EXPERIENCE IN THE USE OF THE ANALYTIC HIERARCHY PROCESS   IN LATVIA

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1. INTRODUCTION

The taking of a decision is the final phase in studying any problem, and it is the most important part of this process. The technology that is used to prepare and adopt a decision has much to do with whether or not all of the information that has been collected during the process is actually used.

The Analytic Hierarchy Process, or AHP, is widely used in the United States, Japan, and in many other countries. AHP has also been used on some occasions in Latvia in order to deal with certain problems and to take relevant decisions. The method was used the first time in Latvia for evaluating the productivity and territorial placement of companies which were engaged in primary processing of grain (Rivza P., 1995). During the last ten years, AHP has been used in many decision activities in agriculture, economy, education, and regional development.

2. APPLICATIONS OF AHP IN LATVIA

THE AHP USE FOR DECISION MAKING IN AGRICULTURE AND AGRICULTURAL PRODUCTS PROCESSING

The first AHP in Latvia was used for choosing the place for a grain primary processing plant (Rivza P., 1995). In the first (or top) level, the overall goal was "Location of a grain primary processing plant". In the second level, there were eight criteria which contributed to the goal: total specific expenses, the project, territorial location, financial regulations, development of the location place, skilled labour power, environmental protection, and grain primary processing system in the district. In the third (or bottom) level, there were three candidate places which had to be evaluated in terms of the criteria in the second level. The experts estimated the significance of the criteria and compared the alternative locations of the grain primary processing plants in relation to each of the criterion.

The AHP and theoretical principles of system analysis were used in decision making about the development strategy of sugar industry in Latvia (Strautnieks A., Rivza P., 1996). In the second level, the experts identified the following eight criteria:

- farmers – to what extent each variant influences the economic situation, development of farmers, and development of farming;
- producers – to what extent each variant influences the economics and perspective of a sugar refinery as a sugar producing enterprise;
- merchants – what possibilities to enlarge the turnover and profit each variant has;
- consumers – to what extent each variant affects the living standard of population and economics of an enterprise as well as the conjuncture of sugar market;
- economics – how each variant affects the efficiency and productivity of a branch in total as well as ensures the development rate;
- finances – how profitable is each variant from the point of finances and how real is the guarantee of financial resources;
- state – to what extent each variant corresponds to the state interests as well as to its socioeconomic politics;
- Europe – to what extent each variant corresponds to the interests of the EU.

The experts also compiled the pairwise comparison matrix of criteria using a special scale of relative importance, but the priorities of criteria were calculated. Financing was the most important criterion in choosing the optimal strategy.

The problem was to construct 4 strategies (the third level):

- Strategy A – sugar production from sugar beets;
- Strategy B – sugar production from raw sugar;
- Strategy C – sugar production from sugar beets and from raw sugar;
- Strategy D – sugar not produced in Latvia, but imported.

A pairwise comparison of these strategies was made against each of the criteria of the second level. Global priorities of the strategy of sugar industry development in Latvia were calculated for all strategies. Strategy C had the highest priority criterion and this strategy was the winner.

The AHP use for technical and technological assessment of tractors. In agriculture, there are several alternatives to choose a tractor. It was a necessity to find out the best method for the tractors' technical and technological assessment.

The Analytic Hierarchy Process as one of the methods has been made for the assessment of tractors (Viesturs D. et al., 1998). Its algorithm was adjusted for the assessment of tractors.

The highest level – the problem – was the assessment of tractors. The next level offers criteria groups:

- technical parameters;
- specific price;
- equipment and aggregation possibilities;
- working conditions and control of the operation;
- operation safety, endurance;
- technical provision of the service.

The alternatives include tractors within the power group up to 75 kW (John Deere 6400, Case IH 5120, Valmet 6300, MF 3065 S, MTZ-820, Zetor 7340, and Ursus 1134).

The AHP method is used also in the analyses of the models of integration of meet production (Zvirbule-Bērziņa A., 2002). Six criteria were offered: Development of the branch of meat; The mutual economic profitability of the meat producers and processors; Cut-down of expenses for the primary and secondary spheres; Assurance of independent and constant quality; Priority of sale prices; Increase of competitiveness for all participants of the integration.

The alternatives include five integration model variants of the meat production, which have to be assessed in relation to criteria.

THE AHP USE FOR DECISION MAKING ON THE PERSPECTIVE DEVELOPMENT OF THE EDUCATION SYSTEM IN LATVIA

In order to prepare and take a decision on **the development of the higher education system in Latvia,** methods and means have to be used as many as possible. For the final decision making on the development of the higher education system in Latvia, it is possible to use the AHP (Rivza B., Rivza P., 1998).

While adapting the AHP to the selection of the development strategy of higher education, the future of higher education in Latvia is the problem of the 1st level. Economical, political, social and technological factors are those influencing the problem and are the 2nd level in the hierarchical process. These factors are influenced by the following groups of people (actors): students, lecturers, administration of the higher educational establishment, government, private sponsors and funds, and producers. They are the third level in the hierarchy. The 4th level shows that each of these actors has its goal and motivation. And, finally, there are the following alternative scenarios for Latvian higher education development – this is the 5th level in the AHP:

- Projection of the future – planning of the future with slight changes;
- The professional (skills) scenario – an orientation toward professional higher education;
- The "for everybody" scenario – subsidized education for everyone;
- The elite scenario – elite higher education for specifically selected individuals;
- The state scenario – there are only state-run institutions of higher education;
- The technical scenario – the emphasis on the use of modern technologies in education;
- The training scenario – higher education institutions are separate from scientific and research facilities.

The experts had to carry out the estimation on all levels. According to the estimation of these experts, the scenarios of higher education development directed to the expansion of higher professional education and the use of up-to-date technical means in training have been estimated as the highest ones.

The AHP method is used in the analyses of the structural models of general upper secondary schools (Eglitis J., Rivza B., Rivza P., 2003).

The AHP algorithm was applied in the analyses of the structural models of general upper secondary school. The objective – the accessibility of a qualitative general upper secondary education is the problem of the 1st level. The 2nd level are groups of criteria:

- Formal criteria (number of pupils, quality indicators, qualification of teachers, teaching aids, facilities, pupils/teacher ratio, andexpenditures per pupil);
- Interests of pupils (competitive education, distance from school, choice of educational programs, extra curriculum activities, out of class activities, and accommodation);
- Interests of local authorities (municipalities, counties – depending on administrative-territorial reform) – working places, the capacity of local authority, perspectives of development, maintaining of historical and cultural environment, political stability, and reducing of public expenditures);
- Regional (according to the laws of the Republic of Latvia) interests (competitiveness of schools, development planning, the system of methodological work, teacher in-service training, and quality assurance);
- State interests (accessibility of qualitative education, integration of society, effective use of resources, and quality control).

Alternatives include probable structural models of general upper secondary school: Integration of General and Vocational Secondary Education, Optimization in the framework of administrative and territorial reform, and Creating a Network of State Gymnasiums.

THE AHP FOR THE ANALYSIS OF VARIOUS VERSIONS FOR THE LATVIA ADMINISTRATIVE AND REGIONAL STRUCTURE

The Analytic Hierarchy Process has been made for the analysis of various versions for the Latvia administrative and regional structure (Rivza P., Rivza B., Ramute L., 1999).

The Hierarchy is structured from the top: Latvia administrative and regional structure. At the second level, the experts proposed five groups of criteria which, in their way, influence the highest level – the way in which Latvia's administrative and regional structure is to be established:

- formal criteria;
- the public interest;
- local government interests;
- national interests;
- EU interests.

As the lowest level we used several variants of Latvia's administrative-regional structure.

3. AHP IN THE STUDY PROCESS

Students of the Latvia University of Agriculture are studying the AHP method as a part of study subjects "Quantitative methods in economics" and "Operation research". PhD students of Economics Faculty are studying AHP method in "Quantitative methods in economics research". Many students have employed the AHP method in their diploma work.

4. CONCLUSION

The Analytic Hierarchy method can be used in the last stage of evaluating any problem, putting it to use at the point where a decision has to be taken or where one of many alternative options must be selected. In Latvia, we have experience of using AHP in the analysis of the grain, sugar, and meat production, rural tourism, and education systems.

5. REFERENCE

1. Rivza P. Methods for the analysis, modelling and optimization of a system for primary processing of grain. Doctoral dissertation, Jelgava: LLU (1995).
2. Rivza B., Rivza P. *Feasibility of using the Analytic Hierarchy Process for decision – making on the perspective development of the higher education system in Latvia.* 1998. Proceedings of the Estonian Agricultural University, No. 196, pp. 155-157.

3. Rivza B., Rivza P., Ramute L., Kruzmetra M. 1999. *An assessment of administrative-regional reform in Latvia*. Proceedings of the Latvia University of Agriculture, Volume 1 (295), pp. 2-7.
4. Rivza P., Rivza B., Ramute L. Experience in the Use of the Analytic Hierarchy Process in Latvia. Humanities and Social Sciences. Latvian countryside today. 1 (30)/ 2001. University of Latvia, pp. 15-23.
5. Eglitis J., Rivza B., Rivza P. Knowledge-based management and the Analytic Hierarchy Process in Latvia. Proceedings of International Scientific Conference "Modelling and Simulation of Business Systems", Vilnius, Lituania, May 13-14, 2003, pp. 123-127.
6. Zvirbule- Berzina A. Integration of meat production. Resume of the Doctoral Dissertation, Jelgava, 2003, pp. 72-74.