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Abstract
This paper provides an overview of the best practices in forest education in Europe based on the submissions received for the best practices global competition. The competition was conducted between November 2018 and March 2019 and was inspired by the 2019 International Day of Forests whose theme was Forests and Education. The organizers of the competition were the Joint IUFRO-IFSA Task Force on Forest Education, University of Helsinki and the University of Helsinki Centre for Continuing Education HY+ in collaboration with the Food and Agriculture Organization of the United Nations (FAO). Despite the competition being conducted at a global scale, this paper only focuses on the submissions from Europe which accounted for 40.8% of the total submissions received, Europe was also the region with the highest number of submissions. The best practices initiatives are highlighted under four topics: the level of education (primary to tertiary/university), learning activities and their benefits, topics covered and learning beyond borders (cross country collaborations). These innovative education models provide insights that continue to shape the discussions on the future of forest education at all levels of education.

Keywords: Best practices, forest education, Joint IUFRO-IFSA Task Force, Europe, SDG 4.

Introduction

Sustainable Development Goal 4 (SDG 4) aims at promoting inclusive and equitable quality education as well as lifelong learning opportunities. One of the targets under this SDG, is to ensure that learners acquire knowledge and skills for sustainable development, which is to be achieved by mainstreaming education policies, curricula, teacher education and student assessment[1]. Although research about the contribution of forests to the SDG 4 is scarce (Kanowski *et al.*, 2020) it is widely known that forests are essential for humans to thrive; therefore, learning about forest services and forest management is an effort that must be made from the basic levels of education. At the primary and secondary levels forest related content is integrated in the context of the environment and sustainability education (ESE) with some successful initiatives in Europe (i.e., Forest Education Foundation, OWL Scotland) and in the United States (Project Learning Tree). In relation to higher forest education, discussions centre on how to harmonize the qualification systems, define skills and competencies needed

[1] https://sustainabledevelopment.un.org/sdg4

by forestry professionals, and change forestry curricula and teaching methods (Arevalo *et al.*, 2010).

The Bologna Declaration of 1999 has been instrumental in significantly reforming higher education programmes in Europe. The coordinated higher education reforms strive to create the European Higher Education Area (EHEA) and to increase international competitiveness of the European higher education system (European Commission/European Education and Culture Executive Agency (EACEA/Eurydice, 2018). European Forest Programmes have adopted the declaration to increase students and faculty mobility as well as to make the programs more visible at the international arena.

Over the years forest education has evolved to keep up with the changes in the forest sector, societal demands and expectations as well as student needs (FAO, *s.a.*). As such, a more integrated approach has been adopted compared to the resource-centred approach. Some universities are establishing holistic and interdisciplinary forestry-related programmes to ensure that missing elements from the curricular such as social skills that cannot be taught within forestry units can be taught by departments specialized in these areas (Shun and Feipin, 2018). The impact of the reforms at tertiary forestry education should be replicated at primary and secondary levels. School children have proven to be powerful agents of changing the attitudes of their parents, neighbourhoods and communities (FAO, *s.a.*).

The expanding scope of forestry has exerted so much pressure on professional foresters who are now facing a new set of challenges in their work due to the wide range of responsibilities and opportunities bestowed on them, most of which are different from traditional forestry that they were trained in. But there is a dilemma of how to train students to be versatile and to apply the knowledge acquired from the university to a wide range of jobs and not only the specific job they were trained for while at the same time ensuring that forestry programmes are robust (Temu and Kiwia, 2008). However, it should be noted that no curriculum can cover all forestry-related areas, therefore the success of forest education lies in its flexibility to solve the dilemma (Längin, *et al.*, 2004; Kostilainena, 2005; Ratnasingam *et al.*, 2013). Good practices and models could help inform how to integrate what is missing from forest education curricula which is critical in shaping the direction forest education will take (Rekola *et al.*, 2017). It is hoped that the results of this competition will contribute to the debate among the relevant stakeholders on how to enhance forest education in Europe.

Limitations

This is not a research paper but a summary highlighting forest education initiatives from Europe that the authors believe offer valuable contributions to the different aspects of forest education including the Bologna Process. More initiatives may exist,

but the ones listed here are based on the submissions from the Best Practices Global Competition. Very little modification has been made to the original descriptions of the best practices provided by the nominators not to cause distortion of any kind.

About the Joint IUFRO-IFSA Task Force on Forest Education

The Joint IUFRO-IFSA Task Force on Forest Education is one of the task forces established by IUFRO to advance inter-disciplinary cooperation in forest research fields that span two or more IUFRO Divisions. This specific task force was established in 2015 and is a collaboration between two organizations. The first partner is IUFRO, a global network that brings together over 15,000 scientists from over 110 countries, with a mission of advancing research excellence and knowledge sharing, and to foster the development of science-based solutions to forest-related challenges for the benefit of forests and people worldwide. The second partner is IFSA, which has members in over 50 countries and represents the interests of over 10,000 students undertaking forestry and related programmes. IFSA's mission is to enrich the members' education through international events, networking and intercultural exchange.

The Joint IUFRO-IFSA Task Force on Forest Education has many ongoing activities seeking to promote and facilitate research and innovation around forest education, fostering international networking on forest education especially using modern online communication and social media applications, and providing capacity building opportunities for students and young scientists in both generic and specific skills, face to face and online. The Joint IUFRO-IFSA Task Force on Forest Education is committed to contributing to quality education which plays a critical role in ensuring that the next generation of foresters are well equipped to face the multitude of challenges that a dynamic society and changing forest landscape will inevitably provide.

About the Best Practices Global Competition

The competition was organized by the Joint IUFRO-IFSA Task Force on Forest Education, University of Helsinki and University of Helsinki Centre for Continuing Education HY+, in collaboration with the FAO. The competition aimed at raising awareness on education in the context of sustainable forest management. Specifically, the competition sought to share valuable information among educators, foresters, students and the general public on the best forest education practices carried out globally for improved learning and encouraging collaborations, which is a central tenet of IUFRO's structure. The competition inspired by the International Day of Forests (IDF) 2019 whose theme was "Forests and Education" also aimed at showcasing how sustainably managed forests provide a variety of contributions in this area. A detailed description of the Best Practices Global Competition and the winners is available in Rodríguez-Piñeros *et al.* (2020).

The competition was open to best practices in forest education related to teaching and learning methods for classroom or online education from primary (including kindergartens), secondary (including high school (lower (typically ages 13-16) and upper (typically ages 16-19) as well as specialized vocational programmes), to tertiary/university (Bachelor to PhD) level. Innovative teaching methods or learning material in the context of teaching and/or learning subjects related to sustainable forest management were also accepted. Evaluation of the applications was based on predefined criteria that included pedagogical quality, novelty of the practice and practical effectiveness. The international call was made on IUFRO's and other partners websites and social media channels. Nominators had to show the excellence or innovation of the practice and success stories in the form of testimonies or anecdotal evidence or through collected data. The competition was carried out from November 2018 to March 2019 in four steps as shown in Figure 1.

Best practices in forest education in Europe

Best practices submissions from Europe: levels of education, types and from where
Out of the 71 submissions received globally from primary to tertiary level, 40.8% were from Europe making it the region with the highest number of submissions (Rodríguez-Piñeros *et al.*, 2020). Tertiary level initiatives accounted for 75.9% (Table 1) of the submissions. The highest number of submissions was received for the Master of European Forestry Programme by the University of Eastern Finland which received

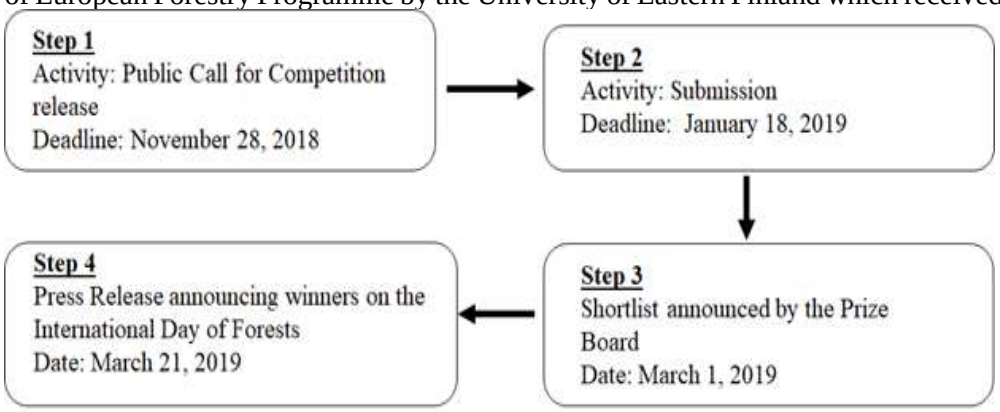

Figure 1: Best Practices Global Competition schedule.

31.3% of the nominations, followed by the coordinator of the Forest Policy and Economics Education and Research (FOPER) capacity building programme in Western Balkans with 17.2%. The nominators were from several European countries as well as regions outside Europe. Other submissions received include:

- Eco-programmes for kindergartens consisting of role plays and use of learning aids made from forest materials.

- Forest kindergartens and schools and their networks that bring together teachers, pedagogues passionately working in that field and guiding groups of children in the forest.
- Work camps aimed at fostering the exchange of issues and aspects of sustainable use of forests in selected regions of Brazil and Germany, as well as management of mountain forest ecosystems.
- The North-South expedition, a 30-day trip through several regions of Brazil for forestry undergraduate students.
- Forestry lecturers using creative teaching styles that have increased students' interests in forestry courses.
- Project/programme coordinators, who have successfully initiated or run the projects/programmes offering learning and research opportunities for students.
- Online education and learning materials in Ecosystem Services Entrepreneurship online course: from ideas to business and the forest virtual tours project based on panoramic pictures and virtual walkthrough programmes.

Table 1: Submissions: country, level of education and frequency of nomination (N).

Country	**Submission by**	**Level**	N
Austria	Coordinator of the Forest Policy and Economics Education and Research (FOPER) capacity building programme in Western Balkans	Tertiary	5
Finland	MSc European Forestry Consortium (https://sites.uef.fi/europeanforestry/)	Tertiary	9
Germany	"SOKO Wald - In the tracks of the Invisible"	Primary/ Secondary	1
	International Work Camp between Brazil and Germany	Secondary/ Tertiary	1
	International Youth Services (Internationale Jugendgemeinschaftsdienste (ijgd) (https://www.ijgd.de/)	Secondary/ Tertiary	1
	Brazil North-South Expedition for undergraduate forestry students including those from German Universities	Tertiary	2
Latvia	Pigman's Detectives (https://bit.ly/3urwaqR)	Primary	1
	The Slovenian Network of Forest Kindergartens and Schools (http://www.gozdnivrtec.si/en)	Primary	2
	Interdisciplinary learning ground: Forest for Today and Tomorrow (FTT)	Secondary	1
Spain	Bringing the forest to the classroom (https://silviweb.blogspot.com/2018/01/virtualtours.html)	Tertiary	1
	ECOSTAR project (www.ecostar.com)	Tertiary	1
	Sustainable Forest Management lecturer	Tertiary	1
Switzerland	Stiftung SILVIVA (https://www.silviva.ch/)	Tertiary	2
Turkey	Lecturer teaching Eco-tourism, Eco-entrepreneurship	Tertiary	1
Total			29

Learning activities and their benefits

Forest kindergartens and forest schools were common in the primary level submissions. The initiatives used forests as a classroom where all or some subjects are taught. The children developed work methods using natural materials found in the forests. In cases where schools and kindergartens have not adopted an area of the forest as their weekly classroom, the learners become "forest wanderers", who continue to explore new areas of the forest.

Games were common among the primary and secondary level submissions. Some of the materials used include sticks and strings of specified lengths to find objects in the forest with similar dimensions or create spider webs for performing movement tasks. The sticks were also used for art which involves creating drawings based on different themes. Specially designed on-line and board games, dance and songs, fairy tales, different types of visualization (such as Pigman dolls and other materials) were also used to teach children how to perform certain tasks as detectives such as assessing the good and the bad consequences of their actions on forests. Some games incorporated feeling, smelling, hearing, and tasting of objects obtained from forests. Digital cameras were also used by the learners to take pictures of the products they have identified in the forest. The findings and experiences were recorded on paper sheets which would be later shared with classmates. It is important to mention that while

these initiatives started as school projects proposed by teachers, they have made a remarkable footprint at the national levels.

Workcamps were common in secondary and tertiary level submissions. They offered learners an opportunity to obtain both practical and theoretical knowledge in different forestry topics. Exchange visits are part of the workcamps enabling learners to travel to different countries for some time to learn about specific forest management aspects and the importance of forests for the local communities. Learners are expected to make summaries in the form of educational activities. The experiences have so far been developed into an educational book with the help of education experts who supplemented them with additional background knowledge on forests. Workshops, poster or group presentations, exciting playful elements of forest pedagogy and the daily support of experts are some of the activities carried out in combination with theoretical knowledge to ensure the knowledge is deeply engraved. The young learners were also equipped with a different perspective, experience in cross-cultural exchange and learned to develop empathy with the local communities.

Field trips and expeditions were used to provide learners at tertiary level with first-hand experience on different forest topics. The students were able to visit different biomes, factories, local communities and learn about different cultures. Photos, taken during the field trips, and reports are submitted at the end. E-learning was another tertiary level submission where the e-learning course was run on Moodle's e-learning platform. The course had a total of 150 learning hours including up to 40 hours of e-modules (about 8-10 hours per week and 6 ECTS credits). The lessons included tutoring, exercises, discussion forums, and group work.

Group work was an important learning aspect in the primary-tertiary level submissions used to equip learners with communication, listening, collaboration, working in groups, and negotiating skills. At the primary level, moving around the forests ensured that learners developed strength, stamina, ability to respond quickly, coordination of their body, attention and creativity. The activities are reported to have cheered the young learners up and helped them relax. The use of naturally occurring materials in the forests enhanced creativity and provided room for the expression of thoughts and the feeling of meaningful inclusion. The submissions also reported that outdoor learning had contributed to increased blood flow, in turn activating broader capacity of the brain, which has a beneficial impact on concentration and memory. Based on the teachers' observations and reflections, regular visits to the forests help in the physical, emotional and social development of children.

Reflection during the activity and, most important, at the end of the lessons was employed to strengthen new knowledge by repeating and sharing between learners and their teachers at all education levels. Repetition on the other hand allowed learners to recall what they learnt previously or use the skills learnt in different contexts.

Printed photos arranged in classrooms also aided the learners not to forget what they learnt.

While most of the submissions highlighted how forests are used as classrooms there were also some innovations that demonstrated how to virtually bring the forest to the classroom. This is particularly helpful in overcoming the challenges of logistical limitations related to field practical classes, costs, academic calendar, accessibility, etc. Appreciation of nature is of course an important component of forest education; however, the impact of COVID-19 pandemic on education has revealed the need for transforming education to enable the transition from classroom based to virtual interface.

The primary level submissions are examples of the wide array of activities that can be developed to incorporate forest content in other subjects and citizen engagement.

Topics covered by the submissions
All the submissions received were centred around sustainable forest management, which was the main eligibility criterion. The initiatives involved lessons on identification of forest products used in daily life, importance of forests and forest products and services, sustainable use of forests and forest management within their countries and beyond.

At primary level, waste and forest management was taught to instil a sense of responsibility in the learners by giving them a chance to play different roles to teach them the pros of protecting the forests and the cons of doing the contrary. Mathematics, mother tongue and foreign languages, drawing, poetry, and art and craft from natural materials were also taught in the forests at this level.

Topics such as recycling of products, fair trade and certification by the Programme for the Endorsement of Forest Certification (PEFC) or the Forest Stewardship Council (FSC) were taught at secondary level to raise awareness on consumption habits, and to promote more sustainable lifestyles. Mountain forest ecosystem was taught at secondary and tertiary levels. Learners engaged in conservation forest projects, for example by establishing mixed tree species plantations, e.g. with silver fir, beech, yew, Scots pine, maple. They were also taught the importance of mountain forests, diverse ecosystems of great biodiversity value, among others.

Ecosystem services entrepreneurship: from ideas to business is an online course that was taught at tertiary level. The topics taught include: Natural Capital, Economic Evaluation, Sustainable Investments, Wild Forest Products, Payment for Ecosystem Services, Forest Certification, Carbon Market, and Ecotourism. Forest Policy and Economics, and Eco-entrepreneurship were also taught at this level.

Education for Sustainable Development was also evident from primary to tertiary level submissions. The initiatives were designed to empower learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society, for present and future generations[2]. With the changed attitudes, increased understanding and practical experience, the learners would in turn be multipliers and influence those around them.

Silviculture was another topic taught at all levels of education. The lessons revolved around the local situations, but some were adopted and designed to tackle other challenges in the global forest sector: tropical forest and the challenge of clear-cuttings, Indonesian forests, Russian forests, forests in Africa or Mediterranean forestry. Other silvicultural aspects covered included planting of trees and their management, watching the felling of trees and helping to prune them. At tertiary level, the silviculture topic was taught through forest virtual tours based on panoramic pictures and virtual walkthrough programmes focusing on silvicultural diagnosis of different forests and silvicultural prescriptions, which would be uploaded to self-designed web pages by the students.

Dendrology, forest ecology, eco-social functions of forests, hunting and wild animals, planning in the forests, inventories (bat trees, diseased trees, dead wood, biotopes, etc.) were also covered at all levels of education.

Learning beyond borders: cross country collaborations
This trend was observed in more than 60% of the submissions from primary to tertiary level with two or more countries collaborating on projects or programmes. Other initiatives also provided opportunities for international participants to take part. They ranged from academic programmes, field trips to online courses. Tertiary levels submissions accounted for 48.3% of the initiatives outlined below.

The Slovenian Network of Forest Kindergartens and Schools was established in 2012 with the intention of systematically introducing forest pedagogics into Slovenian kindergartens and schools but currently incorporates kindergartens in Croatia with plans to expand the network to a Pan-European level. The network is managed and coordinated by the Institute for Forest Pedagogics. In the first year, six kindergartens and primary schools were involved in the network, but currently 83 kindergartens and 39 schools are actively involved in it, including two secondary schools and two primary schools for children with special needs.

The International Workcamp – Young Experts for Sustainable Forest Management project aims at fostering the exchange of ideas and aspects of sustainable use of forests in selected regions of Brazil and Germany and at developing educational material and activities for promoting competencies for sustainable development for pupils between

[2] https://en.unesco.org/themes/education-sustainable-development/what-is-esd

12 and 17 years. The two 10-days workcamps in Brazil and Germany enable the participants from both countries to learn about local forest management practices and the importance of forests for the local societies.

International Youth Services (Internationale Jugendgemeinschaftsdienste (ijgd)) brings together groups of young people (age 16-26; normally 12-16 participants) from different countries who live and work together for two to three weeks. The project combines, in a unique way, the theoretical and practical knowledge transfer about the mountain forest ecosystems. Students from all over the world actively participate in conservation forest projects.

The North-South Expedition is a 30-day trip through several regions of Brazil which has attracted forestry undergraduate students from several universities in Brazil and students from German Universities and other countries. Since 2008, more than 400 students have engaged in the expedition. A total of 20 students from four various German universities have joined the trip in the past few years.

The MSc European Forestry is a two-year interdisciplinary joint Erasmus Mundus Master's Degree Programme in the field of forest sciences and forest-based bioeconomy. It connects the increasing number of forest-related issues with a European dimension at international as well as national levels while offering a common applied research framework, unique both in terms of expertise and academic purposes. It is offered by a consortium of six European forestry universities: University of Eastern Finland (coordinator); AgroParisTech, France; the University of Freiburg, Germany; the University of Lleida, Spain; the University of Natural Resources and Life Sciences Vienna, Austria, and the Transilvania University of Brasov, Romania. Since 2004 over 186 students, from 72 countries globally have graduated from the programme.

The ECOSTAR project funded by the European Commission fosters collaboration between universities and innovative start-ups and successful businesses, operating in the field of Forest and Environmental Policy and Economics (FEPE) in Italy, England, Spain and Romania. Their innovative blended learning course and a European start-up support group on entrepreneurship and innovation targeted PhD researchers, research staff and professors at university departments working in the field of FEPE. The success of the e-learning course was such that they started a second edition at the end of 2018 that lasted until March 2019 titled ECOSTAR – The Nature Accelerator.

It is evident that some tertiary level submissions are in line with the Bologna Process, which is keen on promoting mobility (for students, teachers, researchers and technical and administrative staff) and promoting development of study plans, cooperation between universities, mobility programmes, integrated study plans, training and

research[3]. These initiatives contribute greatly to the increasing trend in internationalization and are best practice examples that can be replicated.

Conclusion

This paper highlights some best practice approaches in forest education at different education levels including the tertiary level. The best practices also show that sustainable forest management is a very important topic which can be taught at all education levels using different learning activities either indoors or outdoors. The submissions from primary and secondary education provide insights on how to incorporate forestry content that will help to nurture pro-forest behaviour at the early ages of individuals (Kanowski *et al.*, 2020). The activities presented for primary and secondary levels can also be modified to suit different age groups and could also be replicated in different countries. At tertiary level, incorporation of innovative pedagogical methods, including online courses. Virtual forest tour programmes will help to create robust education programmes, equipping students with the right skills needed to meet the realities of the changing forest sector as well as the expectations of the different stakeholders. Student mobility, and cooperation between universities, mobility programmes, and integrated study plans, which are part of the objectives of the Bologna Process, were evident in some tertiary level initiatives.

The initiatives from the Best Practices Global Competition could go a long way in contributing to shaping forest education discussions and policies. Platforms such as this competition could be a starting point for information exchange, showcasing trends and providing advice on forest education at different levels. This idea should be embraced because of the huge potential of reaching a wider audience and bringing to light the existing best practices in forest education and their contribution to the SDGs. Such competitions could also provide ideas on how to adapt forest education to the challenges posed by the Covid-19 pandemic such as the abrupt transition of physical classes to online learning mode after the closure of educational institutions, reduced peer interactions among the learners, and limited technological infrastructure and capacity among others.

Authors' statement

The competition was organized and coordinated by all the Joint IUFRO-IFSA Task Force on Forest Education members, but the paper has been written by the two authors, based on the submissions received from Europe.

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[3] https://www.unibo.it/en/international/agreements-and-networks/bologna-process

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References

Arevalo, J., Pitkänen, S., Gritten, D.,and Tahvanainen, L., 2010: Market-relevant competencies for professional foresters in European graduate education. International Forestry Review, 12 (3), 200-208. doi:https://doi.org/10.1505/ifor.12.3.200

European Commission/ European Education and Culture Executive Agency (EACEA)/Eurydice. (2018). The European Higher Education Area in 2018: Bologna Process Implementation Report. Luxembourg: Publications Office of the European Union.

Food and Agriculture Organization (FAO) Education Group Extension, Education and Communication Service. (*s.a.*). Forestry education for the future: expanding the scope. (L. Gasperini, Compiler) Retrieved April 1, 2021, from http://www.fao.org/3/y2993e/y2993e18.htm

Kanowski, P., Yao, D. and Wyatt, S., 2020: SDG 4: Quality Education and Forests – 'The Golden Thread'. Pp. 108-145 in Katila, P., Colfer, C., Jong, W., Galloway, G., Pacheco, P. and Winkel, G. (Eds.): Sustainable Development Goals: Their Impacts on Forests and People. Cambridge University Press.

Kostilainena, A., 2005: A perspective of the students of higher forestry education. Forest Science and Technology(1(2)), 224. doi:https://doi.org/10.1080/21580103.2005.9656292

Längin, D. W. and Ackerman, P.A., 2004: Internet-based learning in higher forestry education. Unasylva 216, 55.

Rekola, M., Abbas, D., Bal, T., Burns, J., Lackner, M., Rodriguez, S. and Sharik, T.; 2017: Global Outlook on Forest Education (GOFE). International Union of Forest Research Organizations (IUFRO).

Rodríguez-Piñeros, S., Walji, K., Rekola, M., Owuor, J., Lehto, A., Tutu, S. and Giessen, L., 2020: Innovations in forest education: Insights from the best practices global competition. Forest Policy and Economics (118). Retrieved from https://www.sciencedirect.com/science/article/pii/S1389934120302033?dgcid=coauthor

Shun, L. and Feipin, Y., 2018: Growing higher forestry education in a changing world: analysis of higher forestry education in the Asia-Pacific Region. Asia-Pacific Network for Sustainable Forest Management and Rehabilitation, & Executive Office of Asia Pacific Forestry Education Coordination. Beijing: China Forestry Publishing House.

Temu, A. and Kiwia, A., 2008: Future Forestry Education: Responding to Expanding Societal Needs. World Agroforestry Centre (ICRAF), Nairobi, Kenya.

United Nations Educational, Scientific and Cultural Organization, 2009: Global Education Digest. Comparing Education Statistics Across the World. United Nations Educational, Scientific and Cultural Organization, Institute for Statistics. Montreal: UNESCO.