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Shortage of Labour Force in Forestry of Bosnia and Herzegovina – Forestry Experts' Opinions on Recruiting and Retaining Forestry Workers

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Abstract

Labour force represents the sum of human physical and mental abilities used for the production of whatever kind of use values. In forestry, the performance of work operations, especially wood harvesting, represents a high-risk, physically intensive, and professionally very demanding activity, which inevitably requires a qualified and sustainable labour force. Professional, skilful and motivated forestry workers are the basic requirement for efficient forestry operations and make a constituent part of todays sustainable forest management. However, the forestry sector has recently been facing the increasing problem of a shortage of forestry workers i.e. the major challenge of obtaining the necessary labour force. The reasons for this are different demographic, economic, technological and political processes, as well as the specifics of the forestry sector itself. Therefore, in addition to some general indicators of the forestry workforce condition in Europe and worldwide, this paper presents forestry experts' reflections on the future perspectives of forest work in Bosnia and Herzegovina. Special attention is paid to current issues and problems in attaining and ensuring the necessary labour force (attitudes on forestry work and the profession of forestry worker, gravity of the labour shortage, leading causes and reasons for the lack of forestry workers) and to possible measures and instruments important for improving the forestry workforce sustainability (factors for successful recruitment of forestry workers, stronger retention of workers, greater work commitment, general forest management issues affecting workforce sustainability, etc.). The opinions of forestry experts in public and private companies were statistically tested for differences. The aim of the study is to sensibilize the sector and the public on the problems of the labour force in forestry, its condition and status, and to create the basis that can contribute to bettering the status and sustainability of the labour force in forestry.

Keywords: sustainable forest management, forestry operations, lack of workers, recruitment, Bosnia and Herzegovina

1. Introduction

Labour force represents the sum of human physical and mental abilities used for the production of whatever kind of use values. The scale of the labour force is determined by the overall population and its many structural attributes. The working population constitutes the most significant element of the production process in every society, including all the changes that occurred in its historical role as the initiator and bearer of the production process (Wertheimer-Baletić 1999).

In forestry, the performance of work operations, especially wood harvesting, represents a high-risk, physically intensive, and professionally very demanding activity, which inevitably requires a qualified and sustainable labour force. So, professional, skilful and motivated forestry workers are the basic requirement

for efficient forestry operations and make an essential component of todays sustainable forest management standards. Forestry work, however, by many indicators stands among the most burdensome and unsafe jobs with high numbers of work accidents, fatal injuries and occupational diseases (EU-OSHA 2008, Adams et al. 2014, Musić et al. 2019, Arman et al. 2022). Working in natural surroundings, often with hand machines and tools, exposes forestry workers to serious physical, psychological and environmental influences (Landekić et al. 2013). Threatening work environment, numerous work related injuries and diseases, characteristics of the workplace and the subject of work, duration and structure of working hours, and extreme physical exertion are constant hazard for maintaining the workers' health and work ability (Landekić et al. 2023). Seasonal work and temporary employment, residing in distant work camps, limited electricity or water supply, scarce medical and other services are usual in developing countries (ILO 2019). Work conditions in wood harvesting also negatively affect workers' mental health causing anxiety, nervousness, insomnia, etc. (Lotfalian et al. 2012). Furthermore, forest workers are often seen as a specific subculture, marginalized in society, which makes the profession unattractive for new employees (Błuszkowska and Nurek 2014). Therefore, today, young generations often consider working in forestry, especially the jobs of loggers, tractor operators, etc. as 3D jobs – dirty, dangerous and demeaning. Consequently, significant difficulties that have arisen in recent years include: lack of interest in forestry work, shortage of production workers, difficult training and retention of forestry workers, old age and poor health of forestry workers, difficult working conditions, etc. (Landekić et al. 2017).

Ongoing processes in Europe and worldwide, such as globalization, aging of the general population, emigration from rural areas, etc., undoubtedly affect the forestry sector and its workforce. UNECE/FAO (2020) state that the total number of forestry workers in Europe declined by 18% in the period 2008–2016. In Germany and Scandinavian countries this mainly happened due to more immanent mechanization of forestry operations. In 40 years, Sweden went from 100,000 forestry workers to 10,000, which is a drop of 90% (Axelsson 1998). In Finland, the number of forestry workers decreased by 50% in only five years, i.e. from 1990–1995 (Salminen et al. 1999). In case of France, 11,000 loggers in 2004 dropped to 7000 in 2013, with continuing decline despite the introduction of migrant labour (Cacot et al. 2015). Tsioras (2010, 2012) states that 85% of Greece professionals indicate the lack of forestry workers as immense future problem, due to the slim interest in forestry occupation and the increasing migration of rural population to cities. Bernasconi and Schroff (2011) also write about the absence of interest of young men for forestry jobs in Europe and North America. Egan and Taggart (2004) cite that around 70% of New England loggers are not recommending forestry work to their children. According to He et al. (2021), the USA forestry sector faces a major structural issue of workforce shortage, especially in wood harvesting, due to a deficit of new, young employees. In Maine, the forestry labour force decreased by 9.4% from 2010 to 2018 (PLCM 2019). In British Columbia, Canada, the number of workers decreased by 30% from 1994–2005 (Proteau 2008).

The existing labour force in forestry is also characterized by an unfavourable age structure. In Europe, the share of forestry workers over the age of 50 increased by 30% in the period 2000–2010. In Sweden, for example, by 2010 half of all workers were aged 50 and over. In countries such as France, Germany, Ireland and Norway, the number of workers over the age of 50 increased in the same period by over 15% and reaches a share of 37% to 46% of the total forestry workforce (UNECE/FAO 2020). It is considered that, for the period 2015–2060, the general aging of the population will have the greatest impact on demographics and labour force of Europe, especially in forestry and other less attractive sectors (Nair 2004, Ackerknecht 2010).

Forestry workers traditionally originate from rural areas (Whiteman et al. 2015, UNECE/FAO 2020). However, predictions say that in the period 2015–2030 Europe will record a much stronger growth of urban population, together with the rural emigration and agricultural abandonment, especially in isolated and harsh conditioned Mediterranean and mountainous areas (Perpiñá Castillo et al. 2019). This will make the pool for forestry worker recruitment even smaller.

In Bosnia and Herzegovina, as in many other countries in south-east Europe, the transition to a market economy at the end of the 20th century significantly reduced the number of employees and working means in forestry administrations and companies entrusted with the management of state forests. At the same time, no significant mechanization took place, and motor-manual forestry work still remained the most widespread. The same period was characterized by the development of new business segments, such as the emergence of private entrepreneurs who became an indispensable part of wood harvesting and other forest operations (Šporčić et al. 2009). However, occasional and short-term engagement i.e., the volume of contracted works,

in most cases did not enable long-term perspective and entrepreneur development into stable entities with a large number of employees and high social and safety standards. The main characteristics of this part of the forestry workforce are mainly the lack or limited care for workers, low wages, insufficient social protection, seasonal employment, poor training, etc. (Šporčić et al. 2018). This makes the interest in forestry work even lower, the existing labour force even more vulnerable and the image of forestry even worse.

In view of the above, forestry sector undeniable faces a major challenge in achieving the necessary and sustainable labour force. This is certainly a very important and complex issue that requires a systematic approach and active participation of all involved stakeholders. This paper shows the opinions of forestry experts in Bosnia and Herzegovina (BH) on future perspectives of forestry work, regarding shortage of labour force and possible mechanisms for improving the workforce sustainability i.e., successful recruitment of forestry workers, stronger retention of workers, greater work commitment, and general forest management issues affecting workforce sustainability.

The results include certain general characteristics of forestry work and pointers of the position and status of forestry workers in BH (work organization, worker care, attitudes towards forestry work and occupation, etc.). Special attention is paid to current issues and problems in attaining and ensuring the necessary labour force – gravity of the labour shortage, leading causes i.e. reasons for the lack of forestry workers; and to possible measures and instruments important for improving the forestry workforce sustainability – factors for successful recruitment of forestry workers, stronger retention of workers, greater work commitment, general forest management issues affecting workforce sustainability, etc.). The opinions of professionals in public and private forest enterprises were statistically tested for differences. The aim of the study is to sensibilize the sector on the problems of the labour force, its condition and status, and to create the grounds for bettering the status and enhance the sustainability of the forestry labour force.

2. Materials and Methods

Bosnia and Herzegovina (BH) is a compound state, which consists of the Federation of Bosnia and Herzegovina (FBH) and the Republic of Srpska. Brčko, which was a subject of disputes and international arbitrage, was proclaimed a district. Thus, Bosnia and Herzegovina has two entities and Brčko District.

The survey covered the entity of FBH, which accounts for 51% of the total state territory. Republic of Srpska as well as the Brčko District were excluded from the investigations because of the contrasting management system of state forests and the great diversity of forest enterprises.

FBH consists of 10 cantons (Fig. 1). State forests (1,233,808 ha or 82% of the total forest land area, i.e. 58% of the entire FBH territory) in each canton are managed by specific public forest companies. Only one canton (C2) with extremely small forest area did not establish its forest company. Accordingly, the research included nine cantons altogether (Fig. 1). The annual cut in FBH reaches 3.1 million m^3 with semi-mechanized, i.e. motor-manual work prevailing in wood harvesting – predominant use of chainsaws and skidders (FMAWMF 2021).

Besides state forest companies, there is a number of private forestry contractors that operate in each canton. Officially, a total of 284 entrepreneurs, i.e., private companies operating in forestry and logging, were registered in 2020 (FSO 2020). The study underlines the difference in attitudes of forestry experts in private and public forest enterprises.

The research encompassed forestry experts in nine public and 26 private forest companies. The scope of the research was defined in such a way that 40 printed questionnaires were prepared for each canton. Distribution of questionnaires was conducted by certain persons in public forest enterprises, i.e. managers who

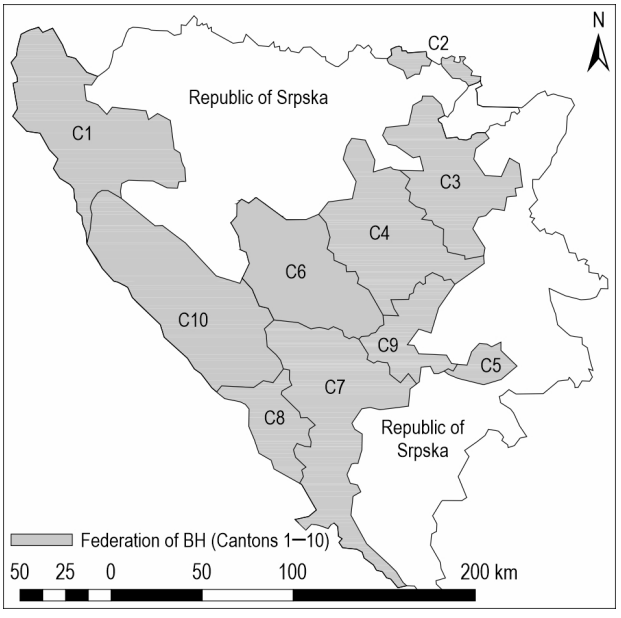

Fig. 1 Administrative-territorial organization of BH

possess organizational powers and were highly motivated and interested in the survey. Private forest companies included in the research encompassed those which are closely and duly cooperating with public enterprises. Designated contact persons personally delivered the questionnaires to forestry experts and gathered them from respondents. Along with the questionnaire, the respondents received a short brochure explaining the intent and anonymity of the survey.

The research was intended to include totally 360 respondents, which corresponds to the sample size required for a 95% confidence level with ±5 significance (De Vaus 2002), on the basis of public reports on the number and structure of all employees in FBH forest sector (N=5224) (FSO 2021). The conducted procedure includes a deliberate (quota) sample determined by relying on personal assessment, and putting the emphasis on choosing the relevant forestry units (private and public forest enterprises) in FBH. The actual respondents in forest companies are largely settled by the forestry experts who were willing and motivated to participate in the investigation. A strong aspiration was expressed that the respondents' profile represents the existing forestry experts population as much as possible. The expertise of the respondents was determined on the basis of their position, i.e. the function they perform in the company (forestry managers, forestry officers, company executives, owners, etc.). The opinions and answers of this group of employees are considered extremely important because they represent the views and attitudes of the persons (experts) who are managing forestry production, managing workers, organizing forestry operations, designing and supervising forestry work (managers, officers, foremen, etc.).

The research was approved by the Ethical Committee of the Faculty of Forestry and Wood Technology of Zagreb University (protocol code EP/02-21, 22 September 2021). Prior to survey and collection of data, all respondents were familiarized with the investigation and acknowledged the research. Collecting of data and gathering of questionnaires was done at the end of 2021.

The questionnaire design included comprehensive literature overview, study of human resource management theory, and analysis of recent findings in forestry practice and science. Along with the introductory section with explanations and instructions for respondents, the questionnaire comprises questions on:

⇒ respondents' characteristics and profile (sociodemographic and other data)

⇒ opinions about forestry worker occupation and forestry employment

⇒ lack of labour force and elements of workforce sustainability with consideration to recruiting, retaining and commitment of forestry workers.

The questionnaire was to be compiled in writing, with autonomous and voluntary participation. Simple language was used with additional descriptions and colloquial terms. A total of 52 questions were asked, with the highest number of questions in the third part of the questionnaire (73%). Questions were predominately close-ended (96%), usually with a 5-point Likert scale (68%). Around 20% of close-ended questions, in addition to set answers, included the additional possibility for free comment or open response. The reliability of the designed questionnaire was assessed by Cronbach's alpha coefficient, with alpha value of 0.764 evaluating the applied questionnaire as satisfactory.

Statistical evaluation of gathered data was conducted with the software package TIBC Statistica 14.0.0.15. The analysis included descriptive statistics (mean, median, st. dev., etc.) as well as inferential statistics – use of parametric (ANOVA, T-Test), and non-parametric tests (χ^2 test, Man-Whitney U test). Previously, each variable was tested on distribution normality and variance homogeneity (Shapiro-Wilk's, Levine's test). The results include tabular and graphical presentation of the research findings.

3. Results

3.1 Respondents' Profile and Structure

Alltogether 141 forestry experts (39.2%) responded to the questionnaire. Four questionnaires were not completed correctly (more than 40% of questions unclearly and improperly answered) and were discarded. So, further analysis icluded 137 accurate questionnaires.

The basic information about respondents (age structure, gender, residence, education level, work position, etc.) are presented in Table 1.

A majority of respondents are of male gender (82%), living in the settlements populated with more than 5000 inhabitants (37%), having graduate education (64%) and working as forestry managers – Forest Office manager, head of department or professional service (31%). One fifth of them are employed by private companies, while the rest is employed by public forestry companies. Most respondents (83%) stated that their employers are organized as limited company (Ltd), while 17% work in the joint stock company (JSC).

Table 1 Profile and structure of respondents

Type of respondents	Forestry experts		
Survey period	September–December 2021		
Analyzed questionnaires, *N*	137		
Respondent profile		*N*	%
Gender *N* = 130	Male	112	81.8
	Female	18	18.2
Age group (years) *N* = 136	<29	7	5.1
	30–39	45	33.1
	40–49	32	23.5
	50–59	43	31.6
	>60	9	6.6
Residence – settlement size (population) *N* = 132	<500	19	14.4
	500–2000	28	21.2
	2000–5000	36	27.3
	>5000	49	37.1
Level of education *N* = 136	Primary school	1	0.7
	High school	36	26.5
	Undergraduate (BSc)	4	2.9
	Graduate (MSc)	87	64.0
	Postgraduate (PhD)	8	5.9
Employer *N* = 137	Public forestry company	111	81.0
	Private forestry company	26	19.0
Workplace – position *N* = 135	Administrative personnel	1	0.7
	Technical staff	22	16.3
	Forestry officer, supervisor	36	26.7
	Forestry manager	42	31.1
	Director, executive officer	34	25.2

The average respondent is 45.5 years old (*sd*=10.52), i.e. 43 years (median), with 18.8 years of service (*sd*=10.70), i.e. 16.9 years of service in forestry (*sd*=9.95). The difference between examined experts shows that the ones in public companies averagely have 15.92 years of forestry experience (*N*=111), while those employed by private employer have 21.15 years (*N*=26) (*t*=–2.45; *df*=133; *p*=0.015). The majority of surveyed experts stated permanent employment (96%), while only a small part of them is employed temporarily (4%). Chi-square(χ^2) test did not show significant difference between private and public enterprises regarding the type of forestry professionals' employment (*p*=0.27). According to labour union activity, 55% of all interviewees declared themselves as forestry union members. However, there is significant difference among two groups of respondents (χ^2 (1, 137)=32.10; *p*=0.00; *fi*=0.50). Among forestry experts employed in private companies, only one is a union member (4%).

3.2 Opinions on Forest Work and Forestry Workers' Occupation

Based on the forestry experts' responses, an estimation was given on the numbers and structure of workers employed in forestry companies (Table 2). The specifics of forestry employment and the profession of forestry worker included opinions on benefits and drawbacks of forest work, incentives for choosing this occupation, respectability of forestry workers in the public, their future status, and main work-related concerns. A separate part refers to work organization, worker care and training in FBH forestry.

The results show that, on average, state forestry companies employ several times higher number of forestry workers than private companies. This is understandable given the structure and way of managing state forests in FBH. At the same time it speaks of private companies as small, family businesses that rarely employ a larger number of workers. It should be noted that these are respondents' answers (estimates), not official data, and when considering the volume and structure of forestry workforce, the total number of such »small« companies should be in mind – 284 private companies (FSO 2020), compared to 9 public forestry companies. The number of tractor operators and auxiliary workers, both in public and private companies, is on average twice as small as the number of loggers. Approximately, the same applies to fixed-term workers and permanently employed workers. According to the given data, the average total number of workers in the company is 83.2 for public, and 23.8 for private companies.

Regarding work organization and worker care, forestry experts state that harvesting operations in their companies are mostly performed with loggers working with an assistant or another logger, and tractor operators together with choke setter (Table 3). The *U*-test (*p*=0.16) did not prove a significant difference in work organization between private and public companies. The majority of companies (87.4%) regularly provide forestry workers with protective gear, equally in private and public enterprises. Two thirds of the companies also regularly provide prescribed systematic medical examinations for their workers. No significant difference (*p*=0.32) was found for the model of meal provision, where most private (92.31%) and public (86.2%) company workers receive financial compensation instead of a hot meal at the workplace.

Table 2 Number of forestry workers employed in public and private companies

Type of worker/company		Responses, *N*	Number of workers, AVG	*St. dev.*	*MIN*	*MAX*	*Med.*
Public companies							
Permanently employed	Loggers	24	30.17	21.72	3	85	23
	Tractor operators	21	13.24	7.18	4	28	11
	Choke setters, etc.	19	14.74	8.23	1	34	13
Fixed-term employment	Loggers	16	12.75	13.27	1	53	11
	Tractor operators	9	5.33	3.64	1	10	3
	Choke setters, etc.	11	7.00	6.77	1	20	3
Private companies							
Permanently employed	Loggers	24	8.29	5.97	2	23	6
	Tractor operators	24	3.58	2.53	1	12	3
	Choke setters, etc.	23	3.83	2.96	1	12	3
Fixed-term employment	Loggers	13	3.54	2.18	1	8	2
	Tractor operators	11	2.45	1.86	1	6	2
	Choke setters, etc.	14	2.14	1.79	1	8	2

Almost all of the companies (94.4%) provide organized transportation of workers to the forest site.

As the key benefit of the forestry worker occupation, the respondents stated good salary (33.6%), challenging job that requires skilful workers (32.0%) and work in the open nature (31.2%) (Table 4). Around half of the examinees (50.7%) consider hard physical labour to be the main drawback of the job. According to a considerable share of respondents the job is dangerous and with high risk of injuries (38.1%). Statistical testing confirmed a notable difference in the evaluation of leading occupational benefits (U=934.50; z=–2.05; p=0.040) regarding private and public employees. In private companies, respondents emphasize more the good salary (56%), while in public companies they emphasize the work in nature (35%) and challenging job that needs skilful employees (35%). Mann-Whitney test did not prove a significant difference in main job drawbacks (p=0.80). Most of the examined experts believe that impossibility of finding another employment (40.0%) and family tradition of working in forestry (40.0%) are the main reasons why forestry workers choose this profession. Very few believe that workers choose their occupation because they appreciate and like the job (11.9%) or because they evaluate the job as well-paid and challenging (8.1%). Regarding reasons for choosing the profession, statistical analysis confirmed significant difference (U=1043.50; z=–2.24; p=0.025), where respondents in public companies put more emphasis on reasons like »*they can't find another employment*« (44.04%) or »*their father (family member)*

Table 3 Elements of forest work organization and worker care

Question	Answer	*N*	%
Forestry company loggers, at a forest site, usuallly work:	With an assistant	56	45.9
	Paired with another logger	52	42.6
	Alone	14	11.5
	No answer	15	–
Forestry company tractor operators, at a forest site, usually work:	With a choke setter	103	88.8
	Alone	13	11.2
	Other	–	–
	No answer	21	–
Forestry company provides its workers with prescribed personal protective equipment:	Yes, regularly	118	87.4
	Occasionally	16	11.9
	Never	1	0.7
	No answer	2	–
Forestry company provides prescribed systematic medical examinations for its workers:	Yes, regularly	87	64.4
	Occasionally	45	33.3
	Never	3	2.2
	No answer	2	–
Forestry company provides a hot meal for its workers at the workplace:	Yes	8	6.1
	No	6	4.5
	I receive a money add-in	118	89.4
	No answer	5	–
Forestry company workers travel to forest site every day by:	Their own car	1	0.8
	Company transport	117	94.4
	Stay in forest camps (containers)	6	4.8
	No answer	13	–

Table 4 Attitudes on key benefits and drawbacks of forestry work, workers' status and perspective

Question	Answer	*N*	%
The main benefit of the forestry workers' job (logger and tractor operator) is:	Good salary	42	33.6
	Work in nature, in the open, and in fresh air	39	31.2
	Fitness and exercise for the body	–	–
	Challenging work that requires a skilled person	40	32.0
	Open answer (none of the above; no advantages)	4	3.2
	No answer	12	–
The main drawback of the forestry workers' job (logger and tractor operator) is:	Hard physical work	68	50.7
	Great distance from family and home	5	3.7
	Underappreciated and poorly paid work	10	7.5
	Dangerous work with frequent injuries	51	38.1
	No answer	3	–
Forestry workers choose their profession for the following reason:	They can't find another employment	54	40.0
	Their father (or family member) did the same	54	40.0
	It is a challenging and well-paid job	11	8.1
	They like and appreciate this work	16	11.9
	No answer	2	–
The public and society regard the job of a forestry worker (logger, tractor operator):	With great respect	7	5.2
	As less valuable work	67	49.6
	As exciting and interesting	8	5.9
	Equally as any other job	53	39.3
	No answer	2	–
Forestry workers position in the next few years will be:	Better	55	40.7
	The same	58	43.0
	Worse	22	16.3
	No answer	2	–
Related to their job, forestry workers' greatest concern is:	Low salary	29	21.6
	Irregular salary payments	11	8.2
	Fear of losing their job	10	7.5
	Possibility of injury	84	62.7
	No answer	3	–

did the same« (39.45%) than the experts employed in private companies. According to the survey, the job of a forestry worker is generally regarded as less valuable (49.6%), or equal as any other job (39.3%). It is very rarely considered interesting and exciting (5.9%) or highly respected (5.2%). The majority of respondents think that forestry workers' position will be the same (43.0%), or somewhat better in the next few years (40.7%), and that the possibility of injuries represents workers' greatest concern (62.7%). Forestry experts in private companies indicate the possibility of injuries as greater worker concern (76.92%), than their colleagues in state enterprises, who stress low salaries (59.26%), but no significant difference between two groups was confirmed by *U*-test (p=0.053).

Table 5 shows attitudes on the time period necessary for acquiring the skills essential for safe and autonomous forest work. Most respondents state that the training should last 1–2 years, both for loggers and tractor operators (39.7% and 38.2%). Fewer think that training requires up to one year (34.6% i.e. 35.1%). The vast majority of forestry experts (93.3%) expressed the need for establishing specialized forestry workers training centers. They also stated that forestry companies

Table 5 Attitudes on the time period necessary for forestry worker training

Question	Answer	Loggers		Tractor operators	
		N	%	*N*	%
To acquire the skills essential for safe and autonomous work in forestry, training should last:	Up to 1 year	47	34.6	46	35.1
	1–2 years	54	39.7	50	38.2
	2–3 years	29	21.3	32	24.4
	3–5 years	6	4.4	3	2.3
	No answer	1	–	6	–

should value and pay their employees according to achieved work effects, without limitations (62.2%), and that public forestry companies should keep their own workers and means needed for performing substantial (34.4%), or somewhat smaller part of their forestry operations (38.7%).

3.3 Problem of Shortage of Forestry Workers

Nearly half of the forestry experts believe that the issue of labour shortage is occurring and that it inclines to get even worse (49.6%). Around 43.1% respondents state that this has been a distinct problem, present for a longer period now. Only a few examinees (7.3%) think that this issue is not pronounced or present at all. There are no significant differences (p=0.25) between respondents from private and public enterprises.

Respondents' views on the leading causes of the labour shortage are shown in Fig. 2. For assessing the influence of specific elements, a Likert five-point scale was used (1 – No influence at all; 5 – Very strong influence). Results for each assessed factor also include information about the sample size, median and arithmetic mean value (given in parentheses). According to analyzed responses, the *»departure of working age population to other countries«* is designated as the leading cause of the labour shortage. It is closely followed by *»unfavourable demographic trends in FBH«*. As the least significant cause, respondents recognized *»increased total volume of forestry work in FBH«*. Statistical testing did not establish significant differences (p=0.25) regarding private and public enterprises. Some open answers that have been given by the examined experts are the following: *the disappearance of the rural population; lack of interest among young people; mass emigration; no schools for professional training; employment procedures*, etc.

Table 6 Views on gravity of labour shortage problem in FBH forestry

Question	Answer	*N*	%
Is there a shortage of qualified work force in FBH forestry?	This has been a distinct problem for a longer time	59	43.1
	This problem is occurring and it inclines to get even worse	68	49.6
	The problem is present, but not pronounced	10	7.3
	There is no such problem	–	0.0

Considering the major reasons for arduous recruiting and retaining the forestry workers, these points were rated as the leading ones: *»physically intensive and tiring work«*, *»outdoor labour in different field surroundings«*, *»basically low interest for these jobs«*, *»overall social, economic and political situation«*, and *»frequent work accidents and diseases«* (Fig. 3). The least significant are: *»excessive labour norms«*, *»ineffective labour inspection and worker rights protection«*, *»indigent communication, employee relations and managers behaviour«*, and *»deficient forest workers training system«*. Established differences in received responses reveal that experts in public enterprises see *»outdoor labour in different surroundings«* (U=1063.00; z=–2.19; p=0.028), and *»low salaries«* (U=925.00; z=–2.95; p=0.003) as a more significant reason than experts in private companies. Some open comments on the reasons for arduous recruiting and retaining forestry workers are: *the same work is valued more abroad; old regulations dated from 70s; worsening situation in the sector; monotonous job*, etc.

3.3.1 Forestry Workforce Sustainability – Worker Recruitment, Retention and Commitment

Workforce sustainability includes principles and measures which contribute to the quality and stability of the labour force, i.e. ensure harmony between the outflow and inflow of qualified workers, in forestry as in any other industry. These factors are numerous and it is difficult to classify them accurately. For the purpose of this study, these elements were grouped into three categories:

⇒ factors for stronger recruiting

⇒ factors for stronger retaining

⇒ factors for higher work commitment.

Although some factors are difficult to categorize and hard to exclusively align in just one group (e.g., regular salary is equally vital for both recruiting and retention), efforts were made to avoid stating the same elements in more categories.

Factors for successful recruiting encompass elements that affect job appeal and attract new workers,

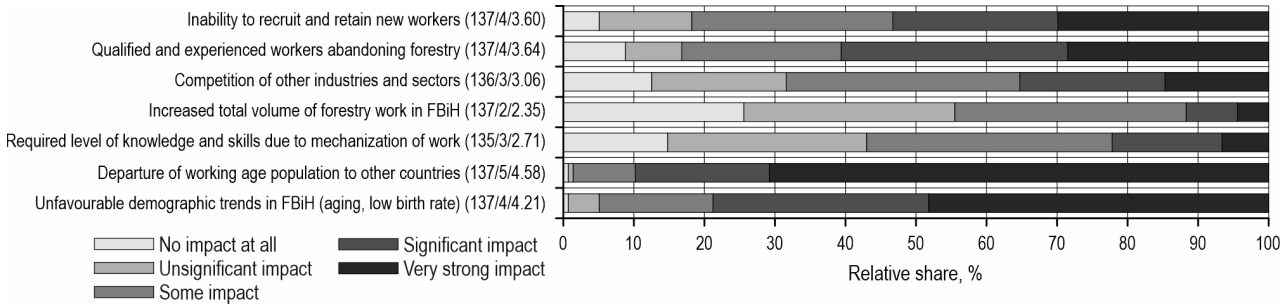

Fig. 2 Attitudes on leading causes of forestry worker shortage in FBH

i.e. increase interest for the occupation and employment in forestry. Fig. 4 presents the results for the factors evaluated in the research. The figures indicate that respondents recognized the next points as the most crucial: (1) *job stability and regular income*, (2) *higher salaries and assured increase for longer service*, (3) *competitive starting salary*, (4) *social rights and working conditions*, and (5) *benefit service*. The least important points are: *»interesting and challenging work«*, *»possibility of learning and developing new skills«* and *»interesting work environment and colleagues«*. No statistically significant differences were found between publicly and privately employed forestry experts. Open responses and comments given by the respondents include comments regarding stronger recruitment such as: *paid prequalifications, scholarships; higher prices in forest sector; new forest machines*, etc.

Elements of successful retention are focused on improving relations between workers (employees) and employers. The goal is in fulfilling the employees' needs and increasing their satisfaction with the job and workplace. Fig. 5 presents the results of the forestry professionals' evaluation, and the prime elements are: (1) *worker rewards and satisfactory salary*, (2) *permanent employment contract*, (3) *salary corresponding to work results*, (4) *adequate worker rights, benefits and work safety*, and (5) *possible promotion, raise and explicit development plan*. The lowest ranked are: *»work over 65 years of age«* and *»worker participating in company decision-making«*. Compared groups of experts evaluated differently only the impact of *»worker participating in company decision-making«*, where respondents from public entities attached more importance to this point (U=1080.50; z=–2.04; p=0.041). Recorded open comments were: *salaries during winter; juridical security; frequent and open communication*.

Upgrading work commitment is oriented towards more effective use of human capital in the organization.

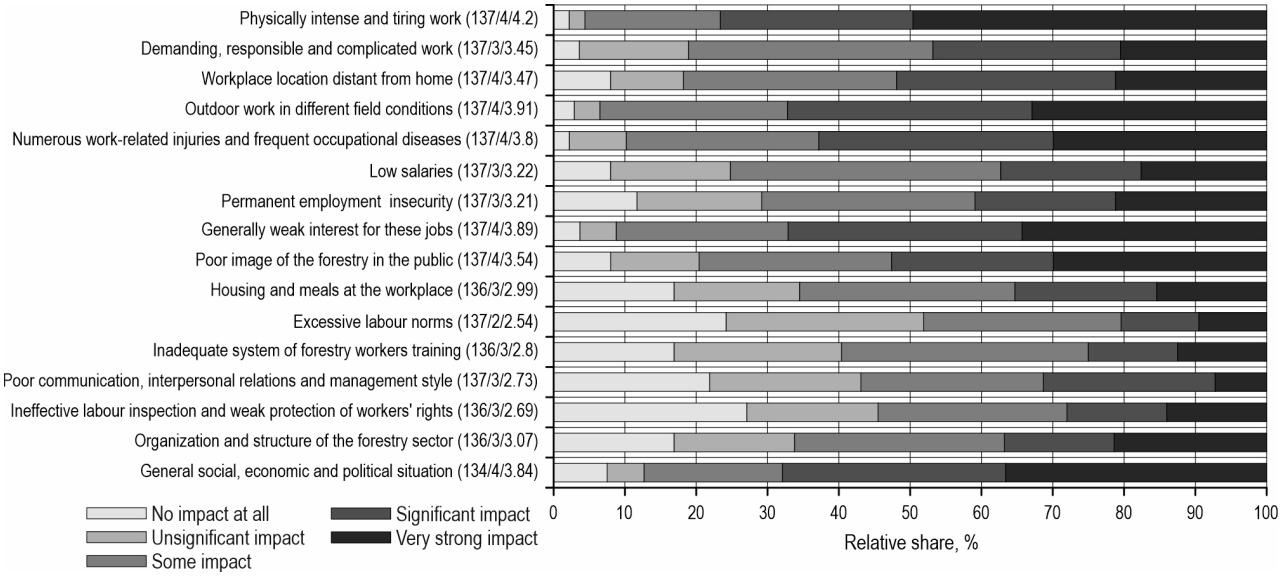

Fig. 3 Views on reasons for arduous recruiting and retaining forestry workers

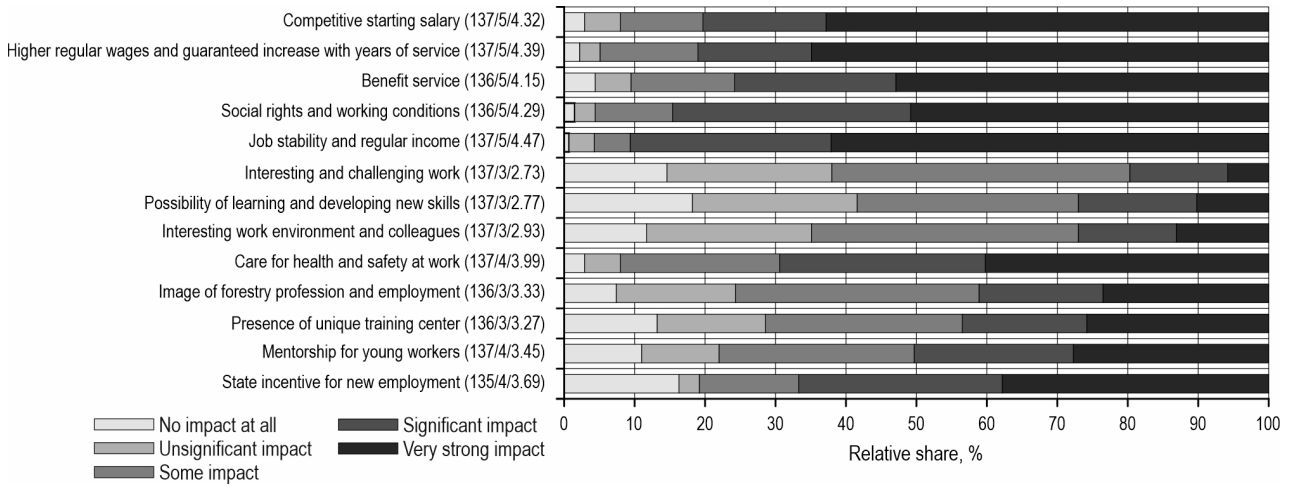

Fig. 4 Evaluation of factors for stronger recruiting in forestry

It includes arranging both financial and non-financial compensations with constant promotion of employee-employer relations. Among the evaluated factors the most prominent are: (1) *clear job and task description*, (2) *good cooperation and relationships within the firm*, (3) *transparent and consistent salary policy*, (4) *high-level work organization in the firm*, (5) *monitoring workers' performance and progress* (Fig. 6). Lower ratings are assigned to elements like: *»possible worker education and development«* and *»delegating responsibility for operational assignments«*. No statistically significant difference was determined between groups of respondents. Some of the listed free comments are: *health care*; *modernized mechanization*; *better wages*, etc.

In the evaluation of the engaged stakeholders' role and responsibility concerning the problem of labour shortage and the imperative of improving forestry workforce sustainability, the surveyed experts stated that public forestry companies together with Cantonal and State Ministry of Forestry should bear the greatest load (Fig. 7). Scientific and educational institutions together with the Chamber of Economy and private forest contractors are rated with the smallest responsibility.

3.3.2 General Forest Management Issues

Since the lack of forestry labour force is a very complicated problem, the investigation took into consideration some general forest management issues that directly (or indirectly) influence worker recruiting and retaining, and determine future prospects of labour force sustainability. Fig. 8 provides insight into

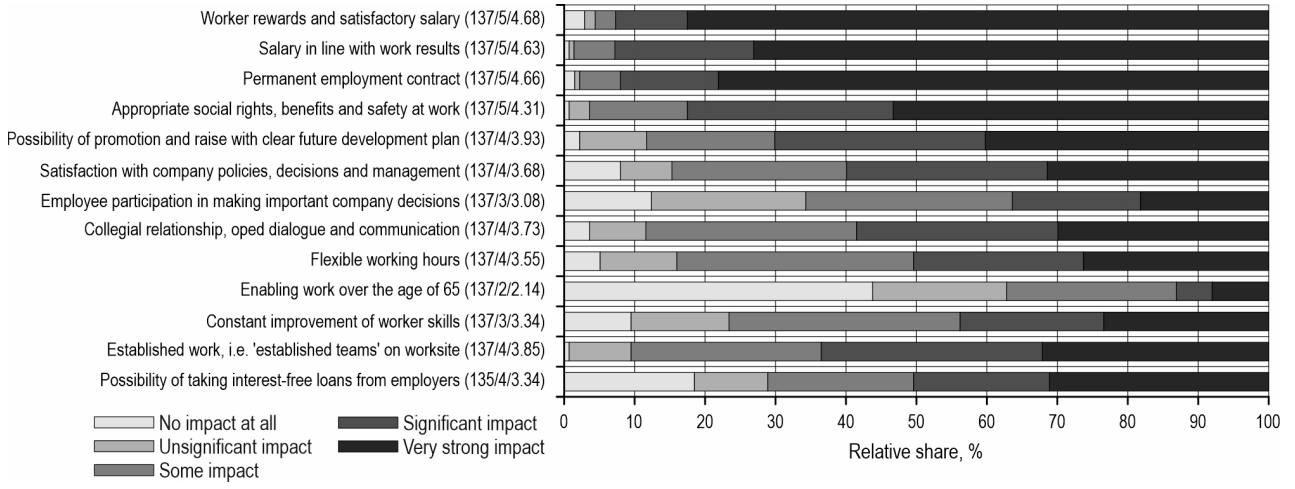

Fig. 5 Evaluation of factors for successful worker retention in forestry

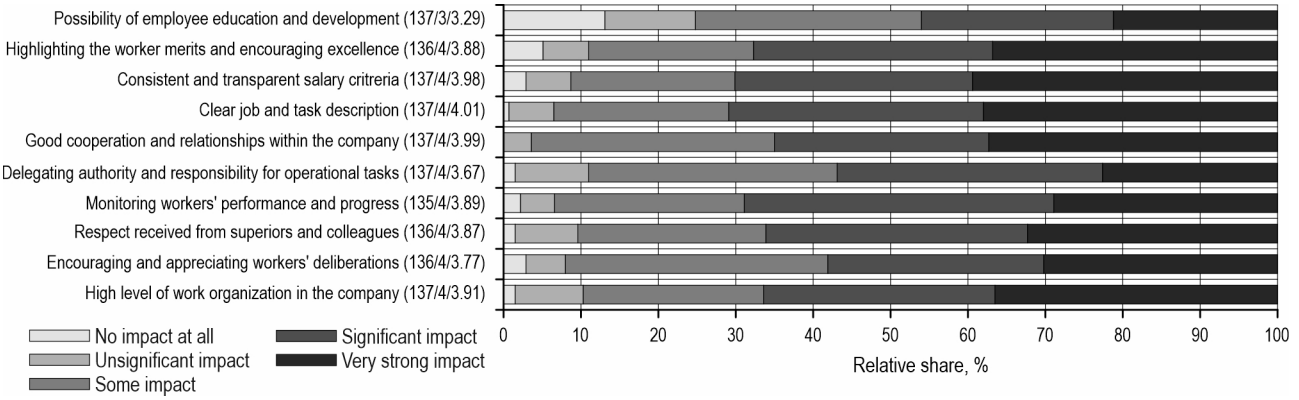

Fig. 6 Evaluation of factors for higher work commitment

forestry professionals attitudes regarding forest workers' training in BH, work quality and labour prices, introduction of fully mechanized wood harvesting systems, forest concessions, sale of standing timber, development of rural area, migrant labour work, etc.

According to the analyzed responses, the greatest level of agreement was determined for the statements *»recruiting entirely depends on retaining the young men in rural areas«* and *»transparent contests with long-term jobs are precondition for investments and forest company development«*. Also highly accepted is the statement *»there is no adequate training system in FBH«*. The lowest acceptance was recorded for statements *»shortage of labour should be resolved by importing migrant workers«* and *»for resolving the problem of workforce, most of the state forests should be given in concessions«*. Statistical analysis

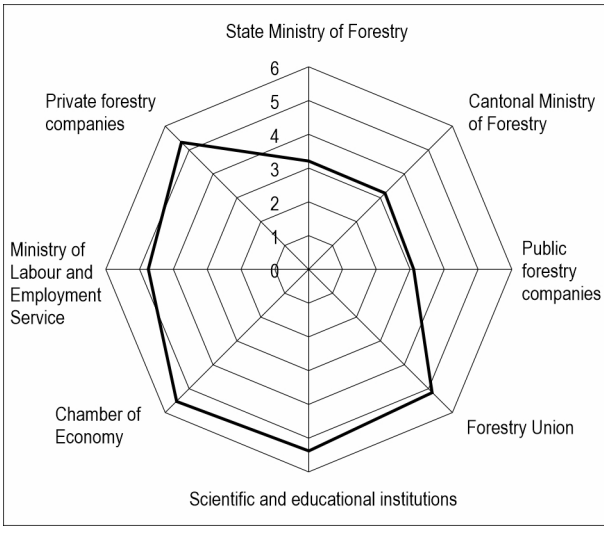

Fig. 7 Attitudes on stakeholders' role and responsibility in achieving workforce sustainability

proved that experts in state-owned companies agree to a higher degree with following statements: *»shortage of labour should be solved by introducing fully mechanized harvesting systems«* (U=1019.50; z=–2.33; p=0.020), *»forest operations and worker recruitment should be passed on wood industry through sale of standing timber«* (U=897.50; z=–3.04; p=0.002), and *»for resolving the labour shortage, state forests should mostly be given in concessions«* (U=641.00; Y=–4.75; Y=0.00).

4. Discussion and Conclusions

The lack of forestry labour force is not a new and unknown problem. Back in 1948, Čop wrote about the deficit of workers in Croatian forestry, the unsystematic recruiting and dissatisfaction of forest workers, stressing the importance of securing higher wages and better working conditions, as well as retaining and selecting workers from traditional forestry rural areas. In 1992, Sabadi similarly wrote that in the first century of the third millennium, we will have 50 year old »grandpas« operating the forestry machinery. Accordingly, forestry workforce, its condition, status and sustainability represent a significant issue, more or less pronounced in certain periods, but certainly present for a longer time and by no means negligible.

Growing world population and higher consumption create extra pressure on forests and forestry (and other sectors as well), which are expected to respond to increased human needs for various products and services, primarily raw materials for the wood industry, but also tourism and other recreational, ecological, aesthetic and protective benefits from the forest. The necessary increase in the forestry productivity was initially achieved by the significant mechanization of forestry work in the second half of the last century. At that time, this greatly reduced the need

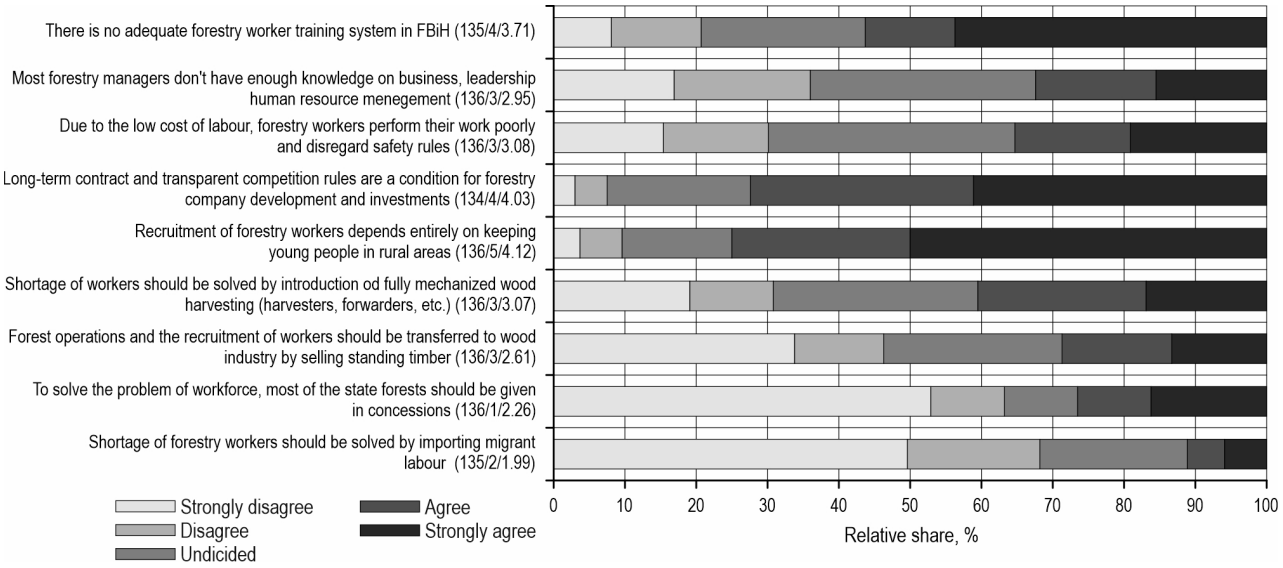

Fig. 8 Views on general forest management issues affecting workforce sustainability

for labour (UNECE/FAO/Forest Europe 2019, UNECE/FAO 2020).

However, today's emigration of the rural population, together with other global processes, makes it much more difficult to obtain the necessary labour force in forestry, especially in Europe, where this trend has become more notable (Blombäck et al. 2003). Besides that, the available labour force, i.e. human capital that is indispensable for the forestry production and sector, is gradually but surely decreasing due to present demographic tendencies (migrations, aging of the population, decrease in birth rates, adverse natural increase); significant lack of interest regarding to 3D (dangerous, dirty, demeaning) or »black collar« jobs; emersion of forestry contractors and shift of work operations from public sector to private domain (Blombäck et al. 2003); significant informal employment in forestry (Lippe et al. 2021) and exploitation of workers (FRA 2019, Křížková and Čaněk, 2011); highly dangerous and risky, physically exhausting job accompanied with frequent work-related accidents and occupational diseases (EU-OSHA 2008, Adams et al. 2014); switch to multifunctional forestry with a growing accent on green economy and bioeconomy (UNECE/FAO 2018, 2019).

This research showed that FBH forestry definitely faces a severe problem of labour force deficit, i.e. the immense challenge of obtaining a quality and sustainable workforce. Among surveyed forestry experts, only few of them (7.3%) consider this as unsignificant or no problem at all. On the other hand, the great majority states that forestry worker shortage has been strongly present for a longer time (43.1%) and that it tends to get even worse (49.6%). Most of the experts believe that forest workers choose their profession because they are unable to find different employment (40.0%) or because their father (or family member) was of the same occupation (40.0%). As the main advantages of the forestry work, the respondents state good salaries (33.6%), and challenging workplace that requires skilful employees (32.0%). Hard physical labour (50.7%) and dangerous work with frequent injuries (38.1%) are recognized as the prime disadvantages of the profession. Regarding the main causes of labour force shortage, migration to countries abroad and unfavourable demographics in FBH have been indicated as the leading ones. Most important reasons for arduous recruiting and retaining forestry workers are: physically exhausting and tiring field work, generally weak interest for these jobs, social, economic and political situation in FBH, and plenty work-related accidents and diseases. According to forestry experts, the decisive instruments for more successful recruiting and retaining workers are principally of a financial nature: job stability and regular income, higher salaries and promised increase with longer service, competitive starting salary; i.e. work bonuses and adequate remuneration, permanent employment contract, and wages according to work effects. The crucial element for higher work commitment are recognized in: clear job and task description, good cooperation and relationships within the firm, and transparent and consistent salary policy. Considering the general forest management issues, respondents strongly agree with the statements that worker recruitment entirely depends on retaining the young men in rural areas, and that

transparent contests with long-term jobs are a precondition for investments and forest company development. On the other hand, they reject claims that the shortage of labour should be resolved by migrant workers, or that in order to solve workforce problem, state forests should mainly be in concession.

Considering all of the above, the forestry sector is clearly struggling to provide better conditions, increase interest for forestry work, and recruit the indispensable labour force. The lack of human capital, i.e. fresh work potential in forestry production tends to overload the existing labour force making it unsustainable. Sustainability of forestry workforce is a crucial segment of todays sustainable forest management, and its strengthening should represent the strategic goal of the industry. Nevertheless, upgrading the sustainability and quality of the forestry labour is a very complex problem, which evokes elaborate, proactive approach and decisive actions from all stakeholders involved, including governmental institutions, forestry enterprises, professional associations and other participants. This study can help raise the awareness and recognition of the labour issue in forestry sector, promote its condition and status, and primarily set the basis for resolving the problem of the lack of workers, point out the possible strategic directions for more successful worker recruiting and retaining, and thus contribute to achieving sustainable forestry labour force in FBH.

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