



Food and Agriculture  
Organization of the  
United Nations

# REGIONAL ASSESSMENT OF FOREST EDUCATION IN AFRICA

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



# REGIONAL ASSESSMENT OF FOREST EDUCATION IN AFRICA

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# CONTENTS

List of Tables .....	iii
List of Figures .....	iv
Acronyms .....	vi
Foreword .....	vii
Executive Summary .....	ix
1.0. BACKGROUND .....	1
1.1 Need to strengthen and adapt forest education to a changing context .....	1
1.2 A global initiative on forest education .....	2
2.0 INTRODUCTION TO THE REGIONAL ASSESSMENT .....	4
2.1 Objective and description of the regional assessment.....	4
2.2 Frame of Reference.....	4
2.3 Forest Education in the Africa Region.....	5
2.3.1 Overview of forests and trees in Africa .....	5
2.3.2 Brief history of forest education in Africa .....	6
2.3.3 Forest education governance in Africa .....	7
2.3.4 Needs and demands in the labor market, economic, environmental and societal perspectives ...	7
2.3.5 Educational institutional arrangements .....	8
2.3.6 Forest education Provincial/State level curriculum and guidelines .....	8
3.0 SURVEY METHODS AND RESPONDENTS.....	9
3.1 Survey methodology, regional data analysis and reporting .....	9
3.2 Socio-demographic background of the respondents .....	9
3.3 Regional data analysis and reporting .....	14
3.3.1 Data checking and preparation.....	14
3.3.2 Data analysis .....	14
4.0 SURVEY RESULTS .....	15
4.1 Forest Education at Primary School level in Africa.....	15
4.1.1 Education content and competencies .....	15
4.1.2 Teaching approaches.....	19
4.1.3 Education resources and policy.....	22
4.2 Forest education at secondary school level in Africa.....	23
4.2.1 Education content and competencies .....	23

4.2.2 Teaching approaches.....	26
4.2.3 Educational resources .....	27
4.2.4 Readiness .....	28
4.3 Forest Education at TVET level in Africa .....	29
4.3.1 Education content and competencies .....	30
4.3.2 Educational resources and policy.....	32
4.3.3 Workplace readiness and employability .....	33
4.3.4 Digital readiness.....	34
4.3.5 General developments and trends in TVET .....	35
4.4 Forest Education at University and college level in Africa .....	36
4.4.1 Forest Education at Bachelor’s level in Africa .....	36
4.4.2 Master’s and Doctoral level .....	41
4.4.3 Forest Education at all university and college levels .....	47
5.0 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS .....	52
5.1 Forest education at primary schools in Africa .....	52
5.1.1 Discussion .....	52
5.1.2 Recommendations.....	53
5.2 Forest education in secondary schools in Africa.....	53
5.2.1 Discussion.....	53
5.2.2 Recommendations.....	54
5.3 Forest education in TVET institutions in Africa.....	55
5.3.1 Discussion.....	55
5.3.2 Recommendations.....	56
5.4 Forest education in universities and colleges in Africa .....	57
5.4.1 Discussion.....	57
5.4.2 Recommendations.....	58
5.5 Forest education at Master’s and PhD level in Africa .....	60
5.5.1 Discussion.....	60
5.5.2 Recommendations.....	61
REFERENCES .....	63
ANNEX I - GFE SURVEY DATA APPENDIX.....	65

# List of Tables

Table 3.1. List of countries of origin of respondents (statistical and snowball) by category.....10

Table 3.2. Gender of the respondents .....11

Table 3.3. Race/ethnicity of the respondents .....11

Table 3.4. Place of work of the professional respondents .....11

Table 3.5. Number of respondents per targeted education level in Africa.....11

## List of Figures

Figure 1. Milestones of the Global Forest Education Project .....	3
Figure 2. Frame of Reference for the Assessment of Forest Education.....	5
Figure 3. Inclusion of forest-related curriculum as individual subjects in primary school education (A1) .....	15
Figure 4. Coverage of forest-related topics and skills in primary education in Africa (A2.1) .....	16
Figure 5. Coverage of forest-related topics and skills in primary education in Africa (A2.2).....	17
Figure 6. Coverage of forest-related topics and skills in primary education in Africa (A2.3).....	17
Figure 7. Impact of forest education at primary level in increasing student interest for nature and natural resources (A8) .....	18
Figure 8. Common teaching and learning approaches used in primary schools to teach forest-related concepts in Africa (A9) .....	19
Figure 9. Recommended improvements to learning to increase student interest in forest-related concepts (A10) .....	20
Figure 10. Ability of out-of-school activities to increase forest knowledge and appreciation (A12) .....	20
Figure 11. Teachers’ opinion on to what extent they feel sufficiently knowledgeable in order to effectively teach forest-related concepts and skills in their classroom (A5).....	21
Figure 12. Forest learning through out-of-school activities in primary schools in Africa (A11).....	22
Figure 13. Availability of forest education resources in primary schools (A7).....	22
Figure 14. Availability of education policies or strategies that could lead to improved forest-related education in primary schools in Africa (A4).....	23
Figure 15. Inclusion of forest-related curriculum as individual subjects in secondary education (A13).....	23
Figure 16. Inclusion of forest-related curriculum in other subjects in secondary education (A14) .....	24
Figure 17. Coverage of forest-related topics and skills in secondary education (A21.1) .....	25
Figure 18. Coverage of forest-related topics and skills in secondary education (A21.2) .....	25
Figure 19. Forest education teachers’ knowledge and skills in secondary schools in Africa (A17).....	26
Figure 20. Students’ exposure to forests through out-of-school activities and its impact on forest knowledge and appreciation (A19).....	27
Figure 21. Availability of forest education resources in secondary schools (A15) .....	28
Figure 22. Impact of forest education at secondary school level in increasing students’ interest in nature and natural resources (A20) .....	28
Figure 23. Students’ motivation to enter higher-level forest course or programme following secondary education (A22) .....	29
Figure 24. Coverage of forest-related topics in TVET forest programmes (forest resources and forest ecology) (A28) .....	30
Figure 25. Coverage of forest-related topics in TVET forest programmes (forest services and socio-cultural issues) (A30.2) .....	31
Figure 26. Coverage of forest-related topics in TVET forest programmes (A33.2) .....	32
Figure 27. Policy or strategy that could lead to improved forest-related education at TVET level (A24) .....	33
Figure 28. Use and benefit of digital learning tools within TVET forest programmes (A27) .....	35
Figure 29. Overall trend in student enrolment in TVET forest programmes over the past decade (A36) .....	36
Figure 30. Availability of resources in forest degree programme (Bachelor’s) (A37) .....	37
Figure 31. Availability of forest-related part-time employment and effect on learning (Bachelor’s) (A76).....	38
Figure 32. Gender as a factor and influence on forest-related employment (Bachelor’s) (A81).....	39
Figure 33. Use of digital learning tools at university and college level (Bachelor’s) (A44) .....	40
Figure 34. Use of digital learning tools in degree programmes (Bachelor’s) (A47).....	40
Figure 35. Desired digital learning tools for use in degree programme (Bachelor’s) (A50) .....	41
Figure 36. Availability of forest-related internship or part-time employment and effect on learning (Master’s and Doctor’s) (A77) .....	42
Figure 37. Workforce readiness within the degree programme (Master’s and Doctor’s) (A79) .....	43

Figure 38. Availability of affordable continuing non-formal forest education (Master's and Doctor's) (A88) .....	44
Figure 39. Use of digital learning tools at university and college level (Master's and Doctor's) (A45) .....	45
Figure 40. Use of digital learning tools in degree programme (Master's and Doctor's) (A48) .....	45
Figure 41. Desired digital learning tools for use in degree programme (Master's and Doctor's) (A51) .....	46
Figure 42. Overall trend in student enrolment in forest-related programmes (ten-year period) (Master's and Doctor's) (A91) .....	47
Figure 43. Graduate understanding of forests' relevance to emerging trends and Sustainable Development Goals (SDGs) (Master's and Doctor's) (A94) .....	47
Figure 44. Coverage of forest-related topics in degree programme (forest biodiversity, forest soils, forest ecology, wood and non-wood forest products, forest genetic resources) (all levels) (A57).....	48
Figure 45. Availability of resources in forest degree programmes (All Levels) (A39) .....	49
Figure 46. Use of digital learning tools at the university and college level (All Levels) (A46) .....	50
Figure 47. Overall trend in student enrolment in forest-related programmes (ten-year period) (All Levels) (A92) ...	51

## Acronyms

AF	Africa
AFF	African Forest Forum
ANAFE	African Network for Agriculture, Agroforestry and Natural Resources Education
AP	Asia and the Pacific
BMEL	German Federal Ministry for Food and Agriculture
EU	Europe
CBD	United Nations Convention on Biological Diversity
CPF	Collaborative Partnership on Forests
FAO	Food and Agriculture Organization of the United Nations
GDPR	European Union's General Data Protection Regulation
GFEP	Global Forest Education Project
IITO	International Tropical Timber Organization
IUFRO	International Union of Forest Research Organizations
KPIs	Key Performance Indicators
LAC	Latin America and the Caribbean
MOOC	Massive Open Online Course
NA	North America
NE	Near East
NENA	Near East and North Africa Region
NGO	Non-Governmental Organization
RECOFTC	Center for People and Forests
RLP	Regional Lead Partner
SDGs	Sustainable Development Goals
TFRK	Traditional forest-related knowledge
TVET	Technical and Vocational Education and Training
UNFCCC	United Nations Framework Convention on Climate Change

## **Foreword**

Africa's forests and woodlands are estimated to cover 650 million hectares, or 21.8 percent of the continent's land area. These forests serve diverse ecological, economic, and socio-cultural functions. They provide numerous environmental and socio-economic benefits to society, and millions of rural and urban poor depend on them for goods and services such as water, food, medicine, construction materials, and employment. Forests have been identified as central in developing solutions to mitigating and adapting to climate change. The capacity of forests to meet society demands and provide goods and services depends on their sustainable management. Forest education plays a crucial role in determining whether forests are to be managed sustainably or not.

This regional report is part of the Global Forest Education Project 2020-2021 that aimed at assessing the goals, achievements, and gaps of forest education at all levels of formal education in order to catalyze and enhance efforts in forest education from local to global levels. In many forest-rich African countries, forestry education has remained in the traditional colonial time model introduced to the continent especially from Europe and America. At primary and secondary education, there is a need to inculcate the environment as a bedrock or foundation for any other development, to demystify conservation strategies into simple and practical undertakings, and to encourage activity-based approaches on environmental matters. Teachers need also to be sufficiently prepared through short courses which can empower them in forest education.

At TVET level, forestry training started with the German workplace learning (master-novice approach) where industrial wood production and processing was dominant. Over the years, the programmes have become highly variable and elements of agriculture, environment, community forestry and natural resources management have been included. The private sector has increased access to mainly small, low quality institutions such as Technical and Vocational Education and Training (TVET) centres.

At the university level, teaching professional forestry approaches follow different formats and the curriculum content is highly variable. This is because some programmes are based on traditional European education where industrial wood production and processing are dominant features while other programmes have some elements of agriculture and environment, and others focus largely on community forestry and natural resources management. There is a need for the professional forester in Africa to be trained to have a broad spectrum of social, environmental and economic skills to serve the forestry industry. In addition, there is a need for training in entrepreneurial skills for both the production of raw materials, and in value addition of the timber produced. Forest education in Africa must sufficiently take into consideration the ecological and socio-economic landscape and thus the need for training students in multiple-use forestry. Forest education must mirror the myriad land use systems and rural livelihoods in the continent.

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**Executive Secretary, ANAFE**

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## Executive Summary

The forests in Africa serve diverse ecological functions and provide numerous environmental and socio-economic benefits to society. They represent a safety net for millions of rural and urban poor in many countries where they provide communities with goods and services such as water, food, medicine, construction materials and jobs. Forests have been identified as central in developing solutions to climate change adaptation and mitigation. However, their ability to sustainably provide these goods and services to society depends on their sustainable management which is affected by forest education.

Sustainable forest management requires that educational institutions equip learners with the knowledge and skills that could help them appreciate the role of forests and adapt to the new trends in tree and forest management. Forest education becomes therefore the means of building the knowledge, skills and shared values that underpin sustainable forest management. There is a need to create awareness among students to help them understand the contributions of forests and trees to the achievement of environmental, social and economic development goals from local to global levels.

Over the past several years however, various regional and international fora have raised concerns that in many countries, forest-related education is inadequate, deteriorating or outdated, leading to a lack of awareness and understanding of the role of forests in job creation among the youth and women. In Technical and Vocational Education and Training (TVET) institutions, universities and colleges across Africa, enrolment numbers in forestry are reportedly declining and it appears graduates are insufficiently prepared to meet the changing demands of the labor market. An online survey on forest education in primary schools, TVET institutions, universities and colleges was carried out in sampled countries in Africa. The target group included professionals, teachers and administrators in primary schools, secondary schools, TVET institutions, and in universities and colleges, and enrolled or recently graduated students of forestry and forest-related programmes in TVET schools and in universities and colleges. A regional online consultation with key informants was carried out for both Anglophone and Francophone countries who discussed the results of the survey and provided new inputs where necessary.

The results of the consultation show a lack of awareness of the importance of forestry at the primary and secondary levels, which results in the limited attention it received as compared to other subjects. Training at TVET institutions and universities and colleges is more theoretical, with inadequate practical opportunities. There is limited information about existing job and professional growth opportunities in forestry to students at all levels. Other conclusions of the consultation include:

- i. Lack of contextual teaching materials;
  - ii. Declining students' enrolments in tertiary institutions;
  - iii. Integrating forestry education in primary and secondary school education programmes;
  - iv. Integrating emerging issues in forestry education without losing focus;
- ✓ Review the content of school curricula so that individual subjects related to forestry are included in teaching programs;

- ✓ Raise the awareness of state decision-makers and partners in order to guarantee the availability of material, financial and human resources for the implementation of the curricula;
  - ✓ Develop the skills of foresters in other areas such as climate finance;
  - ✓ Mobilize resources on biodiversity with socio-economic aspects in the curricula at the level of technical and vocational education and training;
  - ✓ Develop forestry training programmes at national and sub-regional levels through Centers of excellence similar to the existing ones;
  - ✓ Diversify and integrate emerging issues such as climate change, biodiversity mainstreaming, urban forestry, water conservation etc. in forestry education programmes;
  - ✓ Enhance the business, livelihoods and sustainable forest management elements in forestry education programmes;
  - ✓ Rebrand forestry education;
  - ✓ Value forestry for improved profiling and appeal to development partners;
  - ✓ Strengthen research on livelihood opportunities in forestry;
  - ✓ Improve networking, collaboration between education, research and industry;
  - ✓ Bridge the gap between tertiary institutions that offer forestry education;
  - ✓ Undertake forestry jobs characterization to establish job availability and training requirements;
  - ✓ Categorize the drivers for the improved management of forestry education planning.
- v. There is a need to create champions of forestry education at the various planned levels;
  - vi. Regional collaboration needs to be strongly revived and supported, through ANAFE, AFF and other development partners;
  - vii. Improving collaboration, networking and feedback mechanisms between industry, research and education;
  - viii. Integrating forestry education in primary and secondary schools' curricula;
  - ix. Repackaging Forestry education to produce labor for the forestry private sector in general, besides the government;
    - x. Improving linkages and collaboration between policy, education and research;
    - xi. Improving on the valuation of forestry goods and services to reflect the true nature of the sector, and its potential appeal;
    - xii. All need to start impacting on local communities and all stakeholders in general, in one way or another for better appeal and an improved profile of forestry education and the sector generally;
    - xiii. Developing programmes/opportunities for retooling trainers with the desired/current knowledge and skills;
    - xiv. Defining and harmonizing career progression/development opportunities for TVET graduates;
    - xv. Use of digital learning tools at all levels;
    - xvi. Establishment of a training programme for trainers (primary and secondary school teachers);
    - xvii. Strengthening the professionalization of foresters;
    - xviii. Development of training, information and communication on topics related to the forest; and finally,
    - xix. Creating a directory of skills in Africa and knowing how to promote them.

Current curriculum from primary to university levels is deficient in emerging thematic areas and urgently needs to be reviewed. There is a lack of appropriate tools (teaching materials, online documentation at all

levels. The low level of integration of digital learning in most African countries is a major drawback in the field of education. Teachers need to be re-tooled while contextualized learning and training materials relevant to the continent need to be developed. Indigenous knowledge needs to be incorporated in the teaching materials while more resources need to be allocated to forestry and forest education. Digital education should be promoted in forest education at all levels. To improve forest education in Africa, there is a need for forest education institutions to enter into partnership arrangements which can facilitate staff and students' international and regional mobility.



## **1.0. BACKGROUND**

### **1.1 Need to strengthen and adapt forest education to a changing context**

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

Over the past several years however, various international fora have raised concerns that in many places forest-related education is insufficient, deteriorating or outdated, leading in these places to a lack of awareness and understanding of forests, and to forest graduates that are insufficiently prepared to meet the changing demands of the workplace.

Forest education had been largely missing from the global forest policy agenda for nearly 20 years, marked by the limited efforts of the Food and Agriculture Organization of the United Nations (FAO) on the topic. Recently however, attention on forest education has picked up due to the activities of various research organizations and Non-Governmental Organizations (NGOs) and, notably, the inclusion of forest education on the agenda of the 14<sup>th</sup> session of the United Nations Forum on Forests 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 a 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 pool of skilled foresters and environmental professionals;
- a 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 their inter-dependent ecosystems;
- 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 a resurgence of interest 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 disconnect between people, nature and forests. Without robust and suitable forest

education, it is unlikely that forests and trees will provide their potential contributions to the achievement of global development goals and targets, including the Sustainable Development Goals<sup>1</sup>, the targets of the United Nations Framework Convention on Climate Change (UNFCCC), the post-2020 Global Biodiversity Framework of the United Nations Convention on Biological Diversity (CBD), the UN Strategic Plan for Forests and other global goals.

Target 7 of the Sustainable Development Goal 4 (SDG 4) specifically underlines the need for improved education on sustainable development:

*By 2030, ensure 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.<sup>2</sup> It was generously funded by the German Federal Ministry for Food and Agriculture (BMEL). The project was implemented by three lead project partners: The Food and Agriculture Organization of the United Nations (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:

- For Africa: African Network for Agriculture, Agroforestry and Natural Resources Education (ANAFE)
- For Asia and the Pacific: The Center for People and Forests (RECOFTC) and ITTO
- For Europe and Central Asia: University of Helsinki, Forum4Edu and IUFRO
- For Latin America and the Caribbean: IUFRO
- For the Near East and North Africa: Arab Organization for Agricultural Development (AOAD)
- For 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 focus was on formal education.<sup>3</sup> Even though informal, non-formal and continuing forest education and training, and indigenous and traditional forest-related knowledge (TFRK)

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<sup>1</sup>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).

<sup>2</sup> 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/)

<sup>3</sup> See Brack (2019) for definitions of formal, non-formal and informal education

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 traditional forest-related knowledge were included in the survey questionnaire with the expectation that they might be included in an eventual Joint Collaborative Partnership on Forests (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). 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 in turn used to prepare a global assessment of the status of forest education. In June 2021, an International Conference on Forest Education was held virtually to discuss the findings of the global assessment and recommendations for action aimed at strengthening forest education globally.

**Figure 1. Milestones of the Global Forest Education Project**



The project carried out two pilot activities to develop online resources aimed at enhancing forest education. Under the leadership of IUFRO, the ‘Forestra®’ prototype, 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 (LSSC) for Tropical Wood and Tropical Wood Products.

The project culminated in 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. The proposed Joint CPF Initiative would address contemporary and emerging challenges facing forest education and its scope could encompass formal forest education, informal and continuing forest education, and indigenous and traditional forest-related knowledge.

## 2.0 INTRODUCTION TO THE REGIONAL ASSESSMENT

### 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 analyzed were:

- primary education (in most countries from age 5 or 6 to age 12 or 13);
- secondary education (in most countries from age 12 or 13 to age 17 or 18);
- technical and vocational education (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 to October 2020, scientific and grey literature and a regional consultation on forest education held virtually on 2<sup>nd</sup> February 2021 for Anglophone countries and on 15<sup>th</sup> February for Francophone countries. There were 77 and 33 experts and stakeholders who participated in regional consultation workshops for Africa for the Anglophone and Francophone countries respectively. The objectives of the consultations<sup>4</sup> were to validate the findings of the regional assessment report, and to fine-tune the recommendations for strengthening forest education in the region.

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.

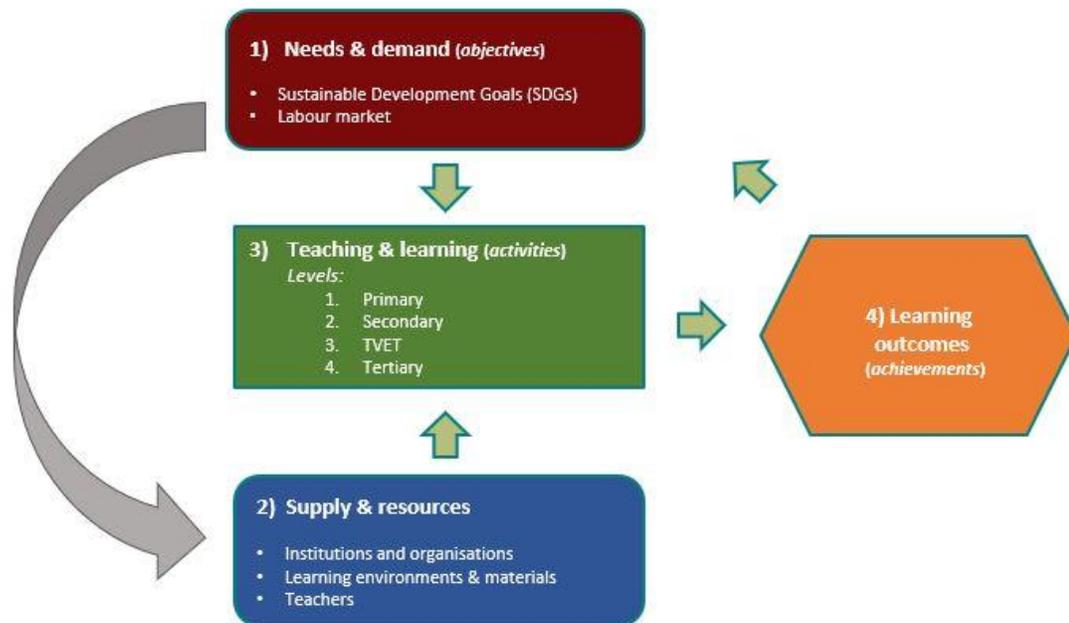
### 2.2 Frame of Reference

A frame of reference was adopted as the conceptual framework for the global forest assessment on forest education. It also was instrumental in defining the questions raised 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).

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<sup>4</sup> Reports of the regional consultations are available on the project website: [www.fao.org/forestry/forest-education/en](http://www.fao.org/forestry/forest-education/en).

**Figure 2. Frame of Reference for the Assessment of Forest Education**



*Needs and Demands* describe the objectives of 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 sought after in labor markets.

*Supply and Resources* are inputs needed to organize and implement educational programmes. There are direct and indirect links between Needs and Demands, 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. Competencies may be subject-specific – related to forest-based knowledge and skills i.e. the 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 the Africa Region**

### **2.3.1 Overview of forests and trees in Africa**

Forests cover 30 percent of all the land on earth and they contribute to the livelihoods of over a fifth of the world's population. Forests serve diverse ecological functions and provide numerous environmental and socio-economic benefits to society. When sustainably managed, forests can be a healthy, productive,

resilient and renewable ecosystem which can provide essential goods and services to people worldwide. An estimated 1.6 billion people i.e. 25 percent of the global population depend on forests for subsistence, livelihood, employment and income generation (UNFF, 2019). Forests have been identified as central in developing solutions to mitigating and adapting to climate change in the world (Brack, 2019). Together with sustainable agriculture, forests have a significant role in mitigating climate change. They can help the world meet at least a quarter of the Paris Agreement commitment to limit the global temperature rise to 1.5° Celsius. In time of crisis, forests act as safety nets as among the rural poor, the majority turn to forest products for their subsistence needs (Sacko, 2020). Forests provide economic and livelihood support for many people around the world, especially the rural poor, generating more than 86 million jobs. The forest sector employs not less than 54.2 million people in the world (ILO, 2020). About 31 percent of the world's population depends on wood-based energy for cooking, while up to 1 billion people feed on bushmeat. There are more than 1.5 billion people, including women, children and other vulnerable groups, who depend on forests for food, nutritional diversity and income (FAO, 2018). In Africa, over two-thirds of the population rely on forests for their livelihoods, while fuelwood accounts for about 70 percent of primary energy source for households (Ebrahim and Weng, 2016).

However, their capacity to provide these services and benefits to society on a sustained basis has been continuously threatened by the environmental crisis characterized by massive forest destruction and degradation. According to the Food and Agriculture Organization (FAO, 2020), it is estimated that forests and woodlands in Africa cover 650 million hectares, i.e. 21.8 percent of the continent's land area. In addition, there is an estimated 350 million hectares (13 percent of the land mass) of "other wooded land". This is made up of wooded savannah, thickets and shrublands. There are huge volumes of wood contained in "trees outside forests" which include trees and other woody plants in rural landscapes (farms, pastures, agroforestry and horticultural systems) as well as in urban settings, on private land, along roads, and in planted forests which are estimated at about 15 million hectares. Forest endowments vary across the different regions and countries of Africa, with far higher proportions in central and southern regions of the continent. African economies are often rooted in abundant natural resources drawn from the myriad of ecosystems. Forests are an integral part of this fabric and could claim to be the pillars of many African countries' economy. For their contribution to remain reliable and strong, forest products and services should be developed wisely and used intelligently. There is therefore a need not only to train technicians and professionals with the right education on forests, but also to create awareness of their benefits at an early age both at primary and secondary levels.

### **2.3.2 Brief history of forest education in Africa**

Measured against other traditional disciplines such as agriculture and law, forestry education in Africa is relatively new (Temu *et al.*, 2006). Forestry training in Africa started with the German "Master Schools" approach as reported by Shirley (1964) in Temu *et al.* (2006), i.e. learning under a master, and gradually developed into a more formal forestry education. It can be said that formal forestry training in the continent started in the 1920s and 1930s with colleges largely focusing on producing forest workers, and vocational and technical staff. The training duration ranged from one to three years (Temu *et al.*, 2006). Although technical training started in the 1920s and 1930s, professional forestry education in Africa is just 45 to 55 years old. The professional degree training was introduced in what was expected to serve as regional schools. In subsequent years, the number of forestry educators grew phenomenally and with the heightened

nationalism and political development, many countries established their own forestry schools, leading to the fading of the regional forestry schools concept.

The early forest education curriculum in Africa borrowed heavily from forestry schools established in the North, but with added emphasis on the aspects of timber production. Thus, in Africa, the content of forestry education programmes varies considerably. On one end, there are programmes that are based on traditional European education where industrial wood production and processing have been the dominant features. In the middle range are programmes that integrate industrial forestry with some elements of agriculture and environment and at the extreme end, are recent forest programmes that focus largely on community forestry and natural resources management. In many programmes, the biological and technical topics are better developed than the social topics, leaving a huge gap in the demand to satisfy the needs of the local population.

### **2.3.3 Forest education governance in Africa**

Forest management in Africa has been highly influenced by forest management and education in temperate countries. The temperate influence on forestry education in Africa has been exerted not only by the historical orientation of the entire profession towards temperate needs, but also in two other fundamental ways. Early training of forestry professionals from Africa took place in Europe, North America and Australia. Upon returning home, these professionals filled positions in natural forest services as well as teaching and leadership positions in forest schools. The establishment of forestry faculties and departments in various countries in Africa was driven by a pool of experts with forestry experience acquired in the North. Although these influences were beneficial in their own rights in ensuring a faster development of forestry manpower needs in Africa, as well as ensuring that forestry as a profession took off, key attributes of the uniqueness of the ecological and socio-economic landscape were not sufficiently taken into consideration (Temu *et al.*, 2006).

Over the years, the hierarchical format of government-led forestry policies and management became unpopular due to failed policies which had led to deforestation and forest degradation. Previously, most of the governments employed highly trained and self-responsible graduates to manage forests. However, due to inadequate policies, forests were poorly managed, leading to their loss. Forest professionals are the people who play key roles in forest governance and hence, to achieve responsible forest governance, forest education institutions needed to train these professionals in the required competencies. According to a 2012 United Nations Report, it is important to train and mentor a new generation of forestry professionals who think differently so as to create a sustainable future. One of the key challenges facing forestry education governance at regional and national levels in Africa, is political influence, which is characterized by a culture of corruption (Ameyaw *et al.*, 2016).

### **2.3.4 Needs and demands in the labor market, economic, environmental and societal perspectives**

Professional forestry education faces significant challenges which are linked to changes in perceptions about nature, sustainability and development. These changes have also served to inform the set of required skills and competencies by public and private organizations and businesses. Hence, higher education institutions such as universities and technical colleges have no option but to keep up with the changing societal demands across the globe (Ramcilovic-Suominen *et al.*, 2016).

In many forest-rich countries across Africa, forestry education has kept the traditional models introduced by the colonizing nations, or those that were copied and emulated from other continents especially Europe and America. With the global change in forest cover and its role, the traditional forestry education model appears to be ill-equipped to produce the necessary human capital to cope with the emerging challenges (Ratnasingam *et al.*, 2013). Inevitably, just like in many other parts of the world, forestry education in Africa is in transition, and under mounting pressure to remain relevant as a professional career education. Several critical reasons have been repeatedly cited for the problems faced by forest education. High on the list of reasons, is the waning interest in forestry academic programs. School leavers have a tendency to choose careers with high salaries, such as business, finance, engineering and computer and Information and Communication Technology (ICT), which offer a grand lifestyle that they may not achieve by choosing a career in the forestry sector (Leslie *et al.*, 2006).

### **2.3.5 Educational institutional arrangements**

According to Cloete & Maassen (2015) higher education in Africa is a system which mainly serves the elite. Nonetheless, the private sector has facilitated access to mainly small, low quality institutions such as the Technical and Vocational Education and Training (TVET) institutions that may not qualify as universities. Sub-Saharan Africa has a much lower rate of higher education participation, averaging between 5-10 percent compared to the rest of the world (Cloete & Maassen, 2015).

In the future, African forestry education would benefit from adopting institutional partnership arrangements that will facilitate the international and regional mobility of staff and students. The aim is to internationalize forestry education. African universities that offer forestry education need to seek to establish larger multidisciplinary schools and curricula in lieu of the old stand-alone forestry departments and degrees. A successful transition into internationalization of forestry education will require greater collaboration between institutions to share students and programme components as well as intensified recruitment of international and regional students (Kanowski, 2015).

### **2.3.6 Forest education Provincial/State level curriculum and guidelines**

The United Nations Forum on Forests (UNFF) held in New York in 2019 shined a spotlight on the topic of forest education. International organizations and member countries alike discussed the importance of strengthening forestry education, starting at a young age at the elementary level up to the university level and beyond. The relevance of forest education in schools is based on ensuring that the next generation understands the positive role forests can play in helping humanity combat some of our most profound challenges: contributing to mitigation and resilience efforts in the face of climate change, housing massive terrestrial biodiversity and contributing positively to food and water security, all of which are outlined in the United Nations 2030 Agenda and featured in their 17 Sustainable Development Goals (SDGs).

African countries are currently facing challenges in forestry education. There is the need to improve the forest and nature-based education curricula, competencies and expertise at higher education institutions (Munezero & Bekuta, 2016). Unlike some regions (e.g. North America, Southeast Asia and Europe) that have reformed their forestry curricula to strengthen the competencies of foresters in their work, Africa has yet to embark on a large-scale reform.

## 3.0 SURVEY METHODS AND RESPONDENTS

### 3.1 Survey methodology, regional data analysis and reporting

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

- Forest professionals working in government organizations, business organizations (private sector), labor 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 clarity, these groups are referred to hereinafter 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 (of TVET and university and college students and recent graduates), digital readiness (for secondary, TVET and university and college students), and general developments and trends in TVET and university and college education. Most of the questions use a Likert scale in which several response options were provided to choose from. Some questions were open-ended, thus allowing the respondents to write in a response.

Sampling of the target groups consisted of statistical sampling and snowball sampling. For the statistical sample, a subset of countries in the region was selected, and individuals, organizations and institutions in the three target groups in these countries were identified and sent survey invitations. Snowball sampling was achieved by sending an open invitation to take the survey through social media channels, such as Twitter; promoting the survey through the use of the Global Forest Education hashtag (*#globalforesteducation*) and through web stories prepared by the partners<sup>5</sup>, sending 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 made available on Webropol in 14 languages.

### 3.2 Socio-demographic background of the respondents

The following tables provide socio-demographic data on the survey respondents in the Africa region. Table 3.1 shows the list of countries where both statistical and snowballing sampling took place and the number of respondents per targeted group. Table 3.2 shows the gender of the respondents while Table 3.3 shows

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<sup>5</sup> See FAO's web story upon the release of the survey on 15 July 2020 <http://www.fao.org/forestry/news/97465/en/>.

the race/ethnicity of the respondents. Table 3.4 shows the organization where the professional respondents were working while Table 3.5 shows the number of respondents per targeted education level. Table 3.6 shows the statistical sample countries, their location in Africa, population size and forest cover where the survey was carried out.

**Table 3.1. List of countries of origin of respondents (statistical and snowball) by category**

Country	Occupation of respondents			
	Professionals	Teachers	Students	Total
Angola	0	0	1	1
Botswana	0	1	0	1
Burundi	1	0	0	1
Cameroon	10	7	6	23
Central African Republic	2	0	0	2
Comoros	0	0	1	1
Congo	1	0	2	3
Democratic Republic of the Congo	4	7	3	14
Djibouti	1	0	0	1
Ethiopia	14	9	2	25
Gambia	2	0	0	2
Ghana	8	4	4	16
Guinea	4	0	0	4
Kenya	25	27	35	87
Liberia	1	0	1	2
Madagascar	0	1	2	3
Malawi	2	5	3	10
Mali	1	1	0	2
Mozambique	1	0	0	1
Namibia	1	0	0	1
Niger	1	0	0	1
Nigeria	14	22	32	68
Rwanda	1	3	1	5
Senegal	1	5	0	6
Seychelles	1	0	0	1
Sierra Leone	4	4	8	16
South Africa	5	6	3	14
South Sudan	3	2	4	9
Tanzania	3	5	0	8
Togo	4	0	0	4
Uganda	10	6	18	34
Zambia	6	1	2	9
Zimbabwe	3	1	1	5
<b>Total</b>	<b>136</b>	<b>117</b>	<b>129</b>	<b>382</b>

**Table 3.2. Gender of the respondents**

Gender	Occupation			
	Professionals (n). %	Teachers (n). (%)	Students (n). (%)	Total
Male	109 (80.1%)	93 (80.2%)	70 (60.9%)	272
Female	22 (16.2%)	22 (19.0%)	45 (39.1%)	89
prefer not to say	4 (2.9%)	1 (0.9%)	0 (0%)	5
prefer to self-describe	1 (0.7%)	0 (0%)	0 (0%)	1

**Table 3.3. Race/ethnicity of the respondents**

	Professionals	Teachers	Students
Majority	53 (39.3%)	40 (34.5%)	53 (41.7%)
Minority	30 (22.2%)	23 (19.8%)	32 (25.2%)
Non-applicable	32 (23.7%)	27 (23.3%)	28 (22.0%)
Prefer not to say	20 (14.8%)	26 (22.4%)	14 (11.0%)
Total	135	116	127

**Table 3.4. Place of work of the professional respondents**

	N	Percent
Governmental organizations	68	50%
Business organizations	8	5.88%
Labor Unions	0	0%
Forest owners' associations, etc.	8	5.88%
Environmental and other NGOs	45	33.09%
Other, please describe:	7	5.15%

**Table 3.5. Number of respondents per targeted education level in Africa**

Targeted Education Levels	Respondents			
	Professionals	Teachers	Students	Total
Primary	61	12	0	73
Secondary	60	23	0	83
TVET	67	32	6	105
Associate's	10	1	5	16
Bachelor's	63	55	70	188
Master's	48	16	28	92
Doctorate	16	8	14	38
All levels	19	0	0	19
Other	0	0	6	6

**A detailed methodology** for the study can be found within the Global Synthesis report. Regional reports will refer to synthesis report in this respect.

**Preparation of the survey** began in January 2020 with a view that the project would end by June 2020. At that point the theoretical framework had already been created, however the survey questionnaire itself was projected to be rather modest in length. Due to COVID-19, a non-cost extension to the project was made and the survey was developed further by the main partners, especially Regional Lead Partners (RLPs), under the supervision of FAO Secretariat. The collection of data for this study using Webropol questionnaires was completed on 31 October 2020.

**Sampling strategies** were based on the global target population of the survey. Sampling strategies used two different approaches: 1) statistical sampling and 2) snowball sampling.

The **Statistical sampling** approach aimed at reaching out to respondents statistically representing the population. Due to limited resources, a statistical sampling approach was first applied to countries and second target respondents within each country. The sampling methods were multiple-stage stratified sampling and convenient sampling. With multiple-stage stratified sampling, the countries were first classified into different categories based on the key performance indicators (KPIs) related to the objectives of the study. The KPIs were: location of the country on the continent, language, forest cover, population and the ease of getting in touch with respondents using information technology. Within each country, institutions involved in education, forestry, natural resources were identified and their websites were searched for email contacts for statistical sampling. Primary schools, secondary schools, staff of TVET institutions and universities and colleges having emails were identified for statistical samples. Teachers in primary and secondary schools whose emails were found were asked to forward the questionnaire or provide contacts for their colleagues. University and TVET teachers were required to forward the questionnaire to their fellow colleagues and students or provide their contacts. For snowball sampling, a list of the organizations involved in forestry was provided for FAO to forward the questionnaire to them.

A selection of countries for the statistical sample in the Africa Region was made based on the criteria described in Table 3.6 below (i.e. location of the country, population size and the total forest cover). Altogether, the following 15 countries representing Western Africa, Central Africa, Eastern Africa and Southern Africa were selected into the statistical sample.

**Table 3.6: Sampled Countries in Africa based on location, population size and forest cover**

Sr No.	Country	Region	Language	Population (2018)	Forest area (/1000 ha sq. km) (2020)
1	Cameroon	Central Africa	French	25,216,237	20,340.48
2	Ethiopia	North Eastern Africa	Amharic/English	109,224,559	17,068.5
3	Democratic Republic of Congo (DRC)	Central Africa	French	84,068,091	126,155.24
4	Ghana	West Africa	English	29,767,108	7,985.71
5	Kenya	East Africa	English	51,393,010	3,611.09
6	Malawi	Southern Africa	English	18,143,315	2,241.7
7	Mozambique	Southern Africa	Portuguese	29,495,962	36,743.76
8	Nigeria	West Africa	English	195,874,740	2,1626.95
9	Senegal	West Africa	French	15,854,360	8,068.16
10	Sierra Leone	West Africa	English	7,650,154	2,534.88
11	South Africa	Southern Africa	English	57,779,622	17,050.09
12	Uganda	East Africa	English	42,723,139	2,337.9
13	Tanzania	East Africa	Swahili, English	56,318,348	45,745
14	Zambia	Southern Africa	English	17,351,822	44,814.03
15	Zimbabwe	Southern Africa	English	14,439,018	17,444.58
<b>Total</b>				<b>740,860,467</b>	<b>356,323.49</b>

**NB. These countries represent 56 percent of the total forest area in the Africa Region.**

The **Snowball sampling** approach aimed to increase the number of respondents beyond the statistical sample. The essence of snowball sampling is a target group-driven communication. Reaching target groups requires exceptionally effective sampling methods that can meet people through channels that they frequently use and which they feel are close to them and trustworthy. A set of social media channels – both regional-based and at global level – were used, e.g. Facebook, Twitter, and YouTube. Messages for these channels were drafted in the research project with assistance from FAO’s Communication department.

**Survey tools.** Due to the planned short running time of the project and limited resources, the online survey method was chosen from the onset. Alternatives like mail surveys or interviews were deemed out of scope. However, the limitations of online survey in certain regions and among some respondent groups were fully recognized. All surveys were executed using Webropol, an online survey tool (Webropol.com). This survey tool was selected mainly because of its large variety of question formats, especially the so-called matrix layout needed in the rich set of learning outcome measurements. Net-based survey system Webropol is based in Finland and operates under the European Union’s General Data Protection Regulation (GDPR).

**Questionnaires.** Regional surveys consisted of three independent, but coordinated questionnaires for three different respondent groups:

1. Questionnaire 1 (Q1): The target groups were Governmental organizations, businesses, labor unions, forest owners' associations, and environmental and other organizations (NGOs);
2. Questionnaire 2 (Q2): The target groups were teachers and educational unit leaders at all levels from primary to universities.
3. Questionnaire 3 (Q3): The target groups were students in TVET institutions, universities and colleges.

All the questionnaires include the following sections: demographic background; questions that focus on forest education in terms of target groups; instruments according to the target group; and open-ended questions according to the target group (see questionnaires in Annex I).

The information forwarded to respondents and all the questions for Africa were prepared in both English and French for Anglophone and Francophone countries.

In addition to information and questions, Webropol managed all these language variants for respondents to guide themselves through the survey.

### **3.3 Regional data analysis and reporting**

#### **3.3.1 Data checking and preparation**

All the survey data was automatically stored through Webropol, an online survey system. After closing the response period (October 31) it was decided to pool together statistical and snowball samples because of the limited number of responses in both of these data strata. A common set of Tables and Figures was thus created for all regions using both statistical and snowball data. The overall quality of the data was checked by FAO Secretariat and the Regional Lead Partners (RLPs).

#### **3.3.2 Data analysis**

For the purpose of writing the Africa regional report, survey data with quantitative elements was mainly analyzed using Tables & Figures produced from Webropol data and further developed using MS Excel. No statistical testing for quantitative data analysis was made at this point. Qualitative data analysis was made using content analysis approaches and text mining with the help of text editors. The report was translated into French.

During the regional consultation workshops, the various needs, challenges and solutions were ranked. All online survey data was automatically stored through using Webropol. The overall quality of the data was checked while it was received. The analysis is based on all the responses received, including statistical and snowball samplings.

## 4.0 SURVEY RESULTS

The survey results sections present results from the following target groups: (i) governmental organizations, business organizations, forest owners’ associations, and environmental and other non-governmental organizations (NGOs) (ii) teachers and educational unit leaders at all levels from primary to universities, and (iii) students in TVET institutions, universities and colleges.

This chapter presents the findings of the survey broken down by educational level i.e. primary, secondary, TVET and university and college. The results include education content and competencies, teaching approaches, educational resources and policy for all levels, including TVETs, university and college levels. Workplace readiness and employability, digital readiness, and general developments and trends have been added. These topics align with the frame of reference used for the study.

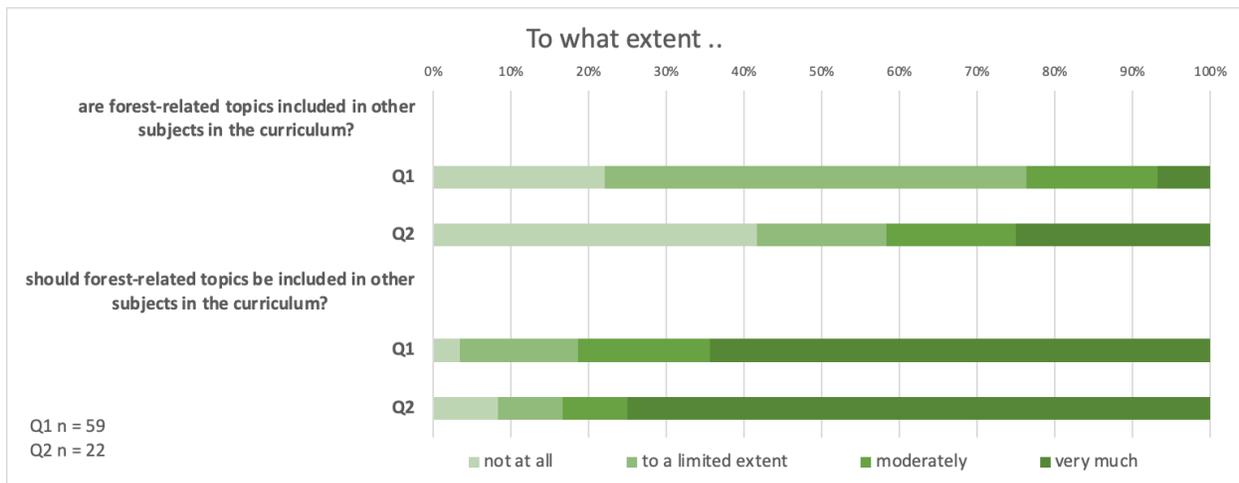
### 4.1 Forest Education at Primary School level in Africa

The following results are based on survey responses received from 61 professionals and 12 primary school teachers in Africa.

#### 4.1.1 Education content and competencies

##### 4.1.1.1 Forest education content in Primary Schools in Africa

The majority of the respondents (72 percent of professionals and 77 percent of teachers) reported that forest-related topics were not at all included in the curriculum or were included to a limited extent only. However, a large majority of both groups (70 percent of professionals and 89 percent of teachers) felt that forest-related topics should be included in primary school curriculum as individual subjects (Figure 3).



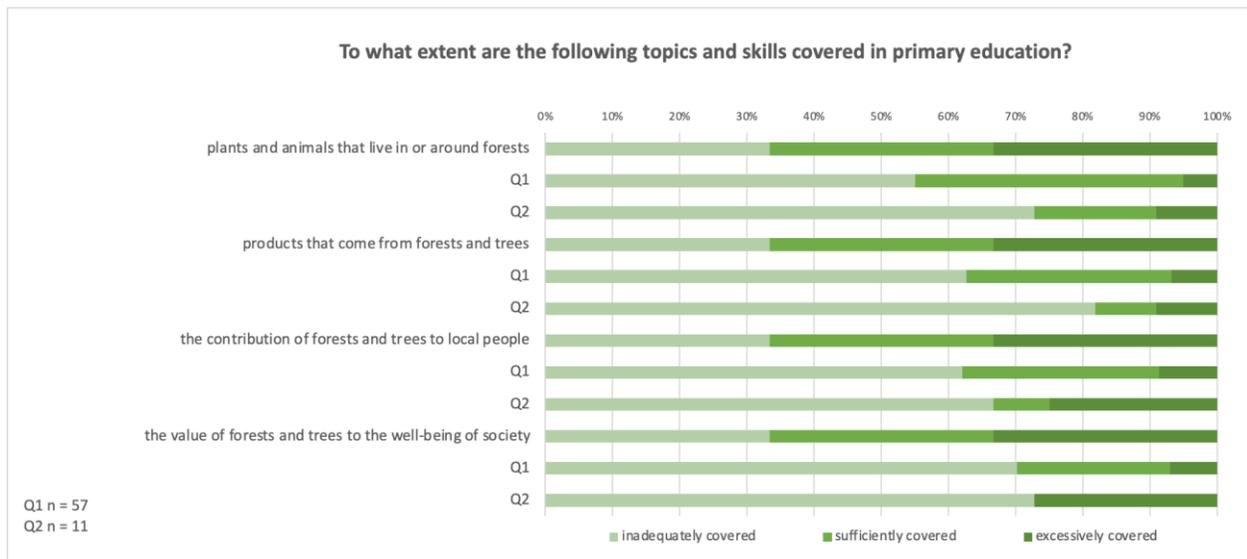
**Figure 3. Inclusion of forest-related curriculum as individual subjects in primary school education (A1)**

When asked to suggest the forest-related topics that should be included in the curriculum as individual topics, the respondents provided a long list of topics such as forest biodiversity and ecology; forest establishment, conservation and management, importance of forests to people, agroforestry, forest products,

wildlife management and ecotourism, watershed management, and forests and climate change among others.

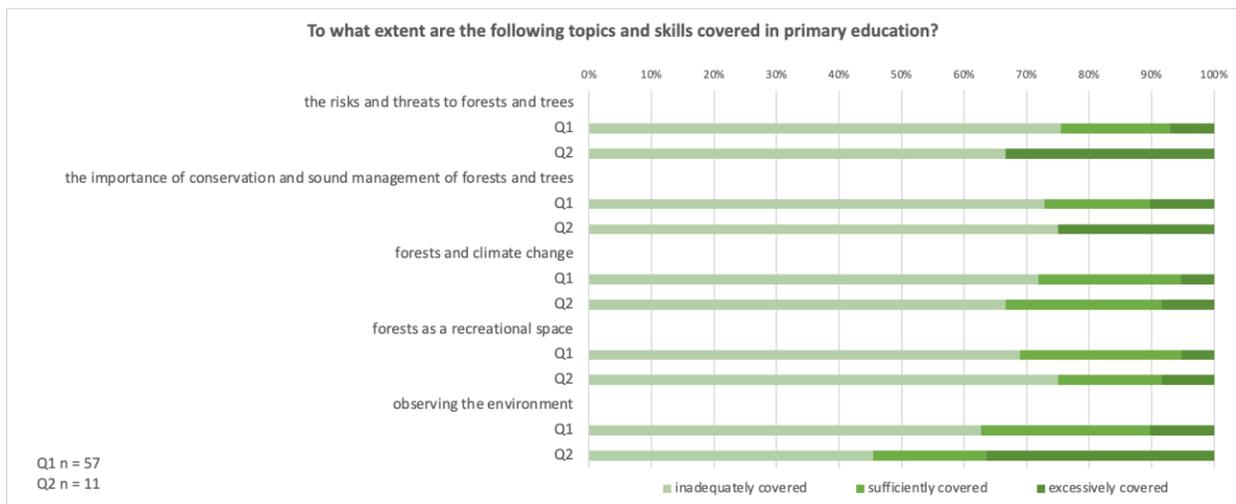
**4.1.1.2 Forest education competencies in primary schools in Africa**

On the extent to which some topics and skills are covered in primary education in Africa, the respondents reported that plants and animals that live in or around forests were inadequately covered. There were more teachers (82 percent) than professionals (62 percent) who reported that products that come from forests and trees are inadequately covered. Other topics that were reported to be inadequately covered included the contribution of forests and trees to local people and the value of trees to the well-being of society (Figure 4).



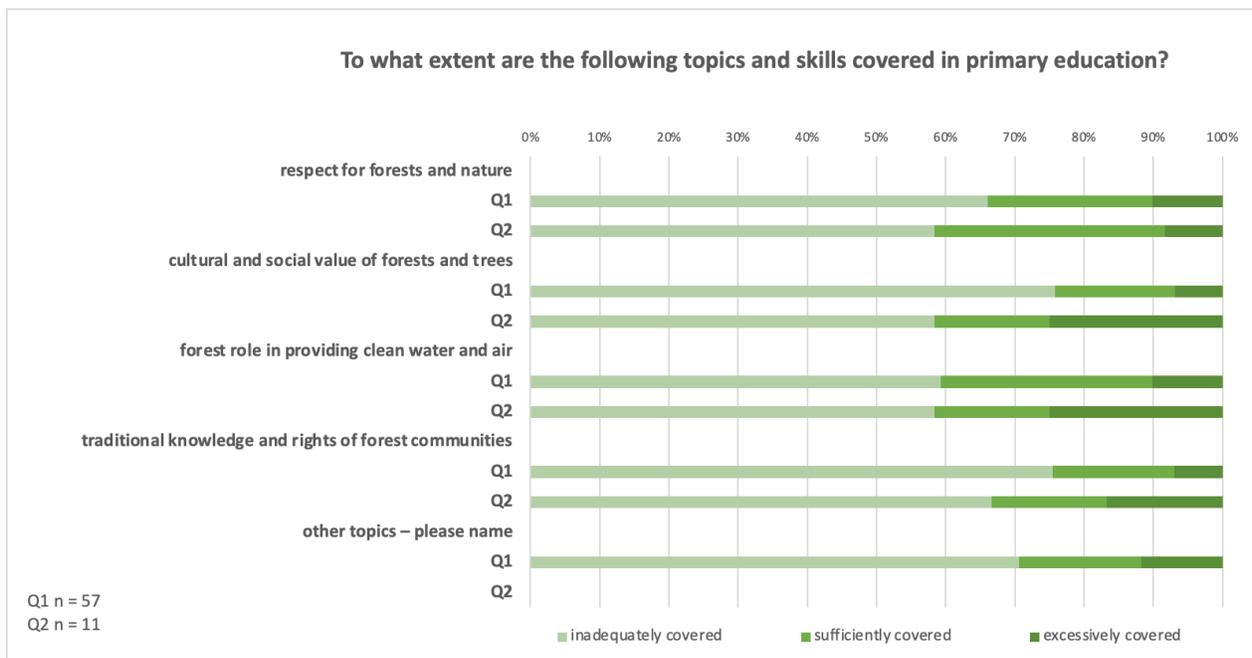
**Figure 4. Coverage of forest-related topics and skills in primary education in Africa (A2.1)**

On the extent to which the risks and threats to forests and trees are covered in primary education in Africa, 74 percent of professionals and 67 percent of teachers felt that it is inadequately covered. The same was reported on other topics including the importance of conservation and sound management of forests and trees, forests and climate change, forests as a recreational space and observing the environment (Figure 5 below).



**Figure 5. Coverage of forest-related topics and skills in primary education in Africa (A2.2)**

In identifying the extent to which other important forest-related topics and skills are covered in primary education in Africa, 76 percent of professionals and 58 percent of teachers reported that the cultural and social values of forests and trees are inadequately covered. Other topics that were identified to be inadequately covered include respect for forests and nature and the role of forests in providing clean water and air, and the traditional knowledge and rights of forest communities (Figure 6).



**Figure 6. Coverage of forest-related topics and skills in primary education in Africa (A2.3)**

#### ***4.1.1.3 Important topics and skills to be included in forest education in primary schools***

The professionals and teachers cited a number of topics and skills that are important and should be taught in primary schools. Some of these topics and skills include: ecosystem benefits of forests, role of forest and tree resources in climate change mitigation and adaptation, water catchment, general awareness of the

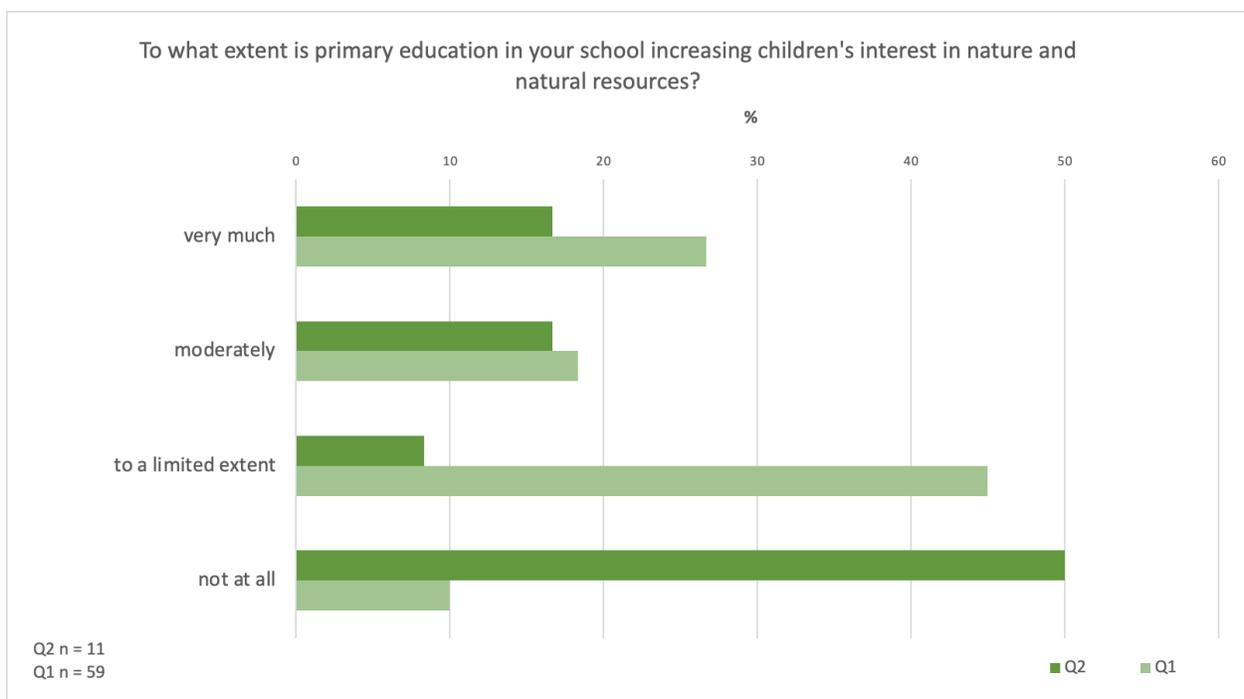
environment, dryland forestry, tree establishment and management, nursery management, tree types, biodiversity studies, deforestation, role of forests in combating global warming, practical skills of raising and planting tree seedlings, community rights to forests, and role of young people in forest protection.

**4.1.1.4 Use of forests as a teaching environment**

The survey found that forests are not used at all or are used to a limited extent as a teaching environment or classroom in primary schools in Africa. About 78 percent of professionals and 67 percent of teachers reported that it is not used at all or only to a limited extent (see Appendix Figure A6).

**4.1.1.5 Interest in learning more about forests**

The survey found that the way primary education in some African countries is taught does not increase children’s interest in nature and natural resources. About 55 percent of professionals and 58 percent of teachers reported that primary education does not at all increase children interest in nature and natural resources or it does to a limited extent. A small percentage of 35 percent professionals and 34 percent teachers reported that it does increase children interest in nature and natural resources moderately to very much, while 45 percent of professionals and 8 percent of teachers reported that it does to a limited extent. Only 27 percent of professionals reported that it does very much (Figure 7).

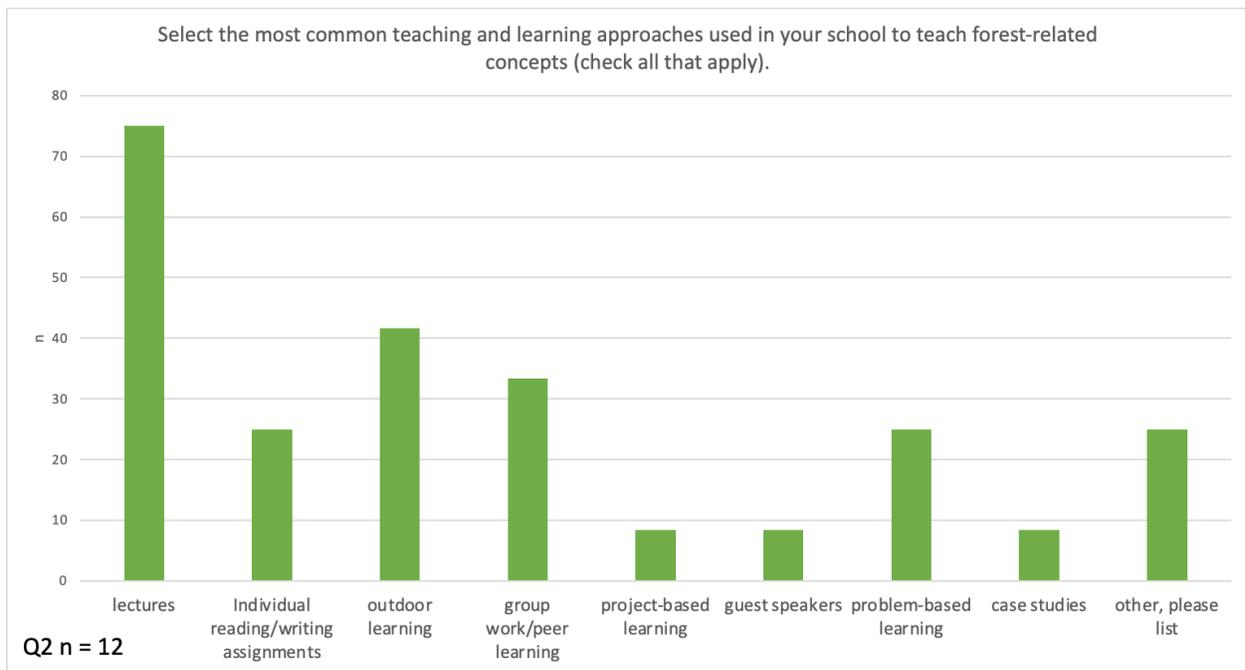


**Figure 7. Impact of forest education at primary level in increasing student interest for nature and natural resources (A8)**

## 4.1.2 Teaching approaches

### 4.1.2.1 Teaching methods

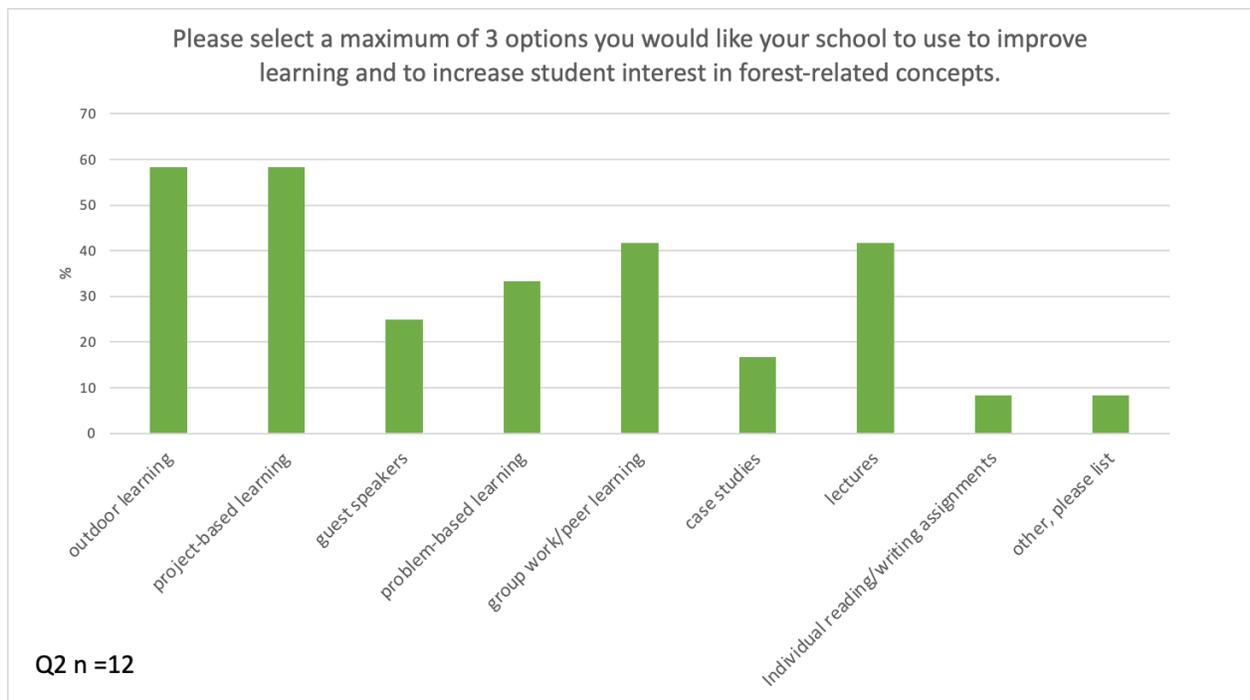
When asked to identify the most common teaching and learning approaches used in primary schools to teach forest-related concepts, almost 75 percent of the respondents identified lectures as the main teaching method while outdoor learning was second according to about 41 percent of the respondents. Other methods identified by about 25 to 32 percent include group work/peer learning, problem-based learning and individual reading/writing assignments. Project-based learning, guest speakers and case studies were identified by less than 10 percent of the respondents (Figure 8).



**Figure 8. Common teaching and learning approaches used in primary schools to teach forest-related concepts in Africa (A9)**

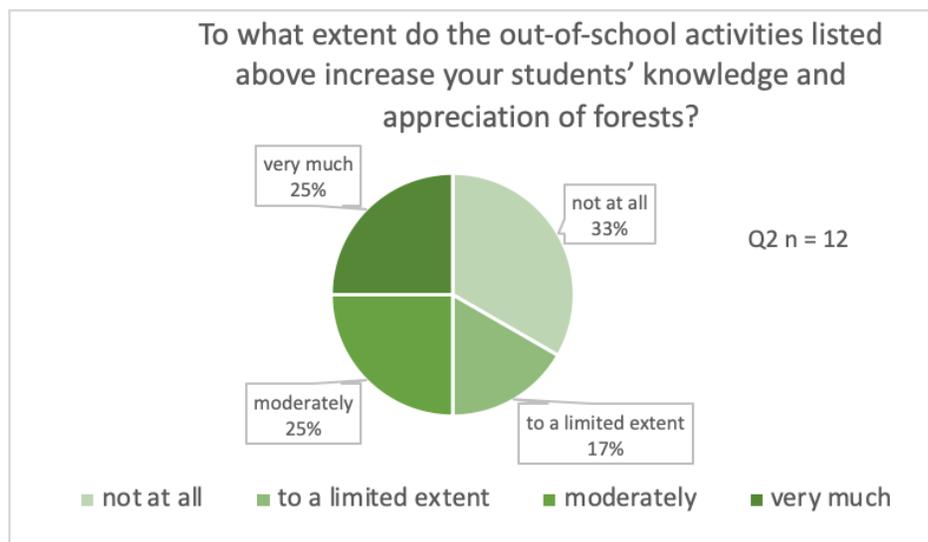
### 4.1.2.2. Preferred teaching methods to improve learning

The best options identified by the respondents that could be used to improve learning and increase student interest in forest-related concepts at primary school level, include outdoor learning, project-based learning, group work/peer learning and lectures. Other options selected include guest speakers, problem-based learning, case study and individual reading/writing assignments (Figure 9).



**Figure 9. Recommended improvements to learning to increase student interest in forest-related concepts (A10)**

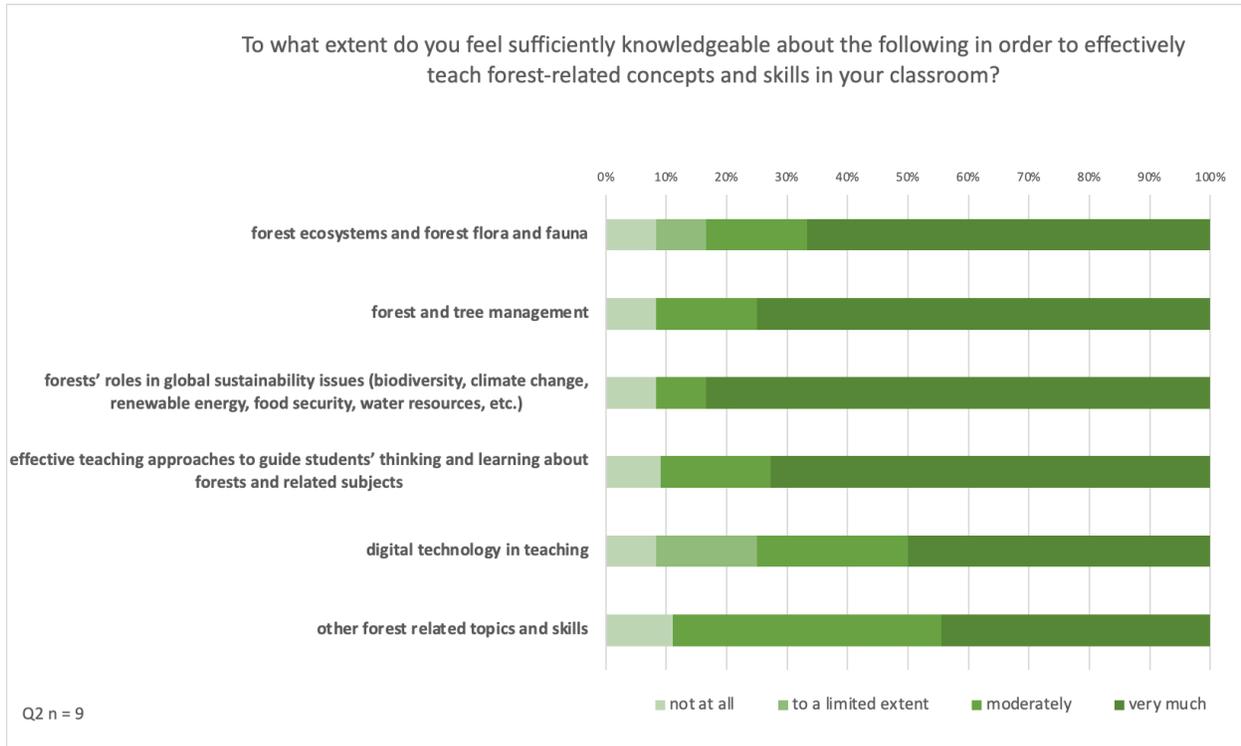
When the respondents were asked the extent to which out-of-school activities increase students’ knowledge and appreciation of forests, 33 percent of respondents reported that it does not at all, while another 17 percent reported that it does to a limited extent. About 50 percent of the respondents reported that it does moderately to very much (Figure 10).



**Figure 10. Ability of out-of-school activities to increase forest knowledge and appreciation (A12)**

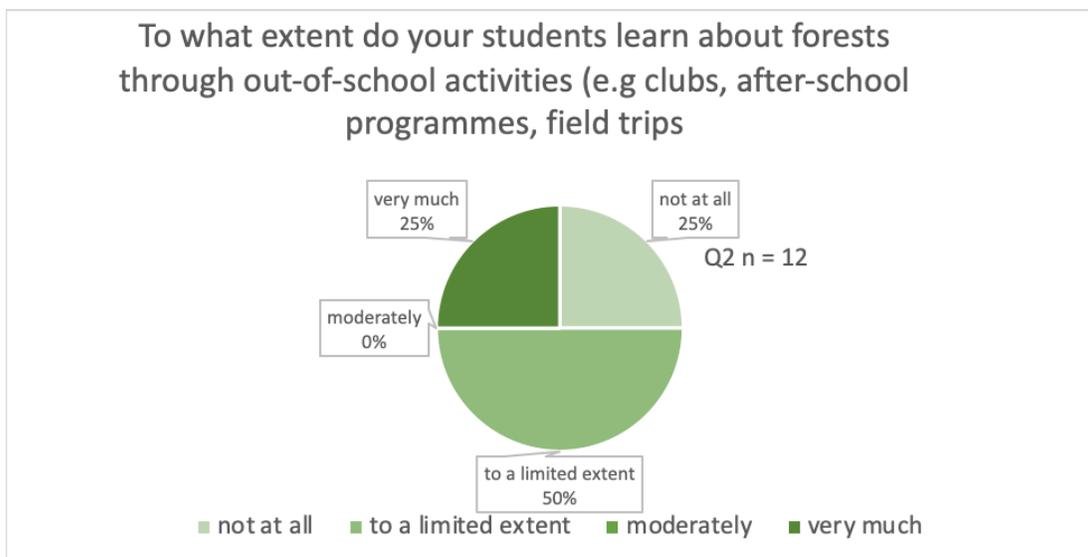
When asked how sufficiently knowledgeable they felt in order to effectively teach forest-related concepts and skills in the classroom, a majority of the teachers (83 percent) reported that they were very much knowledgeable to effectively teach forest roles in global sustainability issues while 73 percent reported that

they were very much knowledgeable to teach effective approaches to guide students’ thinking and learning about forests and related subjects. Another 69 percent reported that they were very much knowledgeable in teaching forest and tree management, while another 67 percent reported the same on forest ecosystems (flora and fauna). Only 50 percent of the respondents felt very much knowledgeable to use digital technology in teaching (Figure 11).



**Figure 11. Teachers’ opinion on to what extent they feel sufficiently knowledgeable in order to effectively teach forest-related concepts and skills in their classroom (A5)**

About 50 percent of the respondents reported that students learn to a limited extent about forests through out-of-school activities e.g. clubs, after-school programmes and field trips, while 25 percent of the respondents reported that students learn very much, while another 25 percent reported that they do not learn at all (Figure 12).

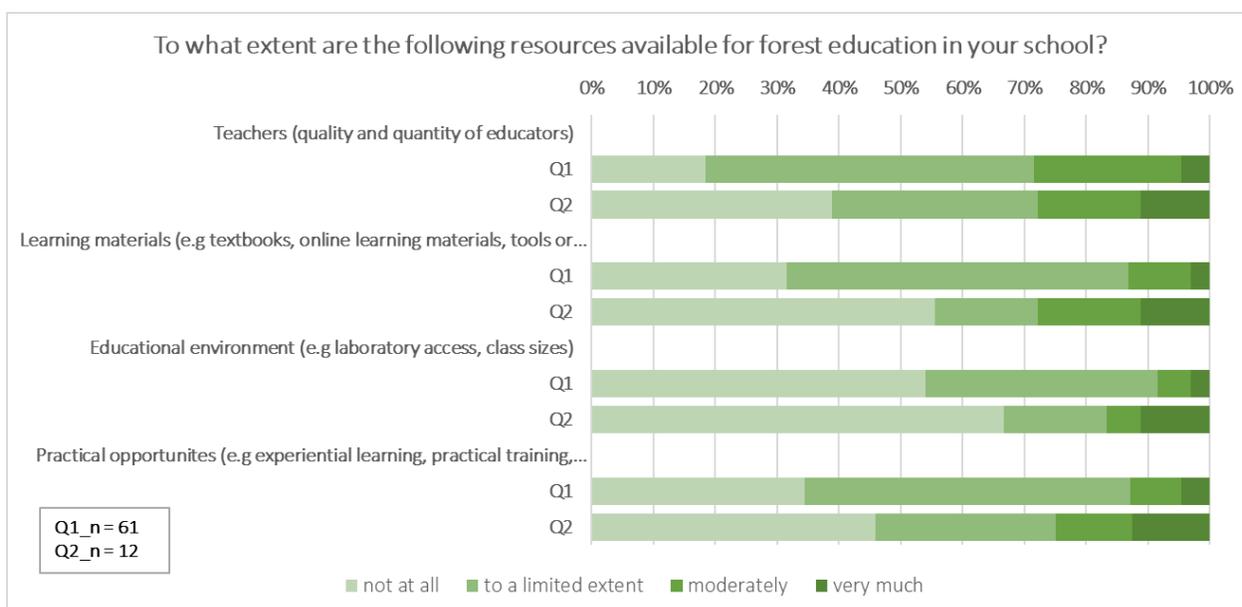


**Figure 12. Forest learning through out-of-school activities in primary schools in Africa (A11)**

Participants identified some out-of-school key activities which the students most frequently participate in as: tree planting, field trips, mini media clubs, visiting the zoo and botanical gardens.

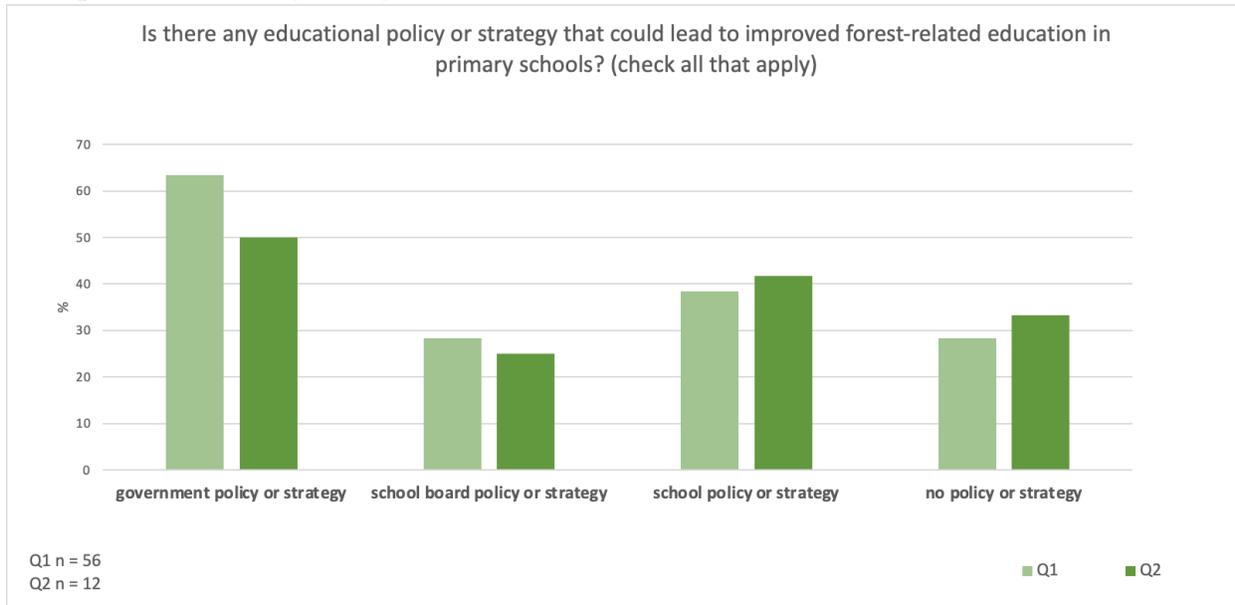
### 4.1.3 Education resources and policy

The survey found that the availability of forest education resources which include learning materials e.g. textbooks and online materials, quality of human resources like teachers, education environment like laboratory access and class size and practical opportunities e.g. experiential learning and practical training, do not exist at all or are limited to some extent in many primary schools in Africa. Practical opportunities are also limited. Laboratory access, class sizes and other educational environments are reported not to be available in many primary schools (Figure 13 below).



**Figure 13. Availability of forest education resources in primary schools (A7)**

To improve forest education in primary schools in Africa, government policies or strategies were identified as the most important. Second in line of importance are school policies and strategies, and thirdly school board policies and strategies (Figure 14).



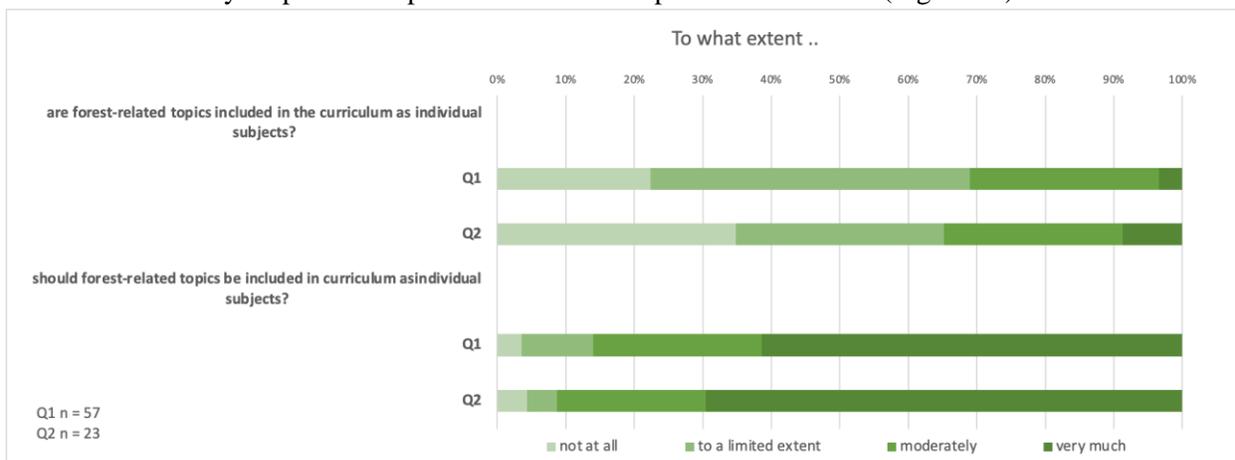
**Figure 14. Availability of education policies or strategies that could lead to improved forest-related education in primary schools in Africa (A4)**

## 4.2 Forest education at secondary school level in Africa

The following are the survey results from 60 professionals and 23 secondary school teachers in Africa.

### 4.2.1 Education content and competencies

Forest-related topics are not at all included or are included to a limited extent as individual subjects in secondary school education in Africa, as reported by 70 percent of professionals and 66 percent of teachers. There is therefore a need to include forest education as an individual subject in secondary school curriculum as recommended by 85 percent of professionals and 95 percent of teachers (Figure 15).



**Figure 15. Inclusion of forest-related curriculum as individual subjects in secondary education (A13)**

Respondents identified, among others, the following forest-related topics that need to be included in the curriculum as individual subjects: Introduction to forest ecosystem, Forest management, Forest extension, Farm forestry, Agroforestry, Non-timber forest products, Tree planting, Afforestation/ Reforestation, Climate change, Environmental management, Natural forest conservation, Production of renewable energy, Forest policy, Forest biodiversity, Production forestry, Tree nursery establishment and management, Forest resources, Tree species and timber production, Forest industries, Environmental services of forests, Drought and desertification control, Sustainable agriculture through trees outside forests, The forest ecosystem and livelihoods, Growing woody plants to improve the climate, Wildlife biodiversity conservation, Soil protection, and Community forestry.

Currently in Africa, forest-related topics are not included or are included to limited extent in other subjects in secondary school curriculum as reported by 69 percent of professionals and 74 percent of teachers. About 82 percent of professionals and 86 percent of teachers reported that it is necessary to include forestry education in other subjects in the secondary school curriculum in Africa (Figure 16).

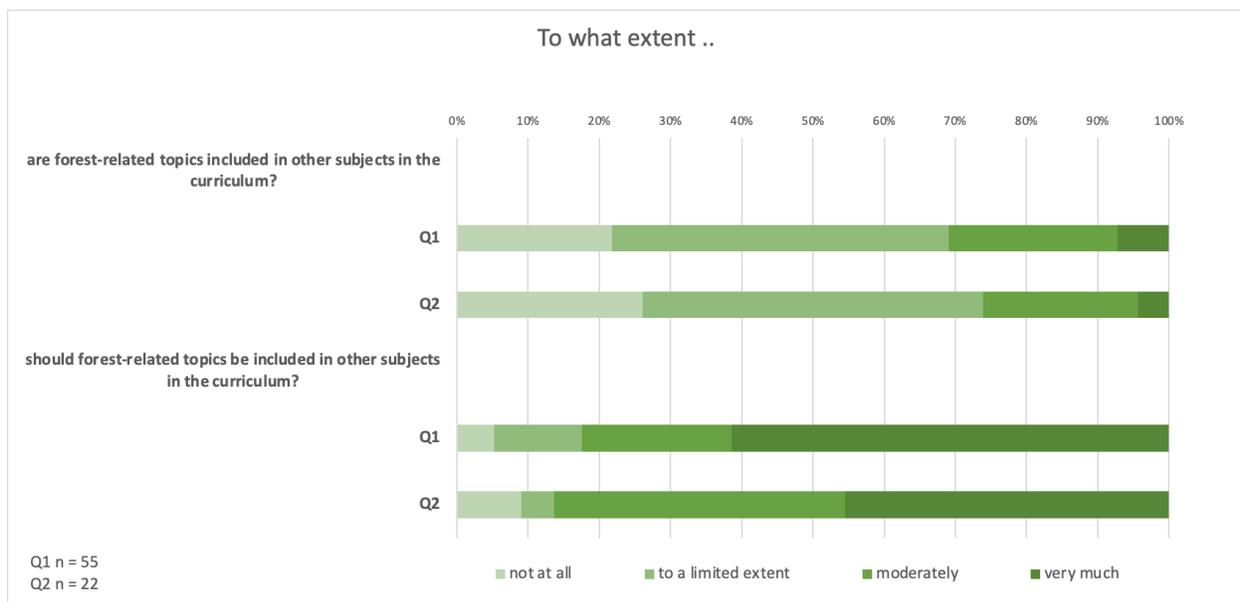
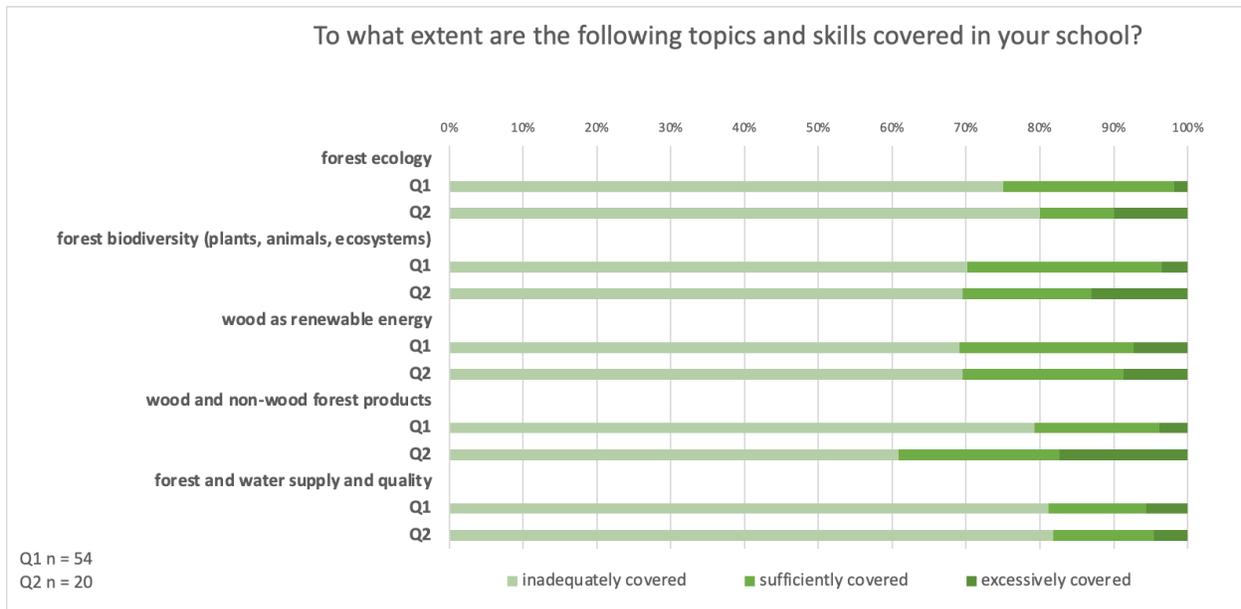


Figure 16. Inclusion of forest-related curriculum in other subjects in secondary education (A14)

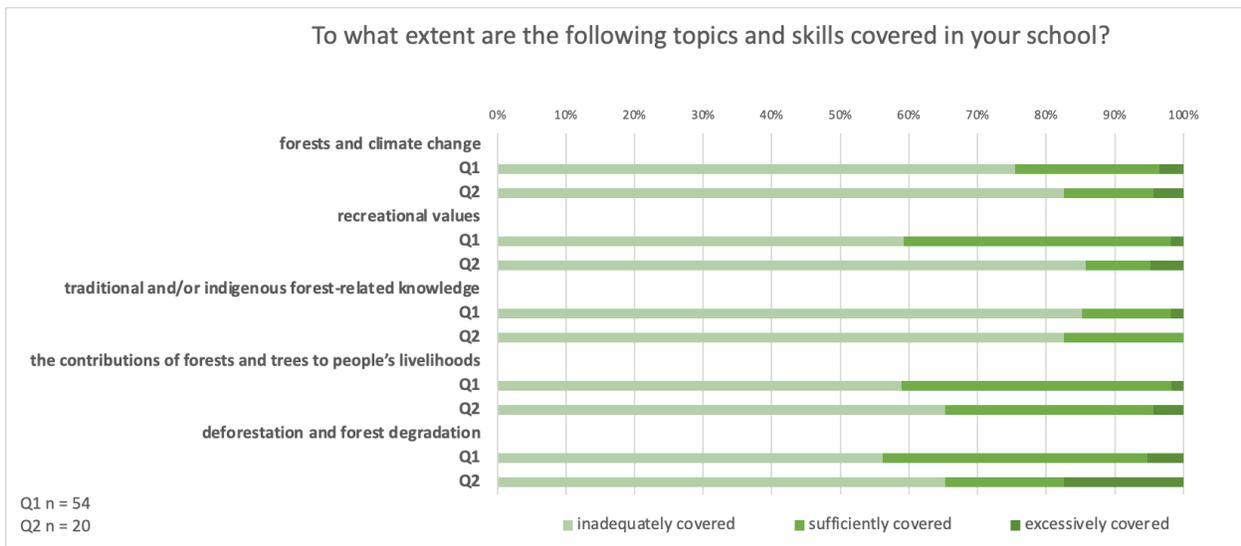
#### 4.2.1.1 Forest-related topics and skills coverage in secondary schools in Africa

Important forest topics such as forest ecology, forest biodiversity, wood as renewable energy, wood and non-wood forest products, and forest and water supply and quality were reported to be inadequately covered in secondary school curriculum as reported by 75 percent of professionals and 80 percent of teachers (Figure 17 below).



**Figure 17. Coverage of forest-related topics and skills in secondary education (A21.1)**

Other topics that are inadequately covered include: Forest and climate change, recreational value of forests, traditional and/or indigenous forest-related knowledge, the contribution of forests and trees to people’s livelihoods, deforestation and forest degradation (Figure 18).



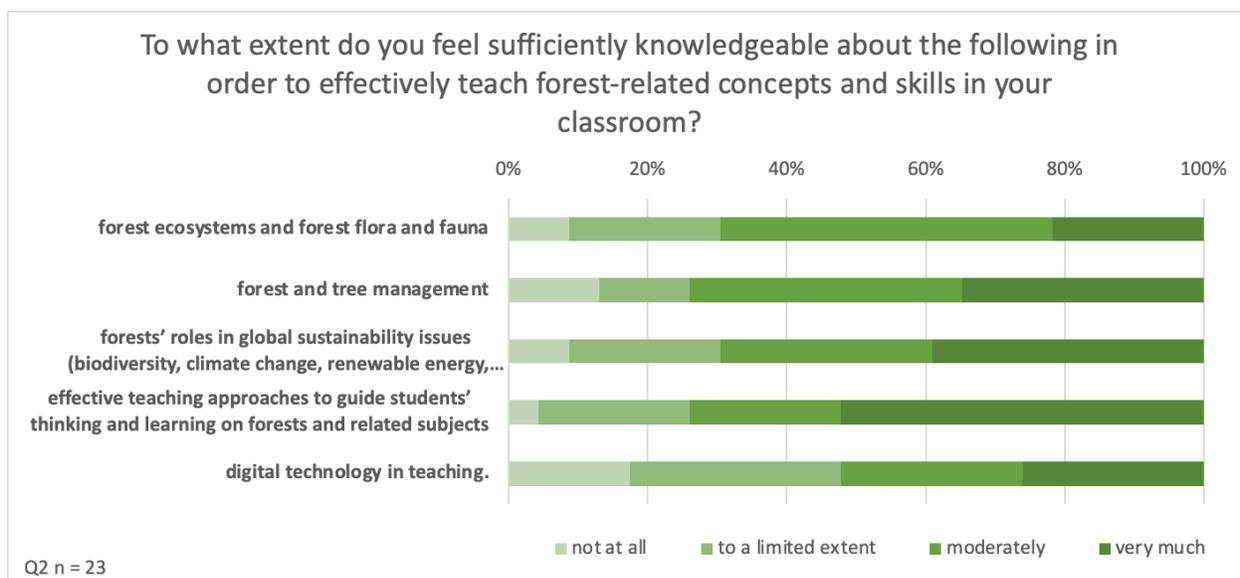
**Figure 18. Coverage of forest-related topics and skills in secondary education (A21.2)**

Other topics that were reported to be inadequately covered included: forest conservation, skills for observing the environment, respect for forest and nature, rights to forest use and products, and cultural values of forests and trees (see Appendix Figure A21.3). The respondents identified the following topics, among others, as additional forest topics and skills that should be covered at the secondary school level: farm forestry, forest and environmental protection, agroforestry systems and techniques, importance and uses of non-wood forest products (NWFPs), water catchments, forest policy, law and administration, forest industries, carbon sequestration, community forestry, endemic species, forest biodiversity monitoring and

sustainable development, ecotourism, tree propagation, forestry and food, forest conservation, rights of forest dependent communities, introduction to forest resources inventory methods, introduction to forest resources valuation techniques, seedling propagation skills, tree planting and care skills, ecosystem goods and services, urban forestry, commercial production of medicinal plants from trees, soil and water conservation, tree nursery (propagation and management) techniques, and forests and livelihood sustainability.

When asked whether they felt sufficiently knowledgeable to teach forest-related concepts and skills in the classroom, 70 percent of teachers reported that they were moderately or very much knowledgeable while about 30 percent of teachers reported that they were not at all sufficiently knowledgeable, or they could only teach those concepts and skills to a limited extent (Figure 19).

Using digital technology for teaching in secondary schools was reported to be limited in Africa as reported by 47 percent of teachers who indicated that they were not at all or they were to a limited extent sufficiently knowledgeable in using digital technology for teaching. This poses a challenge to many teachers even as the government in many countries like Kenya expects teachers to use e-learning platforms. About 74 percent of teachers reported that they were moderately or very much sufficiently knowledgeable to effectively teach forest tree management, and were also sufficiently knowledgeable in effective teaching approaches to guide students’ thinking and learning on forests and related subjects. Moreover, 69 percent of the respondents reported that they were moderately or very much sufficiently knowledgeable to effectively teach forests’ roles in global sustainability issues, while another 31 percent felt they were not at all knowledgeable or were limited, to an extent, to do same (Figure 19).



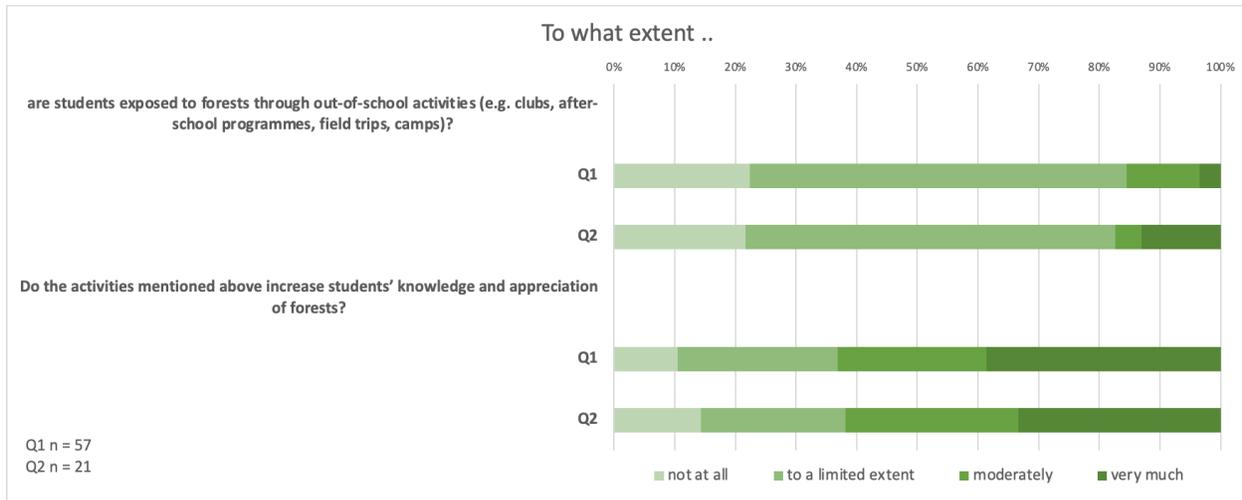
**Figure 19. Forest education teachers’ knowledge and skills in secondary schools in Africa (A17)**

#### 4.2.2 Teaching approaches

Forests are only used to a limited extent as a teaching environment or classroom in schools in Africa as reported by 45 percent of professionals and 38 percent of teachers. About 38 percent of teachers and 27 percent of professionals reported that forests are not used at all as teaching environment or classroom. It

was only about 13 percent of teachers and 10 percent of professionals who reported that forest is used very much (See Appendix Figure A18).

About 84 percent of professionals and 83 percent of teachers reported that students in secondary schools are not exposed at all, or are exposed to a limited extent to forests through out-of-school activities. The respondents observed that exposing students to forests through out-of-school activities can increase moderately or very much their knowledge and appreciation of forests (Figure 20).

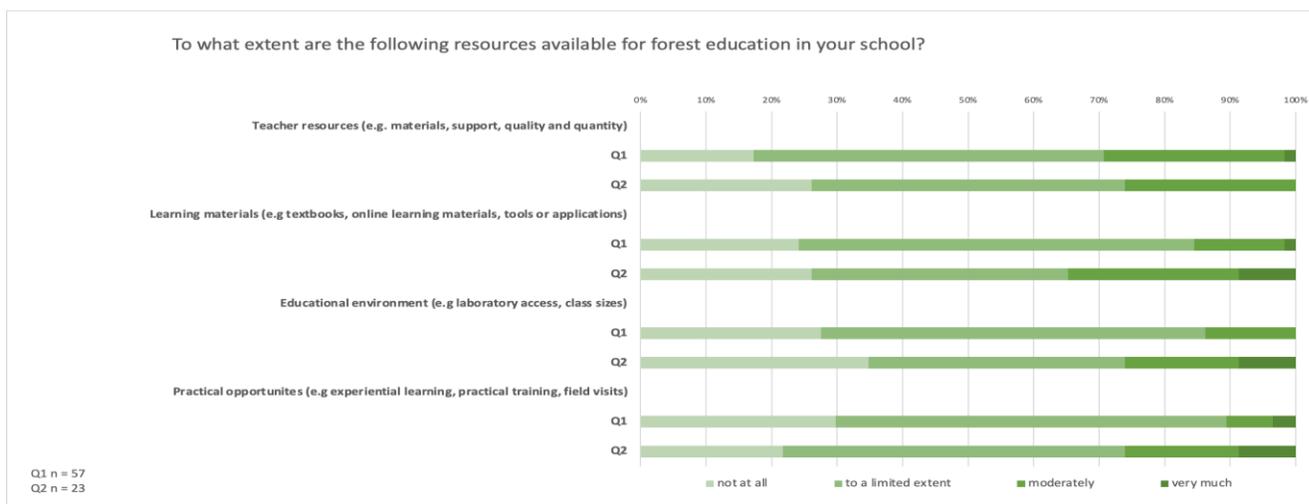


**Figure 20. Students’ exposure to forests through out-of-school activities and its impact on forest knowledge and appreciation (A19)**

The following out-of-school forest-related activities were identified among others as being effective in helping secondary school students appreciate forests: field trips, tree planting campaigns, environmental clubs, visits to zoological/botanical gardens, field excursions, seed collection activities, species identification, hikes, camping, being climate change ambassadors, visits to research institutes, joining environmental projects, labelling trees within the school compound, and participating in community forestry activities in rural areas. All these activities can help students increase their knowledge and appreciation of forests.

#### 4.2.3 Educational resources

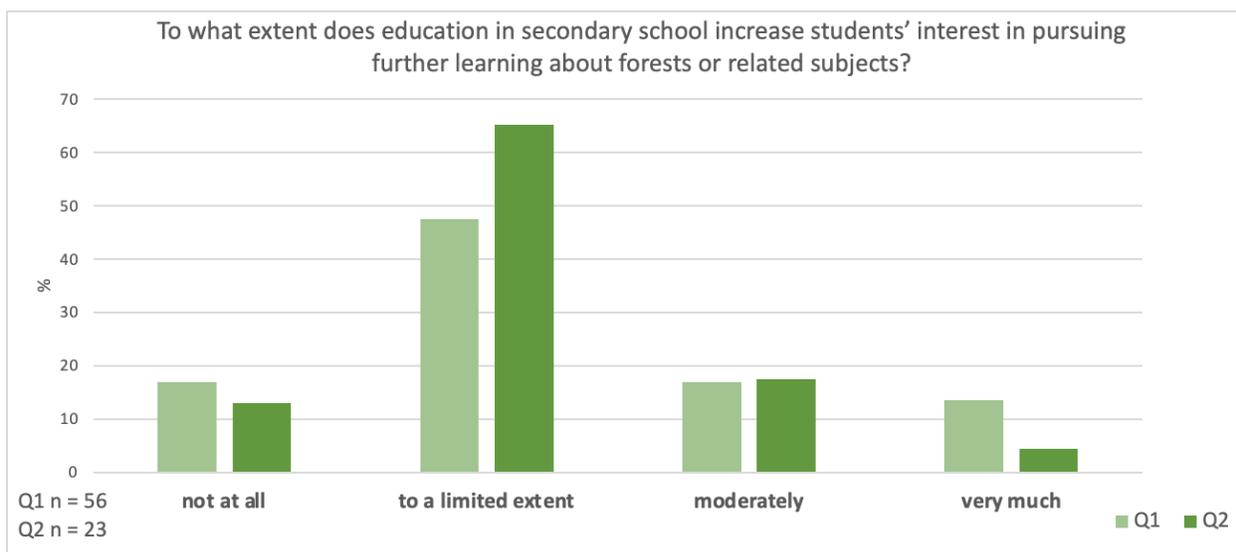
Forest education resources in many secondary schools in Africa were reported to be limited to a certain extent at secondary school level in Africa. Teachers’ resources (materials, support, quality and quantity) were also reported to be either not at all available, or limited to a certain extent as reported by 70 percent of professionals and 74 percent of teachers. Learning materials (e.g. textbooks, online learning materials, tools or applications) were reported by 84 percent of professionals and 75 percent of teachers not to be available at all or to be available to a limited extent. The educational environment (e.g. laboratory access, class sizes), was also reported to be either not available at all, or available to a limited extent. On practical opportunities (e.g. experiential learning, practical training and field visits), 90 percent of professionals and 74 percent of teachers reported that they are either not available at all or limited (Figure 21).



**Figure 21. Availability of forest education resources in secondary schools (A15)**

#### 4.2.4 Readiness

About 87 percent of professionals and 74 percent of teachers reported that the current secondary school education does not increase, or only to a limited extent, students’ interest in pursuing learning about forests or forest-related subjects (Figure 22).

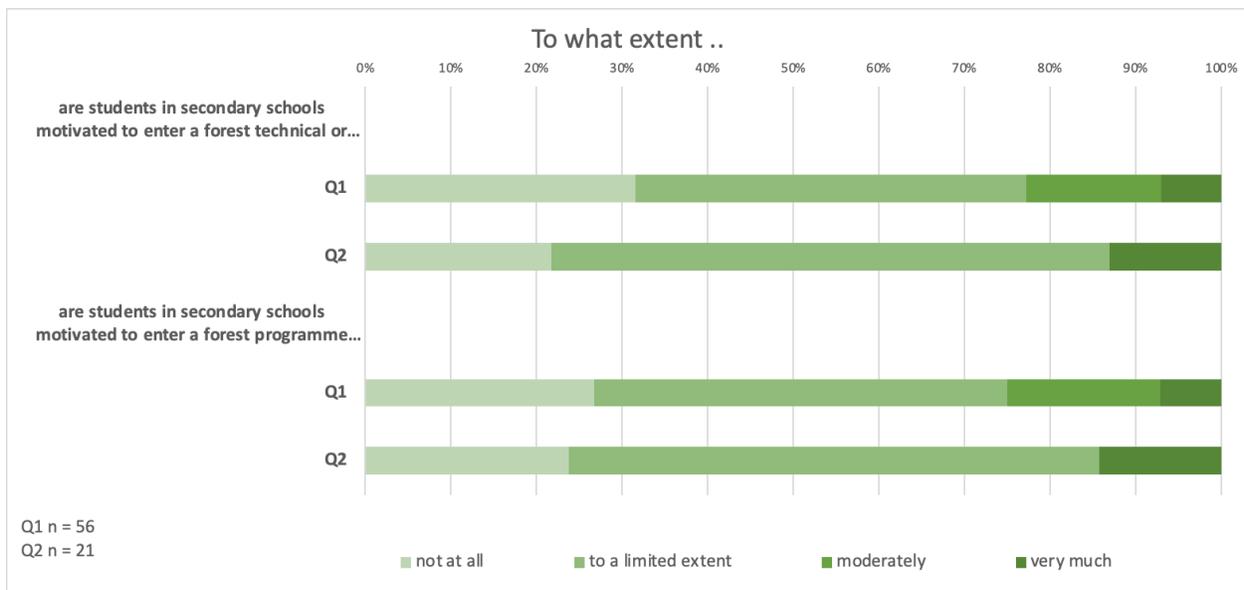


**Figure 22. Impact of forest education at secondary school level in increasing students’ interest in nature and natural resources (A20)**

Respondents reported that the inadequate teaching/coverage of forests or related subjects at the secondary school level in many countries in Africa, dampens students’ enthusiasm for pursuing further studies in forestry education. This was because not all learners’ come from areas that have forests while some are not able to relate to forest science. There are also many secondary schools that treat forest activities e.g. tree planting, as a punishment or just hobbies and thus some students associate forest activities with punishment. It was also reported that many teachers also teach forest-related subjects just for awareness creation but not as a career choice that a student can pursue later in life. In most cases, forest practitioners have found

themselves in the forestry sector by chance and not necessarily by choice. It is noted that forest education in many secondary schools in Africa is covered under general agriculture subjects making the learners unable to acquire in-depth knowledge and skills required to develop interest in pursuing careers in forestry later in life. The lack of enabling and motivating teaching materials and approaches at secondary school was also reported to have contributed in lowering the interest of students to further pursue forest education at the higher level.

Most students are not at all motivated or are motivated to a limited extent to join a forest technical or vocational training school as reported by 78 percent of professionals and 88 percent of teachers. A majority are also not at all motivated or are motivated only to a limited extent to join a forest programme at the university and college level as reported by 75 percent of professionals and 86 percent of teachers (Figure 23).



**Figure 23. Students' motivation to enter higher-level forest course or programme following secondary education (A22)**

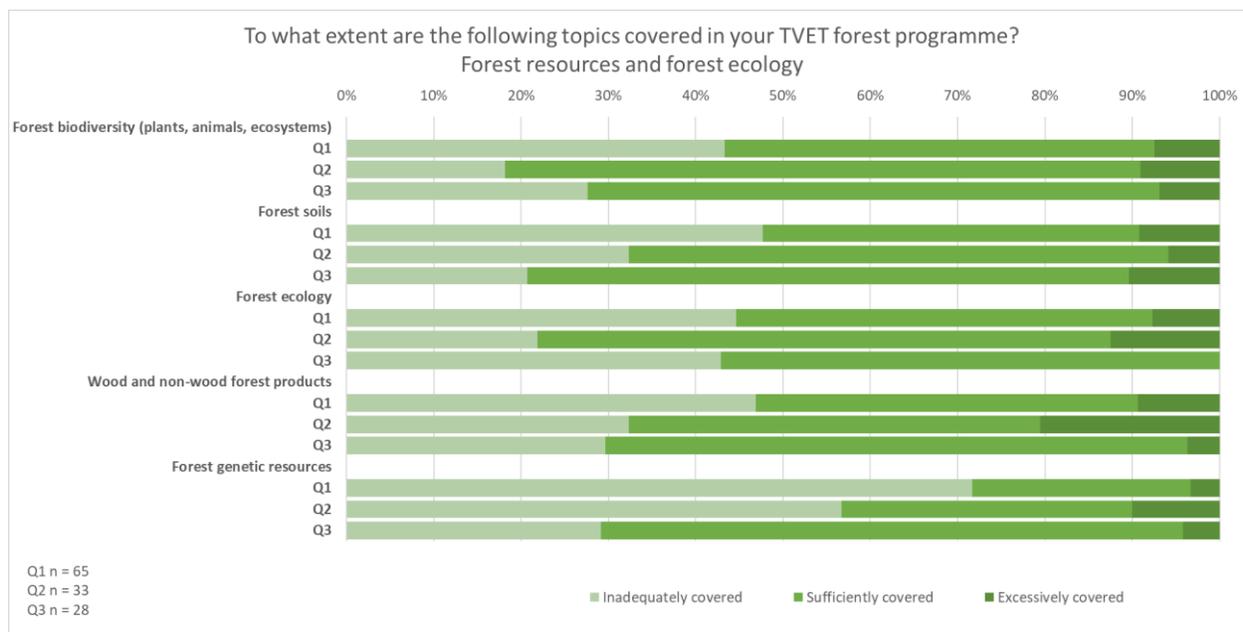
On educational policy or strategy that could lead to improved forest-related education in secondary schools, three types of policies and strategies were identified, including government policy or strategy, school board policy or strategy and school policy or strategy (See Appendix Figure A16).

### 4.3 Forest Education at TVET level in Africa

The following are the survey results from 67 professionals, 32 teachers and 6 TVET students.

### 4.3.1 Education content and competencies

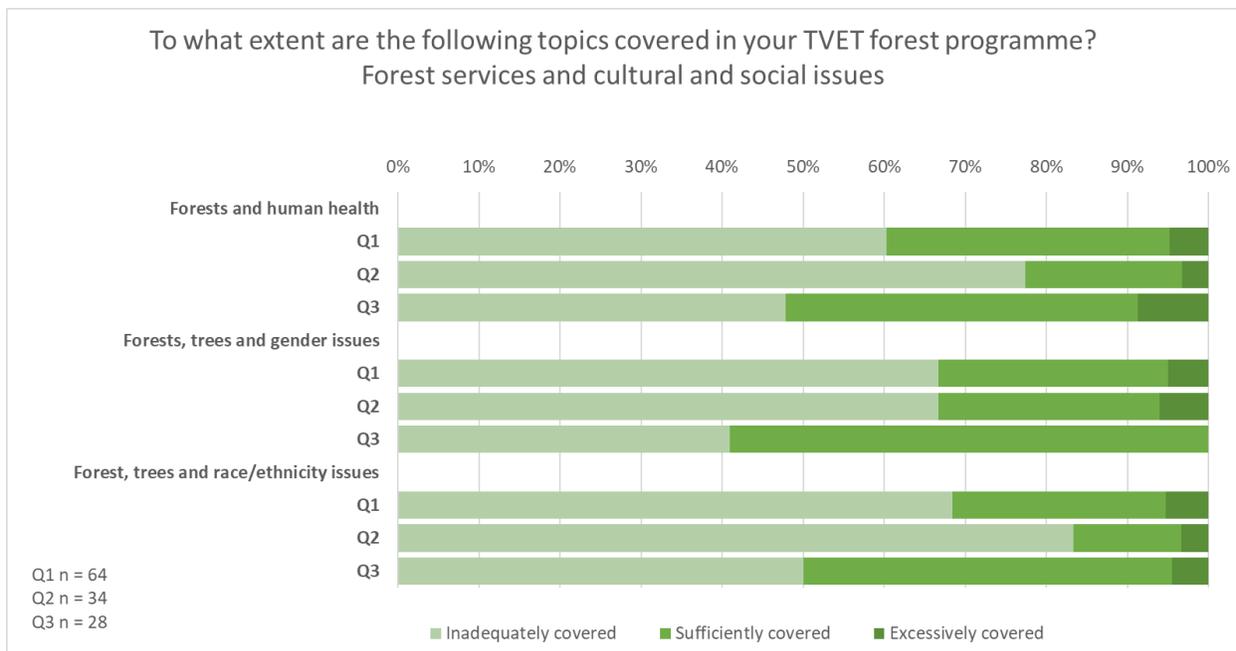
Topics on forest biodiversity (plants, animals, ecosystems), forest soils, forest ecology, wood and non-wood forest products, forest planning and silviculture were reported to be sufficiently or excessively covered. On the other hand, forest genetics, forests and climate change, forest landscape restoration, forest mapping, inventory, remote sensing and GIS were reported to be inadequately covered (Figure 24).



**Figure 24. Coverage of forest-related topics in TVET forest programmes (forest resources and forest ecology) (A28)**

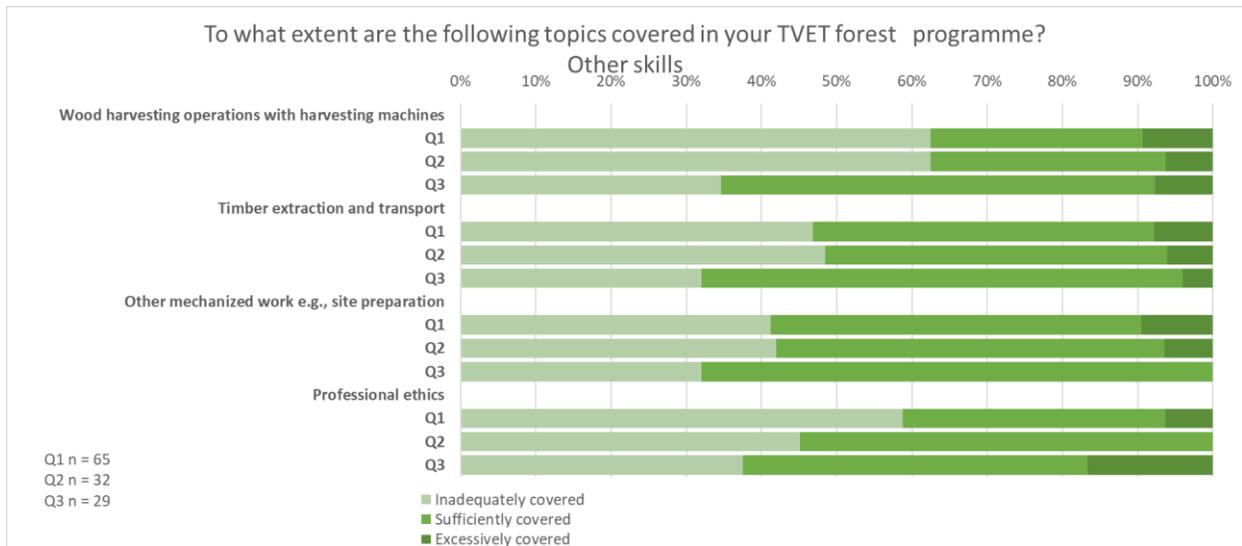
Other important topics that were reported to be inadequately covered include range management, watershed management, wildlife management and urban forestry. Traditional topics like sustainable harvesting systems, agroforestry, forest health (pest and diseases), forest fire management and forest conservation were reported to be either sufficiently or excessively covered (See Appendix Figure A29.2).

On topics relating to forest services and cultural and social issues, about 51 percent of professionals reported that wood as a renewable energy is inadequately covered. Other topics reported to be inadequately covered include forest-based recreation, traditional and/or indigenous forest-related knowledge and cultural values of forests. On topics relating to forest services, cultural and social issues, forests and human health, tree and gender issues, forests, trees and race/ethnicity issues were reported to be inadequately covered (Figure 25).



**Figure 25. Coverage of forest-related topics in TVET forest programmes (forest services and socio-cultural issues) (A30.2)**

Important topics like forest enterprises, forest industry, marketing and management, wood technology and small-scale forest enterprise (wood and non-wood) were reported to be inadequately covered (see Appendix Figure A31). On policy and economics, there was a mismatch between what was reported by professionals and what was reported by teachers and students. About 77 percent of teachers and 63 percent of students reported that forest policies and regulations were either sufficiently or excessively covered while about 60 percent of professionals reported they were inadequately covered (see Appendix Figure A32). Basic science and numeracy skills, written and oral communication skills, forest and agroforestry extension, forest nursery management and wood harvesting operations with manual tools, timber extraction and transport, and other mechanized work e.g. site preparation, were reported to be sufficiently or excessively covered. Wood harvesting operations with harvesting machines, professionals' ethics were reported to be inadequately covered (Figure 26).

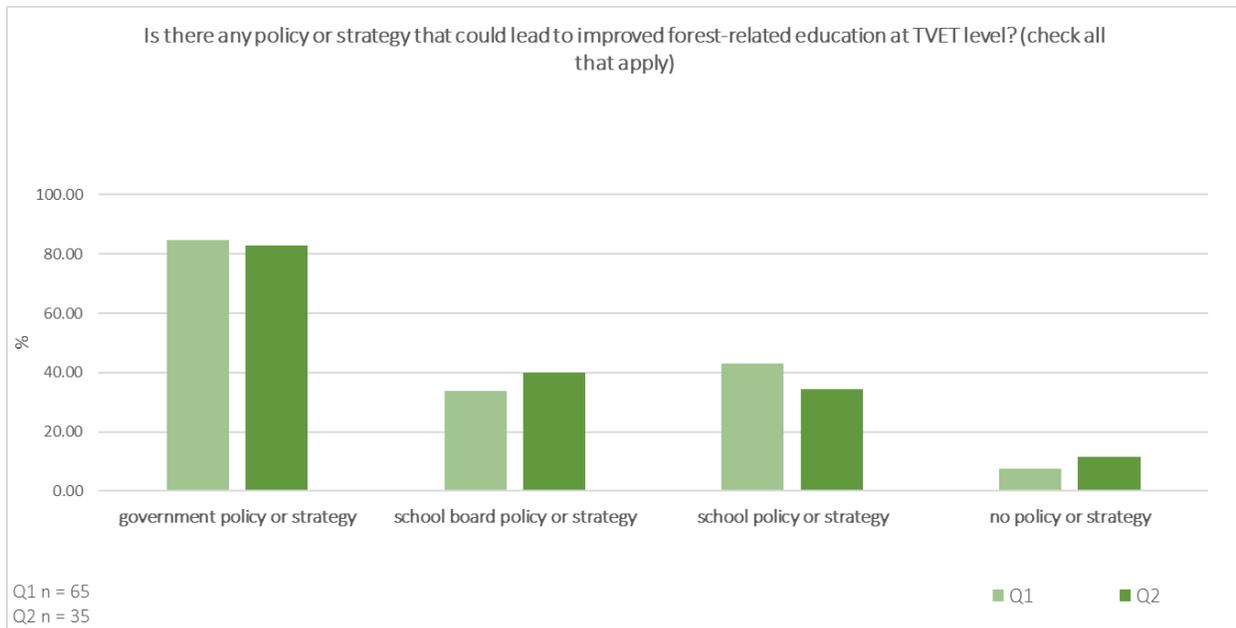


**Figure 26. Coverage of forest-related topics in TVET forest programmes (A33.2)**

The following additional topics and skills, among others, were identified to be inadequately covered at TVET forest education level: life skills, ICT in natural resources management, livelihood security and forests, basic management and leadership, planning and budget preparation, report writing, conflict management/resolution, forest law and jurisprudence, urban landscaping, forest and emerging issues, climate change and global warming, forest monitoring and evaluation, forest mapping, forest certification, ecotourism and digital literacy, forest and disaster risk management.

#### 4.3.2 Educational resources and policy

Most resources to support TVET forest training in Africa were reportedly inexistent or limited to a certain extent. These resources include teachers (e.g. materials support, quality and quantity), learning materials (e.g. textbooks, online learning materials and tools), educational environment (e.g. laboratory access, class size), and practical opportunities (e.g. experiential learning, practical training) (see Appendix Figure A23). Both professionals and teachers identified policy and strategy at government, school board and school levels as being able to improve forest-related education in TVET institutions (Figure 27).



**Figure 27. Policy or strategy that could lead to improved forest-related education at TVET level (A24)**

It was observed that students are not at all engaged or they are engaged to a limited extent in forest-related activities outside of school at TVET level as reported by 67 percent of professionals, and 49 percent of teachers. Part-time forest-related employment or internship was also reported not to be available at all or to be available to a limited extent. It was also reported by majority of all the respondents that students' engagement outside the school increases students learning moderately to very much (See Appendix Figure A26).

The common out-of-school forest-related activities in which students are reported to be frequently engaged in include, among others: World Environment Day, World Forest Day, World Water Day, forest resource management/exploitation, tree planting, field visits, environmental conservation clubs, forest management and conservation, plantation, restoration and rehabilitation of natural forests, *in-situ* and *ex-situ* conservation strategies, internship with governmental institutions and NGOs, training communities in forest-related activities and volunteer work in environmental bodies.

#### 4.3.3 Workplace readiness and employability

About 62 percent of professionals, 76 percent of teachers and 90 percent of students reported that forest education at TVET level in Africa prepares students well for the labor market (See Appendix Figure A34). The prevailing gaps between formal TVET schooling and the skills needed at the workplace were identified as lack of technical know-how in the application of ICT in natural resource management and limited entrepreneurial skills. Most students were reported to be trained to be employed in the formal sector though it has a limited capacity to absorb the students upon graduation. It was also reported that the teaching tools are grossly inadequate and there is a lack of public policies connecting TVET forest programmes and the Ministry of Forest in many countries.

The teaching approaches at TVET level were reported to be more theoretical with limited practical exercises. This is also coupled with inappropriate learning materials, limited field experience opportunities,

lack of internships, lack of incubation opportunities and limited forestry-based enterprises for experiential learning (See Appendix Figure A26). Some respondents also indicated that the duration of industrial training is inadequate for acquiring meaningful and relevant experience for the students. It was also pointed out that forestry is very much advanced in the use of modern technology but that government-funded forestry institutions find it challenging to cope up with the changing technology because of low funding. As a result, the learners complete their training programmes without being exposed to the current technologies in forestry and struggle to fit in a modern forestry world. An example was quoted as the enormous technological advances in Forest resources assessment and inventory which require the acquisition of drones, computers and GPS machines but are not available in most TVET forestry training institutes in Africa.

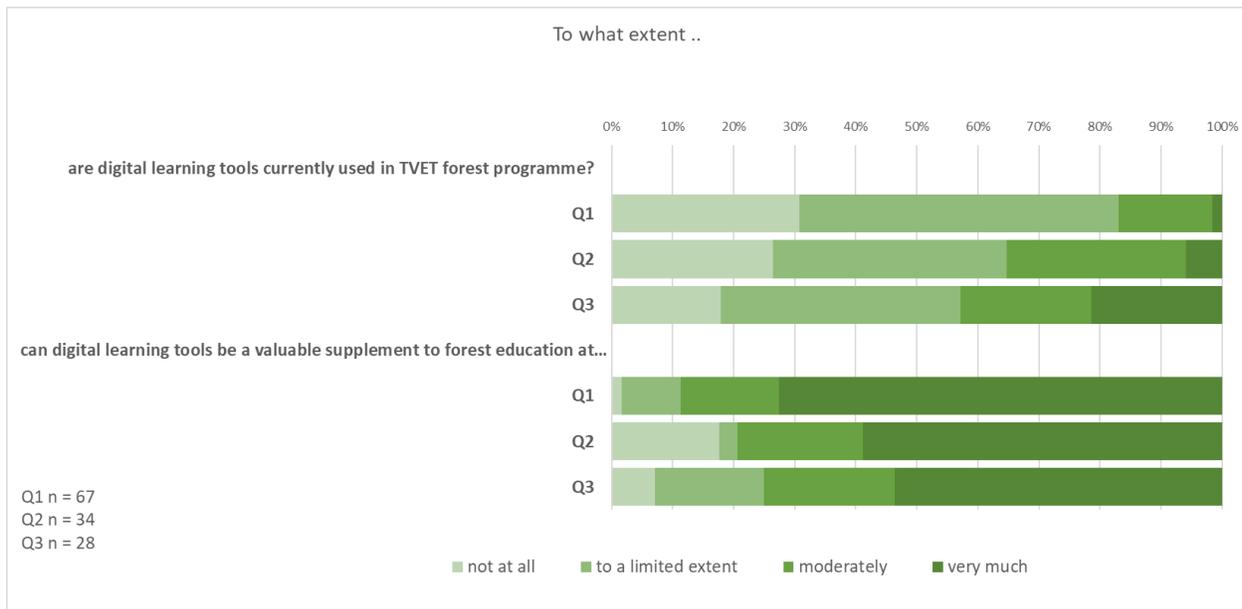
Race/ethnicity was found not to be a major factor in a graduate's ability to find a forest-related job in Africa as reported by 82 percent of professionals and 81 percent of teachers. Race/ethnicity was reported to not at all influence, or only to a limited extent, the kinds of job graduates are employed for in forestry (See Appendix Figure A35). The most important factors reported to be affecting employment opportunities for TVET graduates in Africa, are the limited forestry opportunities compared to the number of graduates. This was associated to the forestry training which was said not to be fully adapted to the market needs. The under-development of the forestry sector including cultural and ethnic biases that affect people's choices was also identified as a factor affecting employment of TVET graduates. Corruption, poor or lack of collaboration between training institutions and the existing employment opportunities leading to non-foresters doing forest work were also identified as factors affecting the employment of TVET forestry graduates in Africa.

It was noted that forestry and related sectors tend to receive less attention in relation to policies and budgetary support which has led to the shrinkage of the forestry industry in most African countries. Other factors identified included conflicts of interest during the deployment process, for example, female foresters (especially those with families) may experience a conflict of choices between family ties and their potential duty stations; limited forest-based industries with only government being the major institution employing foresters, and lack of governmental policies and strategies to support private forest practitioners in setting up and sustaining forest-related businesses.

Affordable continuing education and training (informal/non-degree education) to update and expand forest professionals' skills are reported to be not at all available or only to a limited extent (See Appendix Figure A25). Some respondents reported that though continuing forest education may be available in some countries, it was rather costly and not affordable for many unless with financial support from the government. In addition, continuing forest education was mainly demand-driven and thus it is only offered when the demand is high.

#### **4.3.4 Digital readiness**

According to 82 percent of professionals, 65 percent of teachers and 58 percent of students, digital learning tools are not being used at all, or only to a limited extent, in TVET forest education in Africa. This is besides the fact that digital learning tools could moderately or very much be a valuable supplement to forest education at TVET level, as reported by 88 percent of professionals, 79 percent of teachers and 75 percent of students (Figure 28).

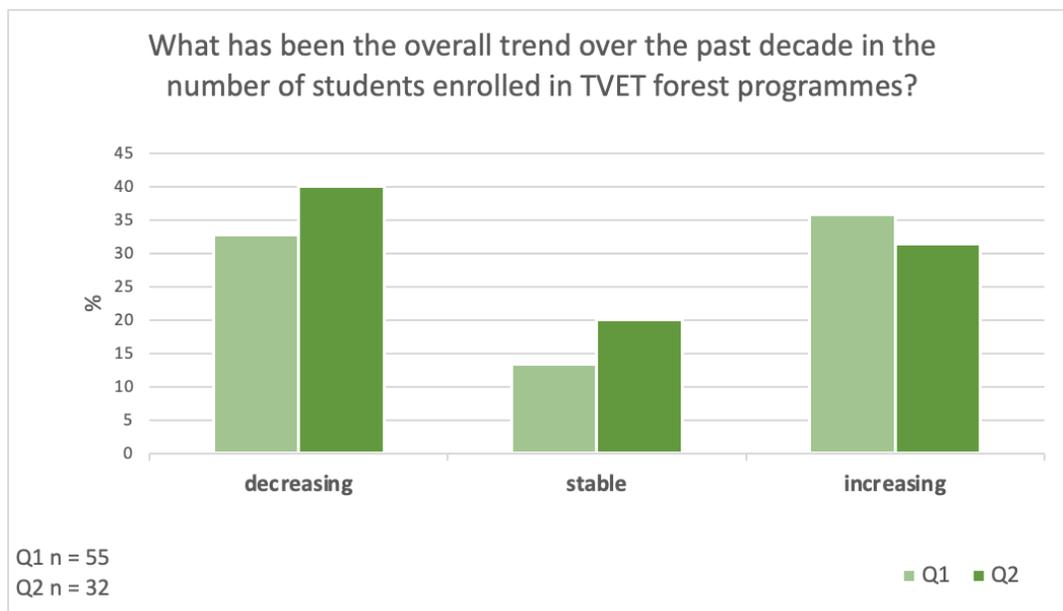


**Figure 28. Use and benefit of digital learning tools within TVET forest programmes (A27)**

The reason why the digital learning tools are used only to a limited extent in the TVET forest programmes in Africa was reported to be the high cost, and the majority of the TVET institutions cannot afford to acquire them. The respondents also indicated that most of the students that enrolled in TVET institutions were from low-income households and hence some may not be able to afford some of the modern technological devices like computers and smartphones. Others reported that digital learning is also limited due to the scarcity of internet and other communication instruments. However, it was noted that digital learning tools could increase the availability of learning resources and teaching materials as well as facilitate sharing of learning and teaching experiences. Moreover, the tools could facilitate the fast dissemination of research findings and good practices while enhancing the practicality of learning especially for GIS and remote sensing, forest planning and monitoring. The respondents indicated that the digital learning tools or enhanced technology ought to be made easily accessible to students in order to equip them and make them competitive for the global job markets.

#### 4.3.5 General developments and trends in TVET

The general trend over the past decade in the number of students enrolled in TVET forest programmes had been decreasing as reported by a majority of the teachers. On the other hand, there were more professionals than teachers who reported that the number has been increasing. In some countries, a few of the respondents reported that the trend had been stable (Figure 29).



**Figure 29. Overall trend in student enrolment in TVET forest programmes over the past decade (A36)**

The key factors that were identified as contributing to the reduced quality of TVET forest education in Africa were the lack of employment opportunities for forest graduates thereby demotivating students from enrolling, poor remuneration of employees working in forestry sectors, limited investment in forestry enterprises and inadequate infrastructural development to support new curricula thus impinging on the quality of TVET forest education.

On the other hand, the expansion of government loan facilities to learners in some countries in Africa was reported to have helped increase the number of students enrolling in TVET forest education, though the number and facilities of TVET institutions have not increased to accommodate the growing numbers. The other reason for the increase was cited as the lowering of the entry mark for high school leavers for the TVET forest programme.

#### **4.4 Forest Education at University and college level in Africa**

##### **4.4.1 Forest Education at Bachelor’s level in Africa**

The following are survey results from 73 professionals, 55 teachers and 70 students who answered questions on forest education at Bachelor’s level from different countries in Africa.

##### **4.4.1.1 Education content and competencies**

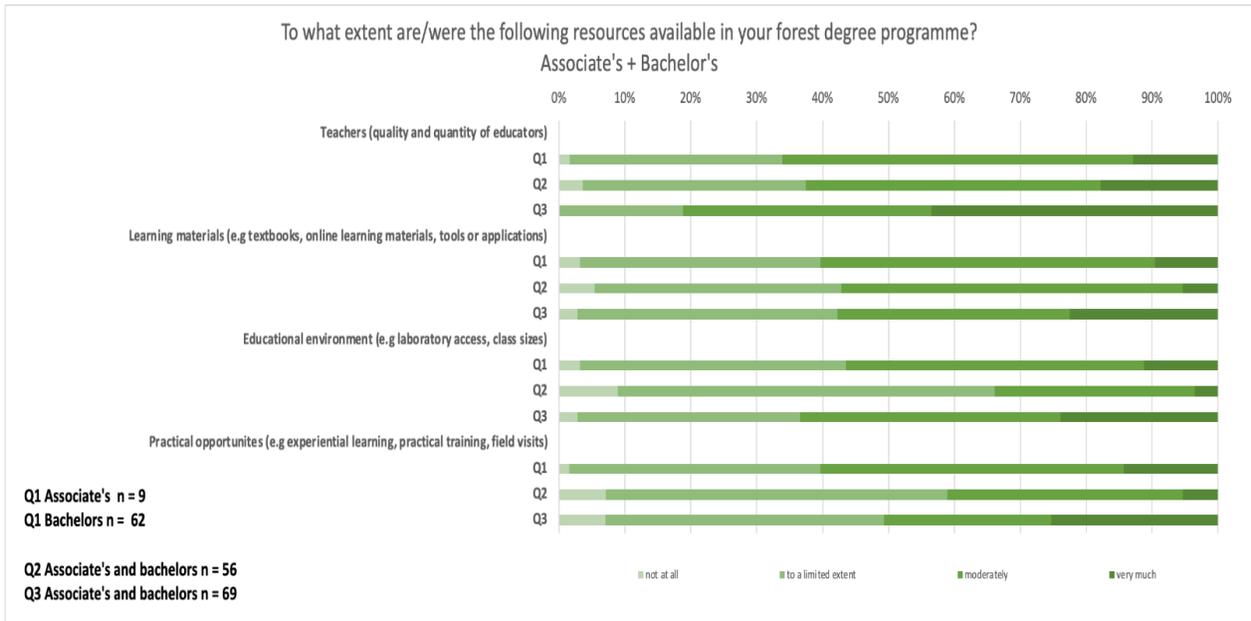
There is a wide difference in topics coverage on forest education at Bachelor’s degree level in Africa. Forest biodiversity (plants, animals and ecosystems) was reportedly sufficiently or excessively covered by 78 percent of professionals, 85 percent of teachers and 80 percent of students (See Appendix Figure A55). Other topics that were reported to be sufficiently or excessively covered include forest ecology, wood and non-wood forest products, silviculture and agroforestry. Other topics reported to be sufficiently or excessively covered include policy and legislation, forest/natural resource/environmental economic, forest tenure and governance and cultural values of forests and trees (See Appendix Figure A58). The respondents

reported that forest soils, forest genetic resources, range management, watershed management, forests and climate change, forest landscape restoration, forest mapping, inventory, remote sensing and GIS, sustainable harvesting systems, forest health (pest and diseases), role of forests and human health, forests, trees and ethnicity issues, forests, trees and gender issues, forest-based recreation and cultural values of forests and trees, wood as renewable energy, wood technology, entrepreneurship, forest industry, marketing and management were inadequately covered (See Appendix Figures A70 and A73).

Part-time forest-related employment or internship was reported to be either inexistent or available to a limited extent. On the other hand, 80 percent of teachers reported that part-time related employment or internship could increase students’ learning moderately or very much (See Appendix Figure A76).

**4.4.1.2 Educational resources and policy**

Teachers (quality and quantity of educators) for teaching Bachelor of Forestry degree programme in many African universities were reported to be moderately or very much available by 57 percent of professionals, 65 percent of teachers and 86 percent of students. Learning materials (e.g. texts books, online learning materials, tools or applications) for teaching were reported by almost 50 percent of the respondents to be either inexistent or available to a limited extent. Practical opportunities (e.g. experiential learning, practical training, field visits) were also reported to be moderately available or available to limited extent (Figure 30).

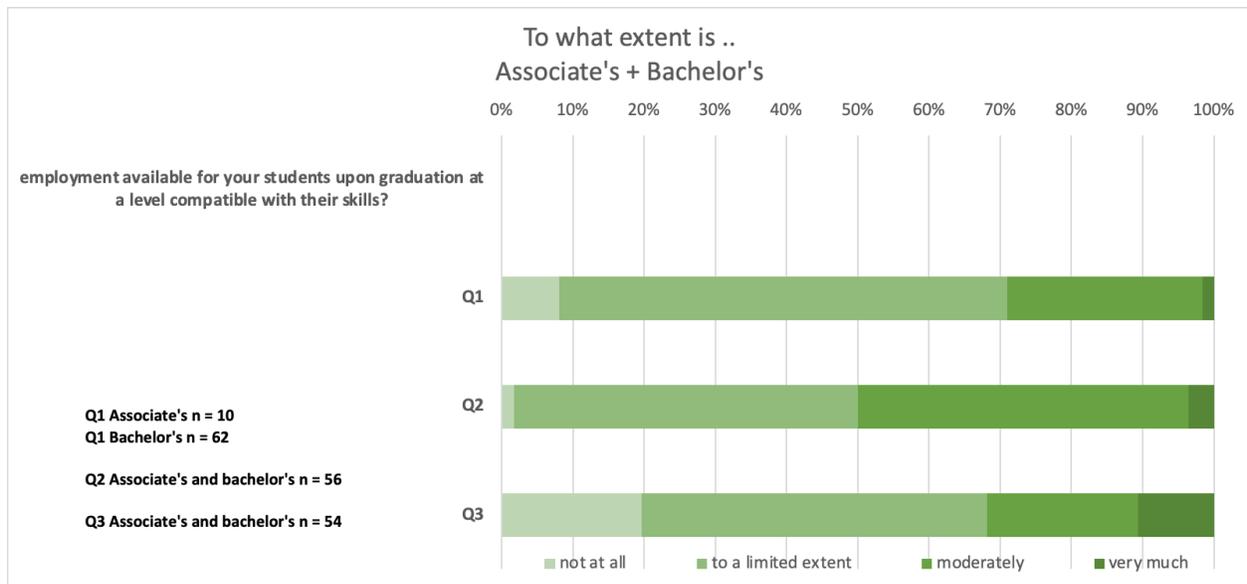


**Figure 30. Availability of resources in forest degree programme (Bachelor’s) (A37)**

The respondents identified the presence of government policy or strategy, school policy or strategy and school board policy or strategy that could be used to improve forest-related education at the university and college level in Africa (See Appendix Figure A40).

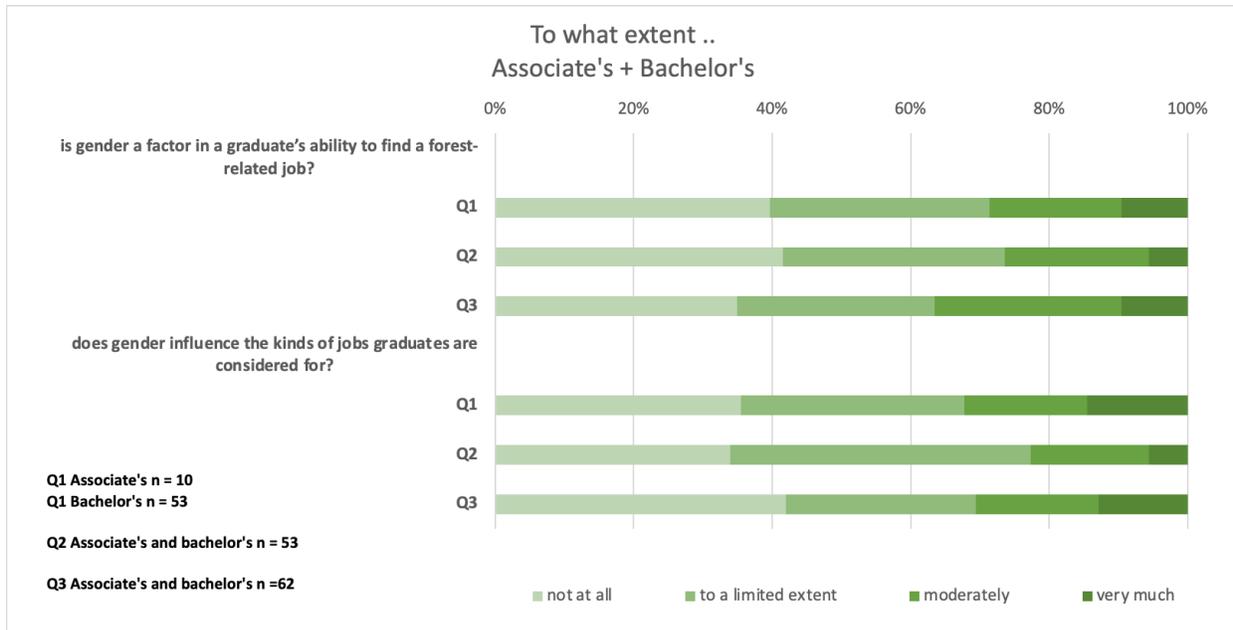
#### 4.4.1.3 Workplace readiness and employability

On improving students' workplace readiness and employability, it was reported that students were not at all engaged or were engaged to a limited extent, in forest-related activities outside the school (e.g. societies, networks, clubs, community outreach). On student's preparedness for the workforce, 68 percent of professionals, 72 percent of teachers and 82 percent of students reported that they are moderately or very much prepared. Employment availability for students who had studied forest education at Bachelor's degree level, was reported by 70 percent of professionals, 50 percent of teachers and 68 percent of students to be inexistent or to be available to a limited extent (Figure 31).



**Figure 31. Availability of forest-related part-time employment and effect on learning (Bachelor's) (A76)**

Gender was reported by 70 percent of professionals, 72 percent of teachers and 62 percent students not to influence at all, or only to a limited extent, a graduate's ability to find a forest-related job. Gender was also reported not to influence at all, or only to a limited extent, the kinds of jobs forest graduates are considered for as reported by 68 percent of professionals, 78 percent of teachers and 70 percent of students (Figure 32). About 58 percent of professionals, 52 percent of teachers and 51 percent of students reported that race/ethnicity has no influence, or very limited influence, on a graduate's ability to find a forest-related job upon graduation. A higher percentage of the respondents reported that race/ethnicity does not influence the kind of job graduates are considered for in forestry sector (See Appendix Figure A84).

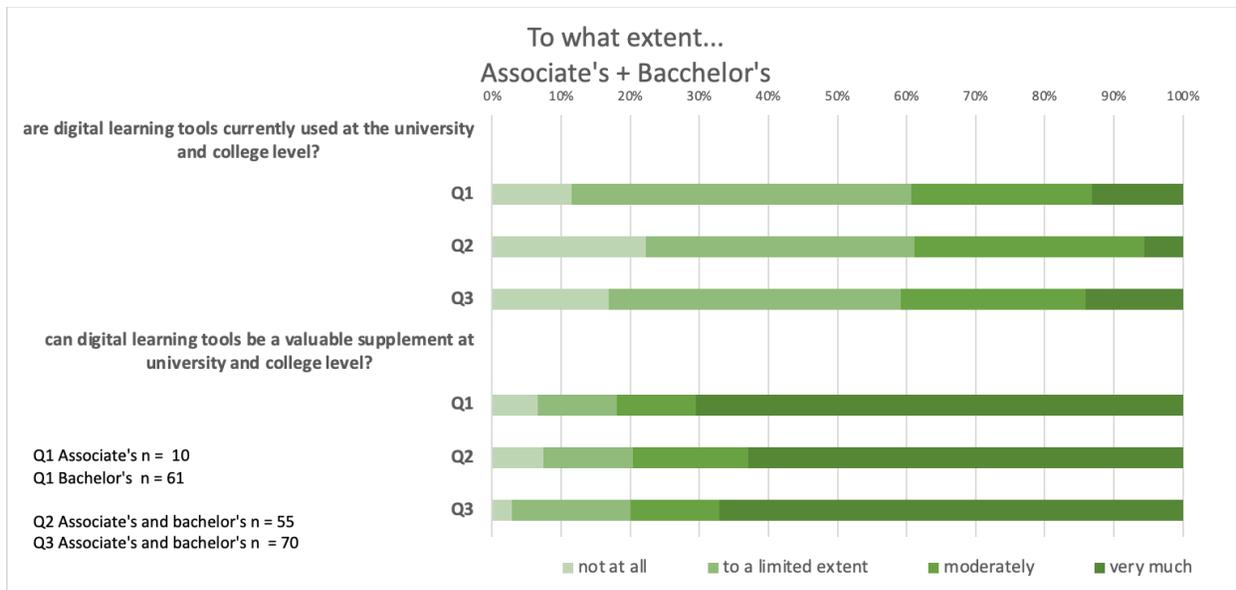


**Figure 32. Gender as a factor and influence on forest-related employment (Bachelor's) (A81)**

Affordable continuing education and training i.e. informal/non-degree education to update and expand forest professionals' skills was reported not to be available at all or it was available to a limited extent as reported by 60 percent of the respondents (See Appendix Figure A87). Most of the respondents reported that the trend in student enrolment for Bachelor of Forestry degree programme has been decreasing over the past decade while some respondents reported that it has been increasing in some universities. In some countries, the trend has remained stable as reported by a few of the respondents (See Appendix Figure A90).

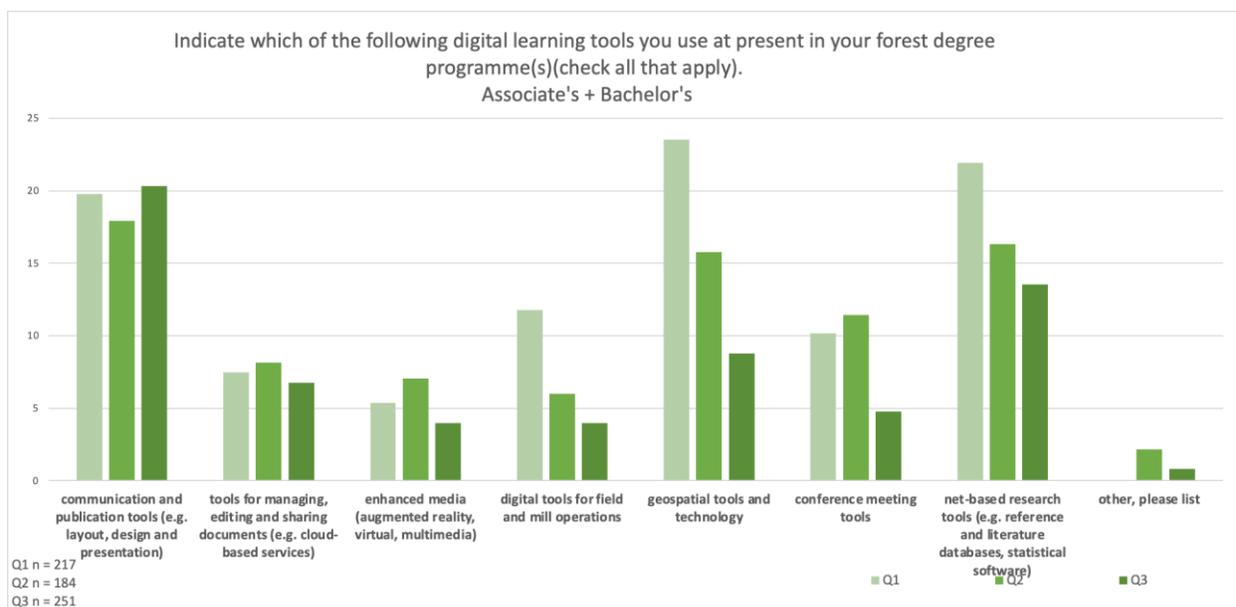
#### **4.4.1.4 Digital readiness**

Digital tools were reported by 61 percent of professionals, 61 percent of lecturers and 59 percent of students not to be used at all or to be used to a limited extent. About 40 percent of all the respondents reported that the use of digital tools was moderate or very much available. Digital learning tools can be moderately or very much a valuable supplement at university and college level as reported by 70 percent of professionals, 62 percent of teachers and 68 percent of students (Figure 33).



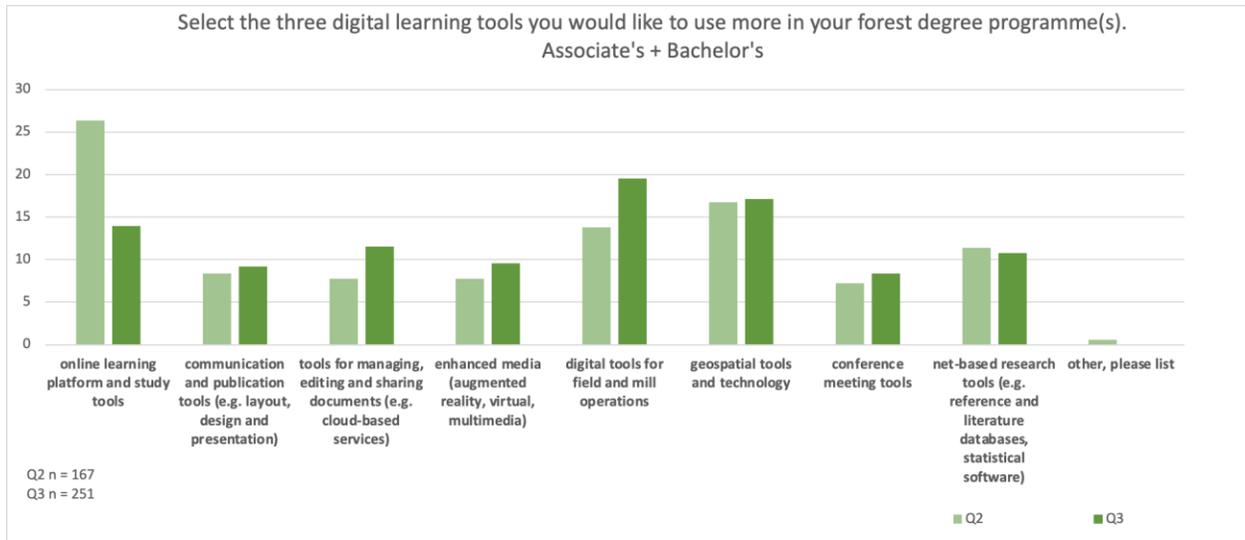
**Figure 33. Use of digital learning tools at university and college level (Bachelor's) (A44)**

Respondents identified geospatial tools and technology, net-based research tools (e.g. reference and literature databases, statistical software, communication and publication tools e.g. layout, design and presentation) as the digital learning tools that are currently used in the forest degree programmes. Teachers reported using geospatial tools and technology, conference meeting tools, tools for managing, editing and sharing documents (e.g. cloud-based services) and enhanced media (augmented reality, multimedia) and digital tools for field and mill operations. They were using these tools more than their students. On the other hand, there were more students who indicated using communication and publication tools compared to their teachers. There were also more professionals than teachers and students who reported using geospatial tools and technology, net-based research tools (e.g. reference and literature database, statistical software) and digital tools for field and mill operations (Figure 34).



**Figure 34. Use of digital learning tools in degree programmes (Bachelor's) (A47)**

The three digital learning tools that the respondents reported they would like to use more in their forest degree programme, are online learning platforms and study tools that were selected by 26 percent of teachers followed by geospatial tools and technology selected by 17 percent of teachers and digital tools for field and mill operations selected by 14 percent of teachers. On the other hand, the top three digital tools that students identified were digital tools for field and mill operations (19 percent), followed by geospatial tools and technology (16 percent) and finally online learning platform and study tools (14 percent). It is important to note that about five digital tools were selected by less than 15 percent of the respondents, showing that most of them were not familiar with different digital learning tools (Figure 35).



**Figure 35. Desired digital learning tools for use in degree programme (Bachelor's) (A50)**

When asked to select the three digital tools they would like to use more in their forest degree programme, more students than teachers selected Forest learning, FAO e-learning academy, Global Landscape Forum (GLF) Landscape Academy and the Council for learning outside the classroom's digital learning environment. More teachers than students selected the Global Forest Information Service (GFIS) and FAO's Sustainable Forest Management (SFM) Toolbox digital learning environment. More professionals than teachers and students selected FAO e-learning academy, FAO SFM Toolbox and GLF Landscape Academy digital learning environment (See Appendix Figure A52).

#### **4.4.1.5 General developments and trends in forestry education at university and college level**

The respondents (67 percent of professionals and 66 percent of teachers) reported that Bachelor of Forestry graduates at university and college level in Africa have a moderate or very high understanding of the relevance of forests and their sustainable management to emerging global trends and to the Sustainable Development Goals (SDGs). Less than 5 percent of the respondents reported that graduates have no understanding at all of the relevance of forests and their sustainable management to emerging global trends and to the Sustainable Development Goals (SDGs) (See Appendix Figure A93).

#### **4.4.2 Master's and Doctoral level**

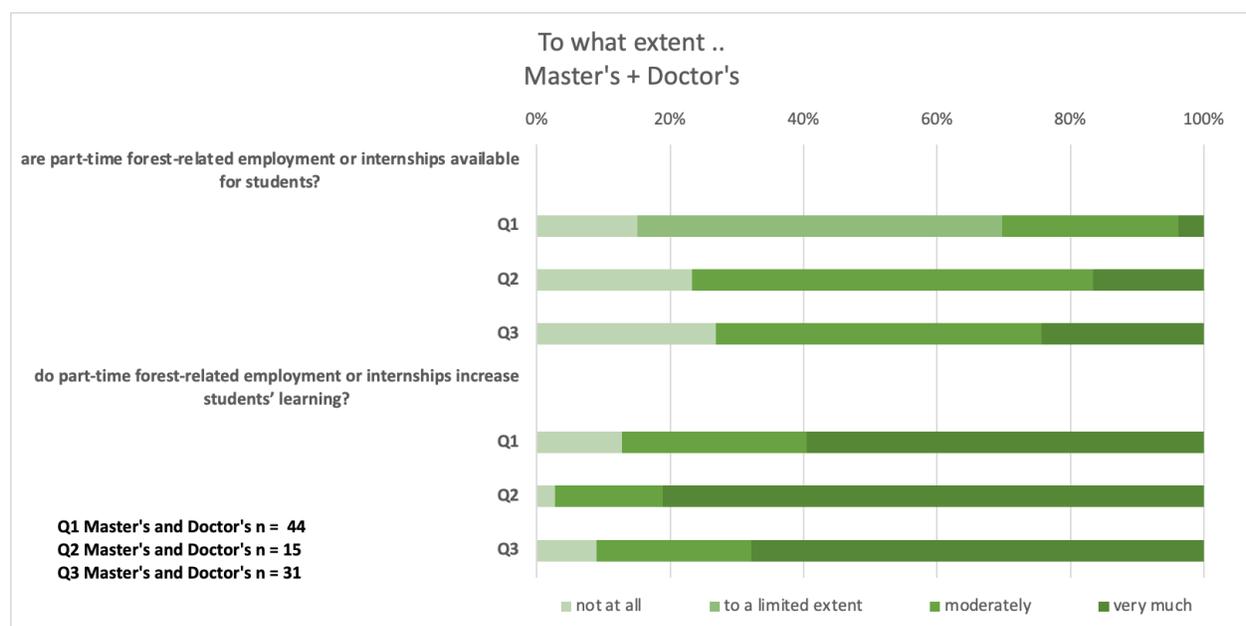
The following are results of a survey of 64 professionals, 24 teachers and 42 students from different countries in Africa.

#### 4.4.2.1 Education content and competencies

Topics on forest education content and competencies at postgraduate level in Africa, are covered differently. As reported by 50 percent of professionals, 54 percent of teachers and 68 percent of students, forest genetics is inadequately covered (See Appendix Figure A56). Other topics reported to be inadequately covered included: forest soils, forest landscape restoration, forest mapping, inventory and remote sensing, forest planning, range management and watershed management. Topics that are reported to be sufficiently or excessively covered include: wood and non-wood forest products, forest ecology, silviculture, forest planning and wildlife management. Topics on forests and human health, gender issues and forests, trees and ethnicity were also reported to be sufficiently or excessively covered by about 50 percent of the respondents (See Appendix Figure A62).

Participants also identified forest fire management, forest health (pest and diseases), urban forestry and forest-based recreation and traditional and/or indigenous forest-related knowledge, entrepreneurship, forest industry, marketing and management, wood technology, small-scale forest enterprise (wood and non-wood), as the most inadequately covered topics. More than 70 percent of the respondents reported that forest conservation is either sufficiently or excessively covered. Other topics that are reported to be sufficiently or excessively covered include wood as a renewable energy, cultural values of forests and trees, forest policy and legislation, land tenure and governance and forest/natural resources/environmental economics (See Appendix Figure A74).

Part-time forest-related employment or internship was reported by 70 percent of professionals to be inexistent, or available only to a limited extent. On the other hand, about 74 percent of teachers and 72 percent of students reported that it is moderately, or very much available. Part-time forest-related employment or internship was reported by 60 percent of professionals, 82 percent of teachers and 68 percent of students, to increase students' learning very much (Figure 36).



**Figure 36. Availability of forest-related internship or part-time employment and effect on learning (Master's and Doctor's) (A77)**

#### 4.4.2.2 Educational resources and policy

Teachers (quality and quantity of education) were reported by 51 percent of professionals, 66 percent of teachers and 85 percent of students to be moderately or very much available at postgraduate level. Learning materials (e.g. textbooks, online learning materials and tools or applications) at postgraduate level were reported by 50 percent of professionals, 54 percent of teachers and 48 percent of students not to be there at all or to be available to a limited extent (See Appendix Figure A38). Other resources like educational environment (e.g. laboratory access, class sizes) and practical opportunities (e.g. experiential learning, practical training and field visits) were reported by about 50 percent of all the respondents not to be available, or to be available to a limited extent. Since policy and strategy play a key role in development and improvement of education at university and college level, when the respondents were asked whether there existed policy or strategy that could lead to improved forest-related education, 50 percent of professionals and 45 percent of teachers identified government policy and strategy, 24 percent of professionals and 19 percent of teachers identified school policy and strategy, while 20 percent of professionals and 28 percent of teachers identified school board policy and strategy, and less than 5 percent of the respondents reported that there was no policy (See Appendix Figure A40).

#### 4.4.2.3 Workplace readiness and employability

On workplace readiness and employability, the postgraduate forestry students are reported by 38 percent of professionals, 58 percent of teachers and 57 percent of students to be engaged moderately or very much in forest-related activities outside schools (e.g. societies, networks, clubs and community outreach). The postgraduate forest degree programme was also reported by 62 percent of professionals, 84 percent of teachers and 92 percent of students to prepare students moderately or very much for the job market (Figure 37).

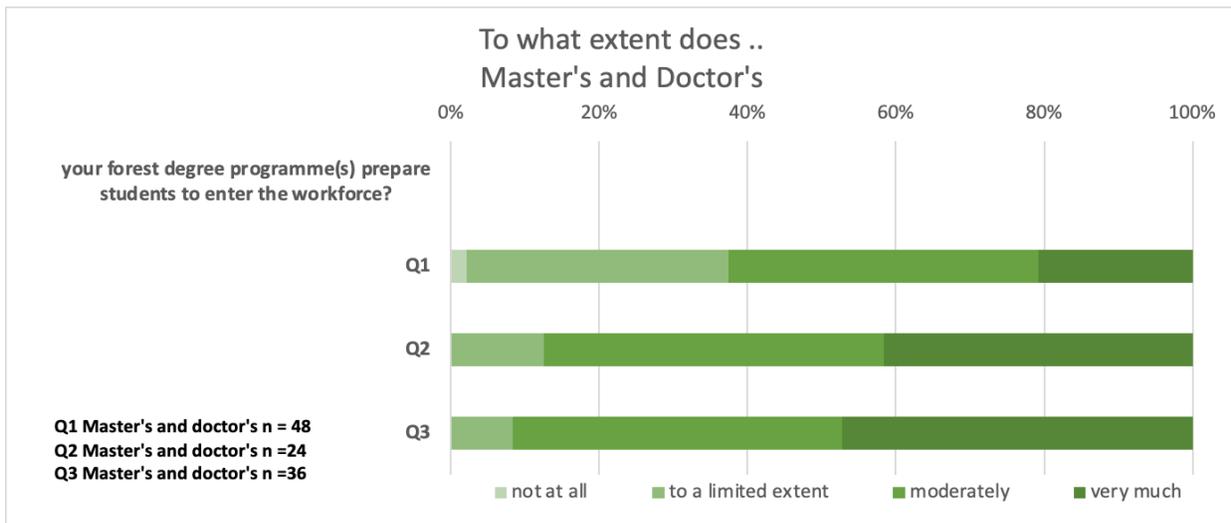
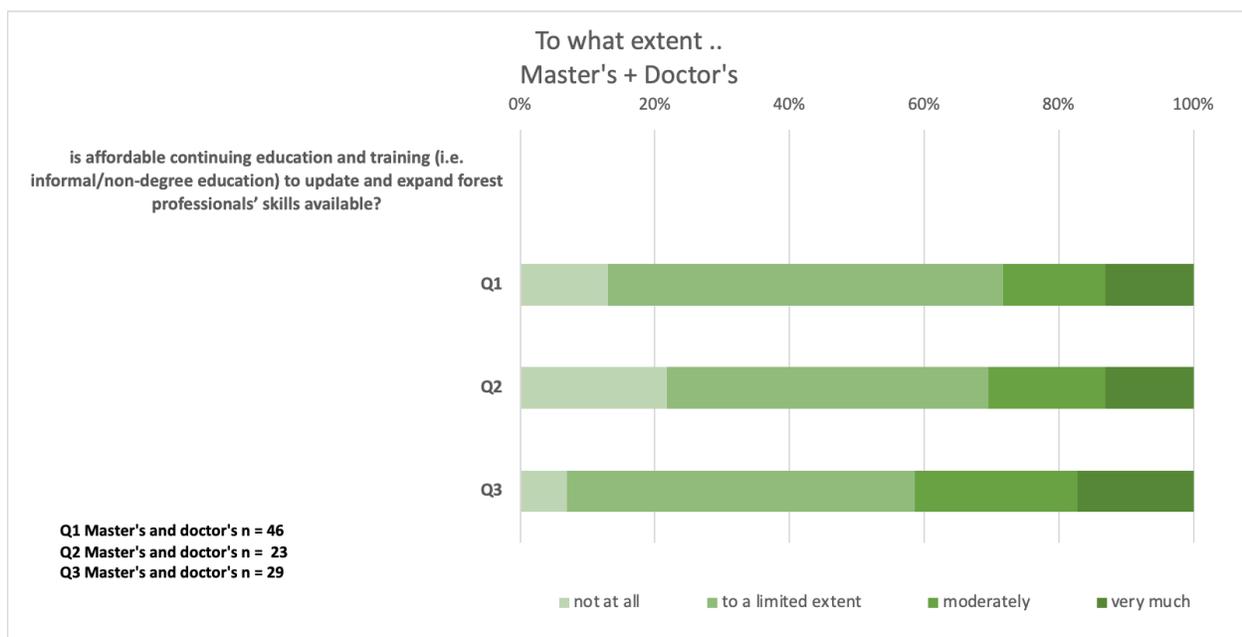


Figure 37. Workforce readiness within the degree programme (Master's and Doctor's) (A79)

Gender was reported by 76 percent of professionals, 70 percent of teachers and 72 percent of students not to be a factor at all, or only to a limited extent, in a postgraduate's ability to find a forest-related job. Gender does not at all influence, or it does to a limited extent, the kind of job postgraduate students are considered for, as reported by 66 percent of professionals, 63 percent of teachers and 84 percent of students (See

Appendix Figure A82). Ethnicity/race is not at all a factor, or only to a limited extent, in a postgraduate’s ability to find a forest-related job upon graduation, as reported by 88 percent of professionals, 62 percent of teachers and 78 percent of students. A majority of the respondents also reported that it does not at all, or does to a limited extent, influence the kinds of jobs graduates are considered for upon graduation (See Appendix Figure A85).

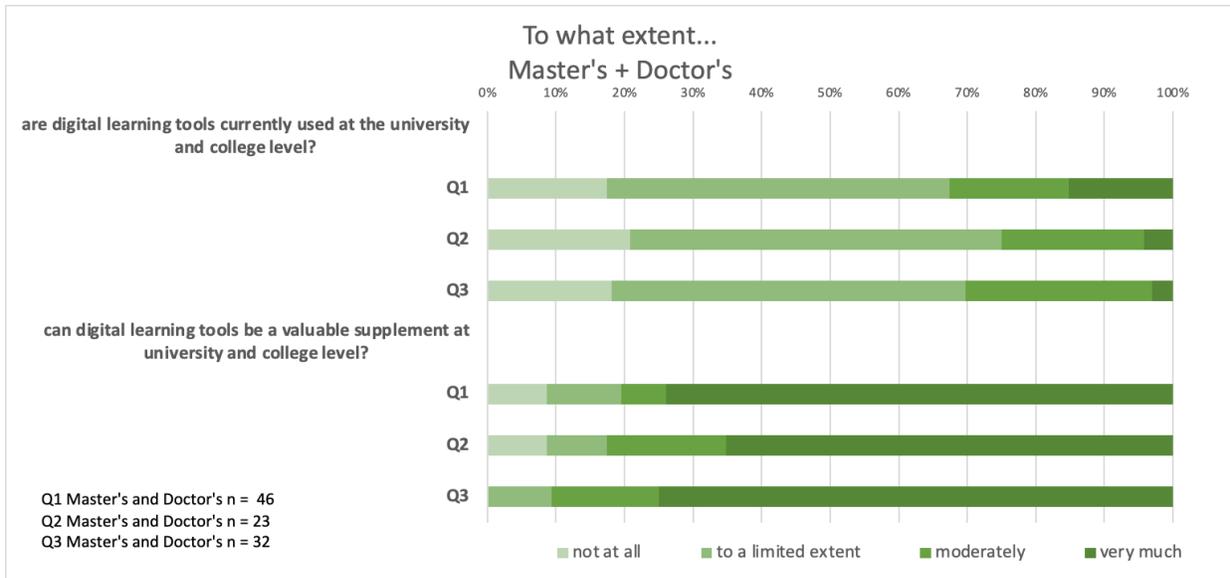
Affordable continuing forest education and training (i.e. informal/non-degree education) that would allow forest professionals to update and expand their skills at postgraduate level was reported by 70 percent of professionals, 69 percent of teachers and 59 percent of students to be inexistent, or to be available only to a limited extent as shown in Figure 38.



**Figure 38. Availability of affordable continuing non-formal forest education (Master’s and Doctor’s) (A88)**

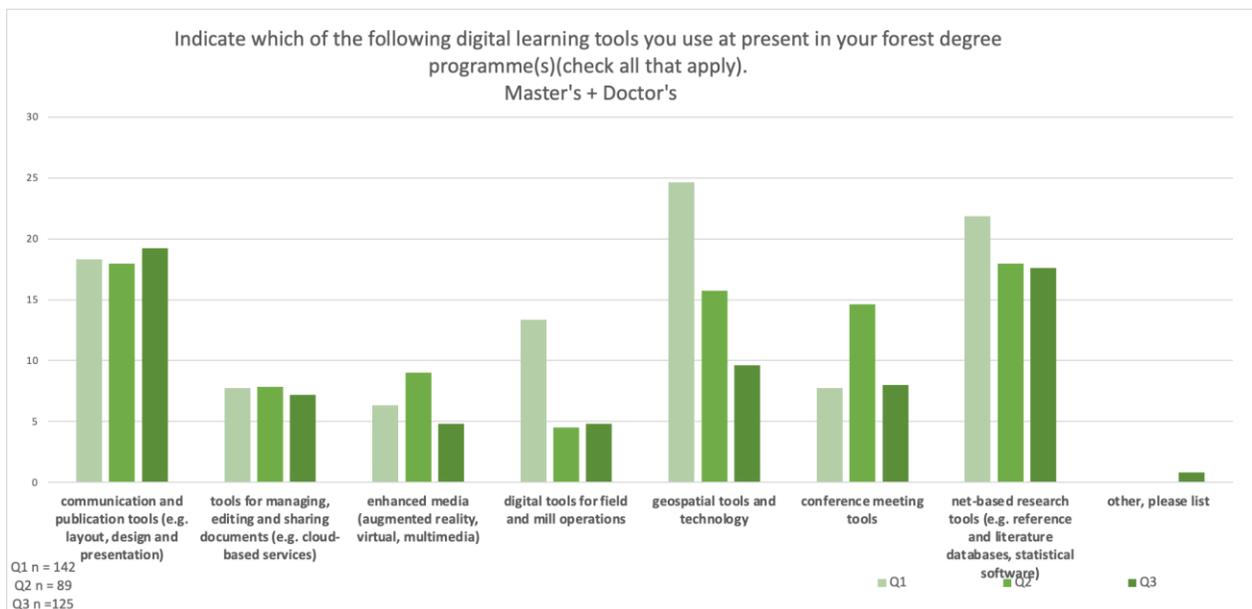
#### 4.4.2.4 Digital readiness

Digital learning tools for forest education at postgraduate level in the universities and colleges in Africa was reported by 68 percent of professionals, 75 percent of teachers and 70 percent of students not to be used at all, or to be used only to limited extent. Digital learning tools were reported by 73 percent of professionals, 65 percent of teachers and 74 percent of students to be potentially valuable supplements at university and college level. This shows that there is potential for digital learning tools as valuable supplements for forestry postgraduate studies in Africa (Figure 39).



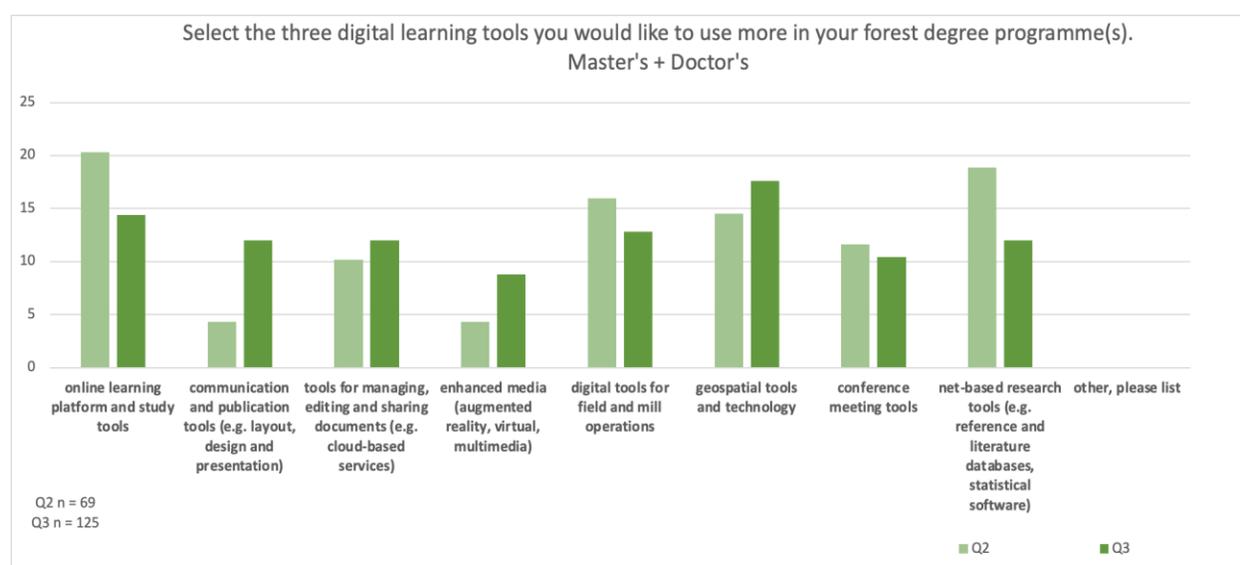
**Figure 39. Use of digital learning tools at university and college level (Master's and Doctor's) (A45)**

The learning tools that are currently in use for postgraduate forest degree programmes as identified by professionals, are geospatial tools and technology, net-based research tools (e.g. reference and literature databases, statistical software), net-based research tools and communication and publication tools (e.g. layout, design and presentation) and digital tools for field and mill operations. Teachers on the other hand identified communication and publication tools (e.g. layout, design and presentation), net-based research tools (e.g. reference and literature databases, statistical software), geospatial tools and technology and conference meeting tools. Students identified communication and publication tools (e.g. layout, design and presentation), net-based research tools (e.g. reference and literature databases, statistical software), geospatial tools and technology, and enhanced media (augmented reality, virtual, multimedia) (Figure 40).



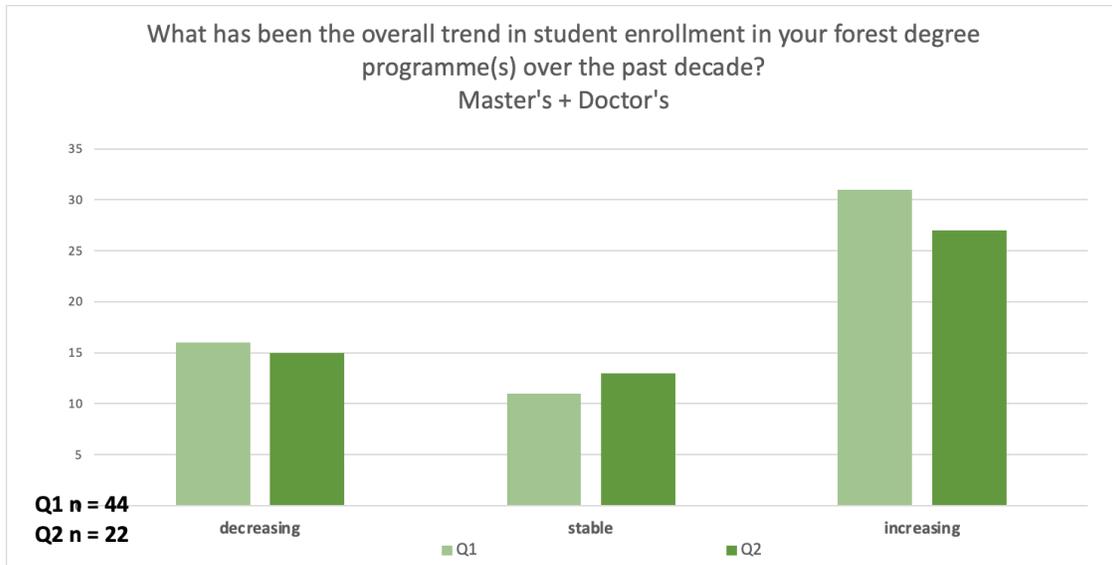
**Figure 40. Use of digital learning tools in degree programme (Master's and Doctor's) (A48)**

The digital tools with which the professionals indicated being most familiar with are the Global Forest Information Service (GFIS), FAO e-learning Academy, FAO SFM Toolbox and GLF Landscape Academy. On the other hand, teachers identified the Global Forest Information Service (GFIS), FAO e-learning Academy, and FAO SFM Toolbox as the most familiar digital tools. Students on the other hand identified the GFIS, FAO e-learning Academy and GLF Landscape Academy as the most familiar tools. Professionals were more familiar with more digital environment tools than teachers and students, except for the project learning tree with which teachers were more familiar than professionals or students. Students were more familiar than teachers with the GFIS, FAO e-learning Academy, and GLF landscape academy (See Appendix Figure A53). The three digital tools most selected by teachers for use in their postgraduate degree programme(s), were online learning platforms and study tools, net-based research tools and digital tools for field and small operations. Students, on the other hand, selected geospatial tools and technology, online learning platforms and study tools, and digital tools for field and mill operations (Figure 41).



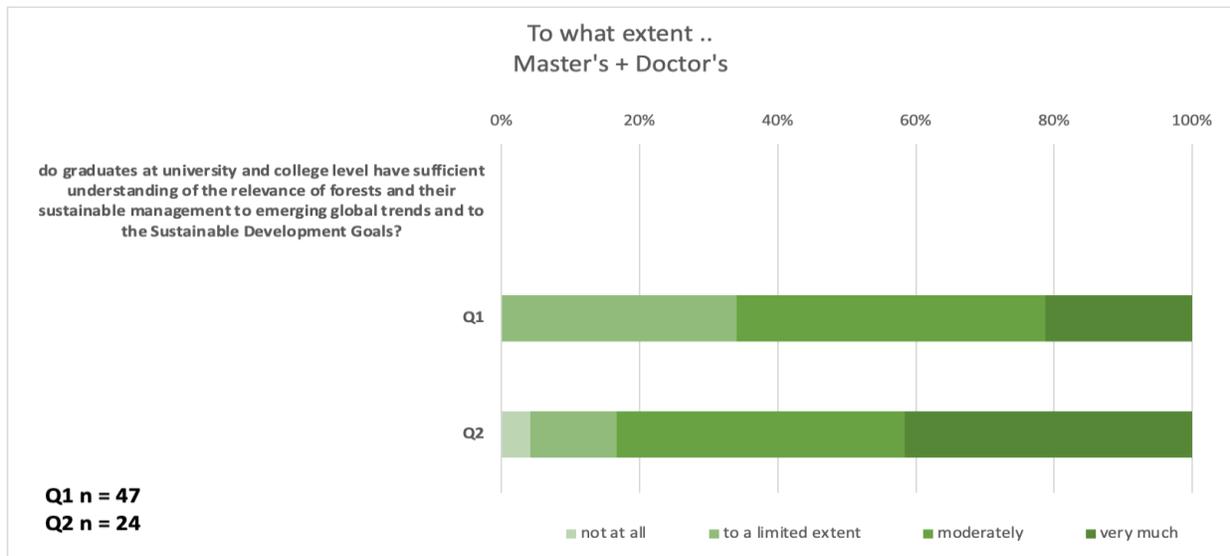
**Figure 41. Desired digital learning tools for use in degree programme (Master's and Doctor's) (A51)**

The majority of the respondents reported that the overall trend in student enrolment in postgraduate forest degree programme(s) over the past decade has been increasing. In answering the same question, there were more professionals than teachers who reported that the overall trend in student enrolment for the postgraduate forest programme(s) over the past decade has been increasing. A small number of the respondents reported that the trend has been decreasing while a very small number of the respondents reported that it has been stable (Figure 42).



**Figure 42. Overall trend in student enrolment in forest-related programmes (ten-year period) (Master's and Doctor's) (A91)**

Concerning the level of understanding by graduates at postgraduate level of the relevance of forests and their sustainable management to emerging global trends and to the Sustainable Development Goals (SDGs), 66 percent of professionals and 84 percent of teachers reported that students had a moderate or very high understanding of the relevance of forests and their sustainable management to emerging global trends and to Sustainable Development Goals (Figure 43).



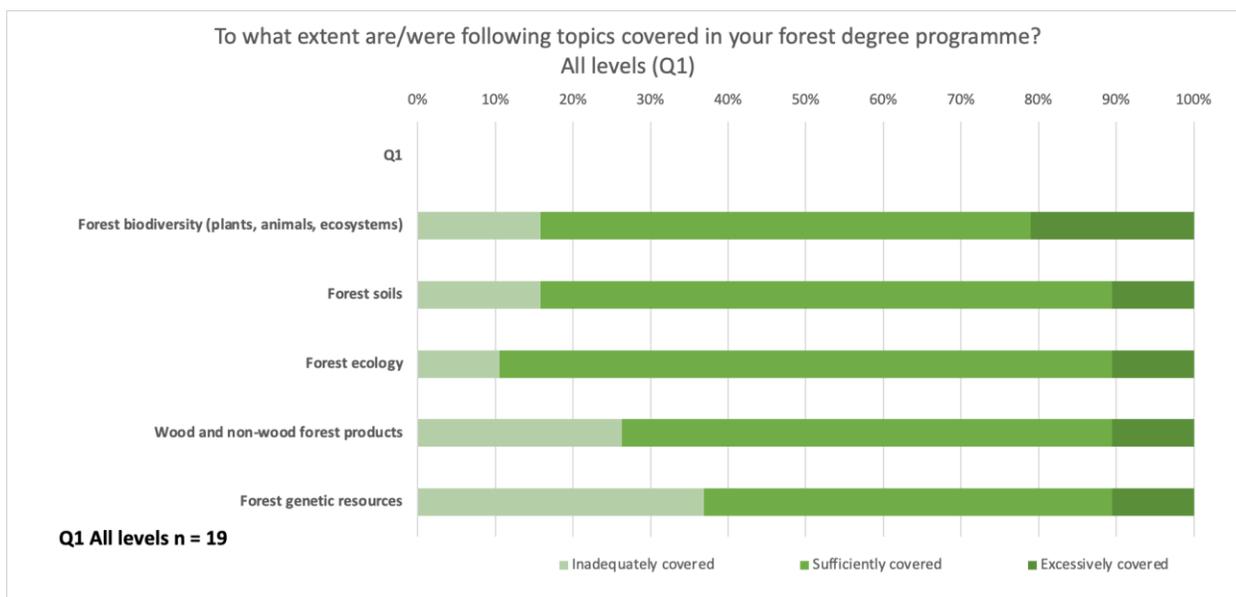
**Figure 43. Graduate understanding of forests' relevance to emerging trends and Sustainable Development Goals (SDGs) (Master's and Doctor's) (A94)**

#### 4.4.3 Forest Education at all university and college levels

The following are results from a survey where data were collected from 127 respondents (professionals and teachers) from 17 countries in Africa.

#### 4.4.3.1 Education content and competencies

There is a big difference on the coverage of different topics at all university and college level. Forest biodiversity, forest soils, forest ecology, wood and non-wood forest products, silviculture, agroforestry, forest conservation, forest planning, wildlife management, watershed management, forest and climate change and forest landscape restoration were reported to be either sufficiently or excessively covered. Forest genetic resources, forest policy and legislation and forest/natural resource/environmental economic resources were also reported to be sufficiently or excessively covered (Figure 44).

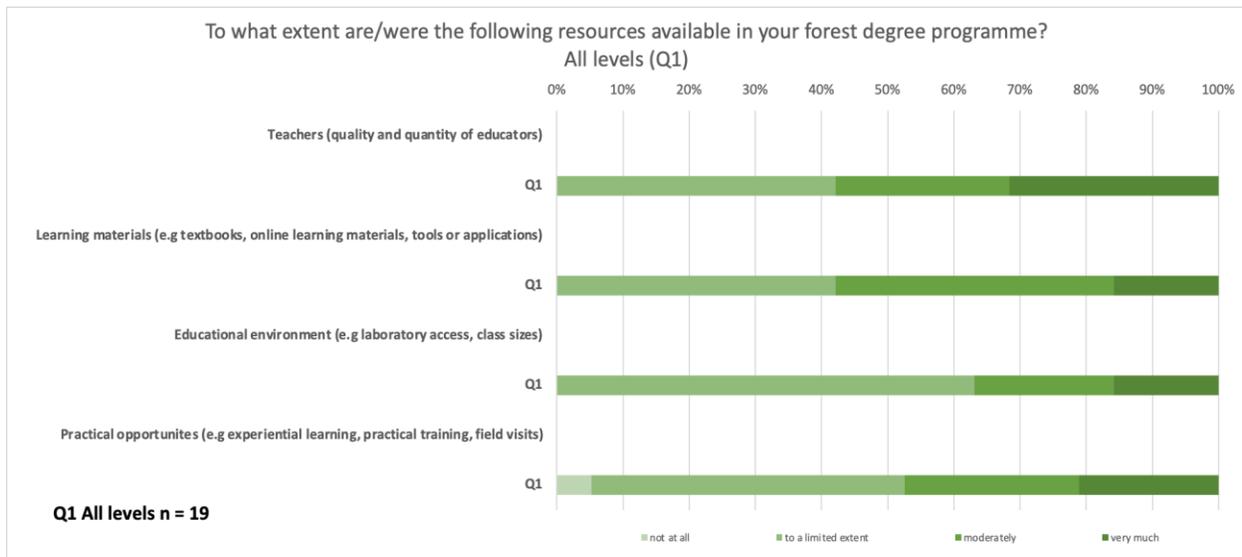


**Figure 44. Coverage of forest-related topics in degree programme (forest biodiversity, forest soils, forest ecology, wood and non-wood forest products, forest genetic resources) (all levels) (A57)**

Topics like urban forestry; forest fire management; range management; traditional and/or indigenous forest-related knowledge; forest-based recreation; forests, trees and ethnicity; forests, trees and gender issues; forests and human health; forest enterprises (wood and non-wood); entrepreneurship; wood technology; forest tenure and governance, were reported to be inadequately covered (See Appendix Figures A60, A67 and A72).

#### 4.4.3.2 Education resources and policy

On education resources and policy, teachers (quality and quantity) and learning materials (e.g. textbooks, online learning materials, tools or applications) were moderately or very much available, as reported by 58 percent of the respondents. The educational environment (e.g. laboratory access and class sizes), practical opportunities (e.g. experiential learning, practical training and field visits) were reported not to be available at all, or were available to a limited extent as reported by 63 and 52 percent of the respondents respectively (Figure 45).



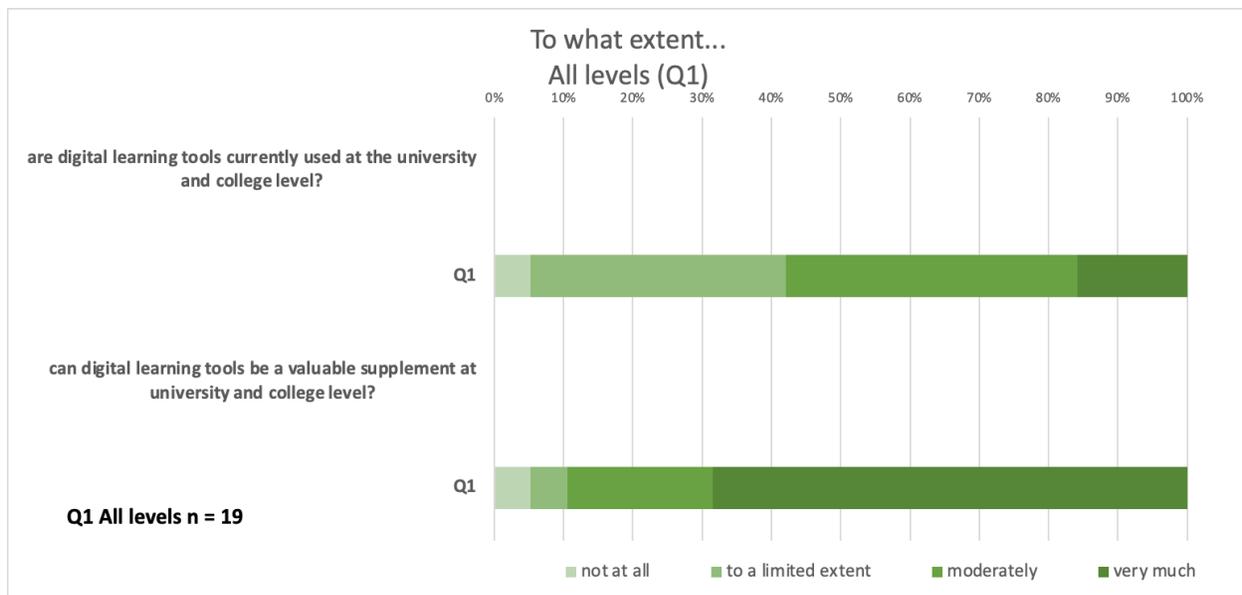
**Figure 45. Availability of resources in forest degree programmes (All Levels) (A39)**

#### **4.4.3.3 Workplace readiness and employability**

University and college programmes in Africa reportedly prepare students moderately or very much to enter the workforce, as reported by 58 percent of the respondents, while 42 percent felt that students are either not prepared at all or are prepared only to a limited extent for the labor market. Gender was reported to influence the graduates’ ability to find a forest-related job or the kind of jobs they are considered for as reported by 62 percent of the respondents. Gender was therefore reported to be a factor in a graduate’s ability not only to find a forest-related job, but also in the kind of forest jobs in Africa. There was only a small percentage of the respondents who reported that gender does not at all influence a forest graduate in finding a job or the kind of job (See Appendix Figure A83). Race/ethnicity is not at all a factor, or only to a limited extent, in a graduate’s ability to find a forest-related job upon graduation as reported by 61 percent of the respondents. It is not at all a factor, or only to a limited extent, in the kind of job a forest graduate is considered for upon graduation, as reported by 76 percent of the respondents. A small percentage of the respondents reported that race/ethnicity is a factor in a graduate finding a forest-related job or the kind of job after graduation (See Appendix Figure A86). On affordability and availability of continuing education and training (i.e. informal/non-degree education) to update and expand forest professionals’ skills, 61 percent of the respondents reported that the training is not at all available or is available to a limited extent.

#### **4.4.3.4 Digital readiness**

Digital learning tools are currently not used at all or are used to a limited extent in forestry education in universities and colleges in Africa, as reported by 42 percent of the respondents. Only 58 percent of the respondents reported that digital tools are moderately or very much used at the university and college level in Africa. Digital tools are recognized as a valuable supplement at university and college level in Africa as reported by 90 percent of the respondents (Figure 46).

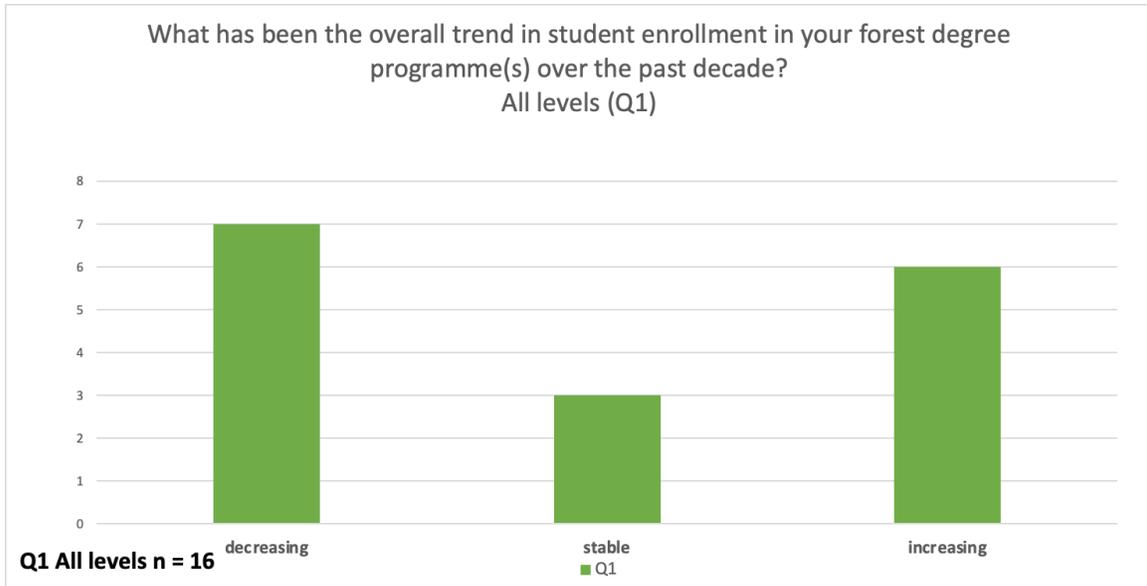


**Figure 46. Use of digital learning tools at the university and college level (All Levels) (A46)**

On identifying the digital learning tools that are presently used in forest degree programme(s), geospatial tools and technology were identified as the most used tools followed by communication and publication tools, tools for managing, editing, and sharing documents, conference meeting tools, net-based research tools, digital tools for field and mill operations and finally enhanced media (See Appendix Figure A49). The respondents identified forest-related digital learning environments that they are familiar with in the following descending order: Global Forest Information Service (GFIS), FAO e-learning Academy, FAO SFM Toolbox, GLF Landscape Academy, Forest Learning, Project Learning Tree and Council for Learning outside Classroom (See Appendix Figure A54).

**4.4.3.5 General developments and trends in university and college forest education**

Students’ enrolment in forest education at university and college level has been decreasing over the past decade in Africa as reported by 44 percent of the respondents. In some countries, the enrolment trend was reported to be increasing while in some universities, the trend has remained stable (Figure 47).



**Figure 47. Overall trend in student enrolment in forest-related programmes (ten-year period) (All Levels) (A92)**

Forestry graduates at university and college level in Africa are reported by 82 percent of the respondents to have a moderate or very high understanding of the relevance of forests and their sustainable management to emerging global trends and to the Sustainable Development Goals (SDGs). A few of the respondents (17 percent) reported that the graduates have limited understanding of the relevance of forests and their sustainable management to emerging global trends and to the Sustainable Development Goals (SDGs) (See Appendix Figure A95).

## **5.0 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS**

Forest education can and must be part of the solutions to many pressing needs such as reducing the rates of deforestation, forest degradation and supplying forest products to the increasing demands in the world. Currently, forestry training in many institutions in Africa is diluted, thereby risking producing incompetent graduates. Such a situation has impacted on the employability of the foresters in the face of receding job opportunities. Issues of dwindling funding and technology take-over have equally had adverse impacts on the forestry sector. All these have resulted in a reduced number of students enrolling for forestry courses in TVET institutions and universities. The training at primary and secondary schools in Africa must influence the attitudes and values of the young students to increase their appreciation of nature and the environment. This calls for the need to expose students to nature, i.e. by organising field trips outside the schools to forests, zoos and national parks at an early age. The training at the TVET and Bachelor's levels must be practical-oriented and in addition, at the Bachelor's level, the professionals must be trained in different technologies and entrepreneurial skills. At the postgraduate level, the students must have strong research capacity and embrace different technologies. At all university and college levels, training must be carried out in such a way as to equip the students with job creation skills rather than remaining job seekers. Since the forestry sector stretches to the outside of forest borders where trees are becoming increasingly important for benefits such as biodiversity conservation and use, watershed functions, carbon sequestration and for the livelihoods of millions of farmers, forest education in Africa must be responsive to the needs of society. Forest education must therefore be taught differently and not only be included in primary and secondary schools, but also in TVETs and at all levels in tertiary institutions.

### **5.1 Forest education at primary schools in Africa**

#### **5.1.1 Discussion**

Currently, the primary education curriculum in Africa does not adequately cover the topics and skills on nature and natural resources. A majority of the respondents (70 percent – 89 percent) indicated that forest-related topics should be included in the primary school curricula as individual subjects. The most common forest-related topics and skills cited by the respondents as important at the primary level education include: ecosystem benefits of forests, role of forest and tree resources, climate change mitigation and adaptation, among others. Majority of the respondents reported that the availability of forest education resources in learning materials e.g. textbooks and online materials, quality of human resources like teachers, education environment like laboratory access and class size and practical opportunities e.g. experiential learning and practical training, does not exist at all, or exists to a limited extent in many primary schools in Africa.

This has an adverse impact on influencing the attitudes and values of young students towards nature and natural resources. Moreover, it was cited that there is no marketing or awareness creation among primary school students on nature or environmental studies which can increase their interest in forest education. According to UNESCO, all pupils should receive Environmental Education (EE) to help them gain knowledge, attitude, capability and behaviour towards conservation (Talero, 2004). In some countries in Africa, efforts have been made to embrace EE through partnerships between governments, NGOs, private businesses and educational entities. In some countries like Kenya, EE has been integrated at all levels of the educational system including Teachers Training Colleges.

There is need to inculcate the environment as a bedrock or foundation for any other development, demystify conservation strategies into simple and practical undertakings and encourage activity-based approaches on environmental matters (e.g. arts and craft and exhibition in forests) in primary schools in Africa. Experiential teaching/learning and having field trips to forest sites can make students appreciate what they learn in the classroom and also improve students' appreciation of the environment. The use of appropriate teaching aids and the establishment of school environmental clubs, and providing necessary support (information, books, training, etc.) can play a significant role in increasing students interest in forests. Students could also be involved in tree growing activities while teachers should be helped to link forests to wildlife conservation when teaching.

### **5.1.2 Recommendations**

- There is an urgent need to review primary school curriculum and incorporate forestry/environmental components in Africa so that it can adequately cover topics and skills on forest education.
- Teachers should be re-tooled through short courses for them to be able to incorporate forest education in their day-to-day teaching.
- There is a need to establish strong linkages between training colleges and universities with primary schools to promote forestry training.
- Governments should formulate and enact policies which promote forest management to grow the interest for forest-related subjects in primary schools for the benefit of teachers and students.
- There is also a need to improve the training standards in forest education so that teachers are better equipped to weave forest education into the general social and natural sciences.
- Schools should be assisted in establishing tree nurseries by promoting conservation clubs where students can gain practical experience in raising tree seedlings.
- Out of school activities should be promoted in primary schools in Africa i.e. field trips to forested areas, game reserves, water catchments, wood industries etc. Teachers can integrate activities that encourage students to explore, create, solve problems, communicate, collaborate, document, investigate, and demonstrate their learning about forests and trees outside the classroom.
- Traditional and indigenous knowledge should be promoted to maximize the application of sustainable management of the environment at community level.
- Schools should be provided with short movies to show students the importance of forests in their daily life and in sustainable development. FAO can spearhead the development of these movies.
- AFWC, UNESCO and FAO, in collaboration with other relevant stakeholders, can spearhead the development of experiential learning materials.

## **5.2 Forest education in secondary schools in Africa**

### **5.2.1 Discussion**

Forest-related topics are not being included at all or are included to a limited extent as individual subjects in secondary school curricula in Africa. There is a need therefore to include them in the curricula as suggested by 85 percent of professionals and 95 percent of teachers. Also, students in secondary schools are not exposed at all or are exposed to a limited extent, to forests through out-of-school activities i.e. clubs which can increase students' knowledge and appreciation of forests. Since there is inadequate

teaching/coverage of forestry topics or related subjects at the secondary level in Africa, students are reported to be unenthusiastic about pursuing further studies in forestry education either at technical or vocational training schools, or a forest programme at the university and college level.

Currently, education at the secondary schools in Africa magnifies subjects/disciplines which are deemed to be marketable such as engineering, medicine and law over other disciplines. Unfortunately, it was reported that there are very few examples of graduates known to the students, who have attained fulfilling jobs from pursuing forestry education. Additionally, it was pointed out that lack of government and education policies that support forest education has contributed to making forestry of lower quality and prominence at the secondary level. As pointed out by Mtsi and Maphosa (2016), there are numerous challenges relating to the lack of required infrastructure and resources for teaching science in Africa. There are also challenges relating to learners' background, language of instruction and lack of parental support.

### **5.2.2 Recommendations**

- There is a need for national ministries in charge of secondary education to review the curricula and introduce forest-related topics.
- While teaching, teachers should expose students to out-of-school activities for them to increase their knowledge and appreciation of forests. These activities could include joining environmental clubs, tree-planting activities, and experiential learning through field trips. Consequently, these activities will increase not only students' knowledge and appreciation of forests and nature, but also their interest in studying forestry later on in life.
- There is a need for re-tooling teachers through face-to-face or online short courses on how to integrate and deliver important forestry-related topics to their students. Governments with support from UNESCO, AFWC, FAO and other development partners can spearhead the curriculum review and the training of teachers.
- Forest education should be promoted in secondary school institutions through formal and informal school systems. These broad approaches and techniques can include infusion, imposition, insertion, and framing. For instance, teachers can invite forest professionals as guest speakers in their schools so that they can serve as role models that the students can emulate.
- Forestry topics should be introduced in Environmental Education which is a vital component of school curricula in many countries in Africa. This will be a way of investing in the youth of Africa so that they can be good custodians of the environment for the sake of conservation and sustainability. The youth have great potential which can only be ignored at the continent's peril. Given that the environment is the greatest heritage, all measures including Environmental Education must be taken seriously to ensure that the youth have the correct attitude towards the environment since our very survival depends on it.
- As part of Education for Sustainable Development (ESD), there is a need to introduce individual approaches for implementing forest education at secondary schools i.e. planting trees in the school compound, introducing forest topics in the curriculum, establishing tree nurseries in schools, involving students in community forest conservation measures.
- Students can be introduced to videos showing the importance of forests in their daily life and in sustainable development. FAO can spearhead the development of these videos.

## 5.3 Forest education in TVET institutions in Africa

### 5.3.1 Discussion

The survey showed that delivery of the curricula is more theoretical and important emerging thematic areas like forest and climate change, forest landscape restoration, urban forestry, forest mapping, inventory, remote sensing and GIS, among others, are inadequately covered. Other topics identified to be inadequately covered include forest enterprise, forest industry, marketing and management, wood harvesting operations with harvesting machines, and professionals' ethics among others. The survey findings are in agreement with Temu *et al.* (2006), who mention that the content of forestry education programmes in Africa is highly variable since TVET programmes in Africa are mostly based on traditional European education where industrial wood production and processing are dominant features. Temu *et al.* (2006), also identified programmes that are in the middle range that integrate industrial forestry with some elements of agriculture and environment, and at the extreme end are programmes that focus largely on community forestry and natural resources management.

On the extent to which digital learning tools were currently used in TVET forest education in Africa, 81 percent of professionals, 63 percent of teachers and 57 percent of students reported that it had not been used or had been used to a limited extent though a very high percentage of respondents reported that digital learning tools could moderately or very much be a valuable supplement to forest education at the TVET level. It was reported that over the years, education has particularly benefited from technologies such as computers and the internet. Sarker *et al.* (2019) state that the integration of digital technology into education is essential for leveraging better education for all by the year 2030. The application of digital technology especially forest education at TVET level can infer to the aspect of modelling using information and communication technology (ICT) for supporting, enhancing and enabling the delivery of education (Sarker *et al.*, 2019).

Resources to support TVET forest training in some institutions in Africa are not available or are limited to a certain extent. These resources include teachers (e.g. materials support, quality and quantity), learning materials (e.g. textbooks, online learning materials and tools), educational environment (e.g. laboratory access, class size) and practical opportunities (e.g. experiential learning, practical training). This has contributed to a more theoretical forest training with limited practical exercises. This is also coupled with inappropriate learning materials, limited field experience opportunities, lack of internships, lack of incubation opportunities and limited forestry-based enterprises for experiential learning. Some respondents also indicated that the duration of industrial training was inadequate for the acquisition of meaningful and relevant experience for the students.

Though continuing forest education may be available in some countries, it was reported to be too costly and many people could not afford it unless with governmental support. There is limited information and awareness about existing jobs and professional growth opportunities in the forestry sector leading to many students only relying on the formal employment sector which has a limited capacity to absorb them upon graduation. This has led to a lack of employment opportunities thereby demotivating students from enrolling in TVET institutions. There is also poor remuneration of employees in forestry employment sectors in some countries. This could be due to the limited investment in forestry enterprises and inadequate infrastructural development.

### 5.3.2 Recommendations

- ANAFE which has been involved in curriculum review in many countries in Africa can spearhead the review of the forest curriculum in collaboration with governmental institutions, the private sector, AFWC and FAO and other relevant stakeholders. During the curriculum review, it is necessary to develop relevant courses for continuing forest education. Furthermore, there is a need to introduce soft skills courses and entrepreneurship to equip students to be able to create jobs rather than just seek jobs.
- Emerging thematic topics like forest genetics, forest and climate change, forest landscape restoration, forest mapping, remote sensing and GIS, urban forestry, forest-based recreation, traditional and/or indigenous forest-related knowledge and cultural values of forests, forest services, cultural and social issues, ecotourism and digital literacy, forest and disaster risk management need to be included in TVET curriculum. Some of these courses can be in the form of Massive Open Online Courses (MOOCs).
- There is need to include in the TVET forest curricula topics on life skills, ICT in natural resources management, livelihood security and forests, basic management and leadership, planning and budget preparation, report writing, conflict management/resolution, forest law and jurisprudence, forest and emerging issues, climate change and global warming, forest monitoring and evaluation, forest mapping, forest certification, ecotourism and digital literacy, forest and disaster risk management. The TVET forestry curriculum should also be enriched with traditional knowledge.
- AFWC and FAO should spearhead the development of a databank showing available forestry-related job opportunities in different countries in Africa.
- TVET institutions should give priority to field courses, practical learning and student attachments. Students should also be involved and be engaged in other common out-of-school forest-related activities including among others: World Environment day, World Forest Day, World Water Day, forest resource management/exploitation, tree planting, field visits, environmental conservation clubs, forest management and conservation, restoration and rehabilitation of natural forests, in-situ and ex-situ conservation strategies, internship with governmental and non-governmental institutions, training communities in forest-related activities and volunteer work in environmental bodies. TVET institutions with support from governments and the private sector in collaboration with local and regional NGOs should spearhead this.
- Governments in different countries in Africa should allocate more resources to TVET institutions to enable them acquire teaching facilities and resources. Digital learning should be promoted in many of the TVET institutions and ICT facilities should be provided. Governments and the private sector can spearhead the identification and provision of ICT facilities.
- FAO and ANAFE can organize short courses and develop training manuals for re-tooling teachers to update them on emerging issues in forestry while also upskilling teachers with the necessary technical skills for digital learning.
- There is a need for TVET teachers to work with other stakeholders in identifying the training needs in their institutions. It will be necessary to provide updated content and engaging methods of delivery to provide teachers with the tools to engage students at all levels.
- There is a need for governments to provide loan facilities to learners to have students enrol in forest TVET institutions. More resources should also be allocated to these institutions to increase and improve the training facilities.

- Development/revival, and/or strengthening regional collaboration of the forestry institutions through ANAFE, AFF and other development partners.

## **5.4 Forest education in universities and colleges in Africa**

### **5.4.1 Discussion**

There is a wide difference in the coverage of topics on forest education at Bachelor's degree level in Africa. Traditional forest topics like forest biodiversity (plants, animals and ecosystem), forest ecology, wood and non-wood forest products, silviculture, agroforestry are reported to be sufficiently or excessively covered. However, topics such as forest soils, forest genetic resources, range management, watershed management, forest and climate change, forest landscape restoration, forest mapping, inventory, remote sensing and GIS, entrepreneurship, forest industry, marketing and management, among others, are inadequately covered. The role of traditional knowledge in enriching forestry education and the potential of forestry sector in creating jobs for the youth is not covered in the curriculum which makes the curriculum inadequate in fully preparing students for the job market. This leads to producing forestry graduates that lack workplace readiness and employability potential.

According to Sungusia (2018), professional forestry teaching approaches in many of the African tertiary institutions, follow different formats. Some of the programmes have some elements of agriculture and environment, while others focus largely on community forestry and natural resources management. As reported by Dyer and Wingfield (2005), there is a need for the professional forester in Africa to be trained to have a broad spectrum of social, environmental and economic skills to serve the forestry industry. In addition, there is a need for entrepreneurial skills for both the production of raw materials and value-addition of the timber produced. Forest education in Africa must sufficiently take into consideration the ecological and socio-economic landscape and thus the need for training students in multiple-use forestry. Forest education must mirror the myriad of land use systems and rural livelihoods in the continent.

Though 80 percent of teachers reported that part-time employment or internship increases student' learning, the study found that it was either not at all available, or was available to a limited extent. On educational resources, some 60 percent of professionals, 57 percent of teachers and 58 percent of students reported that learning materials (e.g. texts books, online learning materials, tools or applications) are either not at all available or are available to a limited extent. Practical opportunities (e.g. experiential learning, practical training, field visits) were reported to be available to a limited extent or moderately available.

As reported by Gabayi and Rekolaii (2019) forestry education at degree level in Africa is facing major challenges in the quality of education offered. The lecturer training is mainly found to take place at the universities, and usually, only a few lecturers combine pedagogical competencies with technical qualifications and industry experience. Based on Gabayi and Rekolaii (2019), students learning in the tertiary institutions are faced with the challenge of obtaining limited opportunities to engage with practical training although this is deemed necessary to acquire a deeper understanding of the dynamics of rural areas. It was also noted that some university lecturers are lacking pedagogical skills in the delivery of the curriculum and there are inadequate linkages and collaboration between training, research, policy and industry.

On employment availability for the students who had studied forest education at Bachelor's level, about 70 percent of professionals, 50 percent of teachers and 68 percent of students reported that it was not there at all or only to a limited extent. As reported by Dyer and Wingfield (2005), since the 1990s, many governments in Africa ceased to be the major employers of forestry-trained people. In many countries, the focus of the government changed from being a significant commercial forest operator to privatizing all commercial forestry operations. This has created a significant decline in demand for graduate forestry professionals. There has also been an increase in the demand for skills in community forestry at diploma level. Therefore, the commercial forestry industry has moved towards out-sourcing where many of the forestry operations (establishment, tending, harvesting and transport) are carried out by contractors. The role of the operation foresters has thus changed to managing contracts.

Sarker *et al.* (2019) state that the integration of digital technology into education is essential for leveraging better education for all by the year 2030. The application of digital technology especially in forest education can infer to the aspect of modelling using information and communication technology (ICT) for supporting, enhancing and enabling the delivery of education (Sarker *et al.*, 2019). Progress in mobile technology and learning applications in Africa can allow students to learn outside the scope of formal education allowing for flexibility and instant access to rich digital learning sources. The relevance of digital learning tools can increase in tertiary institutions because the tools are economical, flexible and accessible without constraints of time and distance (Chuchu and Nodoro, 2019). The application of remote sensing as a digital tool in forest education, has proved to be a powerful tool for collecting satellite images to determine the area under forestry and areas that are constantly undergoing conversion to other uses and deforestation (Ferreira and Mustaro, 2014).

The current teaching approach in forest education in Africa, is one that seeks to transfer ready-made solutions from the instructors to the learners. However, the lecturers need to improve forest education by modelling to the students how to work actively with communities to solve problems (Muir-Leresche *et al.*, 2020). Additionally, based on Muir-Leresche *et al.* (2020), the present teaching approaches can be improved by having the educators change the assessment system so that it reflects not only what students know but also how they can apply what they know. Currently, teaching approaches in some institutions in Africa, are characterized by rote learning and inadequate practical training resulting in students not acquiring all the right skills and forestry values. Subsequently, the absence of meaningful learning has limited students to a particular set of solutions in spite of changing forestry contexts (Sungusia, 2018). Results from the CPF Forest Education survey carried out in Africa, support these claims as the respondents indicated that forest education is more theoretical than practical. The theoretical aspects of the courses taught are relatively covered in more detail but not in a way that encourages a questioning of the theories and underlying assumptions (Sungusia, 2018).

#### **5.4.2 Recommendations**

- There is need to review the forest curriculum to include the emerging thematic areas and soft skills. While reviewing the curriculum, it is important to adopt a participatory approach to enhance stakeholders' ownership/inputs, and forestry education programmes relevancy. The curriculum needs to include diversification and integration of emerging issues like climate change, biodiversity mainstreaming, urban forestry, water conservation, entrepreneurship among others. The curriculum must be at the cutting edge and address the market needs. ANAFE with support from FAO and

other development partners working in consultation with relevant stakeholders can spearhead the review of the forest curriculum.

- To bridge the gap between universities and industry, there is a need to create platforms for linkages between universities, research, industry, policy and private sector. This will not only ensure that the universities are producing graduates that meet the needs of the industry, but also there can be financial, equipment, human resources and material support from the industry.
- There is a need to carry out a forest training needs analysis for the different countries to get information that can inform curriculum review. Organizations with strong experiences in the curriculum review of natural resources like ANAFE and universities can spearhead the process in collaboration with other stakeholders.
- To solve the problem of unemployment, apart from reviewing the curriculum, there is a need to undertake forestry jobs characterization and establish a database for job availability and training requirements in every country in Africa. ANAFE, AFF and FAO can spearhead this activity with support from development partners.
- Lecturers and professors teaching in the universities and colleges need to be re-tooled in pedagogy so that they can also include practical learning and field visits in their training. Additionally, they need to be trained on how to transfer student-centered learning skills, such as problem-based learning, research-based learning and project-based learning. They need to be exposed to computer software that can be used for practical learning where online teaching is being carried out. UNESCO, ANAFE, AFWC and FAO with support from development partners can spearhead this.
- There is a need to develop contextualized training materials that are relevant to the African continent. This can be achieved through the collaboration of universities with national, regional and global forest research institutes (e.g. AFORNET, CIFOR, ICRAF) with the coordination of FAO.
- Training should be carried out in a way that encourages questioning the theories and underlying assumptions in forest education.
- There is a need for governments in Africa to allocate more resources to universities to help them acquire essential teaching facilities and resources.
- There is a need for the relevant government institutions to mainstream gender perspectives into employment policies, support women-led forest businesses and incubation and encourage peer-to-peer mentoring, networks and partnerships at the national and continental levels, and enable spaces and channels for dialogue including digital technology.
- There is a need for regional collaboration among universities and colleges in Africa. Such collaboration can help coordinate joint research projects, study scholarships and promote exchanges between forestry faculty members, both students and educators. There is also a need to form an African think-tank among the forest professionals that will work in collaboration with the policymakers and private sector in advising how forestry education needs to be implemented in the continent. ANAFE having been involved in such projects in the past can play a significant role in coordinating the collaboration whereas AFWC and FAO can spearhead the formation of the think-tank.

## 5.5 Forest education at Master's and PhD level in Africa

### 5.5.1 Discussion

Suominen *et al.* (2016), while analysing university forest curriculum in Kenya reported that the curriculum had a strong science base, with a great attention to scientific (including theoretical) and research knowledge and methodologies, but with comparatively less attention on the so-called soft or complementary skills, such as management and communication skills. In their study, they reported that basic science and research skills are adequately covered at postgraduate level, while the coverage of skills such as information and communication technology (ICT) and skills in emerging issues (e.g. forest governance, gender, climate change) are believed to be narrowly covered (with a narrow focus). Concerning communication, management and business skills, a larger portion of respondents similarly reported that these skills are narrowly covered. This seems to be the case in many postgraduate studies in Africa.

The involvement of postgraduate students in forest-related activities outside school (e.g. societies, networks, clubs and community outreach) seems to be average with some feeling it is moderately to excessively done while a small number of respondents reported that it is not done at all or was done to a limited extent. The delivery of forest curriculum seems to have many challenges. The forestry postgraduate curriculum review in many countries takes a very long time which results in graduates that are neither apt for the changing labour markets nor equipped with the necessary soft skills for the labour market. Part-time forest-related employment or internship opportunities were reported not to be there at all or to be there to a limited extent though most of the respondents indicated that forest-related employment or internship increases students' learning very much.

The postgraduate forest program is preparing students moderately or very much for the job market as reported by 62 percent of professionals, 84 percent of teachers and 92 percent of students. Respondents reported that the main challenge is getting employment upon graduating. As reported by Suominen *et al.* (2016) the challenges of the job market include: (i) small and/or saturated job market. This was described as an overdependence on a few forestry organizations for jobs, lack of public sector employment, such as ministries; (ii) lack of practical and generic working skills and competencies. In their study, they reported that according to employers, the graduates lacked one or more of the following skills: practical experience, job training, managerial skills, ICT-related skills, entrepreneurship, emerging forestry issues, research skills and foreign language skills; (iii) employer-related reasons, including: poor salaries, preference for professional or diploma foresters over university educated foresters; (iv) lack of funding and political will and support for the forestry sector and forestry education; (v) theory-centered and overly specialised training, indicating thus a lack of broad generic knowledge and skills; (vi) corruption and nepotism at the job market and among forestry professionals; and finally (vii) other challenges, such as a lack of awareness and knowledge and a general perception that forestry is irrelevant.

According to the forest stakeholders – a majority of whom represented organisations from where fresh forest professionals seek jobs after graduation – the second most important challenge for hiring these fresh graduates relates to the lack of practical work skills (management, entrepreneurship/business, foreign language, ICT skills), as well as the lack of capacities in the emerging or new issues relevant to forestry. Some of these skills can be obtained through a work-based education, apart from the classroom-based education.

There have been incredible advances in classroom technology over the past two decades in the world. The declining costs of technology have enabled many universities to gain access to new technologies, while increased access to advanced technologies offers classrooms new opportunities to explore different ways to learn about forestry. This has not been the case in many universities in Africa. About 68 percent of professionals, 75 percent of teachers and 70 percent of students reported that digital learning tools are not at all used or they were used to a limited extent in postgraduate training. This is in addition to the fact that 73 percent of professionals, 65 percent of teachers and 74 percent of students reported that digital learning tools can be a valuable supplement at university and college level.

Professionals identified the four most important tools as geospatial tools and technology, net-based research tools (e.g. reference and literature databases, statistical software), net-based research tools and communication and publication tools (e.g. layout, design and presentation) and digital tools for field and mill operations. On the other hand, teachers identified communication and publication tools (e.g. layout, design and presentation), net-based research tools (e.g. reference and literature databases, statistical software), geospatial tools and technology and conference meeting tools as the most important. Students identified communication and publication tools (e.g. layout, design and presentation), net-based research tools (e.g. reference and literature databases, statistical software), geospatial tools and technology, and enhanced media (augmented reality, virtual, multimedia) as the most important tools. This shows that there is a mismatch between what the market needs and what the students are taught as far as digital tools are concerned. Most of the respondents reported that the overall trend in student enrolment in postgraduate forest degree programme(s) over the past decade has been increasing. In answering the question, there were more professionals than teachers who reported that the overall trend in student enrolment in the postgraduate forest programme(s) over the past decade has been increasing. Some of the respondents reported that the trend has been decreasing while others reported that it has been stable.

On the extent to which graduates at university level understand the relevance of forests and their sustainable management to emerging global trends and to the Sustainable Development Goals (SDGs), 66 percent of professionals and 84 percent of teachers reported that students had moderately to very much a good understanding of the relevance of forests and their sustainable management to emerging global trends and to Sustainable Development Goals. Although, Temu and Kiwia (2008) argue that forestry curriculum generally has not been very responsive and is rather slow in reforming its educational programmes, it seems some universities in Africa have managed to relate their training to SDGs. There is still a number of respondents who thought that the understanding of the relevance of forests and their sustainable management to emerging global trends is not well covered. As reported by Vanclay (2007) in Suominen *et al.* (2016), the tendency to offer programmes in accordance with the available capacities and interests of existing staff, rather than the interest of future forestry professionals, is the main obstacle for an effective educational reform.

### **5.5.2 Recommendations**

- There is a need to review the forestry postgraduate curriculum and encourage more research topics on emerging themes in forestry like climate change, urban forestry, forest-based recreation and traditional and/or indigenous forest-related knowledge, entrepreneurship, forest industry, marketing and management, small-scale forest enterprise (wood and non-wood), genetics, forest soils, forest landscape and restoration, forest mapping, forest planning, range management and

watershed management, forest and human health, gender issues and forest, trees and ethnicity. ANAFE should spearhead the process in collaboration with AFWC, FAO, AFF and other stakeholders by developing a generic forestry curriculum that institutions can customize for their own needs.

- Universities should prioritize equipping students with soft skills, in addition to teaching traditional topics at postgraduate level.
- Different governments in Africa should allocate more resources to universities to enable them acquire teaching facilities and resources, and carry out relevant research. Important learning tools can be provided free of charge or at a subsidized cost to both lecturers and students. Digital learning should be promoted in many of the universities and ICT facilities should be provided. Governments and the private sector can spearhead the identification and provision of ICT facilities and funding research in universities. More resources should be allocated to purchasing relevant ICT forest-related software.
- University lecturers need to be equipped with the necessary pedagogic and technical skills to be able to offer online teaching. There is a need to establish centres for training teachers in universities in Africa where re-tooling of university lecturers can be carried out. UNESCO in collaboration with national governments, NGOs and other relevant stakeholders can spearhead the process.
- Regional collaboration among forestry graduate schools in different countries in Africa needs to be strengthened. Such collaboration can help coordinate joint research projects in forest research institutes (e.g. AFORNET, CIFOR, ICRAF), study scholarships and promote exchanges between forestry faculty members and students. Development partners can provide seed money for such collaborations. Regional and international NGOs like ANAFE and other organisations like AFWC and FAO can assist in the development of such collaborations.
- Forest education at postgraduate level needs evidence-based innovative solutions similar to any other sector. Research on forest education requires scientific establishments such as international associations and journals. It is therefore important for research to be promoted at postgraduate level and the findings need to inform the curriculum review.

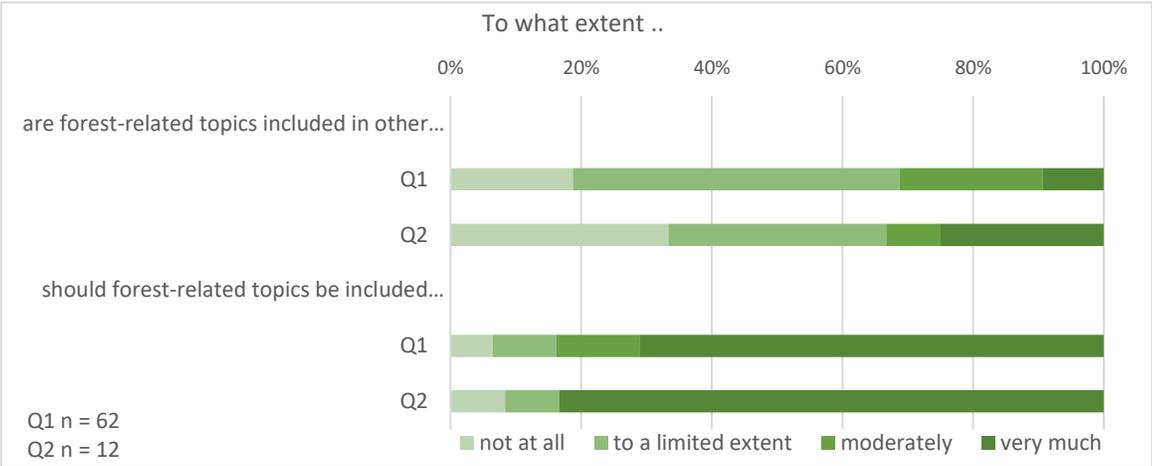
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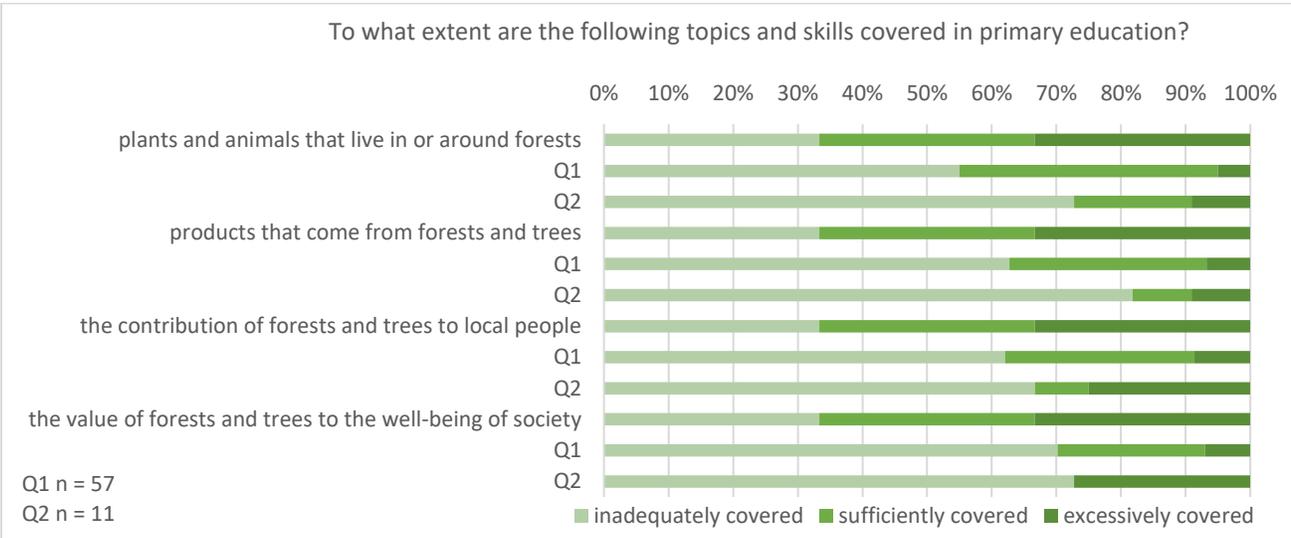
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# ANNEX I - GFE SURVEY DATA APPENDIX

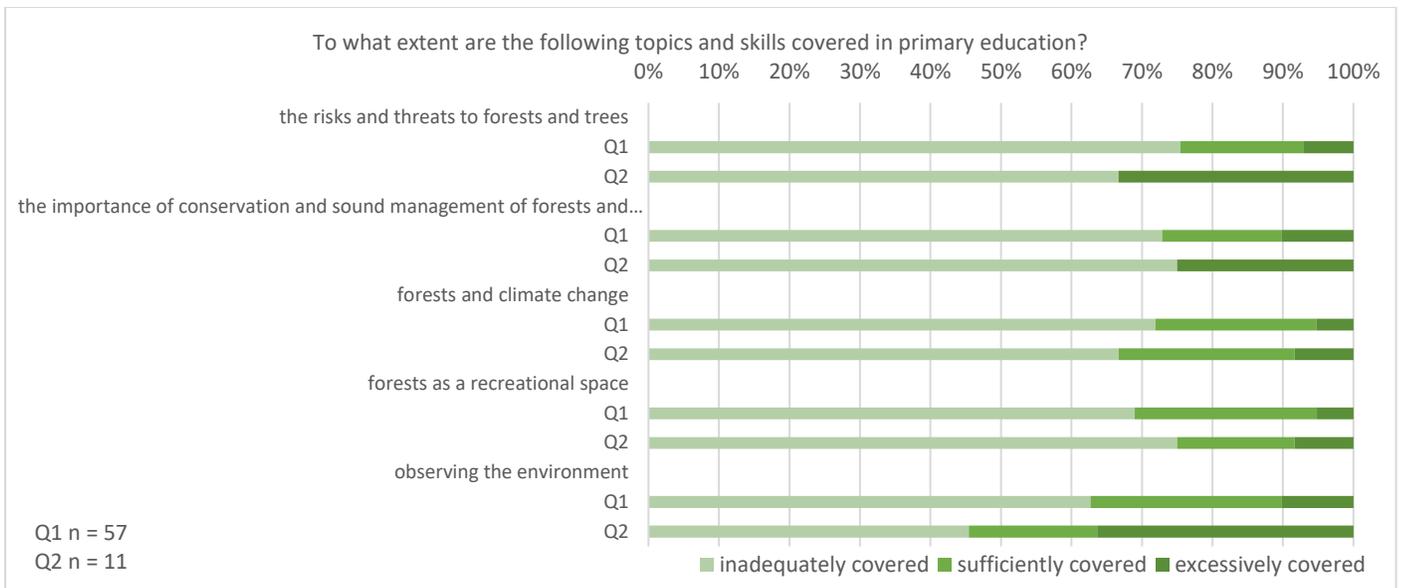
## Primary School



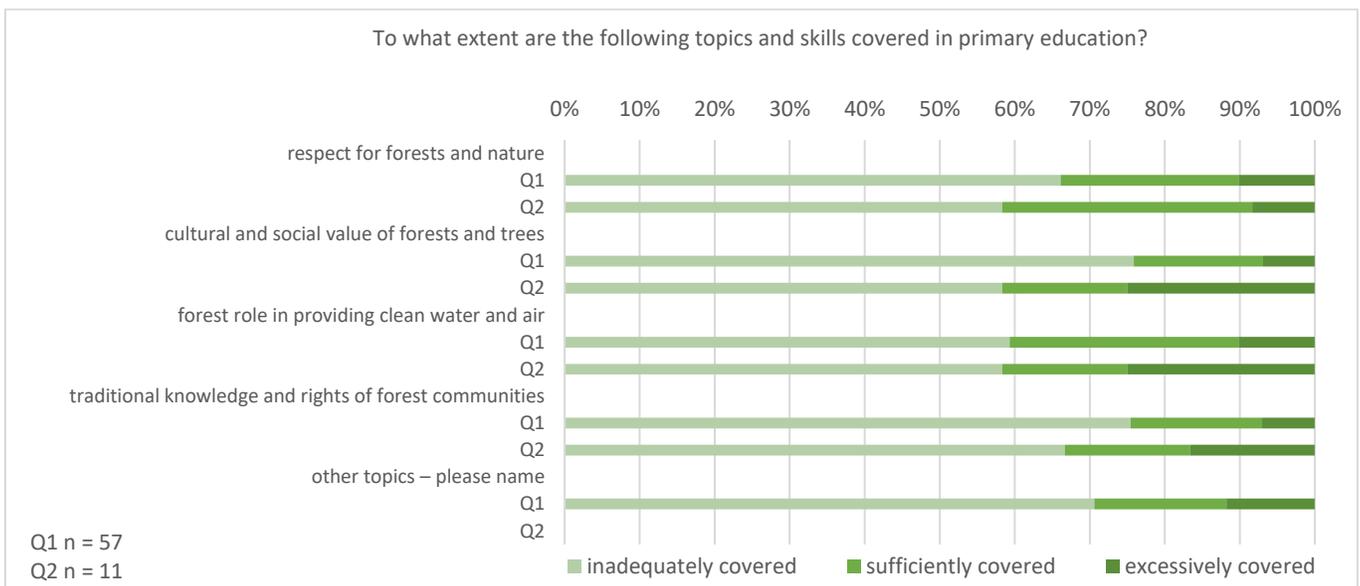
**Figure A1. To what extent are forest-related topics included in curriculum as individual subjects?**



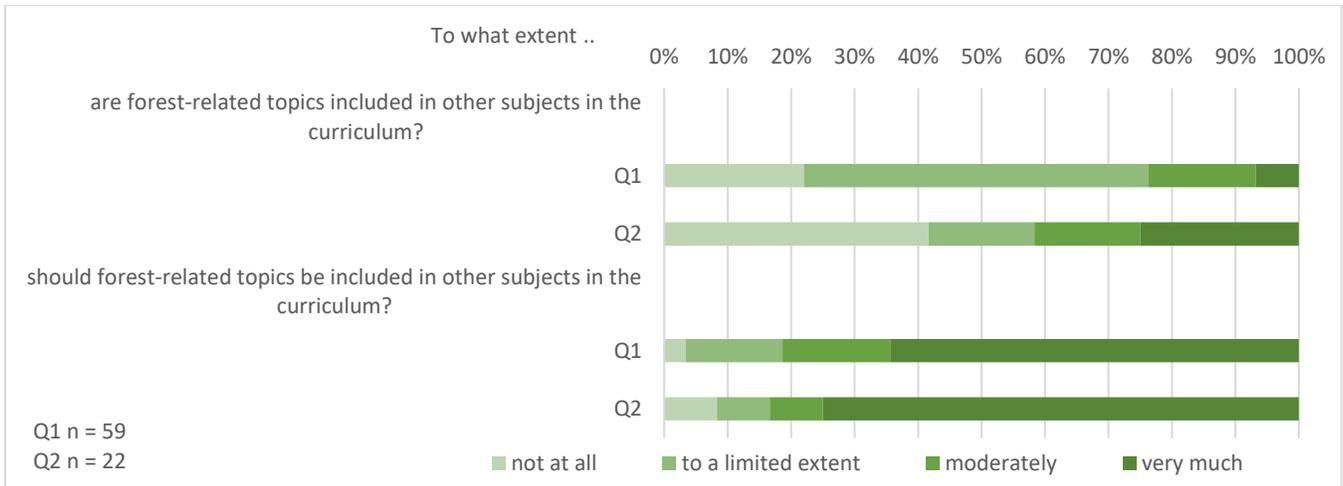
**Figure A2.1. To what extent are the following topics and skills covered in primary education (plants and animals that live in or around forests; products that come from forests and trees; contribution of forests and trees to local people...)**



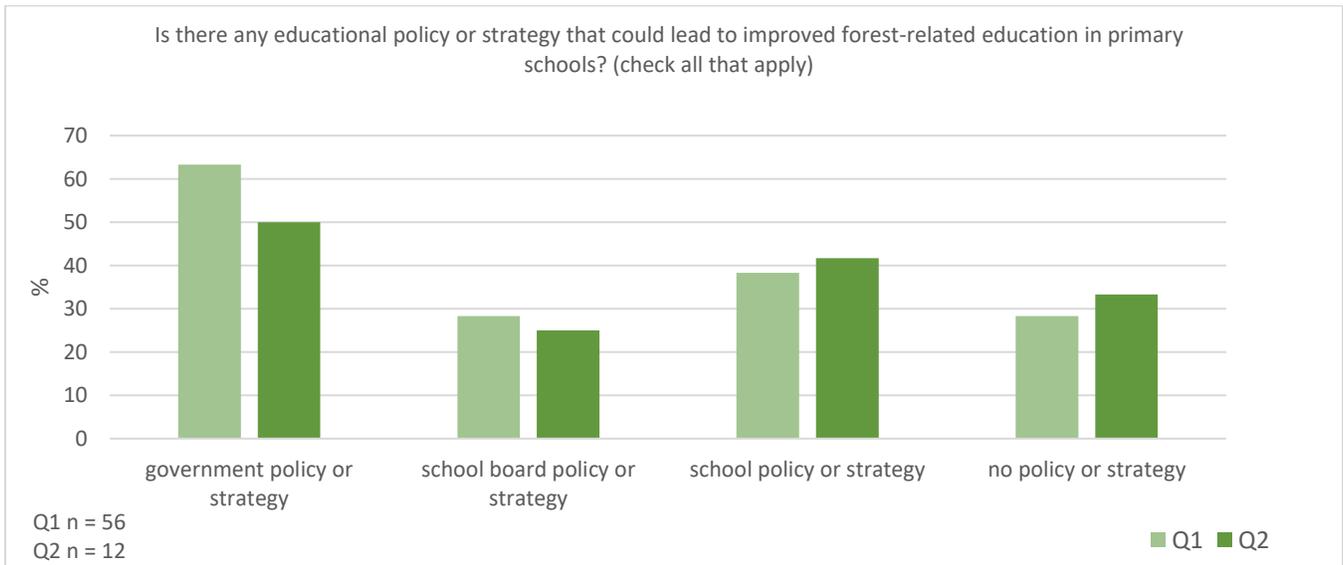
**Figure A2.2. To what extent are the following topics and skills covered in primary education (risks and threats to forests and trees; importance of conservation and sound management of forests; forests and climate change...)**



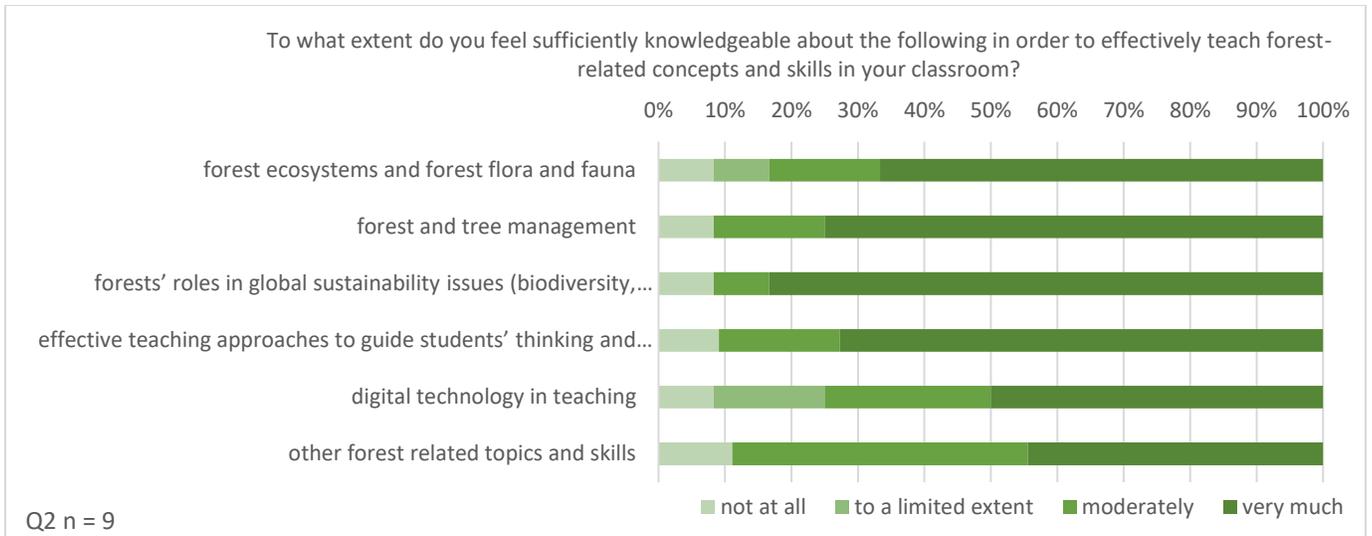
**Figure A2.3. To what extent are the following topics and skills covered in primary education (respect for forests and nature; cultural and social values of forests and trees; forest role in providing...)**



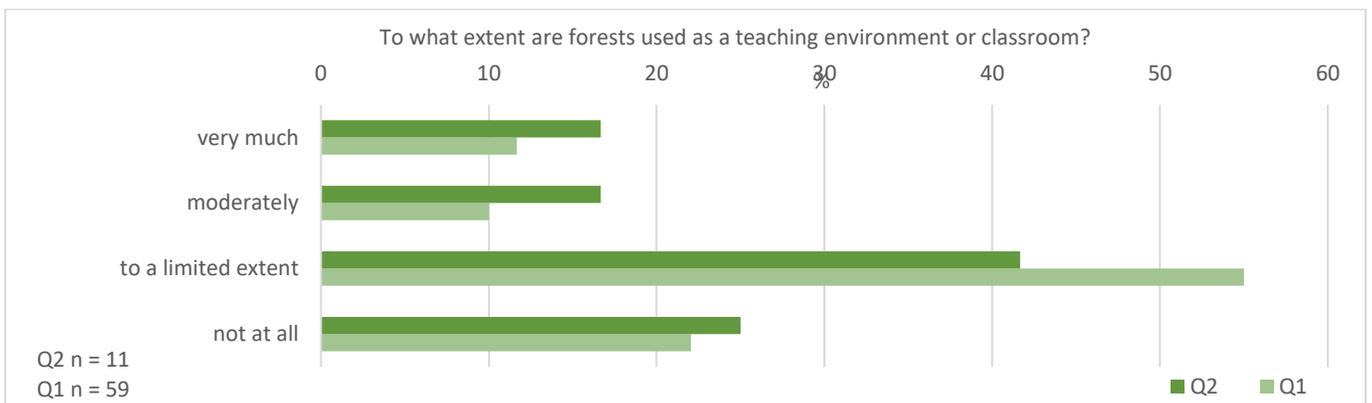
**Figure A3. To what extent are and should forest and-related topics be included in other subjects in the curriculum?**



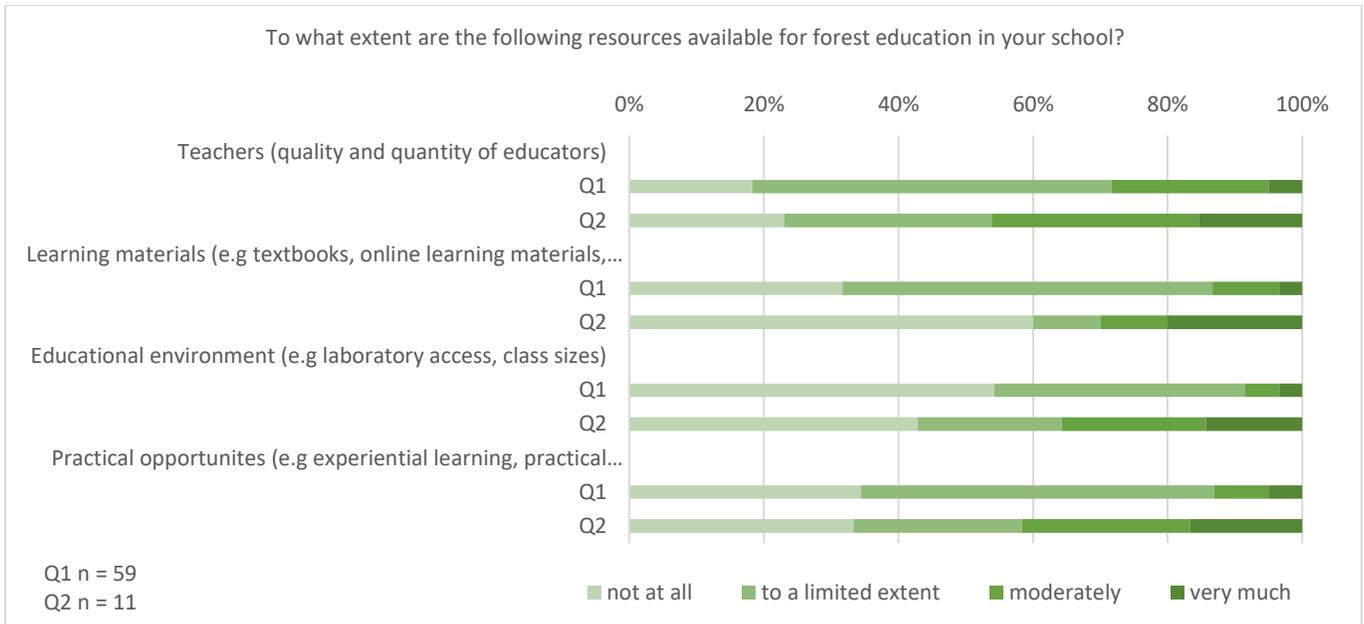
**Figure A4. Is there any educational policy or strategy that could lead to improved forest-related education in primary schools?**



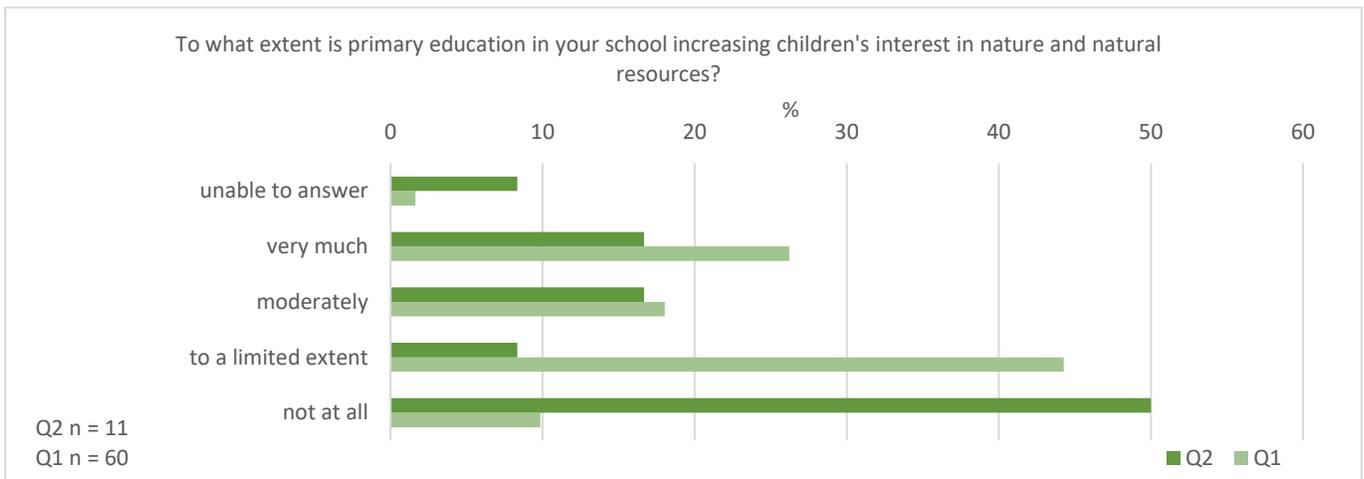
**Figure A5. To what extent do you feel sufficiently knowledgeable about the following in order to effectively teach forest-related concepts and skills in your classroom? (Forest ecosystems and forest flora and fauna; forest and tree management...)**



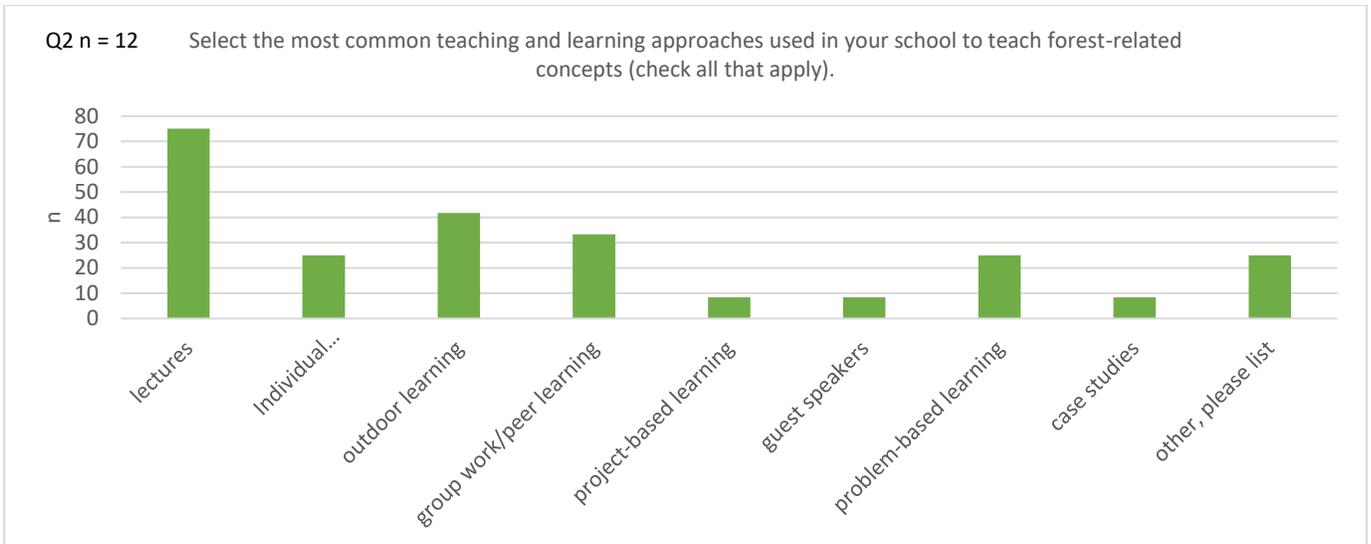
**Figure A6. To what extent are forests used as a teaching environment or classroom?**



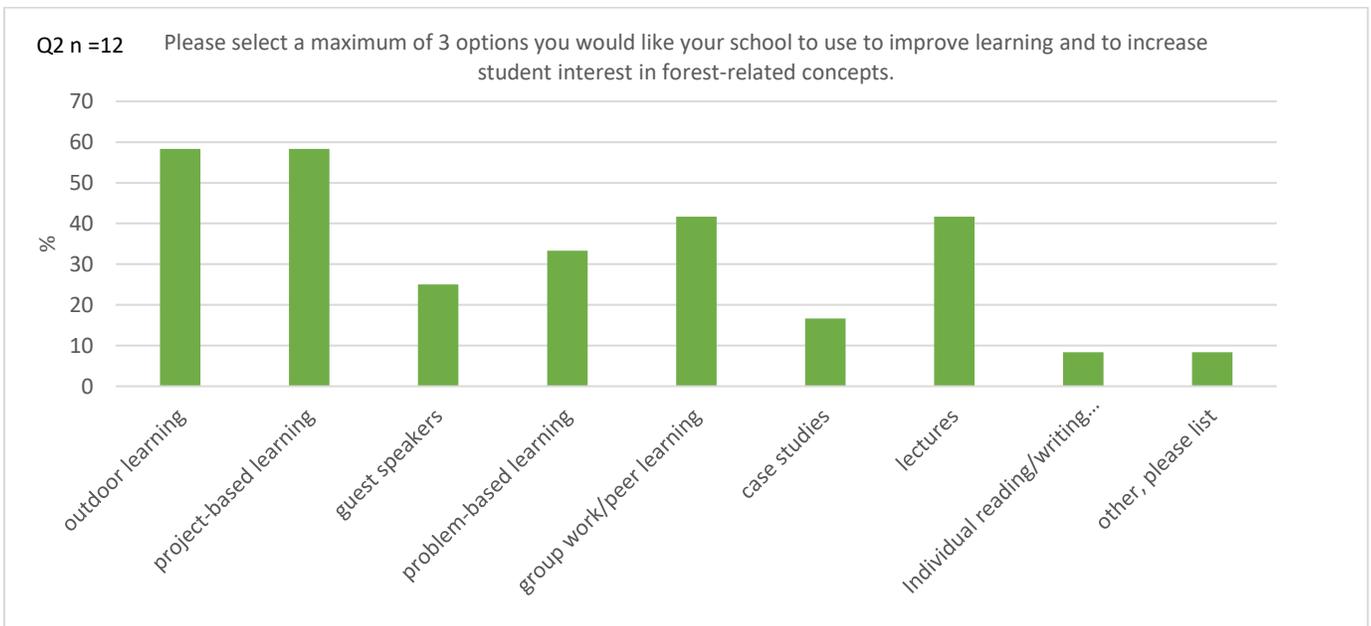
**Figure A7. To what extent are the following resources available for forest education in your school?**



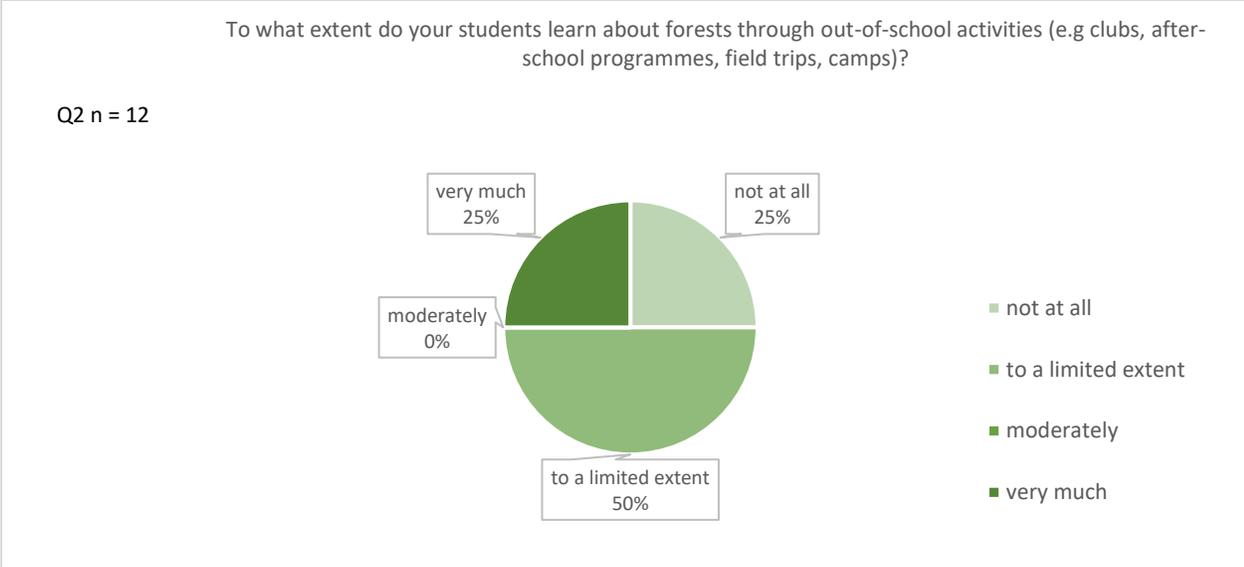
**Figure A8. To what extent is primary education in your school increasing children's interest in nature and natural resources?**



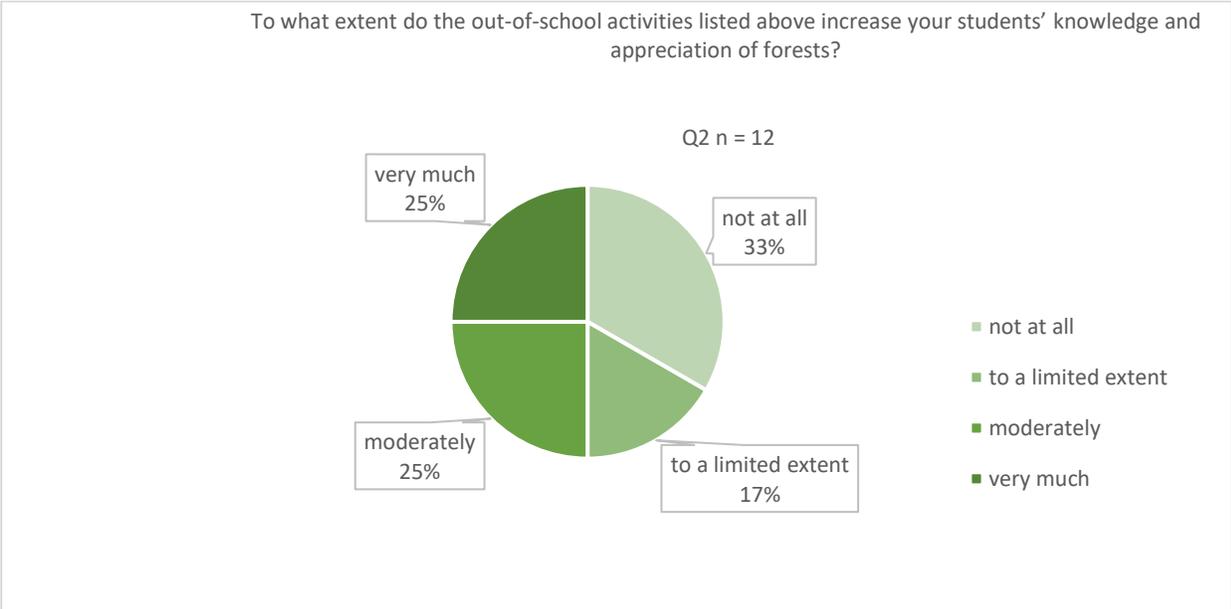
**Figure A9. Select the most common teaching and learning approaches.**



**Figure A10. Please select a maximum of 3 options you would like your school to use to improve learning and to increase student interest in forest-related concepts.**

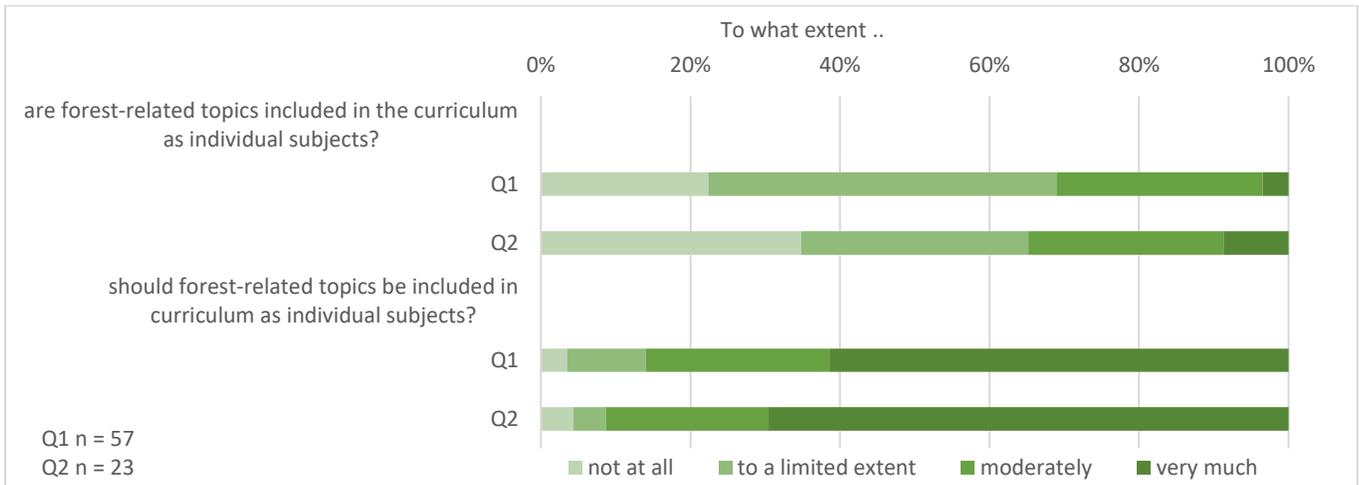


**Figure A11. To what extent do your students learn about forests through out-of-school activities (e.g. clubs, after-school programmes, field trips, camps)?**

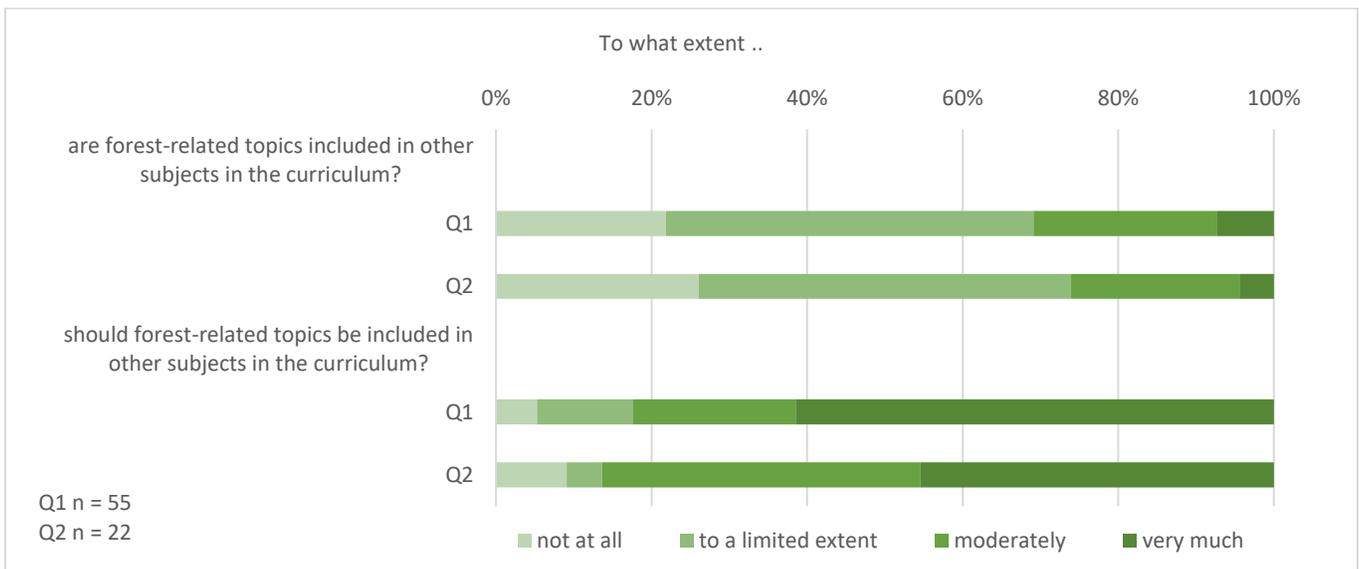


**Figure A12. To what extent do the out-of-school activities listed above increase your students' knowledge and appreciation of forests?**

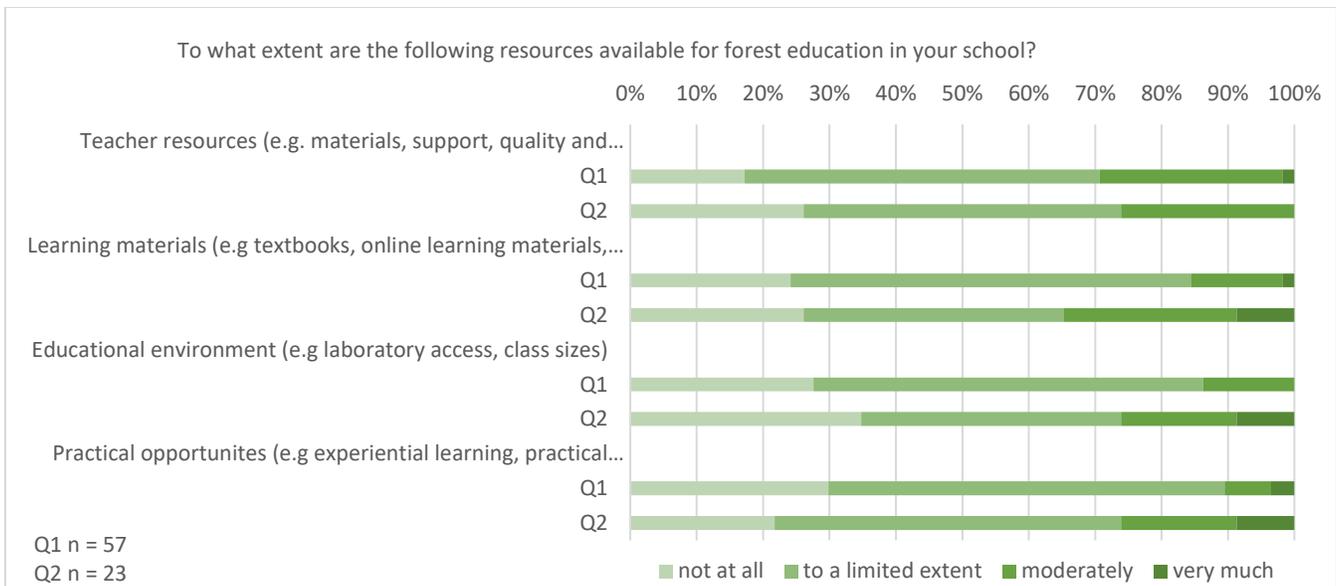
## Secondary School



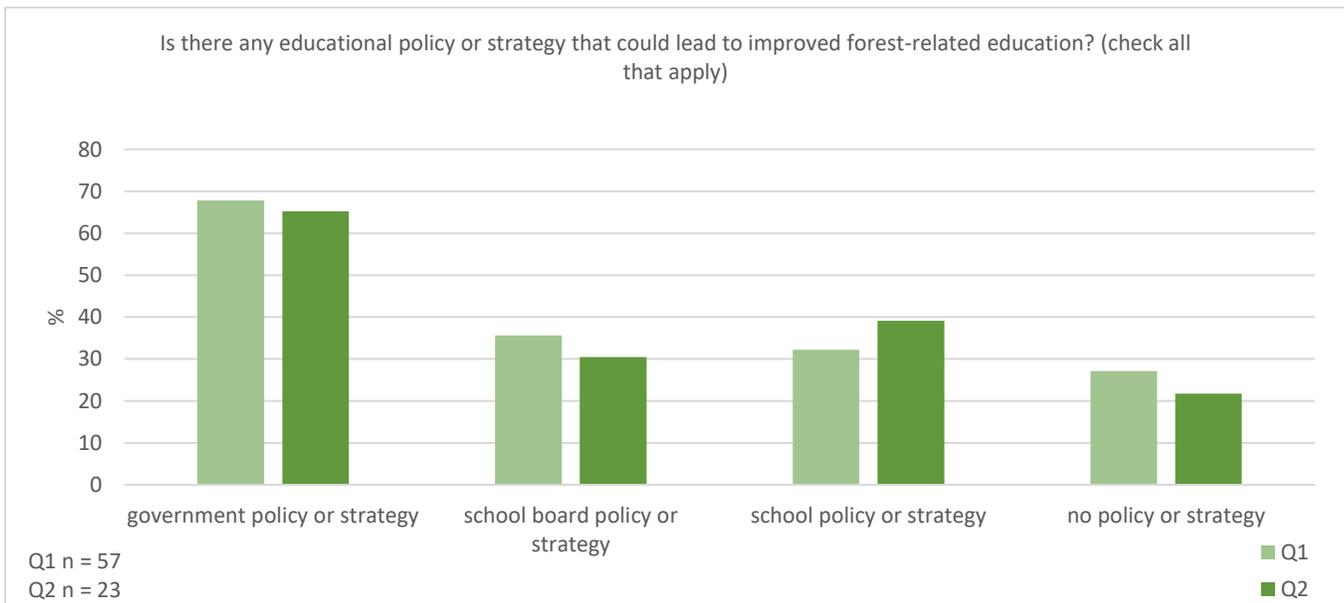
**Figure A13. To what extent are and should forest-related topics be included in curriculum as individual topics?**



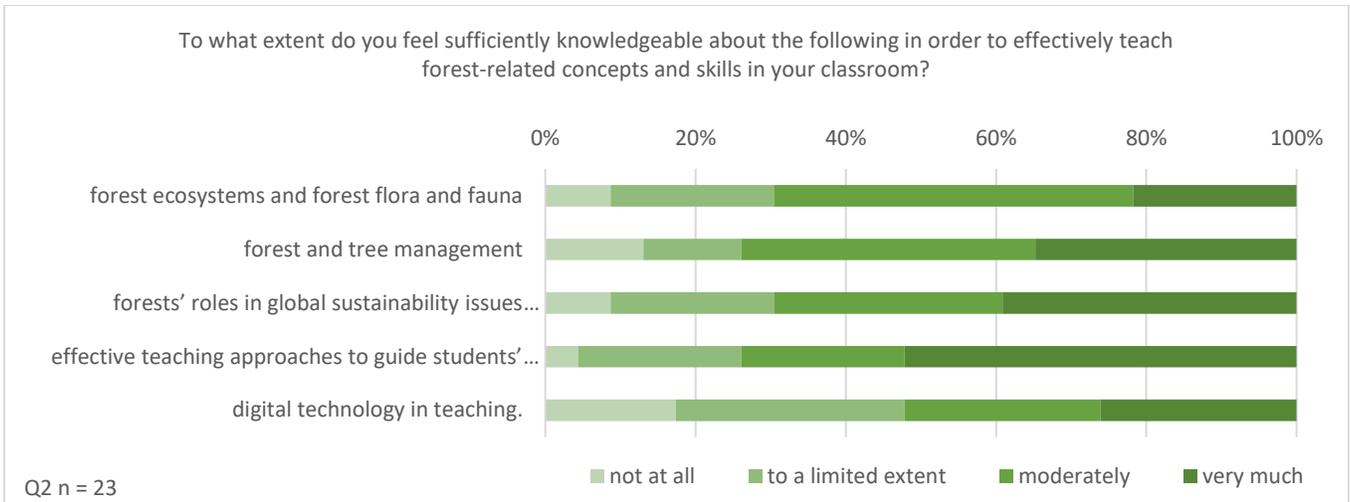
**Figure A14. To what extent are and should forest and forest-related topics be included in other subjects in the curriculum?**



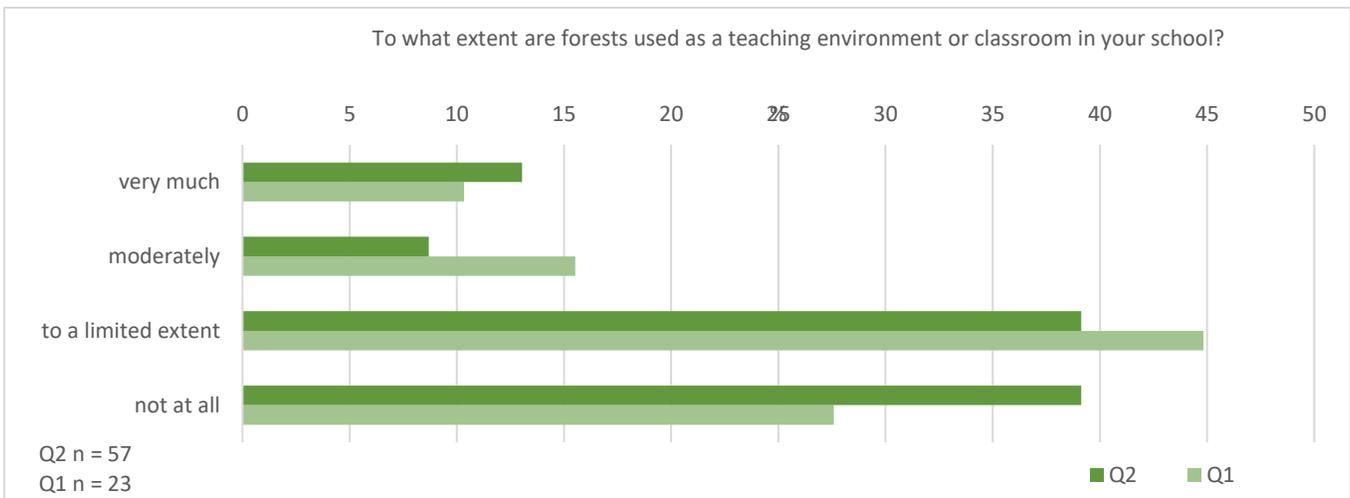
**Figure A15. To what extent are the following resources available for forest education in your school? (Teacher resources; materials; educational environment...)**



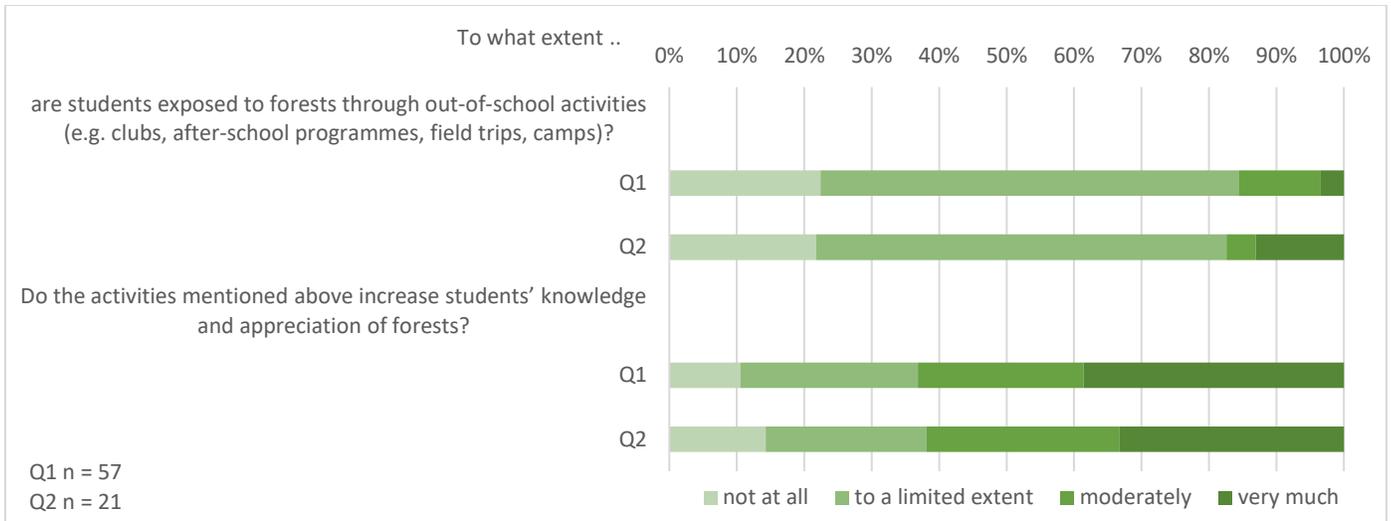
**Figure A16. Is there any educational policy or strategy that could lead to improved forest-related education? (government policy or strategy; school board policy or strategy....)**



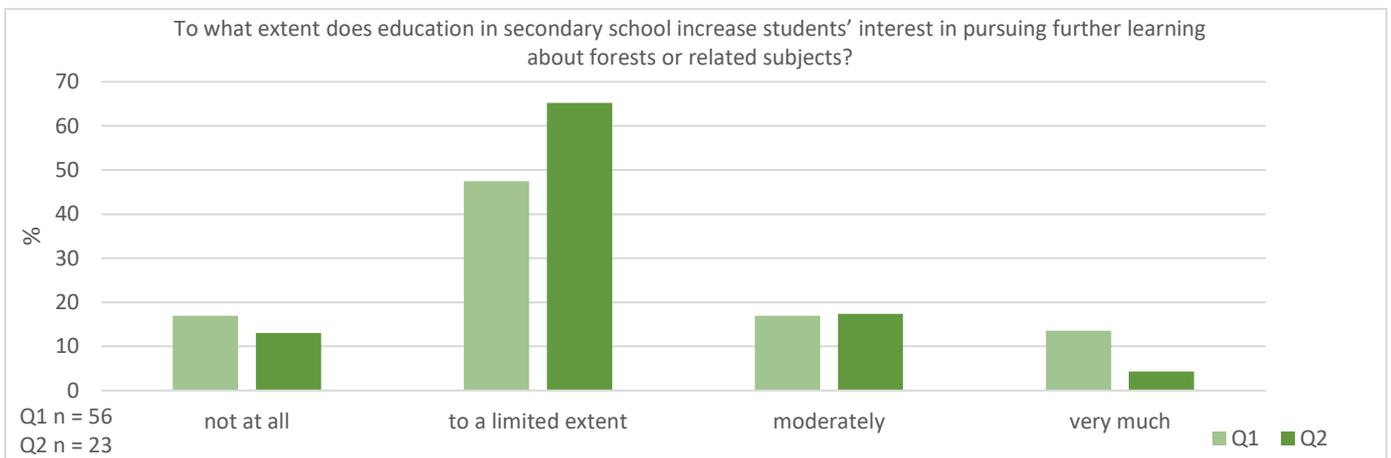
**Figure A17. To what extent do you feel sufficiently knowledgeable about the following in order to effectively teach forest-related concepts and skills in your classroom? (forest ecosystems and forest flora and fauna; forest tree management).**



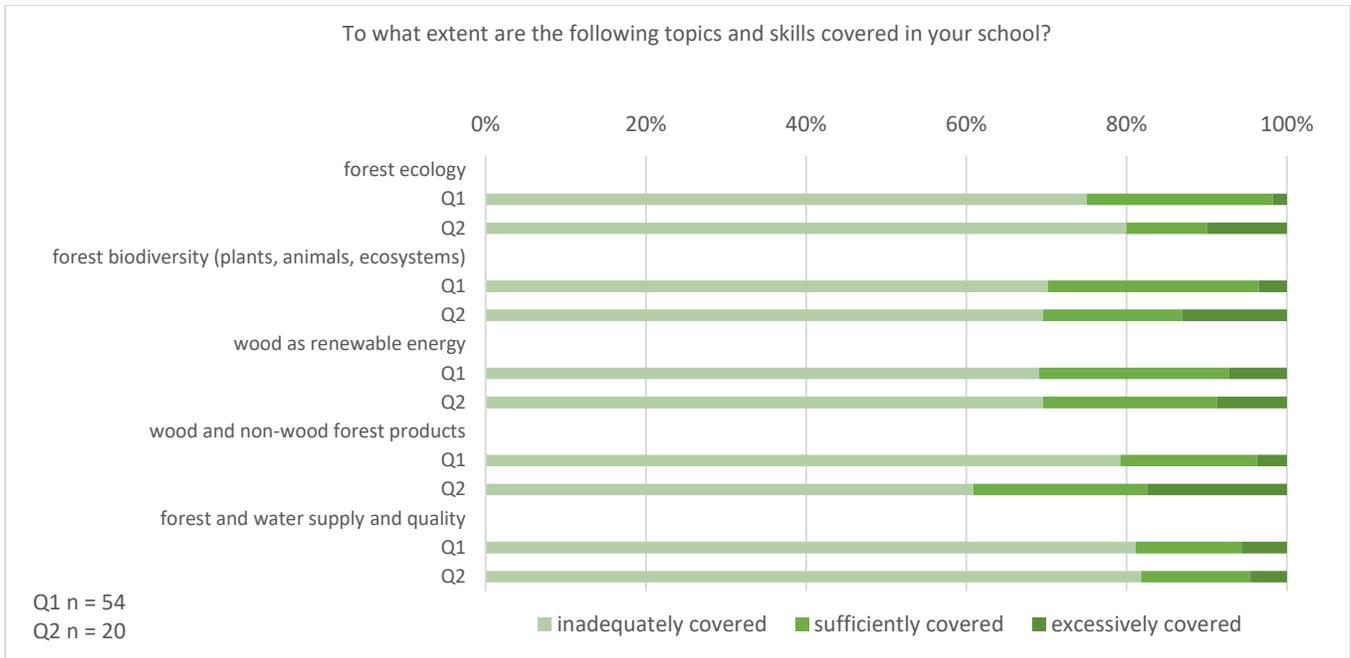
**Figure A18. To what extent are forests used as a teaching environment or classroom in your school?**



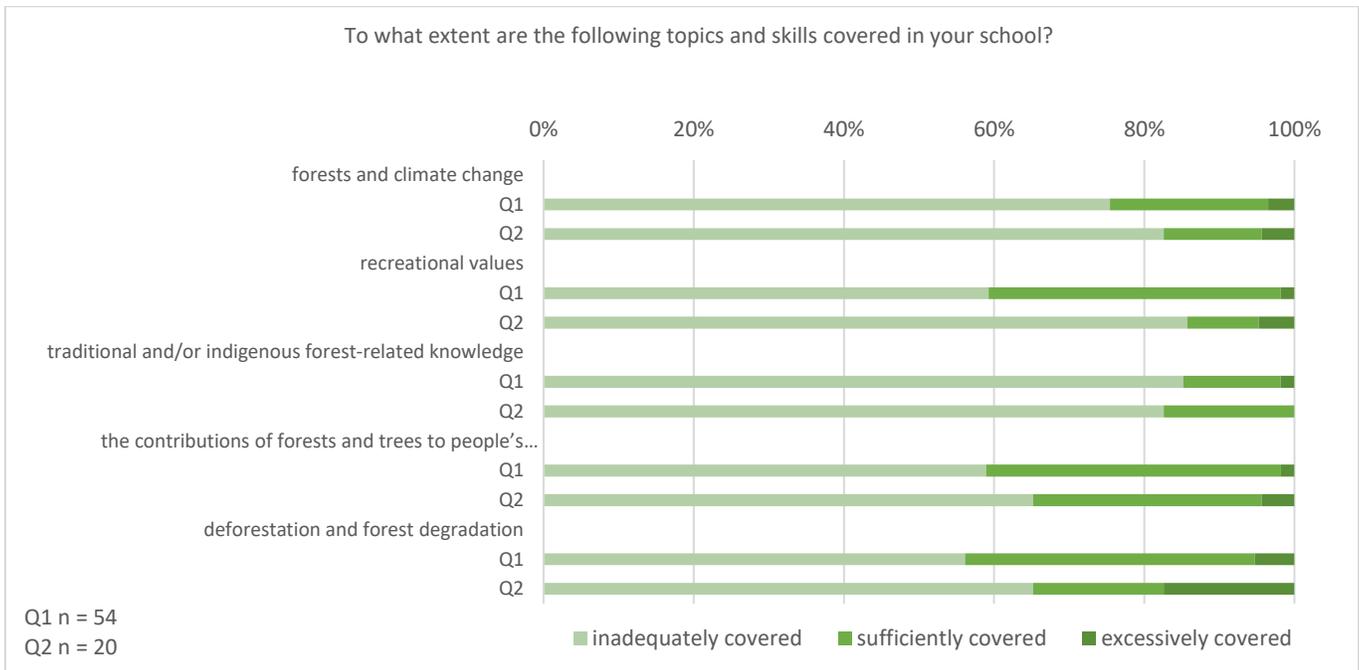
**Figure A19. To what extent are students exposed to forests through out-of-school activities; and do these activities increase students' knowledge and appreciation of forests?**



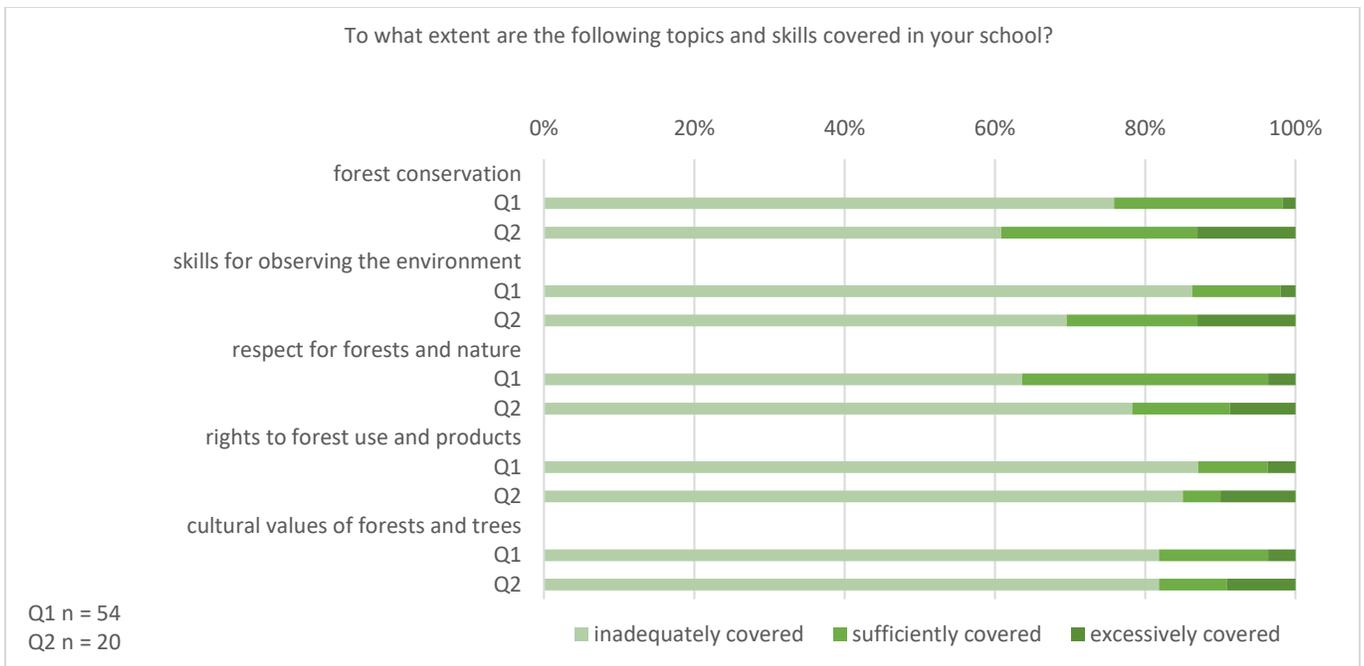
**Figure A20. To what extent does education in secondary school increase students' interest in pursuing further learning about forests or related subjects?**



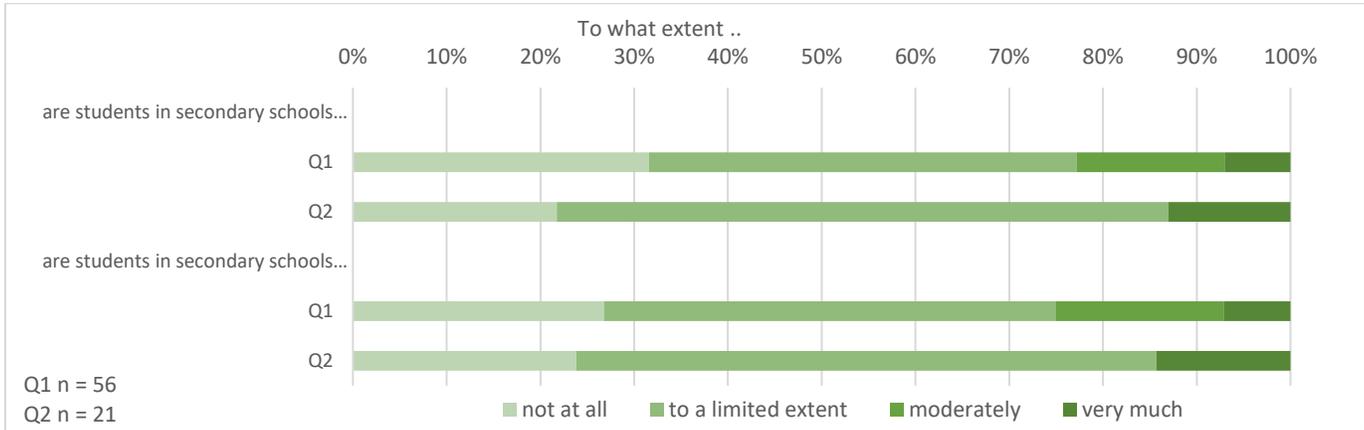
**Figure A21.1. To what extent are the following topics and skills covered in your school? (Forest ecology; forest biodiversity; wood as renewable energy...)**



**Figure A21.2. To what extent are the following topics and skills covered in your school? (forests and climate change; recreational values; traditional and/or indigenous forest-related knowledge ...)**



**Figure A21.3. To what extent are the following topics and skills covered in your school? (forest conservation; skills for observing the environment; respect for forests and nature...)**



**Figure A22. To what extent are students in secondary schools motivated to enter a forest technical or vocational training school, and motivated to enter a forest programme at the university and college level?**

## Technical and Vocational Education and Training (TVET)

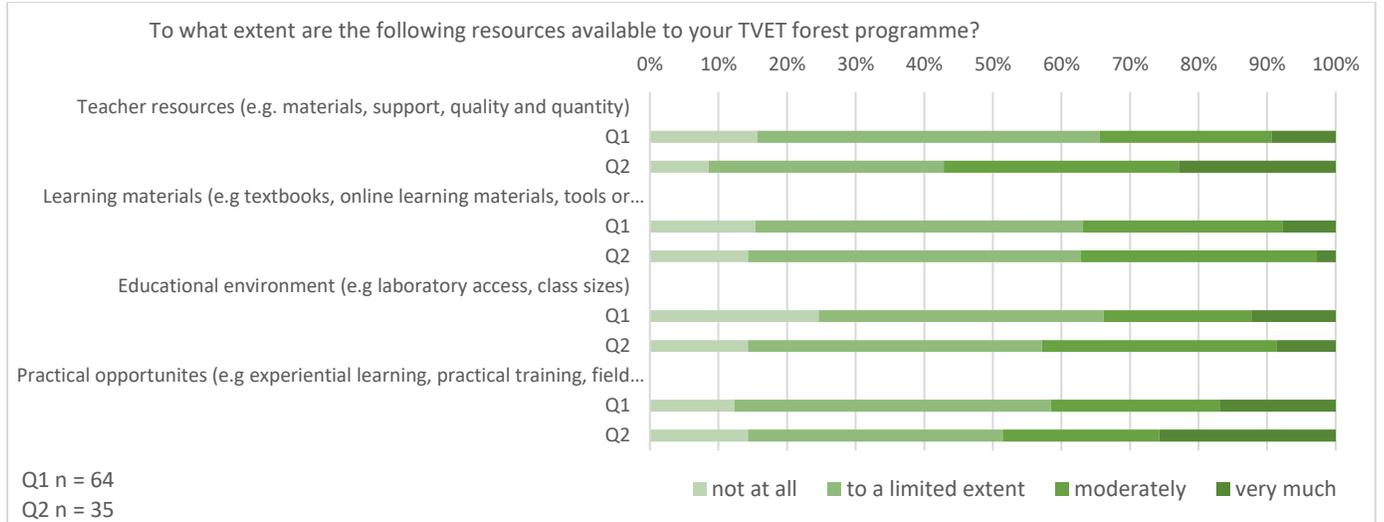


Figure A23. To what extent are the following resources available to your TVET forest programme?

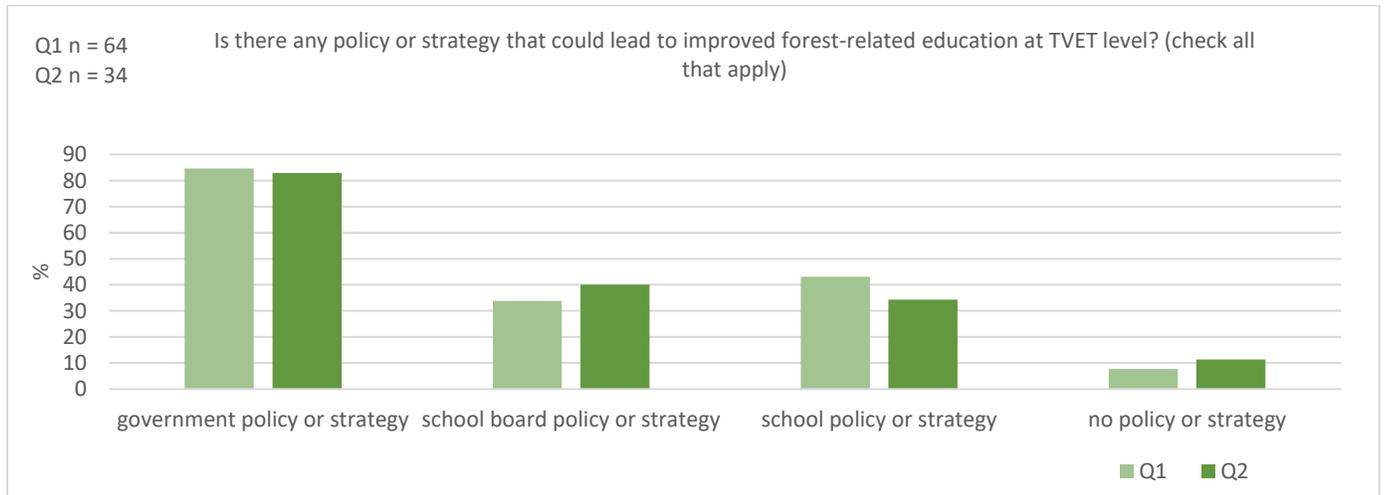
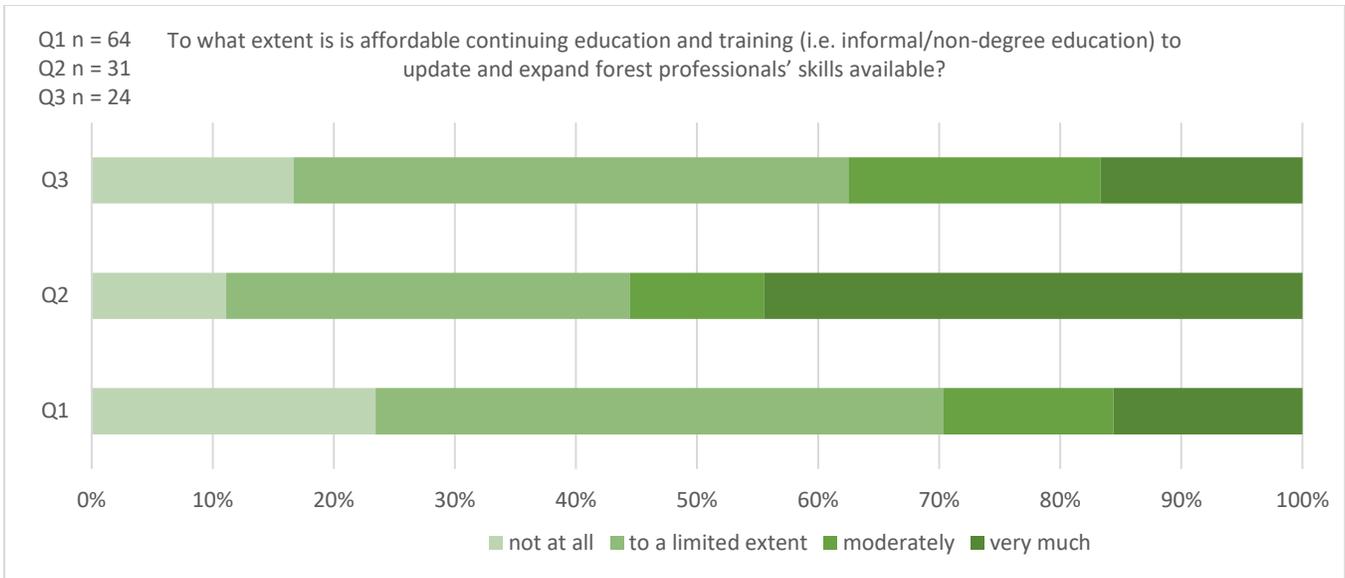
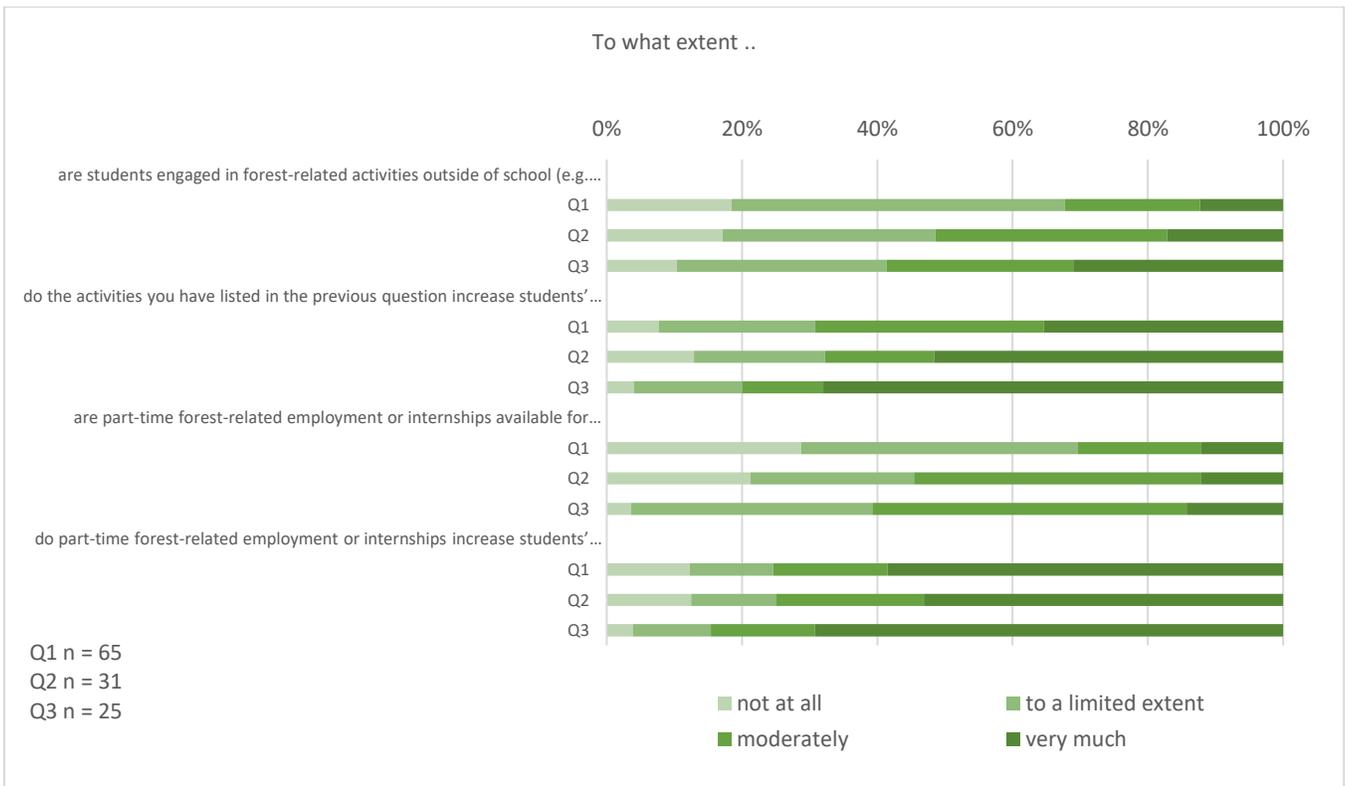


Figure A24. Is there any policy or strategy that could lead to improved forest-related education at TVET level? (check all that apply)



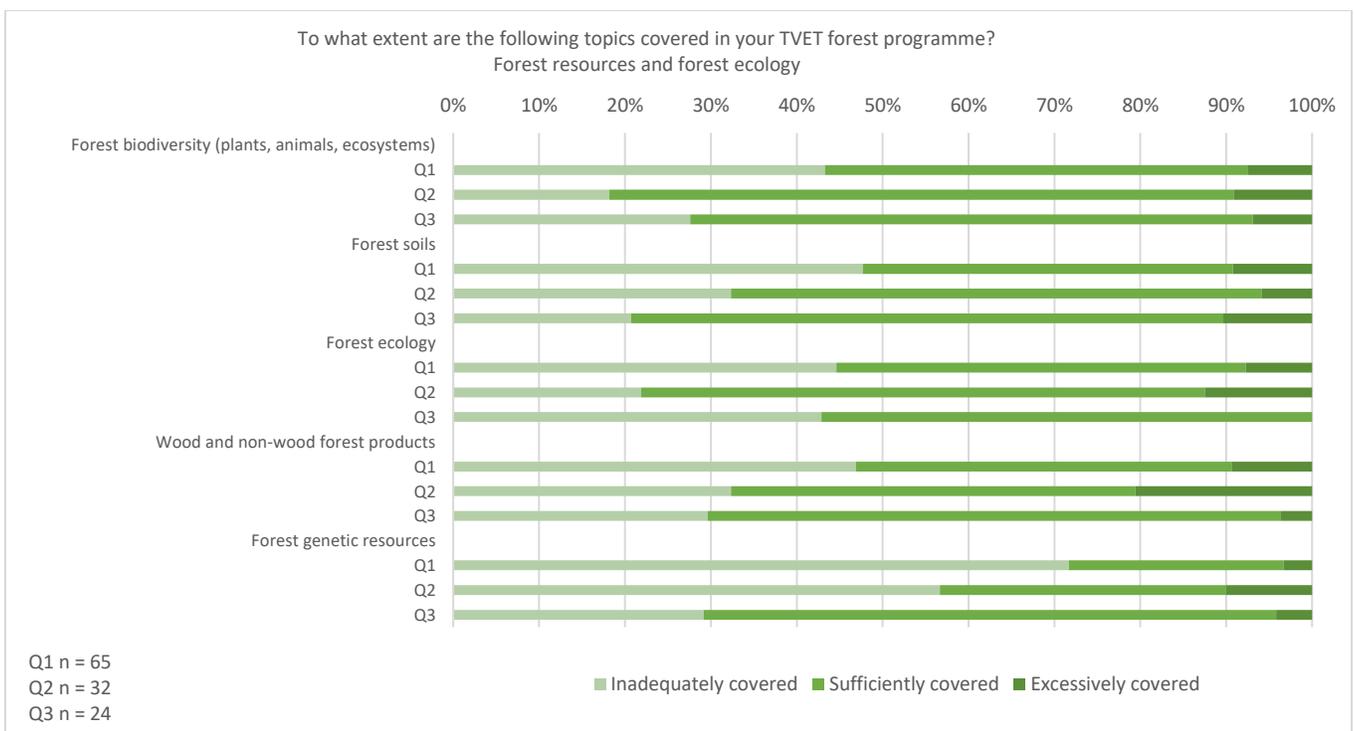
**Figure A25. To what extent is affordable continuing education and training to update and expand forest professionals' skills available?**



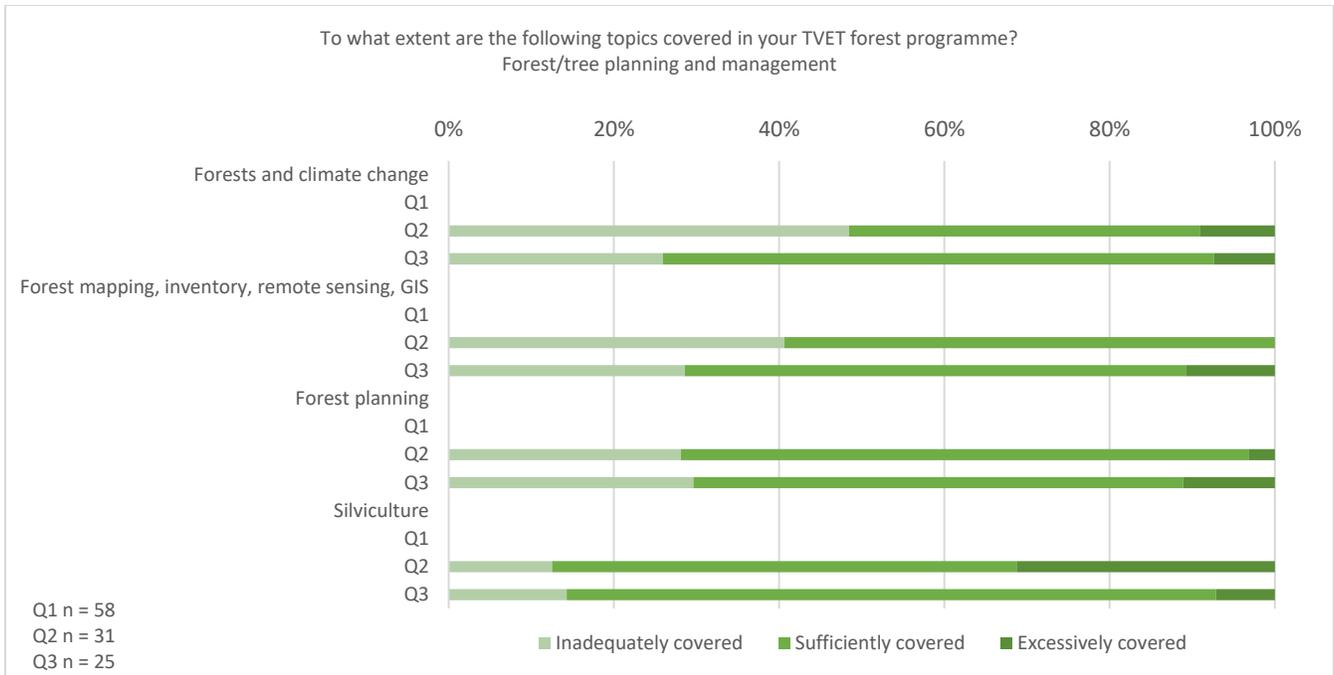
**Figure A26. To what extent are students engaged in forest-related activities outside of schools; do the activities listed increase students' learning; are part-time forest-related employment or internships available for students; and do part-time forest-related employment or internships increase students' learning?**



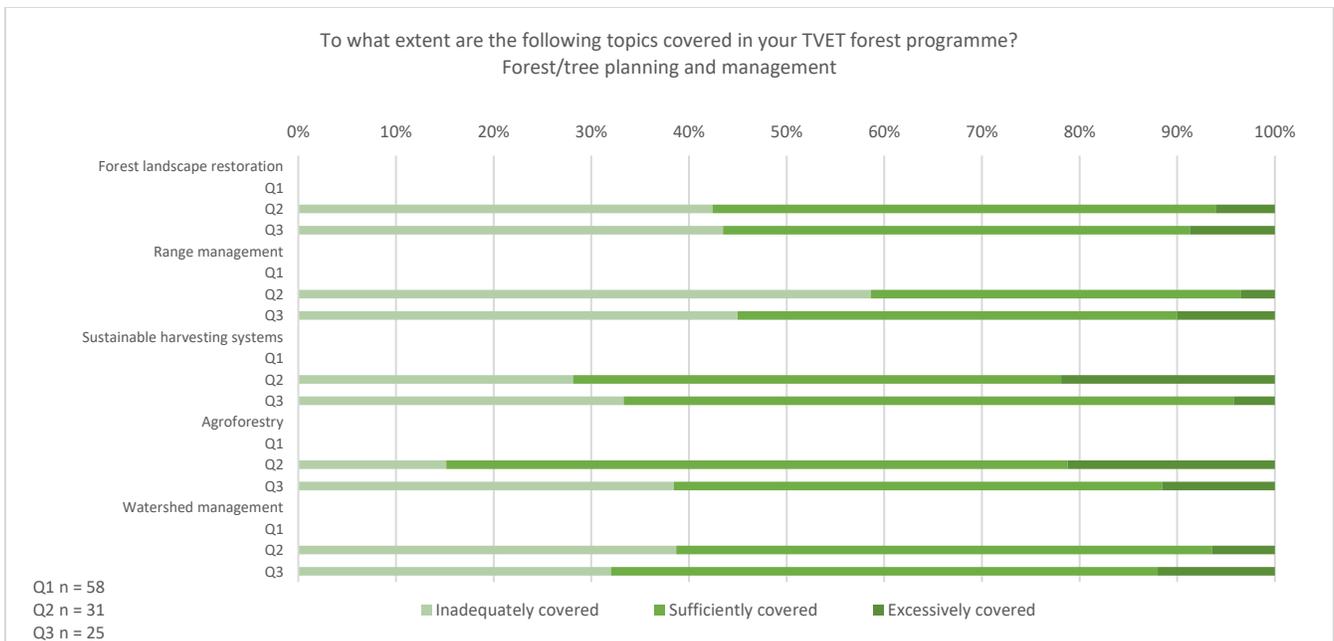
**Figure A27. To what extent are digital learning tools currently used in TVET forest programmes, and can digital learning tools be a valuable supplement to forest education at TVET level?**



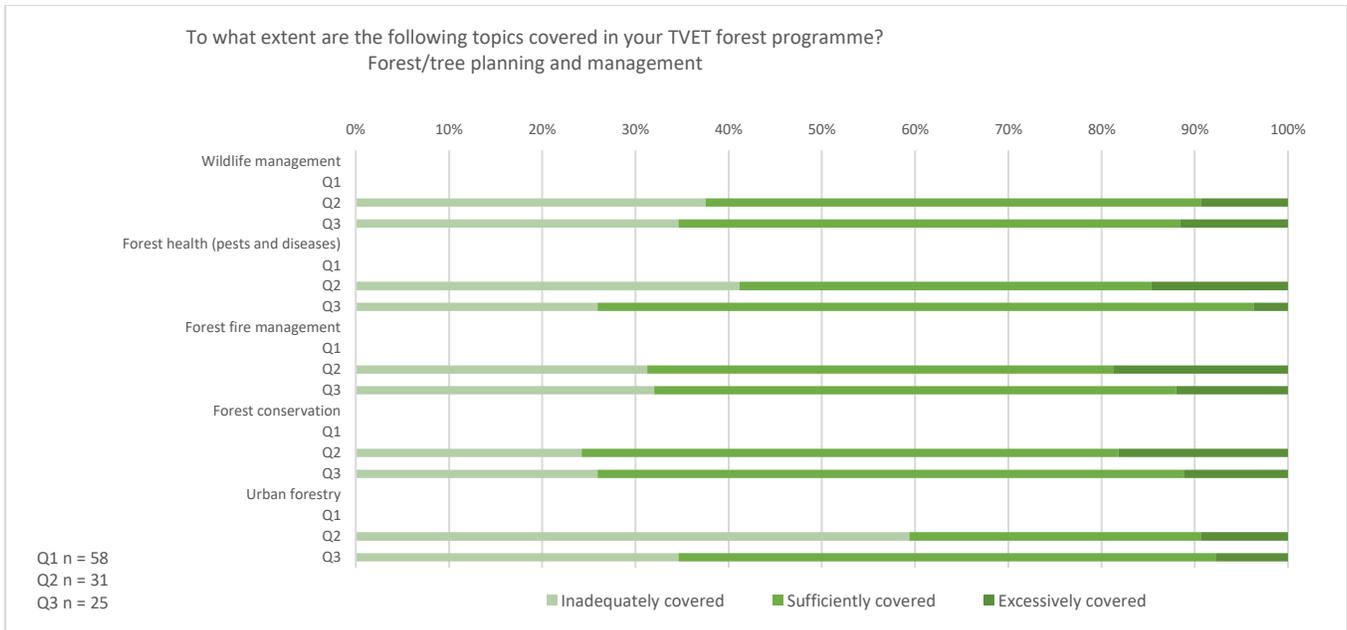
**Figure A28. To what extent are the following topics covered in your TVET forest programme? (Forest resources and forest ecology – includes forest biodiversity...)**



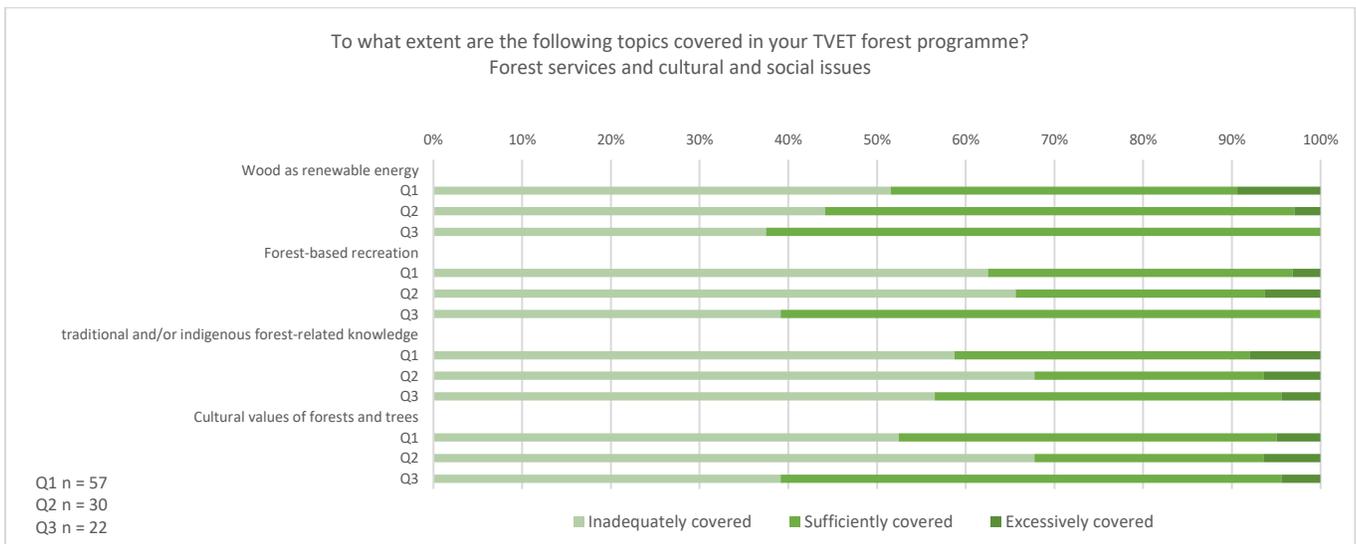
**Figure A29.1. To what extent are the following topics covered in your TVET forest programme? (Forest/tree planning and management: forests and climate change...)**



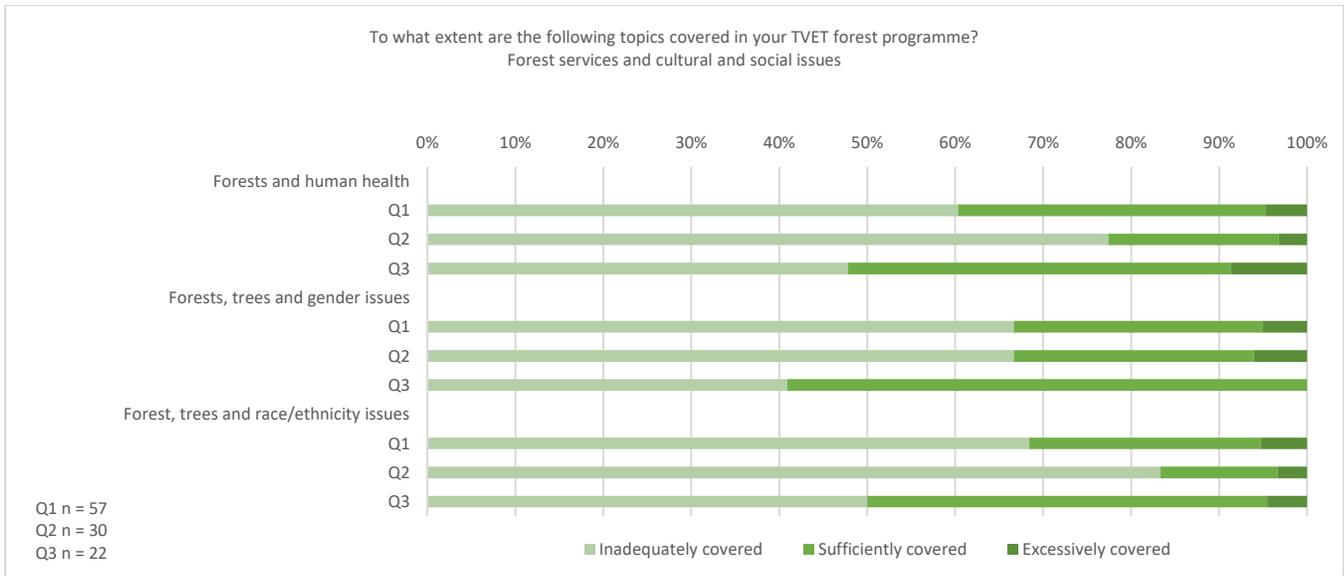
**Figure A29.2. To what extent are the following topics covered in your TVET forest programme? (Forest/tree planning and management: forest landscape restoration).**



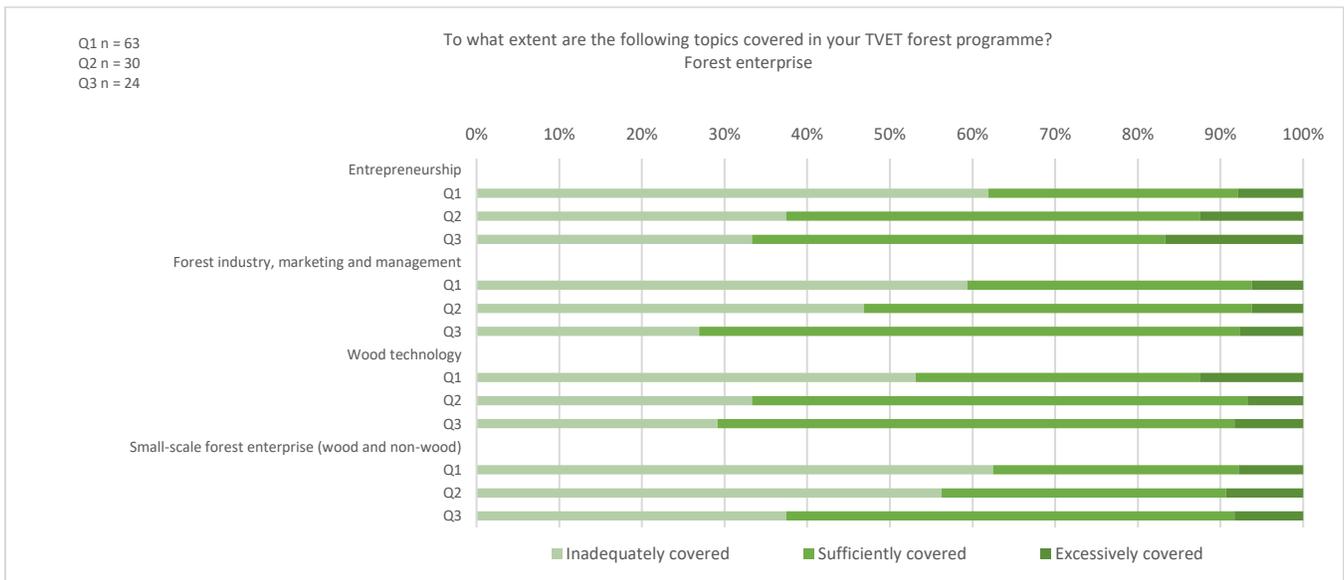
**Figure A29.3. To what extent are the following topics covered in your TVET forest programme? (Forest/tree planning and management: wildlife management....)**



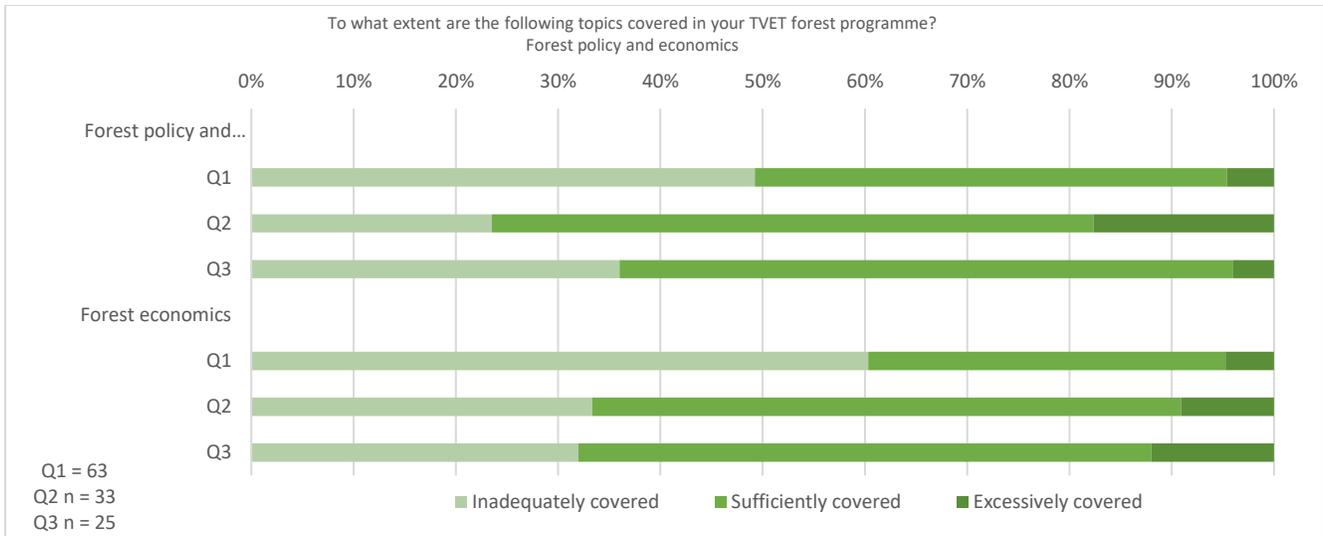
**Figure A30.1. To what extent are the following topics covered in your TVET forest programme? (Forest services and cultural and social issues – wood as renewable energy; forest-based recreation...)**



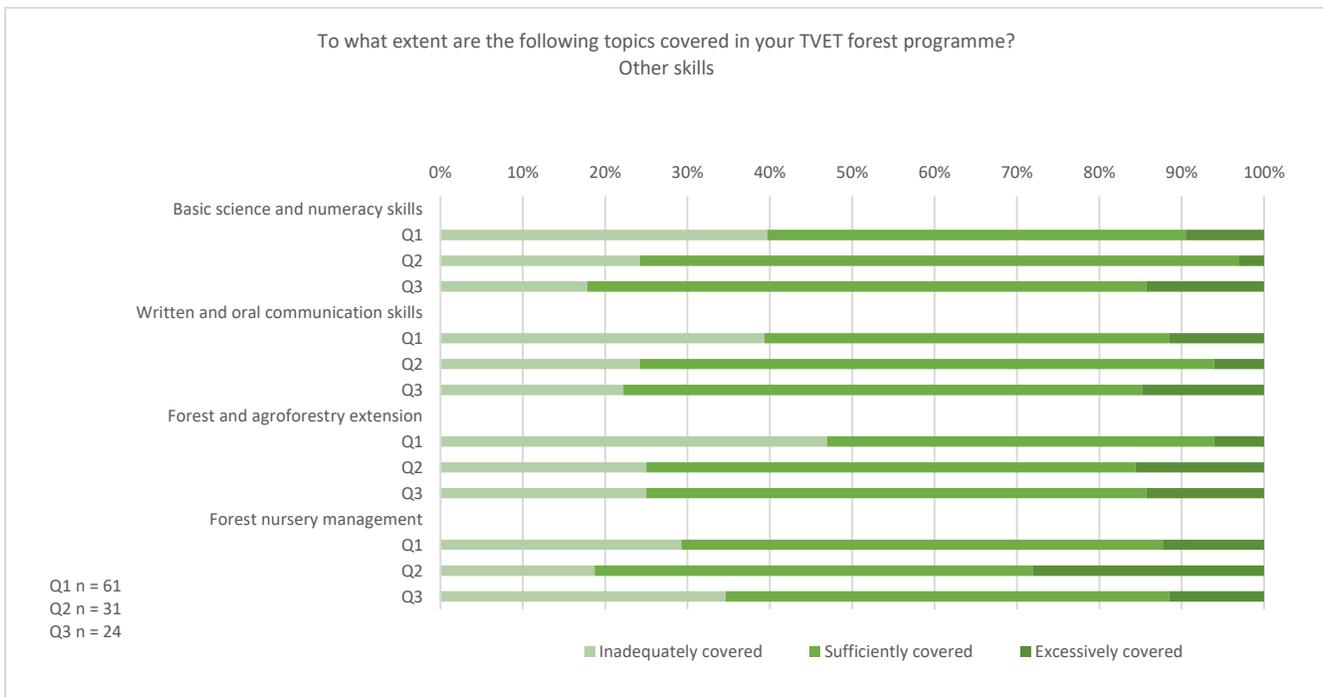
**Figure A30.2. To what extent are the following topics covered in your TVET forest programme? (Forest services and cultural and social issues – forests and human health; forests, trees and gender issues; and forests, trees and race/ethnicity issues)**



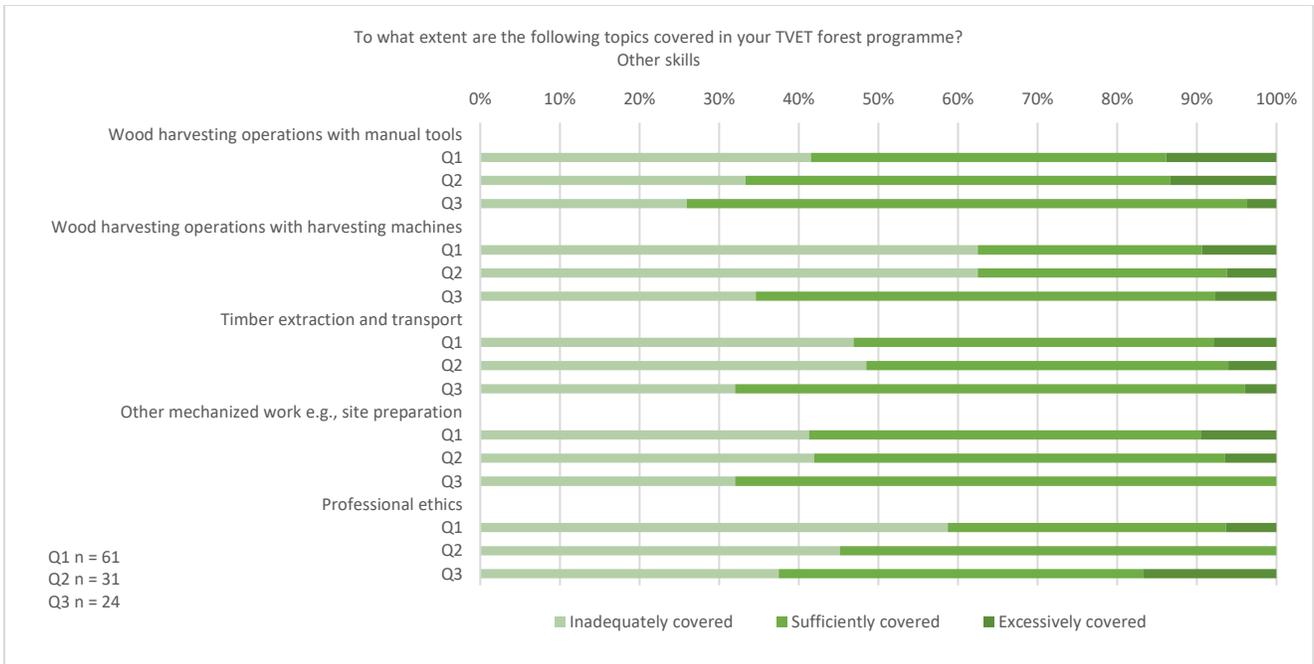
**Figure A31. To what extent are the following topics covered in your TVET forest programme? (Forest enterprise)**



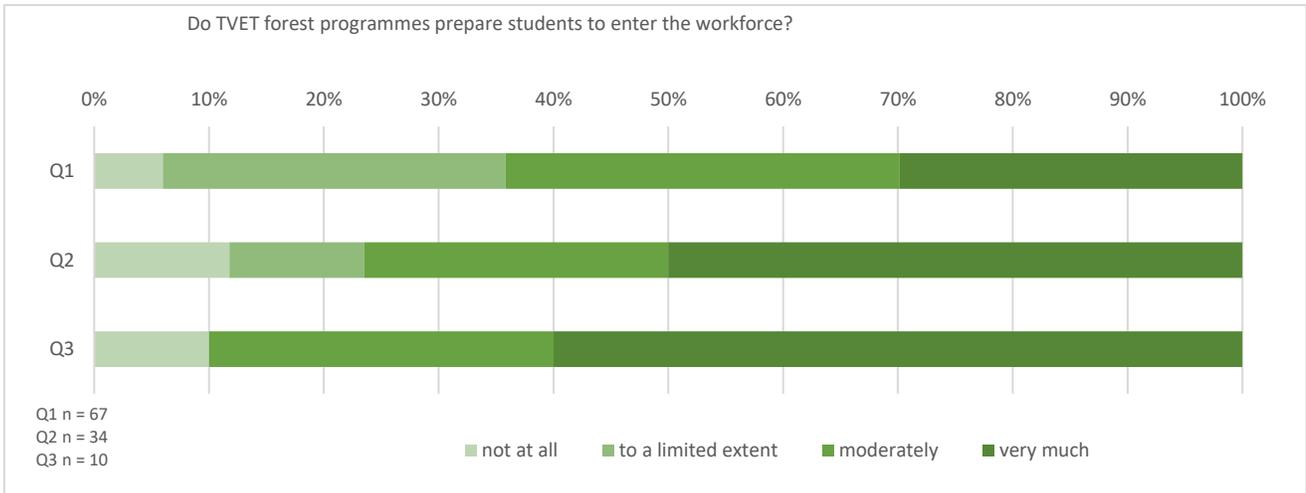
**Figure A32. To what extent are the following topics covered in your TVET forest programme? (Forest policy and economics)**



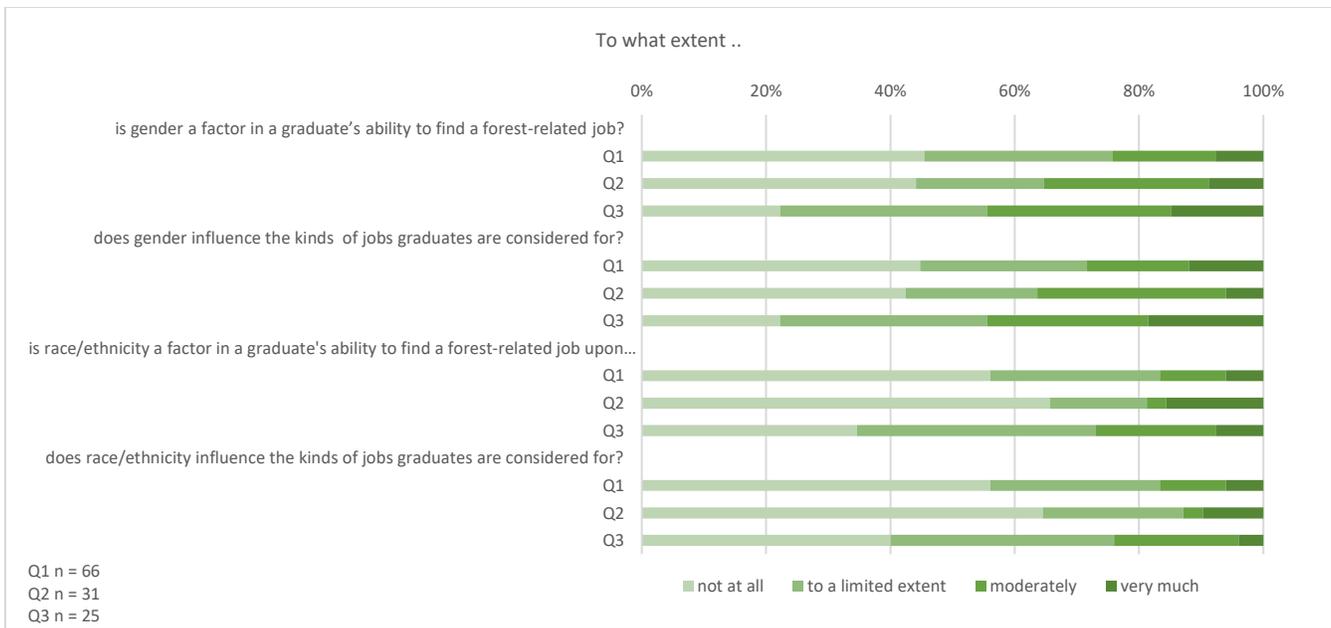
**Figure A33.1. To what extent are the following topics covered in your TVET forest programme? (Basic science and numeracy skills; written and oral communications skills...)**



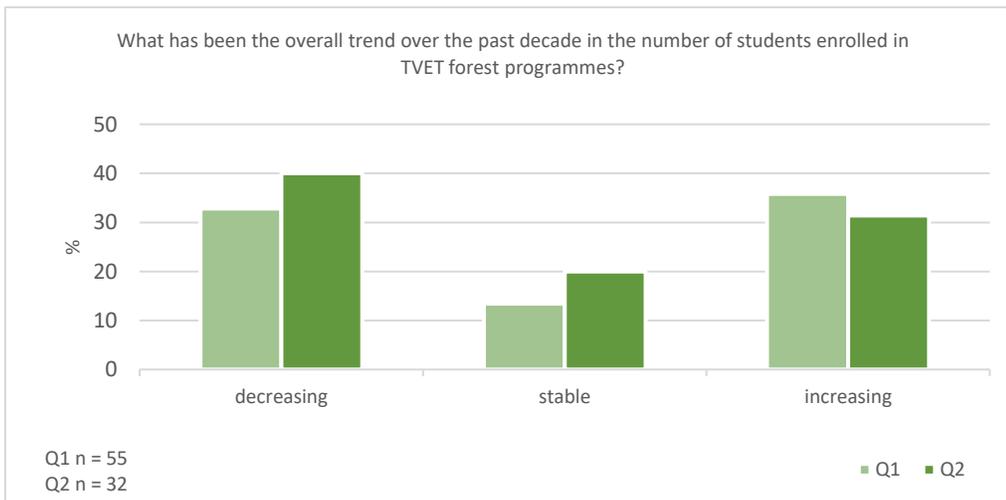
**Figure A33.2. To what extent are the following topics covered in your TVET forest programme? (Wood harvesting operation with manual tools...)**



**Figure A34. To what extent do TVET forest programmes prepare students to enter the workforce?**

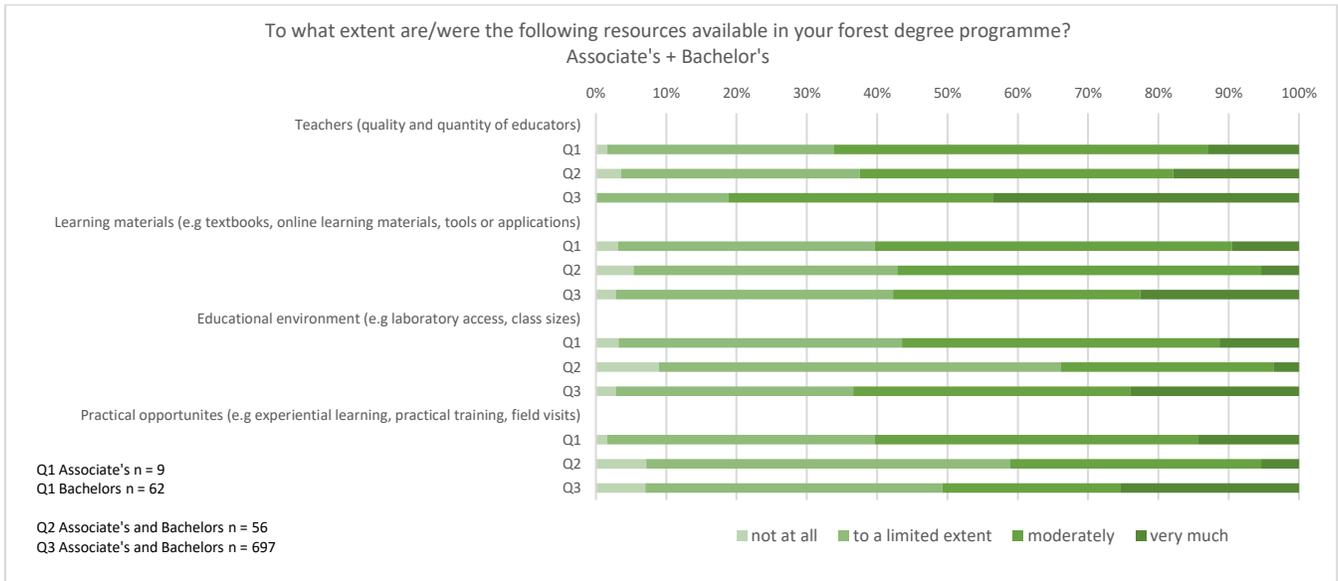


**Figure A35. To what extent is gender a factor...an influence...is race/ethnicity a factor...does race/ethnicity influence...?**

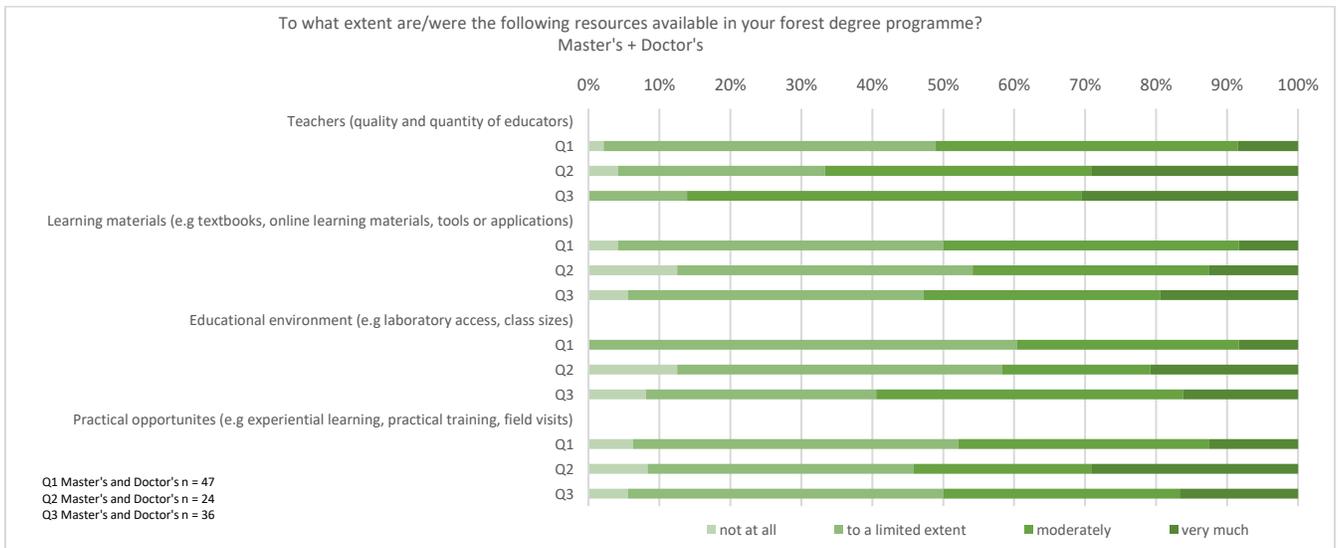


**Figure A36. What has been the overall trend over the past decade in the number of students enrolled in TVET forest programmes?**

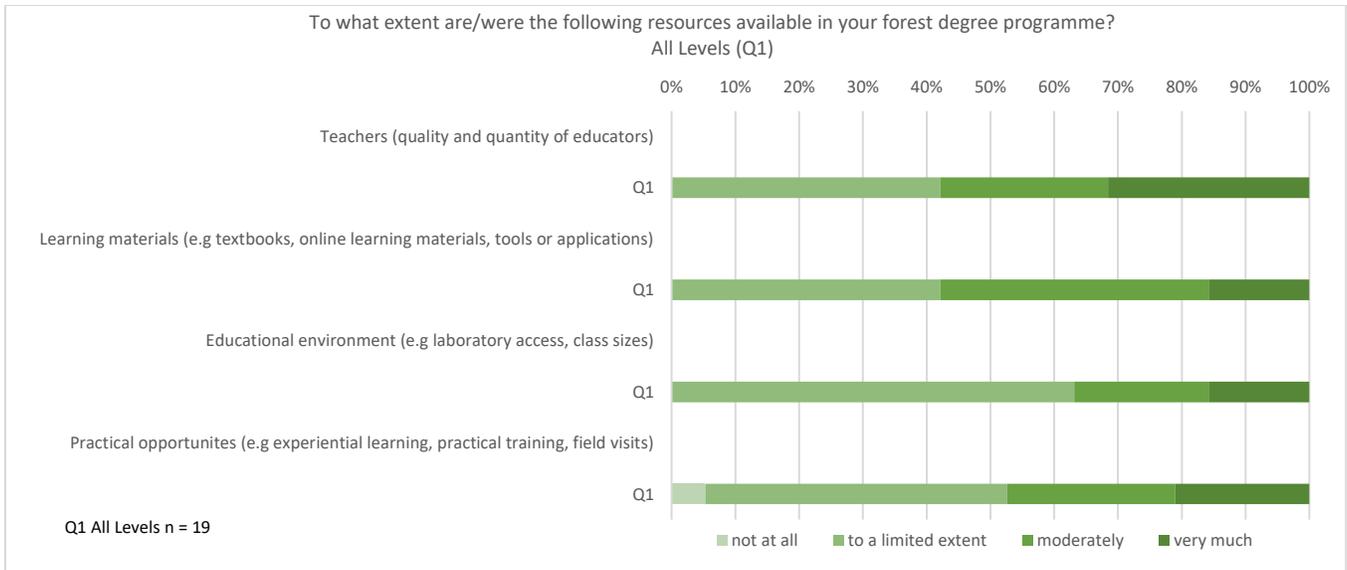
## University/College Level



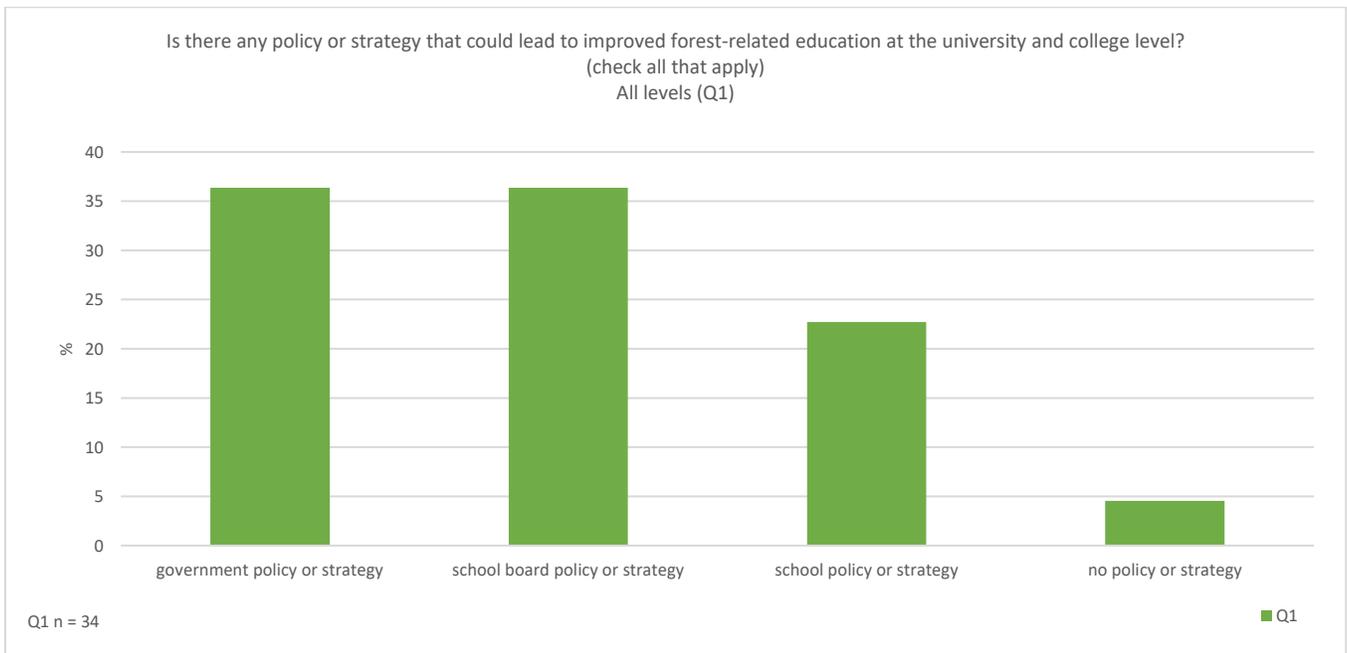
**Figure A37. To what extent are/were the following resources available in your forest degree programme? Associate's & Bachelor's**



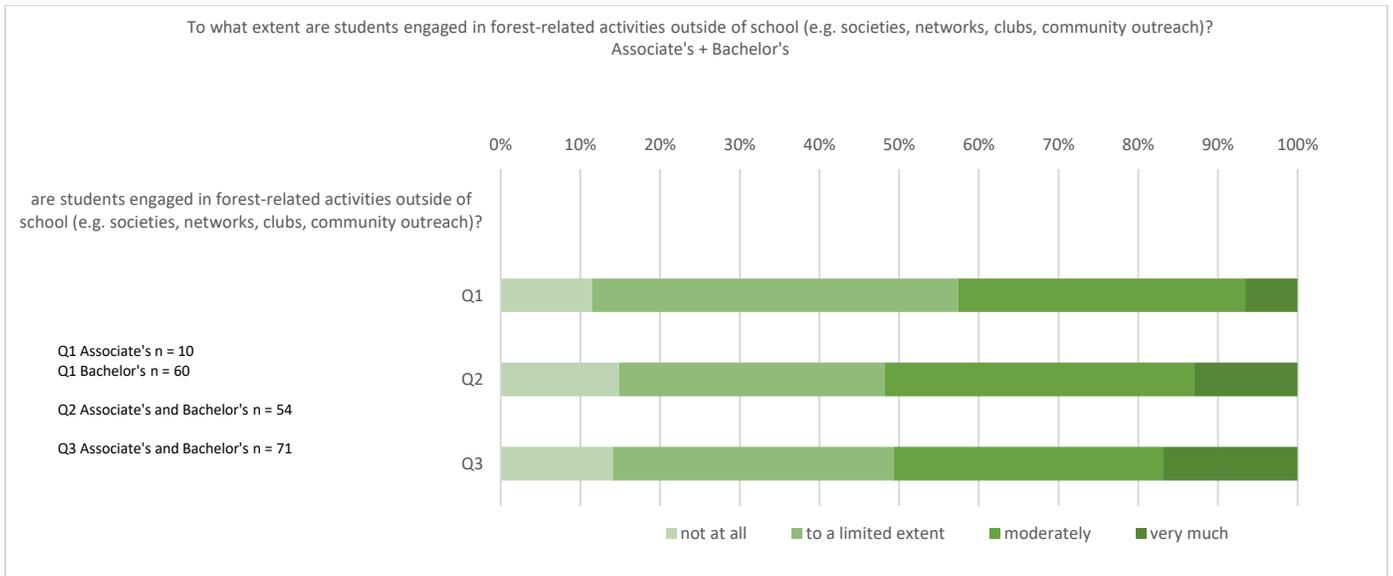
**Figure A38. To what extent are/were the following resources available in your forest degree programme? Master's & Doctor's**



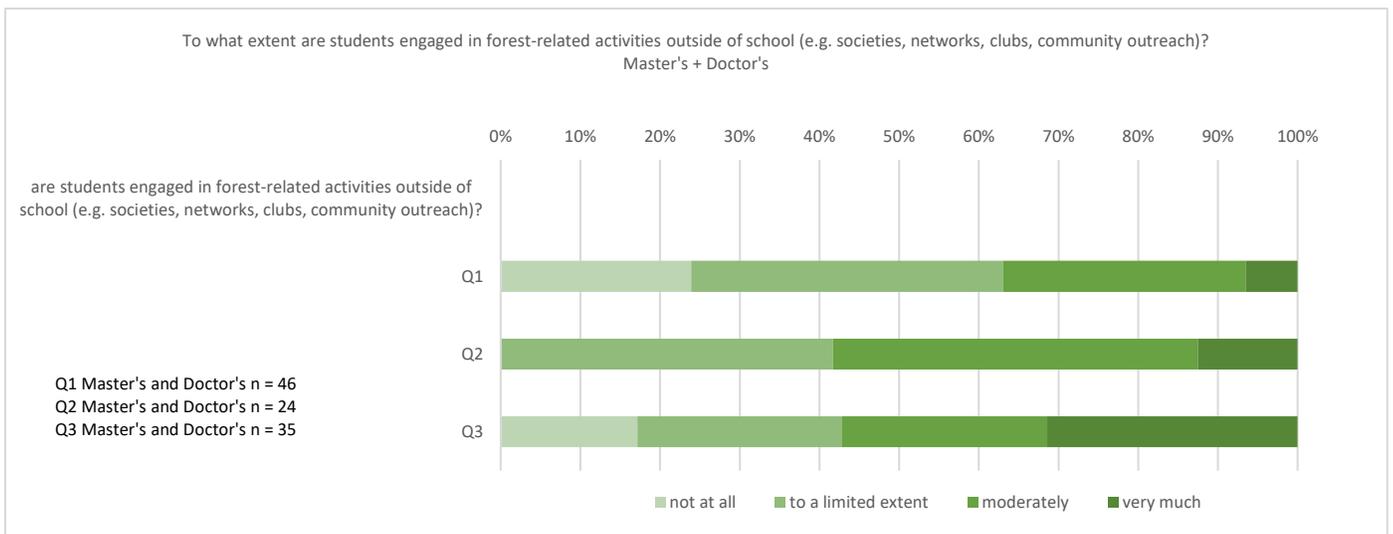
**Figure A39. To what extent are/were the following resources available in your forest degree programme? All Levels**



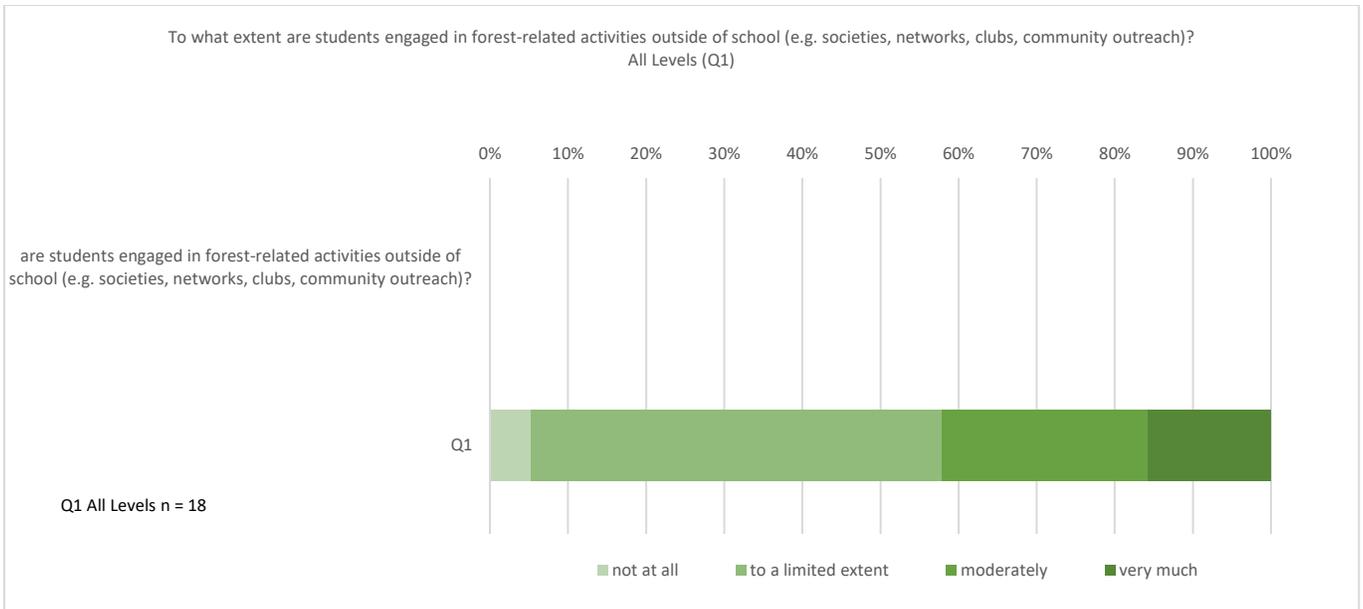
**Figure A40. Is there any policy or strategy that could lead to improved forest-related education at the university and college level? All Levels**



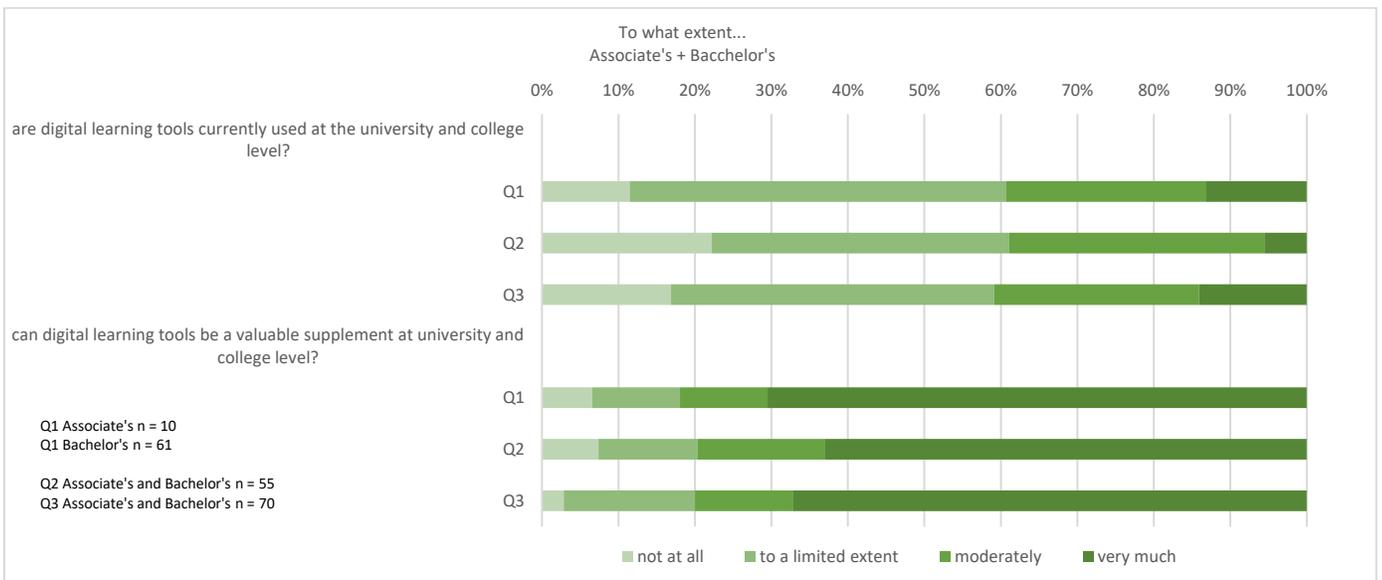
**Figure A41. To what extent are students engaged in forest-related activities outside of school (e.g. societies, networks, clubs, community outreach?) Associate's & Bachelor's**



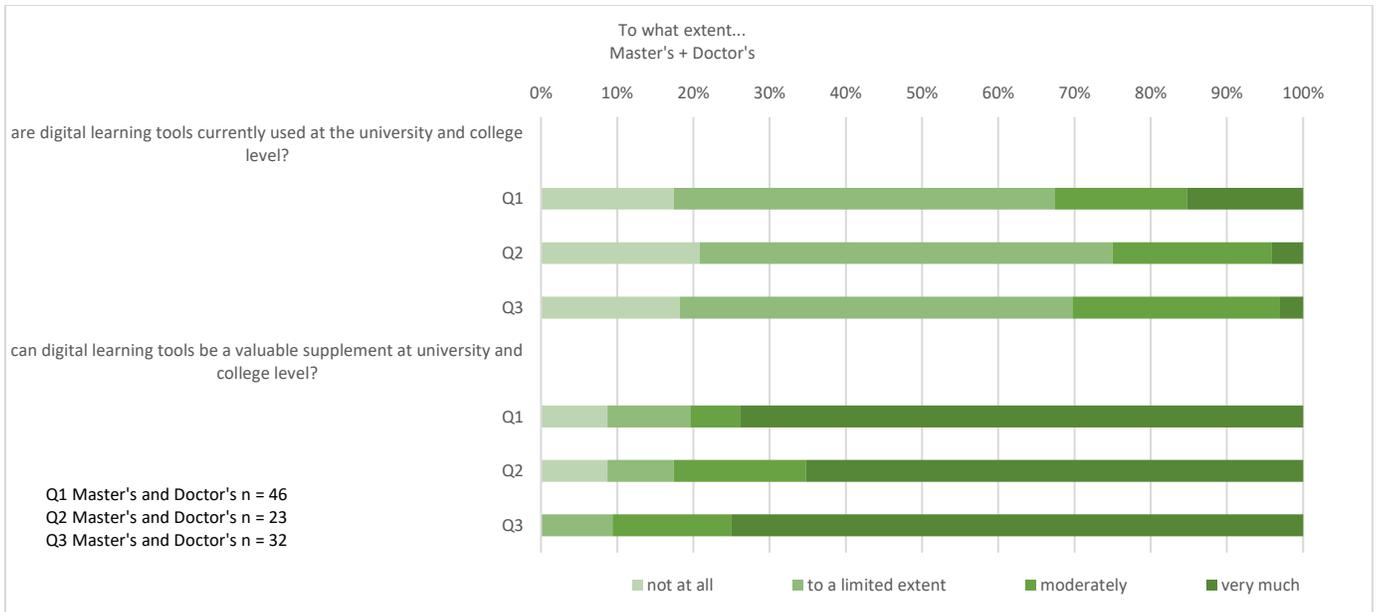
**Figure A42. To what extent are students engaged in forest-related activities outside of school (e.g. societies, networks, clubs, community outreach?) Master's & Doctor's**



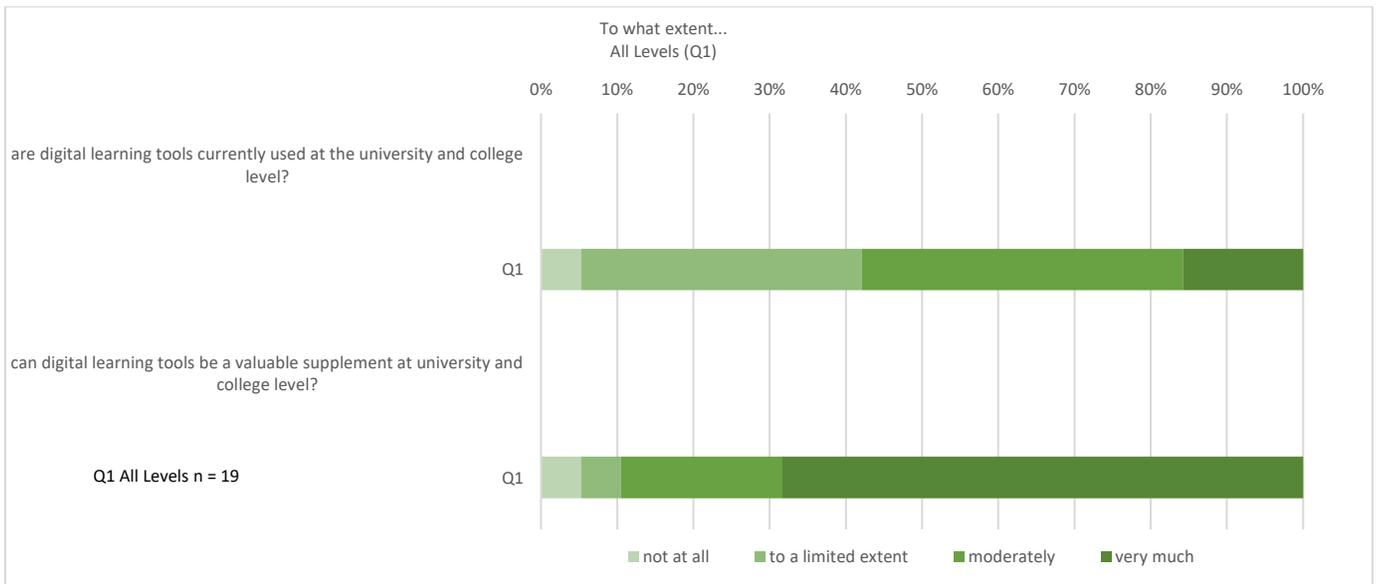
**Figure A43. To what extent are students engaged in forest-related activities outside of school (e.g. societies, networks, clubs, community outreach?) All Levels**



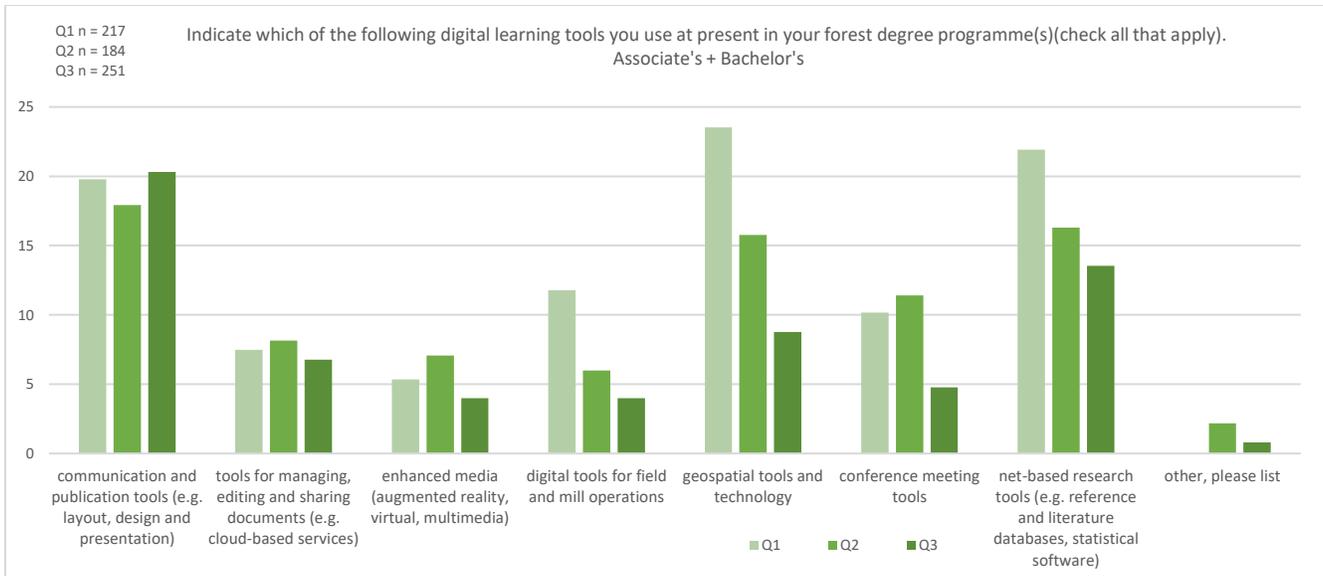
**Figure A44. To what extent are digital learning tools currently used at the university and college level? Associate's & Bachelor's**



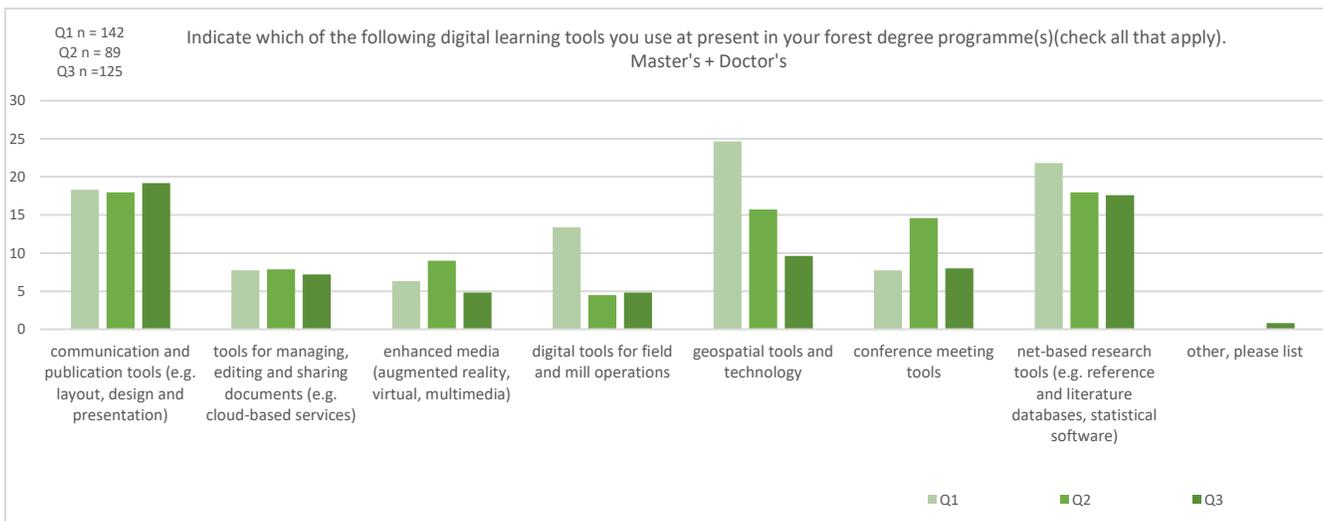
**Figure A45. To what extent are digital learning tools currently used at the university and college level? Master's & Doctor's**



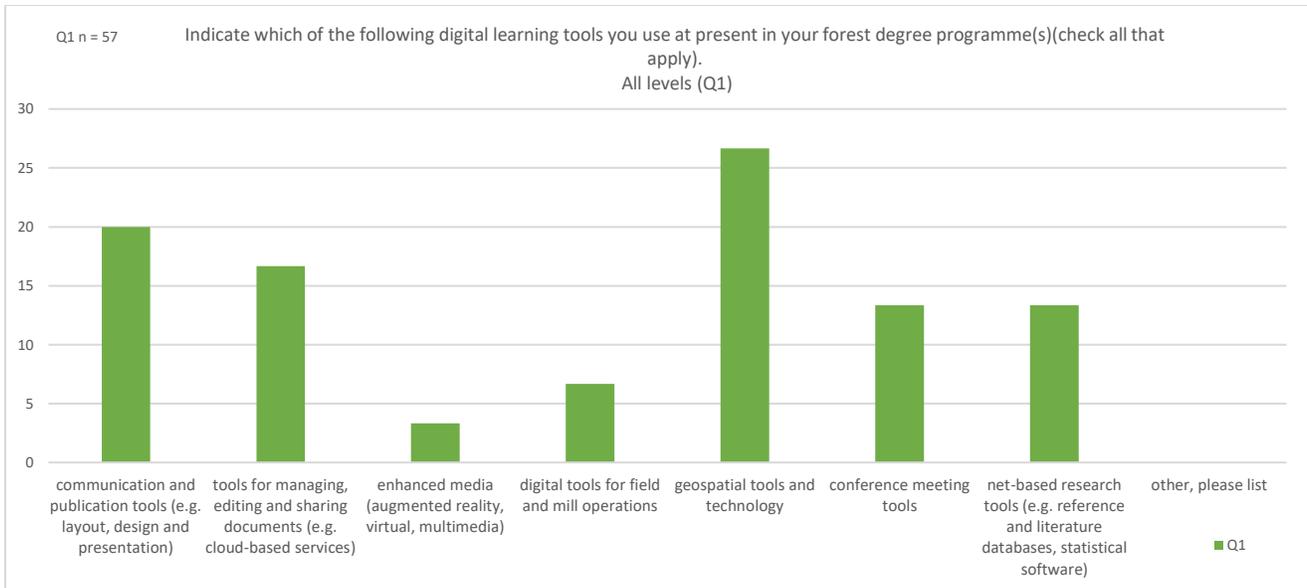
**Figure A46. To what extent are digital learning tools currently used at the university and college level? All Levels**



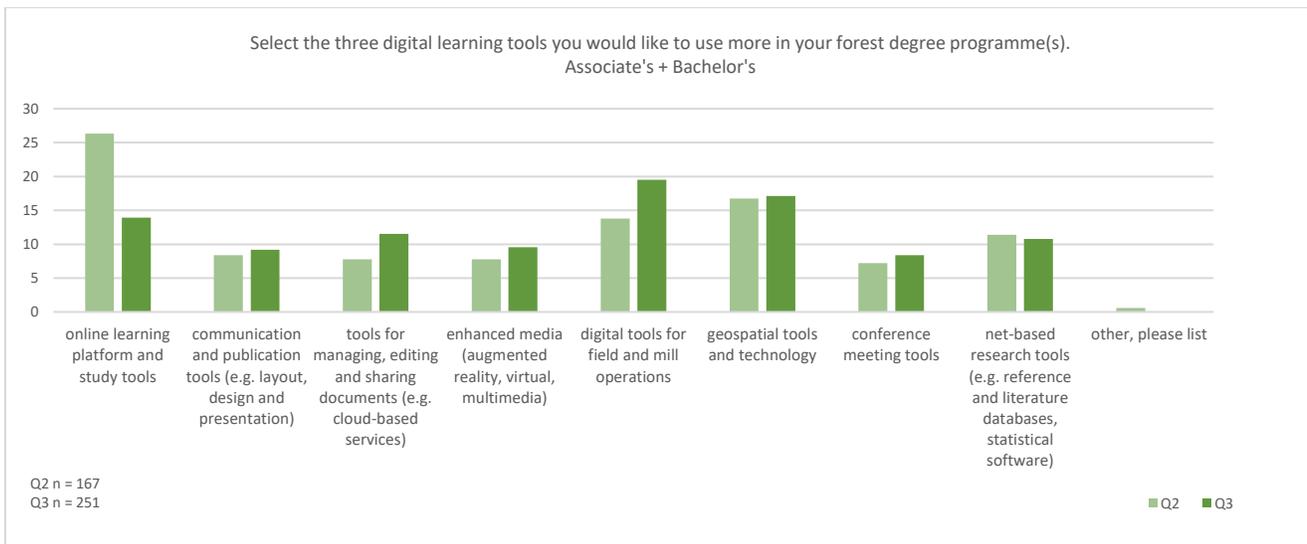
**Figure A47. Indicate which of the following digital learning tools you use at present in your forest degree programme(s) (check all that apply). Associate's & Bachelor's**



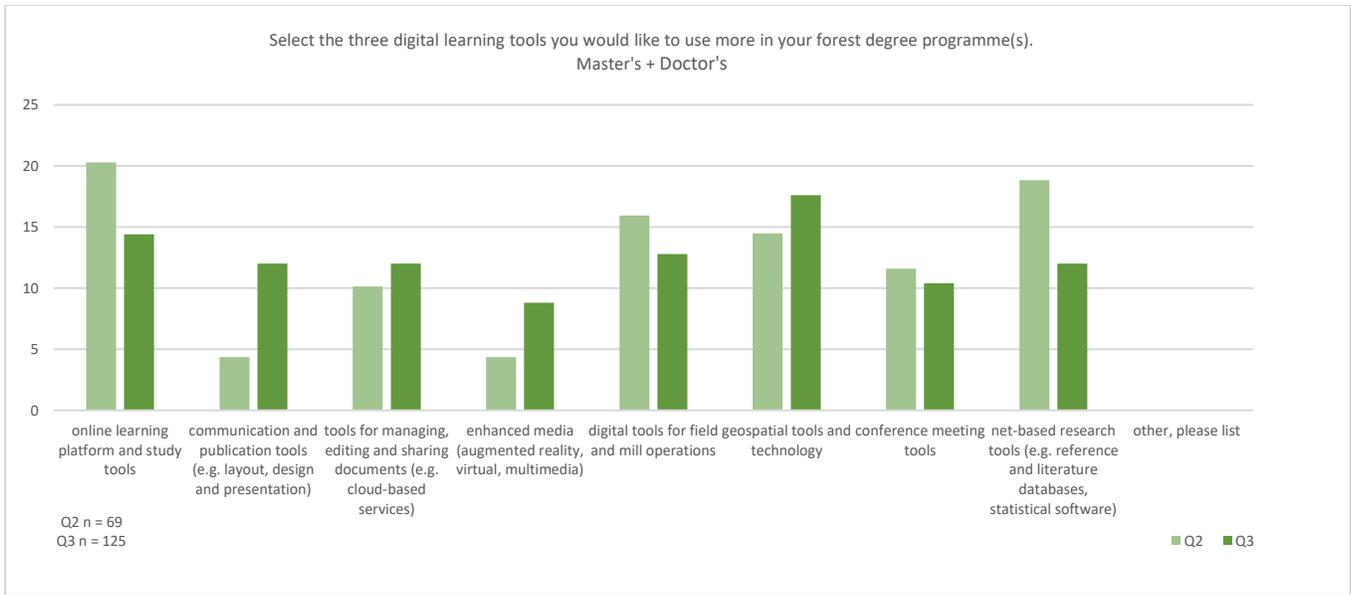
**Figure A48. Indicate which of the following digital learning tools you use at present in your forest degree programme(s) (check all that apply). Master's & Doctor's**



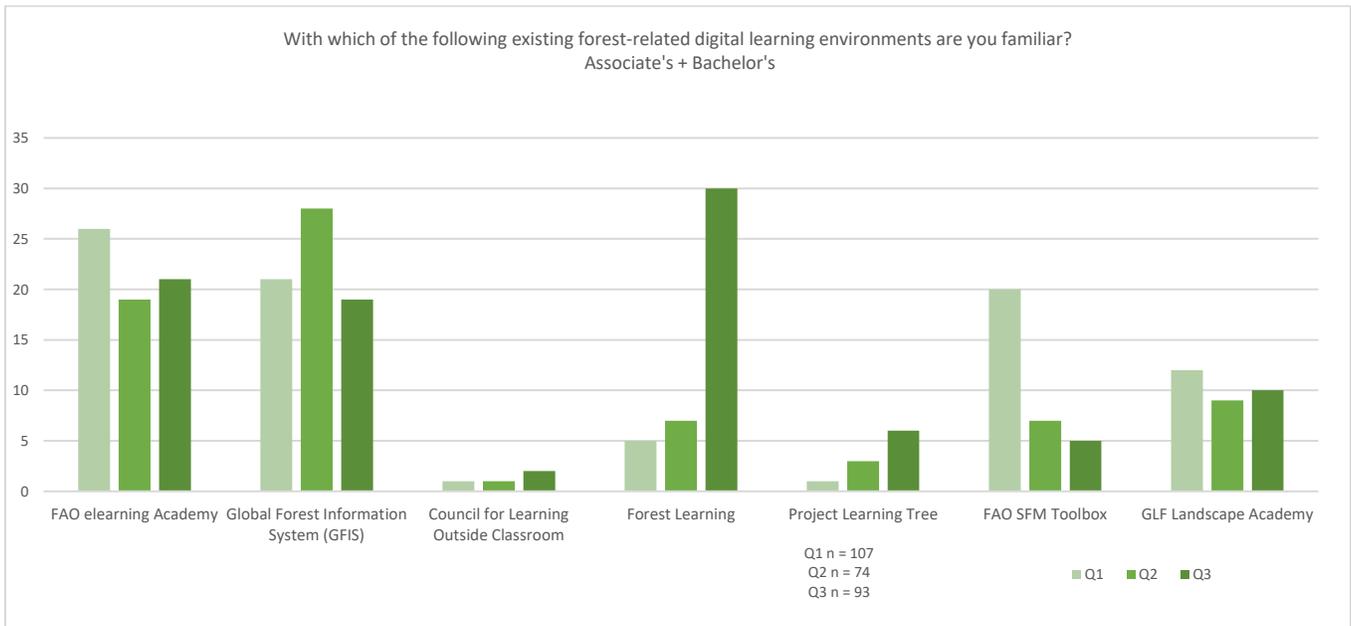
**Figure A49. Indicate which of the following digital learning tools you use at present in your forest degree programme(s) (check all that apply). All Levels**



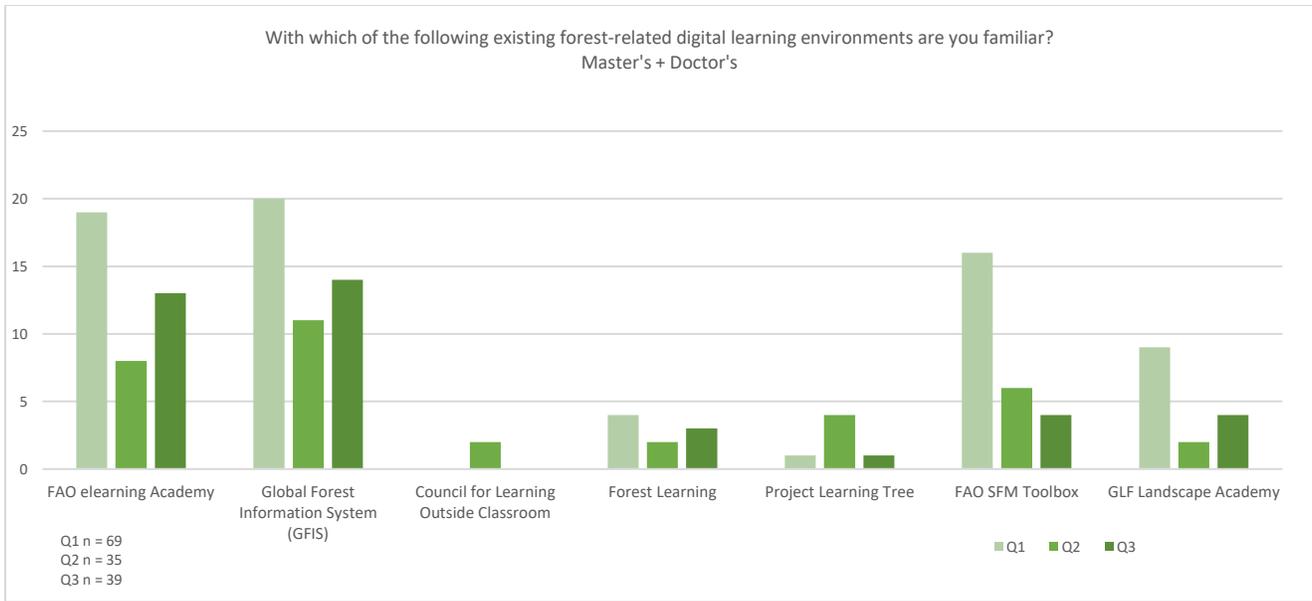
**Figure A50. Select the three digital learning tools you would like to use more in your forest degree programme(s). Associate's & Bachelor's**



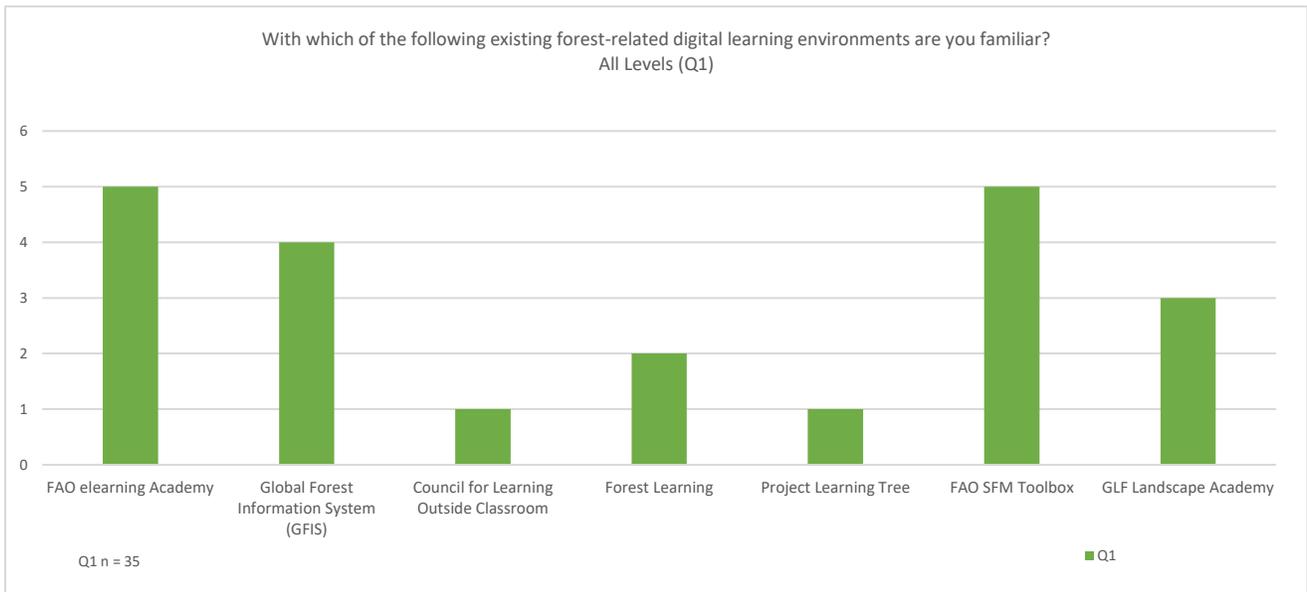
**Figure A51. Select the three digital learning tools you would like to use more in your forest degree programme(s). Master's & Doctor's**



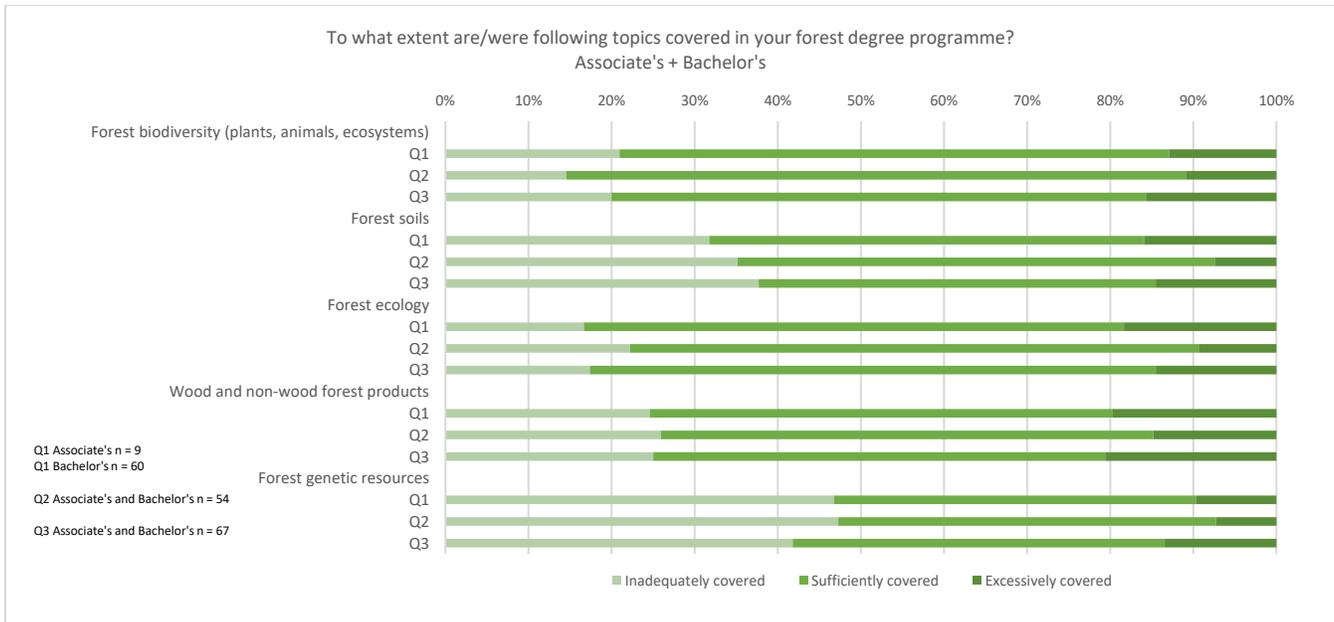
**Figure A52. With which of the following existing forest-related digital learning environments are you familiar? Associate's & Bachelor's**



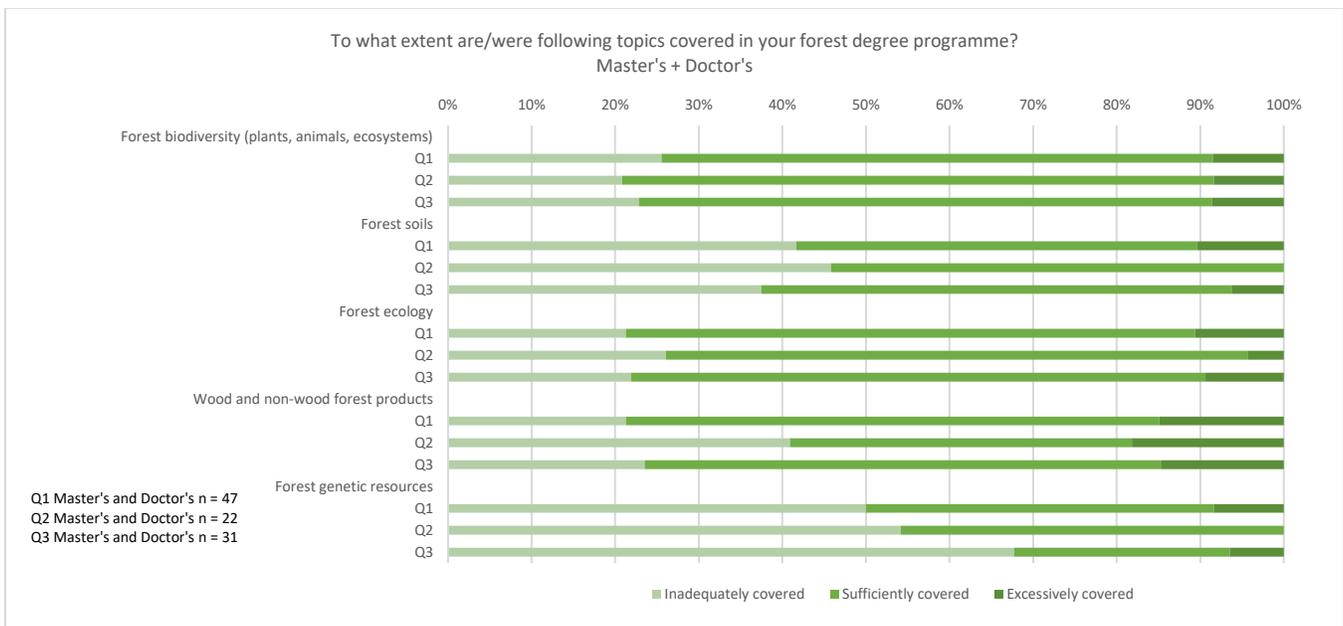
**Figure A53. With which of the following existing forest-related digital learning environments are you familiar? Master's & Doctor's**



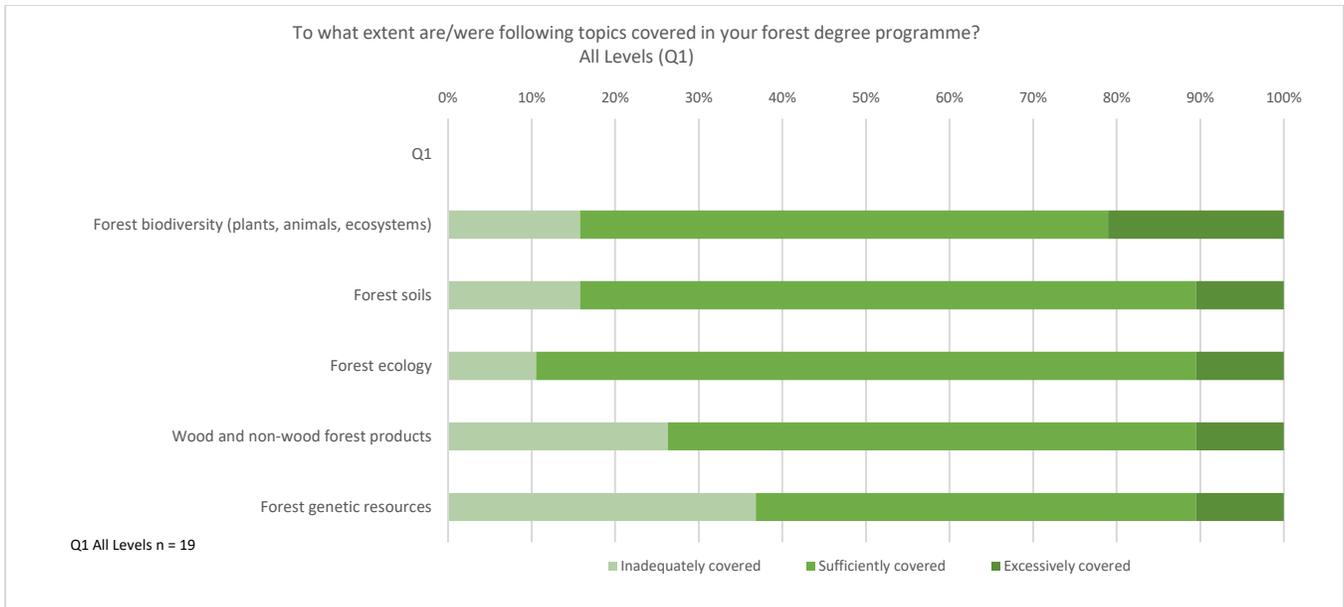
**Figure A54. With which of the following existing forest-related digital learning environments are you familiar? All Levels**



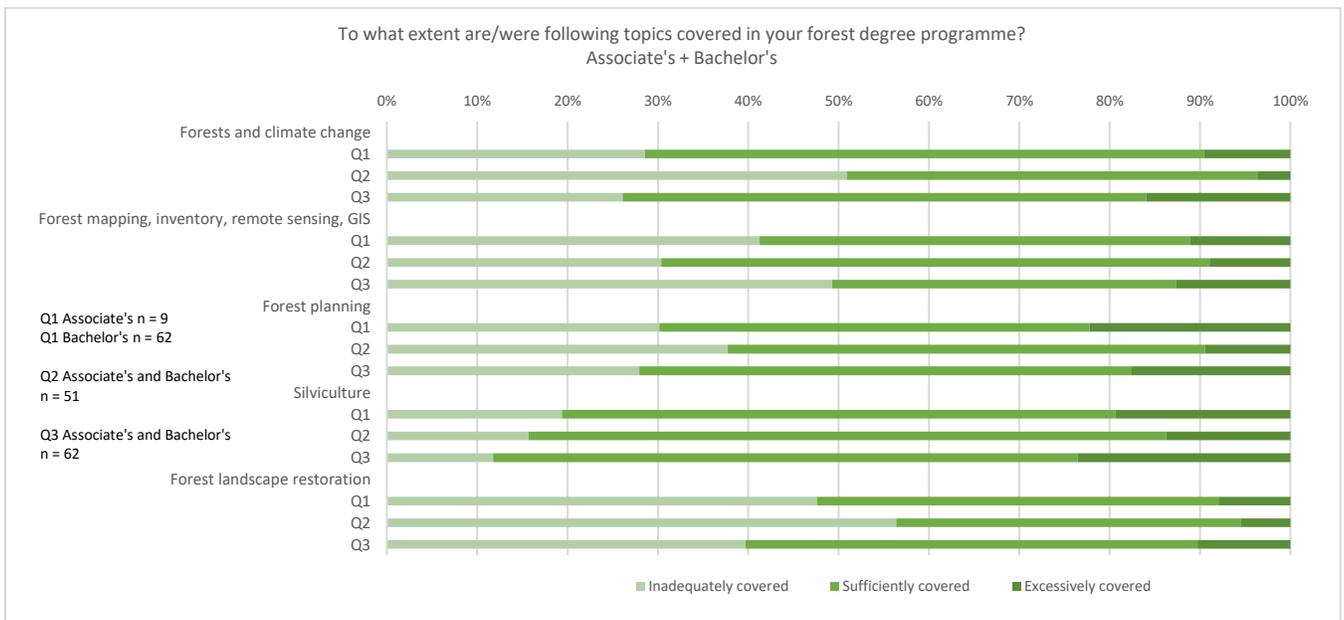
**Figure A55. To what extent are/were the following topics covered in your forest degree programme? Associate's & Bachelor's (forest biodiversity, forest soils, forest ecology, wood and NWFP, forest genetic resources)**



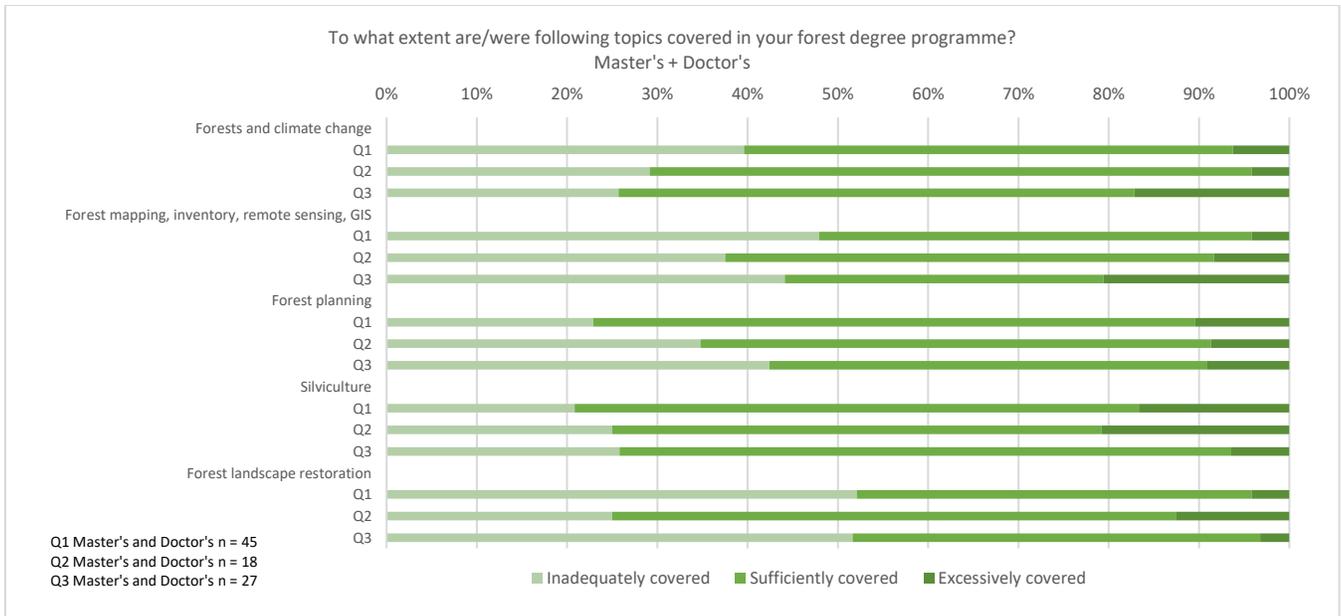
**Figure A56. To what extent are/were the following topics covered in your forest degree programme? Master's & Doctor's (forest biodiversity, forest soils, forest ecology, wood and NWFP, forest genetic resources)**



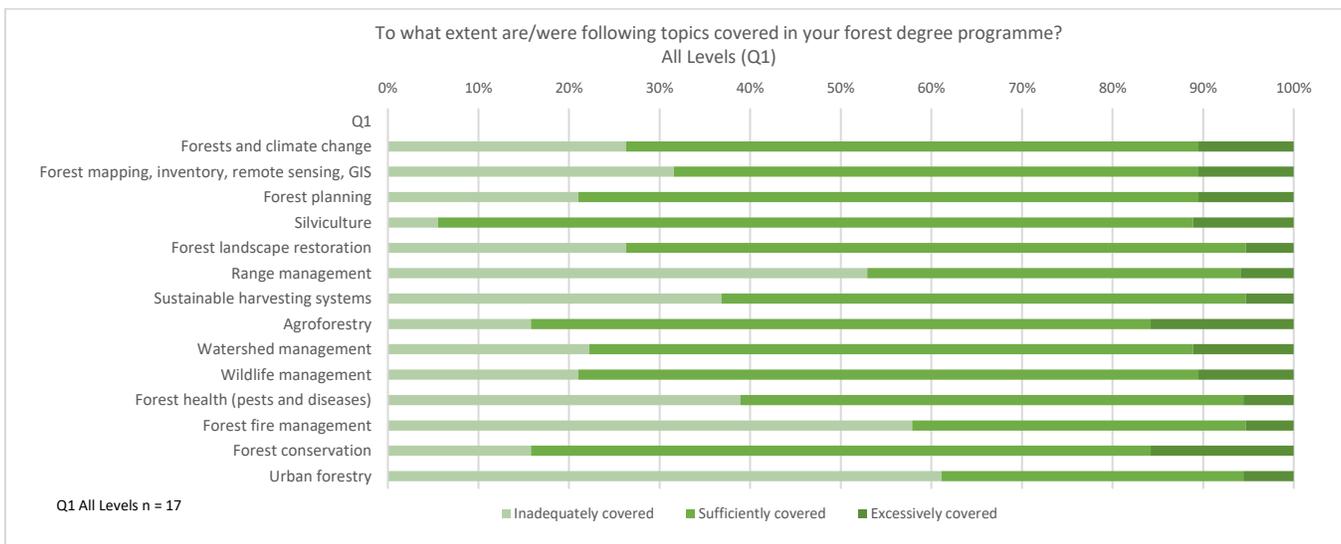
**Figure A57. To what extent are/were the following topics covered in your forest degree programme? All Levels (forest biodiversity, forest soils, forest ecology, wood and NWFP, forest genetic resources)**



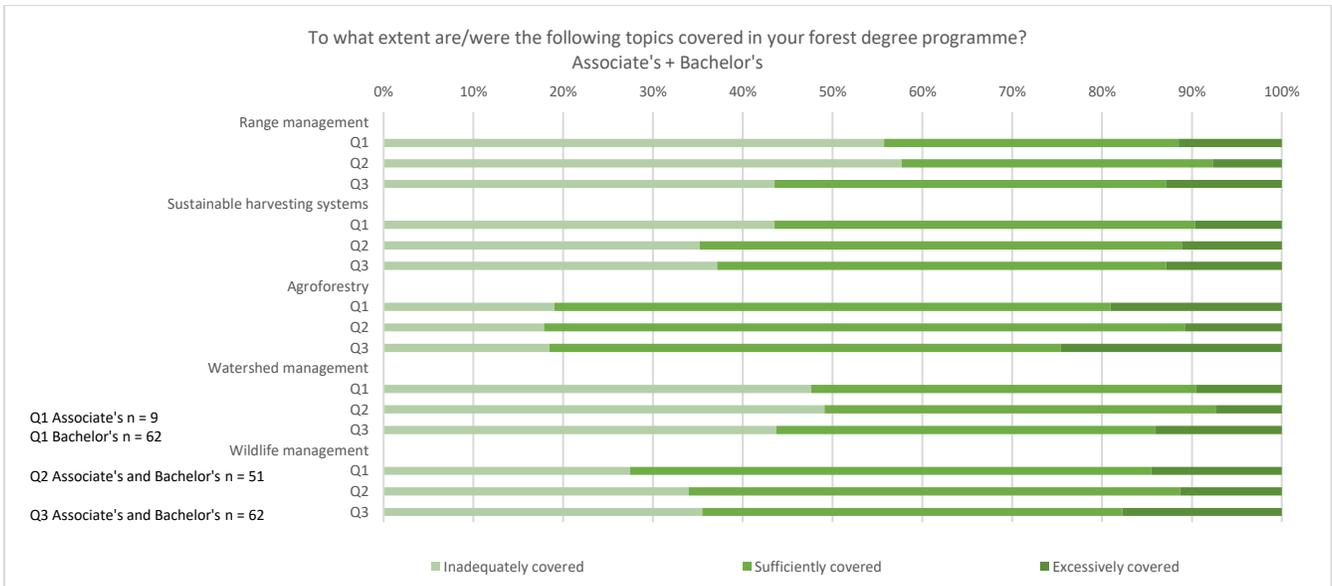
**Figure A58. To what extent are/were the following topics covered in your forest degree programme? Associate's & Bachelor's (Forest and climate change, forest mapping, forest planning, silviculture, forest landscape restoration...)**



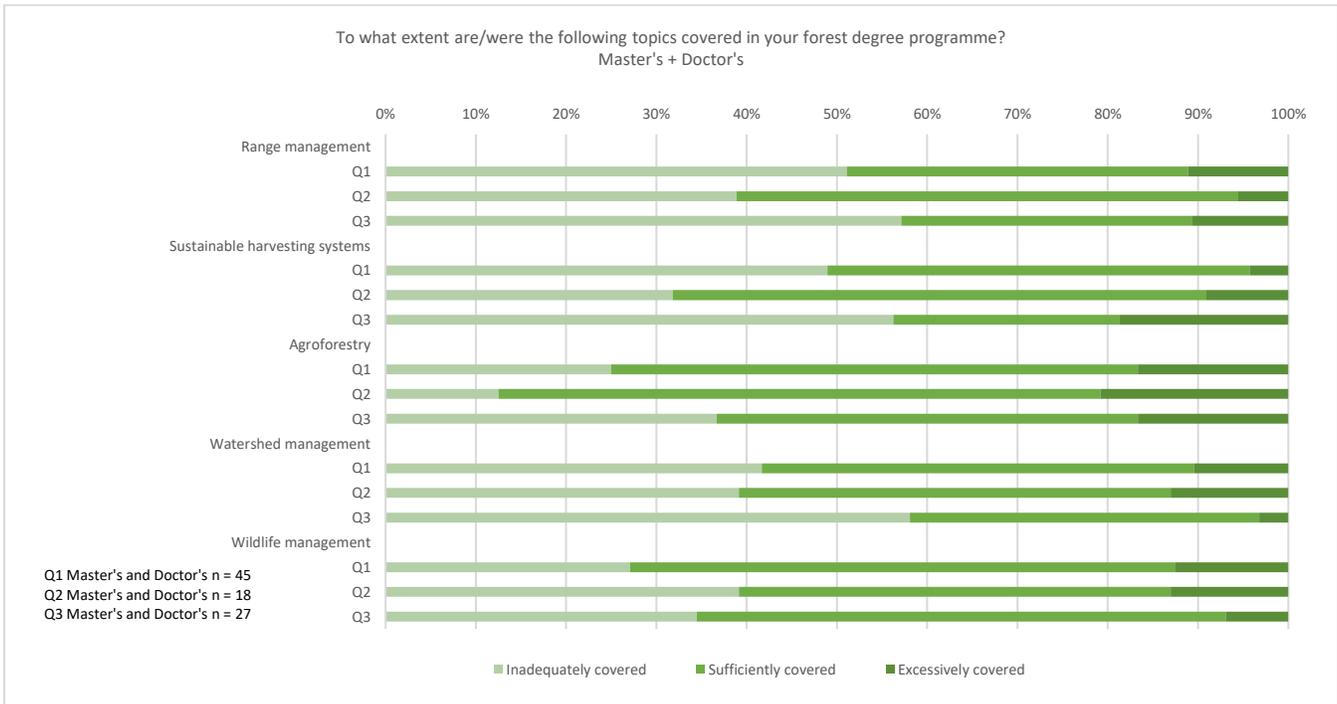
**Figure A59. To what extent are/were the following topics covered in your forest degree programme? Master's & Doctor's (Forest and climate change, forest mapping, forest plan., silviculture, forest landscape restoration...)**



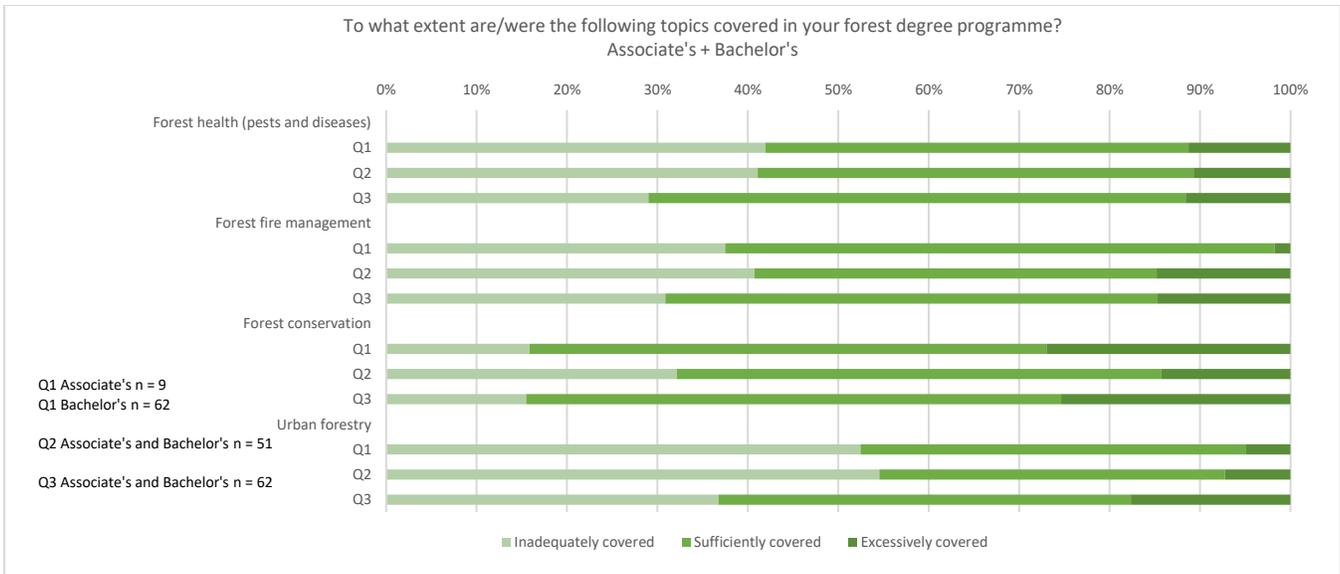
**Figure A60. To what extent are/were the following topics covered in your forest degree programme? All Levels (Forest and climate change, forest mapping, forest planning, silviculture, forest landscape restoration...)**



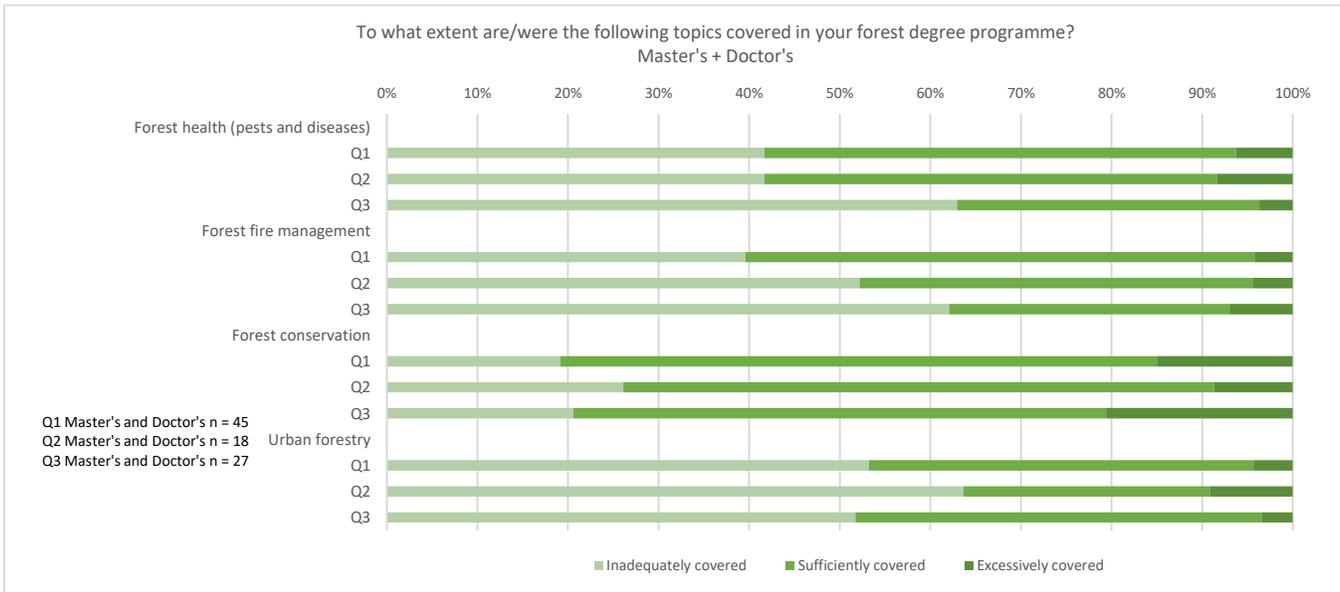
**Figure A61. To what extent are/were the following topics covered in your forest degree programme? Associate's & Bachelor's (Range management, sustainable harvesting systems, agroforestry...)**



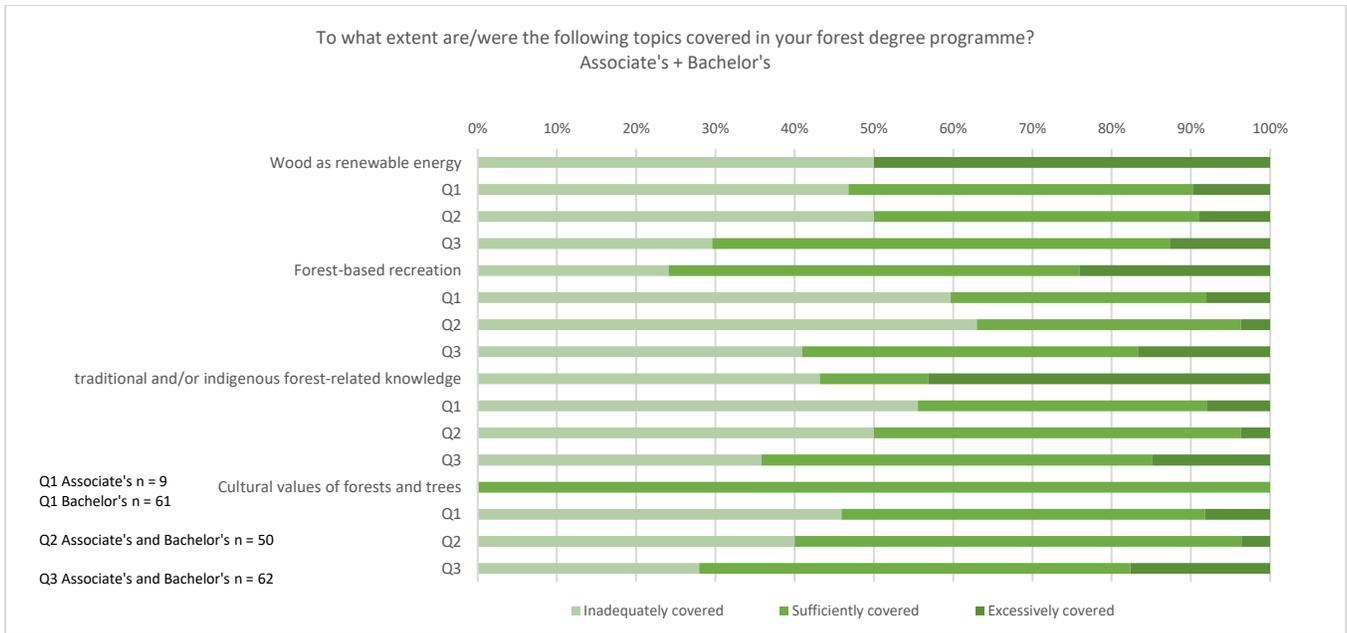
**Figure A62. To what extent are/were the following topics covered in your forest degree programme? Master's & Doctor's (Range management, sustainable harvesting systems, agroforestry...)**



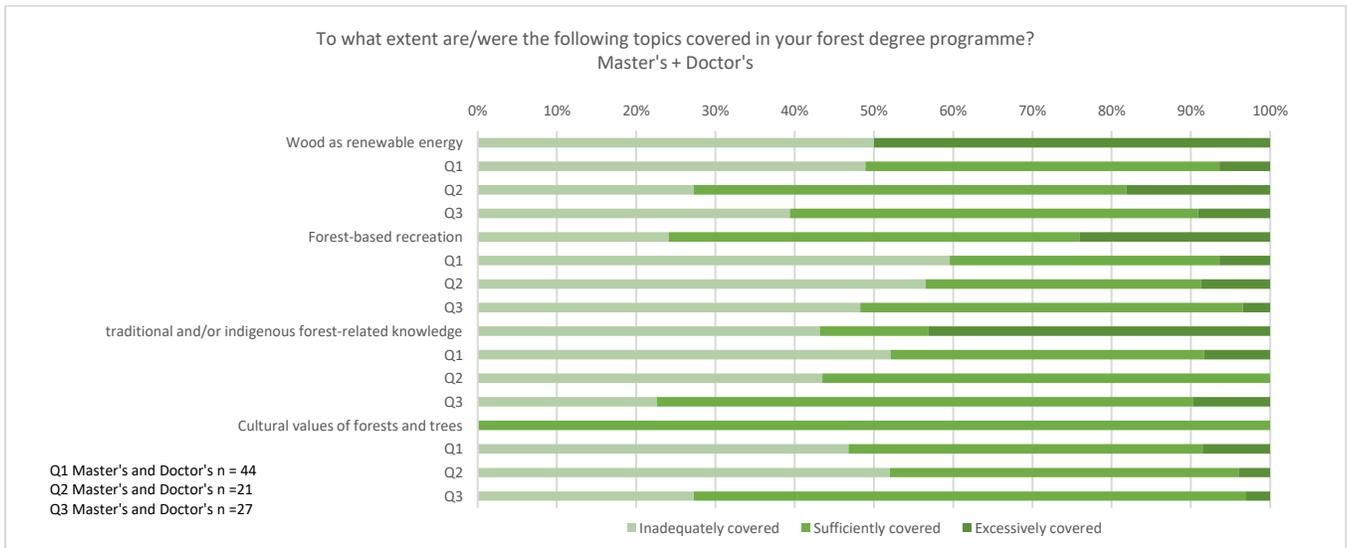
**Figure A63. To what extent are/were the following topics covered in your forest degree programme? Associate's & Bachelor's (Forest health (pests & diseases); forest fire management; forest conservation; and urban forestry)**



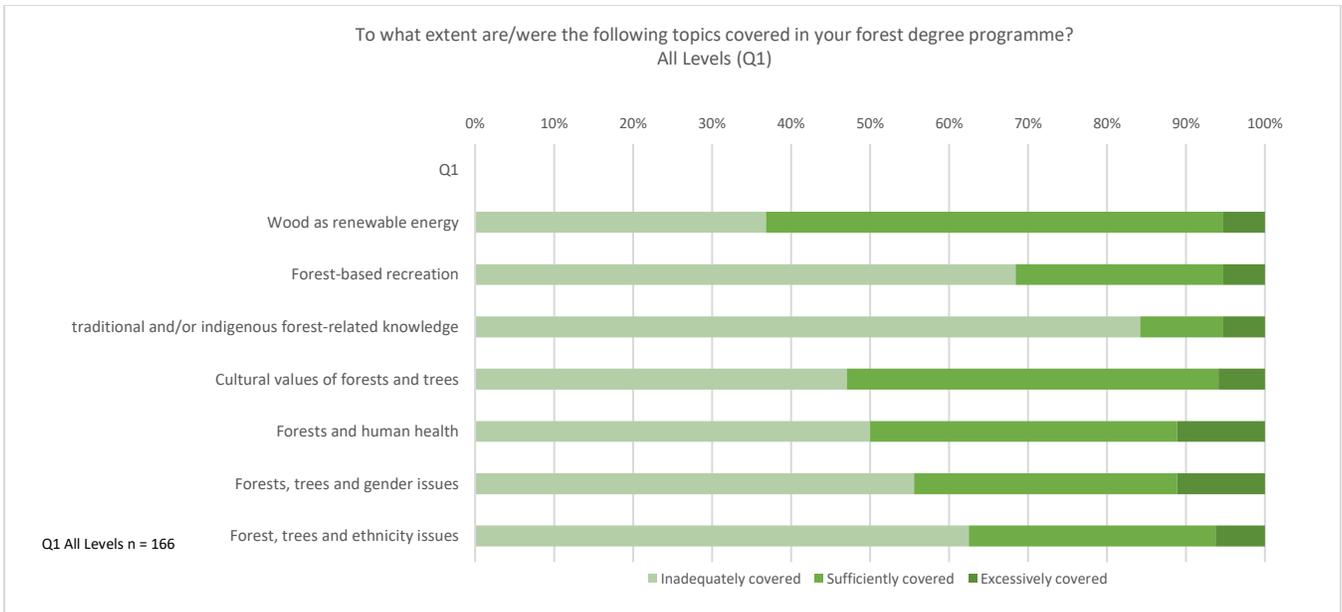
**Figure A64. To what extent are/were the following topics covered in your forest degree programme? Master's & Doctor's (Forest health (pests & disease); forest fire management; forest conservation; and urban forestry)**



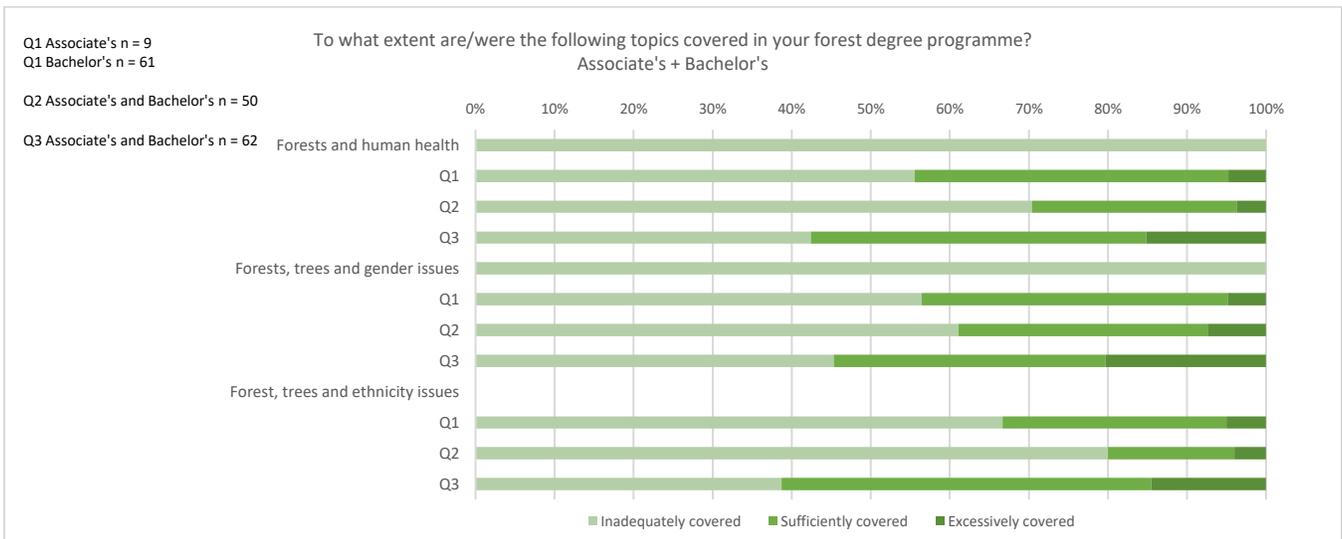
**Figure A65. To what extent are/were the following topics covered in your forest degree programme? Associate's & Bachelor's (Wood as renewable energy, forest-based recreation, traditional/indigenous knowledge, and cultural values of forests)**



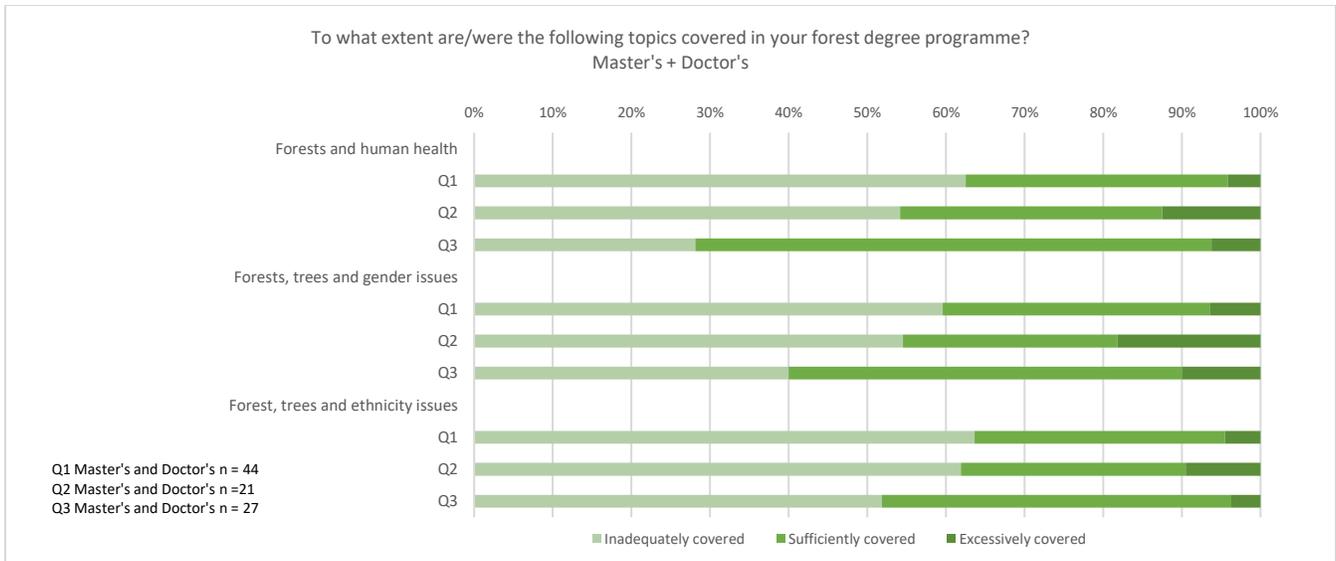
**Figure A66. To what extent are/were the following topics covered in your forest degree programme? Master's & Doctor's (Wood as renewable energy, forest-based recreation, traditional/indigenous knowledge, and cultural values of forests)**



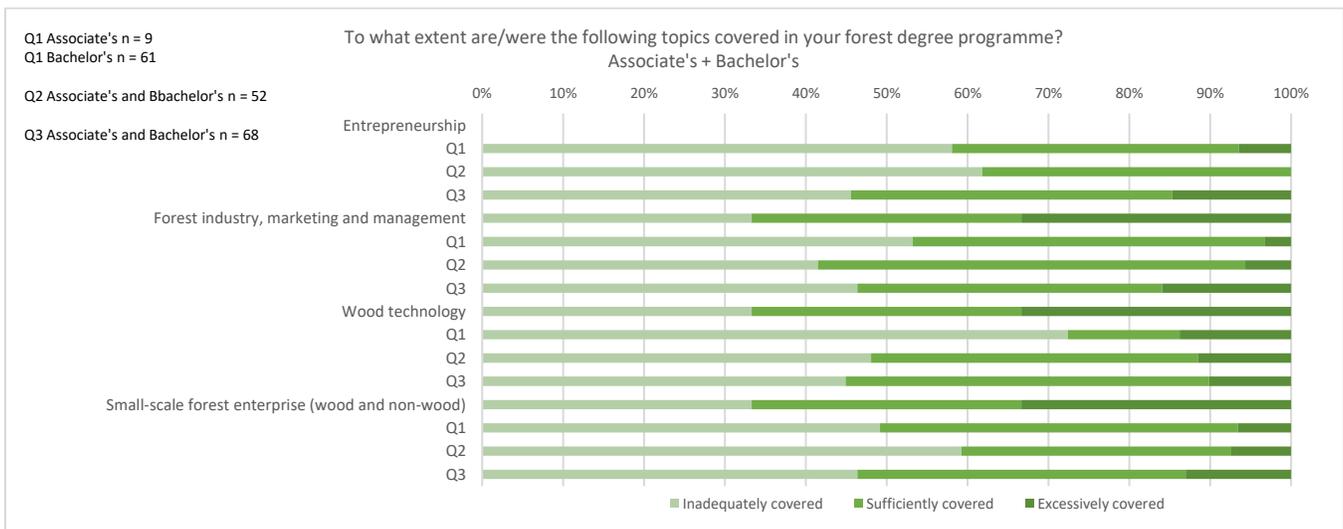
**Figure A67. To what extent are/were the following topics covered in your forest degree programme? All Levels (Wood as renewable energy, forest-based recreation, traditional/indigenous knowledge, and cultural values of forests)**



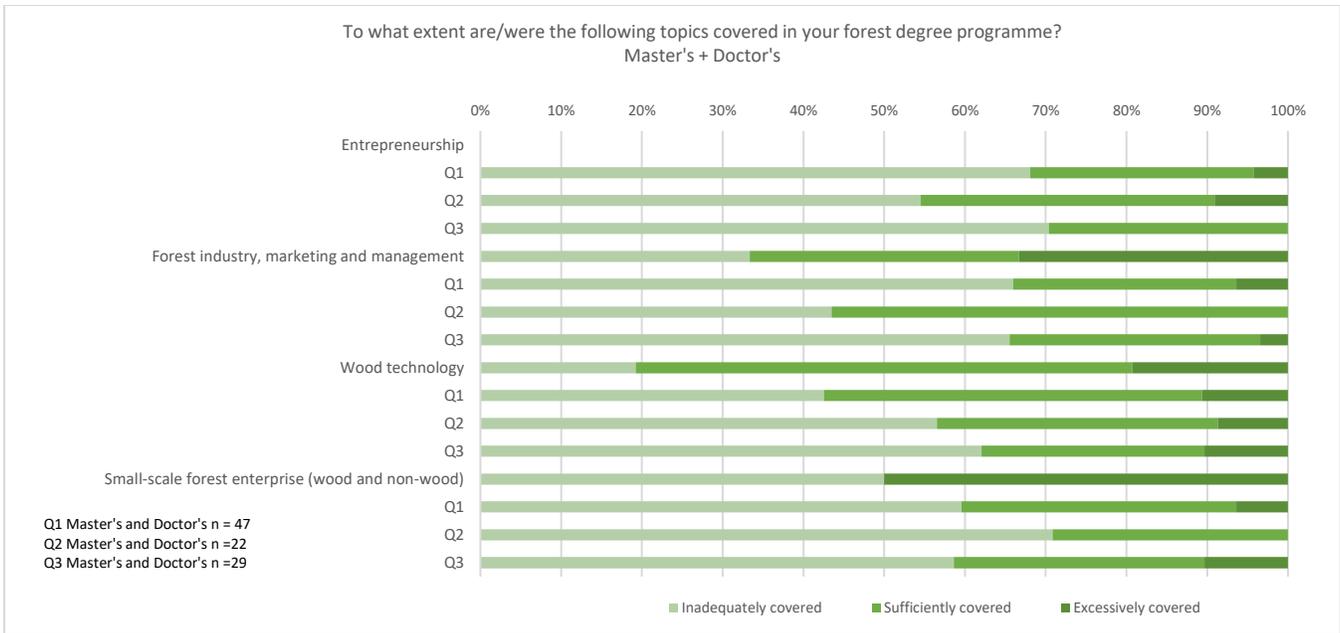
**Figure A68. To what extent are/were the following topics covered in your forest degree programme? Associate's & Bachelor's (Forests and human health; forests, trees and gender issues; and forests, trees and ethnicity issues)**



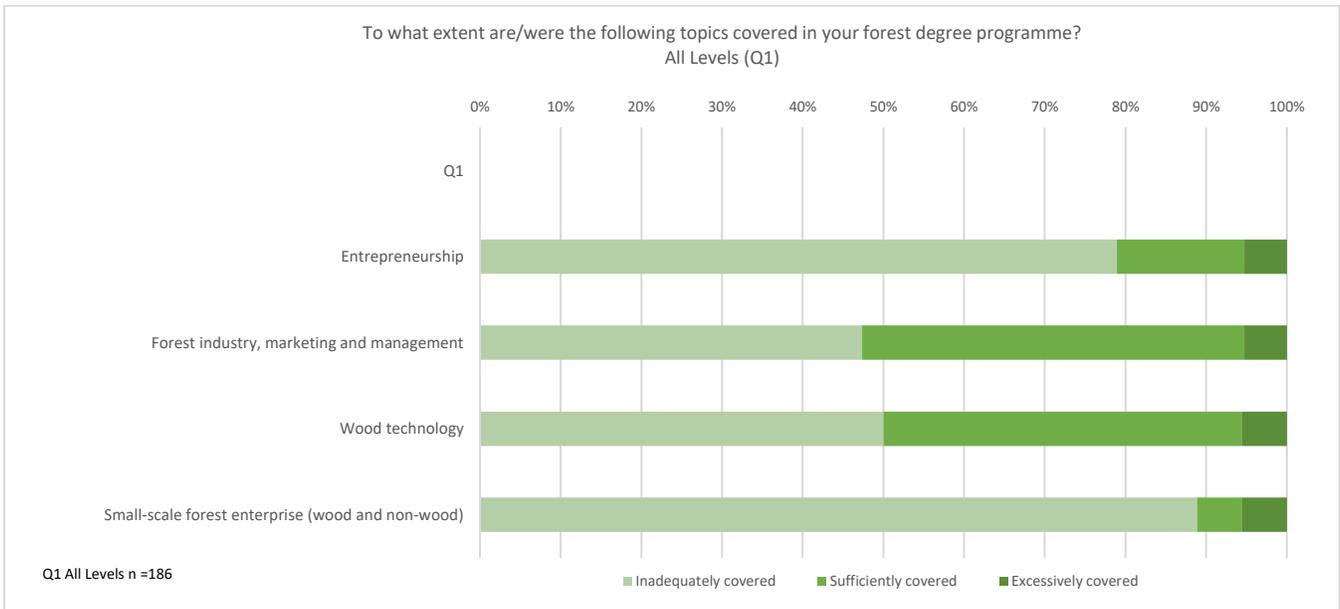
**Figure A69. To what extent are/were the following topics covered in your forest degree programme? Master's & Doctor's (Forests and human health; forests, trees and gender issues; and forests, trees and ethnicity issues)**



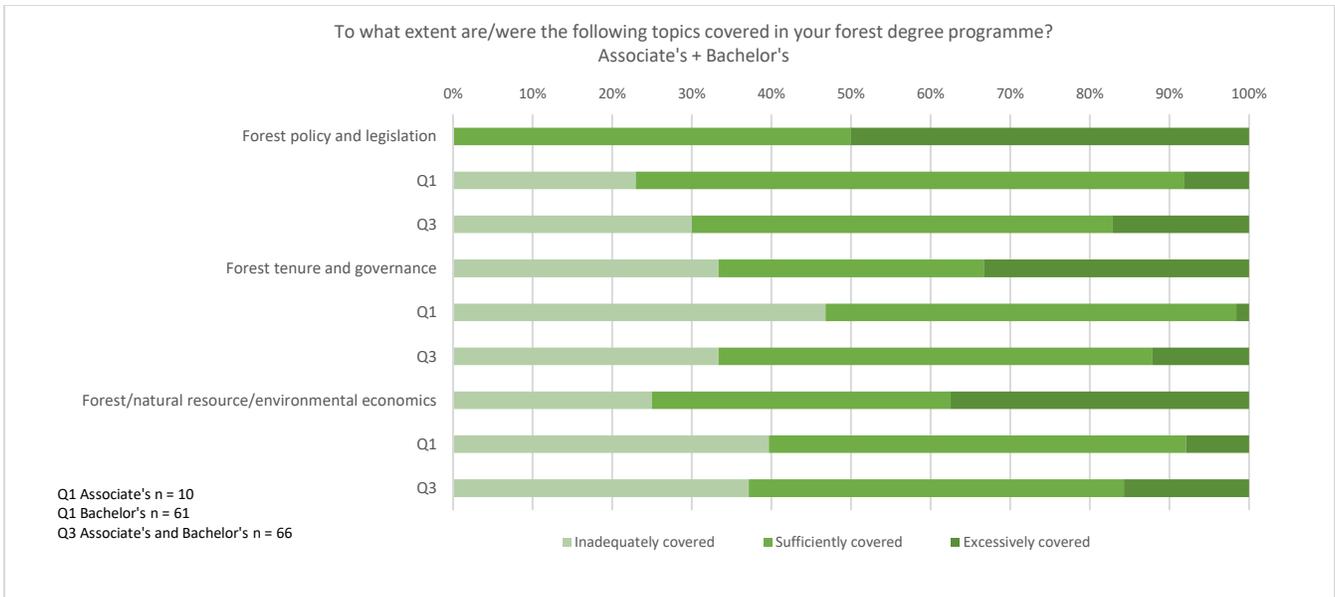
**Figure A70. To what extent are/were the following topics covered in your forest degree programme? Associate's & Bachelor's (Entrepreneurship, forest industry, marketing and management; wood technology; and small-scale forest enterprise)**



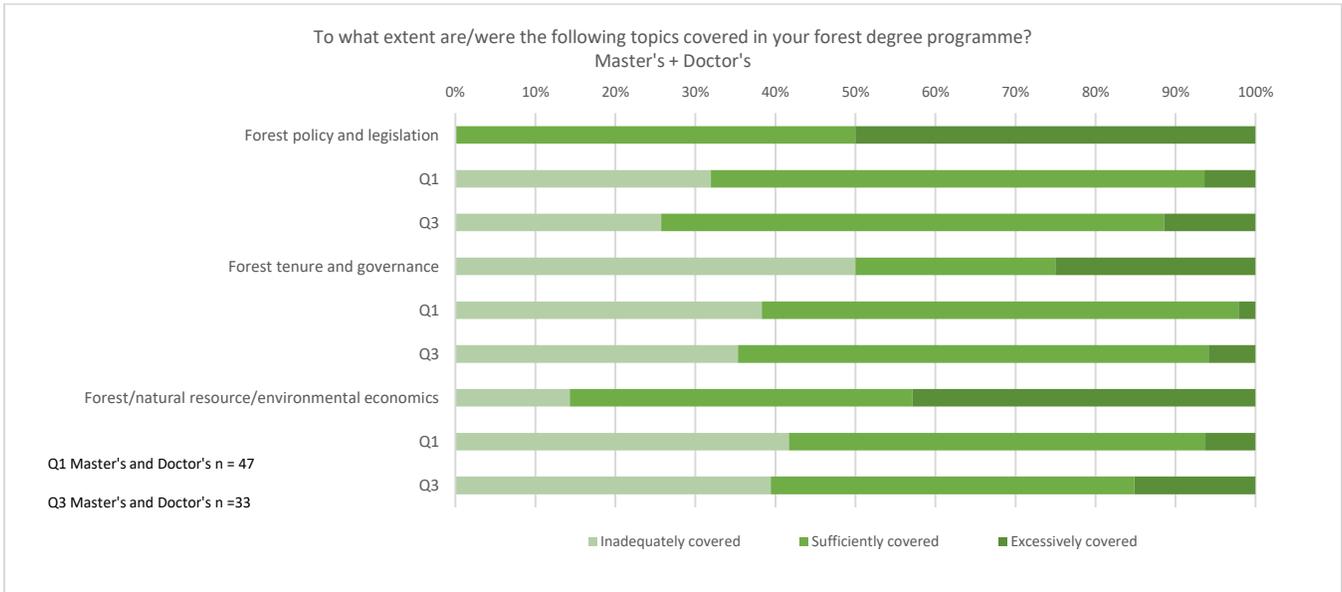
**Figure A71. To what extent are/were the following topics covered in your forest degree programme? Master's & Doctor's (Entrepreneurship, forest industry, marketing and management; wood technology; and small-scale forest enterprise)**



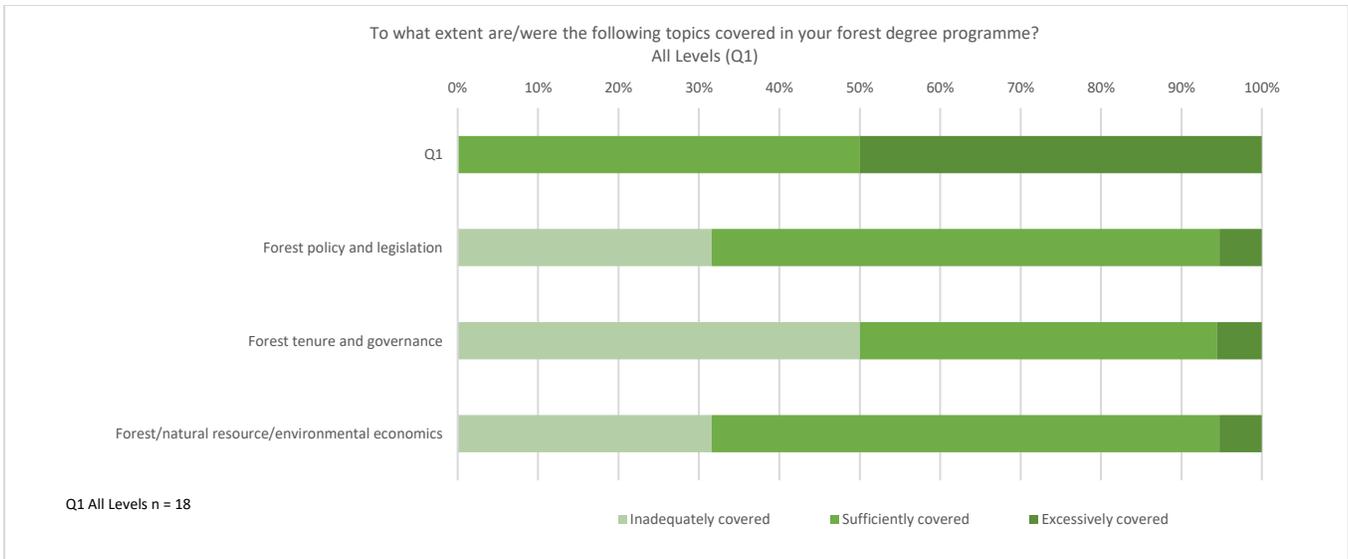
**Figure A72. To what extent are/were the following topics covered in your forest degree programme? All Levels (Entrepreneurship, forest industry, marketing and management; wood technology; and small-scale forest enterprise)**



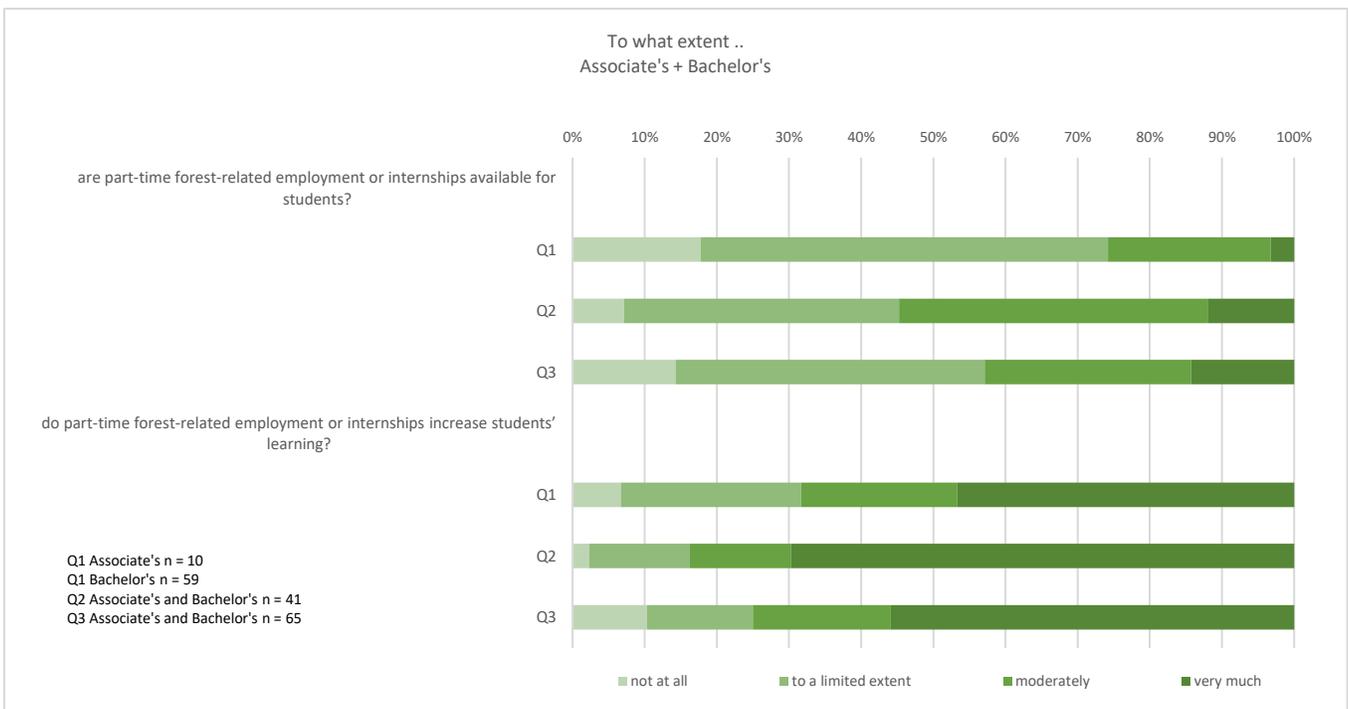
**Figure A73. To what extent are/were the following topics covered in your forest degree programme? Associate's & Bachelor's (Forest policy and legislation; forest tenure and governance; forest/natural resources/environmental economics)**



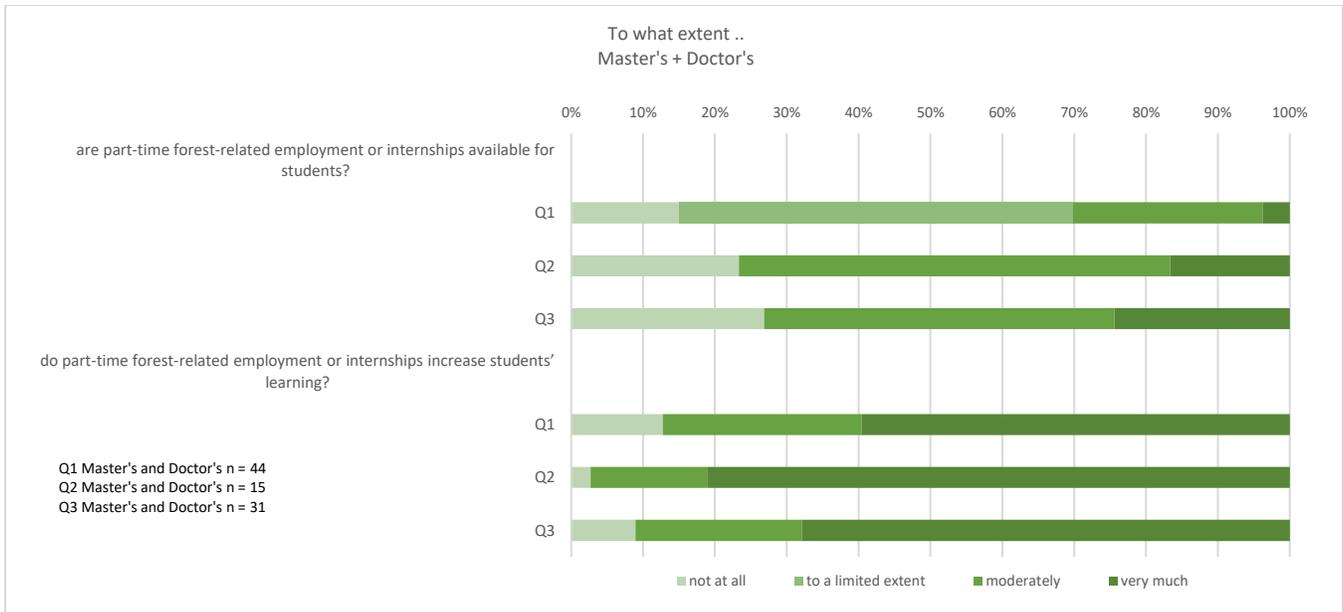
**Figure A74. To what extent are/were the following topics covered in your forest degree programme? Master's & Doctor's (Forest policy and legislation; forest tenure and governance; forest/natural resources/environmental economics)**



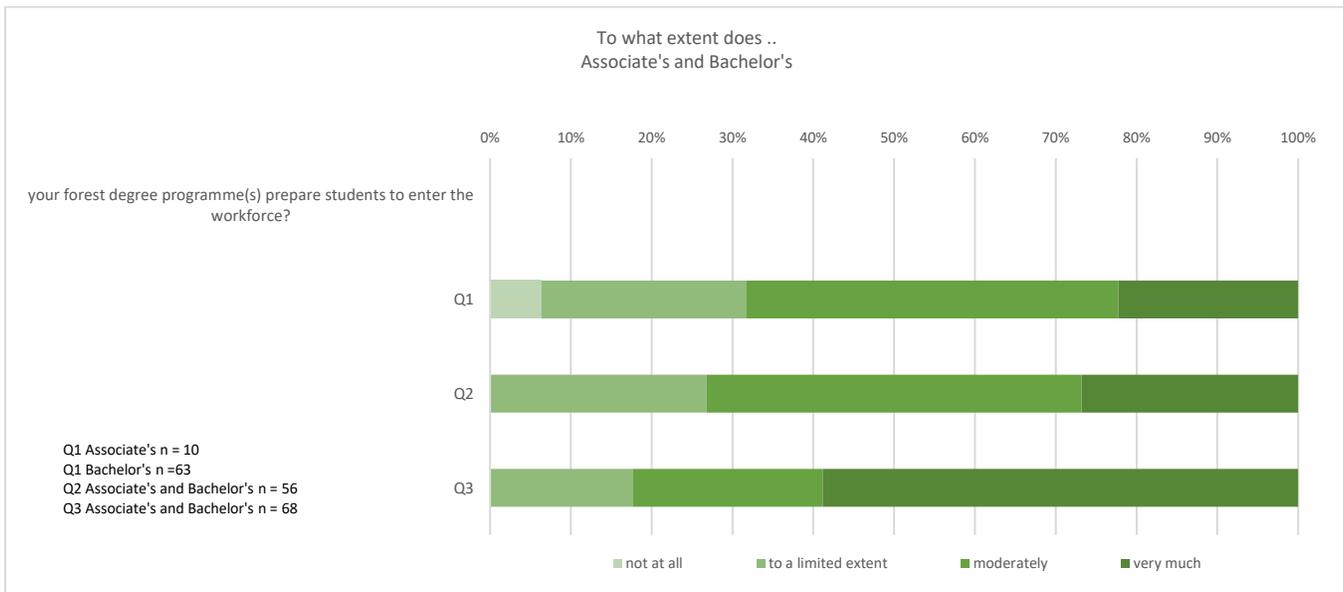
**Figure A75. To what extent are/were the following topics covered in your forest degree programme? All Levels (Forest policy and legislation; forest tenure and governance; forest/NR/environmental economics)**



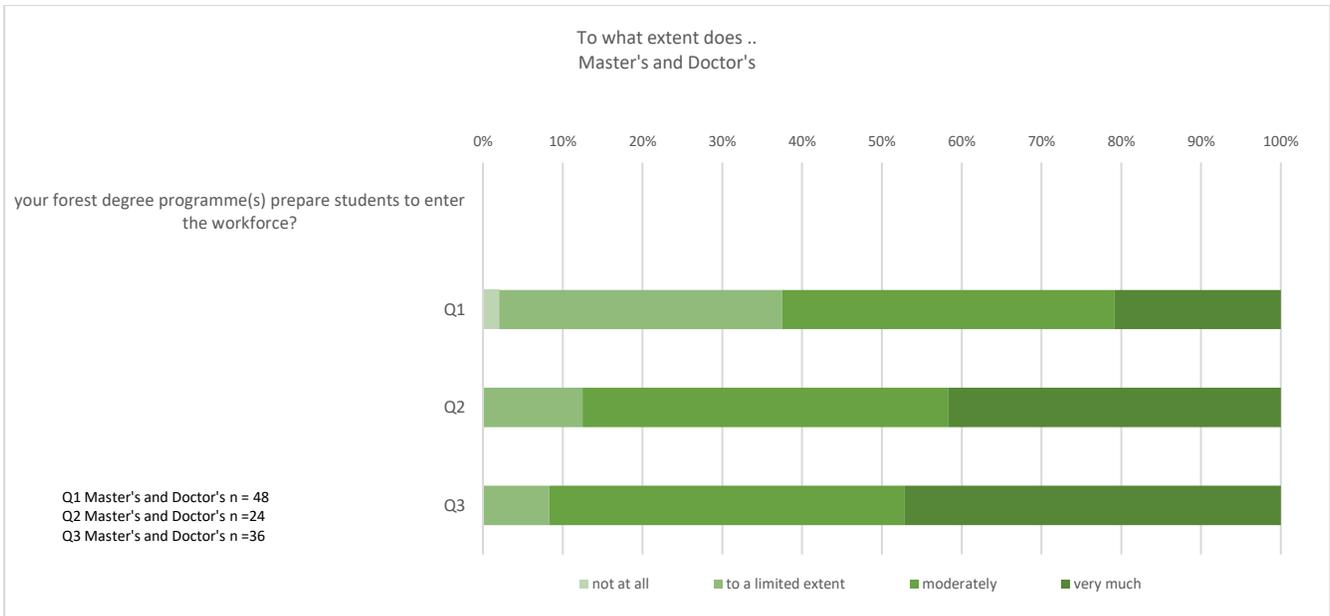
**Figure A76. To what extent are part-time forest-related employment or internships available for students, and does this increase student's learning? Associate's & Bachelor's**



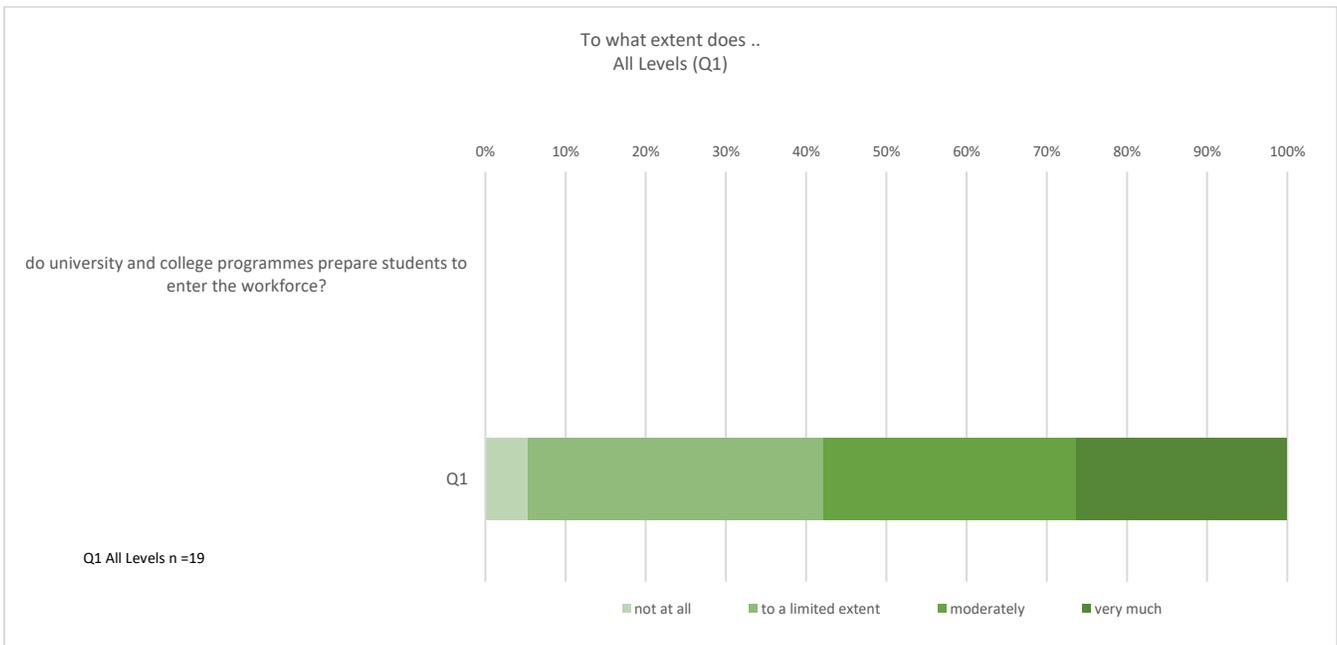
**Figure A77. To what extent are part-time forest-related employment or internships available for students, and does this increase student's learning? Master's & Doctor's**



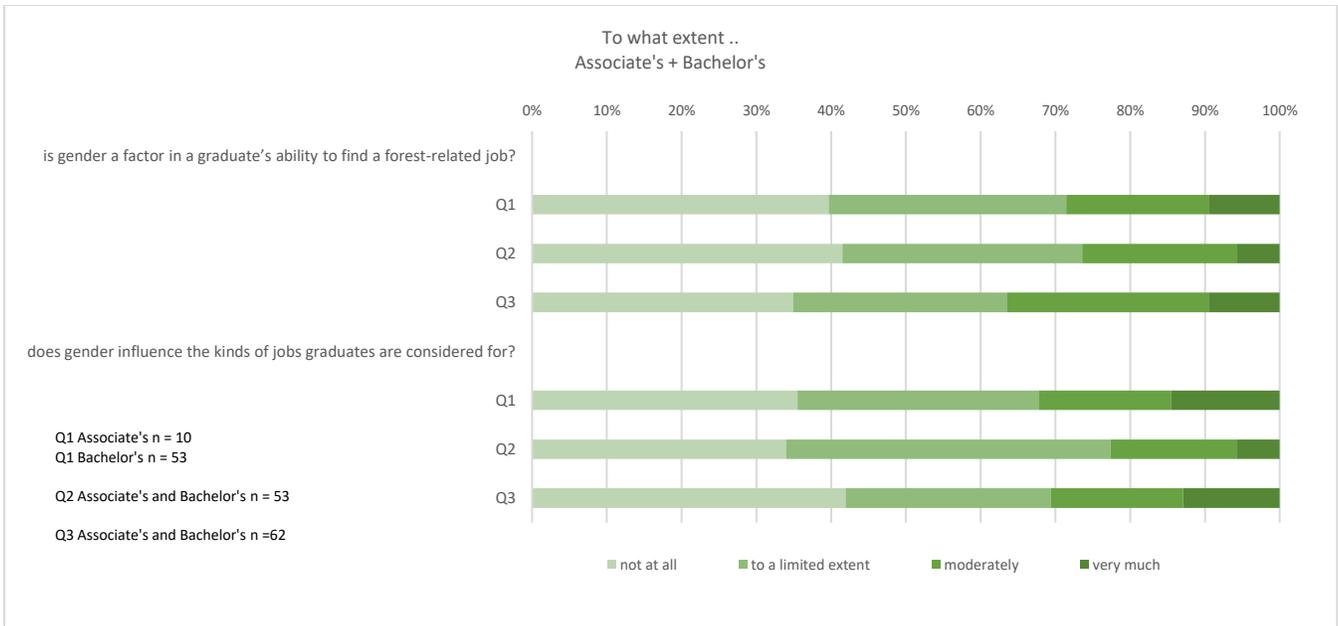
**Figure A78. To what extent does your forest degree programme prepare students to enter the workforce? Associate's & Bachelor's**



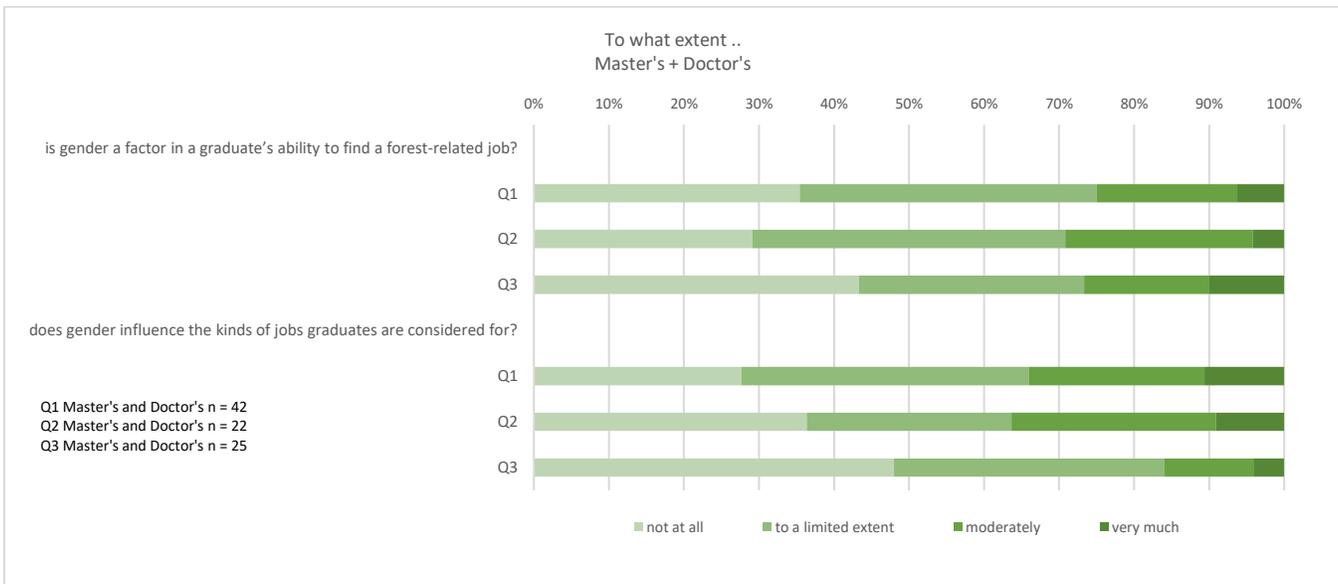
**Figure A79. To what extent does your forest degree programme prepare students to enter the workforce? Master's & Doctor's**



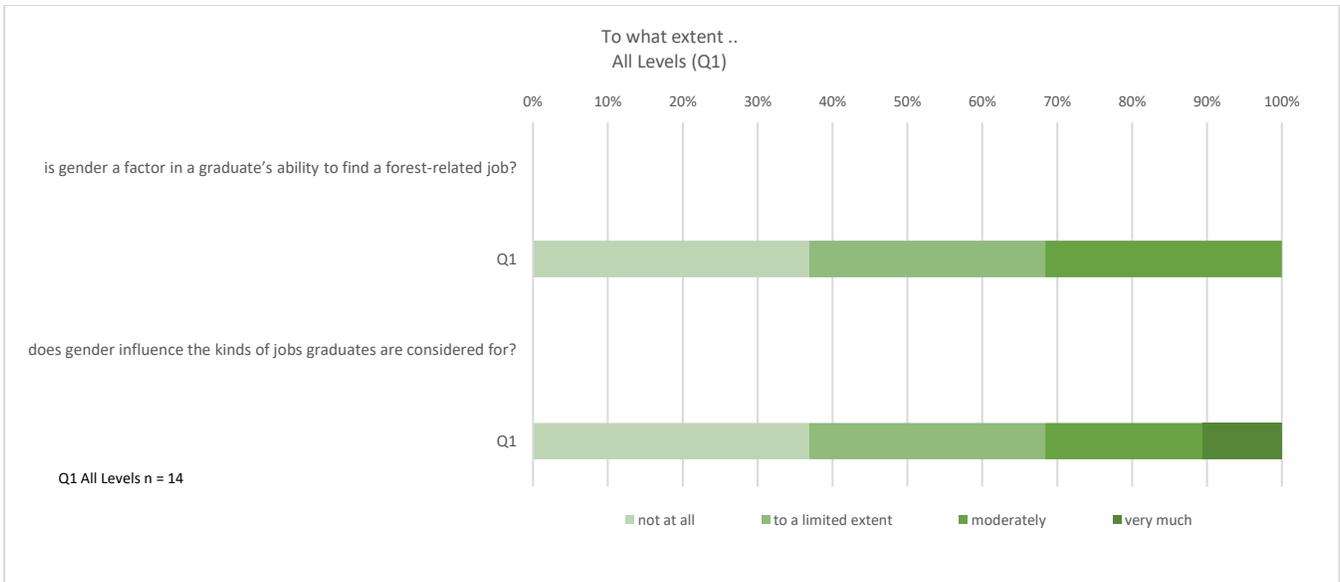
**Figure A80. To what extent do university and college programmes prepare students to enter the workforce? All Levels**



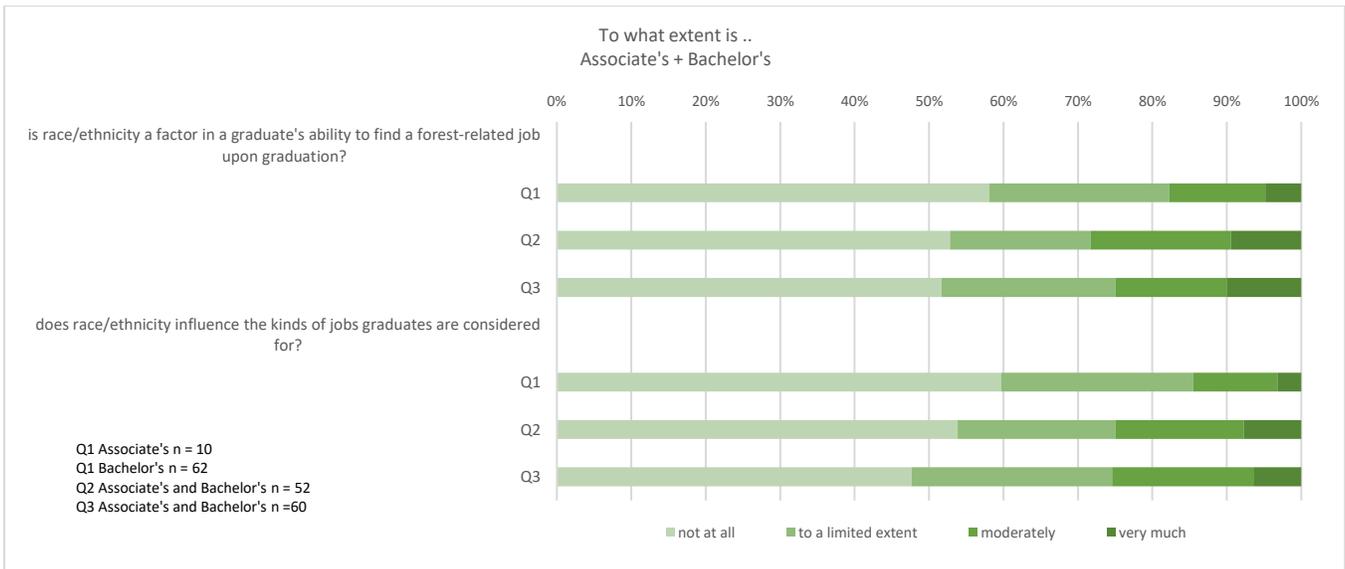
**Figure A81. To what extent is gender a factor in a graduate's ability to find a forest-related job, and does gender influence the kinds of jobs graduates are considered for? Associate's & Bachelor's**



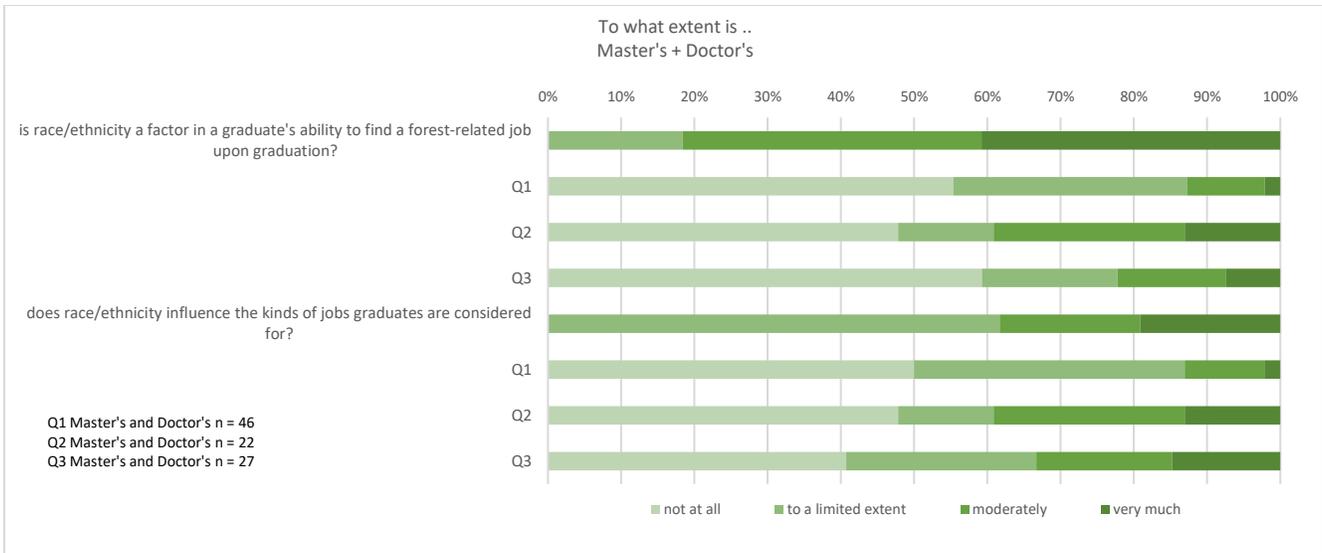
**Figure A82. To what extent is gender a factor in a graduate's ability to find a forest-related job, and does gender influence the kinds of jobs graduates are considered for? Master's & Doctor's**



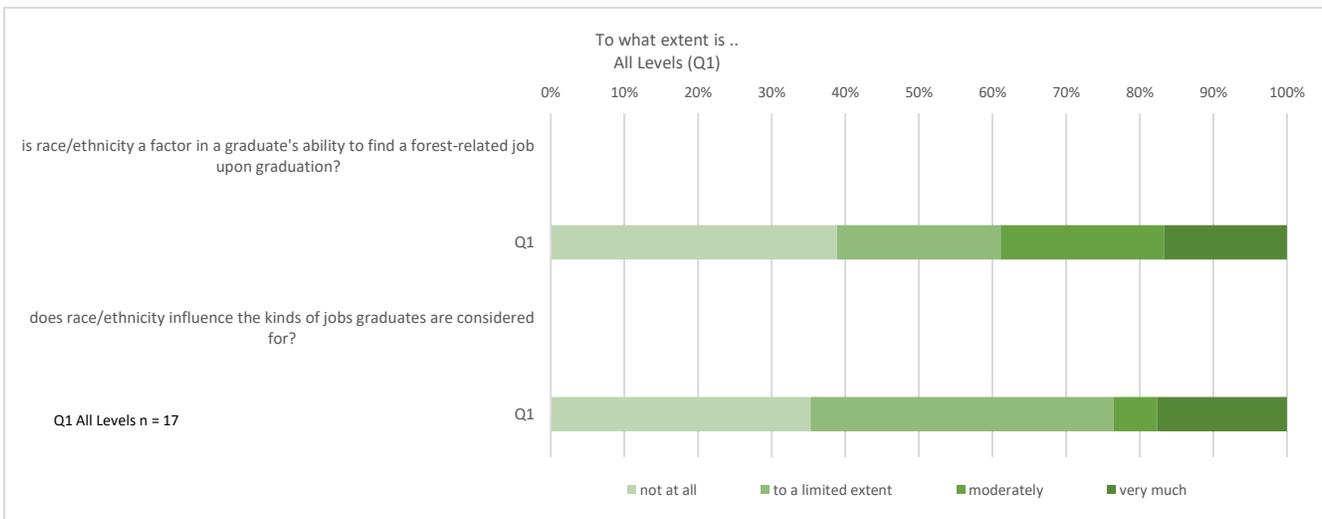
**Figure A83. To what extent is gender a factor in a graduate's ability to find a forest-related job, and does gender influence the kinds of jobs graduates are considered for? All Levels**



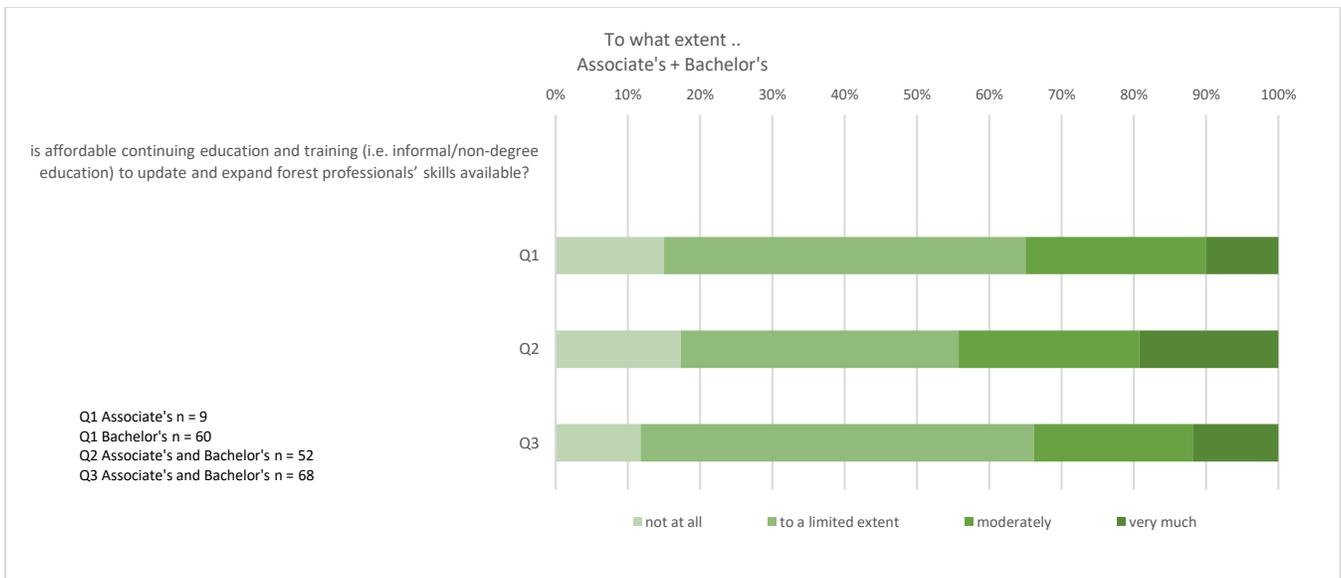
**Figure A84. To what extent is race/ethnicity a factor in a graduate's ability to find a forest-related job upon graduation, and does race/ethnicity influence the kinds of jobs graduates are considered for? Associate's & Bachelor's**



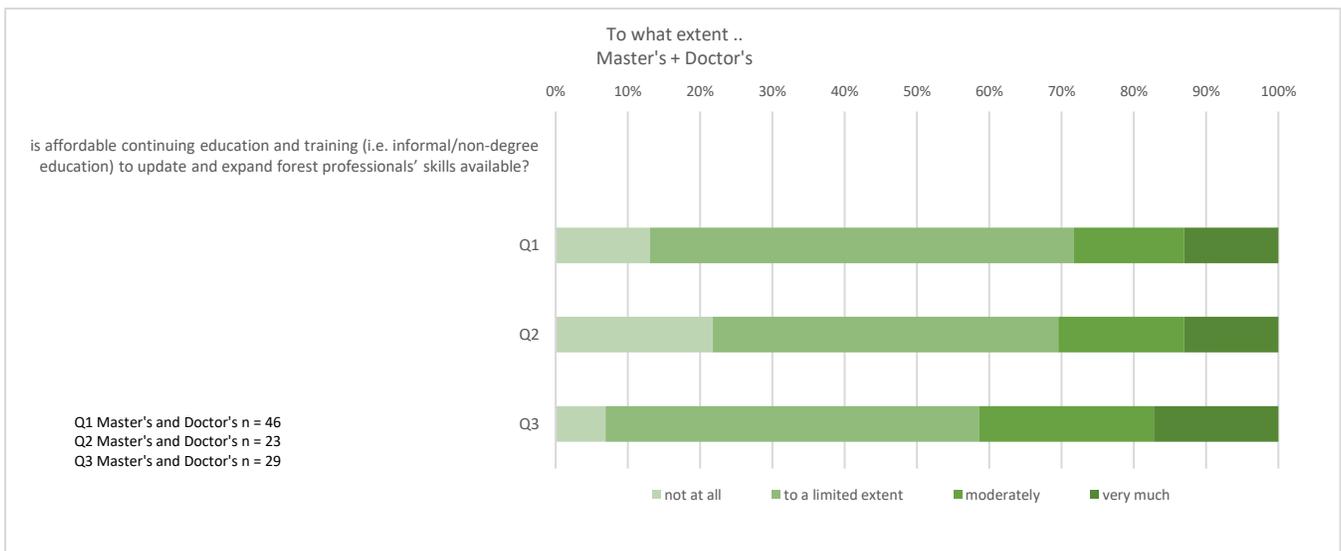
**Figure A85. To what extent is race/ethnicity a factor in a graduate's ability to find a forest-related job upon graduation, and does race/ethnicity influence the kinds of jobs graduates are considered for? Master's & Doctor's**



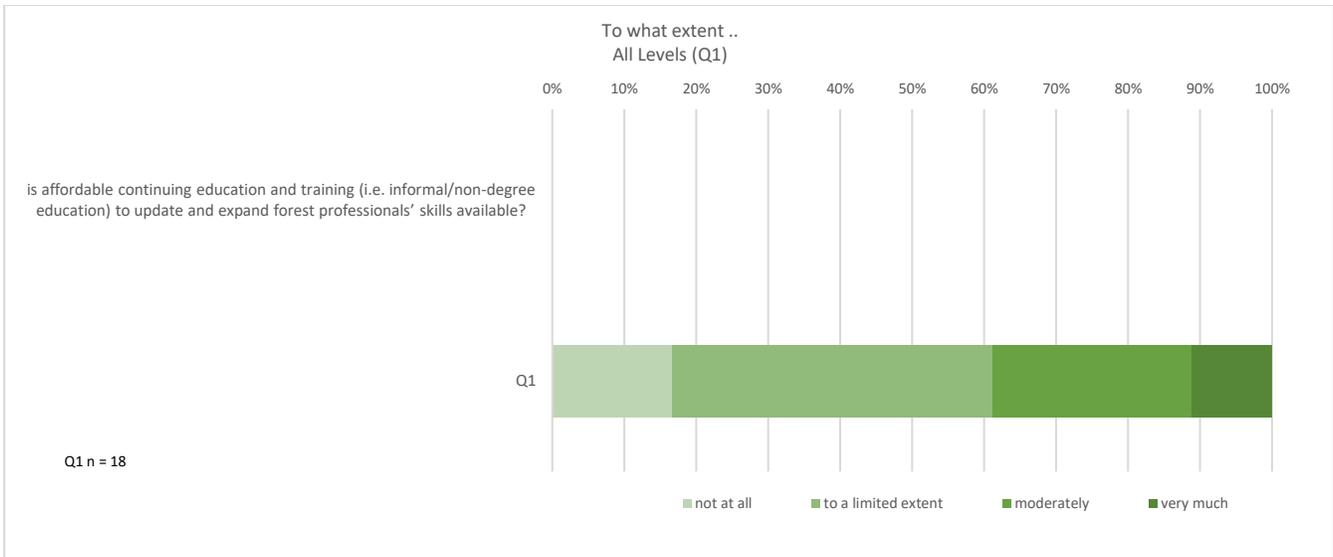
**Figure A86. To what extent is race/ethnicity a factor in a graduate's ability to find a forest-related job upon graduation, and does race/ethnicity influence the kinds of jobs graduates are considered for? All Levels**



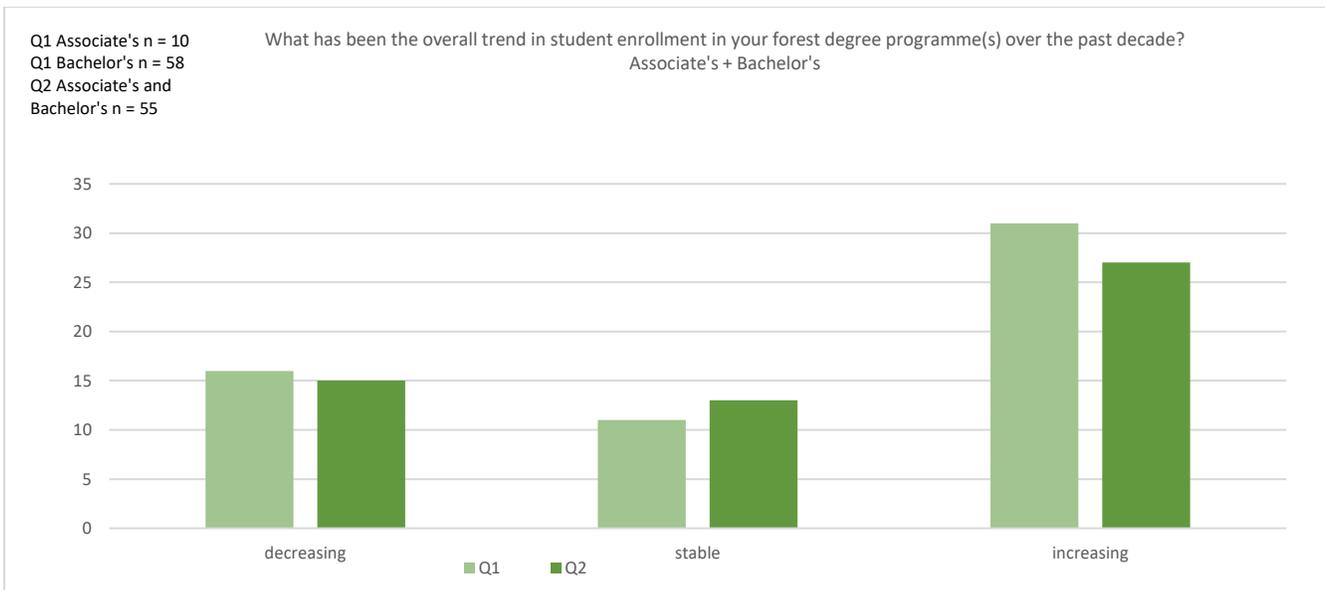
**Figure A87. To what extent is affordable continuing education and training (i.e. informal/non-degree education) to update and expand forest professionals' skills available? Associate's & Bachelor's**



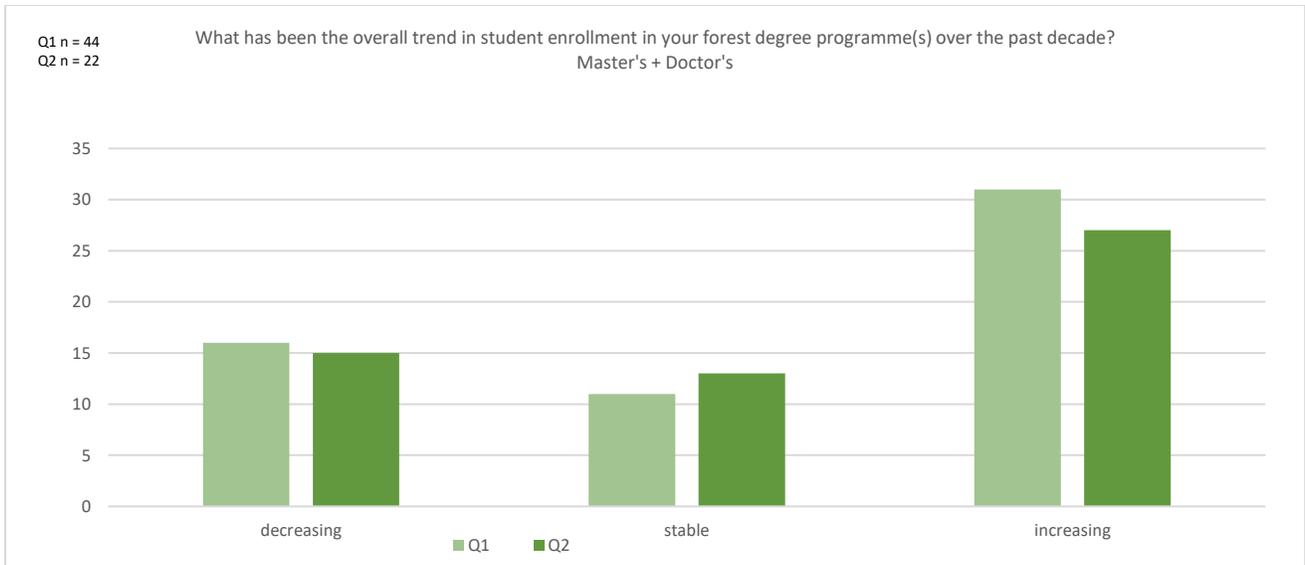
**Figure A88. To what extent is affordable continuing education and training (i.e. informal/non-degree education) to update and expand forest professional's skills available? Master's & Doctor's**



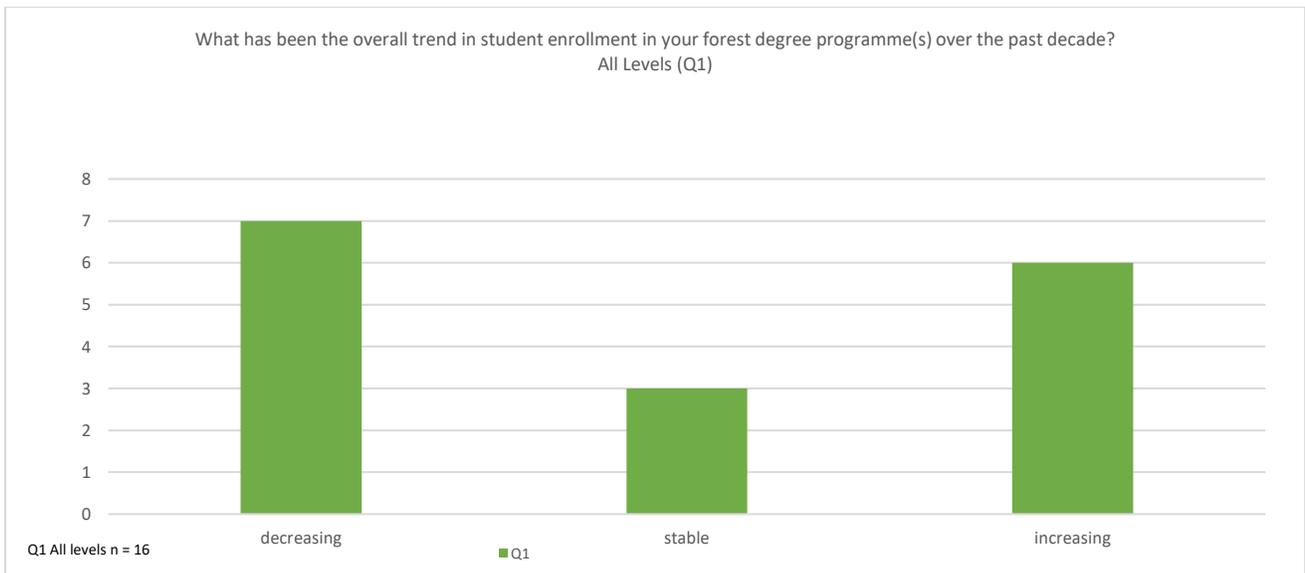
**Figure A89. To what extent is affordable continuing education and training (i.e. informal/non-degree education) to update and expand forest professionals' skills available? All Levels**



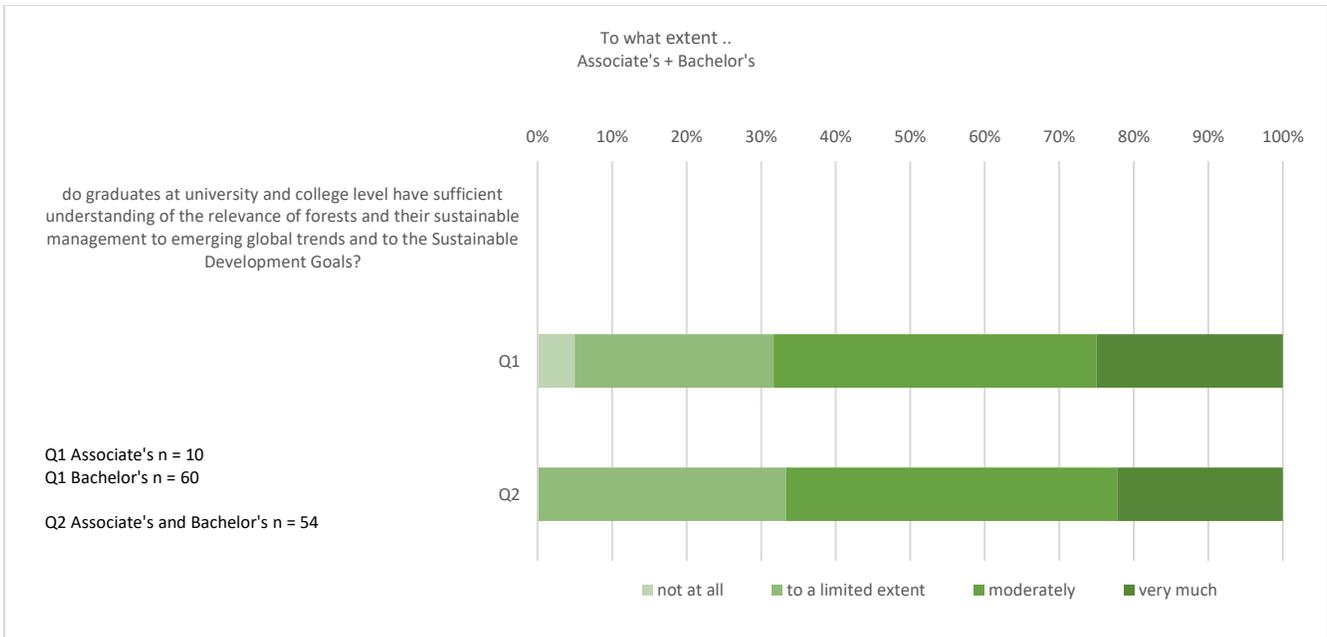
**Figure A90. What has been the overall trend in student enrolment in your forest-related programme(s) over the past decade? Associate's & Bachelor's**



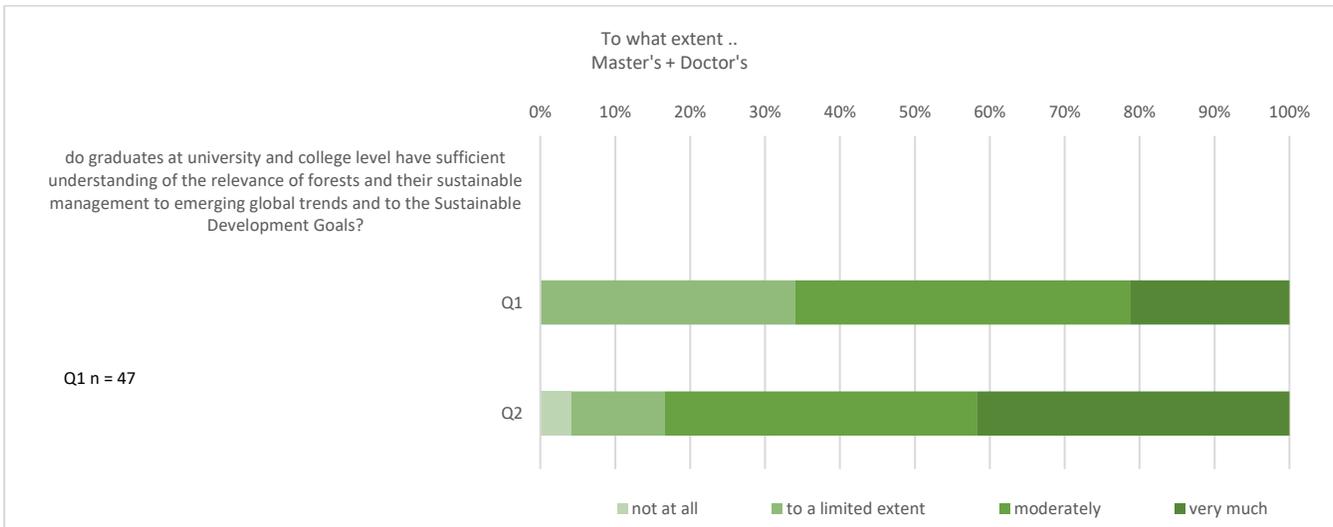
**Figure A91. What has been the overall trend in student enrolment in your forest-related programme(s) over the past decade? Master's & Doctor's**



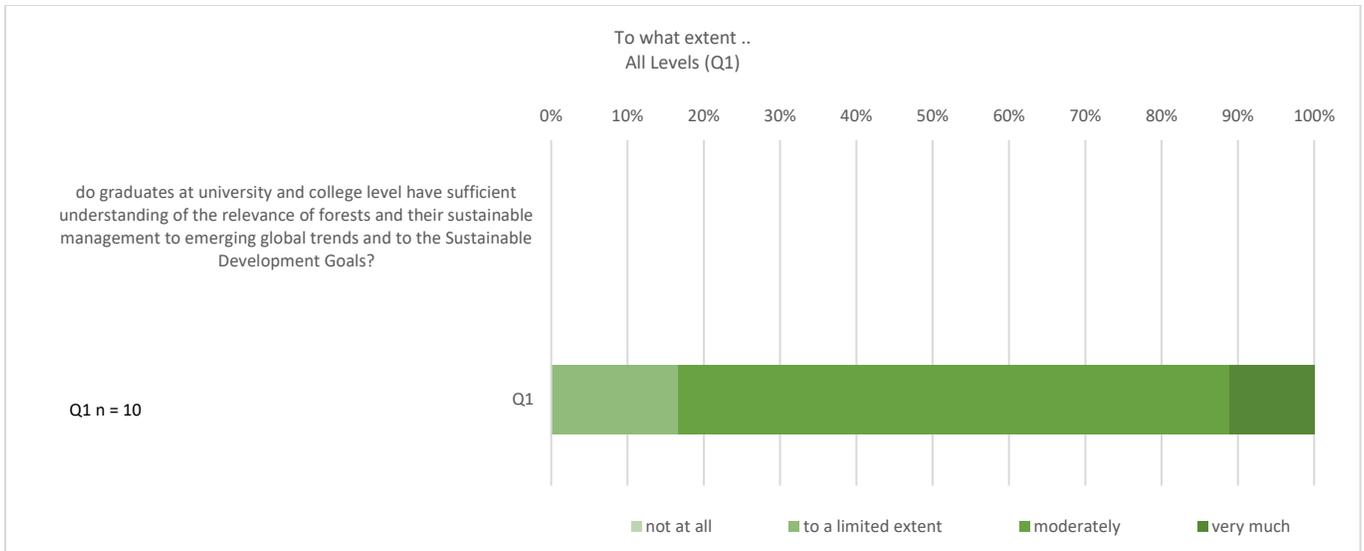
**Figure A92. What has been the overall trend in student enrolment in your forest-related programme(s) over the past decade? All Levels**



**Figure A93. To what extent do graduates at university and college level have sufficient understanding of the relevance of forests and their sustainable management to emerging global trends and to the Sustainable Development Goals. Associate's & Bachelor's**



**Figure A94. To what extent do graduates at university and college level have sufficient understanding of the relevance of forests and their sustainable management to emerging global trends and to the Sustainable Development Goals. Master's & Doctor's**



**Figure A95. To what extent do graduates at university and college level have sufficient understanding of the relevance of forests and their sustainable management to emerging global trends and to the Sustainable Development Goals. All Levels**

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