REGIONAL ASSESSMENT OF FOREST EDUCATION IN NEAR EAST AND NORTH AFRICA

Creation of a Global Forest Education Platform and Launch of a Joint Initiative under the Aegis of the Collaborative Partnership on Forests

Arab Organization for Agricultural Development (AOAD)
REGIONAL ASSESSMENT OF FOREST EDUCATION IN NEAR EAST AND NORTH AFRICA

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Foreword

Previous studies cited by this study have shown a deterioration in forest education at the global level in general. It also showed that forest education has been largely absent from the global forest policy agenda for a long time. On the other hand, this study, which is in your hands, the honorable reader, showed that the status of forest education in the Near East and North Africa region appears - in terms of development and keeping pace - a natural reflection of what is the state of the forest sector as a whole in the region. Despite its importance for the region and its local communities, the sector does not receive the necessary attention and resources it requires. The efforts and measures needed to promote forest education in the region should not be in isolation from those needed to improve the situation of the entire forest sector in the region.

The Arab Organization for Agricultural Development, as well as other international and regional organizations working in the field of agriculture, natural resources and the environment in the region, led by the United Nation’s Food and Agriculture Organization (FAO), work together to support their countries and enhance their capabilities in order to preserve, maintain and develop their forest resources according to the foundations of sustainability, capacity building, broadcasting awareness of the importance of forests and other natural resources. As an extension of these roles played by the Arab Organization for Agricultural Development and FAO in the region in the field of forests, this study, which was carried out by the Arab Organization for Agricultural Development in cooperation with FAO, comes as a continuation of their previous efforts in the region.

Within the framework of the Global Forest Education Project - which aims to develop a vision and framework that defines concrete activities in forest education to meet its needs worldwide, and to lead a joint multi-partner initiative to address contemporary and emerging challenges facing forests and related ecosystems - these regional assessment reports attempt to document the status and needs of forest education in each of the six UN regions.
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Abbreviations and acronyms

AOAD  Arab Organization for Agricultural Development
ANAFE  African Network for Agriculture, Agroforestry and Natural Resources Education
BMEL  Germans Federal Ministry for Food and Agriculture
CPF  Collaborative Partnership on Forests
DGF  Directorate General of Forests
FAO  Food and Agriculture Organization of the United Nations
FNC  Forest National Corporation
FRA  Forest Resources Assessment
FTE  Full-time equivalent
GIS  Geographic Information System
GDP  Gross domestic product
GLF  Global Landscape Forum
ICFE  International Conference on Forest Education
IFSA  International Forest Student Association
IUFRO  International Union of Forest Research Organizations
ITTO  International Tropical Timber Organization
JI  Joint Initiative
LSSC  Legal and Sustainable Supply Chains for Tropical Wood and Tropical Wood Products
NCMs  National consultative meetings
NGOs  Non-governmental organisations
NWFPs  Non-wood forest products
OWL  Other wooded lands
PhD  A doctoral degree
RLP  Regional Lead Partner
SDGs  Sustainable development goals
TFRK  Traditional forest-related knowledge
TOFs  Trees outside forests
TVET  Technical and Vocational Education and Training
UBC  University of British Colombia
Executive summary

The aim of the regional study is to assess the current state of formal forest education at all levels in the region; identify gaps and areas that need strengthening; provide information on initiatives and key actors working to assess or enhance forest education and to make recommendations for actions to promote forest education in the region.

Using different questionnaires, data was collected from three target groups (professionals, teachers and students). The questions of the questionnaires covered a range of topics. Statistical sampling and snowball sampling techniques were used to take samples from the target groups. Statistical sampling was applied to take samples from 6 countries (Algeria, Egypt, Jordan, Saudi Arabia, Sudan and Syria), with individuals, organizations and institutions identified in the three target groups in these six countries to send survey-related invitations. Snowball sampling, on the other hand, was conducted by sending an open invitation via social media to potential respondents to take part in the questionnaire. Analysis of the data received from countries in the region was based on the total responses received, i.e., total statistical and snowball survey responses. Webropol, an online survey and reporting tool, was used to send out surveys and manage incoming data.

Based on the results of the statistical survey and in light of the national and regional consultations outcomes in the region, the study showed that:

- The current development and coping state of formal forest education in the Near East and North Africa region is bleak. This looks a natural reflection of the state of the overall forest sector across the region due to being marginalized with humble official support and funding;

- Educational programmes at the primary and secondary levels seem to have a limited view of forests and deal only with superficial concepts related to environmental issues, and in some cases there is a complete absence of forest concepts in relation to resources. Shortage in forestry-specialist teachers, financial resources and practical opportunities are also noticed;

- Shortage in other areas is also noticed, such as shortage of staff specialized in forestry, lack of financial resources and practical opportunities;

- Technical education and training in forestry was not among the priority options for students. This resulted in technical education was not among the levels of education available in the field of forests in some countries of the region, while it was phased out in other countries in which it was prevalent, leaving a significant impact on the technical management of forests;

- Despite the positive image of university forest education at the regional level, as evidenced by the adequacy of covering most of the topics related to forests and the availability of
resources (teachers, educational materials, educational environment and practical opportunities), the study revealed a shortage and gaps in affordable vocational training for students and the strategies that lead to improving forestry-related education at different levels. According to the study, government forest policies and strategies existed, while school and school councils' policies existence varied at other levels of education;

- Digital tools are used in the field of forest education. Utilizing such tools has been an added value in the educational process. A poor integration between universities, labor market programmes and the private sector was also observed, with limited job opportunities for graduates as a result.

- Despite the clear division among the respondents regarding whether the student’s gender is a key factor affecting job finding, the study eventually indicated that gender is a significant factor in this regard. The study, on the other hand, showed that race is not a challenging barrier for job opportunities available to graduates.

Based on the above deficiencies and gaps in forest education at all levels across the region, the study recommended the following measures to be taken on various levels to promote forest education in the region:

**Government responsibility**

Governments should blatantly recognize the role of forestry in the regional economy; review forest educational policies and strategies; create more job opportunities to bridge in the gaps of forestry sector; increase funds for research and education; encourage the forest-related on-site and educational private sector involvement; review the standards and the quality of education; develop linkages with regional and international organizations to boost forest sector; develop incentive policies that would make forestry more appealing with forestry profile raised; encourage self-employment; and pay greater attention to gender parity. What is more, governments should support technical education efforts in the field of forestry by re-establishing the intermediate diploma where such education was phased out, or establish it from scratch if not available at all in other countries; motivate students who enroll in the programme and in forest education schools as well, by granting them financial subsidies/salaries, as well as improve service conditions after graduation so that students do not have to bridge the diploma degree to the Bachelor’s degree as is the case now.

From the primary, followed by secondary level, forest education should be taught by selected specialized teachers, with real on-country examples incorporated in curriculum. Periodic revision of curricula should be made to keep pace with scientific developments, with topics on natural vegetation cover and the importance of forests incorporated sequentially across all classes. Specialists in forests and environment should take part in primary school curriculum writing committees with forest legislation reconsidered to keep track of changes and developments, as well as to protect, maintain and develop forest field practice, education and research. The Law of the Agricultural Professional Council needs to be activated for the purpose of organizing the forestry profession and ensuring that graduates are employed in public and private jobs.
Primary and secondary school responsibility

Revise school curriculum to incorporate forest and environment issues; strictly implement school policies; support teachers’ forestry and pedagogy training, with incentives given to provide quality education; develop linkages with all institutions dealing with forestry; create an environment education, while exposure of children to out-of-school forestry activities increased; promote classroom and extra-curricular activities through field visits to forests, and participating in planting and afforestation tasks; designate specific forest-related radio and television programs that highlight forests importance, the risks they are exposed to and the implications of these risks. Schools are also to hold periodic educational exhibitions in which students and teachers participate in introducing forests, trees and the environment, in cooperation with the forest authorities. Establish school tree gardens and forest clubs and tree friends in schools to promote voluntary action and committed side in this field.

Technical and Vocational Education and Training responsibility

In collaboration with stakeholders, Technical and Vocational Education and Training (TVET) should revise curriculum to include the up-to-date regional and international issues, while market needs and teacher training highlighted in new forest-related courses and pedagogy; establish and improve linkages with forest institutions and promote exchange of teachers and students with regional and international institutions; encourage regional and international organizations to be involved in forest education. TVET is also to familiarize teachers and students with the use of digital tools and develop the resources that improve forestry training; intensify training and practical applications, organize camps and exchange visits with agencies concerned with forestry in cooperation with local forest officials; hold exhibitions on an annual basis, produce films and create websites that support technical forest education.

University and college responsibility

Universities and colleges should focus on the following aspects: 1) Training student to have their skills of using modern equipment improved, in cooperation with specialized work teams in local forest departments; 2) Promoting the concept of educational forest tourism and qualifying environmental guides for this purpose; 3) Establishing digital networks and securing the necessary means and software that facilitate interaction among specialists, participants and students, so that forest education upscaled with new channels opened for joint student research, artificial intelligence programs and exchange of experiences; 4) Promoting the idea regular scientific dialogues among country forestry officers, and also among students to provide opportunities for potential joint forest projects that contribute to achieving sustainable development goals. 5) Linking students with colleges or universities and expanding the traditional concept of forest to cover the concept of city, university and college forests; 6) Encouraging scientific conferences in which senior and postgraduate students present their research and case studies and problems; 7) Highlighting the achievements of the national forest science figures, and including them in forest education courses; Encouraging scientific research in the field of forest economics and valuing non-timber forest
goods and their environmental services, to highlight the forest contributions to the countries’ gross national income, and the positive role of forests in livelihoods and food security so that decision-makers have a better understanding of forests that leads to political and financial support; 8) Strengthening and supporting the role of forest extension/counseling for a better grasping of research results, approved technologies and information flow; 9) Reviewing curricula on a regular basis in line with the current requirement and keeping pace with future changes; 10) Introducing some new materials such as ecology of mangrove cultivation, environmental disasters, entrepreneurship and alternative energies in order to prepare a new generation of foresters.

Regional and International Organizations Responsibility

Regional and international organizations should focus on the following aspects: 1) Organizing consultative meetings, with advice sought through the Arab Organization for Agricultural Development (AOAD) in collaboration/cooperation with the Food and Agriculture Organization of the United Nations (FAO). The aim of such meetings is to prepare a specialized study on the future of forests (practice, research and education) across NENA to meet the needs of societies, countries and the whole planet; 2) Adopting pilot projects in a number of countries to address deficiencies in forest education across the region; 3) Granting funds by the Syrian Ministry of Agriculture and Agrarian Reform and AOAD to science-branch high school students, i.e. funds shall not be restricted to students holding agricultural vocational high school certificate, so that science-branch students can be admitted to the Arab Technical Institute for Agriculture and Fisheries (formerly, the Arab Institute for Forests and Pastures), with the aim of expanding the circle of qualified high school certificate holders; 4) Recommending AOAD to consider bringing replacing the name of the Arab Technical Institute for Agriculture and Fisheries by its former name of Arab Institute for Forests and Pastures), upscale its academic level, increase its physical capacities, develop its curricula and educational environment, so that it becomes a higher institute capable of graduating technicians and engineers; 5) Establishing other parallel institutes to graduate technicians and professionals in forestry sector across the region; AOAD and FAO are required to lead an initiative to establish regional technical institutes to expand the circle of qualified forestry workers.
1.0 BACKGROUND

1.1. Consolidating forest education and adaptation with a changing context

Forest education is the primary means of building the knowledge, skills and shared values that underpin sustainable forest management and forest/tree contributions to the achievement of local, regional and global environmental, social and economic development goals.

Various reports indicate that countries around the world have experienced variations in student enrolment across forest education programmes and have faced challenges to the inclusion of forest-relevant topics within curricula (van Lierop, 2003; Temu and Kiwia, 2008; Rekola et al., 2017; Jegatheswaran et al., 2018).

FAO’s Global Forest Resources Assessment¹ (FRA) 2020 (FAO, 2020) contains information on forest enrolment trends in post-secondary levels between 2000 and 2015, collected across 119 countries and territories. In those countries/territories that provided information covering all education levels² and complete time-series data³ (representing approximately half of the global forest area), there has been a general increase in forestry graduates and a marked advancement towards gender parity. Although FRA 2020 warns that these trends should be treated with caution since the data are incomplete, the findings appear optimistic.

Forest education had been largely missing from the global forest policy agenda for nearly 20 years, marked by reduced efforts of FAO on the topic. Recently, however, attention on forest education has picked up due to activities of various research organizations and Non-Governmental Organisations (NGOs), and, notably, the inclusion of forest education on the agenda of the 14th session of the United Nations Forum on Forests, which was held in May 2019. This signals a growing realization that forest education can and must be part of the solution to many pressing needs such as reducing the rate of deforestation and forest degradation, protecting ecosystems, enhancing livelihoods and safeguarding human health and well-being, conserving biodiversity, and mitigating and adapting to climate change. There is greater awareness that forest education must adapt to the many challenges facing the forest sector. These challenges include:

- Changes in societal expectations related to the goods and services forests provide to communities, and in how forests are perceived, changes in employment trends, and thus the need for further training and education within the forest sector to maintain a strong cadre of skilled foresters and environmental professionals;
- Lack of interest in the forest sector, which needs to be revamped and rebranded to attract the most talented and interested students to study and manage the world’s forests and inter-dependent ecosystems;

¹ See pages 103-106.
² Aggregated numbers are underestimated at regional and global areas (most countries were only able to provide data for several education levels).
³ Trend was accurate for those who provided a complete time-series of data disaggregated by gender.
An ageing workforce in many countries, and a curriculum that is often outdated, too narrowly focused and in need of broadening to integrate key emerging topics;

There is an urgent need to reinvigorate the interest in forest education, strengthen and expand existing programmes and tap into emerging opportunities, including those offered by modern digital communication and information technologies, and new types of jobs in the growing green economy.

Without resurgence in forest education, it will be difficult to achieve sustainable forest management, to secure widespread recognition of the full value of forest goods and services, and to overcome the growing disconnection between people, nature and forests. Without robust and suitable forest education, it is unlikely that forests and trees will fulfill their potential contributions to the achievement of global development goals and targets, including the Sustainable Development Goals\(^4\), the targets of the United Nations Framework Convention on Climate Change (UNFCCC), the post-2020 Global Biodiversity Framework of the UN Convention on Biological Diversity (CBD), the UN Strategic Plan for Forests and other global goals.

SDG 4’s Target 7 specifically underlines the need for improved education on sustainable development:

\(\text{By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture’s contribution to sustainable development.}\)

1.2. A global initiative on forest education

The Global Forest Education Project, formally titled “Creation of a Global Forest Education Platform and Launch of a Joint Initiative under the Aegis of the Collaborative Partnership on Forests” was carried out between November 2019 and September 2021.\(^5\) It was generously funded by Germany’s Federal Ministry for Food and Agriculture (BMEL). The project was implemented by three lead project partners: FAO, the International Tropical Timber Organization (ITTO) and the International Union of Forest Research Organizations (IUFRO), with the collaboration of other members of the Collaborative Partnership on Forests (CPF) and of regional lead partners that carried out regional-level project activities.

The regional lead partners by region were:

- Africa: African Network for Agriculture, Agroforestry and Natural Resources Education (ANAFE);
- Asia and the Pacific: The Center for People and Forests (RECOFTC) and ITTO;
- Europe and Central Asia: University of Helsinki, Forum4Edu and IUFRO;

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\(^4\) Primarily SDG 15 (life on land), but also SDGs 1 (no poverty), 2 (zero hunger), 3 (good health and well-being), 6 (clean water and sanitation), 7 (affordable and clean energy), 11 (sustainable cities and communities) and 13 (climate action).

\(^5\) For more information on the project visit see the project website at [www.fao.org/forestry/forest-education/en/](http://www.fao.org/forestry/forest-education/en/)
• Latin America and the Caribbean: IUFRO;
• Near East and North Africa: AOAD;
• North America: University of British Columbia (UBC), Michigan Technological University and Project Learning Tree.

Within the scope of the project, forest education was defined as education related to forests, other wooded land, and trees outside forests, including natural forests, forest plantations, woodlands, agroforestry and urban forests. The project focused on formal education. Although informal, non-formal and continuing forest education and training, and indigenous and traditional forest-related knowledge (TFRK) were beyond the scope of the project, the partners consider these sources of education and knowledge to be critical to overall forest-related learning. Several questions that refer to informal and non-formal education and TFRK were included in the survey questionnaire with the expectation that they might be included in an eventual Joint CPF Initiative on Forest Education and other initiatives to strengthen forest education, training and knowledge.

The project consisted of several interrelated activities aimed at taking stock of the current status of forest education (see Figure 1 below). A global survey on forest education was carried out between 15 July and 31 October 2020. The survey results, supplemented with information from other sources, informed six regional assessment reports and a global synthesis report on forest education. Each regional report assessed the status of forest education in the region and provided a set of recommendations to strengthen it. The reports served as background material for regional consultations on forest education, which were convened in February 2021. The regional reports and findings of the regional consultations were used to prepare a global assessment of the status of forest education. In June 2021, an International Conference on Forest Education was held virtually, in which the findings of the global assessment and recommendations for action to strengthen forest education globally were discussed.

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6 See Brack (2019) for definitions of formal, non-formal and informal education.
The project carried out two pilot activities to develop online resources aimed at enhancing forest education. Under the leadership of IUFRO, the prototype of ‘Forestra®’, an enhanced online platform for consolidating and making accessible forest education resources globally, was developed. As a pilot effort to explore new approaches and technologies for training and education, ITTO developed an online course on Legal and Sustainable Supply Chains for Tropical Wood and Tropical Wood Products (LSSC).

The culmination of the project was the preparation of a global framework for action on forest education. It would form the basis for a multi-year, multi-partner initiative of the Collaborative Partnership on Forests (CPF). The proposed Joint CPF Initiative (JI) would address contemporary and emerging challenges facing forest education and its scope could encompass formal forest education, informal and continuing forest education, as well as indigenous and traditional forest-related knowledge.
2.0 INTRODUCTION

2.1 Objective and description of the regional assessment

The aim of the regional assessment was to appraise the current status of formal forest education at all educational levels, identify gaps and areas that need strengthening, provide information on key initiatives and actors working to evaluate or enhance forest education, and present recommendations of actions that could be taken to strengthen forest education in the region.

The levels of education analysed were:

- Primary education (in most countries from age 5 or 6 up to age 12 or 13);
- Secondary education (in most countries from age 12 or 13 up to age 17 or 18);
- Technical and vocational education and training (TVET); and
- Tertiary education in universities and colleges.

The regional assessment draws upon the following sources of information:

The global survey on forest education carried out from July-October 2020, scientific and grey literature, and a series of national consultative meetings held between 10-25 December 2020 and a regional consultation on forest education held virtually on 24 February 2021.

Seventy-five participants of experts and stakeholders, representing 14 countries, participated in the regional consultation for NENA region. The objectives of the consultation were to validate the findings of the regional assessment report, and to fine tune the recommendations to strengthen forest-related education in the region. The reports of all six regional consultations are available on the project website (www.fao.org/forestry/forest-education/en/).

The assessment covers education content and competencies, teaching approaches, educational resources and policy, workplace readiness and employability, digital readiness, and general developments and trends in forest education. These topics reflect the frame of reference that represents the conceptual framework for the assessment.

2.2. Frame of Reference

A frame of reference was adopted as the conceptual framework for the global forest assessment on forest education. It was also instrumental in defining the questions posed in the global survey on forest education. The frame of reference consists of four main components of forest education and their relationships (see Figure 2 below).
Needs and Demand describes objectives for education. Needs are defined as general socially desirable objectives, for instance the Sustainable Development Goals (SDGs). Demand refers to more narrowly defined (economic) requirements on how much and which kinds of skills and competencies are called for in labour markets.

Supply and Resources are inputs needed to organise and implement educational programmes. There are direct and indirect links between Needs and Demand and Supply and Resources.

Teaching and Learning are the essential and central components of education. They are mutually interacting activities, as two sides of the same coin.

Learning Outcomes (or achievements) are the competencies of students upon graduation, including their knowledge and skills, but also their attitudes and values. Competences can be subject-specific – related to forest-based knowledge and skills such as related to ecological, technological, and economical aspects of forests and forestry, and generic – related to skills such as literacy and numeracy, communication, teamwork and leadership.

2.3 Forest education in NENA

2.3.1 Overview of forests and trees across the region

The Near East and North Africa (NENA) region extends from the Atlantic coast of Mauritania and the southern shores of the Mediterranean Sea, across the northern half of Africa, and eastwards over the Arabian Peninsula. It comprises 19 countries, namely (in alphabetical order): Algeria,
Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates and Yemen.

The region is considered one of the driest regions in the world and the least gifted region with forests resources. The forest cover in the region was estimated at 42 million hectares equivalent to 3.0 percent of the region’s land area, while other wooded land (OWL) is estimated at 35.4 million hectares. Both forests and OWL represent 5.4% of the land area of the region (FAO, 2015). Some countries, such as most of the Gulf States, do not have natural forests. Tree planting in the rest of the region is very poor, in view of the demands for wood and the needs for environmental protection. Major forest industries in the region are also very limited.

Forest information in the region is scant, with most countries lack the capacity to collect and report timely and reliable data on forest resources, forest cover changes, and forest uses and users. This was confirmed by the successive Global Forest Resources Assessments (FRA) reports (see FAO, 2015). Compared to the limited extent of these resources, the losses in the region’s forests and OWL are considerably high. This hinders sound national policies, proper planning, informed decision-making and adequate reporting on the status of these resources at national level, and to regional and international processes. Limited natural resources, socio-economic, policy and institutional constraints all contribute to rural poverty in the region.

Most countries have taken up afforestation and reforestation programmes to address the environmental issues in the region. Countries with significant investment in planted forests are Algeria, Morocco, Sudan and Tunisia (Hadri and Guellouz, 2011). Most of the region’s forests are on public land, while governments assume the authority and responsibility of managing them for their multiple functions, with conservation being an important objective. Countries of the region that have forests with management plans are namely Algeria, Egypt, Mauritania, Morocco, Sudan, Syria, and Tunisia. This represents only 13 percent of the total area of the forests in those countries and only 0.4 per cent of the total forests in the region (ibid).

Trees outside forests (TOFs) are an important natural resource that contributes substantially to national biomass and carbon stocks, as well as to the livelihoods of people in the regions. In most NENA countries, TOFs are considered as an integral part of agriculture. For example, TOFs such as Argan (in Morocco) and Gum Arabic (in Sudan) are considered an essential element of Agro-silvopastoral system.

2.3.1.1. Importance of forest for society

Despite the low cover in the region, forests and OWL are a crucial component of all societies and provide a variety of goods and services at local and regional level that contribute to human well-being. In dry regions such as NENA, the important role of forests and OWL in the daily life and subsistence for a large proportion of the rural population is specifically reflected in the provision of building material, human food and animal feeds, provision of non-wood forest products and job opportunities; environmental services such as protection of soil and conservation of water; and a recreational facility and ecotourism.
Non-Wood Forest Products (NWFPs) have paramount importance in dry regions in general and in NENA in particular, as they significantly contribute to the rural household economy. In some countries like Sudan, the revenues from the exports of NWFPs are significant, exceeding by far those from wood products. At the regional level, the contribution of the forest sector to the gross domestic product (GDP) of the countries accounts for more than USD 11 billion. This reflects only part of the real contribution, since large quantities of NWFPs used by the local populations for their daily subsistence are not accounted for in the national statistics. The study did not come across authenticated findings concerning the real contribution of the non-forest products in GPD, regardless of some estimates in Sudan of their contribution that accounted for some 12 percent of the GPD.

2.3.1.2. Forest governance

Two factors have dominated the formulation of forest policies in the region (FAO 1993): First is the overall aridity of the region and the recognition of the benefits of trees on micro-climates, and the mitigation of water and wind erosion; second, is the scarcity of forest resources, due to their historical over-exploitation due to growing population pressure and severity of climatic conditions. This explains the nature of the current forestry programmes carried out in the region, which emphasises protection, afforestation, and forest reservation. The distinguishing feature which characterises the role of forestry in the region, is the marginality of forest lands for commercial wood production and yet the enormous importance of such lands for the subsistence of millions of people. In terms of legislation, there is no standardisation across the various legal frameworks in the region to regulate natural resource management. This conflict could be clearly seen in the impact of mining and agriculture on the forestry sector. In Sudan, for example, mechanized agriculture was considered the main driver of deforestation. (Series of FNC of Sudan reports, e.g., FNC Annual Report 2018).

2.3.2. Needs and demands in labour market

Employment related to the primary production of forest goods and related services, as well as the management of protected areas in the region, constitutes 295,000 FTE. Regarding public institutions, the forestry sector provides 30,499 jobs (FAO paper 1993). These employment figures only include formal or visible activities in the forestry sector. It was estimated that on average, for every reported or visible job in the formal forestry sector, an additional unreported or or two jobs exist in the informal sector. Based on this estimate, employment generated by the forestry sector constitute some 1 million jobs in NENA (FAO, 2010; Lebedys, 2004).

High levels of employment in the forestry sector are reported in Algeria, Egypt, Morocco, Tunisia, Saudi Arabia and Syria (FAO, 1993). Considering the number of jobs relative to forest area, Egypt (0.30 worker/ha), Jordan (0.08 worker/ha), Kuwait (0.33 worker/ha), and Lebanon (0.07 worker/ha) have the highest employment rates in the region. Six countries with 0.01 – 0.02 worker/ha, are Algeria, Iraq, Libya, Tunisia, United Arab Emirates and Yemen. Two countries have very low employment rates in the forestry sector namely: Morocco (0.003 worker/ha) and Sudan (0.0001
workers/ha). In some countries like Sudan the low level of employment is mainly attributed to the extended forest area compared of the number of employees. The high employment rates in the gulf countries can be associated to the need for greening, and recreation of reserves and recreational areas. The majority of NENA countries have an insufficient number of forestry personnel. A labour survey conducted by FAO in 1988 revealed that 4 580-degree holders found in the region, and that this number would need to rise to 5 900 by 1995 if established targets were to be met. Similarly, the survey found out that the number of technicians would also have to increase from 2 620 in 1988 to 3 350 in 1995, and that of vocational staff from 19 710 to 25 330.

Results of the 1988 survey was analysed by an FAO ad hoc working group in November 1989. It concluded that the current need for new breed of foresters varies from that in the past. Forests were considered only for wood production. Therefore, training was restricted silviculturists or managers of forest lands; rather it needed to focus on multi-disciplinary professionals that were able to grasp all facets of socio-economic development, especially in rural areas.

Due to the deficiencies in forestry training then, the ad hoc group recommended that full consideration should be given to the role of forestry in state development. Such a primary issue should be considered by forestry training institutions and needs to be translated by incorporating all new emerging issues in curricula, beside considering the real needs for the private sectors if training of the qualified forestry cadre for both the public and private sectors are to be ensured. These institutions are required to provide forest education with adequate scientific, biological, technical, economic and social content, while maintaining due emphasis on the management and development of forestry and related natural resources geared to the rural economy improvement.

A plethora of challenges needs to be addressed when it comes to the employability of students with forest education. Ninety-one percent of forest areas in the NENA are government-owned (Hadri and Guellouz, 2011); hence, the overall management and utilisation of forest resources is carried out by the national forest services. Unlike many European countries, the role of the private sector in forest management is marginalised. As a result, there are by far fewer job opportunities for forestry graduates compared to other fields, such as agriculture. This has forced many forestry graduates to move to other allied fields of better potential job opportunities, such as environment sciences, agriculture, horticulture, etc. The reason behind fewer jobs in forestry may also be attributed to the negligible contribution of the forestry sector to the national economy of many countries in the region, due to the smaller forest area and the harsh environmental conditions, as well as to the marginalisation of the sector compared to other development sectors in general (Hadri and Guellouz, 2011; FAO and AOAD, 2021 [upcoming]).

As previously stated, forest resources in the region are dominated by the public sector. Non-traditional jobs that require competencies in new emerging issues and create opportunities in the private sector – such as use of digital tools and new technologies - are not adequately reflected in forestry curricula. The increase in number of forestry graduates has been followed by a substantial decrease in government employment opportunities. The reasons behind these unemployability vary within the region. For example, in Sudan, there is no shortage of graduates, and the market is saturated, but the problem of economic difficulty of the country does not allow filling the available
vacancies or creating new ones by institutions. The rate of employment is negligible here compared to the number of students graduating annually. In Tunisia, on the other hand, there is an imbalance between the market needs and the number of forestry graduates. The national school of forestry did not graduate engineers for the last ten years, which created an acute shortage in the market. As a result, forest engineers are recruited at the General Directorate of Forests from disciplines other than forestry.

2.3.3. A brief history of forest education

Forest education in the NENA region started early during the colonial era by training junior forest cadre locally, whereas professional staff were trained abroad. Currently, technical and professional forest education is offered at forestry faculties and colleges housed in universities alongside other schools under different Ministries. In Sudan, Iraq, Syria and Morocco, forest education and training started in 1937, 1957, 1959, and 1968, respectively. Since forests were a public good entrusted to be managed and protected by the state, traditionally, forest education applied a science-based and technical approach, with graduates filling positions in the government sector. Today, forest education is taught at Tertiary and TVET level, with few topics found in primary and secondary level of education.

Forest management at all levels — being top (professional), middle (diploma) or supervisory (certificate) — is crucial for the successful implementation of any forestry programme. Each level must possess certain skills to successfully perform its activities (see Figure 3 below). Such a management system was working well in most NENA countries, but unfortunately it has ceased to exist in many others. TVET has been phased out in some countries. Even the available technical staff like in Sudan was upgraded for degree level, which has been adversely impacting forest management. This is added to the impacts caused by lack of technicians, who have been trained and got the skills for forest technical operations, while training-deficient professionals have been given the responsibility to carry out such activities which in turn lead to a negative impact on forest management (Hamid, 2015).
According to Temu and Kiwia (2008) forest education is in crisis. Over the last ten years, graduates from forest education and training programmes have declined by over 30% worldwide, and many forestry technical schools either have closed down or have vastly reduced enrolment. This was supported by number of studies in recent years that have drawn attention to the declining state of professional forest education, both in developing and developed countries (Nair, 2004; IFSA, 2009). Forest education has not been able to follow the same pace of the global changes and that triggered the perception that foresters are not what society needs. Temu and Kiwia (2008) argued that technical training in forestry in Africa has almost disappeared since 1999. This has created problems for the recruitment of trained forest technicians, particularly in Africa, where the problem seems to be most acute.
Technical and vocational education and training (TVET) in general has not yet enjoyed a strong status in society in many parts of the region. Low wages and a lack of opportunities for forestry technicians prevail. Until recently, any technical training involving manual work and development of practical skills was regarded as an undesirable type of education. Few foresters or professional technicians are prepared to work outside city offices or beyond the boundaries of a forest nursery or public park.

2.3.4. Governance and public policy of forest education within overall educational structures in NENA

In most NENA countries, tertiary education lies under the Ministry of Higher Education, while primary and secondary education are housed under Ministry of Education at the sub-governmental level, and centrally managed at the local or provincial level. According to the above arrangement (in Sudan and in some other NENA countries), the central government was assigned the responsibility of planning of curricula developments, teacher qualification framework and secondary school certificate examinations, with all related aspects of policy, coordination and standardization. Local government/provinces were responsible for the delivery of basic schooling. The responsibility of education is — as mentioned earlier — shared between the central and local/provincial government. The central government is responsible for the sector’s oversight, and for developing and maintaining standards, including curriculum development and resource mobilization from internal and external sources.

2.3.5. Regional and national forest education policies, regulations and strategic plans

2.3.5.1. Provincial/state level curricula and guidelines

A central on-province management of primary and secondary education is observed, while the same curriculum applied at all schools is developed by state. In tertiary education, each university currently develops its curriculum in collaboration with the stakeholders, with some guidance received from the Ministry of Higher Education. The curriculum has to be approved by the faculty board, and eventually by the Senate.

2.3.5.2. Supplementary information on forest education in NENA

A number of forest education and research concerns in NENA were outlined as follows (Hamid, 2015):

- Giving greater attention to gender parity and maintaining harmonisation with other regions;
- Applying complementarity across the region;
- Addressing shortfalls in the region’s education in two ways: 1) short-term hands-on training provided by institutes and organisations; 2) strengthening longer-term degree programmes (Masters and PhD);
• Integrating forestry degrees with wider natural resource management programmes to attract a broader audience. A degree in forestry alone was not enough to help students find employment;
• Updating much of curricula content in the region to incorporate emerging issues, including biodiversity, climate change, etc.
• Applying different approaches in curriculum development across the region.

In the study on strengthening forest education in NENA, FAO identified twelve themes, constraints, and actions to be taken. The themes are: Academic staff, curriculum development, physical resources, sectoral coordination, students, continuous education, libraries, networking system, quality assurance system, education policy, forestry recognition and research activities. The first five priorities (Academic staff, curriculum development, physical resources, sectoral coordination and students) were common throughout the four countries selected for the study in 2015.
3.0 SURVEY METHODS AND SURVEY RESPONDENTS

3.1. Survey methodology and regional data analysis and reporting

Data were collected from three target groups using different questionnaires developed by the project team, as follows:

- Forest professionals working in government organisations, business organizations (the private sector), labour unions, forest owners’ associations and environmental and other non-governmental organizations (Questionnaire 1);
- Teachers and administrators in primary schools, secondary schools, TVET institutions, and in universities and colleges (Questionnaire 2);
- Enrolled or recently graduated students of forestry and forest-related programmes in TVET schools and in universities and colleges (Questionnaire 3).

For the sake of brevity, these groups are referred to hereafter in the report as ‘professionals’, ‘teachers’ and ‘students’. The questions asked in the survey covered a range of topics including education content and competencies; teaching approaches, educational resources and policy, workplace readiness and employability (for TVET and university and college students and recent graduates), digital readiness (for secondary, TVET and university and college students), and general development and trends in TVET and university and college education. Most of the questions apply Likert scale in which multiple options were provided to choose from. Some questions were open-ended for respondents to write their feedback.

Statistical sampling and snowball sampling techniques were applied to the target groups. For the statistical sample, a subset of NENA countries was selected, with individuals, organizations and institutions in the three target groups of these countries identified and sent survey invitations. Snowball sampling was applied by sending an open invitation to take the survey through social media channels, such as Twitter. The survey was promoted through Global Forest Education hashtag (#globalforesteducation), web stories prepared by the partners (e.g. FAO’s web story upon the release of the survey on 15 July 2020 http://www.fao.org/forestry/news/97465/en/), survey announcements to project partners’ membership or contact lists, and encouraging survey respondents to forward the survey invitation to their contacts, networks and colleagues. The regional data analysis was based on the total responses received, combining both statistical and snowball survey responses. Webropol, an online survey and reporting tool, was used to dispatch the surveys and manage the data received (Webropol.com). The survey questionnaires were translated by the project team and were made available on Webropol in 14 languages.

3.2. Regional assessment overview

In NENA, 6 countries (Algeria, Egypt, Jordan, Saudi Arabia, Sudan and Syria) were selected to conduct the statistical survey. A total of 75 respondents participated in the survey as detailed in tables 1 and 2 below.
Table 1. Respondents by target group (statistical and snowball sampling) in the Near East and North Africa region

<table>
<thead>
<tr>
<th>Professionals</th>
<th>Teachers</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 stat</td>
<td>Q2</td>
<td>total</td>
</tr>
<tr>
<td>18</td>
<td>16</td>
<td>34</td>
</tr>
</tbody>
</table>

Table 2. Number of respondents for each level of education

<table>
<thead>
<tr>
<th></th>
<th>Professionals</th>
<th>Teachers</th>
<th>Students</th>
<th>Total</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>16</td>
<td>08</td>
<td>00</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>Secondary</td>
<td>12</td>
<td>10</td>
<td>00</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>TVET</td>
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<td>05</td>
<td>00</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
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<td>10</td>
<td>04</td>
<td>29</td>
<td>27</td>
</tr>
<tr>
<td>Master</td>
<td>09</td>
<td>00</td>
<td>00</td>
<td>09</td>
<td>08</td>
</tr>
<tr>
<td>Doctorate</td>
<td>03</td>
<td>03</td>
<td>01</td>
<td>04</td>
<td>04</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>55</strong></td>
<td><strong>49</strong></td>
<td><strong>05</strong></td>
<td><strong>108</strong></td>
<td></td>
</tr>
</tbody>
</table>

3.2.1. National consultative meetings

Due to low responses from the 6 selected countries, National Consultative Meetings (NCMs) were planned in Algeria, Egypt, Jordan, Saudi Arabia, Sudan and Syria to bridge the information gaps. In each country, an expert meeting facilitator was appointed based on guidelines and directives by FAO and AOAD experts. However, five countries (Algeria, Jordan, Morocco, Sudan and Syria) managed to convene the meetings that involved 109 participants representing the three categories as shown in table 3. National reports were prepared by the facilitators who presented them in the regional consultative meeting held in 24 February 2021.

Table 3. Participants of National Consultative Meetings by target group in the 5 selected countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Professionals</th>
<th>Teachers</th>
<th>Students</th>
<th>Total/country</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>07</td>
<td>07</td>
<td>01</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Jordan</td>
<td>26</td>
<td>18</td>
<td></td>
<td>44</td>
<td>40</td>
</tr>
<tr>
<td>Morocco</td>
<td>07</td>
<td>08</td>
<td>04</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Sudan</td>
<td>06</td>
<td>05</td>
<td></td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Syria</td>
<td>09</td>
<td>11</td>
<td></td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>55</strong></td>
<td><strong>49</strong></td>
<td><strong>05</strong></td>
<td><strong>109</strong></td>
<td></td>
</tr>
</tbody>
</table>
### 3.2.2. Regional consultation

Table 4. Participants in the regional consultative meetings by countries in the Near East and North Africa region

<table>
<thead>
<tr>
<th>No.</th>
<th>Country</th>
<th>Professionals</th>
<th>Teachers</th>
<th>Students</th>
<th>Total</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Algeria</td>
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<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Egypt</td>
<td>05</td>
<td>06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Jordan</td>
<td>09</td>
<td>12</td>
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<td>01</td>
<td></td>
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<tr>
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<td>Libya</td>
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<td>03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Morocco</td>
<td>02</td>
<td>03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Oman</td>
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<td>04</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>Palastine</td>
<td>01</td>
<td>01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Saudi Arabia</td>
<td>06</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Somalia</td>
<td>01</td>
<td>01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Sudan</td>
<td>15</td>
<td>10</td>
<td>04</td>
<td>29</td>
<td>39</td>
</tr>
<tr>
<td>12</td>
<td>Syria</td>
<td>01</td>
<td>01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>United Arab Emirates</td>
<td>05</td>
<td>06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Yemen</td>
<td>01</td>
<td>01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>75</td>
<td></td>
</tr>
</tbody>
</table>
4.0 SURVEY RESULTS

4.1. Primary Education

The following section is based on survey responses from 24 respondents (professionals and teachers). Students were not requested to complete responses under this education level.

4.1.1. Education content and competencies

4.1.1.1. Forest topics as individual subjects

The majority of respondents indicated the presence of related forest topics as individual subjects. Less than half of teachers (45 percent) and nearly one-third of professionals (30 percent) indicated the absence of forest-related topics as individual subjects in the primary education programme. Two-third of professionals and one-third of teachers strongly recommended the inclusion of forest-related topics as individual subjects in the primary education programme. The majority of teachers and the minority of professionals suggested the inclusion of such topics with a limited and moderate extent. Whereas 17 percent of professionals and 11 percent of teachers said forest-related topics were excluded from the primary education programme (See Figure 4).

4.1.1.2. Forest topics in other subjects

As for the inclusion of forest-related topics in other subjects, the majority of both groups (80 percent professionals and 66 percent teachers) supported the idea of including of such topics in other subjects of curricula (Figure 5).

4.1.1.3 Coverage of forest-related topics and skills in primary education

Survey result indicated inadequate or sufficient coverage of forest-related topics and skills in primary education. Figure 6 showed inadequate coverage in nearly 60 percent for the value of forests and trees to the well-being of society, up to 87 percent for the contribution of forest and trees to local people. Sufficient coverage was rated for the value of forest and trees with 40 percent as the highest rating. Figure 7 showed inadequate coverage of forest and climate change, the importance for conservation and sound management, and observing the environment of 100 percent, 86 percent and 80 percent, respectively. Forest as a recreational base was rated as the highest sufficiently covered topic with 60 percent. Figure 8 showed inadequate coverage ranging from 47 percent for respect to forest and nature, to 94 and 100 percent for cultural and social value of forests and trees, and traditional knowledge and rights of forest communities, respectively.

4.1.1.4. Forest as a teaching environment

\footnote{Figures 4 onwards can be found within the Appendix}
Both professionals and teachers identified a limited or zero use of forests as a teaching environment. Over 50 percent of professionals classified the use of forests as a teaching environment as ‘limited’, whilst 40 percent reported ‘not at all’. Two-thirds of teachers reported that forests were ‘not at all’ used as a classroom or teaching environment, with 22 percent reporting this occurring ‘to a limited extent’ (Figure 9).

**4.1.1.5. Interest in learning more about forest**

Both professionals and teachers agreed that primary education increases students’ interest in nature and natural resources. The professionals indicated 25, 17 and 37 percent for ‘to a limited extent’, ‘moderately’ and ‘very much’, respectively, while teachers indicated 37 and 49 percent for a ‘limited’ and ‘moderate’ extent. Teachers and professionals (14 percent and 25 percent, respectively) reported that primary education does not increase the students’ interest in nature and natural resources (Figure 10).

**4.1.2. Teaching approaches**

**4.1.2.1. Teaching methods**

The mostly used teaching methods reported by teachers were lectures (56 percent), and individual readings/writing assignments (56 percent), followed by group work/peer learning (33 percent). Interestingly, outdoor learning was the least favoured method of teaching (Figure 11).

**4.1.2.2. Improving learning and interest**

Teachers were asked to choose three of eight options in order to improve primary schools’ children learning and interest in forest-related topics. Project-based learning is rated highest of 77 percent, outdoor learning 55 percent and problem-based learning 55 percent (Figure 12).

**4.1.2.3. Teachers competence**

Primary school teachers were asked to rate the extent to which they felt sufficiently knowledgeable in each of the five teaching areas: Forest ecosystems and forest flora and fauna, forest’s roles in global sustainability issues (biodiversity, climate change, etc.), effective teaching approaches to guide students’ thinking and learning, digital technology in teaching, and forests and tree management. Respondents identified teachers’ capabilities to teach all five categories as ‘limited’ (12 to 33 percent), ‘moderate’ (37 to 67 percent) and ‘very much’ (11 to 37 percent). Fewer respondents (11 to 25 percent) acknowledged incapability in teaching forest and tree management and forest roles in sustainable issues (Figure 13).

**4.1.2.4. Out-of-school activities**

Forest learning through out-of-school activities
As shown in Figures 14 and 15, 56 percent of teachers indicated that students do not learn through the out-of-school activities, only 44 percent of the teachers identified that students learn about forests through the out-of-school activities as ‘limited’. Most of the teachers have positive opinion regarding the impact of out-of-school activities on students’ learning, with only 22 percent believe that they have zero benefit for students’ learning.

4.1.3. Educational Resources and Policy

4.1.3.1. Educational resources

Figure 16 demonstrates the extent of availability of four categories of resources (teachers, learning materials, educational environment and practical opportunities) in primary education. About one-third of professionals and fewer of teachers indicated unavailability of the four categories of resources. Whereas the majority of both groups indicated the availability of such resources. In general teachers were more positive with regard to the availability of the four categories of resources.

4.1.3.2. Supportive policies/strategies

Figure 17 shows the availability of policies and strategies that lead to improve forest-related education in primary schools. The majority of respondents indicated the presence of government policies/strategies, school board policy/strategy and school policy/strategy. Fewer respondent (4-6 percent) indicated non-existence of such policies/strategies.

4.2. Secondary Education

The following section is based on survey responses from 20 respondents.

4.2.1. Education content and competencies

4.2.1.1. Forest topics as individual subjects

Both professionals and teachers would like to see forest related topics as individual subjects in secondary education curricula. The results showed that three-quarters of professionals and more than two-thirds of teachers reported that forest related topics are included in the curriculum as individual subjects ‘to a limited extent’ by the two groups; approximately eight percent of professionals reported this to a ‘moderate extent’. On the other hand, one-quarter of professionals and about one-third of teachers reported the absence of forest related topics as individual subjects in the secondary curricula. As for the inclusion of such topics as individual subjects in the secondary curricula, the majority of both groups saw the importance of the inclusion of such topics as individual subjects. Fewer respondents from both groups expressed that it isunnecessity for the inclusion of such topics in the curricula (Figure 18).
4.2.1.2. Forest topics in other subjects

The respondents indicated the inclusion of such topics in other subjects in the curricula of secondary education, either to a ‘limited’ or ‘moderate’ extent. On the other hand, more than 91 percent of professionals and 88 percent of teachers reported that forest-related topics should be included (Figure 19).

4.2.1.3. Coverage of specific topics

Figures 20 – 22 show the extent to which secondary school covers each of 15 topics, according to survey respondents. For all topics except for deforestation, forest degradation, respect for forest and nature and forest conservation, which were rated ‘sufficiently covered’ with (66 percent, 55 percent, 50 percent respectively [see Figure 21]), the majority of professionals thought coverage was inadequate, ranging between 50 for forest biodiversity and 90 for forest ecology (Figure 20). The majority of teachers also indicated inadequate coverage for all topics, excluding forest biodiversity, respect for forests, forests, and nature which were rated as inadequately covered (45 percent) and sufficiently covered (55 percent) for both (Figure 22).

4.2.1.4. Teacher competence

The result showed similarity across all five areas (forest ecosystem and forest flora and fauna, forest and tree management, forest role in global issues, effective teaching methodology, and digital technology in teaching). More than 90 percent of respondents felt that teachers were sufficiently knowledgeable in all areas, with ‘not at all’ indicated for the last three areas that received low rating between 10 to 11 percent (Figure 23).

4.2.1.5. Out-of-school activities

Figure 24 showed that most respondents indicated that students were exposed to out-of-school activities. They also believe that the exposure of students to out-of-school activities do increase students’ knowledge. Only the minority of the two groups indicated that students were not exposed to out-of-school activities and no useful impact of student learning.

4.2.2. Teaching Methodology

4.2.2.1. Forests as a teaching environment

Almost half of the respondents said that forests are used as a teaching environment either ‘to a limited extent’ (50 percent of professionals and 30 percent of teachers), or ‘moderately’ (8 percent of professionals and 20 percent of teachers). Forests as a classroom or teaching environment was identified as zero positive impact by both groups (42 percent professionals and 50 percent of teachers) (Figure 25).
4.2.3. Educational resources and policy

4.2.3.1. Resource availability

The result showed varying ratings for availability of the four categories of resources for secondary education. Professionals see the availability of resources ‘to a limited extent’ ranging from 50 to 67 percent, while 33 to 50 percent identified it as ‘not at all’ available. Teachers on the other hand, see a limited availability of resources (30–50 percent), a moderate availability of resources (20–40), with very few respondents expressing resource abundance. Practical opportunity was rated as the highest available resource (Figure 26).

4.2.3.2. Supportive policies/strategies

Approximately half of the respondents of both groups (50 percent professionals and 56 percent teachers) acknowledged the availability of government policy or strategies that could improve forest education. Low percentages were given by both respondent groups to the existence of school board and school policies/strategies of 17 and 11 percent, respectively. The lack of such policies and strategies was indicated by 42 percent of professionals and the minority of teachers (Figure 27).

4.2.4. Readiness

4.2.4.1. Interest in learning more about forest

Figure 28 shows the extent to which education in secondary school increases students’ interest in pursuing further learning about forest or related subjects. Most respondents indicated that secondary school increase students’ interest in pursuing further learning about forest or related subjects. Professionals were more positive than teachers about the impact of secondary education with 42 percent indicated significant increase in students’ interest.

4.2.4.2. Motivation to enter tertiary level programme

Figure 29 shows that only one-third of teachers said that secondary school students were not motivated to enter a forest programme at technical or vocational training school, or at a college or university. 42 percent of professionals said this was even higher. Two-thirds of teachers and more than one-third of professionals said that secondary school students were slightly or moderately motivated to enter a forest programme at technical/vocational training or at a college. A minority of professionals (17 percent) said that students were very much motivated.
4.3. TVET Education

4.3.1. Education content and competencies

Based on responses from 20 respondents, figures 30 – 39 show the extent to which TVET programmes cover 41 topics, according to survey respondents. For all topics, the majority of respondents thought coverage was ‘inadequate’. This proportion ranged from 42 percent to 100 percent for professionals, and between 17 percent and 100 percent for teachers, whereas for students the range goes between 17 percent and 100 percent. Wood technology, small-scale forest enterprises (Figure 36), professional skills (Figure 38), urban forestry and wildlife management (Figure 33) were rated by more than 90 percent of professional as ‘inadequately’ covered. Topics rated by more than 90 percent of teachers were forest genetics (Figure 30), forests, trees and gender (Figure 35), entrepreneurship and small-scale enterprise (Figure 36). While students rated most of the topics as sufficiently covered (37 - 80 percent) and some topics as excessively covered (0 – 30 percent).

4.3.2. Educational resources and policy

4.3.2.1. Resource availability

The majority of professionals acknowledged the availability of the four classes of resources (teachers, learning materials, educational environment and practical opportunity) to TVET programme ‘to a limited extent’, ‘moderate’ and ‘very much’. Teachers indicated availability of teaching resources and learning materials to ‘a limited extent’ and ‘moderate’. As for educational environment and practical opportunity, teachers associated the professionals by rating these two classes ‘to a limited extent’, ‘moderate’ and ‘very much’. Unavailability of resources was indicated by teachers with low percentages (0 – 14 percent) (Figure 40).

4.3.2.2. Supportive policies/strategies

More than two-thirds of both groups of professionals and teachers (69 percent and 71 percent, respectively) said that there were government policies or strategies that lead to improved education at TEVT. School and school board policies/strategies were much less common, with only 23 to 42 percent of respondents saying they existed. No policy or strategy to improve forest-related education at TVET was indicated by teachers (Figure 41).

4.3.2.3. Forest-related activities and work experience

The result showed an increase of knowledge and appreciation of forests as a result of students’ engagement in forest-related activities outside of school. This was strongly indicated by all respondents: 87 percent of professionals, 100 percent of teachers and 91 percent of students. The engagement of students in outside-of-school activities was highly appreciated by all respondents (Figure 42).
4.3.3. Workplace readiness

4.3.3.1. Preparedness to enter workforce TVET forest programmes

Only 13 percent of professionals and 10 percent students said TVET programme did not prepare students to enter the workforce, while the rest of respondents indicated limited, moderate and very much readiness of students to enter workforce (Figure 43).

4.3.3.2. Impact of gender and ethnicity

All professional, 91 percent of students and 85 percent of teachers rated students’ gender as factor impacting graduate’s ability to find a job as ‘limited’, ‘moderate’ and ‘high’. In terms of type of the job, respondents said that gender influenced this category to a ‘limited’, ‘moderate’ and ‘high’ extent. Unlike students who believe that ethnicity was an influencing factor, both teachers and professionals far less likely thought that ethnicity affected job prospects and types as gender did (Figure 44).

4.3.3.3. Availability of affordable professional training

The majority of respondents (over 60 percent professionals, 86 percent teachers, and 60 percent students) acknowledged the availability of affordable continuing education or training to update forest professionals’ skills to a ‘moderate’ or ‘large’ extent. The greatest positive response for the availability of affordable continuing education or training was received from teachers (Figure 45).

4.3.4. Digital readiness

All respondents (professionals, teachers and students) greatly appreciated the value of supplementing digital learning tools to forest education at the TVET level; 100 percent of teachers and professionals and majority of students strongly agreed, that digital learning tools would be a valuable supplement to forest education at TVET level. High percentages (77 percent, 100 percent and 73 percent) were given for the use of digital tools at TVET level by professionals, teachers and students, respectively. The disuse of digital tools was reported by less than one-third of respondents (Figure 46).

4.3.5. General developments and trends

Half of teachers (50 percent) and less than one-third of professionals (27 percent) indicated enrolment in TVET forest programme was increasing. Only 26 percent of professionals said enrolment was decreasing (Figure 47).
4.4. University and college education

4.4.1. Bachelor level

4.4.1.1. Education contents and competencies.

4.4.1.1.1. Coverage of forest topics

Based on responses from 29 respondents, figures 48 – 55 show the extent to which respondents believed tertiary courses covered each of 33 forest-related topics at the bachelor’s level. The proportion of all topics for which a majority of each group of respondents rated coverage as ‘inadequate’ varied from 50 percent of topics for professionals and teachers to 30 percent for students. The most inadequately covered topics of percentage ranging from 50 percent to 100 percent indicated by professionals and teachers were forest genetic and wood and non-wood forest products (Figure 48); forest land restoration and forest and climate change (Figure 49); urban forestry (Figure 51); culture values of forests and trees (Figure 52); forests, trees and ethnicity (53); entrepreneurship (Figure 54) and forest policy and legislation (Figure 55). In all above figures, students indicated sufficiently covered with 100 percent for all topics.

4.4.1.1.2. Additional topics and skills to cover

According to the survey result, the respondents believed that all the 14 topics were covered either ‘inadequately’ or ‘sufficiently’, while the minorities from the three groups felt that the topics were ‘excessively’ covered. The most inadequately covered topics as indicated by professionals were: urban forestry, wildlife management, and sustainable harvesting and range management (93 percent, 93 percent, 92 percent and 85 percent, respectively). Teachers felt that sustainable harvesting, watershed and urban forests were the most inadequately covered topics with 86 percent, 83 percent and 83 percent, respectively. The majority of student group felt that all 14 topics were sufficiently covered within the range of 50 to 70 percent, while some students indicated excessive coverage of forest mapping, wildlife management, forest fire, forest conservation, silviculture, forest planning and watershed management (see figures above).

4.4.1.1.3. Forest-related outside-of-school activities

The results show that (for Q1 respondents) engagement of students in forest related activities outside of their degree programme was largely moderate (60 percent), with fewer respondents ‘indicated to a limited extent’ (13 percent). As far as the influence of engagement of students in such activities, two-thirds of professionals and one-third of teachers and all students indicated the effectiveness of the engagement to a ‘limited’, ‘moderate’ and ‘high’ extent (Figure 56).
4.4.1.2. Educational resources and policy

4.4.1.2.1 Availability of resources

Figure 57 shows the extent to which survey respondents felt that four classes of resources (teachers, learning materials, educational environment and practical opportunities) were available in forest degree programmes. The majority of each group of respondents said that each class of resources was ‘moderately’ or ‘highly’ available. Fewer professionals indicated unavailability of each of the four resources.

4.4.1.2.2. Supportive policies/strategies

The result indicated that 47 percent of teachers and 40 percent of professionals said that there were government policies/strategies that could improve forest education at the bachelor’s level. Existence of school board policies/strategies indicated by 18 percent of teachers, while the existence of school policies/strategies was indicated by 20 percent of professionals and 29 percent of teachers. No policies/strategies that could lead to improve forest education was indicated by 40 percent of professionals and the minority of teachers (Figure 58).

4.4.1.3. Readiness and employability

4.4.1.3.1. Part-time related employment and internships

The majority of professionals (92 percent) indicated part-time employment jobs were limitedly available to graduates of forest programmes at the bachelor level. All Teachers and students indicated unavailability of such jobs to graduates of forest programmes. Professionals indicated 72 percent such jobs ‘very much’ increase students learning. While all students and one-fifth of professionals said part-time employment and internships did not increase students learning (Figure 59).

4.4.1.3.2. Preparing students to enter workforce

The majority of professionals and students and all teachers said that university and college programmes did prepare students to enter the workforce. However, one-third of students and few of professionals indicated university and college programmes did prepare students to enter the workforce (Figure 60).

4.4.1.3.3. Job prospects upon graduation

Aside from a minority of professional and students, all respondents indicated availability of employment for students at a level compatible to their skills. Professionals (87 percent), teachers (70 percent) and students (33 percent) indicated the availability of such employment at a moderate extent (Figure 61).
4.4.1.3.4. Impact of gender and ethnicity on job prospects

More than one-third of teachers and students and 46 percent of professionals indicated gender was not a key factor in a graduate ability to find forestry-related jobs, while gender was considered a key factor in graduate ability to find a job by about two-thirds of teachers and students, 54 percent of professionals as ‘limited’ or ‘moderate’ or ‘very much’. Regarding gender as an influencing factor in the type of jobs graduates are considered for, one-third of the three groups of respondents said it was not at all a factor (Figure 62).

About one-third of teachers and students, and 46 percent of professionals indicated ethnicity was not a factor in a graduate ability to find forestry-related jobs. On the other hand, ethnicity as a factor in graduate ability to find a job was indicated by about two-thirds of teachers and students, 54 percent of professionals as ‘limited’, ‘moderate’ or ‘very much’. Regarding ethnicity as an influencing factor in the type of jobs graduates are considered for, one-third of the three groups of respondents said it was not at all a factor (Figure 63).

4.4.1.3.5. Availability of affordable continuous non-formal forest education

One-third of professionals and students and one-half of teachers said that affordable continuous education or training to update forest professionals’ skills was not at all available. Half of teachers and 57 percent of students said it was available ‘to a limited extent’, while professionals indicated that it was ‘moderately’ and ‘very much’ available (Figure 64).

4.4.1.4. Digital readiness

4.4.1.4.1 Using and perceiving the value of digital tools

Figures 65, 66 and 67 indicate that all students, about one-third of professionals and few teachers indicated moderate use of digital tools. More than two-thirds of teachers and 43 percent of professionals indicated digital tools were limitedly used. The minority of both teachers and professionals believe that digital tools were largely used. Disuse of digital tools was only indicated by professionals. All students and one-third of professionals and teachers said that digital learning tools can be a moderately valuable supplement to forest education, 55 percent of teachers and 47 percent of professionals said such tools can be ‘very much’ a valuable supplement. Most teachers and a minority of professionals said they are ‘to a limited extent’ valuable supplement (Figure 65). All respondents said that digital tools are currently used in forest degree programme except for management and geospatial tools which were indicated by students as ‘not under use’ (Figure 66). The result indicated that the most favourable choices with regard to digital learning tools to be used in forest degree programme among teachers were online learning platforms, study tools, communication and publication tools and geospatial tools. Student selection was online learning platform, conference meeting tools, geospatial tools and technology (Figure 67).
4.4.1.4.2. Familiarity with digital learning environment

Figure 68 shows that professionals were not familiar with Council for Learning Outside Classroom and Project Learning Tree. The Figure also shows unfamiliarity of teachers with GLF landscape academy, while familiarity of students was restricted to FAO learning academy, global forest information system and forest learning.

4.4.1.5. General development and trends in university and college level of forest education

4.4.1.5.1. Enrolment trend

Professionals indicating a decline in enrolment in forest degree programme constituted 38 percent, while 52 percent indicated increasing trend and 15 percent indicated stable trend. As for teachers, the three-quarters said that the trend had been stable, while one-quarter said it was decreasing (Figure 69).

4.4.1.5.2. Understanding forest relevance to emerging trends and SDGs

A much smaller majority (54 percent) of professionals and half of teachers said bachelor graduates had ‘to a limited extent’ sufficient understanding of the relevance of forests to emerging global trends and to the sustainable development goals. One-quarter of professional and 40 percent of teachers replied ‘moderately’. While one-fifth of professionals and few teachers said this was ‘very much true’ for bachelor graduates (Figure 70).

4.4.2. Master and Doctorate level

4.4.2.1. Education content and competencies

4.4.2.1.1. Coverage of specific topics

Based on responses from 15 respondents, figures 71-77 show the extent to which respondents said Master/PhD level programmes cover each of 29 forest-related topics at these levels. The topics for which a majority of each group of respondents rated ‘sufficiently covered’ was forest ecology (Figure 71), whereas those which were indicated by the majority of respondents as ‘limitedly covered’ were: forest genetics (Figure 71), forest and climate change, and forest landscape (Figure 72), agroforestry (Figure 73), forest, trees and gender (Figure 74), and small-scale enterprise (Figure 75). The majority of respondents tends to rate most of the topics more towards ‘sufficient coverage’. Examples of these topics were: biodiversity, forest soil and forest ecology (Figure 71), silviculture (Figure 72), wildlife management (Figure 73), cultural values (Figure 76). Topics that were rated as excessively covered with low percentages were: biodiversity, forest soil, forest ecology, wood and non-wood forest products, forest genetics (Figure 71), silviculture and forest mapping (Figure 72); watershed management and wildlife management (Figure 73); wood
technology (Figure 75). An interesting observation is that students rated topic coverage either ‘inadequate’ or ‘sufficient’ with 100 percent in each case!

4.4.2.1.2. Student engagement in out-of-school forest-related activities

Half of professional and majority of teachers and all students indicated that Master/PhD students were engaged in forest-related activities outside of their degree programme with ‘limited extent’. About one-third of professional ad one-fifth of teachers said that the engagement in such activities were moderate, while fewer of them indicated ‘disengagement’ of students in such activities (Figure 78).

4.4.2.2. Educational resources and policy

4.4.2.2.1. Availability of resources

Figure 79 shows the extent to which survey respondents said that four categories of resources (teachers, learning materials, educational environment and practical opportunity) were available in Master/PhD of forest programmes. The majority of professionals and teachers said that each category of resources was available ‘to a limited extent’. Moderate availability was also indicated by professionals and teachers for all resources with the exception of practical opportunity which was indicated by teachers as ‘unavailable’. Teachers also ranked availability of resources as ‘very much’, except for learning materials. However, students have an overall negative assessment with regard to the availability of the four categories of resources, as they rated ‘limited availability’ for teachers, educational environment and practical opportunity resources, and ‘unavailability’ for learning materials.

4.4.2.3. Workplace readiness and employability

4.4.2.3.1. Part-time forest related employment/internships

Professionals indicated availability of part-time employment and internships at Master/PhD level programme to a ‘limited’ or ‘moderate’ extent (67 and 16 percent, respectively). A minority of professionals (17 percent) indicated such jobs were ‘not at all’ available. All teachers and all students indicated moderate availability of such jobs. The survey results indicated that part-time jobs and internships increased students’ learning. Both professionals and teachers indicated that such jobs and internships increased students’ learning with a ‘limited’ or ‘moderate’ extent, while 100 percent of students indicated a ‘limited’ increase in students learning (Figure 80).

4.4.2.3.2. Availability of affordable professional training

The majority of professionals and teachers believed that continuing education at affordable costs was ‘not at all’ available at Master/PhD level programme. All students, 27 percent of teachers and 16 percent of professionals said affordably continuing education or training to update forest
professional’s skills was ‘available’ or ‘moderate’. Professionals (28 percent) said it was available to a ‘limited’ extent (Figure 81).

4.4.2.3.3. Preparing students to enter the workforce

One-fourth of professionals, the majority of teachers and all students indicated the preparedness of students to enter the workforce at ‘moderate’ extent. Twenty percent of teachers believed that students at Master/PhD level programme were ‘very much prepared’ to join the workforce, while the majority of professionals (58 percent) indicated that students were prepared to a ‘limited’ extent. A minority of professionals and teachers said students were ‘not at all’ prepared to enter the workforce (Figure 82).

4.4.2.3.4. Job prospects upon graduation

All professionals, all students and the majority of teachers indicated a ‘limited’ availability of employment for students of Master/PhD programmes upon graduation at a level compatible to their skills. Forty percent of teachers indicated ‘moderate’ availability of jobs upon graduation (Figure 83).

4.4.2.3.5. Impact of gender/ethnicity on job prospects

Figures 84 and 85 show the extent to which gender and ethnicity as factors impacting students’ abilities to find a job and the type of that job. All students, half of teachers and 42 percent of professionals indicated that gender was ‘not at all’ a factor in the ability of graduated students to secure a job. The other half of teachers was equally divided in rating gender as a ‘limited’ or ‘moderate’ factor for students to secure a job. Professionals ranked gender as a factor influencing the ability of graduates to find a job under ‘limited’ (25 percent), ‘moderate’ (17 percent) and ‘very much’ (17 percent). All students, half of teachers and 28 percent of professionals said that student gender was ‘not at all’ a factor in influencing the type of jobs considered by students. About two-thirds of professionals, and half of teachers however, ranked student gender as a factor really influencing student ability to find a job under a ‘limited’ and ‘moderate’, in addition to 17 percent of professionals said it was a factor ‘very much’ influencing the type of job considered by students.

4.4.2.4. Digital readiness

Regarding using and perceiving value of digital tools at university and college level, the majority of professionals, 40 percent of teachers and all students said that digital learning tools were limitedly used in university and college programmes. Moderate use was indicated by 40 percent of teachers and 15 percent of professionals. Very much was only indicated by 20 percent of teachers. All students and large proportions of professionals (58 percent) and teachers (60 percent) ranked it as a very much valuable supplement at university and college level (Figure 86).

Divergence was noticed in how respondents interpreted the use of ‘digital tools’, with students restricted their focus to geospatial tools. Professionals gave more weight for digital and geospatial
tools (Figure 87). Teachers leaned more towards net-based research tools, conference meeting tools, and communication and publication tools a (Figure 87).

By asking teachers and students about the most preferrable tools to use, most popular choices among teachers were internet-based, geospatial, communication and digital tools. Whereas the top choices among students were online conferencing, enhanced media and geospatial tools (Figure 88). When asked to identify forest-related digital learning environment that they were familiar with, respondents indicated that the most familiar options were Global Forest Information System (GFIS), Forest learning and FAO SFM tools box (Figure 89).

4.4.2.5. General developments and trends in forest education at university and college level

4.4.2.5.1. Enrolment trends

The proportions of professionals who said enrolment in forest degree programme had declined (50 percent) were the same as those who said enrolment had increased. Among teachers, 40 percent indicated that enrolment has been stable over the past decade. Ten percent of teachers indicated a falling trend (Figure 90).

4.4.2.5.2. Understanding forest relevance

Professionals and teachers believed that students had sufficient understanding of the relevance of forests to emerging trends and to SDGs at Master/PhD level to a ‘limited’ and ‘moderate’ extent, while one-fifth of teachers ranked it under ‘very much’ (Figure 91).
5.0 DISCUSSION

5.1. Primary and secondary level

The survey results, supplemented by the results of the national and regional consultations, revealed that forests are not sufficiently included in the curricula of primary and secondary education. Consultative meetings also clearly indicate that the programs taught in primary education have a limited focus on forests and environment, while it addresses superficial concepts in environmental issues with sometimes complete absence of forest concepts, which is a prominent weakness in primary and secondary education programs across the region. Thus, it can be said that teaching defects at these two levels are modest, and need to be revised and developed by introducing topics on the importance and values of forests, forest ecology and biodiversity, threats to forest conservation, climate change, forest management and trees. The results of the study and the consultations revealed that among the topics that should be covered more broadly are the importance and values of forests, the forest environment and biodiversity, threats to forests and forest conservation, forests and climate change, forests and forest management, forest livelihoods, products and value chains. Despite the clear advantage of using the forest as an educational environment, the results showed that the forest was used to a limited extent. This information was validated through the results of the consultative meetings as one of the weaknesses of primary and secondary school programs across NENA. Consequently, the importance of involving school children in outside-the-school forestry activities in order to increase their love for nature and to create a generation that values the importance and vitality of forests is highlighted through field trips and participating in tree planting activities, among others.

5.2. TVET level

Confirming what was reported by Temu and Kiwia (2008), Nayir (2004) and IFSA (2009), the study shows that technical and vocational education is still not accepted across the region, as it was before, with students reluctant to join it. The study and consultations revealed that in some NENA countries like Syria and Egypt, agricultural vocational high schools do exist, however forest or environment subjects are not included in their curricula. The majority of the study participants attributed the decline in technical education and the absence of its role in the region to the lack of financial and employment motivation for the graduates. What is more, the absence of the technicians' role has had an impact on technical forest management. Despite the state of technical education in the region, there are some bright models highlighted in this study such as the Arab Technical Institute for Agriculture and Fisheries (formerly the Arab Institute for Forests and Pastures) and some vocational secondary schools spread in a number NENA countries. This is evident through the coverage of most topics related to TVET programs, and the availability of the
four education resources (teachers, educational materials, educational environment and practical opportunities) needed to support forest education in technical training. It is also evident through the agreement of all respondents that government policies/strategies that lead to improved forest education do exist, such as those of Arab Institute for Agriculture and Fisheries.

Respondents highly acknowledged that knowledge and appreciation of forests have improved through the engagement of students in forest-related activities outside of school. The importance of such activities was also revealed by the participants in the national consultative meetings who indicated the need for creation of arboreta and urban forests, and emphasized the organization of field trips, among others.

Although the majority of respondents indicated the availability of affordable professional training to update forest professional skills, the highest response was mentioned by teachers.

The valuable supplement of digital tools to forest education was highly appreciated by all respondents (professionals, teachers and students). Participants of the national consultative meetings expressed the presence of digital tools in forest, e.g., satellite images for fighting fires and mechanism for preventing natural diseases, etc. However, these uses has not gone beyond the vicinity of universities and scientific laboratories. In some NENA universities, the technology used in teaching forestry is considered intermediate technology. The participants also revealed that the use of this technology increased during year 2020 after the outbreak of COVID-19 pandemic. In Morocco and some other countries across the region, access to information in general, is one of most prominent difficulties that faced by students.

5.3. University and College level

The study demonstrates a variation in forest topics coverage: out of the 19 topics, 4 topics (biodiversity, wood and non-wood forest products, the forest as a recreational environment, environmental economics, forests and natural resources) were classified as being ‘adequately covered’, while forest environment was classified as ‘excessively covered’.

According to respondents, all topics were covered to varying degrees. Some topics such as urban forestry, wildlife management, sustainable harvesting, rangeland management and watershed management have been indicated by respondents as under-covered. In general, the topics covered under the services, cultural and social issues of the higher education program were markedly covered, with three topics (wood as renewable energy, forest-based recreation, forestry and human health) being categorized as excessively covered. The same applies to forest policy and forest economics with respondents rating them as inadequate and sufficient. These results suggest that more attention should be paid to improve the tertiary forest programme.

Professionals and teachers indicated limited availability of part-time jobs or internships for tertiary students. In addition, professionals indicated the engagement of tertiary students in out-of-school forest related activities, as well as the positive impact of such activities in students’ learning
enrichment. According to NCMs, there is lack or insufficient budgets for education and scientific research that affect the job opportunities and hinder scientific research.

All respondents were generally positive about the availability of the resources needed to improve forest education at tertiary level, but marked shortages were indicated as well.

Preparedness of students to enter workforce was indicated by the majority of respondents (professionals, teachers and students), while few respondents indicated otherwise. NCMs outcome indicated a mismatch and poor integration between university educational programmes and labour market requirements and expectations, which may attribute to the level of preparedness of students to enter workforce.

According to the majority of respondents, the availability of employment for students to fill out positions compatible to their skills was acknowledged by the majority of respondents to a moderate extent, but the lowest percentage of the rating was given by students who are the more concerned about the issue of availability of employment. This low rating (moderate) by all respondents could be attributed to the fact that overall management and utilisation of forest resources is done by the national forest services in the region. The role of the private sector in forest management, unlike many European countries, is bleak under the current situation (Hadri and Guellouz, 2011). NCMs showed a disparity and poor integration between university educational programs and labor market requirements and expectations.

Despite the differences in rating gender as a factor affecting job availability and types of available job for students, the overall outcome indicated that gender was not a factor to affect job availability or job type. The same conclusion is applicable to ethnicity, where respondents said ethnicity was not a factor to influence job availability or job type.

The rating of availability of affordable professional training to update professionals’ skills as limited and moderate indicated clear shortages and gaps across the region. This goes in line with the findings of NCMs that continuous training and training abroad for faculty and research staff to enable them to keep pace with new scientific concepts and new technologies is poor. NCMs also highlighted a disparity and poor integration between university educational programs and labour market requirements and expectations.

Like what has been reported for TVET, large proportions of respondents supported that national and regional consultative meeting digital tools were also used at university and college level. But these uses have not gone beyond the university laboratories.

5.4. Formal and informal and non-formal training

NCMs’ as a supplement to survey results highlighted the importance of directing the role of forests to the groups of rural communities in order to preserve the local forest resources and guide the exploitation process of these resources in accordance with the goals of sustainable local
development. Accordingly, education in the field of forestry must be the subject of great concern for all age groups, emphasizing that today's children are the future consumers.

In areas of forests there are wood and non-wood forest product-based handicrafts, all of which contribute to securing livelihoods and the well-being of society and individuals, such as wood sawing industries, carpentry and furniture manufacturing, wooden poles and construction, bioenergy, firewood and charcoal. Among other handicrafts are also fin making, processing and manufacturing of non-wood (natural gums), nutritional and pharmaceutical products. Children, on the other hand, learn a lot about the different tree species prevalent in the area, such as their local names, uses, quality of their wood/non-wood products, uses in traditional medicine and benefits.

In forest areas, forestry is taught to young generations informally, as children learn a lot about the different tree species prevalent in the area. They also learn about their local names, uses, quality of wood, non-wood products, the uses in traditional medicine and benefits.

As for non-formal forest education, including community education for forestry counseling, a major role of non-formal forest education is to provide folks with information on the importance of environmental, economic and social functions of forests. In Algeria, a memorandum of understanding and agreement between the Ministry of Environment and Renewable Energies and the Ministry of National Education was formulated to introduce the concepts and principles of environmental and forest education and to highlight the significance of promotion of education, environmental formation, and sustainable development in school national education programmes.
6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

The aim of the regional assessment was to appraise the current status of formal forest education at all educational levels, identify gaps and areas that need strengthening, provide information on key initiatives and actors in charge of evaluating or enhancing forest education, and present recommendations of potential actions to strengthen forest education in the region.

Based on the results of the statistical survey and in light of national and regional consultations on the current state of formal forest education in NENA, prospects of forest education look bleak in terms of development, and it is a reflection of the state of the overall forest sector across the region, which suffers from marginalization, poor official interest and insufficient budget allocation.

At primary and secondary levels, educational programmes have a limited manifestation of forests and touch only on superficial concepts related to environmental issues, and in some cases, there is a complete absence of forestry concepts. As far as resources are concerned, there are shortages across the board such as shortages in forestry specialists and lack of financial resources and practical opportunities.

It should be noted that TVET level of education in the field of forestry is not among the priority options for students to join. As a result, some countries like Sudan have phased out TVET education completely, whereas in others like Egypt and Jordan TVET has not been available. This led to a shortage of technicians who are responsible for the technical management of forests, instead, professionals, who are not prepared for this type of work, were recruited with marked technical management repercussions on forests.

Despite the positive educational image for bachelor education in the region, the survey, NCMs and regional consultations results revealed insufficient coverage of forest-related topics and capacities of resources (teachers, learning materials, educational environment and practical opportunity). This indicated shortages and gaps in affordable professional training at tertiary level. The survey also showed that government policy was available, while school policy and school board policy often existed.

Availability of digital tools was well expressed and their valuable supplement to forest education was highly appreciated. The pedagogical and sound integration of digital tools promote and enhance other essential skill sets, such as communication, creativity, critical thinking, etc. The result indicated high demand for digital tools for teaching learning and practical work. Currently the technology used in teaching forestry in the region is of intermediate level. Shortages and gaps in affordable professional training at tertiary level existed. Disparity and poor integration between universities and labour market programme do exist. Employment opportunities ranged from limited to moderate.
Involvement of private sector in forest education is weak with consequences impacting all forest aspects such as: forest management, use of technology, employability and improved skills and out-of-school activities.

Despite the clear split in respondents’ opinions regarding whether students’ gender was a factor in their ability to find a job, the result in general indicated that gender was a factor. On the other hand, ethnicity was not a factor affecting graduates job opportunities.

6.2. Recommendations

The following main recommendations, which go in line with previous recommendations recorded during the study of strengthening forest education in the Near East region, presented in the overview section of this report, could be adopted to foster forest education in NENA:

- Giving greater attention to gender parity and maintaining harmonisation with other regions;
- Applying complementarity across the region;
- Addressing shortfalls in the region’s education in two ways: 1) short-term hands-on training provided by institutes and organisations, 2) strengthening longer-term degree programmes (Masters and PhD);
- Integrating forestry degrees with wider natural resource management programmes to attract a broader audience. A degree in forestry alone was not enough to help students find employment;
- Updating much of curricula content in the region to incorporate emerging issues, including biodiversity, climate change, etc.
- Applying different approaches in curriculum development across the region

6.2.1. Government responsibility

- Give clear recognition of the role of forestry in the economy of the region;
- Review forest educational policies and strategies;
- Create more jobs opportunities to fill the gaps in forestry sector;
- Increase funds for research and education;
- Encourage private sector involvement in forest fields and education;
- Review the standards and the quality of education;
- Develop linkages with regional and international organizations to boost forest sector;
- Develop incentive policies that would make forestry more appealing and raise the profile of forestry and encourage self-employment;
- Pay more attention to gender parity;
- Support technical education efforts in the field of forestry by re-establishing the intermediate diploma in the countries in which it was phased out and establishing it in the countries where it was not present. Motivate students who enroll in the programme and in forest education schools by granting them financial subsidies/salaries, as well as improving the after-graduation
conditions of service so that they do not have to bridge the diploma degree to the bachelor’s degree as is the case now;

- Start forest education from the primary and then secondary level, with the selection of specialist teachers for this purpose, with examples incorporated in the curriculum from the local environmental conditions of the countries of the region;
- Update curricula periodically to cover the scientific developments to suit the ages of the pupils in these two levels, with the introduction of topics on natural vegetation cover and the importance of forests sequentially across all classes;
- Involve specialists in the fields of forests and the environment in the primary school writing committees;
- Reconsider forest legislation to keep pace with changes and developments, as well as to protect, preserve and develop forests through practice, education and research;
- Activate the Law of the Agricultural Professional Council for the purpose of organizing the forestry profession and ensuring that graduates are absorbed in related activities in the public and private sectors.

6.2.2. Primary and secondary schools’ responsibility

- Revise school curriculum to incorporate forest and environment-related issues;
- Strictly implement school policies;
- Support teachers’ training in forestry issues and pedagogy, with incentives given to provide quality education;
- Develop linkages with all institutions dealing with forestry;
- Create an educational environment;
- Increase the exposure of children to out-of-school forestry activities;
- Activate classroom and extra-curricular activities through field visits to forests, participate in various activities such as planting and afforestation, and launch special radio and television programmes about forest importance, risks they are exposed to, and the implications of such risks;
- Hold periodic educational exhibitions in which students and teachers participate to introduce forests, trees and the environment, in cooperation with the concerned authorities. Establishment of school tree gardens and clubs of forest and tree friends in schools to devote the voluntary and committed side in this field.

6.2.3. TVET responsibility

- Revise curriculum in collaboration with stakeholders to include the up-to-date regional and international issues and align them with the market needs;
- Train teachers in new forest related matters and pedagogy;
• Establish and improve linkages with forest-related institutions;
• Promote teacher and student exchange programmes with regional and international institutions;
• Promote regional and international organizations to be involved in forest education;
• Familiarize teachers and students with digital tool utilization;
• Develop the resources that improve forestry training;
• Intensify training and practical applications, organize camps and exchange visits with forest agencies in cooperation with local forest officials;
• Organize exhibitions on an annual basis, produce films, and create websites that support technical forest education.

6.2.4. University and college-level responsibility

• Focus on the practical element and training of students to equip them with the needed skills for using modern forest-related devices in cooperation with specialized work teams in local forest departments;
• Promote the concept of educational forest tourism and train environmental guides for this purpose;
• Establish digital networks and supply with the necessary means and software to maintain interaction among specialists, participants and students to upscale forest education offers and opens new channels for joint student research, artificial intelligence programmes and exchange of experiences;
• Promote the idea of periodic scientific dialogues between the parties responsible for forestry in the country and among students and providing opportunities for the possibility of launching joint forest projects that contribute to achieving sustainable development goals for forests;
• Link students with their colleges or universities and expand the traditional concept of forest to include the concept of urban, university and college forests;
• Encourage scientific conferences in which seniors and postgraduate students participate in forest research, case studies and problem solving using modern scientific approaches;
• Highlight the achievements of the national forest science figures and include those achievements in forest education materials;
• Promote research in forest economics and value non-timber forest goods and environmental services, to highlight the contributions of forests to the countries’ gross domestic income, with their role in securing livelihoods and food security highlighted to enhance the decision-makers’ perception of forests, with due political and financial support given;
• Strengthen and support the role of forest extension agents to enable them to digest the results of research, technologies and information flow to be delivered to recipients;
• Ensure a periodical revision of curricula to align them with the current requirement and to keep pace with future changes in order to prepare a new generation of foresters. This may result in the introduction of some new materials such as the ecology of mangrove cultivation, environmental disasters, entrepreneurship and alternative energies;
• Provide teachers training.
6.2.5. Responsibility of regional and international Organizations

- Organize consultative meetings, with advice sought through the Arab Organization for Agricultural Development (AOAD) in collaboration with the Food and Agriculture Organization of the United Nations (FAO). The aim of such meetings is to prepare a specialized study on the future of forests (practice, research and education) across NENA to meet the needs of societies, countries and the whole planet;
- Adopt pilot projects in a number of countries to address deficiencies in forest education across the region;
- A study is to be implemented by AOAD on the contribution of the forest sector to national income across the region;
- Inclusion of grants provided by the Arab Organization for Agricultural Development (the Syrian Ministry of Agriculture) to students who have obtained a high school (the scientific branch) and not being limited to the agricultural professional secondary campaign for admission to the Arab Technical Institute for Agriculture and Fisheries (the Arab Institute for Forests and Pastures previously) to expand the circle of qualified holders of a certificate. The only institute specialized in forestry, environment and biodiversity;
- Grant funds by the Syrian Ministry of Agriculture and Agrarian Reform and AOAD to science-branch high school students, i.e., funds shall not be restricted to students holding agricultural vocational high school certificate, so that science-branch students can be admitted to the Arab Technical Institute for Agriculture and Fisheries (formerly, the Arab Institute for Forests and Pastures), with the aim of expanding the circle of qualified high school certificate holders;
- Recommend AOAD to consider bring replacing the name of the Arab Technical Institute for Agriculture and Fisheries by its former name of Arab Institute for Forests and Pastures), upscale its academic level, increase its physical capacities, develop its curricula and educational environment, so that it becomes a higher institute capable of graduating technicians and engineers;
- Establish other parallel institutes to graduate technicians and professionals in forestry sector across the region;
- AOAD and FAO are required to lead an initiative to establish regional technical institutes to expand the circle of qualified forestry workers.
7.0 REFERENCES


8.0 APPENDICES

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Figure 5. Inclusion of forest-related curriculum in other subjects in primary education (A3)
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Figure 7. Coverage of forest-related topics and skills in primary education (risks and threats to forests and trees) (A2.2).
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![Bar chart](chart1.png)

To what extent is primary education in your school increasing children’s interest in nature and natural resources?

- very much
- moderately
- to a limited extent
- not at all

Q2 n = 8
Q1 n = 16

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![Bar chart](chart2.png)

Select the most common teaching and learning approaches used in your school to teach forest-related concepts (check all that apply).
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Q2 n = 6
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Q1 n = 15  
Q2 n = 8

Figure 17. Policies or strategies leading to improved forest-related curriculum in primary schools (A4).

![Graph showing policies or strategies leading to improved forest-related curriculum in primary schools]

Q1 n = 14  
Q2 n = 7
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Figure 21. Coverage of forest-related topics and skills in secondary education (forests and climate change; recreational values; trad/Indig forest-related…) (A21.)
Figure 22. Coverage of forest-related topics and skills in secondary education (forest conservation; skills for observing the environment; respect for forests and nature (A21.3))

To what extent are the following topics and skills covered in your school?

<table>
<thead>
<tr>
<th>Topic</th>
<th>Q1</th>
<th>Q2</th>
</tr>
</thead>
<tbody>
<tr>
<td>forest conservation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>skills for observing the environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>respect for forests and nature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rights to forest use and products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cultural values of forests and trees</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q1 n = 9
Q2 n = 8

Figure 23. Forest education teaching knowledge and skills. (A17).

To what extent do you feel sufficiently knowledgeable about the following in order to effectively teach forest-related concepts and skills in your classroom?

<table>
<thead>
<tr>
<th>Topic</th>
<th>Q2 n = 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>forest ecosystems and forest flora and fauna</td>
<td></td>
</tr>
<tr>
<td>forest and tree management</td>
<td></td>
</tr>
<tr>
<td>forests’ roles in global sustainability issues (biodiversity, climate change, renewable energy, food security, water resources, etc.)</td>
<td></td>
</tr>
<tr>
<td>effective teaching approaches to guide students’ thinking and learning on forests and related subjects</td>
<td></td>
</tr>
<tr>
<td>digital technology in teaching.</td>
<td></td>
</tr>
</tbody>
</table>
Figure 24. Students’ exposure to forests through out-of-school activities and impact on forest knowledge and appreciation.(A19).

![Figure 24](image)

Figure 25. Forests used as a teaching environment or classroom. (A18).

![Figure 25](image)
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![Image of Figure 32]

Figure 33. Coverage of forest-related topics in TVET forest programme (forest/tree planning and management: *wildlife management*...). (A29.3)

![Image of Figure 33]
Figure 34. Coverage of forest-related topics in TVET forest programme (forest services and socio-cultural issues: wood as renewable energy; forest-based recreation…) (A30.1.)

[Diagram showing coverage of topics]

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[Diagram showing coverage of topics]
Figure 36. Coverage of forest-related topics in TVET forest programme (forest enterprise). (A31)

Figure 37. Coverage of forest-related topics in TVET forest programme (forest policy and economics) (A32)
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![Coverage of forest-related topics in TVET forest programme]

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![Coverage of forest-related topics in TVET forest programme]
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To what extent ...

are digital learning tools currently used in TVET forest programmes?

Q1  
Q2  
Q3  

Q1 n = 13  
Q2 n = 6  
Q3 n = 11

Can digital learning tools be a valuable supplement to forest education at the TVET level?

Q1  
Q2  
Q3  

Figure 47. Overall trend in student enrolment in TVET forest programmes over the past decade (2010-2020). (A36).

What has been the overall trend over the past decade in the number of students enrolled in TVET forest programmes?

Q1 n = 15  
Q2 n = 8

%  
0  
10  
20  
30  
40  
50  
60  
70  
80  
90  
100
UNIVERSITY & COLLEGE LEVEL

Bachelors

Figure 48. Coverage of forest-related topics in degree programme (forest biodiversity, forest soils, forest ecology, wood and NWFP, forest genetic resources) (BACHELORS) (A55)

Figure 49. Coverage of forest-related topics in degree programme (forest and climate change, forest mapping, forest planning, silviculture, forest landscape restoration…) (BACHELORS) (A58)
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<table>
<thead>
<tr>
<th>Topic</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneurship</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest industry, marketing and management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small-scale forest enterprise (wood and non-wood)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To what extent are/were the following topics covered in your forest degree programme? Bachelor’s

Figure 55. Coverage of forest-related topics in degree programme (Forest policy and legislation..). (A73).

<table>
<thead>
<tr>
<th>Topic</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest policy and legislation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest tenure and governance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest/natural resource/environmental economics</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To what extent are/were the following topics covered in your forest degree programme? Bachelor’s
Figure 56. Student engagement in forest-related out-of-school activities (BACHELORS). (A41)

![Bar chart showing student engagement in forest-related activities outside of school.]

Q1: [Percentage distribution]
Q2: [Percentage distribution]
Q3: [Percentage distribution]

Figure 57. Availability of resources in forest degree programme (BACHELORS). (A37)

![Bar chart showing availability of resources in the forest degree programme.]

Teachers (quality and quantity of educators)
Learning materials (e.g., textbooks, online learning materials, tools or applications)
Educational environment (e.g., laboratory access, class sizes)
Practical opportunities (e.g., experiential learning, practical training, field visits)
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![Graph showing workforce readiness](image)

Figure 61. Job prospects upon graduation (BACHELORS) (A78.2)

![Graph showing job prospects](image)
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Figure 73. Coverage of forest-related topics in degree programme (range management...). (A62).

Figure 74. Coverage of forest-related topics in degree programme (Forests and human health; forests, trees and gender issues; and forests, trees and ethnicity issues). (A69).
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Figure 85. Race or ethnicity as a factor and influence in forest-related employment. Masters & DOCTORS. (A85).

<table>
<thead>
<tr>
<th>Question</th>
<th>To what extent is ..</th>
<th>Master's + Doctor's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is race/ethnicity a factor in a graduate’s ability to find a forest-related job upon graduation?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1</td>
<td>not at all</td>
<td>20%</td>
</tr>
<tr>
<td>Q2</td>
<td>to a limited extent</td>
<td>40%</td>
</tr>
<tr>
<td>Q3</td>
<td>moderately</td>
<td>60%</td>
</tr>
<tr>
<td>Q4</td>
<td>very much</td>
<td>80%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>To what extent is ..</th>
<th>Master's + Doctor's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does race/ethnicity influence the kinds of jobs graduates are considered for?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1</td>
<td>not at all</td>
<td>20%</td>
</tr>
<tr>
<td>Q2</td>
<td>to a limited extent</td>
<td>40%</td>
</tr>
<tr>
<td>Q3</td>
<td>moderately</td>
<td>60%</td>
</tr>
<tr>
<td>Q4</td>
<td>very much</td>
<td>80%</td>
</tr>
</tbody>
</table>

Figure 86. Use of digital learning tools at University and college level Master’s & DOCTORS (A45).

<table>
<thead>
<tr>
<th>Question</th>
<th>To what extent is ..</th>
<th>Master's + Doctor's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are digital learning tools currently used at the university and college level?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1</td>
<td>not at all</td>
<td>20%</td>
</tr>
<tr>
<td>Q2</td>
<td>to a limited extent</td>
<td>40%</td>
</tr>
<tr>
<td>Q3</td>
<td>moderately</td>
<td>60%</td>
</tr>
<tr>
<td>Q4</td>
<td>very much</td>
<td>80%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>To what extent is ..</th>
<th>Master's + Doctor's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can digital learning tools be a valuable supplement at university and college level?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1</td>
<td>not at all</td>
<td>20%</td>
</tr>
<tr>
<td>Q2</td>
<td>to a limited extent</td>
<td>40%</td>
</tr>
<tr>
<td>Q3</td>
<td>moderately</td>
<td>60%</td>
</tr>
<tr>
<td>Q4</td>
<td>very much</td>
<td>80%</td>
</tr>
</tbody>
</table>
Figure 87. Use of digital learning tools in degree programme. Master’s & DOCTORS. (A48).

Figure 88. Desired digital learning tools for use in degree programme. Master’s & DOCTORS. (A51).
Figure 89. Familiarity with digital learning environments. Master’s & DOCTORS. (A53).

Figure 90. Figure A91. Overall trend in student enrolment in forest-related programme (ten-year period). Masters & DOCTORS. (A91).
Figure 91. Graduate understanding of forests’ relevance to emerging trends and SDGs, Masters & DOCTORS. (A94).
8.2. **AOAD National Consultative Meetings (Algeria, Jordan, Morocco, Sudan and Syria\(^8\)) (2020)**

**Summary of National Consultative Meetings**

Curriculum, Resources and Development

Education in the Near East and North Africa region consists of primary and secondary education, as well as higher education, which includes technical and university educational levels.

In primary education: the taught programs have a limited view of forests and the environment and touch on superficial concepts in environmental issues and even a complete absence of forest concepts, which is a prominent weakness in this educational level.

Secondary education: Precise scientific concepts expand across subjects. But even subjects related to forestry (natural sciences in particular) do not contain any educational or applied curricula in the field of forest sciences. Thus, forest-related education in the primary and secondary levels is modest and needs to be revisited and developed, with an urgent need to introduce titles and sequential forests and the environment topics throughout the classes of this level.

It should be noted that technical education in forestry is not highly respected by society across the region, which led students to refrain from joining it. In Sudan there is no technical forest education, which created a gap in technical management of forests. In Syria, there is at least an agricultural vocational secondary school in every region across the Syrian Arab Republic. However, the only two courses that cover forests and the environment are ornamental plants, forestry and natural resources. The sole institute specialized in graduating forest technicians with distinguished experiences is The Arab Technical Institute for Agriculture and Fisheries, formerly the Arab Institute for Forests and Pastures. Affiliated with AOAD, it is considered the most important forest education institute in the Near East with students graduating with two majors: forests, environment and biodiversity.

As for university education, forestry sciences are taught in different levels: Diploma, bachelor's, master's and doctoral degrees. Before establishing higher scientific institutions, students were sent to Europe, America, and some Asian countries to be awarded various degrees in forest sciences. Since its independence, Algeria has prioritized training in forestry. After the Technical Institute of Agriculture had been established, Applied Forestry Engineering was included. A university education or training in forestry is highly acceptable in Algeria, as specializations related to forests, environment, and biodiversity in particular are featured in many university programs. The study of forests differs from one country to another across the region. In Sudan, school years vary from two to five. Whereas in Syria, forestry science education extends for two years (fourth and fifth).

Gaps in primary, secondary and higher education

- Concepts of forestry are not expansively addressed in curricula, especially in successive grades of the second cycle (preparatory);

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\(^8\) Where reports for the National Consultation Meetings were received.
• There is a shortage of specialized staff who are limited to graduates of Faculties of Education;
• Lack of financial resources to implement events, activities and field trips that consecrate the love of nature and create a generation aware of the importance and role of forests in life on Earth;
• Lack of modern laboratories, devices, and technologies that keep pace with modern technological advances, with shortage in students training in the field of forest sciences;
• Lack of effective participation by students in afforestation and tree planting;
• Poor focus on forestry in a sequential manner throughout secondary education;
• Lack of school gardens that help familiarize students with tree species;
• Lack of linking theoretical with practical and applied knowledge;
• Lack of crucial material resources for field/applied activities to promote the contents of theoretical sciences (lectures);
• The labor market does not encourage young people due to the lack of demand for this sector, which requires great effort and knowledge in return for modest wages;
• Lack of programme that guarantees the continuous qualification of specialists in forestry in order to raise their capabilities and keep them abreast of developments in the forestry process through courses and regular internal and external dispatches.

Traditional/local and non-traditional forest education

The significance of forests’ role to rural communities has been highlighted to increase their capacities to preserve the local forest wealth and align forest exploitation with sustainable development goals. Accordingly, forest education must concern all age groups, taking into consideration the fact that today’s children are the future consumers. Thus, effective and purposeful forest education has to be implanted in children’s minds. In areas of forests, informal forestry is taught to the young generations, as children learn a lot about the different tree species prevalent in the area, such as local tree names, uses, the quality of wood, their non-wood products the uses in traditional medicine and benefits. As for non-formal forest education, including community education for forestry counseling, a major role of non-formal forest education is to provide folks with information on the importance of environmental, economic and social functions of forests. In Algeria, a memorandum of understanding and agreement between the Ministry of Environment and Renewable Energies and the Ministry of National Education was formulated in 2002 to introduce the concepts and principles of environmental and forest education and to highlight the significance of promotion of education, environmental formation, and sustainable development in school national education programmes. The final agreement signed on 29 March 2019 gave a ray of hope for a greater inclusion of forest education in curricula for future teachers’ programmes and workshops. According to the report, some 800 national societies active in the fields of environment and forests were counted. In Morocco, traditional local education is available on two levels, the first relates to technical education and the second to higher education. The links between forest formation, primary and secondary education can only be observed within the framework of educational activities related to life and land sciences offered in primary, middle and secondary schools.

Production and processing of wood and non-wood products

Production and processing of wood and non-wood products is one of the most important fields of forest use. In the local communities of NENA, agricultural equipment and equipment for personal use are made from forest wood. In Algeria, women and children collect non-wood products for domestic consumption and trade, such as fruits of Ziziphus, Balanites and Adansonia wood
products which are highly valued by the public and private sectors, although the use of forest wood is not included in the development programmes. This is due to a national policy which aims at protecting forests from wood investments lest that this wealth might disappear one day if left open for exploitation. A consensus between investors and forest-dwellers has been reached regarding current concepts, especially those related to non-wood products after verifying the value of the forest-associated products that gave a real added value that exceeds the financial value of wood. Forests are also rich in many profitable resources, of which are various types of mushrooms, aromatic plants, natural seeds that can be sold, plant varieties suitable for consumption, fibers for traditional industries, flowers producing natural colors, not to mention the large gains that can be obtained upon preparing and opening some of the picturesque forests for ecological tourism, while preserving the environmental balance in income-generating activities for the benefit of the local population.

**Employment and skills**

A seasonal (temporary) employment of workers from villages adjacent to forests is available each season. Examples of such work could be manifested in the cultivation of forest seed/seedlings, thinning and logging after completion of forest cycle. In Sudan, employment of degree-holding qualified staff has long been suspended due to economic policies, which resulted in a large number of graduates being unemployed. This made forest education, as well as studying other agricultural sciences, not very appealing to students due to the lack of employment opportunities.

**Supply and demand for forestry multisectoral employment**

Forests are a source of employment and income catalyzing economic activity by creating job opportunities in various sectors that can positively affect the resources of the national economy. Information about supply and demand varies from one country to another across the region. In Morocco for example, since only two forest training institutions (ITREF and ENFI) exist, demand by far exceeds supply, with a difference of 30% for engineers and 54% for technicians. This led to the employment of non-forest graduates in forestry jobs. Whereas in Sudan the supply of qualified staff is much more than the demand in the forest sector and forest-related sectors, such as wildlife and various environmental fields, because there are ten forest colleges, while graduates are not employed through annual contracts due to economic difficulties across the country. Between 1994 and 2018, 888 students graduated from the College of Forestry, University of Khartoum, of whom 502 were females and 386 were males (Academic Office - College of Forestry, University of Khartoum).

**Technology and digitization in forest education**

Forest education programs are rich in modern training that goes in line with global digital educational curricula, such as the use of satellite images to fight fires and prevent natural disasters in accordance with accurate technological extracts, which are currently being implemented in university educational programs and in some forest departments specialized in follow-up and planning of prevention mechanisms and rapid intervention in urgent cases. In many countries, the application of this qualitative technological leap has not gone beyond the vicinity of universities and scientific laboratories to become among the resources of effective development plans, since digital technology is almost completely absent in investment despite the significant number of
current programs in forest education and forest resources. The technology used in teaching forests
is intermediate, whereas modern and advanced technology is applied in some forest sciences (as in
remote sensing). Modern applications to communicate between students and their professors are
sometimes used, with increasing trend during 2020 after the outbreak of the Covid-19 pandemic.

In Morocco, access to information in general is one of the most blatant difficulties students face.
No preset programmes or organized structure exist to ensure regular access to international
scientific documents, especially those published in paid journals. Apart from the data related to the
human milieu (demography, social economy) produced by the High Commission for Planning
(HCP), access to data related to the natural environment (climate, soil, vegetation cover,
agriculture, satellite imagery, etc.) is almost not possible. There is an urgent need for a
comprehensive information system that collects national data for easy access. Digitization of all
the knowledge that ENFI has accumulated over fifty years of teaching and research has been among
the most needed proposals.

**Broader Policy and Legislation**

*Interaction between science, legislation and forest education policy*

The first policy for the forest sector in Sudan goes back to the colonial era. It kept developing until
it reached its current form of the year 2002. When forest legislation was established, forest
counseling remained the focus and one of the forest educational methods applied in the extension
workshops held in villages and rural areas to raise the awareness of the locals on the importance of
the forest sector and their own role in preserving it. An important addition to forest legislation is to
give local communities a role in establishing and managing forests (grassroots forests). Authorities
train citizens on how to manage, care for and harvest wood and non-wood products. In some
educational institutions, curricula are modified according to political and legislative changes. In
Algeria, the principles and policies of legislation are based on comprehensive organizational
foundations built through multi-level consultations and discussions stemming from the necessity
of legislation to take decisions and include specialized education mechanisms in vital areas.
Accordingly, the previous legislation was implemented through legislative executive decrees
requiring the establishment of national schools of forest sciences, such as the executive decree to
establish the National School of Forestry, which does not work under the Ministry of Higher
Education, but it is affiliated with the Ministry of Agriculture. NSF is not allowed to issue university
specialization certificates, with its certificates only restricted to professional competency. All
higher education schools that are under ministerial tutelage have been established and legislated by
ministerial decisions entrusted with executive decrees that generally define the goals and
mechanisms for the management of these groups and higher schools, which sometimes contain
specializations in forest sciences (such as the National School of Agricultural Sciences in Algeria
and the New National School of Forestry in Khenchela). Since school curricula stem from the
forestry strategies in Morocco, there is a good connection between forest management and the
institutions of forests. In this framework, the Forest Training Coordination Council convenes every
4 years in order to study the compatibility of training with the needs of the management in terms
of technical, administrative and legal matters.
Promote a multi-landscape or mixed landscape approach

Some forestry faculties and departments in universities began to introduce curricula concerned with sustainable natural resources management, in addition to technical management of forests. Approaches to sustainable natural resource management deal with an integrated landscape ecosystem that includes forests, rangelands, wildlife, farms and orchards. In addition to the communities that affect and are affected by these resources, forest by itself is not seen as an independent entity. In terms of legislation, the National Forest Authority needs to issue legislation that allows dealing with the various components of the ecosystem as a single entity, and works in coordination with other components on forest management without negatively affecting other components of the ecosystem. In Algeria, systematic scientific planning is currently calling for advanced new approaches that aim to broaden the understanding and education perspective through comprehensive interdisciplinary studies, and even go beyond them to interdisciplinary studies of the effectiveness of this approach in highlighting and defining ways to develop and protect forests that cannot be attributed to, or covered by, a single methodology or a single discipline. It does not highlight any interactions or overlaps between the scientific, economic and social forest-related domains and does not guarantee any effectiveness of directive and educational interventions if it stems from an individual field or specialty.

Most of the supervisors are now aware of the importance of a comprehensive expansion of forestry training and education due to the aforementioned advantages, but some weak points have been observed in many university forestry programs. Professors, trainers, and supervisors generally descend from the same research disciplines, which imparts a kind of highly specialized or single-vision education. This does not benefit the formation of a desirable and required multi-skilled workforce by the investing economic institutions and operating agencies. Such individual and in-depth specialization in limited forestry areas is not beneficial neither to graduates nor to employment. Significant weakness has also been observed in some qualifications, especially field competence, because higher training in forestry has become broadly based on lessons and lectures within classrooms, which makes the graduates scientific outcomes almost devoid of applied experiences on the ground.

In Morocco, a specialization in protected areas management was created in 2004, with an aim to preserve the rich and private ecosystems, in which the study of landscapes and mixed landscapes is a major focus. However, mountain, protected and unprotected areas landscape course remains highly significant both theoretically and practically. Magazines are also valued in environmental training and raising awareness of citizens in general and tourists in particular (mountain tourism). What is more, training programs on biological diversity, ecological cartography, joint management of natural resources, the concept of the biosphere and management of protected areas are not less significant, with some 10 engineers have been trained in this domain.

Public education, advocacy and awareness

Several public education, advocacy and awareness activities have been made across NENA. In Sudan for example, there are activities and radio and television programmes that work in public education, advocacy and awareness, such as programmes on disseminating the culture of tree conservation and protection, the benefit from tree non-wood products such as shade and fruits, not to mention the environmental role of trees. Tree Festival is one of the important annual activities
that the National Forests Authority is keen on. On the other hand, Sudanese associations play a key role in maximizing the benefit of trees through various programmes, such as the Student Tree. In this programme, each student is given a tree that carries his/her name with the necessary guidance to breed. Radio and television also provide educational forestry programmes for children, in that they introduce them to the most important tree species in Sudan, highlighting their economic/environmental importance. Many songs are frequently broadcasted on radio and television that glorify the tree, and indicate that logging leads to desertification, and so on.

In Algeria, audiovisual media is used to spread forest education and culture through audience-appealing educational programmes, such as presenting reports and photo about the various forest areas in the country, giving different information to get to know them more, attracting visitors, and carrying out publicity and awareness campaigns for forest and animal wealth preservation. Entertainment programs and competitions in which audience can participate, answer questions, and win trips to some natural areas are also organized. It is possible to conduct training courses and special training for journalists interested in environment and forestry at the forestry services in order to get firsthand information and know how to communicate it to the public.

In Morocco, we find that this axis of training remains underdeveloped at the level of training institutions despite its importance and the recommendations that have been emphasized. However, in this context there are some workshops that students and professors conduct within the framework of forestry. A class on communication is also found within training.

**Rename Forest Education**

The participants in the symposium in Sudan believe that there will be general education courses that contain fundamentals in forest education such as the climatic regions in Sudan, the characteristics of those regions, the types of trees and forest shrubs prevalent in each region, and their economic, social and environmental importance. In post-general education stages, there may be schools for forest education (technical education or vocational training) such as School of Forest education or Institute of Forest Technicians. Specialized institutes can be established to educate forest technicians that qualify students in specific fields such as forest nursery technician or sawing and production technician, among others. By this, specialist technicians have no opportunity to continue for obtaining a bachelor’s degree. Students who are selected for education in forest education schools or specialized institutes for the education of forest technicians may be granted financial subsidies/salaries that are an incentive for them to enroll in this type of education, with guarantees that they will be employed at the National Forest Authority or other similar authorities after graduation, while a job description and career progression kept separate from currently available one for forestry professionals.

As for university education, there is no need to change the names, perhaps, if necessary to graduate professionals specializing in various fields, as is the case in the College of Forestry at the University of Khartoum. In the Morocco, forest training was traditional from inception in 1960s until 2004, where the forest was seen as a mere field of production. In 2004, after the Coordination Council meeting, there were calls for opening training to broad aspects of natural resources, water, soil and vegetation cover. Later, new names were introduced to the forest formation, including: economics of natural and environmental resources, valuation of wood and non-wood forest products, ecology and natural resources management and protected areas management.
Educating the next generation of forest researchers

Algeria: All efforts should be directed to educate present and future generations on the importance of forestry. The major challenge is the ability to train generations to be competent in the field, so that they are aware of the problems of the moment and provide innovative solutions. Most of the participants in the forum focused on the importance of this area. Discussions revealed a great weakness in educating the current generation whose interests are generally focused on other areas. This necessitates carrying out serious work in this context, while specialists have unanimously agreed to activate forest education through some proposed solutions at the end of this report.

Student admission

Admission policies and forest education guidelines

In Morocco, at the technical education level, students are admitted to the baccalaureate from secondary education through a competitive examination based on selection criteria associated with specific working conditions in the woods: Physical aptitude, moral qualities and intellectual abilities. The duration of the study is two years. The first 12 female technicians joined ITREF in 2015 and graduated in 2017. Today, females make up some 50% of the cohort.

At the higher education level, students are admitted to ENFI, by selection, from candidates who have passed the first course at IAV Hassan II (2/3) and ENAM (1/3). Admitted foreign students have been already proposed by the Moroccan Agency for International Cooperation (AMCI), as they generally have a Diploma in General University Studies (DEUG), baccalaureate + 2 years.

In Sudan there are no special policies and guidelines for admission in the field of forestry. Students of forest education, like those majoring in natural resources, needs to be enrolled in a scientific course, such as a major in biology in the last year of high school. This specialization is chosen by Sudanese degree students in their last year of high school, where they attend for compulsory courses. This group of courses qualifies those who choose to compete for many colleges, including the colleges of health and medical sciences (such as human medicine, pharmacy, dentistry, medical laboratory sciences, nursing sciences, public health, environmental health and veterinary medicine), and natural resource colleges (such as agriculture, animal production and forestry), in addition to educational sciences. Due to the state's lack of interest in natural resource majors, and the desire of degree students to go for medical and health sciences, we find out that students refrain from applying for forest education or agriculture, preferring to study what appeals to them in non-governmental higher education institutions, despite the high costs associated with studying in these institutions. Currently, there are no incentive policies that promote students to apply for forest education, since graduates of a bachelor's degree in forestry have not been employed for a long time, and their opportunities for serving outside the field of specialization are narrow, with very limited opportunities for self-employment.

In order to ignite the desire for students of the Sudanese Certificate of Forestry Studies, it is necessary to develop incentive policies for forest education graduates, with job opportunities for graduates secured and curricula amended to allow training in establishing self-employment projects.
Summary of the main challenges

An overall weakness in forest education programs and curricula has been observed, especially in the middle and secondary levels causing erosion to previous educational gains. Of such week points are complete absence of educational activities and field trips to enrich environmental and forest education, lack of systematic supervision by forestry professors and teachers, lack of definition or ability to define the benefits and importance of forests in investment and sustainable development. Inconsistency and integration between university educational programs and higher degrees regarding the requirements and employment-related expectations is demonstrated as one of the most significant weaknesses that were pointed out during the consultations. Among other weak points are the incompatibility between scientific research and the requirements of forestry institutions, particularly those that invest and complain about the lack of actual technical solutions issued by forestry research that are not aligned with desired research needs of investors; the confinement of education and university and professional training in forestry sciences to very specialized concepts at universities, institutes, and higher schools without directing the formative content to meet the requirements of the employment sector and the investing institutions. What is more, many programs are not updated and contain some outdated old curricula, since programs are only introduced with few individual initiatives by some professors and supervisors. Training is largely theoretical and contains little applied studies and field outputs; failure to integrate the competencies of the economic sector in the field of forest education, that is, to involve them in preparing, updating, and providing training programs and targeted technical lectures. Lack of coordination between the structures and departments of education, training, research and economic dealers is also among the weak point, in addition to the lack of coordination between vocational training and higher education in forestry, taking into consideration that mutual sectoral support may improve supervision and boost both education and professions. The dual education system, which is governed, from the administrative point of view by a single institution, and from the pedagogical point of view by another institution, weakens current and future training abroad and at home for faculty and research members for them to keep pace with new scientific concepts and new technologies. Deficiency in budget for scientific research has also been observed. In addition, programs/organized structures to ensure regular access to international scientific documents, especially those published in paid journals, have not been established. Finally, periodic review of curricula is missing.

Summary of planned solutions, interventions and associated actors

1. Valuing the benefits and gains brought by forests to sustainable development and financial resources;
2. Inclusion of forest sciences effectively in education programs, especially those of the intermediate and secondary stages;
3. Training teachers of forest education by local trainers, with simplified and documented curricula prepared for the benefit of supervising professors to raise their awareness on the importance of the field;
4. Taking new educational measures that harness special training for teachers living in the vicinity of forests to effectively prepare them for forest protection and management;
5. Reviewing curricula in cooperation with all interested parties and beneficiaries of forests;
6. Improving the levels of staff and trainers in forest sciences through training courses adapted to new developments and quality requirements in training;
7. Organizing and expanding awareness days throughout the year, without being confined to reviving national and international days to highlight the role and importance of forests through national and international conferences, seminars;
8. Involving forestry professions specialized to non-wood products in university education programs, especially university degrees;
9. Establishing a consensus on correct uses of terms and dictionaries related to forest concepts to enrich the linguistic diversity of forest education, as well as on professional forest training and university training;
10. Allocating permanent places or centers for awareness;
11. Activating the role of associations in the field of forests, and re-establishing green clubs in the primary and secondary education stages.
12. Activating the attractiveness of forest professions among the constituent groups to ensure their actual and voluntary integration into forestry professions to fill the void registered in the labor market, where the shortage of qualified workers in forestry professions has been identified;
13. Prioritizing these forestry professions for the benefit of people in rural and mountain forest areas to improve professional skills and open employment opportunities in areas close to forests for local talents;
14. Reviving forestry professions and crafts that are in constant decline today since the young generation is no more interested in them;
15. Revitalizing some forestry trades and professions which have become very few, if not rare in light of the increasing demand for competing products by markets and through investment projects of some institutions aspiring large future investments;
16. Promoting environment sections for groups of school children;
17. Reformulating scientific research programs as required due to investors' concerns to achieve an effective compatibility between scientific research and economic development, which would benefit the national economy and protect forest resources;
18. Working on institutional reform to develop a lasting partnership with regional forest institutions to sponsor students and facilitate the integration of recent graduates;
19. Strengthening the partnership with similar institutions at the regional and international levels: double diploma, exchange of professors, regular students and postgraduate;
20. Starting forest education at the primary school, while focusing on selecting specialized trainers for this purpose, with real examples incorporated in curriculum;
21. Detecting association between the moral values of society and the environmental and natural concepts;
22. Involving specialists in forest education in book writing committees for all grades, while ensuring concepts and vocabulary are included in a sequential and logical manner within the relevant courses.
Conclusions

Syria

The workshop focused on the most important points related to the current situation and the gaps. It also focused on the procedures and basic needs required to achieve the basic objective of strengthening all efforts toward overcoming deficiencies and developing forest education, skills, capacities and procedures that result in preserving forests and achieving the most important goal — the sustainable management of forests in the Syrian Arab Republic. The main conclusions of the workshop are:

I- The main challenges facing forest education in Syria are summarized as follows:
   1- The continuation of the current crisis in Syria and its reflection on all aspects related to the different stages of education;
   2- The insufficiency of resources necessary to develop educational systems, and equipment and tools needed to improve the systems’ performance, thus the level and competence of graduates, especially with regard to forest education.
   3- Forest fire caused severe damage in the summer of 2020. This has deprived concerned students of the sites required for training and rehabilitation for many years to come, and hindered harvesting the desired benefits of these forests, which need great potential for rehabilitation. To address these challenges, assistance and support should be provided to the Syrian Arab Republic by international organizations and friendly countries.

II- Non-formal continuing education is necessary to complete the role of formal forest education, although its role in Syria is still very limited and below the required level.

III- Education at the national level in Syria has been improving through personal initiatives of volunteers and the governmental encouraging role despite many difficulties. Teachers’ enthusiasm and constant desire to develop curricula and methods of education also has a role in this improvement. The current initiatives focus on changing plans and encouraging postgraduate studies to qualify specialized staff capable of teaching students at different educational levels.

IV- Forest education needs to be redefined to align with the overall expectations of forest management and the proposals for required actions addressed in the Summary of Solutions and Required Interventions section.

Sudan

I. Clear weakness is observed in forest education, and this calls for the inclusion of forest education courses across the various stages of public education, taking into account the size of the doses to suit the age groups of students and their digesting capacities (in kindergartens, for example, love for trees is to be developed in children who are familiarized with their benefits. In the primary stage, introducing climatic zones and the most important trees these zones. In the secondary stage, introducing global environmental activities and their international agreements;

9 Where reports from the National Consultation Meetings were received.
II. Lack of forestry technical education is detected. Technical education was canceled due to the lack of enrolling students who prefer academic education under which they are granted a bachelor's degree, which allows continuing to postgraduate programs (Master/PhD);

III. Poor keeping up of some departments/colleges with the developments of forest sciences. Some departments have been established for more than two decades without the curricula being reviewed or modified;

IV. Poor laboratories for basic sciences, with the absence of tree gardens, museums, and lawns have been observed. Moreover, nurseries, forests, and university workshops to train students are lacking;

V. Poor funding of the private sector for scientific forestry research;

VI. Closer attention should be paid to risks associated with the shortage of engineers in the forestry sector;

VII. Attention should also be given to regulatory text reform, curriculum modification, educational reform, budget revision, human resource development and staff recruitment and training program.

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Solutions and interventions</th>
<th>Associated actors</th>
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<tr>
<td>The absence of courses concerned with forest education in all stages of public education.</td>
<td>Introduction of courses concerned with forest education in all stages of public education in proportion to the age groups of each stage.</td>
<td>The Ministry of Education in cooperation with the National Forest Authority and academics specializing in forestry.</td>
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<td>The lack of vocational schools to teach forestry (vocational training) to benefit from educational losses.</td>
<td>Establish vocational training schools for forest education to accommodate students who have failed to enroll in universities after the Sudanese certificate exams.</td>
<td>Ministries of Education at the national and state levels in cooperation with the National Forest Authority, the Ministry of Labor and Human Resources Development and specialized academics in forestry.</td>
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<tr>
<td>Lack of intermediate technical cadres (intermediate diploma)</td>
<td>Designing specialized intermediate diploma programs in various fields of forest education, such as nursery technology, saw maintenance, and others</td>
<td>Faculties of Technical Education of the Ministry of Higher Education and Scientific Research in cooperation with the</td>
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<tr>
<td>Problem Description</td>
<td>Proposed Solution</td>
<td>Sponsoring Authority</td>
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<td>The lack of commitment of some forest colleges and departments to the regular updating of their curricula.</td>
<td>Paying attention to the regular review of the curricula in forest colleges and departments every 5 years to strengthen some courses and incorporate updates.</td>
<td>Teaching staff in colleges and departments in consultation with stakeholders (i.e. those with whom the graduate is likely to affiliate)</td>
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<td>Curricula do not support a forest graduate to work independently (self-employment).</td>
<td>Inclusion of curricula and training programs that open the student’s horizons towards self-employment.</td>
<td>The experiences of forest professionals who have been able to create their own businesses (self-employment) can be invested.</td>
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<td>Lack of/weak integration between the executive management of forests, forest research and forest education.</td>
<td>Conclusion of memoranda of understanding between the three components and developing a research strategy to address the problems of executive management of forests.</td>
<td>The higher departments of the National Forest Authority and the agencies/agricultural and forest research centers and forest colleges</td>
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<td>Lack of a strategy to absorb forest graduates.</td>
<td>Opening jobs that guarantee graduate employment.</td>
<td>Ministries of Manpower and Finance in coordination with the National Forest Authority to identify and meet the needs</td>
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<td>Absence of the private sector in funding scientific research.</td>
<td>Attracting the private sector to contribute to scientific research, especially in non-wood forest products such as natural gums and forest tree fruits.</td>
<td>Attracting the private sector to contribute to scientific research, especially in non-wood forest products such as natural gums and forest tree fruits. Coordination can be made to improve product quality through scientific research. This will benefit private investors.</td>
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<td>Weak budgets allocated for education.</td>
<td>Increase the budget for primary, secondary and higher education.</td>
<td>The Ministry of Finance, Education, Higher Education and Scientific Research in addition to the private sector</td>
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<td>Disparity and lack of integration between university educational programs and labor market requirements and expectations.</td>
<td>Involve all groups related to forests and educational institutions committees in developing curricula.</td>
<td>Educational institutions and representatives of the labor market</td>
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<td>Incompatibility of the axes of scientific research and the requirements of institutions active in the field of forests.</td>
<td>Development of research programs for universities in line with the actual needs of investors and the labor market.</td>
<td>Universities, other research institutions and investors</td>
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<td>Poor continuous training and training abroad for faculty and research staff to enable them to keep pace with new scientific concepts and new technologies.</td>
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<td>Lack of a budget dedicated to scientific research in particular.</td>
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