Short Communication

Forestry Activities that Forest Rangers Give Priority to in Seasonal Terms

İsmail Şafak*, Emre Göksu

Aegean Forest Research Institute, Urla, Izmir, Turkey

Abstract

Forest engineers and forest rangers fulfill the forest management activities considering the principle of efficiency and sustainability in Turkey. Forestry activities that forest rangers prioritized for each season were questioned in the study in accordance with the purpose of forest enterprises. The study was carried out in the Denizli Forest Enterprise Directorate in Turkey. The seasonal priority value of each activity performed in forestry departments was determined by the ranking technique. The ranking of most prioritized forestry activities on a seasonal basis was determined using the linear combination technique. As a result of analysis, the forestation, silviculture, production and marketing activities are given the highest priority in autumn, winter and spring seasons by forest rangers. Also, the activities of combating forest fires are given the highest priority during the summer season. The least priority is usually given to the activities in the non-wood forest products and services department. As a result, forest rangers' priorities for forestry activities differ according to the seasons.

Keywords: forestry activities, forest rangers, linear combination technique, ranking technique

Introduction

Forest resource management is a complex process comprising a large number of variables in the economic, social and environmental issues involved in the decision-making process. Forestry engineers and forest rangers are actively involved in the execution of technical, managerial and financial affairs for the management of these resources. In Turkey, the title of forest engineer is given to the people who graduated from the forestry engineering department of a forestry faculty. Forest rangers are required to have an associate degree education in one of the fields such as forest management, hunting and wildlife, seedlings and non-wood forest products.

Forest rangers, who are considered as the auxiliary technical staff, work under the forest engineers. The duties and responsibilities of the forest rangers were collected in 13 headings in Turkey [1]. These headings are as follows: i) the conservation of forest areas; ii) care and regeneration of forests; iii) conservation of forestation sites; iv) conservation of hunting and wildlife fields; v) production of wood raw materials; vi) production of non-wood forest products; vii) combating forest fires; viii) combating forest pests; ix) fighting against forest crimes (investigation and filing official reports); x) seed supply, forestation, arboriculture, soil preservation, and rangeland works; xi) surveillance and supervision of workers in the field; and xii) protection and care of guns, tools, and materials given to them.

---

*e-mail: isafak35@hotmail.com

As can be seen, forest rangers do important and serious work on forestry issues. In addition, forest rangers undertake a role in facilitating communication in the implementation of forestry projects and transferring them to society.

Research related to the management of forest enterprises in Turkey generally reflects the views of the forest engineers. Yılmaz et al. [2] determined the workload level of forest engineers. Kuvan et al. [3] explained the factors affecting the perception of forest administrators on basic forestry issues. Şafak and Göksu [4] determined the amount of job diversity in the Denizli Forest Enterprise Directorate. According to this, 14.1% (308 pieces) of the 2189 works performed by the forest enterprise directorate were carried out by forest rangers. Research on forest rangers is less than the amount of research on forest engineers. Maier and Winkel [5] examined the individual characteristics and personal perceptions of forest rangers within the scope of integrated forest management. Elvan [6] examined the duties and powers of forest rangers, and Öztürk [7] investigated the problems of forest rangers. Alkan and Uğur [8] investigated the training, problems experienced in the workplace and efficiencies of forest rangers.

As can be seen from the topics presented above, forest resource managers must take a large number of decisions affecting the long-term future of forest ecosystems and their daily activities. These decisions require consideration of the views of stakeholders involved in forestry and the use of multi-criterion decision-making approaches. In multi-criteria decision-making models, the value and preferences of stakeholders and decision makers can be taken into consideration [9]. For this purpose, sorting, grading, and binary comparison techniques are widely used in the evaluation of criteria and the emergence of preferences [10]. In this study, we used linear combination and ranking techniques.

Şafak and Gül [11] found that forest engineers in the Aegean region of Turkey prioritized 12 forestry functions and 13 forestry activities in February-March 2011. In this study, in preference to the importance level, it was seen that the effects of the current season were dominant, affecting the results. Therefore, unlike the other study, in this study i) the opinion of the forest rangers was included, ii) forestry activities were elaborated upon on the basis of the subject, and iii) the priority ranking of the activities was realized with the linear combination technique.

Material and Methods

The Denizli Forest Enterprise Directorate was chosen as the study area because it covers almost all forestry activities in the Aegean region in Turkey (Fig. 1). In the study, the departments working on forestry in the Denizli Forest Enterprise Directorate and the activities carried out in these departments
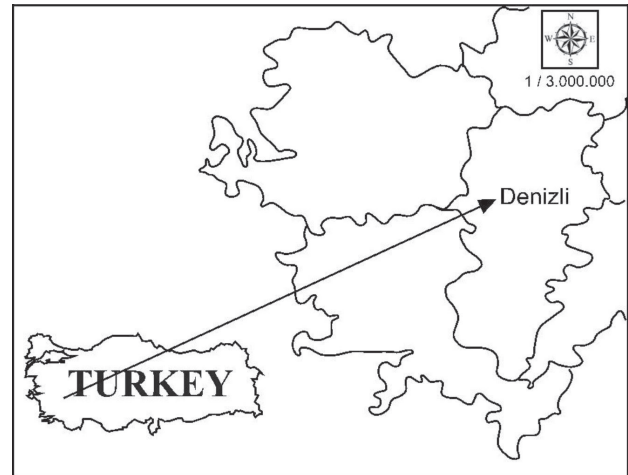

Fig. 1. Study Area (Denizli Forestry Operation Directorate).

were determined at first. Then, seasonal questionnaire forms were prepared, taking into consideration the departments and departmental activities for each season. 24 forest rangers working in the Denizli Forest Enterprise Directorate in 2016 attended to the survey. The autumn questionnaire was answered in October, the winter questionnaire in January, the spring questionnaire in April, and the summer questionnaire in July.

Ranking Technique

The ranking technique was used to rank the values of forestry activities and to determine the relative seasonal priority of the forestry activities performed in each department. A nine-point scale was utilized to determine the priority given to each forestry activity on a seasonal basis. On this scale, -1- is unimportant while -9- is considered to be very important. In this regard, taking into consideration the objectives of the Denizli Forest Enterprise Directorate, forest rangers gave a priority value between 1-9 points to the forestry activities.

For example, a forest ranger (k), gave a priority value (j) in the form of r_{jk1}, r_{jk2}, r_{jk3}, r_{jkm}, to the activities in the forestry department. Accordingly, the relative priority value (X_{ji}) of the activities (i) of the forestry department (j) was calculated using the ranking technique in Formula 1 as follows [12]:

$$X_{ji} = \frac{\sum_k r_{jki}}{\sum_i \sum_k r_{jki}} \ (i = 1,2,\dots,m)$$

(1)

Linear Combination Technique

In the linear combination technique, the relative priority values of forestry departments and the relative priority values of forestry activities performed in the departments are multiplied. Thus, the relative priority values on both sides are made comparable to

each other on the same scale [12]. When the priority values obtained by the linear combination technique are sorted, the ranking of forestry activities, which are prioritized by forest rangers, is achieved. The linear equality used in this technique is represented in Formula 2:

$$P_{ji} = \sum_{i=1}^{m} X_{ji} W_{ji} \quad (i = 1,2,...,m); (j = 1,2,...,n)$$

(2)

Here,

P_{ji} = The final priority value of the activity (i) in the department (j)

W_{ji} = The relative priority value of the department (j) in the department (i)

X_{ji} = The relative priority value of the activity (i) in the department (j)

In this study, the following phases were observed in the analysis through the linear combination technique with the ranking technique.

- Step 1. Forestry departments were compared to each other. Then, with the ranking technique, the relative priority values of each department were obtained.
- Step 2. Forestry activities in the departments were compared with each other. Then, with the ranking technique, the relative priority values of each activity were obtained.
- Step 3. The priority values of each department were multiplied by the priority value of the forestry activities in the departments.
- Step 4. The final priority value of each activity was determined.

Results and Discussion

In the first step, the forest rangers assessed 7 forestry departments separately on a seasonal basis with ranking technique. Thus, the order of priority values of the departments was reached (Table 1). The highest priority is given to the production and marketing

department activities in autumn and winter and to the silviculture department activities in the spring and to the forest fires combating department activities in the summer. Activities of the non-wood forest products and services department are given the least priority in all seasons compared to the other departments.

The priority values given in the general column were calculated by taking the arithmetic mean of seasonal priority points assigned to the forestry departments by forest rangers. Accordingly, with the priority score of 0.1653, the production and marketing department is considered to be the most important department. This is followed by the silviculture department with 0.1590 priority points and the forest fire combating department with 0.1527 priority points.

In the second step, forest rangers evaluated the activities of forestry departments separately on a seasonal basis with the ranking technique. Accordingly, the priority values of the calculated department activities are presented in Table 2.

In the third step, the priority value of the relevant department (Table 1) obtained in the first step and the seasonal priority values of the department activities obtained in the second step were multiplied separately in accordance with the linear combination technique. Thus, the final priority value of each activity was obtained on a seasonal basis, called the fourth step (Table 3).

In this study, within the scope of management purposes, we tried to determine at what level the forest rangers prioritize forestry activities and in which season. The most prioritized activities are forestation, silviculture and production and marketing department activities in autumn, winter and spring. Priority in summer is given to combating forest fires. The lowest priority is generally given to the activities in the non-wood forest products and services department. As can be seen here, priorities of forestry activities vary according to the seasons.

As a result of this study, the activities in the non-wood products and services department were cited as the forestry activity given the least priority by forest rangers. Similarly, in the study of Şafak and Gül [11],

Table 1. Priority values of departments.

Departments	Seasons				
	Autumn	Winter	Spring	Summer	General
Afforestation	0.1559	0.1608	0.1579	0.1207	0.1485
Silviculture	0.1618	0.1652	0.1663	0.1444	0.1590
Production and Marketing	0.1657	0.1784	0.1621	0.1595	0.1653
Planning	0.1131	0.1344	0.1158	0.1401	0.1255
Forest Fire Combating	0.1540	0.1278	0.1411	0.1853	0.1527
Forest Pest Combating	0.1404	0.1322	0.1558	0.1379	0.1423
Non-Wood Forest Products and Services	0.1092	0.1013	0.1011	0.1121	0.1067

Table 2. Priority values of Department activities.

Code	Activities	Seasons				
		Autumn	Winter	Spring	Summer	General
Afforestation						
C1	Erosion control and soil conservation activities	0.1731	0.1952	0.1785	0.1389	0.1719
C2	Etude project activities	0.0866	0.0843	0.0915	0.1194	0.0944
C3	Nursery activities	0.1025	0.0964	0.1030	0.1250	0.1065
C4	Main forest tree species afforestation activities	0.1936	0.2000	0.1830	0.1806	0.1889
C5	Rangeland improvement activities	0.1139	0.1205	0.1259	0.1222	0.1211
C6	Private afforestation activities	0.1595	0.1542	0.1556	0.1611	0.1574
C7	Fast growing species afforestation activities	0.1708	0.1494	0.1625	0.1528	0.1598
Silviculture						
C8	Rehabilitation activities of degraded forests	0.1347	0.1269	0.1245	0.1187	0.1265
C9	Fire resistant species facility project activities	0.1442	0.1383	0.1305	0.1233	0.1345
C10	Natural generation activities	0.1594	0.1629	0.1667	0.1644	0.1627
C11	Artificial regeneration activities	0.1480	0.1458	0.1486	0.1530	0.1486
C12	Activities of care of regeneration and cultivation	0.1499	0.1591	0.1626	0.1598	0.1586
C13	Precommercial thinning care activities	0.1613	0.1572	0.1647	0.1781	0.1647
C14	Pruning activities	0.1025	0.1098	0.1024	0.1027	0.1044
Production and Marketing						
C15	Activity of tree marking	0.1507	0.1549	0.1537	0.1464	0.1521
C16	Determination of timber production costs	0.1436	0.1362	0.1442	0.1407	0.1410
C17	Supervision of timber production activities	0.1489	0.1455	0.1518	0.1578	0.1503
C18	Activities for standing timber sales	0.1526	0.1622	0.1557	0.1501	0.1558
C19	Activities for sale of forestry products	0.1152	0.1213	0.1290	0.1369	0.1262
C20	Activities for transport of forestry products	0.1472	0.1530	0.1461	0.1426	0.1466
C21	Stock activities carried out in forest storage yard	0.1418	0.1269	0.1195	0.1255	0.1280
Planning						
C22	Forest management plan implementation activities	0.1688	0.1598	0.1542	0.1737	0.1638
C23	Writing of stand activities on compartment cards	0.1396	0.1515	0.1315	0.1455	0.1419
C24	Plan change activities	0.1354	0.1266	0.1293	0.1197	0.1288
C25	Activities for determination of the allowable cut	0.1375	0.1575	0.1610	0.1268	0.1463
C26	Activities for the stand tending program	0.1666	0.1535	0.1587	0.1479	0.1572
C27	Unregulated felling activities	0.1458	0.1494	0.1474	0.1620	0.1506
C28	National park and protection forest planning activities	0.1063	0.1017	0.1179	0.1244	0.1114
Forest Fire Combating						
C29	Surveillance, supervision and control activities	0.1455	0.1546	0.1600	0.1531	0.1535
C30	Extinguishing and cooling activities	0.1584	0.1452	0.1726	0.1664	0.1616
C31	Air vehicle activities	0.1326	0.1241	0.1053	0.1191	0.1212
C32	Activities related to first intervention teams	0.1418	0.1522	0.1431	0.1493	0.1455
C33	Communication activities	0.1436	0.1616	0.1516	0.1437	0.1495
C34	Reducing flammable substances on roadsides	0.1400	0.1194	0.1495	0.1474	0.1394

Table 2. Continued.

C35	Determining forest fire costs	0.1381	0.1429	0.1179	0.1210	0.1293
Forest Pest Combating						
C36	Activities for the determination of forest crimes	0.1805	0.1767	0.1656	0.1663	0.1723
C37	Activities for seized crime tools	0.1515	0.1559	0.1532	0.1422	0.1511
C38	Checking grazing areas	0.1328	0.1268	0.1408	0.1291	0.1324
C39	Activities related to protection teams	0.1473	0.1435	0.1512	0.1488	0.1471
C40	Activities for forest pests combating	0.1535	0.1455	0.1573	0.1751	0.1576
C41	ICP forest program activities	0.1141	0.1206	0.1056	0.1160	0.1134
C42	Training activities in the forest pests combating	0.1203	0.1310	0.1263	0.1225	0.1261
Non-Wood Forest Products and Services						
C43	Activities for urban forest	0.1366	0.1538	0.1294	0.1144	0.1325
C44	Forest recreation area activities	0.1481	0.1346	0.1443	0.1692	0.1500
C45	Hunting and wildlife activities	0.1319	0.1676	0.1169	0.1294	0.1350
C46	Inventory activities	0.1134	0.1126	0.1318	0.1095	0.1175
C47	Activities for production of medicinal aromatic plants	0.1598	0.1401	0.1642	0.1542	0.1550
C48	Activities for mushroom production	0.1528	0.1484	0.1791	0.1716	0.1625
C49	Activities for the establishment of honey forest	0.1574	0.1429	0.1343	0.1517	0.1475

Table 3. Priority values of activities.

Code	Autumn		Winter		Spring		Summer		General	
	Score	No	Score	No	Score	No	Score	No	Score	No
C1	0.0270	2	0.0314	2	0.0282	2	0.0168	34	0.0255	5
C2	0.0135	40	0.0136	43	0.0144	42	0.0144	40	0.0140	44
C3	0.0160	34	0.0155	37	0.0163	37	0.0151	36	0.0158	40
C4	0.0302	1	0.0322	1	0.0289	1	0.0218	18	0.0281	1
C5	0.0178	26	0.0194	26	0.0199	26	0.0147	38	0.0180	31
C6	0.0249	8	0.0248	9	0.0246	11	0.0194	24	0.0234	14
C7	0.0266	3	0.0240	12	0.0257	7	0.0184	27	0.0237	12
C8	0.0218	18	0.0210	19	0.0207	24	0.0171	31	0.0201	25
C9	0.0233	15	0.0228	14	0.0217	20	0.0178	28	0.0214	20
C10	0.0258	5	0.0269	6	0.0277	3	0.0237	11	0.0259	3
C11	0.0239	12	0.0241	11	0.0247	10	0.0221	17	0.0236	13
C12	0.0242	11	0.0263	7	0.0270	5	0.0231	13	0.0252	6
C13	0.0261	4	0.0260	8	0.0274	4	0.0257	6	0.0262	2
C14	0.0166	31	0.0181	31	0.0170	34	0.0148	37	0.0166	35
C15	0.0250	7	0.0276	4	0.0249	9	0.0234	12	0.0251	7
C16	0.0238	13	0.0243	10	0.0234	17	0.0224	16	0.0233	15
C17	0.0247	9	0.0260	8	0.0246	11	0.0252	7	0.0248	8
C18	0.0253	6	0.0289	3	0.0252	8	0.0239	10	0.0258	4
C19	0.0191	23	0.0216	16	0.0209	23	0.0218	18	0.0209	23

Table 3. Continued.

C20	0.0244	10	0.0273	5	0.0237	15	0.0227	15	0.0242	11
C21	0.0235	14	0.0226	15	0.0194	28	0.0200	22	0.0212	22
C22	0.0191	23	0.0215	17	0.0179	32	0.0243	8	0.0206	24
C23	0.0158	35	0.0204	22	0.0152	38	0.0204	21	0.0178	33
C24	0.0153	37	0.0170	33	0.0150	39	0.0168	34	0.0162	37
C25	0.0156	36	0.0212	18	0.0186	29	0.0178	28	0.0184	30
C26	0.0188	24	0.0206	21	0.0184	30	0.0207	19	0.0197	26
C27	0.0165	32	0.0201	23	0.0171	33	0.0227	15	0.0189	27
C28	0.0120	42	0.0137	42	0.0137	43	0.0174	29	0.0140	44
C29	0.0224	16	0.0198	24	0.0226	18	0.0284	2	0.0234	14
C30	0.0244	10	0.0186	29	0.0244	13	0.0308	1	0.0247	9
C31	0.0204	22	0.0159	35	0.0149	40	0.0221	17	0.0185	29
C32	0.0218	18	0.0195	25	0.0202	25	0.0277	3	0.0222	18
C33	0.0221	17	0.0207	20	0.0214	21	0.0266	5	0.0228	16
C34	0.0216	19	0.0153	38	0.0211	22	0.0273	4	0.0213	21
C35	0.0213	20	0.0183	30	0.0166	35	0.0224	16	0.0197	26
C36	0.0253	6	0.0233	13	0.0258	6	0.0229	14	0.0245	10
C37	0.0213	20	0.0206	21	0.0239	14	0.0196	23	0.0215	19
C38	0.0186	25	0.0168	34	0.0219	19	0.0178	28	0.0188	28
C39	0.0207	21	0.0190	28	0.0236	16	0.0205	20	0.0209	23
C40	0.0216	19	0.0192	27	0.0245	12	0.0241	9	0.0224	17
C41	0.0160	34	0.0159	35	0.0165	36	0.0160	35	0.0161	38
C42	0.0169	29	0.0173	32	0.0197	27	0.0169	33	0.0179	32
C43	0.0149	38	0.0156	36	0.0131	46	0.0128	41	0.0141	43
C44	0.0162	33	0.0136	43	0.0146	41	0.0190	26	0.0160	39
C45	0.0144	39	0.0170	33	0.0118	47	0.0145	39	0.0144	42
C46	0.0124	41	0.0114	44	0.0133	45	0.0123	42	0.0125	45
C47	0.0175	27	0.0142	41	0.0166	35	0.0173	30	0.0165	36
C48	0.0167	30	0.0150	39	0.0181	31	0.0192	25	0.0173	34
C49	0.0172	28	0.0145	40	0.0136	44	0.0170	32	0.0157	41

where the evaluation was made by forest engineers, the activities of this department were given the least priority. The main reason for this result is the low tariff price for non-wood forest products.

In the study of Şafak and Gül [11], forest engineers gave the most priority to combating and preventing forest fires, as well as silviculture activities in 2011. The present study also resulted in similar ways. The production and marketing department are given the most priority in autumn and winter, similarly the silviculture department in the spring, and the forest fire-combating department in the summer, compared to the other departments.

Forest engineers are executive in forest enterprises, and forest rangers serve as auxiliary technical personnel. These individuals have different duties and responsibilities for forestry activities, affecting the level of priority given to the activities. For this reason, forest rangers gave less priority to the activities that are the responsibility of engineers. For example, forest rangers attributed low priority to the activities such as etude project (C2), inventory (C46), and national park and protection forest planning (C28), which are not in their direct responsibility.

Maier and Winkel [5] stated that the personality characteristics of forest rangers can be sorted as four

types: multi-functional, protectionist, public servant and production-oriented. These characteristics are similar to the characteristics of forest rangers working in different departments with different knowledge and experience in Turkey.

Forest rangers, as stated by Alkan and Uğur [8], graduate with associate degrees, which includes various expertise areas such as forest management, hunting and wildlife, arboriculture, and non-wood forest products. However, the departments where forest rangers are employed in forest enterprises are not usually related to their associate degree. However, as stated by An et al. [13], forest rangers trained in the fields of forestry, agriculture, and fisheries perform the duties in a more qualified manner when assigned to protect wetlands. In other words, employing forest rangers in departments related to associate degree education will enable them to specialize and increase productivity.

Conclusions

In forest enterprises, jobs are grouped with names such as department, unit, and sub-unit so that activities can be effectively executed. Drawing the boundaries of these groups and defining their duties are important for the effectiveness of forestry activities. In this context, assessments aimed at determining the activities carried out in forest enterprises on the basis of years and periods are important for sustainable forest management.

The priority ranking of the activities obtained through this research reveals essentially the prioritized objectives of Denizli Forest Enterprise Directorate. In addition, this ranking allows for the evaluation of the intelligibility of management purposes by forest rangers. In the future, key roles at the organizational level for the planning, design, and development of forestry organization can be compared more concretely with these study conclusions.

Acknowledgements

Conflict of interest

The authors declare no conflict of interest.

References

1. ANONYMOUS. Regulation on the duties and working principles of forest custodians, Ministry Approval No: **4**, Ministry Approval Date: **06.03.1996.**
2. YILMAZ, E., ERPULAT, M., ALKAN, S., GÜLER, K. H., KOŞDEMIR, Z. Workload analysis of forest rangers in western Mediterranean region. Southwest Anatolia Forest Research Institute, **2017**.
3. KUVAN Y., EROL S.Y., YILDIRIM H.T. Forest managers' perceptions of the foremost forestry issues and functions in Turkey. Polish Journal of Environmental Studies. **20** (2), 393, **2011**.
4. ŞAFAK I., GÖKSU E. Determination of job diversity at forest district directorates in Turkey: a case study of Denizli Forest District Directorate. Journal of Forestry Research. **1** (4), 114, **2016**.
5. MAIER C., WINKEL G. Nature conservation through integrated forest management: A street-level bureaucracy perspective on the German public forest sector. Forest Policy and Economics. **82**, 14, **2017**.
6. ELVAN D. Authorities and duties of general security forces for protection of forests. Journal of the Faculty of Forestry Istanbul University. **55** (1), 85, **2005**.
7. ÖZTÜRK A. A study on the problems of forest rangers. Artvin Çoruh University Journal of Forestry Faculty. **14** (2), 253, **2013**.
8. ALKAN H., UĞUR G.E. Analysis related to the technical assistant staff problem in forestry. Turkish Journal of Forestry. **17** (2), 132, **2016**.
9. CHOU J.R. A weighted linear combination ranking technique for multi-criteria decision analysis. South African Journal of Economic and Management Sciences, Special Issue, **16** (5), 28, **2013**.
10. KHADKA C., VACIK H. Use of multi-criteria analysis (MCA) for supporting community forest management. iForest. **5**, 60, **2012**.
11. ŞAFAK İ., GÜL A. U. Evaluation of importance given to the functions of forests and forestry activities by forest engineers. Turkish Journal of Forestry. **13** (2), 123, **2012**.
12. YILMAZ E. The R'WOT technique; case study of a participatory approach to beekeeping sector. Eastern Mediterranean Forestry Research Institute. Release No: **40**. Tarsus. **2006**.
13. AN L.T., MARKOWSKI J., BARTOS M. The comparative analyses of selected aspects of conservation and management of Vietnam's national parks. Nature Conservation. **25**, 1, **2018**.