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Development of a Method for Priority Setting in Forestry Research Projects in Turkey

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Abstract: This paper deals with the priority-setting problem in public research projects in the Turkish forestry sector. For this aim, a combined method has been developed, that is scientific, objective, dynamic, consistent, multidimensional, easily applicable and understandable. The theoretical framework, peculiarities and criteria of the method and weighting of the criteria are explained. Assuring hierarchical multidimensional consistency between the purposes and priorities in the national and sectoral plans with the priorities of forestry research projects was followed for selecting the criteria and weighting them. This method was suggested to the Ministry of Environment and Forestry and its application was implemented through a case study in the Research Consulting Workshop consisting of 60 participants to determine the priorities of new 15 forestry research projects on the basis of Turkey. The research projects dealing with plantation, nature conservation, erosion control, range improvement and agroforestry were primarily ranked in accordance with the priorities of development purposes, the National Forestry Program and the Forestry Research Master Plan of Turkey. This means that the method gives successful results and it is applicable. Differences between this method and some other similar methods and its benefits were discussed with regards to the effective use of scarce resources and sustainable development.

Key Words: priority setting, forestry research project, multi-criteria method, sustainable development.

Türkiye'de Ormancılık Araştırma Projelerinin Önceliklerini Belirlemede Kullanılabilecek Bir Metodun Geliştirilmesi

Özet: Bu çalışma Türkiye'de kamu sektörü ormancılık araştırma projelerinde öncelik belirleme sorununa çözüm getirmek amacıyla ele alınmıştır. Bu amaçla uygulanması ve anlaşılması kolay ve pratik, çok boyutlu, objektif, dinamik, tutarlı ve bilimsel bir metod (kombine metod) geliştirilmiştir. Metodun teorik yapısı, özellikleri, kriterleri ve bu kriterlerin ağırlıklandırılması açıklanmıştır. Kriterlerin seçiminde ve ağırlıklandırılmasında, ulusal kalkınma ve sektörel planlardaki amaçlar ve öncelikler ile ormancılık araştırma projeleri öncelikleri arasında hiyerarşik olarak çok boyutlu tutarlılığı sağlayan, bir yaklaşım izlenmiştir. Çevre ve Orman Bakanlığı'na önerilen metod, Türkiye bazında 60 uzmanın katıldığı Araştırma Danışma Çalıştayında, 15 adet yeni ormancılık araştırma projesinin önceliğini belirlemek amacıyla uygulanmıştır. Uygulama sonunda, Türkiye'nin kalkınma amaçlarına, Ormancılık Araştırma Master Planı ve Ulusal Ormancılık Programındaki önceliklere uygun olarak ağaçlandırma, doğa koruma, erozyon kontrolü, mera ıslahı ve agroforestry gibi konuları içeren projelerin ilk sıralarda yer alması, metodun başarılı sonuçlar verdiğini ve kullanılabiliyor olduğunu göstermektedir. Metodun diğer bazı ülkelerdeki uygulamalardan ve benzer metotlardan farkları ortaya konularak, sağlayacağı faydalar kıt kaynakların etkin kullanımı ve sürdürülebilir kalkınma açısından değerlendirilmiş ve tartışılmıştır.

Anahtar Sözcükler: Öncelik belirleme, ormancılık araştırma projesi, çok kriterli metod, sürdürülebilir kalkınma.

Introduction

In general, research is mainly carried out to make a contribution to science, and to produce useful knowledge and technology for society. It is also an investment for the future, and each different research project has the character of an investment project. Investment projects are used as a means to reach certain production levels and

to support development. Hence, it should be known which benefits will be attained by the projects and what their contributions to development are. Projects should be evaluated and priorities set by certain methods to allocate the scarce resources to the fields giving maximum utility. For evaluating investment projects, there are some multi-criteria techniques including goal programming,

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multiple cost-benefit analysis, delphi, scoring, preference techniques etc., as well as certain single-criterion techniques including rate of return, net present value, employment, income distribution etc. (Bennet and Bowers, 1977; UNDP, 1977; Geray, 1986; Brent, 1996; Halaç, 2001).

The current scarce resources in the forestry sector should be allocated to the projects making the biggest contribution to the development goals, as in all sectors of the economy. The investment side of forestry is more intensive than its other sides, and its forward linkages are more significant than those in most other sectors (Geray, 1993; Türker, 1999). Similarly, forestry research requires more investment, financial, human and other resource inputs. Since resources are limited and forestry research has to compete with other public demands, it is necessary to establish priorities and to match them by clearly defined development goals and functions (Richardson, 1995, 1997). While the above techniques for the assessment of investment projects can generally be used in the forestry sector, there are also some special criteria developed particularly for this sector. However, there is not a universal method to determine the priorities of forestry research projects because this sector possesses different characteristics particular to each country. Therefore, each country needs to develop a method for priority setting in its own forestry research projects. Many countries have solved the priority-setting problem in forestry research projects and developed certain methods for this. There are some research and applications varying by country, time and sector on this topic (White, 1975; Kalipsız, 1987; Alston, 1992; Hyde et al., 1992; Beach and Cornezo, 1993; Blyth and Upstill, 1994; Nautiyal et al., 1996; Verma et al., 1996, 1997). However, in certain developing countries such as Turkey, the priorities of public sector forestry research projects have not yet been determined by a scientific and multi-criteria method, and hence have not been funded according to systematically determined priorities.

The private sector generally gives priority to projects according to the maximum profit principle. In the public sector, however, projects providing maximum benefit to society are selected by taking into account the goals in national, regional and sectoral development plans, as well as profitability. Since 99.9% of Turkish forestry is in the public (state) sector, the National Development Plans (NDP), the Forestry Main Plan (FMP) and the National

Forestry Program (NFP) of Turkey give some public responsibilities to the forestry sector including a contribution to national income, creating employment, decreasing income differences, supplying wood etc. These macro goals have to be reflected in the district, enterprise plans and projects. In other words, a forestry research project should hierarchically serve to realize the goals in regional, sectoral and national plans. Thus, priorities of forestry research projects in Turkey must be set by means of a multiple criteria technique consistently and relevantly to the national, regional and sectoral goals and strategies.

The priority-setting problem in forestry research projects in Turkey has been an important issue mainly since 1994, when the Forestry Research Master Plan (FRMP) was prepared as a part of the Turkish Agricultural Research Project (TARP) supported by the World Bank. Before this, a simple and traditional cost-benefit analysis taking into consideration only monetary dimensions had been used to assess research projects. Although the method was objective, the results were not taken into consideration when allocating resources, and so research projects were assessed subjectively. The currently applied method is insufficient to assess the priorities of forestry research projects multidimensionally and objectively.

The majority of current forestry research projects in Turkey are proposed, funded and carried out by the Ministry of Environment and Forestry (MEF) and its 12 Forestry Research Institutes (FRIs). A new forestry research project in the MEF is accepted or rejected in an assessment process consisting of 3 steps. In the first step, the research project tasks are discussed in the technical workshop of each FRI. After this, the researchable project tasks are submitted for second step assessment. In the second step, the workshops are constituted on the basis of "Areas of Research Opportunity (AROs)" in the FRMP. After the project tasks are discussed in each ARO workshop, the acceptable research project tasks are forwarded to the Research Consulting Workshop (RCW). In the third step, the final assessment is made by the RCW, the participants in which consist of scientists, leaders of research projects and AROs, FRI managers, representatives of the forestry and forest products industry, faculties, other public institutions and private-sector organizations related to forestry, research users, providers of finance and donor agencies and other stake-

holders. The RCW discusses and assesses the decisions made by each ARO workshop and so a new research project is accepted and conducted after the approval of the RCW.

Within this process, participants in each workshop assess the research projects based on their own experience and expertise. Certainly, the technical and scientific quality of the research projects is elevated through the 3 workshops. However, it cannot be said that the research projects are assessed and their priorities determined according to a scientific, objective and multi-criteria method in this process. On the other hand, as resource allocations to forestry continuously decline, priority setting in forestry research projects is especially important for the effective use of scarce resources. Furthermore, publicly funded forestry research projects have to be of value to the economy and the public of Turkey, and to compete with alternative opportunity areas for these resources. As a result, the priority-setting problem (which method will be used? who will carry it out etc.) in forestry research projects has not been solved exactly hitherto in Turkey. Therefore, an objective and multidimensional priority-setting method is needed. In this study, a scientific, objective and easily applicable multi-criteria method was developed, suitable for Turkish forestry, to set priorities in forestry research projects, and its application was implemented in a case study.

Materials and Methods

Theoretical Framework of the Method

During the development of the priority-setting method in this study, the following points were taken into consideration (Daşdemir, 1996): (1) Special importance was given to make the method understandable and usable, (2) The method is based on the multi-criteria assessment of research rather than on only one criterion, (3) Zero correlation between the criteria and thus each criterion measuring different benefits of the research was aimed for, (4) The criteria were weighted taking into consideration the national and sectoral development goals. The method gives a possible aggregation of the criteria weights and sets the priority of each research as a score of between 1 and 100, (5) It is also aimed that the structure of the method be dynamic for the preparation, implementation and conclusion of research within the competitive process.

The method developed according to these was named the multidimensional priority-setting method (or combined method) and formulated as follows:

$$PS = w_1 C_1 + w_2 C_2 + \dots + w_n C_n = \sum_{i=1}^n w_i C_i \quad (1)$$

where PS: priority score of the research ($1 \leq PS \leq 100$), w_i : weight of i th criterion ($0 \leq w_i \leq 1$), C_i : score given the research for i th criterion ($1 \leq C_i \leq 100$), n : number of criteria are shown. Two conditions are needed for determining the priority of each research as a score between 1 and 100. Firstly, the weight of each criterion has to range between 0 and 1, and the sum of all weights has to be 1. Secondly, scores given for each criterion should be between 1 and 100.

Determination of Criteria in the Method

The macroeconomic structure, sectors, regions, enterprises, projects, etc. constitute an integrated system of scope that narrows from top to bottom and the elements of which are ranked hierarchically. The most comprehensive and multidimensional purposes of each country are set down in its own development plans (upper systems). These purposes are realized through subsystems. Sectors have an important function in achieving development purposes. Similarly, enterprises and projects have an important function in achieving the purposes of sectors. Sectors' purposes can be derived from the purposes of the macroeconomic structure. In the same way, the enterprises and projects' purposes can be extracted from the sectors' purposes. It can be judged that the national resources are misused or unsupportively used for the national development purposes and strategies in cases when this consistency between the elements of the system cannot be seen clearly, objectively, quantitatively and qualitatively (Geray, 1993). Based on the above explanations and taking into consideration Turkish forestry characteristics and some previous research results (Türker, 1986; Daşdemir, 1996), the purposes of the lowermost systems (enterprises and projects) in Turkish forestry are determined and ranked as shown in Table 1.

It is expected that a new research project in Turkish forestry must initially have and serve the purposes in Table 1. Therefore, the method has to have the criteria to measure the contribution of each research project for the above purposes. Taking into consideration the national and sectoral characteristics of Turkey and priorities in

FRMP and NFP, the following 7 criteria used in the method were developed:

1. Net Economic Benefit (NEB) Criterion: This criterion measures the potential economic benefits of research to the national economy and end users in the short and long term. The potential economic benefits of research change according to the scope, scale, tree species, technology, depreciation factor and success level of the research, and target mass and acceptable ration of its results. It makes good use of their real cost-benefit analysis results and logical frameworks in data and evaluation sheets while giving them scores regarding this criterion. Participants in the RCW taking into consideration all their outcomes in data and evaluation sheets accordingly estimate the net economic benefits of the research projects as a score between 1 and 100. Since this criterion is related to all economic outcomes, total production and efficiency of the project and cost minimization, it can be said that the criterion serves to achieve the purposes of productivity, profitability and cost minimization in Table 1.

2. Environmental Security (ES) Criterion: This criterion measures the environmental effects of research on sustainable development. It concerns the potential contribution of the research outcomes to the environmental security involving such issues as the conservation of forests, biodiversity, and use of ecofriendly and biodegradable products. Therefore, the criterion relates to the concepts of protection, improvement, use of product, public health etc. The ES criterion is particularly critical for Turkey inasmuch as it refers to the country's primary environmental issues including erosion control, range improvement and nature protection. All direct-indirect and positive-negative effects that come from the application of the research results must be analyzed while the research project is assessed by the criterion. Scores between 1 and 100 are given to the research projects according to their suitability degree to the definition and questions of the criterion. Thus, it can be said that the criterion serves and is related to the purposes of nature conservation and collective service in Table 1.

3. Social Contents (SOC) Criterion: The objective of this criterion is to measure the distribution of benefits provided between income groups by the research and seek income distribution in favor of the lower income groups. Conceivably, welfare will increase at a larger

degree should the poor people benefit from the research results. This is yet another critical criterion for Turkey as it is a developing country with approximately 7.5 million poor forest villagers (OGM, 2004) and its rural poverty is extreme. Thus, this criterion seeks the answers to some key questions such as "What is the distribution of the research benefits amongst income groups?", "Who is the target mass and what is its scale?", "How much benefit will the poor and rural people get?", "Does it create new employment?" and "Are there any spillover benefits?". Briefly, the concepts of income distribution, employment and rural poverty are involved in this criterion scope, and so it mainly serves the employment purpose in Table 1. Assessing the research projects by this criterion, scores between 1 and 100 are given to them.

4. Consistency (CON) Criterion: This measures the internal and external consistency and congeniality in the use of resources and accomplishment of purposes. It can be judged that national resources are misused inasmuch as such consistency and congeniality are not clearly observed. The development goals and strategies may not be achieved in the event of choosing unsuitable technology, regions, tree species etc. in research. This criterion essentially has 2 steps. In the first step, scores are given to the research projects between 1 and 50 according to their degree of serving the goals and strategies in the NDP, FMP, NFP and FRMP as quality and quantity (external consistency). In the second step, scores are given out of 50 according to the internal consistency and congeniality degree of their aims, scope, originality, being scientific, material and method. Later, combining the scores given in the 2 steps, a new score between 1 and 100 is attained for each research project. In essence, this criterion that measures the degree of effectiveness in the use of resource helps to realize the purposes of cost minimization and profitability.

5. Participation and Collaboration (PC) Criterion: Since forestry is a multidimensional sector, the research in this area calls for a PC. If a PC cannot be established in forestry research, it is unlikely to be manifested in integrated economic land use and sustainable management. A PC helps to increase the validity and application of the research results to establish a rational balance between the economic and ecological values. In other words, it assists in obtaining maximum return, and building and maintaining the natural balance. Therefore, this is an important criterion with regard to the purposes

Table 1. The purposes of subsystems in Turkish forestry and their priorities.

Rank	Kinds of purposes
1	Productivity (especially to prevent obstacles to wood supply)
2	Nature (and Environment) Conservation
3	Cost Minimization (to use resources effectively)
4	Profitability
5	Employment (to decrease income inequalities)
6	Collective Service

of nature conservation and profitability. When scores are given for the research by this criterion, it is based on the PC proposed by the research with regard to knowledge, skill, technology and use of resources, specialists, land managers, disciplines, national and international institutions, non-profit organizations and private agencies, as well as pure scientists. If there is a PC with non-profit organizations and private agencies or international institutions, it is assumed to be of the first degree of importance. If there are PCs with the national institutions or the research and application units in the MEF and interdisciplinary, they are assumed to be of the second and third degrees of importance respectively. In addition, types of PC and numbers of institution are important to give a real score. Taking into consideration this criterion definition, scores are given for the research projects between 1 and 100.

6. Attractiveness (AT) Criterion: If the results of research do not solve any problem and have not got any clients, the research will not have any importance, urgency or actuality, or any contribution to science or application. For this reason, all research has to answer positively some key questions such as "Is the research subject original, actual or urgent?", "What is its contribution to science and application?", "Does it have

any customers providing financial support to it?", "What is the implementation chance of its results?", "What is its potential to increase productivity?", "What is its competitive strength?". The research projects responding positively to the above questions have high attractiveness and provide an increment in potential productivity. Scores are given to them between 1 and 100 according to their suitability to the criterion definition.

7. Feasibility (FE) Criterion: This criterion makes it possible to assess research projects with respect to research capacity, ability and feasibility (staff, senior researcher, skill, experience, technology, facilities, financial resources etc.). The proposed research is assessed with regard to certain key questions such as "Are there enough senior and other researchers?", "What are the levels of experience and skills of researchers and collaborators?", "What is the availability of necessary technology, facilities, financial and other resources?". The research projects responding to these questions have a high likelihood of feasibility. Basically, since the criterion represents the financial feasibility of research and effective use of resources, it can be said that it serves the purpose of cost minimization in Table 1.

Based on the above explanations, 7 criteria in the method and the purposes served by these criteria are shown in brief in Table 2.

The first 3 criteria assess the research project on the macro level and the last 3 assess it on the micro level. The fourth criterion assesses it on both the macro and micro levels. The number of the above criteria can be increased. However, the more the number of the criteria increases, the more their overlapping areas increase. This is inconsistent with the assumption of the method "zero correlation between the criteria". Likewise, it can be thought to decrease their numbers. Yet in such cases the

Table 2. The criteria in the method and their purposes.

Criteria	Purposes
1. NEB (Net Economic Benefit)	Productivity + Profitability + Cost Minimization
2. ES (Environmental Security)	Nature Conservation + Collective Service
3. SOC (Social Contents)	Employment
4. CON (Consistency)	Cost Minimization + Profitability
5. PC (Participation and Collaboration)	Nature Conservation + Profitability
6. AT (Attractiveness)	Productivity
7. FE (Feasibility)	Cost Minimization

research cannot be measured multi-dimensionally. Therefore, these 7 criteria are sufficient for priority setting in forestry research projects on the basis of Turkey at present.

Weighting of the Criteria

The above 7 criteria do not have equal weight or importance because each one serves different goals. Hence, the criteria should be weighted objectively and scientifically. The technique of logical weighting used earlier for the determination of the success level of forest enterprises (Daşdemir, 1996) was used in this study. The criteria were weighted in a way assuring multidimensional consistency between the uppermost system with the lowermost system regarding the purposes and strategies. Thus, the weights of the criteria on the project level were determined within a 2-step process. In the first step, the purposes in Table 1 are ranked from the least important to the most important, and are scored by a row scale as in the second column of Table 3. In order for this scoring to be valid statistically, the sum of the scores must be equal to 1 or 100. To calculate easily, the purposes are this time scored upon 100 as in the third column of Table 3. According to this new scoring, the least important purpose has 5 scores or weights and the most important one 28 weights.

Table 3. Importance degrees and weights of the purposes.

Purpose	Importance Degree	Weight
Collective Service	1	5
Employment	2	10
Profitability	3	14
Cost Minimization	4	19
Nature Conservation	5	24
Productivity	6	28
Total Score	21	100

In the second step, the repetition number of each purpose was counted taking into consideration all rows in Table 2. The weight of each purpose in each row was calculated by dividing the score of each purpose into its repetition number. Then the weight of each criterion was computed by accumulating all weights in each row. Doing similar computations for all purposes, all criterion weights were calculated. After the criterion weights were proportionally redistributed to the criteria, provided the

sum of all criterion weights is equal to 1, the PS function was obtained as follows:

$$PS = 0.25 NEB + 0.17 ES + 0.10 SOC + 0.11 CON + 0.16 PC + 0.14 AT + 0.07 FE \quad (2)$$

This function is based on multiplying the criterion scores by their weights, combining them, and stating each research project’s priority as a score between 1 and 100.

Results

This method developed for priority setting of new research projects in the Turkish forestry sector should be applied by only one RCW, whose scientific structure has to be heterogeneous and its participation size has to be large. For members of the RCW to be able to assess effectively, data and evaluation sheets should be prepared for the research projects. The data sheet includes the logical framework consisting of the short-term and long-term purposes of each research, and the results of its real cost-benefit analysis and information related to the key questions and definition of each criterion. The evaluation sheet is organized for the 7 criteria, and includes the concise definitions of the criteria and the names of the research projects. It presents an evaluation of the relevant data and information contained in the data sheet in the context of the key questions and definition of each criterion. The data and evaluation sheets are attached to the research projects, and all documents are sent to each RCW participant 20-30 days before the priority workshop so that the participants have the chance to peruse these documents and to make preliminary assessments thereon. During the workshop, under the overviews given by the head and experts, the research projects are discussed by each criterion in turn. At the scoring step, participants make judgments based upon both qualitative and quantitative information contained in the data and evaluation sheets and assign a score between 1 and 100 to the research projects for each criterion and record them on the score sheet.

After this process is completed, the score sheets are collected from the participants and the scores are entered into a spreadsheet for final assessment. The average score of each research project for each criterion is calculated by dividing the sum of the scores given to each research project for each criterion into participant number. The weighted scores are found by multiplying the average scores of each research project for all criteria

by the criterion weights; then the total of the weighted scores of each research project is computed by accumulating the weighted scores in each row (formula 2), and they are ranked according to their weighted score in the final evaluation sheet to allocate resources to them.

To test this method, the priorities of 15 new research projects to be handled by the MEF in Turkey were determined by the RCW with 60 participants. The priority-setting process was applied as explained above. The results are given in Table 4 of the average scores, the weighted scores, the total weighted scores and ranks of the research projects. The research projects pertinent to plantation, nature conservation, erosion control, range improvement and agroforestry were located in the initial rows. These results are suitable for the priorities of development purposes, NFP and FRMP of Turkey. Consequently, successful and effective results were obtained by use of this method for priority setting in forestry research projects on the basis of Turkey.

Resources are allocated to research projects according to their priorities in Table 4. In principle, resources are primarily allocated to the research project having the highest score and then to others according to the budget possibilities. Likewise, with a threshold value of 50, 60 etc. according to the situations and possibilities, the research projects having scores under this threshold value are not supported and resources are not allocated thereto.

Discussion

Each country has developed a method or system suited to its own characteristics for priority setting in research projects. For example, Hyde et al. (1992) basically suggested a scoring system measuring the economic benefits of research projects, while White (1975) suggested a method consisting of criteria with 5 points such as scientific sufficiency, financial support, employment, relevance to the aim, cost/benefit ratio and success probability for priority setting in research projects in the USA. In India, priority setting in forestry research was defined as a process with 8 steps, and priorities were set by a composite index consisting of 3 criteria (0.35 economic efficiency + 0.36 environmental security + 0.29 income distribution) (Nautiyal et al., 1996; Verma et al., 1996, 1997). On the other hand, in New Zealand and Australia a scoring model consisting of

4 criteria (potential benefits, ability to capture benefits, research-development potential and capacity) is used in the priority assessment (Blyth and Upstill, 1994; Richardson, 1995). Since the above systems or methods do not reflect the characteristics of the Turkish forestry sector, they are considered insufficient for setting priorities in forestry research projects multidimensionally and objectively on the macro level. For example, the above methods do not include the criteria of social issues, participation-collaboration, consistency, attractiveness, feasibility etc. and they do not have the hierarchical consistent weighting of criteria either. The criteria in the method and their weights were determined taking into consideration the development goals and priorities in national and sectoral plans, NFP and FRMP, and Turkish forestry characteristics. Thus, the method enables the selection of forestry research projects suitable for the purposes and priorities in national, sectoral and other forestry plans, and the effective use of resources for sustainable development. Therefore, this method is different from other systems or methods and suitable for priority setting in forestry research projects on the basis of Turkey. This is a scientific, objective, consistent and multi-criteria method, and it is also readily applicable and understandable.

On the other hand, the method resembles a delphi technique and its modifications. However, in a real delphi, the opinions of experts on a specific issue are obtained by a formal questionnaire in several rounds including controlled feedback without face-to-face discussions and meetings, and anonymous judgments of the group are obtained and there are no earlier defined and weighted criteria or scoring (Dalkey, 1969; Listone and Turoff, 2002). However, in the developed method, a priority workshop with heterogeneous participants is held. Research projects are discussed face-to-face for each criterion in turn. Participants give scores to the research projects for each weighted criterion according to discussions and information on the data sheets in only one round. Therefore, this new method was considered to be a combined method since its structure and application were different from the delphi technique.

The method is based on the multi-criteria assessment of research projects rather than being based on only one criterion. It simultaneously measures all the benefits of research projects and provides linear aggregation of all criteria with certain weights and sets their priorities

Table 4. Ranking of different forestry research projects in the final evaluation sheet.

Names of the research projects	Evaluation criteria(*) and average scores							Total weighted scores (PS)	Rank (Priority)
	NEB	ES	SOC	CON	PC	AT	FE		
Species selection on irrigated and non-irrigated sites for industrial plantations in the southeast Anatolia region	79.19	74.32	73.32	77.17	72.26	77.32	78.23	76.12	1
Developing natural management model in Firtına Valley and its near environment	70.30	84.37	72.22	71.97	79.45	73.67	74.62	75.31	2
Determination of species usable in erosion control in the Gümüşhane and Bayburt regions	73.05	80.47	72.90	71.42	71.27	74.35	73.30	74.03	3
Application opportunities of silvo-pastoral systems in unproductive but irrigated sites in the region of southeast Anatolia Project	75.07	72.65	74.97	72.07	70.77	75.35	78.55	73.91	4
Determination of range improvement methods to be used in the Burdur-Kemer region	73.92	72.50	72.42	67.67	70.57	68.70	71.77	71.42	5
Vegetative production of native alders in the eastern Black Sea region	72.07	71.93	69.07	68.70	68.48	72.67	71.55	70.85	6
Species and their qualities, supply and demand of wood products in ship construction	72.49	64.23	69.43	69.00	69.54	69.59	74.23	69.64	7
Determination of maintenance treatments in young stands of <i>Cedrus libani</i>	66.18	65.57	60.75	69.10	66.52	66.12	75.97	66.59	8
Research on vegetative production techniques of <i>Robinia pseudoacacia</i>	66.10	64.60	68.25	64.70	68.75	64.97	71.20	66.53	9
Effects of fertilizing on range improvement and its economics in the eastern Anatolia region	65.93	63.63	70.65	67.40	66.75	64.90	69.75	66.43	10
Determination of standard times and costs of techniques of pruning and removing root stumps in different aged poplar plantation	68.45	62.79	63.97	68.58	62.29	63.84	73.74	65.79	11
Effects of management studies to control erosion on water and silt efficiency in Tarsus-İnköy Incirli dere watershed	59.03	67.50	61.81	62.16	63.47	62.26	61.21	62.41	12
Determination of natural vegetation and their ecological demands in potential erosion areas in the central Anatolia region	60.05	68.15	58.40	63.52	59.45	61.22	64.35	62.01	13
Establishment of an observation system and a conservation plan in nature protection areas of <i>Pinus nigra</i> Arnold. subsp. <i>palasiiana</i> var. <i>pyramidata</i>	55.53	71.40	51.90	57.07	61.40	59.10	59.42	59.75	14
Determination of silvicultural treatments to be applied in <i>Pinus pinaster</i> stands established in mining areas	51.85	57.77	51.28	55.74	57.49	54.46	62.87	55.27	15

(*) NEB: Net Economic Benefit; ES: Environmental Security; SOC: Social Contents; CON: Consistency; PC: Participation and Collaboration; AT: Attractiveness; FE: Feasibility.

systematically. Thus, this method does not have the shortcomings of the single-criterion methods. Yet this method rests upon certain assumptions such as “zero-correlation between the criteria” like other multi-criteria methods. In addition, the dynamic structure of the method assures the preparation, implementation and conclusion of research projects in competition, and thus their quality increases. Moreover, the method gives one the opportunity to measure the priority of each research project as a score between 1 and 100, and to interpret, rank and evaluate the projects objectively.

The current structure of the method and its 7 criteria are sufficient and suitable for priority setting in forestry research projects on the basis of Turkey at present. However, the names, definitions and weights of the criteria can conceivably change in time in the country. Therefore, the names, definition, weights of the criteria in the method should be discussed and revised periodically according to the changing conditions, and priority seminars should be held. On the other hand, this method should be only used by a RCW instead of ARO workshops because the final assessment is made by the RCW. The RCW must also consist of internal and external participants: scientists, researchers, users, customers, providers, forest and research managers, leaders of

research projects and AROs, and representatives of the forest industry, faculties, other public institutions, the private sector, donor agencies and others related to forestry. Participants should adequately scrutinize the data and evaluation sheets, the research projects, definition of assessment criteria and all documents sent to them for using the method effectively. They should also participate in the priority workshop with substantial information and preparation beforehand. Otherwise, the method does not give valid results and its sensitivity decreases. The most important shortcoming or disadvantage of the method is that the priority decisions are limited to the experience and expertise of the individuals participating. However, if the participation size of the RCW is extended and scientific heterogeneity is provided, this shortcoming can be mitigated.

Consequently, this priority process is useful not only in ranking the research but also in determining technical assistance requirements to improve the system's capacity to undertake priority research. The method developed to use in this process is both to solve the priority-setting problem of forestry research projects and to help the effective use of resources for sustainable forestry and development in Turkey.

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