INDICATORS AND SUB-INDICATORS CHARACTERIZING COMPETITIVENESS OF FORESTRY COMPANIES

Assoc. Prof. Dr. Konstantin Kolev[1]
Prof. Dr. Nikolay Stoenchev[1]
Assoc. Prof. Dr. Nasko Iliev[1]
Assoc. Prof. Dr. Galin Milchev[1]
Assoc. Prof. Dr. Maya Tsoklinova[1]

[1] University of Forestry, Bulgaria

ABSTRACT

In connection with elaboration of scientific project 'Statistical study of forestry companies competitiveness' and on the basis of the accumulated national and foreign experience a system of indicators and sub-indicators for complex quantitative assessment of forestry companies competitiveness has been offered. The proposed indicators are: competitiveness of product being offered; labor productivity; financial results; enterprise growth; market adaptability; economic realization of property of forest resources; silvicultural activities. In current paper are presented the scientific results from the verification of the offered indicators and sub-indicators reliability.[1] The verification is carried out on the basis of questionnaire survey among specialists connected with forestry. The questionnaire includes two parts. Through the first one is checked the reliability of the system of indicators related with competitiveness of economic subjects that manage Bulgarian forest territories. By means of the second part is checked the reliability of the system of indicators connected with competitiveness of economic subjects engaged with timber harvesting and silvicultural activities in Bulgarian forest territories. On the grounds of the collected and processed data the initial system of indicators and sub-indicators is supplemented and improved.

Key words: forestry, competitiveness, indicators, sub-indicators, questionnaire survey

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[1] Here should be underlined that in accordance with the accepted conceptual framework of the project NIS-B-1140 from statistical point of view the competitiveness is a complex indicator characterized by multifaceted dimensions. It consists of derived and one-dimensional indicators. The former reflect several features of certain phenomenon while the latter reflect only one separate feature of it. The assessment of the derived, or complex, indicator as a result of the transition from singular to general, is based on the significance of one-dimensional indicators. The very calculation of the assessment can be done through aggregation of the values of the one-dimensional indicators, which in their unity characterize the complex indicator that is studied [8]. In present paper to facilitate the exposition the set of derived indicators that characterize the complex indicator competitiveness are called indicators and one-dimensional indicators, which constitute them are called sub-indicators.

INTRODUCTION

During the first phase of research project NIS-B-1140, which is funded by the University of Forestry – Sofia on the basis of study of literature sources indicators and sub-indicators for complex quantitative assessment of forestry companies competitiveness in Bulgaria are justified theoretically [8]. In this relation the goal of this article is on the basis of empirical sociological study, which is carried out among specialists connected with Bulgarian forestry to verify the reliability of the initially proposed system of indicators and sub-indicators characterizing the forestry companies competitiveness.

1. METHODS FOR CONDUCTING EMPIRICAL SOCIOLOGICAL RESEARCH

The choice of appropriate method for carrying out empirical sociological research requires consideration of advantages and disadvantages of some basic sociological methods: observation, study of documents, experiment, questionnaires and interview.

• **The observation** is method for registration that directly monitors person's behavior or the course of specific event [4]. The main advantage is that it gives to the researcher the opportunity to describe in detail behavior, intention, situation and event, which are analyzed afterwards. As a result of that new research questions or hypotheses arise [9]. At the same time the main drawback is the subjectivity of the researcher's assessments and perceptions especially when using the so-called key informants. It is not uncommon for researchers to extract different information from different key informants using the same observations. [9].

• **Study of documents** is interdisciplinary method that has its own place. Under the term document is understood all things in which is contained or from which information about the studied subject or event can be obtained [10]. The advantage is the opportunity to study the objects in historical aspects. At the same time the disadvantages are: the documents are not detailed enough as they are prepared for goal different from the research's one; the necessary documents are not always available and the available ones do not reflect the essence of things we are interested in [3]. Towards these shortcomings must be added the risk of subjectivity in the work of the researcher [12].

• **The experiment** is method used in modeling interpersonal situations. The main advantages of the experiment are the use of different sources of information and the discovery of causal relations [12]. However it should be taken into account the fact that unlike economics and political science the opportunities for experimentation in sociology are not so many [1]. In particular different aspects of social life can't be studied in laboratory conditions. In most of the cases the observed individuals do not behave naturally as they know that they are part of a study [5].

• **The questionnaires** are method of scientific research in which the respondents are provided with inquiry card with open and/or closed questions. The main advantage of the questionnaire method is the possibility to collect a large quantity of data at low cost which can be processed quickly [7]. In comparison with all other methods the

difficulties, which are met in providing representativeness of the information, in questionnaire survey are less [10]. Furthermore one of the essential advantages of the questionnaire survey is the possibility to process the collected data with statistical methods as well as to use them for hypotheses verification [6, 12].

•   **The interview** is based on verbal communication for information gathering. Important disadvantages of the interview are the high costs of time and money [11].

In correspondence with the principle of objectivity of the received sociological information and possibility to compare the quantitative information **the questionnaires** are accepted as main research method. For receiving additional objective information as auxiliary methods are used observation, study of documents and interview.

2.   RESULTS FROM THE QUESTIONNAIRES

The inquiry card has two parts. By means of the first one the reliability of system of indicators and sub-indicators connected with competitiveness of economic subjects managing forest territories is verified. Through the second one the reliability of a system of indicators and sub-indicators connected with competitiveness of economic subjects engaged with timber harvesting and silvicultural activities in forest territories is verified. In theory and practice there is still no consensus on the indicators and sub-indicators for assessing competitiveness. Due to this towards them some **general requirements** may be set up: practicality, which is associated with low data acquisition costs; objectivity and measurability of sub-indicator, which permit comparative analysis of the achieved results; intelligibility of the indicator, which is expressed in clear definition and unambiguous interpretation [13].

Through the inquiry card a questionnaire survey is carried out among 162 specialists connected with forest territories management in Bulgaria as well as with companies engaged in timber harvesting and silvicultural activities. To fill the inquiry card is necessary to assess the general requirements from above by means of four-score scale with the lowest score of 1 and the highest score of 4. On these grounds the reliability of the proposed system of indicators and sub-indicators is verified.

The results from the questionnaires are presented in Table 1 and Table 2 as scores. The lasts are arithmetic mean scores for some of the indicators (in bold in the tables) and all sub-indicators concerning the general requirements towards them. In last column of the table the total score for some of the indicators and all sub-indicators is calculated as an arithmetic mean.

Table 1. Scores of indicators and sub-indicators for assessment of competitiveness of economic subjects, which manage forest territories

Indicators and sub-indicators	Practicality	Objectivity and measurability	Intelligibility	Importance of indicator/sub-indicator for company competitiveness	Total scores
Competitiveness of product being offered					
Price of the realized timber, BGN/m³	3.88	3.55	3.77	3.66	3.72
Quantity of realized timber, m³	4.00	3.55	3.55	3.67	3.69

Labour productivity, BGN/employee	3.22	3.11	3.22	3.77	3.33
Costs for wages and insurances, BGN	3.22	3.11	3.55	3.77	3.41
Depreciations, BGN	3.50	3.40	3.33	3.00	3.31
Number of employees	3.60	3.51	3.40	3.02	3.38
Profit, BGN	3.77	3.77	3.77	3.88	3.80
Financial results					
Profit, BGN.	3.77	3.77	3.77	3.88	3.80
Equity, BGN	3.60	3.58	3.54	3.00	3.43
Long-term liabilities, BGN	3.63	3.61	3.54	3.10	3.47
Short-term liabilities, BGN	3.57	3.46	3.6	3.41	3.51
Short-term assets	3.64	3.29	3.7	3.3	3.48
Enterprise growth					
Value balance of fixed assets, BGN	3.33	3.22	3.33	3.78	3.42
Mean annual increment, m^3/ha	3.66	3.22	3.33	3.00	3.30
Market adaptability (determined on the basis of the amount of offered and sold timber),%	2.88	3.11	3.66	3.44	3.27
Economic realization of property of forest resources					
Payments in Forest Investment Fund (Rent Income), BGN	3.33	3.00	3.07	3.04	3.11
Total area of managed forest territories, ha	3.33	3.11	3.66	3.01	3.28
Forested area of the managed forest territories, ha	3.55	3.33	3.33	3.00	3.30
Total growing stock of managed forest territories, m^3	3.22	3.11	3.22	3.33	3.22
Silvicultural activities					
Fire protection belts, BGN/dka	3.50	3.64	3.56	3.67	3.59
Mineralized stripes, BGN/m	3.55	3.44	3.66	3.67	3.58
Fencing, BGN/dka	3.40	3.55	3.66	3.52	3.53
Afforestation, BGN/dka	3.00	2.66	3.33	3.00	3.00
Completion, BGN/dka	3.00	3.00	3.00	3.00	3.00
Soil preparation, BGN/dka	3.00	3.00	3.22	3.11	3.08
Maintenance, BGN/dka	3.33	3.22	3.22	3.00	3.19
Cuttings without material yield, BGN/dka	2.55	2.77	2.89	2.68	2.72
Supporting regeneration, BGN/dka	2.11	2.33	2.77	2.22	2.36
Pruning, dka	1.88	2.22	2.66	2.01	2.19
Qualification of the workforce	2.88	2.88	2.77	3.56	3.02
Contemporary level of equipment and technologies used in production process	2.11	2.44	2.55	2.55	2.41
Availability of written strategy for human resources management	1.88	2	2.33	1.55	1.94
Annual expenditures for research and development, BGN	1.66	2.11	2.33	1.55	1.91
Interaction with research organizations and universities	1.55	1.66	2.00	1.77	1.75

Table 2. Scores of indicators and sub-indicators for assessment of competitiveness of companies engaged with timber harvesting and silvicultural activities in forest territories

Indicators and sub-indicators	Practicality	Objectivity and measurability	Intelligibility	Importance of indicator/sub-indicator for company competitiveness	Total scores
Competitiveness of product being offered					
Price of the realized production	3.89	3.77	3.55	3.89	3.78
Volume of the realized production	3.77	3.67	3.77	3.88	3.77
Labour productivity, BGN/employee	3.29	3.51	3.53	3.66	3.56

Costs for wages and insurances, BGN	3.26	3.4	3.44	3.33	3.36
Depreciations, BGN	3.40	3.43	3.20	3.05	3.27
Number of employees	3.44	3.40	3.21	3.10	3.29
Profit, BGN	3.60	3.22	3.56	3.76	3.54
Financial results					
Profit, BGN.	3.60	3.22	3.56	3.76	3.54
Equity, BGN	3.50	3.52	3.49	3.00	3.38
Long-term liabilities, BGN	3.60	3.57	3.58	3.20	3.49
Short-term liabilities, BGN	3.53	3.49	3.42	3.24	3.42
Short-term assets	3.61	3.40	3.30	3.52	3.46
Enterprise growth: Value balance of fixed assets, BGN	3.11	3.33	3.11	3.67	3.31
Qualification of the workforce	2.88	2.88	3.4	3.66	3.21
Opportunities for changes in the production capacity in accordance with the needs of the market	2.88	2.88	3.34	3.55	3.16
Average level of production costs, BGN	3.11	3.02	3.11	3.22	3.12
Available trade partners	2.67	2.67	3.00	3.00	2.84
Contemporary level of equipment and technologies used in production process	3.44	2.56	2.66	2.55	2.80
Rhythmic delivery of raw materials necessary for the production process	2.88	2.67	2.67	2.88	2.78
Availability of written strategy for human resource management	2.44	2.55	2.44	2.00	2.36
Annual expenditures for research and development, BGN	1.77	2.44	2.44	1.78	2.11
Interaction with research organizations and universities	1.55	1.77	1.77	2.22	1.83

It is necessary to make brief explanations of the scores concerning some of the sub-indicators characterizing the indicator 'silvicultural activities'.

In accordance with the natural conditions and applied silvicultural systems for forests management the territorial departments (TP) – state forest ranges (DGS) and state hunting ranges (DLS)[2] are divided in two main groups:

The first group involves TP DGS and TP DLS in which is relied on natural regeneration. It is provided through application of different regeneration cutting methods. In this group of TP the large size of afforestation is negative sub-indicator. It points out that TP does not apply correctly the regeneration cutting.

The completion of young forest plantation might be considered in two aspects: From one hand the survival of young forest plantations is unsatisfactory, which is associated with application of inadequate afforestation technology. On the other hand the sub-indicator is positive because TP DGS/DLS performs what is necessary for positive final result from silvicultural activities.

Regarding the cuttings without material yield the assessment also should be considered in two ways. The necessity of them means that a large initial density has been applied at the afforestation which requires optimization of trees growth space. At the same time the application of such cuttings improves the mechanical stability of forest plantations.

The fencing in all cases is related with better survival of forest plantations.

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[2] TP DGS and TP DLS are territorial departments of state enterprises (DP), which are established with art. 163 from Forest Act (ZG), for management of state forest territories in Bulgaria.

Pruning is traditionally applied only in poplar plantation and for TP from this group does not have practical significance.

Supporting natural regeneration can be interpreted in two ways. The unsatisfactory natural regeneration may be result of incorrect regeneration cuttings. However if the right technology is applied the support of natural regeneration has better economic results than afforestation.

Forest fires are one of the most common causes for disturbances in forest plantations. Due to this all preventive activities should be assessed positively.

The second group involves TP DGS and TP DLS located mainly along Danube River. In these TP the activity is conducted mainly in poplar plantations. The rotation is 15-25 years after which forced cutting is carried out with intensity of 100%. The regeneration is artificial through afforestation. The afforestation is prerequisite for forestry as a whole. Because of that the activities related with soil preparation, afforestation, completion and maintenance should be evaluated with maximum score.

Cuttings without material yield does not have place in this way of management as the initial density must be the same as the density in maturity age.

The importance of fencing is clarified above. At the same time pruning is compulsory activity for maintenance of large-sized high-quality timber.

The support of regeneration is not applied as the completion of poplar plantation is carried out regardless of the size of losses.

Fire protection belts are not done as usually poplar plantation border with agricultural lands.

Making of mineralized stripes is favorable as it is possible poplar plantations to be affected by fire after burning the dry grasses.

On the basis of the scores presented in Table 1 and Table 2 is taken the final decision about the system of indicators and sub-indicators for assessment of competitiveness of forestry companies. **In order to achieve practical applicability of the developed system of variables for assessment of competitiveness in it are included only those indicators and sub-indicators that have score above 3 by all four general requirements mentioned above**. In this relation **the following variables are excluded** from the system of indicators and sub-indicators characterizing the competitiveness of economic subjects managing forest territories: cuttings without material yield; supporting regeneration; pruning; qualification of the workforce; contemporary level of equipment and technologies used in production process; availability of written strategy for human resources management; annual expenditures for research and development; interaction with research organizations and universities. At the same time **the following variables are excluded** from the system of indicators and sub-indicators characterizing the competitiveness of companies engaged in timber harvesting and silvicultural activities in forest territories: qualification of the workforce; opportunities for changes in the production capacity in accordance with the needs of the market; available trade partners; contemporary level of equipment and technologies used in production process; rhythmic delivery of raw materials necessary for the production process; availability of written strategy for human resource management; annual expenditures for research and development; interaction with research organizations and universities.

Here should be underlined that the indicators and sub-indicators excluded above are important for the competitiveness of forestry enterprises but due to lack of practicality, objectivity and measurability as well as intelligibility their use does not correspond to the main goal of project NIS-B-1140. The last one is to propose system of indicators and sub-indicators on the basis of which to be calculated complex quantitative assessment of the level of competitiveness of forestry enterprises.

CONCLUSION

On the basis of the conducted questionnaire survey the initially proposed system of indicators and sub-indicators characterizing the competitiveness of forestry enterprises is verified and supplemented and the following conclusions are formulated:

•   The indicator labor productivity (3.77) and sub-indicators – profit (3.88), value balance of fixed assets (3.78), costs for wages and insurances (3.77), quantity of the realized timber (3.67), fire protection belts (3.67), mineralized stripes (3.67) and price of realized timber (3.66) are most important for the competitiveness of **economic subjects managing forest territories** (see Table. 1). The above sub-indicators characterize the indicators: financial results, enterprise growth, competitiveness of the products being offered and silvicultural activities.

•   The sub-indicators – price of the realized production (3.89), volume of the realized production (3.88), profit (3.76), value balance of fixed assets (3.67) and indicators labor productivity (3.67) and qualification of workforce (3.66) are most important for the competitiveness of **companies engaged with timber harvesting and silvicultural activities in forest territories** (see Table. 2). Regardless of the importance of the indicator 'qualification of the workforce' for the competitiveness of forestry companies due to insufficient practicality and objectivity it is not used in project NIS-B-1140 for complex quantitative assessment of forestry companies competitiveness.

•   The accepted indicators and their sub-indicators (put in brackets after the respective indicator) on the basis of which is characterized competitiveness of **economic subjects managing forest territories** are: **Competitiveness of product being offered** (realized quantity; price); **Labor productivity** (gross added value; number of staff); **Financial results** (return on equity; liquidity ratio; financial autonomy ratio) [2, 8]; **Enterprise growth (**mean annual increment (m^3/ha); increment of value balance of fixed assets); **Market adaptability** (offered timber quantity; realized timber quantity); **Economic realization of property of forest resources** (rent income and total growing stock of managed forest territories, BGN/m^3; rent income and total area of managed forest territories, BGN/ha); **Silvicultural activities of forest ranges from first group** (soil preparation, BGN/dka; afforestation, BGN/dka; completion, BGN/dka; maintenance, BGN/dka; fencing, BGN/dka; fire protection belts, BGN/dka; mineralized stripes, BGN/m); **Silvicultural activities of forest ranges from the second group** (soil preparation, BGN/dka; afforestation, BGN/dka; completion, BGN/dka; maintenance, BGN/dka; fencing, BGN/dka; pruning, dka; mineralized stripes, BGN/m).

•   The accepted indicators and their sub-indicators (put in brackets after the respective indicator) on the basis of which is characterized competitiveness of **companies engaged with timber harvesting and silvicultural activities in forest territories** are: **Competitiveness of product being offered** (realized quantity; price); **Labor productivity** (gross added value; number of staff); **Financial results** (return on

equity; liquidity ratio; financial autonomy ratio); **Enterprise growth (**increment of value balance of fixed assets);

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