourism cluster is not achievable without appropriate economic and mathematical models and tools for their support, which would make it possible to accurately predict the main indicators of the sustainable development of agritourism, identify the main factors of sustainable development, determine the degree of the effectiveness of certain management decisions.

- *Originality/value* – based on the applied software products developed in this way, support systems for making complex management decisions can be formed that make it possible to identify all potential scenarios for the development of any complex systems and transitions between them, as well as provide a predictive function for evaluating key blocks. In the future, the proposed toolkit can be used to model and optimize the sustainable development of specific tourism investment projects in rural regions, as well as to select investment areas at the regional agritourism cluster level.

Key words: region, cluster, agritourism, mathematical modeling in economics, sustainable development, tourism, Belarus.

1. Introduction

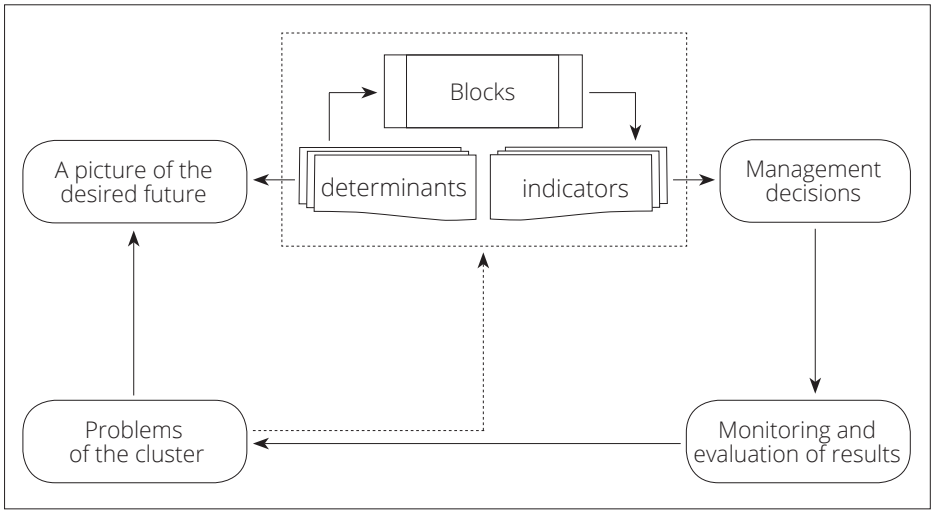
Under the influence of almost uncontrolled anthropogenic impact, accelerated urbanization, investment and infrastructure construction, in many countries of the world, the natural and social environment of rural regions continue degrading and losing their recreational potential. At the same time, in order to obtain a stable positive effect, strategic planning and management should be carried out on the basis of the concept of sustainable development. The purpose of this concept is to increase the living standards of the local population due to economic growth from the development of agritourism cluster in the conditions of the unconditional preservation of socio-cultural values and environmental benefits [Mowforth, Munt 1998: 23–24]. A systematic solution to the environmental, social, and economic problems of the development is not achievable without appropriate economic and mathematical models and tools for their support, which would make it possible to accurately predict the main indicators of the sustainable development, identify the main factors of sustainable development, determine the degree of the effectiveness of management decisions.

2. Theoretical and methodological basis

An approximate scheme for implementing the strategy of sustainable development of agritourism in a certain territory should be based on a complex of economics and mathematical models, including blocks of economic, environmental and social sustainability, the development of an agritourism cluster, as well as factors and indicators of sustainable development [Sharpley, 2000: 4].

To design the strategy for the sustainable development of agritourism in a particular region is based on the image of the desired future agritourism cluster, determined by industry problems and reflected in the sustainable development strategy in the form of goal-setting. Thus, an effective agritourism cluster of the agrarian region as an image of a desired future requires satisfying such basic criteria of sustainable development as: the share of revenues from agritourism and ecotourism in the structure of the gross regional product (GRP) is significant (which will subsequently be a criterion for the development of the agritourism cluster), the vast majority of agritourism objects clusters bring profit and have a certain degree of usefulness for both investors and local residents (an economic criterion takes place here), the functioning of tourist facilities and infrastructure does not have a significant negative impact on the natural environment (environmental criterion), the arrival of tourists does not create widely understood discomfort for local communities (social criterion) [Kirstges, 2002: 175]. In order to implement the strategy of sustainable development of agritourism in the region, a formalized approach should be taken to assess the current situation in the agritourism cluster, to determine the leading factors in the sustainable development of agritourism in the region [Bramwell, Lane, 1993: 3].

Figure 1. Scheme of implementation of the sustainable development strategy



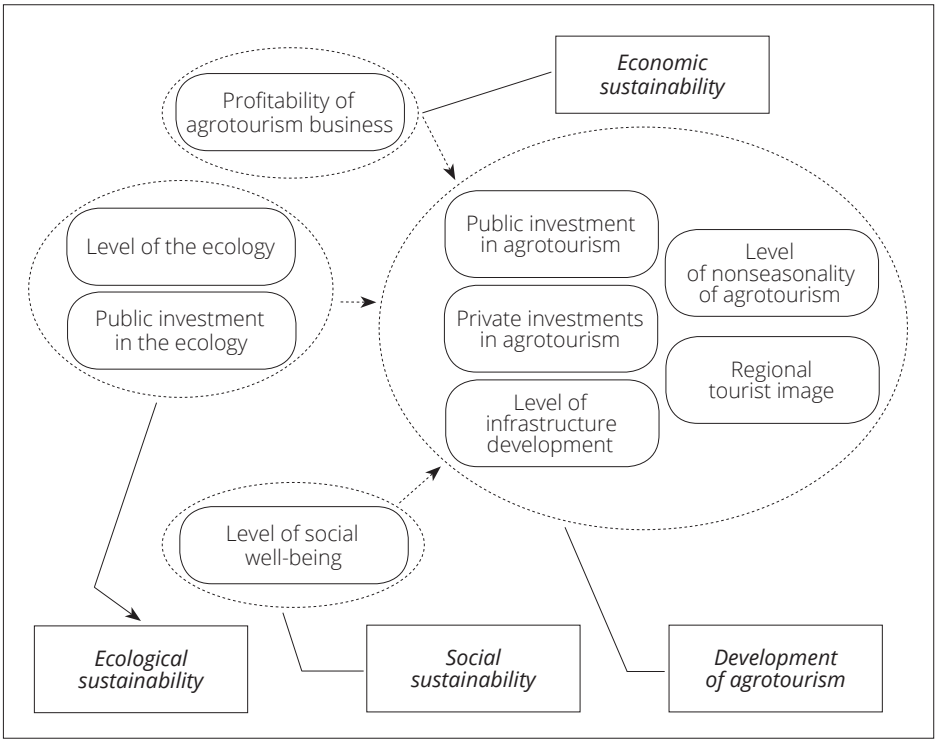
Source: compiled by the authors.

The given approach is based on a whole complex of economic and mathematical models, involves taking into account the criteria for the sustainable

development of agritourism, which together determine the functioning of the agritourism cluster of factors and indicators that reflect the current level of development. Prediction of the functioning of the agritourism cluster, based on a system of factors and indicators, makes possible the adoption of effective and efficient management decisions [Batista e Silva et al., 2018: 106]. In Figure 1 presents the proposed scheme for implementing the sustainable development strategy based on the criteria (blocks) of sustainable development.

FSpecific indicators and factors are local in nature and selected individually for each specific territory directly by the researcher. As indicators of the sustainable development of agritourism, almost any characteristics at the discretion of the researcher can be applied, which in one aspect or another reflect the success of the development of the block in this particular territory, including indirect socio-economic indicators [Tymošenko, Golovach, 2018: 264]. The complex of blocks and factors of sustainable development of agritourism is shown in Figure 2.

Figure 2. The structure of the model of sustainable development of agritourism in the context of blocks and factors



Source: compiled by the authors.

The set of economic and mathematical models used in the framework of this research includes a qualitative model used to assess the qualitative regularities of the processes of the effective functioning of the rural recreation and agritourism industry in the system of blocks and factors, as well as the PLS-PM (Partial Least Squares Path Modeling) – model of sustainable agritourism development used to realize the opportunity forecasting key indicators in a system of blocks and indicators.

Qualitative modelling is understood as modeling, which is based on the relationship of various qualitative indicators [Khazova, 2014: 54]. At the initial stage of qualitative modelling, the process of identifying the totality of variables involved in the modeling process occurs: X_1, X_2,…, X_n. In the framework of this study, a qualitative model of sustainable development of agritourism for the entire territory of Belarus was formed. The variables in this case were the factors of sustainable development of agritourism: private and state investments in the rural tourism and hospitality industry, state investments in the field of ecology and environmental protection, the level of development of rural tourism and recreation types not affected by seasonal phenomena, the state of tourism, accompanying and general infrastructure, image and tourist attractiveness, level of profitability of economic activity in the field of agritourism, level of ecological well-being situation, and the level of social tension / social well-being in rural areas.

The next stage of qualitative modeling was the identification of pair wise qualitative mutual dependencies between the indicated variables (factors) using the method of expert estimates and methods of formal logic. Thus, the interdependence of the variables X_i and X_j within the framework of the model under consideration can be represented both in graphical form (as a graph) and in the form of the following triplet (1):

$$(X_j, DX_j / DX_i, DDX_j / DDX_i) \quad (1)$$

In this triplet, the first component characterizes the sign of the variable X_j, the second – the sign of the first qualitative derivative of the variable X_j with respect to the variable X_i, and in turn the third one – the sign of the second qualitative derivative of the variable X_j with respect to the variable X_i. In this case, the first qualitative derivative will show the dynamics of the variable X_j with a corresponding change of the variable X_i. In turn, the second qualitative derivative will show the rate of change of the increase or decrease of the variable X_j when the value of the variable X_i changes.

5. Case study of Belarus

In the study, qualitative interdependencies were set between all the main factors of the model for Belarus and the corresponding triplets (Table 1).

Table 1. Qualitative interdependence of factors in the model of sustainable development of agritourism in Belarus

Independent variables, X_i.	Dependent Variables, X_j								
	InvP	InvST	InvSE	WinT	Inf	Image	Profit	Eco	Social
Private investment in the rural tourism and hospitality industry (InvP)	×			++–					
Government investment in the rural tourism and hospitality industry (InvST)		×			++–				++–
State investment in ecology and environmental protection (InvSE)			×					++0	
Development of types of rural tourism and recreation not affected by seasonal phenomena (WinT)				×		++–			
State of tourist, related and general Infrastructure (Inf)					×			+–+	
Image of rural areas and tourist attractiveness of the region (Image)						×	++0		
Profitability of economic activity in the field of agritourism (Profit)	++0						×		++–
The level of environmental well-being in the region (Eco)								×	
The level of social tension / social well--being in rural areas (Social)									×

Source: compiled by the authors.

The third stage is the identification of the totality of potentially possible qualitative scenarios, also called qualitative solutions. Such a solution is considered to be completely determined if all the participating variables are described by the corresponding qualitative triplets (2):

$$(X_1, DX_1, DDX_1), (X_2, DX_2, DDX_2),..., (X_n, DX_n, DDX_n), \quad (2)$$

where X_i is the i^{th} variable (factor), and DX_i and DDX_i are the first and second, respectively, qualitative derivatives of the independent variable t, which is the time parameter. Such a model has the m^{th} number of qualifying scenarios or solutions. A set consisting of the m^{th} number of qualitative n-dimensional scenarios will be described using the corresponding set of triplets (3):

$$[(X_1, DX_1, DDX_1), (X_2, DX_2, DDX_2),..., (X_n, DX_n, DDX_n)]_k \quad (3)$$
$$K = 1, 2,..., m$$

While performing the research conducted by the authors of the article, all scenarios for the development of agritourism cluster in Belarus were determined using a specially developed tool implemented in the programming environment R. As it turned out, for the available set of variables (factors) and defined during the study of qualitative mutual dependencies, a set of 35 potential possible qualitative scenarios, a fragment of which is presented in Table 2.

The fourth stage of the study was the allocation of all possible transitions between existing scenarios, which are subject to economic and mathematical principles. In the case of n-dimensional transitions in the future, it will be necessary to comply with the transition rules for n one-dimensional transitions.

In the study, a directed graph was used as the most convenient way to visualize multidimensional qualitative transitions. In this case, the vertices of the graph will represent a set of scenarios, and the directed arrows will represent the potential transitions between them. In the course of a study using a specially designed tool for this, a graph of potential transitions between all available scenarios for the development of an agrotourism cluster in Belarus was built.

A significant difference between the qualitative model of the sustainable development of agritourism formed during the study, in contrast to the ones described in the specialized scientific literature, is that it is applicable for the analysis of possible directions for the development of an agritourism cluster in a situation of insufficient or complete lack of statistical information. Also, the

developed model makes it possible to take into account practically any factors, both quantitative and qualitative, including the socio-political situation, the peculiarities of hospitality traditions in a country and a specific region, as well as other characteristics that will be considered significant for each particular cluster.

Table 2. Qualitative scenarios for the development of agritourism cluster in Belarus (fragment)

Scenario	Variables								
	Image	Inf	InvP	InvSE	InvST	WinT	**Profit**	**Eco**	**Social**
1	+−−	+−−	+−−	+++	+−−	+−−	**+−−**	**+++**	**+−−**
2	+−−	+−−	+−−	+++	+−0	+−−	**+−−**	**+++**	**+−−**
...									
9	+−−	+−−	+−−	+−+	++−	++−	**++−**	**+−+**	**++−**
10	+−−	+−−	+−−	+−+	+−0	++−	**++−**	**+−+**	**++−**
...									
13	++−	++−	++−	+−+	+++	++−	**++−**	**+−+**	**++−**
14	++−	++0	++−	+−+	+++	++−	**++−**	**+−+**	**++−**
15	++−	+++	++−	+−+	+++	++−	**++−**	**+−+**	**++−**
...									
29	+++	+++	+++	+−+	+++	+++	**+++**	**+−+**	**++−**
...									
32	+++	+++	+++	+−+	+++	+++	**+++**	**+−+**	**++0**
...									
34	+++	+++	+++	+−0	+++	+++	**+++**	**+−0**	**+++**
35	+++	+++	+++	+−+	+++	+++	**+++**	**+−+**	**+++**

Source: compiled by the authors.

Based on the previously defined qualitative mutual dependencies of the factors of this model, as well as the identified potential scenarios for the future development of the agritourism cluster and the constructed transition graph

between the various available scenarios, we can select the most optimal set of scenarios and determine the main transition factors of the entire system from one set of available scenarios (or clusters) in another.

Based on the dynamics of the target variables of the model (profitability of economic activity in the field of agritourism, the level of well-being of the ecological situation in the region, the level of social tension / social well-being in rural areas), it is possible to determine "good" and "bad" from the point of view of sustainable development lists of scenarios for the development of agritourism cluster (in this study, this was done for the Belarusian realities – "Rich, happy, relatively clean").

Thus, the first such set included scenarios 29, 32, and 35, and the second set included 9, 10, 13, 14, and 15 from Table 2. These sets of scenarios are characterized by an increase in the profitability of economic activity in the field of agritourism and an increase in the level of social well-being in rural areas, while the indicator reflecting the level of well-being of the ecological situation in the region showed a negative trend. At the same time, the function of the dependence of the level of environmental welfare in the region on time (Eco (t)) has a positive second derivative (the third component of the triplet is positive here) – this suggests that over time, the rate of environmental degradation in the region slows down and there is the opportunity in the territory under consideration to maintain a high level of natural environment. In Belarus today, a decrease in the value of the indicator of profitability of economic activity in the field of agritourism is unacceptable due to the already low level of its values. Therefore, the indicator of profitability of economic activity in the field of agritourism has received priority in the process of identifying "good" sets of scenarios for the development of agritourism cluster in Belarus.

The analysis of possible scenarios for the development of the agrotourism cluster in Belarus made it possible to argue that in a situation of significant growth in tourism, related and general infrastructure, as well as in a situation of a sharp decrease in public investment in ecology and environmental protection, the system will switch from a set of available scenarios (or clusters) with values of 9, 10, 13, 14, 15, respectively, in the set of scenarios in 11 and 12, according to which the ecological situation in the region under consideration is an extremely negative impact. As shown in fig. 3, from the set of scenarios 29, 32, and 35, the system will switch to the set of scenarios "Rich, happy, very dirty" only if the level of public investment in the field of ecology and environmental protection is significantly reduced. At the same time, the growth of tourism, related and

general infrastructure does not adversely affect this particular set due to the fact that it is itself characterized by significant rates of development of tourism, related and general infrastructure while maintaining the relative prosperity of the ecological situation in the region.

Based on the foregoing, it can be argued that the set of scenarios 29, 32, and 35 obviously exceeds the set of scenarios 9, 10, 13, 14, and 15 due to the fact that in the first case, fewer factors affect the output of the entire system from a "good" state with point of view of sustainable development. Also, this set of scripts is not irrevocable. In this situation, there is the possibility of a transition from a moderate growth of the factor of social well-being in the region (scenario 29) to its rapid growth (scenario 35). At the same time, all other factors will remain unchanged.

As the analysis of Table 1, the main factor in this qualitative model, which affects the transition of the entire system from one development scenario to another, is the level of tourism, related and general infrastructure. Thus, in order to comply with the principles of equilibrium of the ecosystem of rural areas in the process of building objects of general and related infrastructure for agritourism, it is imperative to plan and implement protective engineering measures, in the process of creating and operating in rural areas objects of tourist-recreational and transport infrastructure, strict observance of sanitary-epidemiological and environmental requirements, the implementation of integrated landscaping and the maximum landscaping investment and infrastructure construction, and others.

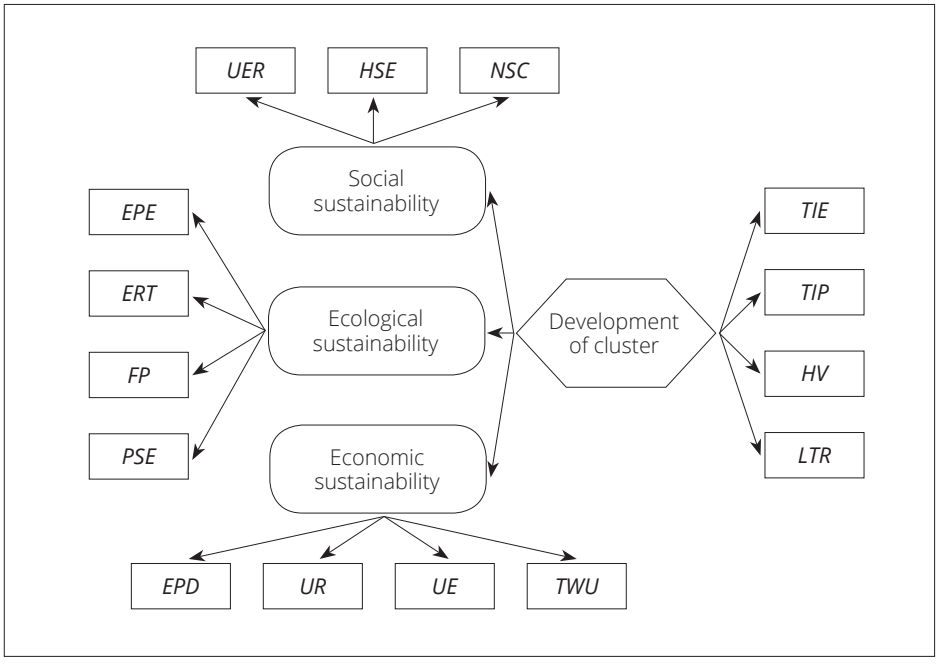
6. The Partial Least Squares Path Modeling (PLS-PM)

The PLS-PM model for the development of agritourism and tourism development in rural areas makes it possible to view the tasks of sustainable tourism development systematically and comprehensively, allows an objective assessment of the results of the practical implementation of the sustainable development strategy based on a comparison of basic and current values of estimates of variables that clearly characterize the level of development of the regional agritourism cluster. The model under consideration includes indicators of a socio-economic nature, which make it possible to make forecasts of the level of agritourism development.

In this study, PLS-PM is a tool for modeling various relationships between various implicit or latent variables. This technique is applicable for the analysis of high dimensional data in a situation of an insufficiently structured environment. The model of sustainable development of agritourism formed in the framework

of the study contains indicators and blocks. In the study, indicators of sustainable tourism development for a territory with a fairly developed tourism industry were used as indicators [Greenwood, 2006: 37]. These include: the total number of jobs in the field of agritourism (TIE), the wage fund in the field of agritourism (TIP), the level of housing prices (HV), the level of tax revenues from agritourism (LTR), the number of participants in social tourism / social recreation programs and rehabilitation (NSC), expenditures of state and local budgets for various social services for the rural population (HSE), current unemployment rate (UER), expenditures of state and local budgets for ecology and environmental protection (EPE), percentage of employees employed in agritourism (ERT), the number of low-income households (FP), state and local budget expenditures on public safety (PSE), state and local budget expenditures on economic development (EPD), state and local budget expenditures on utilities (UR), utility budget (UE), and volume of water consumption (TWU). For indicators from open sources, the study collected relevant statistics for 2001–2018. The initial model for the study is shown in Figure 3.

Figure 3. The initial model for the study of the sustainable development of agritourism cluster



Source: compiled by the authors.

The external part of the model is the relationship of implicit (latent) variables with explicit indicators, and the internal is the relationship of only latent variables. Thus, the analytical form of the internal part of the model has the form (4):

$$LV_{tourist} = \beta_0 + \beta_1 LV_{social} + \beta_2 LV_{ecologic} + \beta_3 LV_{economic} + error_{tourism} \quad (4)$$

where $LV_{tourism}$, LV_{social}, $LV_{economic}$, $LV_{ecologic}$ are latent variables, β_0 is a free term, β_1, β_2, β_3 are "path" coefficients, agrotourism is a residual term.

Below is an analytical view of the external part of the model formed in the course of this study (5):

$$\begin{cases} X_{TIE} = \lambda_{0TIE} + \lambda_{1TIE} LV_{tourism} + error_{TIE} \\ X_{TIP} = \lambda_{0TIP} + \lambda_{1TIP} LV_{tourism} + error_{TIP} \\ X_{UER} = \lambda_{0UER} + \lambda_{1UER} LV_{social} + error_{UER} \\ X_{UER} = \lambda_{0UER} + \lambda_{1UER} LV_{social} + error_{UER} \\ X_{EPD} = \lambda_{0EPD} + \lambda_{1EPD} LV_{economic} + error_{EPD} \\ X_{UR} = \lambda_{0UR} + \lambda_{1UR} LV_{economic} + error_{UR} \\ X_{EPE} = \lambda_{0EPE} + \lambda_{1EPE} LV_{ecologic} + error_{EPE} \\ X_{ERT} = \lambda_{0ERT} + \lambda_{1ERT} LV_{ecologic} + error_{ERT} \end{cases}, \quad (5)$$

where X_{TIE}, X_{TIP}, …, X_{ERT} are explicit variables, λ_{0TIE}, λ_{0TIP}, …, λ_{0ERT} are free terms, λ_{1TIE}, λ_{1TIP}, …, λ_{1ERT} are load factors, $error_{TIE}$, $error_{TIP}$, …, $error_{ERT}$ are residual terms.

The system of equations (6) shown below reflects estimates of latent variables:

$$\begin{cases} \widehat{LV}_{tourism} = Y_{tourism} = W_{TIE} X_{TIE} + W_{TIP} X_{TIP} + W_{HV} X_{HV} + W_{LTR} X_{LTR} \\ \widehat{LV}_{social} = Y_{social} = W_{UER} X_{UER} + W_{HSE} X_{HSE} + W_{NSC} X_{NSC} \\ \widehat{LV}_{ecologic} = Y_{ecologic} = W_{EPE} X_{EPE} + W_{ERT} X_{ERT} + W_{FP} X_{FP} + W_{PSE} X_{PSE} \\ \widehat{LV}_{economic} = Y_{economic} = W_{EPD} X_{EPD} + W_{UR} X_{UR} + W_{UE} X_{UE} + W_{TWU} X_{TWU} \end{cases}, \quad (6)$$

where by w_{TIE}, w_{TIP}, …, w_{TWU} we mean the external weights of the sustainable tourism development model.

The resulting model with appropriately calculated parameters (travel coefficients and loads, external weights) allows you to monitor compliance with all the

basic principles of the concept of sustainable development of agritourism in each individual time period. In this case, stability or instability can be determined by comparing different values of the block estimates for different periods. And here two scenarios will be possible. The first – estimates of latent blocks / variables related to the field of ecology, economy, and society should not have lower values in the current period than in the previous period. Under such conditions, if this kind of condition is successfully fulfilled for a block, then development can be considered sustainable. The second – the base level or reference point should be determined for each block. The value of the time period in which the corresponding indicator of the block (profitability of economic activity in the field of agritourism, the level of well-being of the environmental situation or the level of social tension / social well-being) had an acceptable value should be taken as such a level. If the block estimate in the current period is less than the corresponding estimate for the previous period, but more than the base value, then this development can also be considered sustainable.

While performing further research based on the PLS-PM technique, the model parameters were calculated, namely, the load coefficients of the external model (λ_{jk}), the path coefficients of the internal model (β_{ji}), and also the external weights to obtain latent estimates variables (w_{jk}) with model optimization. At the same time, the following conditions were fulfilled: consistency in the blocks, the absence of the so-called "traitor variables", the significance of the variables of the external model, the correspondence of the model with data by the general index, and the verification of the internal model. During the optimization process of the model, the initial information is corrected; variables and blocks that do not have a sufficient degree of significance are eliminated. The result of this work can be visualized in the form of a graph (Figure 4, see: the next page), where the external weights will be indicated above the arrows of the external model, and the path coefficients above the arrows of the internal model.

In this case, the internal model of the system will have the following form (7):

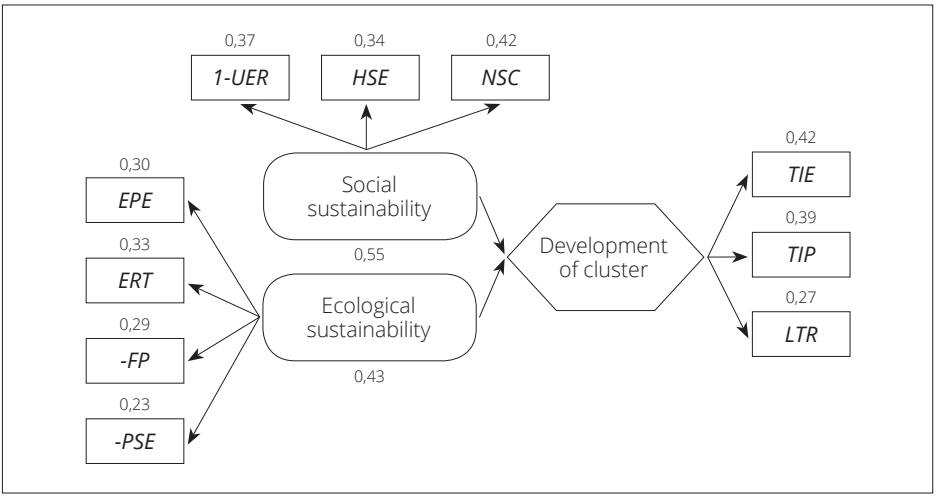
$$LV_{tourism} = 0.55LV_{social} + 0.43LV_{ecologic} + error_{tourism} \quad (7)$$

Such characteristics as environmental and social sustainability with a power of influence of 0.43 and 0.55, respectively, have an incredibly significant impact on the level of agritourism development. During the study, it was found that the impact of economic sustainability on the development of agritourism in Belarus

is very small. Most likely, this fact is explained by the specifics of a particular research area. At the same time, the following equations were obtained for estimating latent variables (8):

$$\begin{cases} \widehat{LV}_{tourism} = 0.42X_{TIE} + 0.39X_{TIP} + 0.27X_{LTR} \\ \widehat{LV}_{social} = 0.37\left(1 - X_{UER}\right) + 0.34X_{HSE} + 0.42X_{NSC} \\ \widehat{LV}_{ecologic} = 0.3X_{EPE} + 0.33X_{ERT} - 0.29X_{FP} - 0.23X_{PSE} \end{cases} \quad (8)$$

Figure 4. The final model of sustainable development of agritourism



Source: compiled by the authors.

According to the results obtained in the course of this study, social sustainability will be characterized to the greatest extent by such indicators as the unemployment rate, the amount of state funding for public health programs and other social programs, and the average monthly number of people falling under social tourism programs. In turn, environmental sustainability is characterized by such indicators as the size of public investment in the field of ecology and environmental protection, the share of tourism jobs in the total number of jobs, the number of households with incomes below the subsistence level (negative relationship), and the amount of government spending to maintain public safety (negative dependence). An assessment of the level of development of agritourism can be based on indicators such as the number of jobs in the agritourism sector, the wage fund in agritourism, and the amount of income to the budgets of all levels from activities related to agritourism.

A significant advantage of the described PLS-PM method is that it does not have strict requirements for the number and characteristics of the applied source data, both for multi-collinearity and statistical distributions, etc. In the PLS-PM study, the method was first used to model the sustainable development of agritourism – similar models in the currently available specialized scientific literature are not yet available. In the future, this model can include not only the indicators of sustainable development itself, but also various factors that influence the formation of an agrotourism cluster in each specific country or region.

7. Conclusions

A significant component of economic growth for rural areas and regions with significant tourist and recreational potential is the development of agritourism cluster. In such a situation, the application of economic and mathematical models of sustainable development is the development of well-thought-out, justified, and balanced decisions in the field of economic, regional and tourism policies. In the course of the research conducted by the authors of the article, models for the sustainable development of agritourism were built and analyzed. Based on these models in the future, simulators can be formed to support the processes of making complex managerial decisions in this area, which allow us to consider all potential scenarios and transitions between them on the basis of a qualitative model for almost any complex systems, as well as implement models based on PLS-PM prognostic function for evaluating latent variables. The structural model can also include indicators characterizing the development of an agritouristic cluster, as well as factors influencing the development. The tools developed in the course of this study can significantly simplify the process of forming economic and mathematical models of sustainable development of agritourism and have the potential to apply them in order to ensure the optimality of various management decisions in the field of regional management. The successful construction of a set of models for the sustainable development of agritourism provided the scientific novelty of the study, its theoretical significance lies in the further development of the theory of economic and mathematical modeling of various economic processes in the field of qualitative and PLS-PM modeling, and the significance of this study for practice lies in orienting its results to a wide application by authorities to achieve the sustainable development goals of rural areas.

References

Batista e Silva F. et al., 2018, *Analysing spatiotemporal patterns of tourism in Europe at highresolution with conventional and big data sources*, "Tourism Management", No. 68, DOI:10.1016/J. Tourman.2018.02.020.

Bramwell B., Lane B., 1993, *Sustainable tourism: An evolving global approach*, "Journal of Sustainable Tourism", No. 1.

Greenwood J. B., 2006, *Sustainable Development in a Tourism Destination Context: a Plimsoll Model of Sustainability in Tyrell Country*, North Carolina State University, Raleigh.

Khazova D. S., 2014, *Modeling of sustainable tourism development using the method of projection on latent structures*, "Financial Analytics: Science and Experience", No. 26 (212).

Kirstges T., 2002, *Basic questions of "sustainable tourism": does ecological and socially acceptable tourism have a chance?*, "Current Issues in Tourism", No. 5 (3–4), DOI:10.1080/13683500208667917.

Mowforth M., Munt I., 1998, *Tourism and Sustainability: New Tourism in the Third World*, Routledge–London.

Sharpley R., 2000, *Tourism and sustainable development: exploring the theoretical divide*, "Journal of Sustainable Tourism", No. 8 (1), doi.org/10.1080/09669580008667346.

Tymošenko M., Golovach K., 2018, *Modeling of the prospects for sustainable development of agricultural territories by the bayesian networks*, "Management Theory and Studies for Rural Business and Infrastructure Development", No. 40 (2), doi.org/10.15544/mts. 2018.2.