THE ECONOMIC IMPORTANCE OF CONIFERS

The economic uses of conifers can be conveniently divided in those centring on wood, other derivative products, and horticulture. The first two are mostly industrial. Horticulture does not generally manufacture products but focuses on the cultivation and trade of the whole plant and has a strong element of non-commercial interest. However, there are manifestations of both applications evident in all three categories of economic use of conifers, so that the demarcation between industry and leisure is not an absolute one. It could even be argued that these distinctions have become less clear in recent times than they were in the past, and examples will be given in this chapter.

Today the world trade in coniferous wood is huge. Conifers provide about 60% of all wood used for industrial purposes. They dominate industrial wood supply because of both technical and economic advantages over wood from angiosperms. The vast reserves of natural conifer forest in the boreal zone of the northern hemisphere play an important part in this supply, but plantations, especially in the southern hemisphere, of particularly pines take up an increasing proportion of this. Nearly all this mass production goes into pulpwood for the paper industry, although about ⅔ of conifers in plantations in the world are destined for timber. The more specialized, high quality woods used for all the versatile applications mentioned in this chapter come from forests that can be allowed to grow older. In the trade, the wood of conifers is known as softwood and that of angiosperms as hardwood. These terms are misleading if applied to all conifers, because many species produce very hard wood indeed, while some of the softest woods in use do not come from conifers but from angiosperms. By far the greatest volume of industrial wood is produced by species in the family Pinaceae, which occur naturally in the northern hemisphere only, but have been widely planted for this purpose in the southern hemisphere. In particular, the genus Pinus stands out, with several species being among the fastest growing plantation trees producing pulpwood on short-term rotations. Several other species, especially ‘white pines’ (Pinus subsect. Strobi), are providing wood of higher quality with properties such as high dimensional stability, straight grain, softness and workability together with large, straight dimensions especially when taken from ‘old growth’ forests. These timbers are applied in the building industry for, e.g. doors and windows, in furniture making and even for musical instruments such as organ pipes and piano keys. Firs (Abies) produce lightweight, relatively soft, creamy white to pale brown wood; the high grade timber from forests with these species is sawn for framing material and for plywood and veneer. The wood of spruces (Picea) differs markedly from that of firs and is consequently used for different, mostly less refined purposes. In northern lands, it was and often still is the principal tree for the construction of log houses. In Norway, the ancient village churches were entirely made of wood, often a mixture of spruce (Picea abies) and pine (Pinus sylvestris); some date from nearly 1000 years ago and are still intact. In the Alps similar uses in construction are made of larch (Larix decidua), as its wood is particularly resistant to weather and rot. All three genera also provide pulpwood for the paper industry; the transparent windows in envelopes are a paper made from larch wood. In some genera of conifers, various circumstances have caused only one of the species to become of high economic importance. An example is the Douglas fir (Pseudotsuga menziesii), which has become the most important timber tree in North America. It has consequently been introduced by foresters in many temperate regions around the world. Douglas fir grows rapidly, is straight and tall and produces large volumes of wood per hectare, especially in managed forests where competing species are excluded or suppressed. Its wood is used for plywood and construction, both exterior and interior, and it has a reasonable durability for outdoor applications such as telephone poles and railway sleepers. The wood of the Cupressaceae differs markedly from that of Pinaceae. It is more fibrous and contains less resin; it is also mostly very decay-resistant and many species have fragrant properties due to volatile chemical compounds. These properties make it highly desirable in China and Japan, where it was traditionally used in the construction
of temples and other ceremonial buildings. Some species have been over-exploited and good sized trees are now rare. Other species, like Cryptomeria japonica, have been widely planted, in plantations in Japan, where it is native, as well as in China and Taiwan. Some of this cupressaceous wood splits easily into shingles, and its rot-resistance was noted by people in regions as far apart as the Pacific coasts of Canada and the northwestern United States, Chile, Japan and Vietnam, where these shingles were traditionally used to cover the roofs of houses. Durability has also been the major property that made juniper (Juniperus) the tree of preference for fence posts, but metal is pushing it out of the market. Some species in the Cupressaceae produce wood with beautiful patterns and are therefore prized for the making of cabinets and other pieces of furniture. In particular, the large, ancient copice stools of the North African species Tetroclinis articulata are valuable and were already sought after by the Romans. Few conifers have this coppicing capacity, i.e. re-growth from a stem base after repeated cutting. Another source for this type of wood, suitable also for wood turning, is yew (Taxus), which is hard, dense, heavy and resistant to decay. Perhaps most famous were the English yew longbows of the Middle Ages; the arrows shot from these bows could penetrate a knight's armour at 200 meters and helped the English win the battles of Crécy, Poitiers and Agincourt in the Hundred Years' War (1337–1453).

The most tropical of the conifer genera, Agathis (Araucariaceae) is one of the most valued timber trees in Australasia. The wood known as kauri in the timber trade is light and soft, pale yellow or straw-coloured, often with darker heartwood ranging from pink to dark red brown. The wood of Agathis has many uses, such as indoor construction, panelling, boat masts, joinery, furniture, pencils, matches and matchboxes, rulers, and piano parts. Naturally it is excellent for plywood and veneer, while more industrial uses of lower grade wood are pulp for paper manufacturing and high grade charcoal. In Indonesia and Malaysia Agathis is exploited heavily for export of raw timber (round logs); in the Philippines this has already led to a total ban on further cutting, while export is banned from Papua New Guinea. In tropical countries the wood of the Podocarpaceae is usually highly valued and trees belonging to this family are often selectively logged for timber. The most important genus, Podocarpus, is also the most widespread; of regional importance are Afrocarpus (Southern Africa), Dacrydium and Dacrycarpus (Australasia) and Nageia (Southeast Asia). All yield light to medium-weight, pale coloured wood, known as podo in the trade, with a straight grain and even texture that is easy to saw and plane but is often brittle. It is not durable when exposed to the weather, so its building applications are for indoor construction only. High grade timber can be used for door and window frames, panelling, veneer, cupboards, furniture, cabinet work, joinery, household utensils and engineering instruments like drawing boards and rulers. The New Zealand species Podocarpus totara provides the only softwood that is resistant to attack by marine borers, so it was used for ship and boat building as well as wharf building and harbour construction until a ban on further logging stopped it. The Maori built their famously long war canoes with the wood of this large indigenous tree.

Of second industrial importance to wood of conifers is their resin. Resin is present in all conifers, albeit not in equal quantities. Resin in leaves can be distilled from them, resin in wood can be tapped as well as distilled, and there is even resin to be mined. The resins of conifers are mostly terpenoid, with some phenolic resins (Langenheim, 2003). Only two families, Araucariaceae and Pinaceae, produce copious amounts in the wood, where the resin is stored in resin ducts or canals. The genus Agathis (Araucariaceae) is the most copious producer of resin; over centuries, resin has flowed from the trunks of large trees onto the ground where it has accumulated, forming large deposits of copal which can be excavated. Its use is mostly for varnishes. More commonly, resin is tapped from the trunks of pines. Major resin producing species are, or were, Pinus kesiya in Southeast Asia, P. massoniana in China, P. pinaster in Europe, especially France, and P. palustris and P. elliottii in the Southeastern United States. The resin tapped forms the basis of many products in industry, such as turpentine, rosin and pitch – together known as naval stores – oils, varnishes, printing inks, sealing wax, soap, plastics, and fireworks. Coarser products are obtained by destructive distillation of resinous wood. In the age of wooden ships, pitch and tar were indispensable to keep them seaworthy by caulking the seams with pitch and by tarring the rigging. The term naval stores for these and similar products dates back to the 17th century, when the English navy required large quantities of these for an expanding fleet.