Journal of Tropical Forest Science 30(Anniversary Issue): 439–445 (2018)
https://doi.org/10.26525/jtfs2018.30.5.439445

TERTIARY FORESTRY EDUCATION BEYOND 2020: THE CASE FOR MALAYSIA

Faridah-Hanum I[1, 2, *] & Salleh MN[2]

[1]*Faculty of Forestry, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor*
[2]*Academy of Sciences Malaysia, Level 20, West Wing, Menara MATRADE, Jalan Sultan Haji Ahmad Shah, 50480 Kuala Lumpur*

** f_hanum@upm.edu.my*

The development of human capital at the professional level beyond 2020 is needed to meet the expansion of the forestry sector in Malaysia. It takes care not only of biodiversity and the forest but also the good economic returns for the country. Professional foresters also manage the services provided by forest ecosystems for the daily sustenance of Malaysia's population of about 32 million. The importance of forestry education in the country in relation to the nation's needs and what is expected of professional foresters beyond 2020 are herein discussed.

Keywords: Foresters, forest, biodiversity, ecosystem services, career

INTRODUCTION

Forests are complex ecosystems that house a plethora of living things, from the simplest to the most intricate of life forms. However, the sheer complexity and biodiversity of these forests are both their strength and their own undoing. Forest produce, timber and non-timber products alike, are indiscriminately exploited by man for economic returns. Even environmental and recreational services provided by forests have become important economic sectors in many countries especially in the tropics. International agencies such as the Food and Agriculture Organization (FAO) of the United Nations (UN) and the International Tropical Timber Organization (ITTO) continue to fund development projects. Their objective and hope is that forest resources in developing countries will be effectively and sustainably managed. However, the reality on the ground is that success is very much dependent on the ready availability in those countries of forestry professionals who are equipped with expertise and knowledge in managing forests and forest resources. This necessary and indispensable trained human capital pool must be developed through a proper education scheme (Ratnasingam et al. 2013).

In the past, the focus of professional foresters in managing forests was timber production to meet the needs of wood-based industries producing an extensive range of timber products. However, the scope of forest management now covers a fuller spectrum of ecosystem values and services. As Malaysia's forest ecosystems play an integral, beneficial role in the overall well-being of its people, it is vital that these ecosystems maintain the capacity to continue providing the needed products and services. The work of today's professional foresters encompasses a wide variety of land-use management and related roles that include watershed management, wildlife conservation and management, biodiversity conservation, forest health, recreation and ecotourism, carbon management, eco-park management, urban forestry, plantation management and heritage conservation. The forestry sector is also witnessing the emergence of new-generation industries that require the services of professional foresters with the relevant knowledge and skills.

Biodiversity and ecosystems feature prominently in many of the Sustainable Development Goals (SDGs) and associated targets in the 2030 Agenda for Sustainable Development agreed upon by 193 countries of the UN (2015) to address a range of global societal challenges. Biodiversity contributes directly to human well-being and many economic activities including forestry. The implementation of the Strategic Plan for Biodiversity 2011–2020 and its Aichi Biodiversity Targets (SCBD 2010) adopted under the Convention of Biodiversity (CBD) by countries including Malaysia contributes to the achievement of the SDGs. The Strategic

Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets are mutually supportive and reinforcing, and tertiary forestry education is of utmost importance in helping to meet the UN SDGs. In this paper, we discuss the 'must haves' in tertiary forestry education and the relevance of forestry education for Malaysia.

IMPORTANCE OF FORESTRY

In 1973, the Society of American Foresters (SAF) defined forestry as "managing and using for human benefit the forestlands and natural resources that occur on and in association with forest lands, including trees, other plants, animals, soil, water and related air and climate". In 1989, SAF defined forestry as "the science and art of attaining desired forest conditions and benefits". SAF further stated that "As professionals, foresters develop, use and communicate their knowledge for one purpose: to sustain and enhance forest resources for diverse benefits in perpetuity. To fulfil this purpose, foresters need to understand the many demands that forests must satisfy and the potential for forest ecosystems to satisfy these demands now and in the future". These truths have not changed today and are even more relevant with greater public demand of professional foresters for transparency and integrity in forest management. Forestry education must respect and educate these values.

The world needs forests to survive and the gravity of their importance is undeniable. We depend on them for our very lives, from the air we breathe to the many forest-derived resources we use on a daily basis such as water, food and medicines. Forests offer habitats and sustenance to both plants and animals and they provide livelihoods for humans. They also offer watershed protection, prevent soil erosion and mitigate climate change.

According to the UN (2016) an estimated 2 billion people worldwide rely on forests as a means to earn a living and for basic essentials such as food, water, fuel, shelter and security. As much as 80% of the world's terrestrial organisms call forests home. In terms of numbers, approximately 300 million people live in forests in various human settlements, including 60 million indigenous peoples who also look to forests for their livelihoods. In addition, about 13 million people across the world depend on forest-related jobs for their livelihoods.

Forests provide ecosystem services that are critical to man. They are the sources of clean water for drinking, bathing and washing. They protect watersheds, slow down erosion, reduce sedimentation in waterways and act as buffers when natural disasters like floods and torrential rain happen. Forests are also the world's largest storehouses of carbon, second only to oceans. They absorb harmful greenhouse gases that result in climate change.

Although the survival of the world pivots on the survival of forests, we continue to mismanage what nature has generously given to us. Between 1990 and 2015, approximately 129 million ha of forest were lost. When forests disappear, we lose not just the trees—entire ecosystems begin falling apart. Should that happen, needless to say, all life on earth will face the appalling consequences. We cannot afford to lose more forests.

We need to remember that forestry is the only profession where one can enjoy nature, breathe in fresh air, live a healthy life and get paid for it! It has been scientifically proven that people who live or frequent forest ecosystems live a much longer and healthier life. Not many professions can offer such priceless opportunities. Forestry is also a business and should be profitable for those who manage and harvest forests. Above all, forestry is about managing for the future. Future generations will judge us for what we do today. We do not want our grandchildren to say that we had abdicated our professional responsibilities.

TERTIARY FORESTRY EDUCATION IN MALAYSIA

Malaysia is recognised as one of 12 mega-biodiverse countries in the world and has an expanding forestry sector. This international recognition is a compelling reason to ensure that sufficient numbers of professional foresters are available to manage the nation's forests; trained human capital that Malaysia has both the means and the experience to produce.

Universiti Putra Malaysia (UPM), formerly known as Universiti Pertanian Malaysia or Agriculture University, has an impressive history that dates back more than 80 years to 1931. The Faculty of Forestry, one of the university's three founding faculties, was established in 1971 to produce professional foresters for the nation. From its initial Bachelor of Forestry degree programme, which reflected the traditional forestry education model introduced by the British, three academic programmes have since been developed in the

last 47 years to cater to the demand for trained forestry personnel. Bachelor degrees in Forestry Science and Wood Science and Technology were offered beginning 2006, while a Bachelor of Parks and Recreation Science degree was offered from 2011 (Faridah-Hanum & Awang Noor 2015). Since the 1980s, the Faculty of Forestry has also offered Masters and PhD degree programmes for advanced studies and research in forestry-related fields with the cooperation and support of institutions such as the Forestry Department of Peninsular Malaysia and state forestry departments, Department of Wildlife and National Parks, Forest Research Institute Malaysia (FRIM), Tropical Forestry and Forest Product (INTROP), Fibre Development Centre (FIDEC), Wood Industry Skill Development Centre (WISDEC), Furniture Industry Technology Centre (FITEC), Malaysian Palm Oil Board (MPOB), Nuklear Malaysia, Lembaga Getah Malaysia (LGM), Malaysian Timber Industry Board (MTIB), Malaysian Timber Council (MTC) and Malaysian Timber Certification Council (MTCC). Wood research projects to produce value added products are also done with the collaboration of wood-related associations in the country such as Malaysian Plywood Manufacturer Association (MPMA), Malaysian Wood Industry Association (MWIA), Malaysian Furniture Industry Council (MFIC), Malaysia Furniture Council (MFC), Kuala Lumpur-Selangor Furniture Exporter Association (KLSFEA), Timber Exporter Association Malaysia (TEAM), Persatuan Pengusaha Kayu-kayan dan Perabot Bumiputra Malaysia (PEKA) and Persatuan Pedagang Kertas Malaysia (MAPA).

In Malaysia, studies in forestry have progressed far beyond traditional forestry topics such as efficient timber extraction. Several new and restructured forestry and forestry-related diploma and bachelor's programmes are now being offered by institutions of higher learning in the country. This development in the academic curricula of forestry programmes can be attributed to two main factors that financially impact the Malaysian economy: the timber industry and ecotourism.

Since the timber industry is a key contributor to the Malaysian economy, it is crucial that sustainable development of the industry is carried out so that this sector remains relevant. One of the steps taken by stakeholders was a realignment of the industry to achieve an average annual growth rate of 64%, with the goal set at RM53 billion per year by 2020 (MPIC 2009), in addition to commercialising any new products as a result of R&D efforts.

The implementation of Malaysia's Third Industrial Master Plan (2006–2015) saw an appreciable increase in demand during this period for people with knowledge of and training in wood science and technology, especially in the manufacturing sector for value-added downstream products. Malaysia is also the 8th largest exporter of furniture in the world. There are over 3500 wood industry factories di Malaysia (MIDA 2016). To cater to the expected augmented demand, a Bachelor of Wood Science Technology programme introduced by UPM in 2006 that complemented the Diploma in Wood Industries programme offered by Universiti Teknologi Mara (UiTM) since 1973. Universiti Sains Malaysia (USM) also offers a Bachelor of Bioresource, Paper and Coating Technology programme (since 2003), formerly known as the Bachelor of Wood, Paper and Coatings Technology programme offered since 1989.

Pulpwood production is a sector of the economy that is presently being closely watched as Malaysia imports huge quantities of pulp and paper to satisfy rising demands. The country's single operating paper mill will soon be joined by several new ones (Ratnasingam J, personal communication), prompting an urgent need for more pulpwood plantations and consequently, for more professional who are equipped to manage them. To prepare for this escalating demand even beyond 2020, new forestry programmes in plantation management are needed. An alternative is to restructure existing programmes, such as the Bachelor of Forestry Science (Plantation and Agroforestry) programme in Universiti Malaysia Sabah (UMS). It is expected that the growing industry will be able to absorb new forestry graduates at the Diploma, Bachelor, Master's and PhD levels (Faridah-Hanum & Awang Noor 2015). The second factor to consider is the ecotourism sector in Malaysia that has expanded by leaps and bounds within a short time and continues to show great potential for further development. In 1999 alone, the country welcomed approximately 7.9 million foreign tourists, which resulted in RM13.4 billion in foreign exchange earnings. Tourism remains one of the fastest-growing industries and plays a pivotal role in the overall national economy (JPSM 2003). The National Ecotourism Plan 2016–2025 focuses on five main areas namely investment in ecotourism, tourism concessions, synergy between ecotourism and conservation, ecotourism marketing and ecotourism cluster.

Tourism will serve as an instrument within the overall sustainable development of Malaysia and the economy and as a tool for conservation of ecotourism sites in the country (MOTAC 2018). Malaysia also has many urban forests. There is thus a growing need for professional foresters to properly manage these natural areas, a fresh look at current forest management systems–especially the important elements of planning and training–is imperative, so that the resources of these elements can be consolidated for ecotourism and biodiversity conservation purposes. Based on altitudes and soil types, 16 types of forests (such as mangrove, beach and heath forests) are found in Malaysia and they are distributed from the coasts to the mountaintops. In Peninsular Malaysia alone, a total of 116 recreational forests boast myriad examples of biological diversity and attractive forest ecosystems, so essential to thriving ecotourism destinations (JPSM 2003). Some considerations taken into account by academic forestry programmes and curricula in Malaysia are the inevitable trade-offs that are a result of competing uses for forests and timber. This is especially evident when a balance has to be reached between reaping immediate economic benefits and providing for longer-term ecosystem services.

Biological diversity has important economic, environmental and social implications for the nation, especially in the forestry and environmental sectors. In the forestry sector, a copious amount of timber and non-timber products are obtained from a broad assortment of plant and animal life of the forests. In terms of the environment, biodiversity is key to the supply of a slew of ecological services such as providing habitats for wildlife and helping to ensure environmental stability, which includes carbon sequestration, maintenance of hydrological regimes and recycling of nutrients.

The National Policy on Biological Diversity of 1998 was recently revised to cover the period 2016 to 2025 (NRE 2016). The revision was necessary on two fronts: to meet current biodiversity needs and to fulfill Malaysia's obligation under the UN CBD. As the 12th most mega-diverse country in the world, Malaysia is committed to conserving its biodiversity, promoting its sustainable use, and ensuring fair and equitable sharing of the benefits arising from the use of its bio-resources by adhering to the outlined principles and strategies for effective management of its biodiversity. To effectively carry out all these commitments, it is of vital importance that Malaysia continues to produce professional foresters who can be on hand to manage the forests (including urban forests) and their immense biodiversity. In 2016, UiTM introduced two new programmes: the Bachelor of Science (Biodiversity Management) programme and the Bachelor of Science (Forest Resource Management) programme which offers three options i.e., Forest Management, Urban Forestry, and Ecology and Wildlife Conservation (Faridah-Hanum & Awang Noor 2015). These added degree offerings aim to help meet the anticipated demand in the forestry sector for properly trained and equipped personnel.

FORESTRY BEYOND 2020

The authors are convinced that forestry is poised to play a critical role in mitigating global climate change in the future. Concerns about climate change and population growth shall dictate the future direction of forestry in Malaysia and the region. Conservation of natural forests is critical for the unique and special role of tropical forests as a habitat for wildlife and as the nation's watershed. It is the responsibility of the Government and, on the ground—forest managers, to ensure that natural forests are conserved for their biodiversity and as wildlife habitat. The tendency to prioritise direct and immediate economic benefits is short-sighted and in the long term is economic and environmental suicide. The loss of the rich tropical biodiversity of the tropical forests is akin to 'burning our library books before we have read them'. As professionals we cannot let that happen. Forest cover in insular South-East Asia declined at a rate of 1% per year between 2000 and 2010, with the highest deforestation rates occuring in peat swamp forests at 2.2% yearly (Miettinen et al. 2011). In addition to deforestation, forest degradation is driving biodiversity loss and a decline in ecosystem services (Haddad et al. 2015).

The world will continue to require timber but wood is a renewable resource that can be grown. With our tropical climate of abundant sunshine and rain and relatively good soil, there is no reason why we cannot grow the timber needed by the country now and for the future. It is economic and logical. Currently, there is a worldwide increase in plantation forests, usually in monocultures and typically of non-native species. Both economic development and state policies have been

important in driving these changes (FAO 2015)at the request of its member countries.

Natural tropical forests grow at an average of 1 m^3 ha^{-1} $year^{-1}$ while a forest plantation of fast-growing species can grow at a rate of more than 25 m^3 ha^{-1} $year^{-1}$. Research on some fast-growing species have shown potential growth of 50 m^3 ha^{-1} $year^{-1}$. Rotations can be as short as five years and with good silvicultural and management systems, it is estimated that Malaysia's current timber needs can be met by a forest plantation area of less than half a million ha (MPIC 2009).

Water is becoming a critical resource. Even though Malaysia receives heavy rain, due to past poor management our water supplies are poorly managed. For example, Malaysia's low water rates (among the lowest in the world) does not encourage water conservation but instead promotes water wastage and overuse (Lee et al. 2018). Water is required for consumption and for agriculture but our river systems are not managed to be a source of good, clean water. Our riparian reserves are not respected and are instead being destroyed by illegal activities. Enforcement of the law is lax. Our rivers are muddy and it is the national sewage system. River pollution has been identified as a major cause of unscheduled water disruptions in Malaysia (Lee 2015). These issues have to be addressed and a proper integrated watershed management system integrating forests and rivers needs to be developed.

The key to good forest management is good governance. Corruption in forestry is a recognised fact (Callister 1999, Transparency International 2011) but while the authorities speak against such practices, the reality is that it is a common practice that transcends the whole spectrum of forestry. This needs be seriously addressed as the opportunity cost is huge. The good name of the profession is at stake.

Finally, the forestry profession should be firmly governed by the Forestry Act, which was passed by Parliament to govern the activities and behaviour of foresters. Gone are the days where loggers were allowed to 'manage' the forests. In the past loggers typically harvested the most valuable timber species with little regard for environmental conservation or planning for future harvest—they are not forest managers nor are they trained as such.

TERTIARY FORESTRY EDUCATION BEYOND 2020

With the current pressing global issues related to forestry such as climate change, deforestation, trade (especially timber certification), sustainable forest management, forest ecosystem management and biodiversity and ecosystem services, the role of forestry education is becoming more relevant than in the past. Forestry curricula should address the challenges of forestry beyond 2020. It needs to inculcate a sense of pride and passion for forestry. We should at the outset aim to attract good students and not be satisfied to take the residuals of the education system. Forestry is primarily a business and the education system needs to incorporate good and efficient financial management that includes ecosystem audits, especially financial management of future resources both tangible and intangible. Foresters will have to put values to forest ecosystem services such as water, biodiversity and oxygen, and include these in the curricula. The science of forecasting and valuing future values is similar to that of an actuarist putting values and costs to insurance policies. Together with finance, foresters must be given a strong foundation of economics as forestry is fundamentally a business. Experts in finance could be invited to teach these subjects.

Climate change is a topic of increasing importance that foresters need to be aware of, and how they as professional foresters can manage forests to mitigate climate change. The curricula should incorporate courses that teach them to measure carbon sequestration by trees, forests and ecosystems including the soil. Carbon credits and the global carbon trading are important topics to know for the opportunities they open for the professional forester. Topics such as reducing emissions from deforestation and forest degradation (REDD) need to be included with experts invited to give lectures. Will there be biodiversity or water credits in the future? These can open new opportunities for professional foresters of the future.

Urban forestry is becoming a very important aspect of modern living and in this regard foresters should also qualify as arborists skilled in the management of urban trees.

The forestry industry should also be given emphasis in forestry education. Students need to know of new technologies in timber and wood

utilisation that have been developed. Wood is fundamentally cellulose and lignin, and cellulose can be converted into many new and modern products. Minor forest products such as bamboo, rattan and medicinal plants should not be forgotten.

While foresters should have a good education in the life sciences such as biology, botany and ecology, it is important they also have adequate training in the social sciences and humanities and on how to deal with people and the public. In this respect, effective communication—both oral and written—is key, hence mastering the English language in addition to the National language is an advantage. Students need to be taught how to effectively communicate information and ideas in writing for a broad audience that includes policy makers, peers, and the general public. This ability to write is a dying skill amongst present foresters.

Overseas professional development and employment opportunities for foresters abound, with numerous international organisations such as FAO, UNESCO, CIFOR and ICRAF needing good tropical foresters. Do not be limited to Malaysia or the region. Consultants are always needed for projects. Closer to home, forestry- and environment-related NGOs offer memberships and platforms on which foresters can participate in and contribute to local and national discussions on forestry. Enterprising foresters drawn to the growing tourism and ecotourism sectors may capitalise on their forestry training to set up niche eco-tourism companies with an international reach.

Foresters have numerous opportunities to further their professional development in areas of forestry that interest them, and become specialists in mangroves, peat swamps, biodiversity, REDD, climate change or any other subject. Good managers are also in demand and foresters who pursue additional MBA (Masters in Business Administration) qualifications are better equipped professionally as forestry is fundamentally a business. Elements of business administration are also appropriate to be taught at the undergraduate level.

Practical training is compulsory. In Australia, a forestry student must attain 12 months of field experience before being allowed to graduate. This field experience with the private sector as interns or as attachments is critically important to mould the potential forester into a full-fledged professional. It is also presents to graduating students an opportunity to experience working in the field for which they have been studying, and to—hopefully positively—envision their future career in forestry.

In the context of South-East Asia, a much closer collaboration to develop student exchange programmes between forestry faculties in the universities throughout the region is to be encouraged. Study tours can be organised and internship programmes in different countries can be developed.

The best teachers are those with experience in the field and technology that has been acquired through personal experience and learning. Forestry faculties need to be able to tap into the vast experience of the industry and prominent individuals in the forestry profession from within and outside the country. The faculty budget should allocate expenses related to bringing industry professionals in as adjunct or guest lecturers to teach and share their experiences with forestry students. This is priceless!

After considering all that, basic training in an undergraduate course is only the beginning of a lifelong learning in a career in forestry. Forestry training should seek to inculcate in the undergraduate, critical thinking, self-confidence, good communication skills and a social responsibility to serve the people and the country.

As we move in the 21st Century and the Fourth Industrial Revolution and the UN SDGs, foresters must play their role and rise to the fore in addressing the future challenges of Mother Earth and the environment. That is what foresters are taught! Forestry is definitely not a sunset profession. It is a 'sunrise' profession but it needs competent, passionate, capable, hard-working and honest foresters to rise to the challenge.

CONCLUSIONS

Labour is becoming a critical commodity in all industries in Malaysia and the influx in foreign labour does not auger well for the nation in the long run. Modern technology such as automation and artificial intelligence should be explored for their possible applications in the whole spectrum of forestry activities both upstream and downstream. Moving forward, collaboration with technical institutions such as Universiti Technologi Malaysia should be promoted to address the numerous technological issues faced by the forestry sector. Forestry curriculum should

also introduce the potential uses of such technologies to students.

Forestry education must be multidisciplinary, having national and/or importance and contribute to the development of positive attitudes, responsibility, ethical values and good citizenship, which is part of personal character building of the forestry graduates. Consultations with stakeholders are necessary and will criss-cross institutions, disciplines, organisations, specialisations, roles, and identities.

Mahatma Ghandi once said "The Earth has enough for everyone's needs but not for everyone's greed". The forestry profession by definition must manage resources for the future. Future generations shall judge us for what we do today.

REFERENCES

Callister DJ. 1999. *Corrupt and Illegal Activities in the Forest Sector: Current Understandings and Implications for the World Bank*. Forest Policy Implementation Review and Strategy Development: Analytical Studies. World Bank, Washington DC.

FAO (Food and Agriculture Organization of the United Nations). 2015. *Global Forest Resources Assessment 2015*: *How are the World's Forests Changing?* FAO, Rome.

Faridah-Hanum I & Awang Noor AG. 2015. Forestry education in Malaysia: trends and challenges. *The Malaysian Forester* 78: 151–160.

Haddad NM, Brudvig L, Clobert J, Davies KF, Gonzalez A, Holt RD & Townshend JR. 2015. Habitat fragmentation and its lasting impact on Earth's ecosystems. *Science Advances* 1: 1–9.

JPSM (Jabatan Perhutanan Semenanjung Malaysia). 2003. *Buku Panduan Hutan Lipur Semenanjung Malaysia*. JPSM, Kuala Lumpur.

Lee P. 2015, May 11. Dirty water major cause of disruption. *The Star Online*. Retrieved from https://www.thestar.com.my

Lee KE, Shahabudin SM, Mokhtar M, Choy YK, Goh TL & Simon N. 2018. Sustainable water resources management and potential development of multi-purpose dam: the case of Malaysia. *Applied Ecology and Environmental Research* 16: 2323–2347.

MIDA (Malaysian Investment Development Authority). 2016. *Facts and Figures: Statistical Data*.. Retrieved from http://www.mida.gov.my/home/facts-and-figures/posts/

Miettinen J, Shi C & Liew SC. 2011. Deforestation rates in insular Southeast Asia between 2000 and 2010. *Global Change Biology* 17: 2261–2270.

MOTAC (Ministry of Tourism and Culture). 2018. *National Ecotourism Plan 2016–2025*. MOTAC, Putrajaya. Retrieved from http://www.motac.gov.my/muat-turun/category/86-pelan-eko-pelancongan kebangsaan-2016-2025

MPIC (Ministry of Plantation Industries and Commodities). 2009. *National Timber Industry Policy (NATIP) 2009–2020*. MPIC, Putrajaya. Retrieved from http://www.mtib.gov.my/natip/Natip3.pdf

NRE (Ministry of Natural Resources and Environment). 2016. *National Policy on Biological Diversity 2016–2025*. NRE, Malaysia. Retrieved from https://www.mybis.gov.my/pd/42

Ratnasingam J, Loras F, Vacalie CC & Wenming L. 2013. The future of professional forestry: trends and challenges from the Malaysian perspective. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca* 41: 12–20.

SCBD (Secretariat of The Convention on Biological Diversity). 2010. Strategic Plan for Biodiversity 2011–2020 and the Aichi Targets: Living in Harmony with Nature. SCBD, Montreal. Retrieved from https://www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf

Transparency International (TI). 2011. *Analysing Corruption in the Forestry Sector: A Manual*. TI, Berlin. Retrieved from https://www.transparency.org/whatwedo/publication/analysing_corruption_in_the_forestry_sector_a_manual

UN (United Nations). 2015. *Transforming Our World: The 2030 Agenda for Sustainable Development* Retrieved from https://sustainabledevelopment.un.org/post2015/transformingourworld

UN (United Nations). 2016. *Life on Land: Why it Matters*. Retrieved from https://www.un.org/sustainabldevelopment/wp-content/uploads/2016/08/15_Why-it-Matters_Goal15__Life-on-Land_3p.pdf

Faridah Hanum Ibrahim *graduated with a Bachelor's degree in Botany from Universiti Kebangsaan Malaysia in 1984 and PhD in Botany from University of Reading, England in 1989. She was former Dean of the Faculty of Forestry in Universiti Putra Malaysia, Head of Department of Forest Production and Deputy Director of the university's Research Management Centre. Currently a Professor of Forest Botany at the Faculty of Forestry, she is also a Fellow of the Academy of Sciences Malaysia and has served as Coordinating Lead Author for Deliverable 2(b) Asia-Pacific for Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services from 2015–2018.*

Salleh Mohd Nor *was educated at the Royal Military College, Adelaide University and Michigan State University. He started his career in forest inventory and retired as Director General of FRIM. He is currently Pro Chancellor of Universiti Teknologi Malaysia and Chairman of Tropbio Research Sdn Bhd. Salleh was the President of IUFRO and the Malaysian Nature Society, and served as Vice President then Council member of the Academy of Sciences Malaysia and is presently a Senior Fellow. Currently, he is the President of the Malaysian Scientific Association. He has won numerous awards including the Langkawi Award, the Brandlaureate Leadership Award and Merdeka Award.*