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Human resources for forestry in Kazakhstan: Current status, potential and problems

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Abstract

The aim of this research is to assess the current status, potential and problems of human resources for forestry in municipal state forest management institutions (MSFMIs) of Kazakhstan. A total of 120 MSFMIs are functional in Kazakhstan, with almost 5.5 thousand employees, of which 6.1% are women. Overall 63% are foresters, 13% are masters of the wood, 13% are engineers of forestry of all categories, 7% are forest wardens and 4% are directors. The quality of education of forest workers also varies and a minority of forest workers has a higher education. The scenario also suggested that almost 3000 specialists had taken up the advanced training courses from 2003 to 2019. According to a survey of employees of the MSFMIs of two pilot oblasts (Almaty and East Kazakhstan), the average age of an employee is 44.7 years and 79.2% of employees have a work experience of up to 15 years. The main issues and difficulties observed in the work of MSFMIs staff were low wages, lack of modern technique and equipment for forest service, lack of systematic continuing education of employees, poor quality of education, as well as staff turnover, especially foresters, which consequently affects their professional level.

Key words

forestry, municipal state forest management institution, human resources potential, education quality, continuing education, problems in work

Introduction

The forest is a major concern of the world not only for conservation of biodiversity but also because it helps in climate regulation, biomass production, pollination, water supply and purification (Bauhus et al. 2010; Thompson et al. 2011; Brockerhoff et al. 2013; Decocq et al. 2016; Liang et al. 2016; Mori et al. 2017). Apart from this, the forest also provides habitat to humans and other species, provides timber, helps in providing resistant to wind storms; it also has significance in supplying vital resources and cultural benefits to local and

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global societies (Olivero et al. 2016; Brockerhof et al. 2017). Forest ecosystems are considered as the largest terrestrial carbon sequestration unit as it absorbs roughly 2 billion tonnes CO_2 each year (FAO 2018). United States (Heilman et al. 2002) and Australia (Watson et al. 2009) have few intact areas, but the overall intact forests continue to decline worldwide (Bryant et al. 1997) as decline in old forests in the U.S. Pacific Northwest is reported (Strittholt et al. 2006), whereas most of Europe (outside Russia) has no intact forests (Wesolowski 2005; DellaSala et al. 2011). A recent study has stated reduction in the global forest area by 1.2%, with a major decrease in Africa and South America between 2010 and 2020. However, since 1990, Asia, Europe and Oceania showed net increase in forest area by 1.1% between 2010 and 2020 (FAO 2020).

The Caucasus and Central Asia countries have low forest cover in general as most countries have in the range of 4–13%, the only exception is Georgia with forest cover over 40% (FAO 2019). The largest country in Central Asia is Republic of Kazakhstan, which is world's 9th largest country and is located in the middle of Eurasia continent. The total area of Kazakhstan is 2,724.9 thousand square km, and the absolute elevation varies from 132 to 6995 m.a.s.l. Kazakhstan is composed of 14 oblasts (regions) (from June 2022 – 17 oblasts), 3 cities of national significance, 177 administrative districts, 87 cities, 30 villages and 6,668 rural settlements. The population of Kazakhstan in 2020 was 18.877 million, of which 57.4% live in an urban environment and the rest is rural. Figure 1 shows a map with the administrative division of Kazakhstan into 14 oblasts (from June 2022 – 17 oblasts). Forests in Kazakhstan are located very unevenly and types of forest vegetation are determined by the variety of natural zones, which determines the different techniques and methods for economic management. Kazakhstan is considered a low forest cover country as the total area of the state forest is 30.0 million ha (as of 1 January 2021) or 11% of the total area of the country. In turn, the forested territories of the republic are only 13.3 million ha (44.3% of the total forest area) and the forest cover is 4.9% (Kazakh Forest Regulation Enterprise 2021). Although the country has less forest covers, it plays an important role in providing climate regulation, soil and water protection, sanitary and hygienic functions and conservation of forest biological diversity. They also have a key role in the country's economy, supplying its population with forage, food, fuel, drug plants, and are also used by people for recreation (Meshkov et al.



Figure 1. Administrative and territorial structure of Kazakhstan until June 2022

2009). Although the country has less timber reserves for harvesting, the forests can provide non-timber forest products which are the valuable resources to the local community and has great potential for increasing revenue from non-wood products and tourism (Turner 2015; UNECE 2017). In 2016, Kazakhstan's production of round wood was about 342.7 thousand cubic meters, whereas the harvested commercial timber was 127.9 thousand cubic meters and the rest of the wood was used as firewood. This suggested that the Kazakhstan's timber production exceeds the volume of domestic wood harvesting, and it was balanced by importing round timber from Russia and Belarus. For wood and wood products, including processed products, imports have dominated over exports over the past five years. This is in large part due to the existing ban on the export of wood from Kazakhstan, the proximity to the Russian timber market, and a lack of local suppliers (World Bank 2018).

However, in spite of all previous policies, there are not many initiatives taken up by the private sector due to a various issues and challenges (World Bank 2018). Although the Government of Kazakhstan has now placed restoring the country's forest resources at a high priority and for this, the country is working on UN-funded capacity-building project for a sustainable forest management to strengthen the involvement of regions and businesses in the forest sector (UNECE 2017). Recently, it has been observed that over the past five years, Kazakhstan has managed to improve statistics on illegal logging of the state forest resources and reduction of forest fires, and the country's forest area has increased by 188,000 ha in 2020 (The Astana Times, 18 February 2021). The country has also agreed on reducing the greenhouse gas emissions and to implementing projects to adapt to the effects of climate change according to the Paris Agreement (2016) and the country intends to reduce greenhouse gas emissions by 15 percent before 2030 (The Astana Times, 1 November 2021), for which forest plays an important role. There is a two-tier system of forest management of the State Forest Fund: the republican (national) level and the local (regional) level. At the national level, the forests are managed by the Government of the Republic of Kazakhstan through its authorized central executive body – the Ministry of Ecology, Geology and Natural Resources (Under Ministry of Agriculture before 2019). Direct control, economic control and supervision of the forests throughout the country are carried out by a specialized body–- the Committee of Forestry and Wildlife, which is a part of the Ministry of Ecology, Geology and Natural Resources and its territorial departments. All the issues regarding the protection, restoration and use of land of the State Forest Fund are within the competence of national authorities. At the regional level, control is executed by the local executive bodies – regional akimats through their subordinate management of natural resources and environmental control and forestry institutions (Prins et al. 2019). Therefore, specialists are required to have comprehensive knowledge necessary for forestry, depending on the soil and climatic conditions of the forest land location.

Human resources are the most important assets of the country, not only for the development of the society and economy but also in contributing in the development of forestry. The human being is the core and momentum in management as well as the key guarantee of the invincible position occupied by enterprises facing increasing competition (Pan 2006; Jiang 2020). Hence, the study of human resources in the sphere of forestry is crucial not only for developing key programs in the forest sector and improvement in the ecological environment but also to achieve sustainable forestry and building a harmonious society. For this, it is necessary to focus on managing people to accelerate the development of forestry; also the forestry enterprises should pay special attention to the development and research of human resources. Improving the system of competitive motivation is an internal force to form talented human resources (By 2004; Wang and Li 2018). However the studies on human resources in forestry around the world are scanty and present incomplete data. The study of FAO (2019) on Kazakhstan only reported the total manpower managed by State forest organisations (SFO) and no data with respect to problems associated with forest workers are considered. Similarly reports of World Bank (2018) and Anderssen and Ardfors (2021) covered other aspects and problems related to forest plantations of Kazakhstan, but no data related to human resource have been covered. Whereas reports from other countries like Turkey (Yoshimura and Acar 2004; Yurdakul Erol 2017; Köse et al. 2020) and China (Wang and Chen 2013; Zhang 2014; Ma and Jia 2015; Xu 2015; Zhang and Li 2015; Wang and Li 2018; Jiang 2020) have

studied the most detailed problems of human resources in forestry and proposed measures to solve them.

Keeping this in mind, the aim of this research is to assess the human resource's works, his/her position, education, gender, the specialty according to the diploma, the age of the employee, work experience in forest management and problems faced by human resources of the forestry in municipal state forest management institutions (MSFMIs) of Kazakhstan for the first time.

Material and methods

Study area

Kazakhstan is mostly composed of plains, lowlands and hills but also a small number of mountains, inland rivers and lakes. The plains are mainly distributed in the West, North and Southwest, the central part is the Kazakh hills, and the Eastern and Southeastern parts are the Altai and Tien Shan Mountains. Between the Caspian Sea and Tien Shan Mountains, farmland, grassland and desert are distributed from North to South. High mountain areas are stretched along the southern and eastern part of the country and occupy less than 10% of the territory of Kazakhstan. Farmlands are mainly concentrated in the Northern plain area, East and Eastern foothill area, and grasslands are mainly distributed in the central, northeastern and northwestern plain areas (Fig. 2A). Desertification occurred in more than a half of the territory (more than 60%) and the deserts are mainly distributed in the central and southern areas (Hu et al. 2020). Since the territory of Kazakhstan is mainly located in steppe, semi-desert and desert zones, the predominant tree species is saxaul (*Haloxylon* spp.) and other shrub communities, which occupy about 70% of the total forest area (Fig. 2B). There are only 996 ha in private ownership, and they do not include forested land (Kazakh Forest Regulation Enterprise 2021). The climate conditions in Kazakhstan are characterized by frequent droughts and high continentality. Except for the high mountain areas, annual precipitation in most of the country is almost two times lower than potential evaporation (250–300 and 500–600 mm/year respectively), which results in a severe moisture deficit for plants (Zubairov et al. 2019).

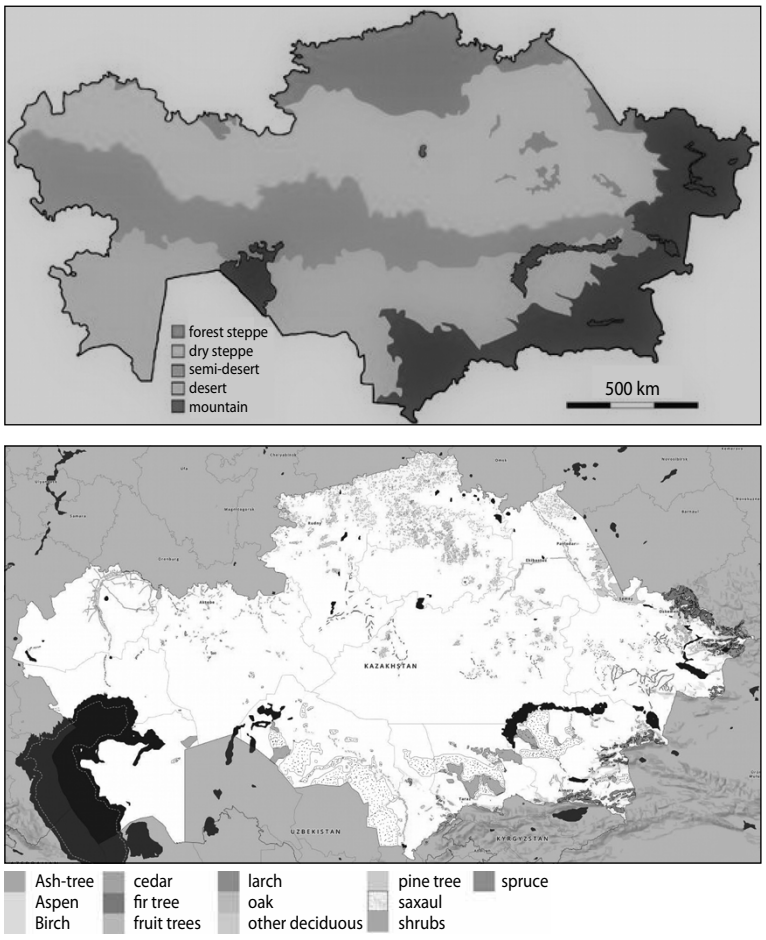


Figure 2. Forestry in Kazakhstan: (A) ecological zones across the country and (B) forests map consisting of different plant species

For the survey of forest workers, two pilot oblasts were selected: Almaty and East Kazakhstan, since these oblasts have a significant wood reserve in the Republic, and the forest cover is 9.4 and 7.2%, respectively, which is higher compared to other oblasts of the country. In Almaty oblast, saxaul forests, floodplain and riparian forests, mountain forests of the Tien Shan grow, and in East Kazakhstan, dark coniferous and larch forests of the Kazakhstan Altai and Saur, Irtysh ribbon forests, steppe forest outliers of Kazakh Upland and Tarbagatai. In the Almaty

oblast, there are concentrated reserves of wood species, including valuable ones, such as Schrenk's spruce, fir, birch, aspen, poplar, apple tree in the mountainous part, and black and white saxaul, turanga or the asiatic poplar, willow tree in the flat part whereas in the East Kazakhstan oblast the pine, fir, spruce, cedar and larch are main species. In the republic, 74.7% of the total forest area is part of 120 MSFMIs, which are subordinate to the fourteen Natural Resources and Environmental Control Departments of the akimats of the oblasts (a regional executive body in Kazakhstan). The area of the state forest resources of the MSFMIs is divided into forestry departments on a territorial basis. The remaining area of the total forest area is occupied by specially protected natural territories under the jurisdiction of the Committee of Forestry and Wildlife of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan (Kazakh Forest Regulation Enterprise 2021). The number of employees in specially protected natural territories of Kazakhstan was 3.5 thousand people in 2017.

Data collection

Data from regional executive bodies

For the goals of our research, we analysed the qualitative and quantitative composition of 120 MSFMIs, whose data were obtained from the Natural Resources and Environmental Control Departments at the akimats of 14 oblasts (as of 1 September 2020):

Classification	Position of people
By category	– forester – master of the wood – forest warden – engineer of forestry of all categories – director
by gender composition	– female – male
by education	– higher – specialized secondary – secondary or incomplete secondary
by completing advanced training courses and other training activities (from 2003 to 2019)	– yes – no
by staff turnover (from 2015 to 2019)	in the MSFMIs of Almaty and East Kazakhstan oblasts

Questionnaires

The survey was detailed and the human resource's works, his/her position, education, gender, the specialty according to the diploma, the age of the employee and the work experience in forest management were covered. The surveyed employees answered questions about difficulties and problems in the performance of work duties, the availability of forest institutions with the necessary forestry machinery and equipment, the availability of computer equipment and communication facilities. To improve the implementation of advanced training courses and the acquisition of new knowledge, the questions that most interested the employees were included.

The survey was carried out by distributing questionnaires to 840 people from 1793 employees which is 46.8% of the total number of specialists from two pilot oblasts – Almaty and East Kazakhstan. A total of 22 MSFMIs (81.5%) out of 27 MSFMIs took part in the survey through the Natural Resources and Environmental Control Departments of these oblasts in which 9 from Almaty oblast (64.3%) and 13 from East Kazakhstan oblast (100%). The survey was conducting in print format and online at any time convenient for the surveyed in the period from September to December 2020. The sample questionnaire is given as Appendix.

Data analysis

Descriptive statistics

The data obtained were processed, systematized and presented in the form of graphs and tables. To summarize the available data, we used percentages as the basic methods of descriptive statistics.

Comparative method

The obtained qualitative and quantitative data were compared with the reports and overviews, prepared by International organizations (UNECE, FAO, WHO, etc.) and 19% of all sources used. The regulatory documents such as resolutions, laws, regulations, norms and standards, rules, etc., approved in the Republic of Kazakhstan were also used to comply with the data obtained with the above-mentioned documents and 19% of all sources used for this too. For the statistical data, 15% of all sources used and 47% sources were utilized for scientific results in the field of human resources research and development in forestry. The comparative research

was defined by means of descriptive features that claim to enhance knowledge.

Results

Organizational structure

The general management of all operational processes in a forest institution is carried out by the director (chief forest wardens) and deputy director (deputy chief forest wardens). Organization and coordination of works on conservation, protection and regeneration of forests and forest management are carried out by forestry engineers of all categories (senior forest wardens). The forest warden manages the forestry department, organizes control over the performance of works on the harvesting of minor forest products and ensuring forest conservation and protection. A master of the wood follows the instructions of forest warden's, an allotment of the total forest area is assigned to him/her, which as a rule includes 2–3 forest ranges. A forester carries out direct conservation, protection of allotments of the state total forest area (State Forest Fund) and the property entrusted to him/her (Regulation on the State Forest Protection 2015).

Qualifications and number of forest workers

Almost 5.5 thousand people of the state forest service works in 120 MSFMIs of the country (Tab. 1) and the qualifications of these employees are shown in Figure 3.

Table 1. Number of employees of the state forest protection (forest service) in the context of 120 the municipal state forest management institutions (MSFMIs) in Kazakhstan as of September 1, 2020

Name of the oblast	The number of MSFMIs	Category of employees	Number of employees	
			total	women
1	2	3	4	5
Akmola oblast	13	foresters	326	4
		masters of the wood	63	5
		forest wardens	35	0
		engineers of forestry of all categories	35	10
		directors	31	1
Total			490	20
Aktobe oblast	7	foresters	147	7
		masters of the wood	28	5
		forest wardens	14	1
		engineers of forestry of all categories	8	2
		directors	12	1
Total			209	16
Almaty oblast	14	foresters	499	1
		masters of the wood	105	7
		forest wardens	48	1
		engineers of forestry of all categories	143	34
		directors	30	1
Total			825	44
Atyrau oblast	4	foresters	60	1
		masters of the wood	12	1
		forest wardens	0	0
		engineers of forestry of all categories	8	1
		directors	5	0
Total			85	3
East Kazakhstan oblast	13	foresters	661	33
		masters of the wood	141	25
		forest wardens	48	5
		engineers of forestry of all categories	86	33
		directors	32	7
Total			968	103
Zhambyl oblast	13	foresters	218	6
		masters of the wood	33	5
		forest wardens	42	0
		engineers of forestry of all categories	82	11
		directors	22	1
Total			397	23
West Kazakhstan oblast	8	foresters	202	0
		masters of the wood	37	6
		forest wardens	27	1
		engineers of forestry of all categories	29	8
		directors	16	3
Total			311	18
Karaganda oblast	5	foresters	146	9
		masters of the wood	10	0
		forest wardens	8	0
		engineers of forestry of all categories	12	5
		directors	5	0
Total			181	14

1	2	3	4	5
Kostanay oblast	11	foresters	235	4
		masters of the wood	52	5
		forest wardens	43	2
		engineers of forestry of all categories	39	11
		directors	18	1
Total			387	23
Kyzylorda oblast	8	foresters	224	5
		masters of the wood	52	1
		forest wardens	12	0
		engineers of forestry of all categories	34	5
		directors	9	0
Total			331	11
Mangystau oblast	3	foresters	56	0
		masters of the wood	2	0
		forest wardens	27	0
		engineers of forestry of all categories	19	10
		directors	6	0
Total			110	10
Pavlodar oblast	3	foresters	143	0
		masters of the wood	30	2
		forest wardens	17	2
		engineers of forestry of all categories	7	2
		directors	6	0
Total			203	6
North Kazakhstan oblast	12	foresters	358	0
		masters of the wood	75	2
		forest wardens	37	1
		engineers of forestry of all categories	36	14
		directors	23	1
Total			529	18
Turkestan oblast	6	foresters	195	0
		masters of the wood	54	0
		forest wardens	22	0
		engineers of forestry of all categories	168	24
		directors	14	1
Total			453	25
Kazakhstan	120	foresters	3470	70
		masters of the wood	694	64
		forest wardens	380	13
		engineers of forestry of all categories	706	170
		directors	229	17
Total for the Republic			5479	334

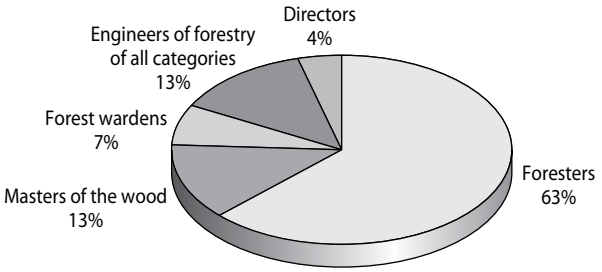


Figure 3. Qualifications of employees of municipal state forest management institutions of Kazakhstan

It was depicted that majority of the employees are foresters (63% of the total number), followed by masters of the wood (13%), engineers of forestry of all categories (13%), forest wardens (7%) and directors (4%). Figure 4 shows the number of MSFMIs employees in different oblasts depending on the area covered by the forest, suggesting that majority of the employees are in the East Kazakhstan and Almaty oblasts and least in Atyrau and Mangystau oblasts. On the contrary, in Zhambyl, Kyzylorda and Turkestan oblasts where the area covered by forest is quite extensive (1665.6 to 3146.7 thousand ha), the number of employees is comparatively less (331 to 453 people). This is because these oblasts belong to desert areas and mainly saxaul is growing which has anti-erosion as well as field and soil protective functions. Thus, following the rules and regulations for the state forest resources (State Forest Fund) (Norms and standards… 2015), the area of forest range per 1 forester is 30–40 thousand ha and the area of the forest plot of master of the wood is 150–160 thousand ha. In the Akmola, Karaganda, Kostanay, Pavlodar and North Kazakhstan oblasts where field and soil protective forests grows, steppe and forest-steppe areas are predominant, the area of forest range per 1 forester is suggested to be 1.5–2.0 thousand ha of forest and the area of the forest plot of master of the wood is 7.0–9.0 thousand ha. Whereas in Aktobe, Atyrau and West Kazakhstan oblasts have anti-erosion, field and soil protective forests, restricted belts of forests along the banks of rivers, lakes, reservoirs, channels and other water bodies predominate, and thus, the forest range per 1 forester is 1.75 thousand ha and for one master of wood is 8.0 thousand ha (Norms and standards… 2015; Fig. 4).

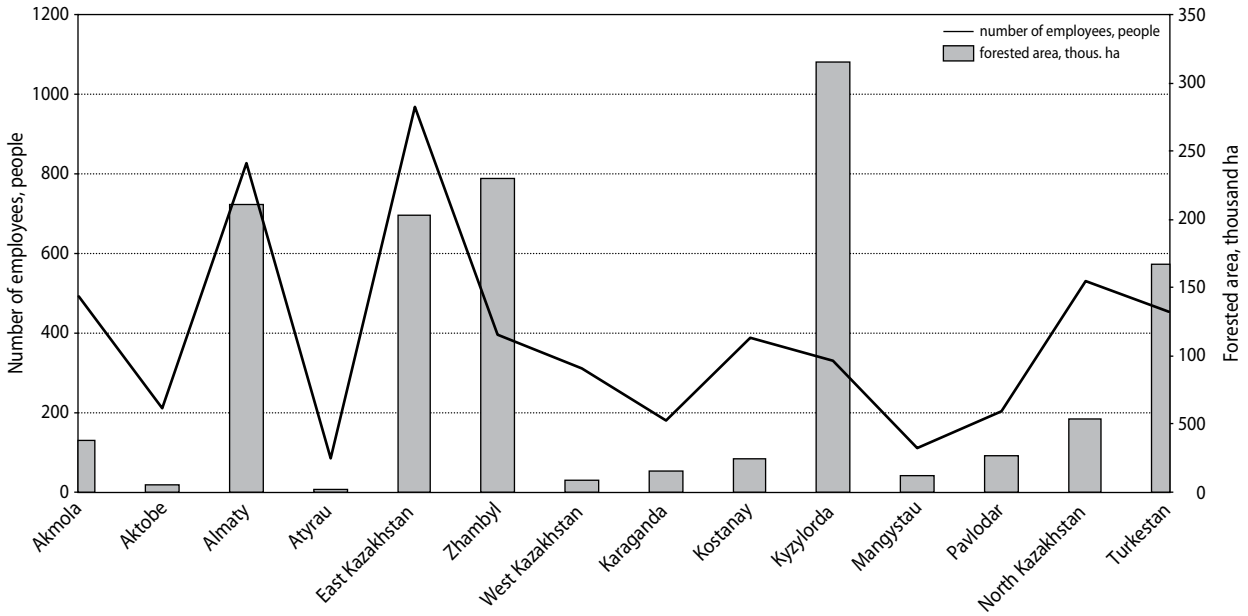


Figure 4. The number of employees of state forest management institutions of Kazakhstan in the context of oblasts and depending on the area covered by forest

Gender composition

In MSFMIs, the share of women is 6.1% of all categories of employees. In terms of position categories women in forest institutions work mainly as engineers of forestry of all categories (51%), foresters (21%) and masters of the wood (19%), while only 4% are forest wardens and 5% are directors (Fig. 5). In terms of oblasts, the largest number of women is represented in the MSFMIs in East Kazakhstan oblast (103 people), the lowest in Atyrau (3 people) and Pavlodar (6 people) oblasts (Fig. 6).

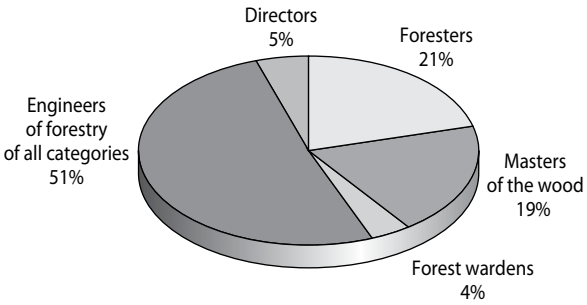


Figure 5. Categories of positions held by women in the MSFMIs

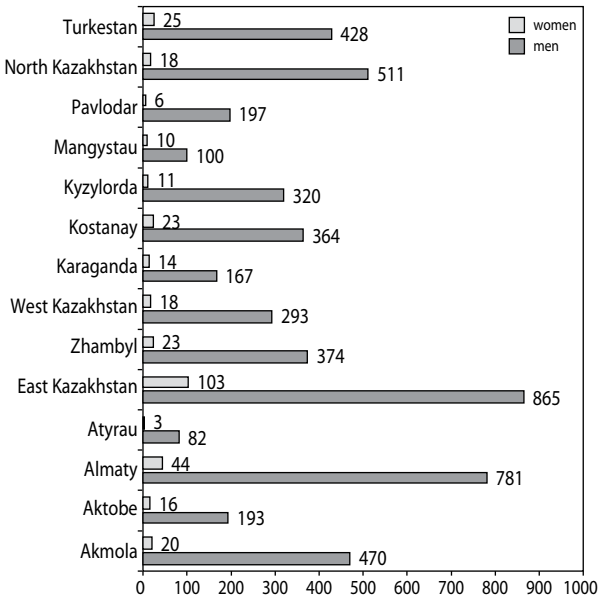


Figure 6. The number of men and women in the MSFMIs in the context of oblasts

Quality of education

The training of specialists in the field of forestry is carried out in colleges and universities in Kazakhstan. The college confers the following qualifications: landscape architect, master of the wood, forester, landscape de-

sign master and technician-technologist. Specialists are being trained in 9 universities in six oblasts, whereas in four oblasts (Aktobe, Atyrau, Karaganda and Mangystau), there is no professional training of specialists in the field of forestry. The level of education of forest workers is low as only 55% of the MSFMIs employees have higher, specialized secondary or vocational education, and the remaining 45% have secondary or incomplete secondary education (Fig. 7). Similarly, the number and qualifications of forest workers with respect to their position in 120 MSFMIs is shown in Figure 8.

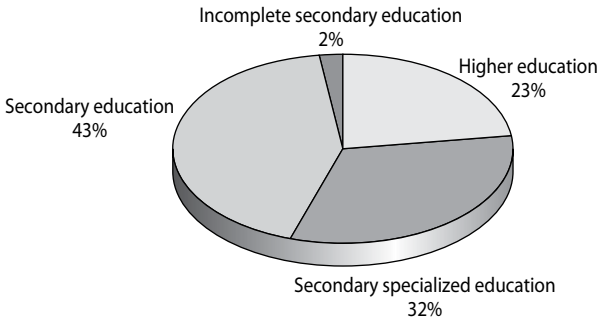
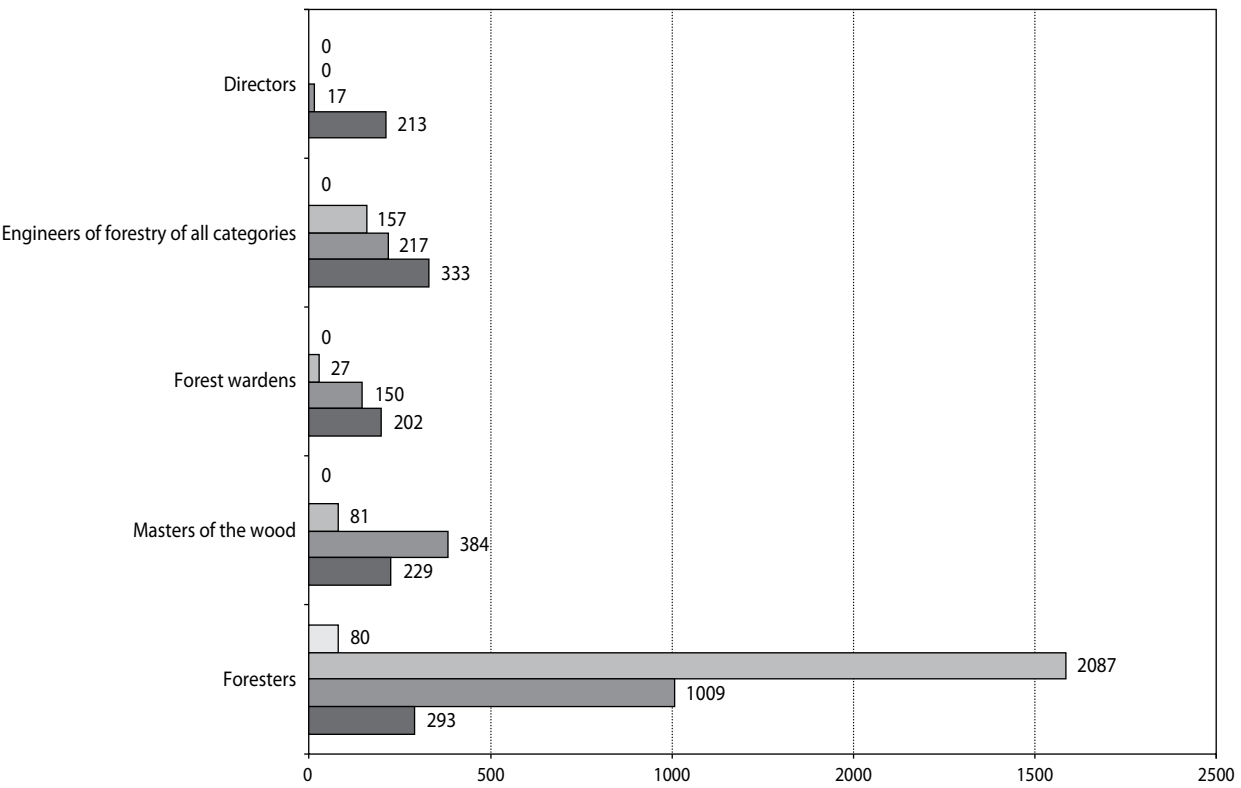


Figure 7. Level of education of employees of 120 MSFMIs

Continuing education of forest workers

Currently, forest sector workers can improve their professional level at the Institute of Advanced Studies of the Kazakh National Agrarian Research University (Almaty) and at the Kazakh Research Institute of Forestry and Agroforestry named after A.N. Bukeikhan (Shchuchinsk). According to the data from 2003 to 2019 of the Natural Resources and Environmental Control



	Foresters	Masters of the wood	Forest wardens	Engineers of forestry of all categories	Directors
Incomplete secondary education	80	0	0	0	0
Secondary education	2087	81	27	157	0
Secondary specialized education	1009	384	150	217	17
Higher education	293	229	202	333	213

Figure 8. The level of education of employees of 120 MSMFI in the context of staff position categories

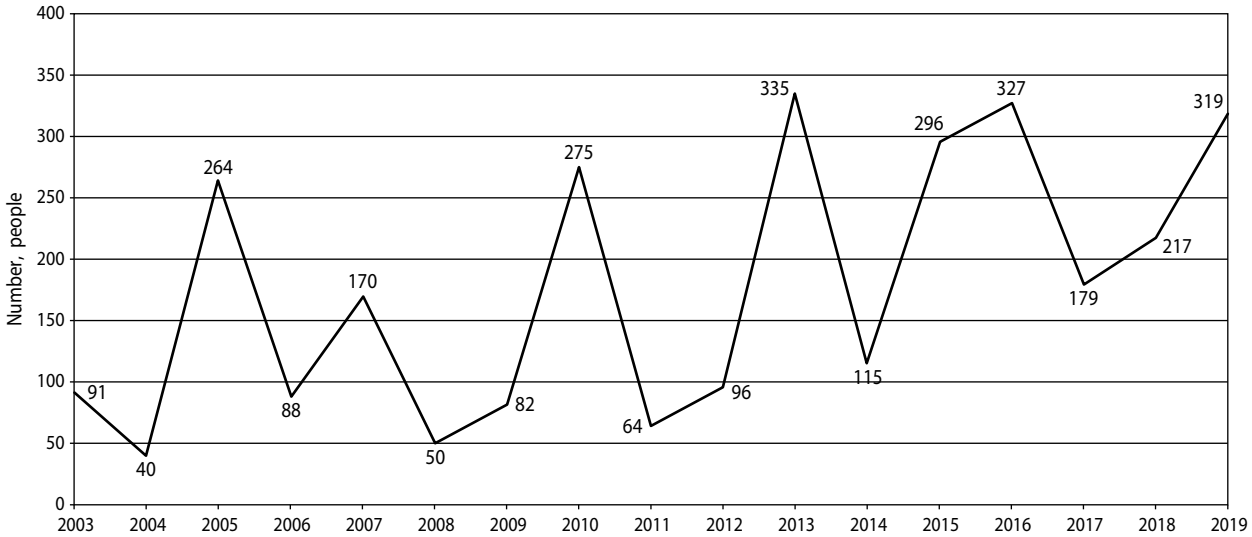


Figure 9. Number of forest specialists who have completed advanced training

Departments of the oblast's akimats, a total of 3,008 specialists were trained in advanced training courses including 161 women (Fig. 9). It was observed that the largest number of forest workers (more than 250 people per year) has completed advanced training in years 2005, 2010, 2013, 2015, 2016 and 2019, which suggested that the growth of advanced training of employees every 3 years. Following the Rules and Conditions of civil servants review engaged in activities in the field of agriculture, water industry, forestry and wildlife (2016), forest specialists who are part of the state protection are certified after each subsequent 3 years of stay in the civil services for which they must undergo training or advanced training, and this can be correlated with the data collected in the present study.

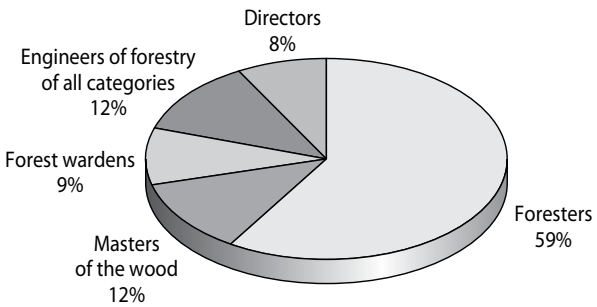


Figure 10. Continuing education of forest workers in the context of staff positions from 2003 to 2019

Further collecting the data for the specialists who have passed advanced training courses depicted that the number varies according to the region, and in North Kazakhstan, East Kazakhstan and Akmola oblast a total of 1530, 508 and 213 people, respectively, have taken up the training. According to the directorate for subsurface use, environment and water resources of Pavlodar oblast not a single forest specialist took advanced training courses. Whereas the percentage of specialists of MSFMIs who completed advanced training courses were foresters (59%), engineers of forestry of all categories (12%), masters of the woods (12%), forest wardens (9%) and directors (8%) (Fig. 10).

Questionnaires

The survey involved 840 people consisted of 90% men (758 people) and 10% women (82 people). In terms of staff positions, 64% were foresters, 17% were masters of the wood, 9% were engineers of forestry of all categories, 6% were forest wardens and 4% were directors. The largest number of participants in the survey was represented with secondary specialized (44%), secondary (36%) education and higher education (20%).

The foresters, in addition to forest specialties, presented more than 50 different specialties according to the diploma, e.g., associated with livestock farming, technical knowledge, electricity, with pedagogics, with financial and legal education, agriculture, and cook, turner, builder, carpenter, mason, welder, etc. Masters

of the wood were represented by 27 different specialties but mostly agricultural and technical. Foresters and engineers of forestry of all categories had skills which met the qualification requirements of higher (or postgraduate) education in specialties such as forest resources and forestry, ecology or technical and vocational education such as forestry and garden-park and landscape construction and ecology and environmental activities (Standard qualification characteristics of positions… 2017). The directors had 14 different specialties, including technical and legal education. The work experience in the forest sector ranges from 0 to 5 years (33.6%), 6 to 10 years (22.6%) and 11 to 15 years (23.0%) (Fig. 11). It was noted that only 20.8% were more experienced forest professionals with more than 15 years of experience, who did not provide appropriate continuity and mentoring in forest institutions. According to the classification of the World Health Organization (WHO 2015), young age is from 18 to 44 years, mean age is from 45 to 59 years and elderly age is between 60 to 74 years. According to this classification, 50.6% of workers were young, 43.6% were middle-aged and 5.8% were elderly, and the average age of a forest worker was 44.7 years (Fig. 12).

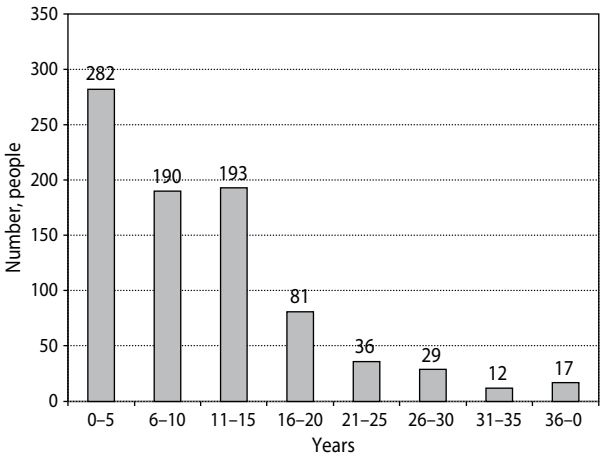


Figure 11. Distribution of the MSFMIs employees of the Almaty and East Kazakhstan oblasts by work experience

The observation of the present study revealed that more than half (57.6%) of forest workers in the pilot oblasts were not satisfied with their wages. Similarly, all categories of forest workers indicated the lack of sufficient funding for the forest industry, the lack of material and technical resources, as well as low wages in

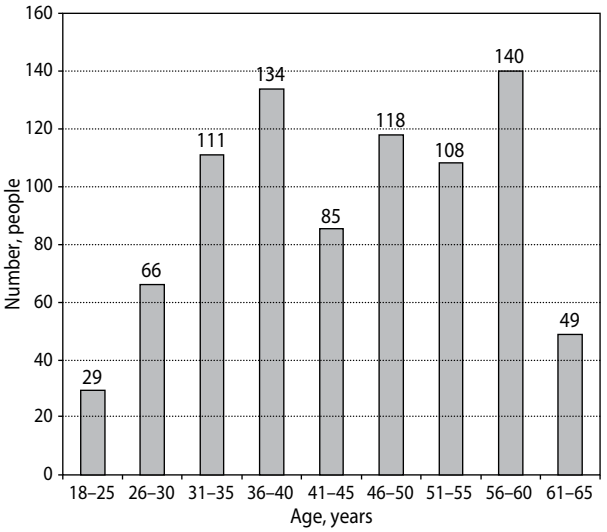


Figure 12. Distribution of the MSFMIs employees of the Almaty and East Kazakhstan oblasts by age

comparison with other industries. At work, foresters experienced difficulties with filling out documentation, in the fight against poaching and drawing up reports on violations. Masters of the wood, in addition to the above problems, experienced other difficulties like getting into hard-to-reach areas due to problems with vehicles, repairs in office premises, lack of fire extinguishers and need for mechanization of manual labour. Foresters and engineers of forestry of all categories note the lack of specialists and systematic improvement of their skills. Directors point to the weak material and technical support due to insufficient funding from the state, the lack of specialists with higher education, staff turnover, especially foresters, the difficulty of moving on mountain rivers is due to the lack of appropriate infrastructure, etc. The average percentage of facilities of the MSFMIs with technical equipment in the Republic is about 65% of the standard. For example, the technical equipment of the MSFMIs of Almaty was more than 80%, whereas for East Kazakhstan, it was about 40%.

It was noted that currently the forest service workers are in urgent need of modern off-road vehicles (UAZ, UAZ Farmer, GAZ-66), especially in mountainous areas, tractors of various categories (crawler-type, wheel-type) and forestry equipment for them, shift buses of the URAL brand for transporting workers to hard-to-reach areas, fire trucks, patrol and over-snow vehicles and all-terrain vehicles (ATVs). Also, the questionnaires in-

dicated the need to obtain modern and new equipment like quadcopter and drones, GPS-navigators with offline maps that display the boundaries of the state total forest area, portable transmitter and transmission facilities. Quadcopter and drones are necessary for the organization especially for forest fire fighting in mountainous conditions, to accurately and quickly determine the boundaries of the fire. This technique can also be used when patrolling the state total forest area, especially in mountainous conditions and hard-to-reach places.

In the pilot oblasts, 64% of employees have never upgraded their skills and only 3% of employees have taken advanced training courses four or more times or annually. In the questionnaires, the MSFMIs employees noted the need for systematic training courses in all areas of forestry. For efficient and better assimilation of the material for training courses for forest workers, the MSFMIs offer (1) to expand, deepen and update previously acquired theoretical and practical knowledge, taking into account the latest world experience; (2) to carry out more laboratory and practical classes in the forest, combine theory with practice; (3) to apply and implement the latest and innovative technologies in the field of forestry, the ability to work with the latest and modern surveillance technology; (4) to exchange experience between specialists from different MSFMIs, universities, research institutions in the field of forestry and wildlife; and (5) to carry out training with the use of computer technologies. Also, more than half of the employees (51%) offer to carry out advanced training courses for forest workers in a remote format. More than 70% of the employees of the MSFMIs need knowledge of psychology and psychological training in their work which affect their professional as well as career growth. Psychological trainings increase the self-esteem of each member of the team, the level of team cohesion, inspire confidence in their abilities and skills and reduce the level of emotional burnout and anxiety of the employees.

The analysis of the current state of human resources in MSFMIs revealed that the problem and difficulty

Table 2. The reasons for staff turnover in the municipal state forest management institutions (MSFMIs) of the Almaty and East Kazakhstan oblasts

Category of employees	2015–2019							
	In total	Including for the following reasons						
		At employee's request	At the initiative of the administration	By the decision of the court	Conscription into the army	Transfer to another job	Retirement	In connection with the death
Almaty oblast								
Directors	28	21	1	0	0	2	3	1
Engineers of forestry of all categories	150	135	3	0	0	4	7	1
Forest wardens	11	8	0	0	0	2	1	0
Masters of the wood	54	40	1	2	1	5	4	1
Foresters	288	226	16	1	3	10	25	7
Total	531	430	21	3	4	23	40	10
East Kazakhstan oblast								
Directors	17	6	0	0	0	9	1	1
Engineers of forestry of all categories	92	65	0	0	0	17	10	0
Forest wardens	40	22	1	1	0	10	6	0
Masters of the wood	90	57	2	0	0	22	9	0
Foresters	583	482	3	1	4	38	51	4
Total	822	632	6	2	4	96	77	5

in the work of these institutions was staff turnover. The Labor Code of the Republic of Kazakhstan (2015) does not contain the concept of staff turnover. According to the Labor Code of the Russian Federation (2001), "staff turnover is the movement of the workforce due to employee dissatisfaction with the workplace or the organization's dissatisfaction with a specific employee". Table 2 shows the reasons for staff turnover in the MSFMIs of the Almaty and East Kazakhstan oblasts and in most cases, employees left at their own request (81% Almaty and 77% East Kazakhstan oblast), in connection with the transition to another job (4% Almaty and 12% East Kazakhstan oblast) and retirement (7% Almaty and 9% East Kazakhstan oblast). In terms of staff positions, the turnover was mainly observed in foresters (54% Almaty and 71% East Kazakhstan oblast), followed by engineers of forestry of all categories (28% Almaty, 11% East Kazakhstan oblast) and masters of the wood (10% Almaty, 11% East Kazakhstan oblast).

Discussion

Organizational structure

Eleven thousand people were employed in forestry in the Kazakhstan in 2017, of which seven thousand works in inspectorate (state forestry guards), which is a national average of over three people (full time equivalent) per thousand ha of forest (Prins et al. 2019). For comparison, the forestry of the Russian Federation employed about 440 thousand employees in 2010, where the forests occupy 49.8% of total area of the country (FAO 2012). According to 2012 data in Finland, the forestry employed about 22 thousand people where the forests occupy 71.6% of country's total area, and still significant part of the forestry work has been carried out by private forest owners and their families (Lier and Parviainen 2013). Whereas in Japan 61.8% of the total territory occupied by forests and for that the number of employees employed in forestry was approximately 64 thousand in 2015 (Forestry Agency 2019). In the central and provincial units of the General Directorate of Forest in Turkey, where forests cover 28% area, the number of officers, permanent and casual workers, temporary employees and casual staff was around 39 thousand as of 2016. 45.7% of these personnel hold civil servant status and the main employee groups responsible for activities regarding forestry in the General Directorate of Forest are forest engineers (27%) and forest rangers (39%) (Yurdakul Erol 2017). In United Kingdom where 13% of the area is covered by forests, the average employment in 2018 in forestry was 16 thousand (Forest Research 2020). According to the present data, the forestry employed about 5.5 thousand people where the forests occupy 4.9% of total area of Kazakhstan (Kazakh Forest Regulation Enterprise 2021). If we take the ratio of 1 thousand foresters per 1% of forest cover, then in comparison with the Russian Federation Kazakhstan has about 8 times less foresters, whereas it is 3.5 times more in comparison to Finland, and about the same with countries like Japan, Turkey and the United Kingdom.

Gender composition

Employment in forestry is based on gender roles and stereotypes. A study by the Eurasian Economic Commission (EEC) and the Food and Agriculture Organization of the United Nations (FAO) found that women are much less represented in forestry and prefer not to be trained and, consequently, not to work in this field. This is due to reasons including the predominance of men in the industry and perceptions of hard physical labour. Nevertheless, equal opportunities should be created for women in the sphere of forestry. The adoption of flexible working arrangements, the creation of networks made up exclusively of women, appropriate training, mentoring and adequate working conditions, all of these can be used to attract more women professionals to the industry. Mostly women work in forest nurseries, as well as they engaged in tree planting and tending of the stand. Some also perform work related to heavy physical labour, such as logging operations (timber-harvesting) and fire-fighting (UNECE 2006).

The present study revealed that the women comprise 6.1% of the overall employees in the forestry which is less as compared to many other countries. As in US, the percentage of women employees was 38.5% of the total forest service workforce in 2001, of which the professionals were 30.7%, technical were 32.7% and administrative were 59.1%, whereas the percentage women employees were 27.8% in 1981 and 43.5% in 1991 (Lewis 2005). The Finnish forest sector was also dominated by men, with women accounting for only about 20% of all employees (Lier and Parviainen 2013) whereas the share of women engaged in the forest man-

agement and logging industry in Canada was 18.4% (Gesner 2017). In 2010, the number of women employed in forestry worldwide reached around 1.4 million. High employment of women in the forest sector has been observed in such countries as Bangladesh (600 thousand), China (300 thousand), Mali (180 thousand) and Brazil (90 thousand). The countries with the highest share of female employment in forestry are Mali (90%), Mongolia and Namibia (45%) and Bangladesh (40%). Higher women employee in forestry in some countries can be partly attributed to progress in policies and legislation, such as in Bangladesh, where its forest policies and legislation were updated to increase women's participation (Whiteman 2015). The survey of the women employed in forestry in Bosnia and Herzegovina found that only a quarter of the surveyed women had agricultural or forestry educations, while others have some other educational institutions (Mašić 2020). The author suggested that forestry as a profession is more attractive to women who have graduated from other high schools, e.g., liberal arts schools or other technical schools. They have also reported that majority of the working women engineers in forestry were aged between 20 and 35 years.

Age of workers

The average age of a forest worker of Almaty and East Kazakhstan oblasts was 44.7 years, whereas the average age of employees in state-financed and autonomous forest institutions (the equivalent of the MSFMIs) of the Volga Federal district of the Russian Federation as of December 31, 2018, was slight higher (47.5 years). However, the number of employees in the age group under 36 years compared to the number of employees in the age group over 60 years is 2.3 times more. In the event of retirement or dismissal of older employees, the replacement of vacant jobs will be promptly provided from among young professionals. The personnel shortage was 1,710 people (22.5%). To a greater extent, there are not enough employees of the lower level of district divisions, nurseries, processing shops, in the context of professions such as masters of the wood, foresters, tractor operators, daggers, etc., in the Republic of Mari El; the shortage of personnel was 75.6%, or 65 people (Cherkasova and Voldaev 2019). To the best of our knowledge, the age structure of forest workers for countries other than Russian Federation is scanty.

Problems associated with forest workers

Previous studies on forest management institutions of China observed that the major problems are the inadequate number of forestry personnel, semiskilled or low qualified human resources, the ageing of personnel, inconsequent structures of personnel, scarcity of technical personnel, unbalanced distribution of forestry human resources, out of date mindsets and management mechanism, lack of a human resources development plan and their organization system, little attention is paid to the education and retraining of the talented personnel, the procedure for admission to job and hiring is not justified and lack of deeper education, training and research (Wang and Chen 2013; Xu 2015; Zhang and Li 2015; Jiang 2020). To overcome these problems, it has been suggested that they should increasing awareness of the importance of forestry human resources development and management, improving the management mechanism, deepening forestry education reform, strengthening continuing education for the in-service staff and increasing investment on human resource development. The reform of human resource development should be innovative and pay much more attention to education and professional retraining, invest more in scientific research and focus on environmental construction and forestry development (Zhang 2014; Ma and Jia 2015; Wang and Li 2018).

Place of work and livelihood

Most of the MSFMIs in the Kazakhstan are located in rural areas in places remote from developed infrastructure. This is one of the major reasons behind employees' resignation because it is difficult for families of employees to receive high-quality medical care, a high-quality education for children, the lack of high-speed internet as well as the lack of some other benefits that are available in cities. Also, the reason for an employee's resignation and transition to another job may be dissatisfaction with the level of pay. However, according to Judge et al. (2010), "level of pay bears a positive, but quite modest, relationship to a job and pay satisfaction". The average wage of a forester in the MSFMIs of Kazakhstan is 66,557 tenge (about $ 160) (Kz.trud.com, salary survey for the position of forester in Kazakhstan), master of the wood – 84,153 tenge (about $ 204) and engineer of forestry of all categories – 1,31,678 tenge (about $ 319) (Kz.trud.com, salary

survey for the position of forestry engineer in Kazakhstan). Depending on the region, work experience and category, the average monthly nominal wage in Kazakhstan for 2020 is more than 2,11,000 tenge (about $ 511) (Bureau of National Statistics); however, it is less as compared to other countries. The average wage of a forester in the Russian Federation is 20,147 Russian rubles (about $ 279) (Trud.com, statistics of wages of foresters in Russia), an engineer of forestry of all categories – 35,238 Russian rubles (about $ 489) (Trud.com, statistics of wages of forestry engineers in Russia) at that, the average monthly nominal salary for 2020 is more than 49,000 Russian rubles (about $ 680) (Federal State Statistic Service). The study on forest workers in Indonesia also suggested that they are dissatisfied with their salary (Gandaseca and Yoshimura 2001) whereas most of the employees are satisfied by their wages in Turkey (Köse et al. 2020).

Difficulties in living

A 2001 study on the work safety, health protection and living conditions of forest workers in Indonesia found that working and living conditions of forest workers are quite unfavorable because of very severe thermal conditions in the work area and because forestry work is also heavy, dirty and dangerous, requiring poor working postures and exposure to noise and vibration. Thus many forest workers suffered from lower back pain that resulted from muscle exertion, especially when lifting heavy objects such as chainsaws or logs. To prevent such accidents while driving and execution of work, it is necessary to supply more personal protective equipment, establish traffic rules on forestry roads, improve the surface course of forestry roads and give forest workers training and education on safe driving (Gandaseca and Yoshimura 2001). The study on the occupational health and safety of forest workers provided in 2004 in the Artvin region in northeastern Turkey found that many forest workers were living in barracks or caravans located in mountains away from their families and were doing heavy work. 24% of the surveyed experienced accidents during work many of which were caused by chainsaws or axes and 47% of those surveyed were dissatisfied with their jobs mainly because of low salary and heavy work which affected the cumulative fatigue of forest workers (Yoshimura and Acar 2004). The study of Köse et al. (2020) on 496 people from 9 provinces of Turkey observed that the unfair and incompetent personnel policies and political pressure are main factors that are affecting work satisfaction in Turkish forest sector.

Staff turnover

The increased turnover of personnel reduces certain staffing of workplaces, distracts more experienced workers from the labour process, worsens the moral and psychological climate in the team and reduces labour productivity, which ultimately entails economic losses. The management of turnover becomes one of the determining factors in ensuring the sustainable and stable development of the organization (Avcharenko 2010). The problem of turnover or outflow of personnel in forestry is also typical for Russia. The outflow of qualified specialists from the industry has led to the emergence of elements of the disintegration of human resources in forestry. The annual number of vacancies in the forest sector has been steady in recent years (around 15%). It is assumed that the formation of a set of measures within the framework of the program of the Russian Federation "Development of Forestry" aimed at supporting and developing the workforce capacity of the industry will allow to solve the issues of attracting young specialists to the industry. The revival of the institute of mentoring and support of families of forest specialists is proposed. It has been suggested that the improvement of the branch system of staff training will allow modernizing the process of developing the workforce capacity, consolidate personnel and give them the opportunity for career growth (Morkovina and Netrebskaya 2020). In the Kyrgyz Republic, staff turnover, reduced capacity of forest employees and the interest of qualified forest industry professionals are the most serious problems of forest management institutions. As discussed earlier, due to the low wages, it is difficult to attract necessary number of local workers on a contract basis to carry out cultural work. Therefore, foresters, instead of carrying out their functional duties for the conservation and protection of the forest, are forced to engage in fatigue duties.

Conclusion

For a small-wooded country like Kazakhstan, a study of human resources in forestry, namely, the current state, potential and problems, will help in improving

forestry management and solving problems related to human resource. Thus, the present study assessed the human resources of the forestry in 120 MSFMIs for the first time in Kazakhstan. Among the main workforce capacity problems of forest institutions were identified as high turnover of personnel especially foresters, lack of highly qualified employees with work experience of 15 years or more, lack of employees with specialized forest education and low qualification of personnel, lack of sufficient funding, material and technical resources (specialized forestry transport and equipment, computers, communications, fire extinguishing equipment, etc.) as well as low wages in the forest sector.

To overcome all the stated problems, we recommend following measures in the forest sector of Kazakhstan: (1) increase the salaries of workers in the forest sector; (2) introduction of educational programs related to the needs of the forest sector starting from secondary specialized or higher education; (3) to carry out regular advanced training courses for forest workers at least once every 3 years, taking into account international best practices, innovations and achievements in the field of forestry, and cover all target groups of employees; (4) develop the infrastructure of rural areas to improve the standard of living of rural residents as well as forest workers; (5) strengthening of computerization and mechanization of certain types of forest management works; (6) updating the material and technical base with modern equipment, devices and machines; and (7) when carrying out forest management works, forest cultural works and works on forest fire control and protection of forests, allow at least 20% of experiments and tests of modern scientific developments to be conducted.

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Appendix

The survey was performed in Kazakh and Russian.
840 people were involved (target – 1793 people).

Some example questions of survey:

1. The name of the municipal state forest management institution (MSFMI).
2. Your position in the MSFMI.
3. Your gender (please underline): male or female.
4. Education (underline): higher, specialized secondary, secondary, others.
5. Your specialty by diploma.
6. Work experience (years) in the MSFMI.
7. Your age (years).
8. What difficulties or problems do you have in working in the MSFMI?
9. How many times during your work in the MSFMI have you passed advanced training courses for forestry workers?
10. Are you satisfied with your salary? (Yes or No)
11. Is it applicable for you to conduct advanced training courses for forestry workers in online format?
12. Do you need knowledge of psychology and psychological trainings in your work?
13. Is the state forest protection of your MSFMI provided with machinery and equipment in accordance with the norms and regulations?
14. What kind of machinery and equipment do forest protection workers need?
15. Are computers and internet available in the MSFMI?