# Status and Perspectives of the Forestry Education in Papua New Guinea

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*Abstract*

*The future of forestry within economic and social activities has to be envisioned and defined, in order to better integrate its multi functionality into education. Only a good definition of the roles played by forestry and the responsibilities future practitioners will carry can help define the curricula and methods. A revision of the current status of forestry science development in Papua New G is given considering its geographical location, market new trends, potential advantages, historical enrollments of students and staff, facilities, and nexus with other institutions. It was found that the forestry department of University of Technology Papua New Guinea has been releasing graduates in the last 36 years with a sub optimal formation, the causes are discussed and possible solutions formulated.*

*Keywords: forestry education, academic institution, curricula, forestry department*

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## Introduction

Despite the materialization of new education programs covering areas of environment, biodiversity, and integrated natural resources management, forestry remains critical to sustained productivity and conservation, hence the need to refocus forestry training to make it more responsive to ever changing societal demands in Papua New Guinea (PNG) and worldwide. New challenges are faced by forestry education in PNG to cope with both international demands and internal environmental conditions. Being the only academic institution that offers a forestry degree in the South Pacific, it is supposed to keep up with the latest technologies available, run a comprehensive inter disciplinary research program on key subjects with other institutions, and provide technical solutions in the field to local industrial enterprises, NGOs, and government programs. These objectives are not efficiently catered because of insufficient funds, academic isolation, social unrest, and shortage of highly skilled teaching staff. The future of forestry in the socio economic context of PNG has to be envisioned and defined in order to better integrate its multi functionality into education. Only a good definition of the roles played by forestry and the responsibilities future practitioners will carry can help define the curricula and methods. The paper discusses current problems in relation with the status of similar institutions abroad and opens up with possible solutions which are not always necessarily linked to funds availability.

## Forest science development and national development

Although several developed countries built wealth from forest management and related industries, tropical countries are immersed in a complex website of problems like landscape fragmentation, rural-urban migration, weak laws enforcement, forest degradation, and conflicts over land rights; and face new global tendencies like globalized timber trade, technological changes (biotechnology, "precision" forestry), proliferation of reduced impact logging norms and of guidelines and toolkits, and increase of the role of global forest governance, focus on multi-scale analysis and intervention, increased role of NGOs into management decisions, expansion of secondary forests, and increased contribution of informal forest sector into national economies and in the rural economies (around ¼ of rural household incomes comes from tropical forests). Whereas the United State of America spends more than $200 person$^{-1}$ year$^{-1}$ on research and development, Latin-American countries spend only $5, while in Africa and Asia the figure falls to $1 (Turney 1984). This means the lasts do not have the scientific and technological means to fuel development, relying on imported technologies not often adapted to their needs.

Direction and measures for improvement have to be carefully analyzed and not just imitated. The United States for example has lost 50% of its wetlands, 90% of its northwestern old-growth forests, and 99% of its tall grass prairies (Suzuki & McConnell 1997). Japan who comes second only to the USA in its research and development budget, prioritizes the development of technologies that lead to the invention of new materials, allow the widespread use of alternative energy sources, and are applicable to social systems (Turney 1984). Main differences on forestry education in PNG and other countries are given in Table 1.

PNG largely remains a naturally forested country where land and people are inseparable. Forestry takes the second

position in revenue earning next to mining. While in the developed world, 80% of the wood produced is used for industrial purposes, in developing countries the same rate is used for energy (Giese 2010). Around 7.0–7.5 million ha in the country are commercial or productive forest, out of a total of 34 million ha (Duncan 1994). The annual sustainable yield of saw logs was estimated in 1994 to be over 3 million $m^3$, while the annual permitted cut is nearly 3 times greater, and actual removals (including illegal logging) even larger (Aplin *et al*. 1999). At current rates of forest depletion and/or degradation rates, this available forest will be gone within a generation; besides this, only 2% of the land area is under conservation management (Figure 1), and the complex land tenure system militates against major extensions. Due to these reasons the government has formulated policies to promote reforestation, down streaming wood processes to add value, and to implement the REDD strategy nationwide. Profits from the sustainable utilization of these resources can potentially match the nation's short, medium, and long term development goals, as harvests are possible under multiple cycles and mixed plantations (hardwoods and softwoods), trees can be integrated with agricultural systems, several non timber forest products have high demand in the market, and other related "green" economic activities are increasingly popular worldwide (eco tourism, bio fuels, carbon storage, wildlife management, and environmental services such as the maintenance of hydrological services and soil conservation).
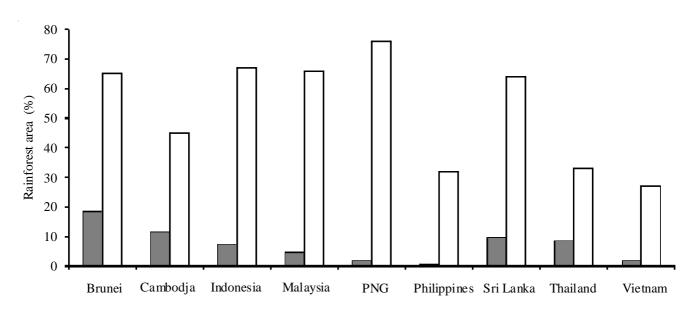
The state of a forest is a function of the quality of forestry practice adapted to the diversity of forest types in PNG, of which the 60% are lowland forests, 14% montane forests, 14% swampy forests, and 2% mangroves (Collins *et al*. 1991). Likewise, the state of forestry practice depends on the quality of forest science produced in this case at University of Technology (UNITECH). The challenge is to disclose the conditions for a strong forest science in tandem with a strong forestry practice.

Forestry is an atypical profession because of the high percentage of baccalaureate trained professionals and the small fraction of self-employed professionals, the highest percentage being employed in the public and private sectors, however the increased complex nature of forestry has led many employers to prefer graduates with advanced degrees (Giese 2010). Worldwide forestry graduates have declined by 30% since the 1990s and have difficulties on securing jobs as university programs do not match changing market demands. In PNG the trend is similar (Figure 4), around 50% of graduates are employed in monitoring of commercial logging in natural forests.
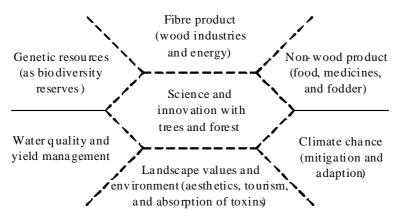
## Forestry science at UNITECH

UNITECH is the only institution in the South Pacific region that offers training in tropical forestry at the professional level. The University is located in the industrial city of Lae which is the second largest in Papua New Guinea. The forestry department has integrated Degree and Diploma curricula offered at Taraka and Bulolo campuses, respectively. The 3-year course leading to Diploma in Forestry is normally completed at Bulolo while the 4-year course leading Bachelor of Science Degree is completed at Taraka Campus. The department has 2 laboratories furnished with some sophisticated equipment and instruments including desktop computers for students use, a herbarium, a 15 ha forest plantation, a ha of arboretum, and a forestry nursery. A complementary herbarium, arboretums, nursery, and treatment plant are available at Bulolo Campus. The area is bordered by the largest state owned pine plantation, and encloses plywood and sawmill plants. All these facilities are currently underutilized.

The minimum entry requirement for UNITECH 4-year



Figure 1 Rainforests area per country in percentage of total area (Collins *et al*. 1991). Conserved (■) and remaining (□).

Fibre product
(wood industries
and energy)

Genetic resources
(as biodiversity
reserves)

Non-wood product
(food, medicines,
and fodder)

Science and
innovation with
trees and forest

Water quality and
yield management

Climate chance
(mitigation and
adaption)

Landscape values and
environment (aesthetics, tourism,
and absorption of toxins)

Prinsiples underpinning content resource dynamics, policy,
sociology, ecology, economics, and business

Figure 2  Main areas to consider in a forestry curricula (Temu & Kiyiapi 2008).

Bachelor's degree program is Grade 12 or equivalent with minimum of B grade in mathematics, english, biology, and any other of chemistry or physics. Students who graduated with merit at the undergraduate level are eligible to pursue post-graduate studies in Forestry leading to a 1 year Post Graduate Diploma in Forestry or 2 year duration MSc. or Mphil. in Forestry.

The forestry curricula in PNG underwent some revisions to enhance its depth and width; however knowledge transmission and research planning are suboptimal. The speed at which curricular programs are restructured in response to emerging issues can determine the viability of the forestry department in terms of enrolment and graduation rates. The department registers 95% undergraduate and 5% postgraduate intake according to admission records. The working world for the field has become more interdisciplinary, collaborative and global, requiring scientists broadly trained, flexible, and capable of collaboration as well as technically proficient (Figure 4). Proficiency is required in a broad range of functions, from the biophysical aspects of forest resource management to complex social interactions with people and groups with diverse interests.

Table 1  Comparative table on forestry education in 3 countries

| Variable | Shimane University [1] | UNA La Molina [2] | UNITECH [3] |
|---|---|---|---|
| Global natural environment | Very good environmental quality and low biodiversity | Deforestation, soil erosion, and pollution | Deforestation, soil erosion, and pollution |
| Forestry contribution to country | Environmental services, wood industries, and low biodiversity | Energy, eco tourism, and small scale industries high biodiversity | Energy, eco-tourism, small scale industries, and high biodiversity |
| Infrastrucure and labs | Good infrastructure, facilities, good maintenance, and upgrading | Good infrstructure and facilities, irregular maintenance, and upgrading | Good infrastructure and facilities, no maintenance and upgrading |
| Specialization level | Very specialized since $1^{st}$ year | Orientations ($3^{rd}$ –$5^{th}$ year): forest industries, forest management, and forest conservation | General for all |
| Postgraduate program | MSc. in Life and Environmental Science, PhD (coordinated with other 2 universities) | MSc. with 5 orientations | MSc. in forestry |
| Research progress | Comprehensive, multiple, opportunities, funds from government and companies | Variable results, variable funding sources but generally difficult to get them | Approved program but not functional |
| Scientific journals | High number and diversity of national journals | Revista Forestal del Peru (only spanish) | PNG Environment Klinkii (inactive) |

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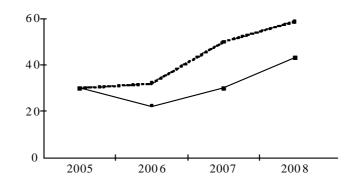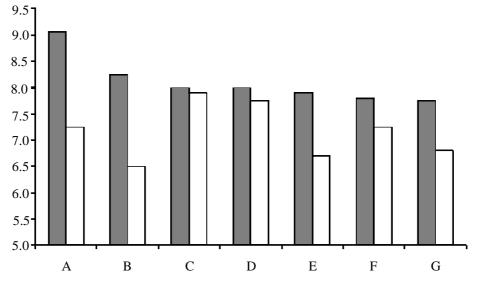[3]Department of Forestry, Lae, Papua New Guinea

Figure 3  Number of students that enrolled and graduated at the Forestry Department of UNITECH at last 5 years. Enrolled ( ▪▪▪▪ ) and graduate ( —— ).

Causes of substandard forest science and education in PNG are:

1  Global discussions outpace institutional capacities to keep up.
2  Lack of transparency and of accountability. The country has been classified as one of the fragile or failed states (Irland 2010) due to the negative effect of poor governance and conflicts on the condition of its natural resources.
3  Rigidity of institutional philosophies (historic separation of agriculture and forestry) and of administrative structures that restrain teaching across disciplines, with scant cooperation with other departments (Agriculture, Applied Sciences and Architecture), national research institutions (UPNG, PNGFRI, NARI, NRI), universities abroad, and companies with whom long term partnerships can be established, research projects of common interest designed, and students exchange formalized.
4  Current departmental staffing is bottom heavy with 0% at the professorial cadre, 0% at the senior lecturer level, 46% at the lecturer 2 and below levels, 34% at the technical and secretarial levels, and 20% for supporting staff. The recommendation for institutional management sustainability is of 20% Professorial, 35% Senior Lecturer level, and 45% at Lecturer 2 and below cadre (Figures 5a and 5b).
5  Inadequate equipment maintenance and upgrading because of funding instability.
6  Emphasis given to biological studies in forestry while the physical, mechanical, social, and economic aspects are given less weight. Over 50% of research efforts are directed to biological factors of forestry, including watershed management, forest hydrology and protection, wildlife, recreation, and resource inventory. Twenty and 22% of the resources addressed forest products and plantation management research, respectively. Agroforestry and



A: ability to work in teams, B: ability to address public concerns, C: understanding of requirements for healthy forests, D: innovative approach to forest management, E: innovative approach to working with the public, F: ability to evaluate and synthesize information, G: understanding of landscape-level planning.

Figure 4  Skills identified as necessary for success in forestry and their fatings of importance (■) and performance (□) by employers with scale 1–10 (Giese 2010).
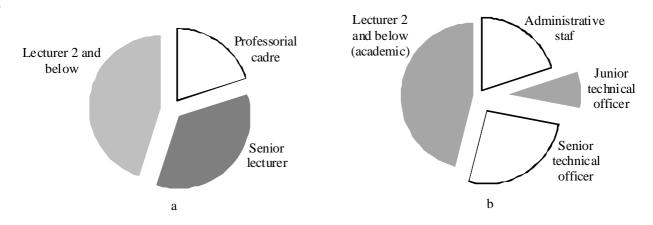
Figure 5  Current departmental staff structure (a) and academics at optimal level (b).

social forestry research accounted for less than 6% of the resources (Chamberlain & Moore 1992).

7  Teaching goes above average (mostly in a theoretical form), research below average, and community service is barely optimum according to the department's capacity assessment.

8  Discussion of daily issues at departmental meetings prevents analysis of long term chronic problems. Feeble integration between Taraka and Bulolo campuses staff.

9  Most of UNITECH forestry graduates remain poorly equipped on effectively responding to global forestry issues, technical, and economic aspects of multiple-use management at large scales, participatory approaches to forest resource use, mapping, harvesting, decision making, integrating knowledge, and tools from the biophysical, economic, and social sciences, and dealing with uncertainty in a scientific manner. Few successful graduates stand better chance of securing senior responsibilities, research, teaching, and management/ administrative positions in the forest industries, national and provincial forest authorities, NGOs, Department of Environment and Conservation, secondary and tertiary institutions, research institutes, international organizations (FAO, UNEP, UNDP, IUFRO). For example, few UNITECH students have access to the PNGFRI publication on micro-identification of all commercial timbers and other 10 volumes on wood preservation and utilization of minor forest products (Chamberlain J & Moore E 1992). Much of the research activities currently undertaken by staff and students are with the assistance of the Australian Centre for International Agricultural Research (ACIAR), the University of Melburne and the Office of Higher Education (OHE).

## Possible solutions

A solid training in the field of forestry is one of the fundamental ways to remediate these long term problems. A restructuring of the undergraduate forestry program at UNITECH into the following research units was proposed, and not implemented in 2009: forest biology and ecology,

silviculture and yield studies, forest management and inventories, forest utilization and wood sciences, and forest techniques and engineering. Akande (2010) proposed a revised curriculum "compact and devoid of issues that merely occupy space without adding value" with the following options for a Master of Philosophy in Forestry: forest environmental services and management, forest industry, forest biometrics and mensuration, forest planning and development, and agro forestry and soils management. Although reasonable and comprehensive, neither proposal included orientations on forest conservation, wildlife management and/ or ecotourism, areas of high potential considering the unique and vulnerable status of Melanesian biodiversity. Other recommendations are:

1  Increase researchers capacity through training/ workshops, etc. All research programs have results, experience, expertise to share, and research from all countries should be considered for its potential benefit to other programs.

2  Aggressive postgraduate training, improved retention of existing staff base, improvement in sources of scholarship for enterprising and capable graduates, and a prospect of better quality living for university academicians.

3  Halt over-specialization of departments as highly specialized students often lack comprehensive judgment on contemporary forest industry issues.

4  Promote team teaching and educate people to undergo research. Prepare modular courses. Decisions often involve a mixture of spatio-temporal scales. There is the need for information at global scales consistent with local scale information and vice-versa.

5  Promote interdisciplinary breadth without sacrificing disciplinary depth, promote interdisciplinary exchanges among students.

6  Drive curriculum package towards market relevance. Conduct research with impact that will attract funding from various donors.

7  Promote research topics on the propagation of native species (endangered and endemic), workability of main commercial wood species, economic studies of acacia and

balsawood mixed plantations, farming possibilities of cassowaries, crocodiles and bandicoots, timber certification, green biomass quantification (in field and by remote sensing), feasibility of community forestry microenterprises, forests and food security in New Guinea, improved processing of small logs and residues reutilization, local demand of round log and current related-policy, ecology of mountainous forests (cloud forests). More attention must be given to the societal characteristics that complicate the technical aspects of forestry (Figure 2).

8  Strengthen communication through various means of media. Networking is a 2-way process, there must be a proactive information exchange between and among the member-institutions, network officers, and network core or host-institution. Collect and resume results of 36 years experience in forestry research and education for exchange with other institutions in the Asia Pacific region and plan the way ahead.

9  Sign up agreements with communities who own the trees they grow but market them through the forestry department, which may recover its own costs of production before passing along the community share (Compton & Bruce 2003).

10 Perform reengineering, a rethinking, and radical redesign of educational processes to bring out dramatic improvements in performance.

11 Promote landscape scale approaches to sustainable forest management by developing partnerships, incorporating local knowledge, and embracing complexity

## Conclusions

As global societies recognize the multi-functional nature of forests, their expectations from forestry professionals are changing, creating a gap between what is learnt in forestry schools and the new expectations. Increasingly, the role of society in determining how forestry will be managed to meet the challenges is rising. The trends of deforestation and illegal logging will continue unless the country's youths get an education that will enable them to add value to their work. Current education program at UNITECH is a patchwork of reviews and additions to the old curricula. A primary survival principle is diversity, which also should be reflected in the academic curricula. Both broad main fields (forest industries and forest conservation and management) need to be strengthened simultaneously at under and post graduate levels. There is a need to link forestry to other land use and environment disciplines in order to curve out the content of forestry education. Interinstitutional collaboration through networking is needed. However, it is feasible to enhance the research and educational capabilities at UNITECH Forestry Department with the limited funds available by internal restructuring of research plans, academic, and administrative duties, and promotion of competitiveness. It is important to reverse past trends of lost opportunities of collaboration with other institutions by strengthening direction and continuity in the department. Consensual periodic planning and transparency will assure that when "the wind changes direction, the department may build windmills instead of walls".

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