Survey and documentation of timber species converted at sawmills of Sirsi Taluk, Uttara Kannada district of Western Ghat region, Karnataka

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ABSTRACT

The present study was undertaken to document the different timber species converted and processed at different sawmills in Sirsi Taluk of Uttara Kannada district of Western Ghat region, Karnataka. Information was collected from different sawmills through semi-structured questionnaire during 2022-23. A total of 14 sawmills were selected in and around Sirsi for the study. Among the different converted species, *Tectona grandis* (85.71%) followed by *Pterocarpus marsupium* (50.00%), *Terminalia tomentosa* (50.00%) and *Acacia* hybrid (42.85%) were the major timber species, whereas, *Vitex altissima* (7.14%), *X xylocarpa* (7.14%) and *Albizia odoratissima* (7.14%) were least converted. Among the species, *Artocarpus heterophyllus*, *T tomentosa* and *Acacia* hybrid were used for production of maximum number of products (4) followed by *Dalbergia latifolia* (3) and *T grandis* and *P marsupium* (2). The average roundwood price/cft varied from Rs 300 to 3,750. *T grandis* (Rs 3,750/cft), *Dalbergia sisoo* (Rs 2,800/cft), *D latifolia* (Rs 2,600/cft), *A heterophyllus* (Rs 2.500/cft) and *V altissima* (Rs 2,500/cft) were high valued while *Acacia* hybrid (Rs 600/cft), *Acacia mangium* (Rs 600/cft) and *Eucalyptus* hybrid (Rs 300/cft) were low valued. Among the different factors, durability (34.00%) and demand (29.00%) were the major factors deciding the choice of timber species followed by availability (18.00%), low cost (16.00%) and others (3.00%). The fluctuation in use of timber was greatly affected by non-availability (37.00%), government policy (34.00%) and seasonality (27.00%) and to lesser extent by over-exploitation (2.00%).

Keywords: Wood; sawmills; timber; species; products

INTRODUCTION

Wood, a raw material, has offered precious services to man from time of his appearance on earth and has decisively contributed to his survival and to the development of civilization. Since prehistoric times, man relied on wood for survival, shelter, weapons and fire to cook his food and warm himself. Afterwards, when he grasped the significance of its ability to float and followed this with invention of the wheel, he relied on wood as a means of transportation over the land and across water bodies. The list of present uses of wood is much longer. Aside from lumber for construction and furniture, poles, railroad, mine and bridge timbers and other common products, wood is manufactured into veneer and glued-often with water proof adhesives to produce plywood, laminated constructions (beams, arches, boat keels, aircraft carriers decking, mine sweepers and helicopter propellers) and particle boards. Wood is the raw material for paper and paper board, rayon and cellulose acetate yarns, cellophane, photographic films, synthetic sponges, lacquers, plastics, ethyl alcohol, methanol, acetic acid, molasses, nutritional yeast, glucose, synthetic vanillin and many other derived products. Wood is a century-old source of fuel too.

Sawmilling is a primary industry which provides raw materials to other industries such as construction,

joinery, furniture and others. Sawmills can be categorised according to size, machinery and raw material requirements (Weerawansa et al 1997). Sawing of logs is an essential requirement to their proper and ultimate use and sawmilling plays a significant role in wood utilization. Substantial amount of total industrial wood products reaches the consumer after sawing. Sawmilling is defined as the process of converting roundwood from the forests into lumbers by using a variety of machines (Aghimien et al 2020). Although the sawmilling and planning industry is the smallest sector, it is the largest consumer of timber mostly in the form of roundwood. The estimated annual consumption of wood by sawmills in India is about 29 million m^3 with about 62 per cent of production used by the construction sector (mainly housing), 8 per cent sleepers, 6 per cent packing, 7 per cent furniture, 7 per cent vehicle industry, 4 per cent ship building, 2 per cent mining and the rest used in other miscellaneous uses such as stationery (mainly the pencil industry), sports goods, toys, handicrafts and agricultural implements (Kant and Nautiyal 2021). Several kinds of timber species are converted and processed into different products at sawmill; but the data regarding this information is lacking in most of the regions. Hence, to document the timber species converted/processed at sawmills, the present study was undertaken in Sirsi Taluk of Uttara Kannada district of Karnataka.

METHODOLOGY

Study area

Sirsi is a Taluk located 35-40 km from Sirsi in Uttara Kannada district, Karnataka (Fig 1). It is located at 14.6° N, 74.8° E. It has an average elevation of 611 m amsl and is situated in the heart of the Western Ghats. Taluk has different types of forest types with rich biodiversity. Most of the people living in villages depend on forests for food, fuel, wood etc. But information regarding different types of timbers reaching at various sawmills in the Taluk is very limited.

Data collection

The study was undertaken at 14 sawmills of Sirsi Taluk during July 2022 to October 2022. Information on timber species utilized and converted and other relevant issues was collected from different sawmills in and around Sirsi Taluk by semi-structured questionnaire survey.

RESULTS and DISCUSSION

Types of timber species used at sawmills

In this study, fourteen timber species belonging to seven families were documented at different sawmills. The major timber species recorded at sawmills and converted were *Tectona grandis*, *Pterocarpus marsupium*, *Acacia* hybrid and *Terminalia tomentosa* and least were *Xylia xylocarpa*, *Vitex altissima* and *Acacia mangium*. The major wood species fell under Lamiaceae, Fabaceae and Combraetaceae families (Table l, Fig 2).

Earlier, Gawali et al (2022) reported that total 31 species were commercially utilized at sawmills in Ratnagiri district of Maharashtra. Though many timber species were available in the district, only few species were preferred for sawing purpose. *T tomentosa* (21.85%), *Mangifera indica* (21.67%), *T grandis* (13.20%), *Gmelina arborea* (9.42%), *Artocarpus integrifolius* (8.55%) and *Acacia arabica* (8.01%) were favoured for sawing in the area which contributed 82.70 per cent of the total utilized volume of lumber. Hanumantha et al (2018) while studying the wood utilization pattern in Siddapur Taluk of Uttara Kannada, Karnataka, reported that 22 tree species belonging to 14 families were used by the local people. The major wood species utilized were *Artocarpus heterophyllus, Callophyllum apetalum, Acacia auriculiformis, Hopea ponga* and *Callopyllum inophyllum* and least used were *Poeciloneuron indicum* and *G arborea*. The major timber species utilized belonged to Clusiaceae, Combretaceae, Verbenaceae, Mimisaceae, Lythraceae and Fabaceae families. Awe et al (2019) documented timber species availability at selected sawmills and markets in Kogi state, Nigeria and found that major timber species used and exported were *Khaya senegalensis*, *Triplochiton scleroxylon*, *Terminalia superba*, *Mitragyna ciliate*, *Milicia excelsa* and *T grandis*. Adedokun et al (2017) reported that at sawmills and markets in Nigeria, the species were *Albizia coriaria* (66.7%), *Anogeissus leiocarpu* (44.2%), *Cleistopholis* spp (32.5%) and *Musanga cecropioides* (1.7%).

Ofoegbu et al (2014) reported that timber species commonly processed at the sawmills in Nigeria were *T grandis, Afzelia africana, Pterocarpus soyauxii, G arborea* etc. Pang et al (2015) surveyed different timber species used at the sawmills of Malaysia and reported that more than 50 per cent

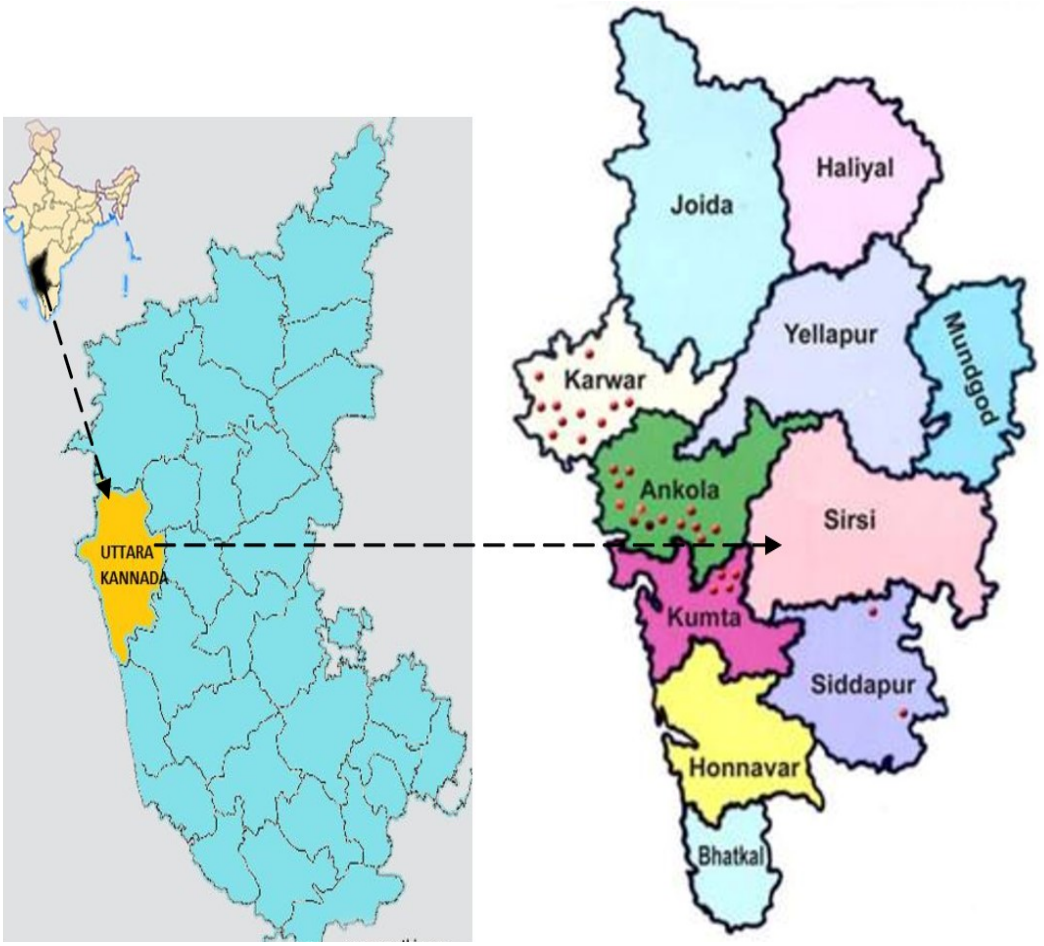

Fig 1. Location map of Sirsi Taluk, Uttar Kannada district, Karnataka

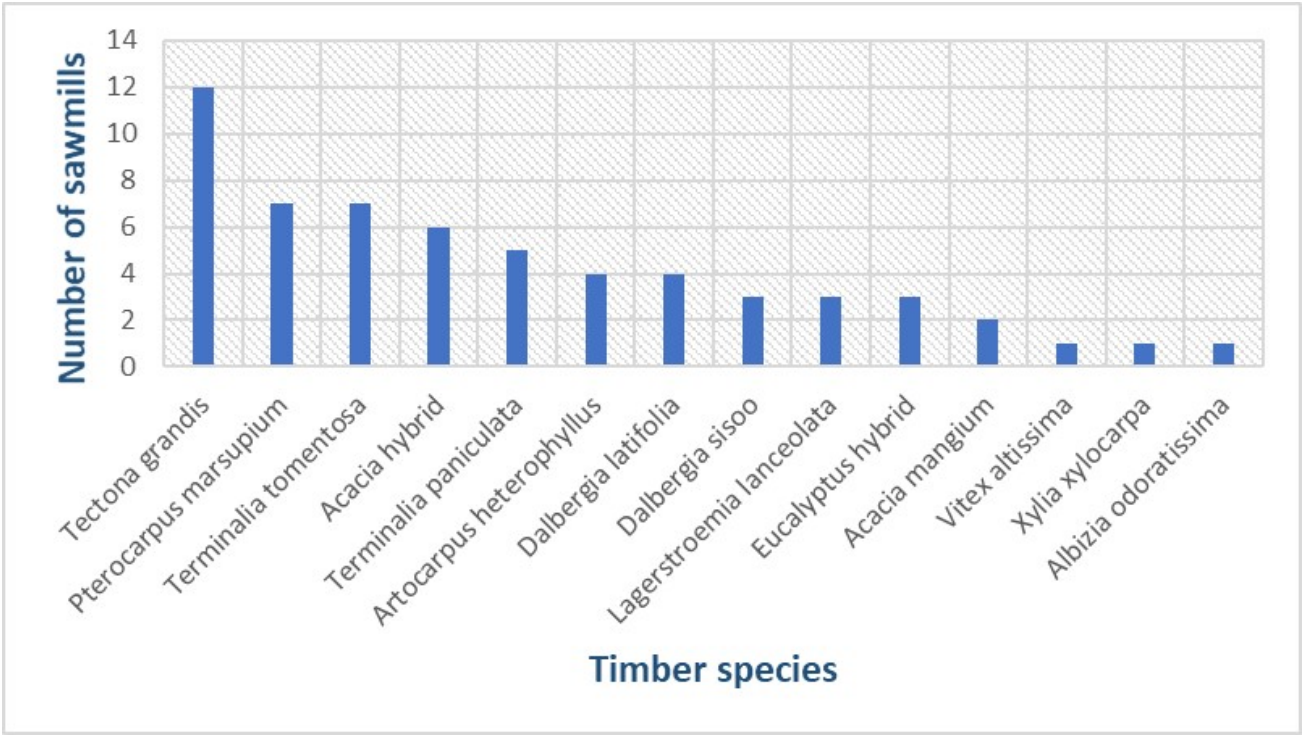

Fig 2. Utilization of timber species at different sawmills

Table 1. Size types of wood species used by villagers of Sirsi Taluk, Karnataka

Timber species	Common name	Family	Purpose
Tectona grandis	Teak	Lamiaceae	Cut pieces, frames etc
Pterocarpus marsupium	Honne	Fabaceae	Doors, windows
Terminalia tomentosa	Matti	Combraetaceae	Doors, windows, beams, roofing material
Dalbergia sisoo	Sheesham	Fabaceae	Cut pieces, furniture
Terminalia paniculata	Kindal	Combraetaceae	Furniture, planks, roofing material
Lagerstroemia lanceolata	Nandi	Lythraceae	Doors, windows, roofing material
Vitex altissima	Bharanige	Lamiaceae	Doors, windows
Artocarpus heterophyllus	Halsu	Moraceae	Doors, windows, planks, temple building
Acacia hybrid	*Acacia* hybrid	Fabaceae	Cut pieces, planks, door frames, beams
Acacia mangium	Mangium	Fabaceae	Doors, windows, cut pieces
Xylia xylocarpa	Jambe	Fabaceae	Planks
Dalbergia latifolia	Rosewood, bete	Fabaceae	Doors, windows, furniture
Eucalyptus hybrid	Nilgiri	Myrtaceae	Roofing, planks
Albizia odoratissima	Bilvaara	Mimosaceae	Furniture, planks

species used fell under family Dipterocarpaceae followed by Myristicaceae (11.1%), Sapotaceae (7.7%), Guttiferae (5.8%) and Myrtaceae (4.1%). The raw materials that they got from the sawmilling sector were used for production of secondary products such as moulding, furniture, builder's joinery and carpentry.

Utilization of timber species for different products

The converted size materials produced in sawmills were furniture, doors, windows, cut pieces, frames, planks, beams and roofing material. Among different species, *T tomentosa, A heterophyllus* and *Acacia* hybrid were used for manufacture of main four product sizes (doors, windows, planks and beams) followed by *Dalbergia latifolia* for three product sizes (doors, windows and furniture), *T grandis* and *P marsupium* for two product sizes (doors and windows), *X xylocarpa* for one product sizes (planks) and contributed about (11.76%), (11.76%), (8.82%), (5.88%), (5.88%) and (5.88%) respectively to the total products (Table 2). These results are in the line with the observations made by Caldera and Amarasekera (2015) who reported production and reduction at selected sawmills in Sri Lanka. Teak and mahogany were the major species converted and processed in sawmills. The average percentage loss in conversion of teak and mahogany timber in all sawmills was 53.10 per cent. The converted and processed wood-based products produced were beams, planks etc. Hanumantha et al (2018) documented the wood utilization pattern in Siddapur Taluk of Uttara Kannada, Karnataka and reported that among different species, *P marsupium* (six), *T grandis* (four) and *A heterophyllus, Lagerstroemia lanceolata, D latifolia, Calophyllum inophyllum* (three each) were used for making more number of products as compared to other species.

Among the surveyed sawmills, majority produced sizes of doors, windows, furniture and planks (>8 sawmills), whereas, less produced size products were cut pieces, roofing material, frames, beams and temple building materials (<4.0 sawmills) (Table 3, Fig 3). With respect to frequency of size products produced at sawmills, doors (20.40%) were predominately converted followed by furniture (18.36%), windows (18.36%) and planks (18.36%); least were cut pieces, roofing material, frames, beams and temple building materials (<7.0%).

Adedokun et al (2017) reported the end products produced at sawmills of Nigeria and found that mainly converted at most of the sawmills surveyed were planks as they earned higher profit through the sale of planks.

Average roundwood prices of timber and reasons for choice of different timber species

It was found that the average price (per cubic feet) of *T grandis, D latifolia, D sisoo* and *V altissima* were high viz Rs 3,750, 2,800, 2,600 and 2,500 per cft respectively while of *Acacia* hybrid, *A mangium* and *Eucalyptus* spp were low viz Rs 600, 600 and 300 per cft respectively (Table 4). The variation in the prices of different species was mainly due to choice of species by consumers and durability and quality parameters of the species. The main criteria deciding the choice of timber were low cost, demand, availability, durability

Table 2. Number of products produced from different timber species

Timber species	Products	Percentage
Terminalia tomentosa	4	11.76
Artocarpus heterophyllus	4	11.76
Acacia hybrid	4	11.76
Terminalia paniculata	3	8.82
Lagerstroemia lanceolata	3	8.82
Acacia mangium	3	8.82
Dalbergia latifolia	3	8.82
Tectona grandis	2	5.88
Pterocarpus marsupium	2	5.88
Dalbergia sisoo	2	5.88
Vitex altissima	2	5.88
Xylia xylocarpa	2	5.88
Eucalyptus hybrid	2	5.88
Albizia odoratissima	2	5.88

Table 3. Frequency and percentage of converted material sizes produced at different sawmills

Product	Percentage	Available at sawmills (number)
Doors	20.40	10
Furniture	18.36	9
Windows	18.36	9
Planks	18.36	9
Cut pieces	6.12	3
Roofing material	6.12	3
Frames	4.08	2
Beams	4.08	2
Temple building	4.08	2

Table 4. Average roundwood prices of different timber species

Timber species	Average price (Rs/cft)
Tectona grandis	3,750
Dalbergia sisoo	2,800
Dalbergia latifolia	2,600
Vitex altissima	2,500
Artocarpus heterophyllus	2,500
Pterocarpus marsupium	2,200
Albizia odoratissima	2,000
Xylia xylocarpa	1,500
Terminalia paniculata	1,100
Terminalia tomentosa	1,000
Lagerstroemia lanceolata	1,000
Acacia hybrid	600
Acacia mangium	600
Eucalyptus hybrid	300

and others. Durability (34%) and demand (29%) were the major factors which decided the choice of timber species at the sawmills followed by availability (18%), low cost (16%) and others (3%) (Fig 4).

These results are in the line with the study conducted by Awe et al (2019) who studied timber species availability in selected sawmills and markets in Kogi state, Nigeria. They found that demand and

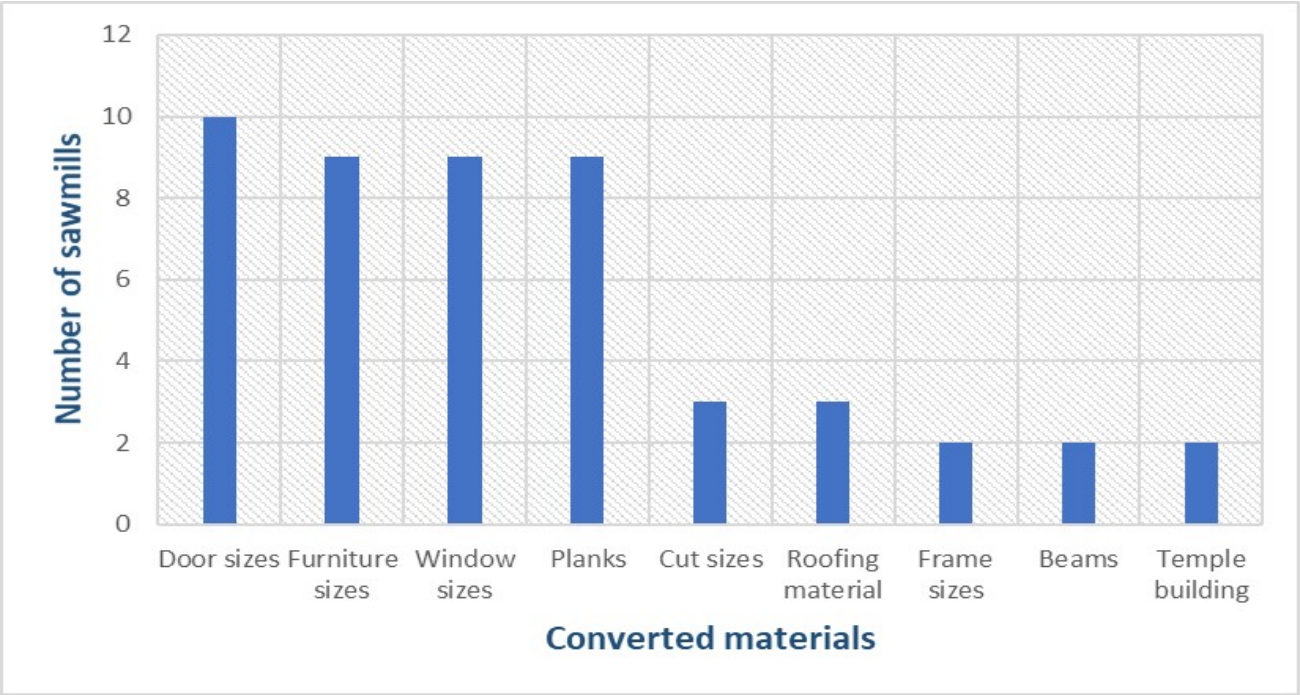

Fig 3. Number of sawmills producing different converted materials

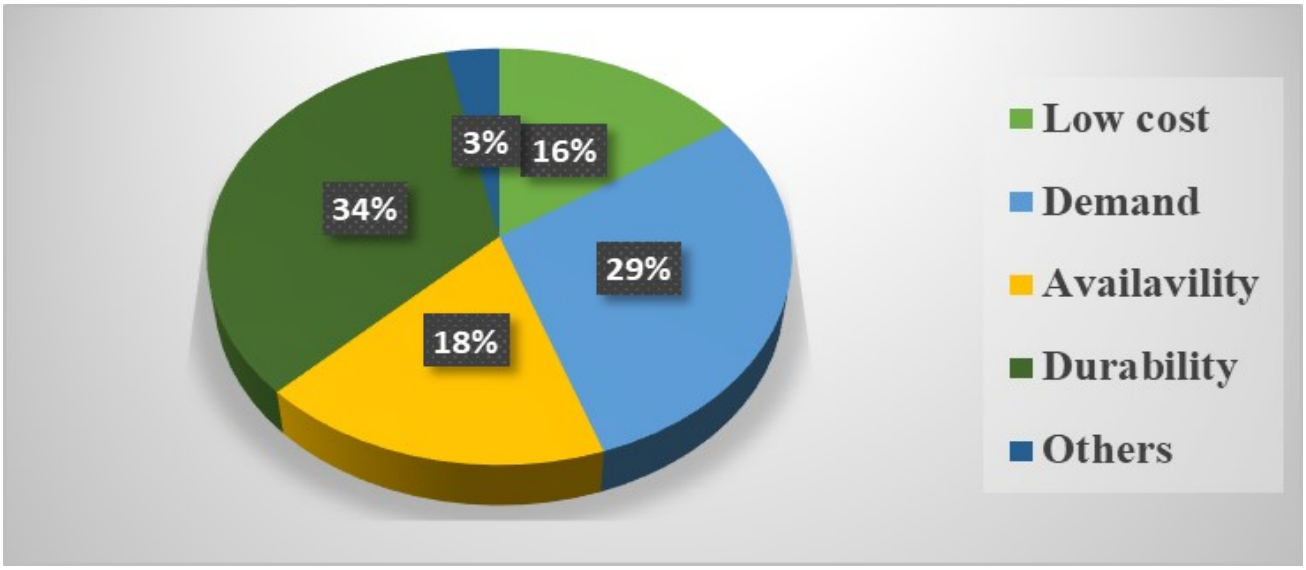

Fig 4. Reason of choice of different timber species at sawmills

durability were the major factors for choice of timber species in sawmills.

The reasons for fluctuation in use of different timber species at sawmills

In main reasons/criteria for fluctuation in use of different timber species were government policy, non-availability, seasonality and over-exploitation. Non-availability (37%) and government policy (34%) were the major factors for fluctuation in the use of timber species at the sawmills followed by seasonality (27%) and over-exploitation (2%) (Fig 5).

On similar lines, observation was made by Awe et al (2019) who found that 96 per cent of the timber sellers of the view that there had been fluctuation and decline in the availability of timber species traded within the last three decades and gave various reasons for the fluctuation. Prominent among the reasons given was over-exploitation.

Waste generated at different sawmills

The major wastes generated at sawmills were sawdust (48%) and waste wood (48%) followed by wood chips (4%) of which sawdust was sold in the local markets and waste wood was dumped and disposed off by selling it for firewood (Fig 6). Sawdust was mainly used for fuel and also for production of particle boards. The results are also in line with the study conducted by Aghimien et al (2020) who reported major species and waste utilization at sawmills of Kajola, Nigeria. Species converted were *Melicia excelsa, T superba, Ceiba petandenra, Annogeisus leiocarpus* and *Danieila oliverii.* Sawdust and bark were the major waste material; bark was sold to traditional healers free of charge while slabs were sold as firewood in local markets. Pang et al (2015) reported that the waste generated in sawmills was used for production of secondary products such as moulding, furniture, builders joinery and carpentry.

CONCLUSION

In Sirsi Taluk, Uttara Kannada district of Western Ghats region, Karnataka, among the different species, *T grandis* (85.71%) followed by *P marsupium* (50.00%), *T tomentosa* (50.00%) and *Acacia* hybrid

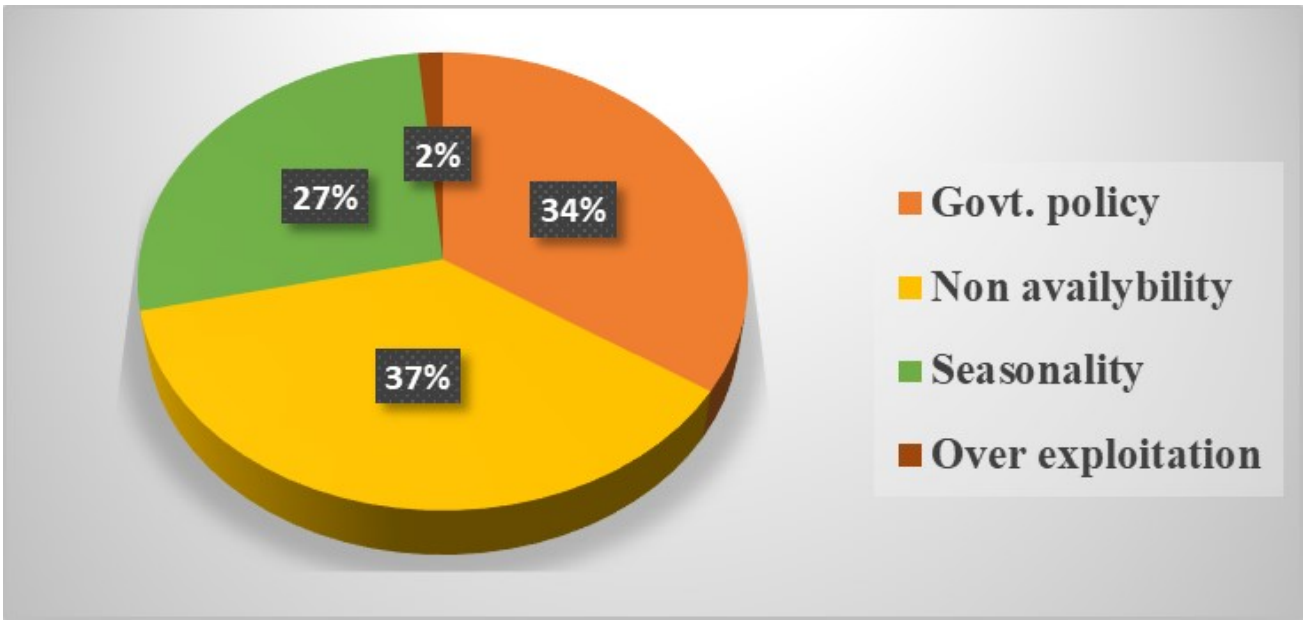

Fig 5. Reasons for fluctuation in use of different timber species at sawmills

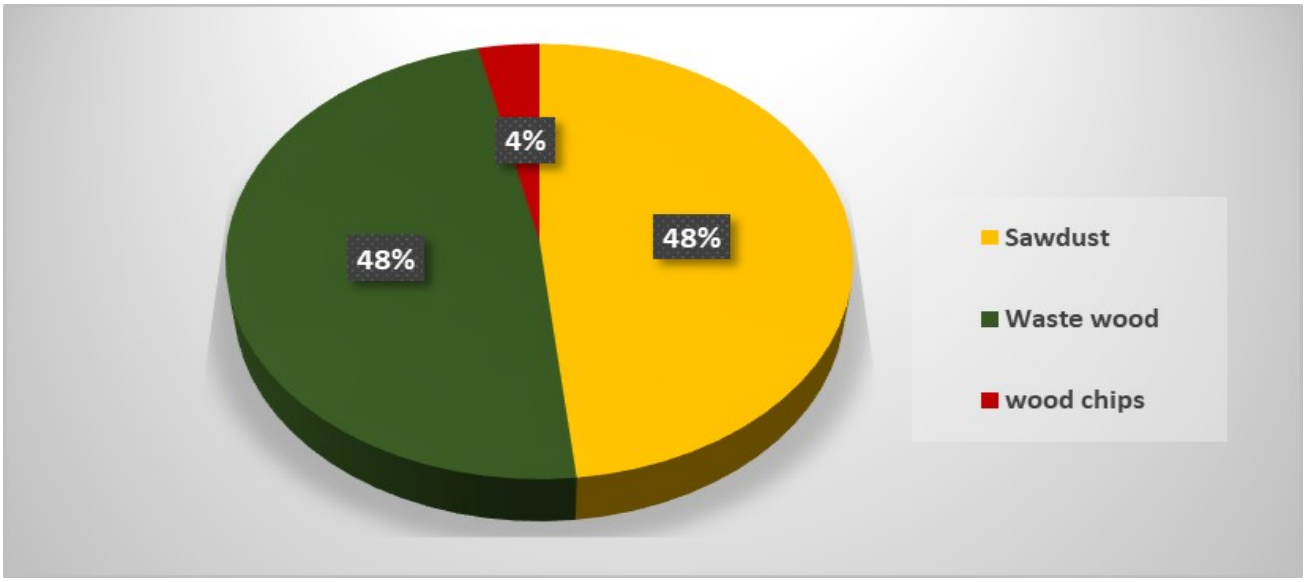

Fig 6. Type of waste generated at sawmills

(42.85%) were the major timber species available at sawmills and *V altissima* (7.14%), *X xylocarpa* (7.14%) and *Albizia odoratissima* (7.14%) were the least. Among the main species, *A heterophyllus*, *T tomentosa* and *Acacia* hybrid were used for production of maximum number of products (4) followed by *D latifolia* (3), *T grandis* and *P marsupium* (2 each). The average roundwood price (per cft) varied from Rs 300 to Rs 3,750. The average roundwood price (per cft) *of T grandis* (Rs 3,750), *D latifolia* (Rs 2,800), *D sisoo* (Rs 2,500) and *V altissima* (Rs 2,500) was high while of *Acacia* hybrid (Rs 600), *A mangium* (Rs 600) and *Eucalyptus* spp (Rs 300) was low valued. Among the different factors, durability (34.00%) and demand (29.00%) were the major factors deciding the choice of timber species in sawmills followed by availability (18.00%), low cost (16.00%) and others (3.00%). Non-availability (37.00%) and government policy (34.00%) were the major reasons for fluctuation in use of timber species at the sawmills followed by seasonality (27.00%) and to lesser extent by over-exploitation (2.00%). Wastes generated at the sawmills were mainly sawdust (48%) and waste wood (48%) followed by wood chips (4%).

Promotion of highly valued and utilized species in agroforestry systems helps to meet the requirement of wood at sawmills and other wood-based industries. It is very vital and imperative to promote the species which can give maximum number of products viz *A heterophyllus, T tomentosa, D latifolia, T grandis, P marsupium* etc. Creation of awareness is very essential among the local people regarding utilization pattern, market value, durability, seasonality, government policy etc. Government should also improve wood efficiency, logging operation, limiting the area of natural forests to be converted to artificial forests and production and market development for plantation species through the introduction of lesser known species.

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