

What does the future hold for forestry education?

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With rapidly accelerating social, economic and technological changes, educational concepts and institutions that have been in place since the industrial revolution could become obsolete.

A number of studies in recent years have drawn attention to the declining state of professional forestry education, both in developing and developed countries. Symptoms of this decline include a significant reduction in funding to educational institutions, low student enrolment rates (Van Lierop, 2003), inability to attract the most talented students and most important, the declining demand for forestry graduates. Confronted with rapidly changing circumstances, many institutions are adopting survival strategies, primarily attempting to outcompete other similar institutions.

Some of these strategies include making appropriate changes in the curriculum “to encompass the broad disciplines of ‘new forestry’” (Saddler, 2001), improvement in teaching methodologies, development of research partnerships with industries and networking with other research and education institutions. Most often these are inadequate and too late, and their impacts are so short-lived that institutions need to make continuous adjustments to survive. There have been few systemic efforts to analyse the problems and remedy the situation, particularly taking into account the broader changes in society, economy and forestry. The concern has rested largely with the educational institutions themselves. Reinventing forestry education in a different form requires more concerted efforts than educational institutions can be expected to carry out within their limited capacities.

This article points out that many of the problems confronting professional forestry education are deeply rooted and are common to other disciplines and indeed to education in general. The article describes how fundamental changes in soci-

ety, the economy and the forest sector affect forestry education directly and indirectly. It also examines some of the basic issues relating to society’s perception of what constitutes education, and the implications for forestry education as it is perceived now.

CHANGING CONTEXT OF FORESTRY EDUCATION

Historically most of the forestry knowledge system – which includes research, education, training and extension – has been largely geared to the needs of industrial forestry. In most countries forestry departments were established almost entirely to protect forests and to secure industrial wood supplies to meet domestic or external demand. Apart from protected areas, management of natural

The rapid growth of cross-disciplinary and interdisciplinary work would indeed argue that new knowledge is no longer obtained from within the disciplines around which teaching, learning and research have been organized in the nineteenth and twentieth centuries.

Drucker, 1989

forests (which in many countries, especially in the tropics, has been predominantly exploitation) or plantations has largely focused on producing industrial wood. Until recently, traditional resource use systems that cater to the needs of local communities largely remained outside the framework of the formal knowledge system. Although some broadening of curricula has taken place during the past two decades through the inclusion of community forestry and allied subjects, the core of forestry education in most countries still remains timber focused.

Traditionally forestry education has largely concentrated on the supply side of the equation, assuming a continued upward trend in the demand for wood and wood products and thus the need to produce more forestry professionals and technicians. Assumptions that justified the production of “more-of-the same”

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are becoming less tenable and need to be revisited.

IMPLICATIONS OF SOCIETAL, ECONOMIC AND SECTORAL CHANGES

Changes in society

A knowledge system, including education, forms the essential framework for the interaction of society and nature, and to a large extent its development is linked to the characteristics of society and their changes over time. To understand the relationship between people and forests, societies can be grouped into four broad categories: traditional forest-dependent communities, agrarian societies, industrial societies and postindustrial societies (see Table) (see Nair, 2003).

The proportion of the different segments of society varies from country to country and changes over time. Most developing countries are characterized by a high proportion of forest-dependent and agrarian societies and a small segment of industrial and postindustrial societies. In many of the emerging economies, there is a rapid increase in the proportion of industrial societies and a corresponding decline in the proportion of agrarian and forest-dependent

communities. On the other hand, most developed countries are characterized by an expanding postindustrial segment, with knowledge becoming the main source of wealth.

The different segments of society have significantly different systems of production and consumption and rely on divergent knowledge systems, as outlined in the Table. These differences also permeate the forest sector. As societies are transformed, the requirements of the knowledge system also change.

- As the postindustrial segment expands, provision of environmental services becomes more important. Many countries that were at the forefront of industrial forestry are already finding that it is no longer economically viable, while there is an increasing demand for the use of forests for recreation and other services.
- Changes in markets and costs of inputs are resulting in the relocation of industries, including forest industries, to emerging economies, espe-

Perhaps the most pronounced change in North American forest management over the next several decades will be a continuation of the dramatic shift in public perception concerning the value and appropriate use of forests.

In particular, publicly owned natural forests will become increasingly valued for environmental services they provide – notably watershed protection, biodiversity conservation and carbon sequestration – instead of just their wood and other forest product values.

Dombeck and Moad, 2001

cially in Asia, Latin America, southern Africa and Eastern Europe. The growth of industrial societies in these regions will alter the demand for products and services. A significant proportion of technology will be provided by transnational corporations.

- Depending on the specific situation, in many countries other segments of society could also expand. Expansion of the agrarian segment would also have impacts on forests, including reduced forest cover. Agrarian society requires a knowledge system different from the system appropriate for an industrial society.



Traditional forest-dependent societies, agrarian societies, industrial societies and postindustrial societies all have different kinds of knowledge systems and thus different educational needs

Overview of different societies' linkages to forests, production and consumption characteristics and knowledge systems

Type of society	Principal uses of forests	Production and consumption	Knowledge system
Forest-dependent	<p>Forests are used to meet basic needs such as woodfuel, medicines, food and construction materials; these societies have limited capacity to alter the forest environment drastically</p> <p>Forests permeate cultural, social and religious beliefs and perceptions</p>	<p>Almost entirely subsistence focused</p> <p>Communal production and shared consumption</p>	<p>Reliance on local knowledge accumulated through experience and transferred from one generation to the next</p> <p>Few technological inputs; production almost entirely dependent on natural factors</p>
Agrarian	<p>Forests are viewed as space to expand agriculture, including livestock; as a source of low-cost inputs for agriculture and of woodfuel, fodder, medicines and other non-wood forest products such as bushmeat; sale of products also supplements income of farming communities</p> <p>With settled cultivation, the service functions of forests (e.g. watershed protection, arresting land degradation) become important</p>	<p>Largely subsistence consumption</p> <p>Some surplus traded to procure industrial goods</p> <p>Land and labour the key factors of production</p>	<p>Knowledge acquired through sharing of experience and limited local experimentation</p> <p>Land as the key factor of production</p> <p>Labour-intensive technology</p>
Industrial	<p>Forests are used as a source of industrial raw material with increasing emphasis on large-scale plantations to reduce pressure on natural forests</p> <p>Forests are a source of services such as clean water and recreation</p>	<p>A high proportion of goods and services produced is traded</p> <p>Large-scale production and trade, dependent on mass markets</p> <p>Capital and skilled labour the main factors of production</p>	<p>Knowledge acquired through a more organized system including research, education, training and extension</p> <p>Energy-intensive technologies</p> <p>Large-scale production and increasing emphasis on consolidation</p>
Postindustrial	<p>Forests become less important as a source of products and more important as a source of services – e.g. watershed protection, biodiversity conservation and carbon sequestration</p> <p>Cultural, environmental and aesthetic values gain primacy</p>	<p>Shift from mass production to meeting needs of smaller markets</p> <p>Increased emphasis on customization</p> <p>Information and knowledge become the critical inputs in production of goods and services</p> <p>Dematerialization of production</p> <p>Emphasis on sustainability and multifunctionality</p>	<p>Information and knowledge become the critical resources</p> <p>General education needed to develop skills in accessing and processing abundant information</p> <p>Shift towards more energy- and material-efficient technologies</p> <p>Most income derived from the sale of technology and provision of services</p>



O. SERRANO - FAO/1126/E. MCDONALD - FAO/1794/P. JENKIN - FAO/CH13/7/R. FAO/11/11

These changes, especially the shifts in demand for products and services from the divergent needs of different segments of society, would make the traditional standard package of forestry education, primarily developed in the context of industrial forestry, increasingly irrelevant.

STRUCTURAL CHANGES IN ECONOMIES

Change in the relative economic importance of the different sectors also affects forestry and forestry education. Although agriculture and other primary sectors account for a significant share of the gross domestic product (GDP) and employment in many countries, these are diminishing rapidly, particularly because of the very rapid growth of the industrial and service sectors. In general, growth of the primary sectors has been slow, and prices of most commodities have declined. Employment and income are thus on the decline in most primary sectors, while they are increasing in the industrial and service sectors. For example, globally the forest sector's contribution to GDP has declined from about 1.6 percent in 1990 to 1.2 percent in 2000 (FAO, 2004). A decline has been registered even in Nordic countries, where the forest sector has always been important. In Finland, for example, the forest sector's contribution to GDP has been declining since 1994, and it accounts for only 3.5 percent of employment. The only regions where the forest sector's share in GDP has registered some increase are Latin America and Eastern Europe (including the Russian Federation). Globally, the gross value added in the forest sector increased only marginally from about US\$349 billion to about \$354 billion. This situation has the following implications for forestry and forestry education.

- Professional job opportunities in the primary sectors, including forestry, are unlikely to expand.
- Most increases in production in the

primary sectors, including forestry, will be achieved through productivity-enhancing technologies and are thus unlikely to be accompanied by increased employment, even of professionals.

- As the prices for most primary products remain low and even continue to decline, the profitability of agriculture and other sectors will continue to decline, further reducing the demand for professionals.
- Expansion of the industrial and service sectors opens up opportunities for more remunerative employment, especially for professionals.
- In many developed countries, especially in Europe, demographic changes are also affecting the size of the available workforce, especially in forestry, which is less attractive than other fields in terms of remuneration and working conditions.

As professions like medicine, law, engineering and information technology offer more attractive employment opportunities, forestry has not been able to attract the most talented students in many countries. For example, the British Forestry Commission has expressed concern that the number of "good graduates" interested in joining the Commission has fallen to less than the number of available places (Miller, 2003). Of course this problem is not limited to forestry; it is shared by other primary sectors such as agriculture, animal husbandry and fisheries (see Wallace, 1997; Maguire, 2000).

Changes within the forest sector

Changes in institutional arrangements.

Important institutional changes in the forest sector in most countries in recent decades include:

- diminution of the role of the public sector in forest management, especially as regards wood production,

and the increasing assumption of production functions by the private sector;

- emergence of large multinational corporations, especially in the pulp and paper sector, and their increasing consolidation through mergers and acquisitions;
- decentralization and devolution of administration to local bodies and the declining importance of hierarchical forestry administrations;
- emphasis on community participation and transfer (including restoration) of ownership and management to local communities and individuals;
- an increasing role of non-governmental organizations in advocacy and support to local communities.

These changes will continue to have an impact on the demand for "professional foresters" and even on the concept of what professional forestry education really means. In most countries the educational system in forestry has been designed primarily to produce a professional cadre to manage public-sector forestry organizations. Economic viability of wood production received much less attention when forests were under public administration, and in many countries income from forestry is inadequate to cover the expenditure on salaries. The expansion of public-sector forestry organizations in the 1970s and 1980s, often supported by international development assistance, created overcapacity in professional education which cannot be sustained now that such assistance is declining. This has been further compounded by changes in donor priorities, as many donors have shifted their attention away from supporting public-sector forestry institutions.

With the private sector emerging as a major player in wood production, remuneration is increasingly linked to productivity. However, the observed increase in

Traditionally the bulk of persons trained were employed in the civil service. Today we have opportunities for private initiatives in forestry, self-employment, community managed forests, etc. The role of the public sector in managing forests is being transformed into policy and more regulatory/monitoring functions.

In short job opportunities and profiles are changing and so must the curricula.

The situation has changed drastically over the last few years. Many graduates are now being poured into the streets with no jobs to do.

Temu and Kasolo, 2001

wood production in some countries is not paralleled by a significant increase in professional employment because of productivity-enhancing technologies. In addition, mergers and acquisitions by transnational forest corporations are significantly reducing the demand for senior and middle-level managers.

Although communities and small farmers are becoming important players in wood production, the growth of small-scale wood production is unlikely to increase employment opportunities. Tree-growing undertaken by communities and small farmers is very different from traditional forestry and has different technical needs. It is often integrated with farming and largely based on traditional knowledge, and may thus require minimal support from forestry graduates. Although there may be some demand for professional extension services, management is carried out by the farmers, and small-scale production employs fewer professional foresters than industrial forestry relative to the amounts of wood produced. Moreover, employment in community-managed initiatives may not be attractive in terms of remuneration and other benefits.

Changes in wood production and processing. Growth rates of indus-

trial wood production have been very low, i.e. about 0.5 percent annually between 1980 and 2000 (FAO, 2003), and appear unlikely to change very much in the near future.

Increasingly forest plantations are becoming an important source of industrial wood supply. Plantations require higher initial labour inputs, but as productivity increases and production is simplified, the demand for professional

foresters is unlikely to increase significantly.

Technological changes in harvesting and processing have increased productivity and efficiency, reducing opportunities for professional employment. Advances in processing technologies in the pulp and paper industry, for example, have enhanced the scale of operations, reducing employment per unit of production. Automation of processing has reduced the need for supervision, resulting in a declining demand for professional and technical staff; in Europe, forestry employment declined overall by about 170 000 during the past decade. A continued increase in productivity suggests a further decline by 2010.

Increased reliance on technology transfer. Expertise regarding production and

In the industrialised countries in western and northern Europe, future increases in productivity are expected to be less dramatic than in the past.

Still employment will continue to fall as a result of an even slower growth in production. The member countries of the European Union could expect a drop in employment of almost 160 000 jobs of which the pulp and paper subsector accounts for about 70 000 jobs.

Blombäck, Poschen and Lövgren, 2003

processing of wood is increasingly obtained through technology transfer, often linked to foreign private investments. Although there is a need to adapt the technology for local situations, technology transfer is less expensive and requires fewer resources than original research and development. In most cases, once a technology becomes standard, it can be applied by skilled and even semi-skilled workers with minimal supervision. This also suggests a likely decline in the demand for forestry professionals.

**THE DISTANT FUTURE:
DEMISTIFICATION OF FORESTRY**

From the discussion above it appears that a number of factors are already undermining the concept of forestry education as it was developed decades ago. In the longer term, some other fundamental changes could significantly alter the nature of forestry and thus forestry education.

Increasing integration of forestry with other land uses

As tree growing becomes increasingly integrated with agriculture and other land uses and a significant share of wood production shifts from forests to farms, the nature of the forestry profession is bound to change drastically. Increasingly the traditional sectoral boundaries will become less recognizable at the field level, as is already evident in some farming systems.

The demand for professional advice will mainly shift towards those who are able to provide broad-based technical advice, not just on forestry or tree growing, but on all aspects of land use, and those who can provide highly specialized advice on certain topics such as pests and diseases and markets. The concept of a specialization called forestry may itself become obsolete, just as "agriculture is becoming an obsolete term on account of its integration with the broader concept

of renewable natural resource management” (Wallace, 1997).

Technological advancements and the consequent demystification of many professions, including forestry

With wider access to information, facilitated by rapid developments in information technology, a considerable segment of knowledge that was privy to foresters has moved to the public domain, and this trend is likely to accelerate. At least some of what was taught in institutions of higher education a few decades ago is now being taught in less advanced schools. As this process continues, there will be some demystification of the profession. Most of the information required by a farmer or forest manager (if that title remains relevant) will be easily accessible from the Internet. Call centres (even located in other countries) may be able to respond quickly to most of the day-to-day needs of farmers and others involved in tree-growing.

Advances in biotechnology and informatics and improvements in the use

of raw materials including the development of composite materials – disciplines outside the realm of forestry as it is known today – are likely to alter the way trees are grown and used. Thus forestry and forestry education as they are today may be squeezed from two ends: what is now regarded as specialized forestry knowledge will be available in the common domain, easily accessible and better integrated at the field level, while developments in the frontier areas of technology will require specialization far beyond the current realm of forestry education.

In a knowledge society, increasingly more knowledge and skills will be acquired outside the formal system of education. Thus many of the existing institutions will fade out. The monopoly of educational institutions as providers of knowledge is already under threat. The emphasis in education is likely to shift from teaching a predetermined set of skills to enhancing the capacity to learn from a variety of sources. Creating an open and critical mind will be the main task of educational systems. For this

task, the disciplinary boundaries on which many traditional professions thrive will be an obstacle.

CONCLUDING REMARKS

Most problems facing forestry and thus forestry education are symptoms of larger social, economic and technological changes, which appear to be accelerating at a rapid pace. Many of the concepts and approaches that were appropriate since the beginning of industrial revolution are unlikely to survive, and so are the institutions that have arisen during that period. The question is to what extent these institutions can be effective agents of change and can change themselves. The incremental approaches that were appropriate when the pace of change was slow are unlikely to continue to be effective. To adapt to rapid changes, it will be necessary to create an environment for continuous learning and to jettison ideas and concepts that will not stand the test of time. Undoubtedly, the key question is how well prepared we are to embrace the changes. ♦



As tree growing becomes increasingly integrated with agriculture and other land uses, the forestry profession is bound to change drastically; demand for professional advice will shift towards those who can provide broad-based technical advice on all aspects of land use



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