

Fundamental properties of Masson Pine (*Pinus massoniana* Lamb.) Wood from Plantation

Shuqin ZHANG

Benhua FEI

Sustainable Development of Wood and Biomass in our New Global Economy

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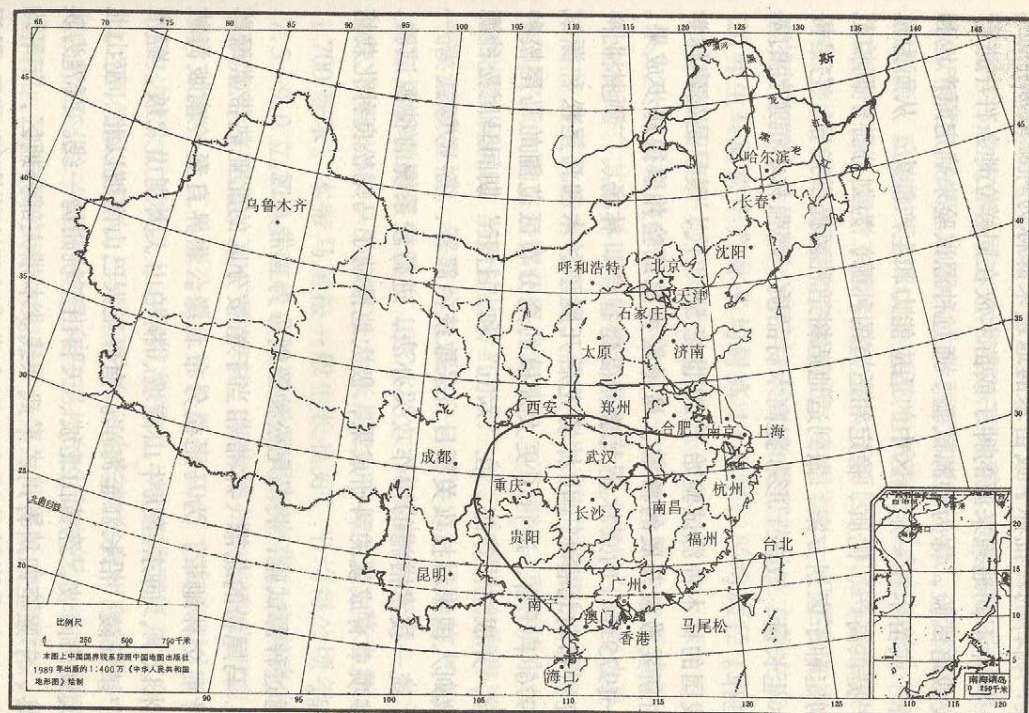
Beijing, China



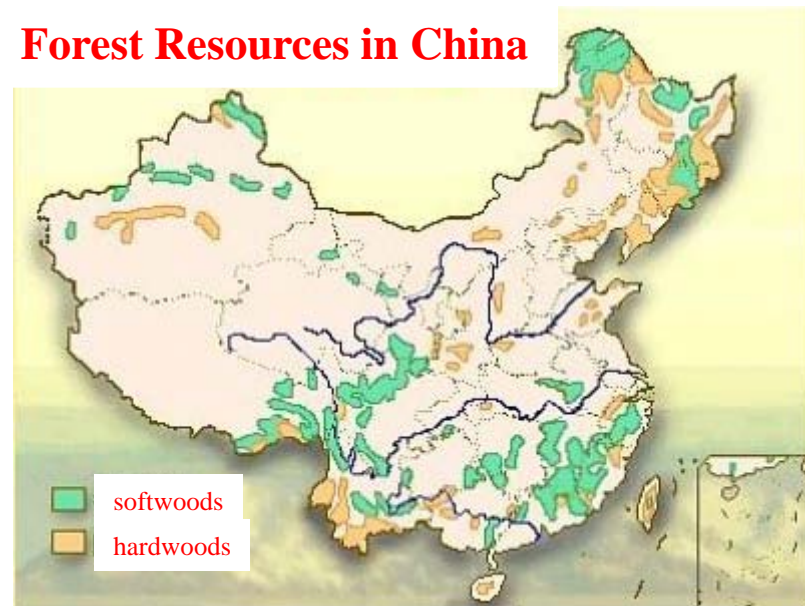


Masson pine plantation in China

native to a wide area of central and southern China
fast-growing & important commercial species
the area of 3.36 million hm²
accumulation of 157.93 million m³



Forest Resources in China





The objective of this study

To better and efficiently utilize the Masson pine wood from plantation, it is essential to study the basic wood properties important to manufacturing processes and uses, including density ρ , microfibril angle (MFA), modulus of elasticity (MOE), and so on.



Materials

Huangshan plantation stand

1.5 mm (R) × 10 mm (T) × 80 mm (L)



Tree No.	DBH (cm)	Tree height (m)	Clear length (m)	Growth ring (a)
1	23.8	14.0	7.3	40
2	31.9	19.0	11.0	44
3	25.1	14.0	5.3	33
5	28.9	19.0	13.8	43
7	22.0	17.0	11.8	41
8	23.3	16.3	11.3	43
9	39.8	19.7	9.7	43
10	31.8	18.3	10.0	42
11	30.0	20.0	11.5	44
12	40.3	22.0	11.3	44
13	44.3	20.0	12.0	43
14	43.7	20.0	10.0	43
15	33.5	18.0	8.0	37
16	27.0	16.3	10.8	41
17	28.0	15.6	9.6	34
18	20.6	16.3	12.3	38
19	32.1	18.5	9.5	37
20	34.7	20.0	12.6	44
21	31.6	18.3	10.3	41
Mean	31.2	18.0	10.4	40



Measurement of MFA

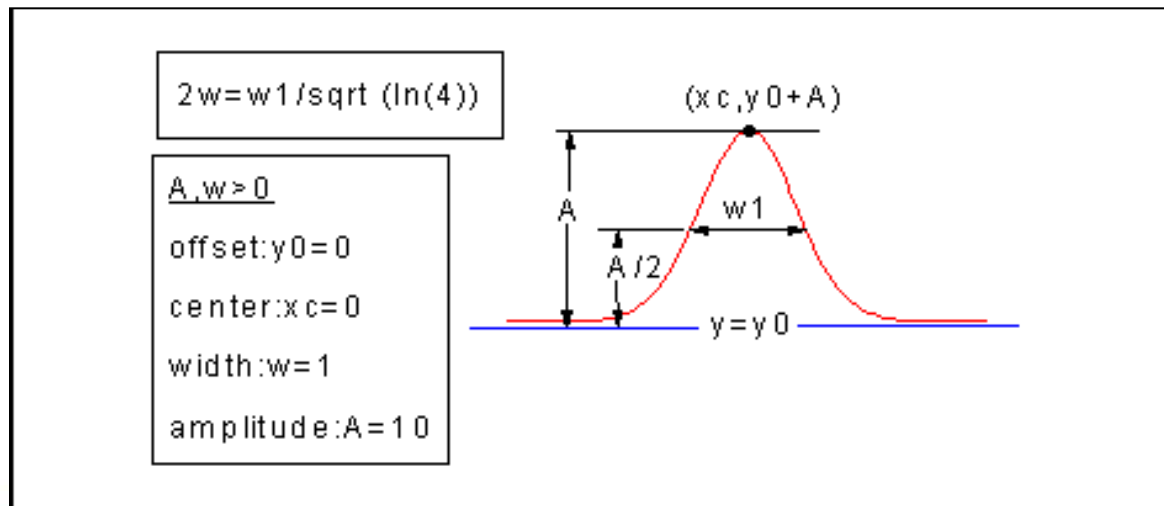
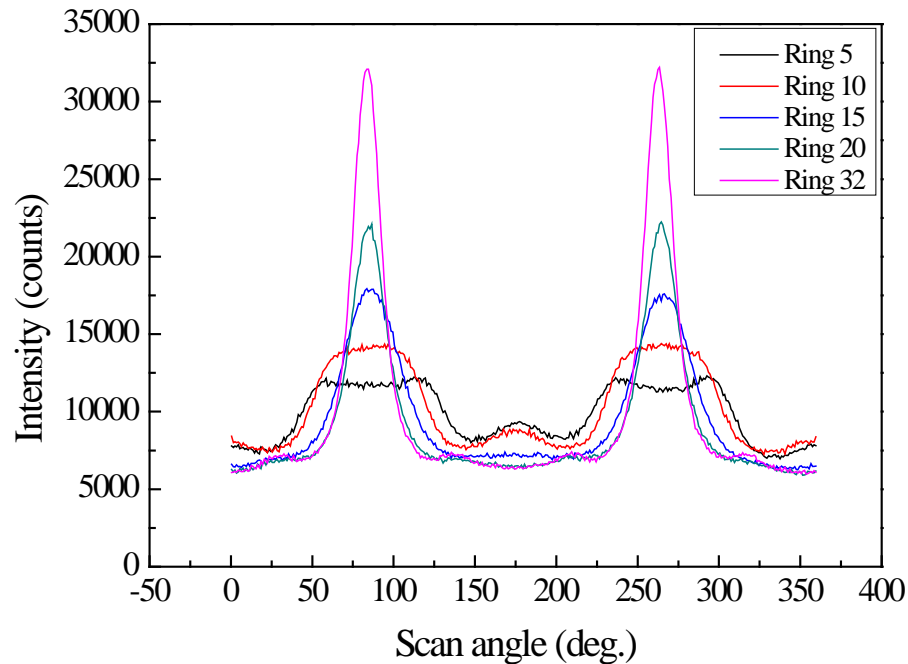
PHILIPS X'Pert PRO PW3050/60
 $2\theta=22.4^\circ$, 2 mm diverging slit,
1 mm receiving slit, 0.5 sec/step ,
scan step size 1°





Measurement of MFA

MFA=0.6T





Measurement of tensile E_L

INSTRON 5848 Micro-Tester

250 N grip air of

2 kN static load cell

25 mm dynamic extensometer

1.5 mm/min loading rate

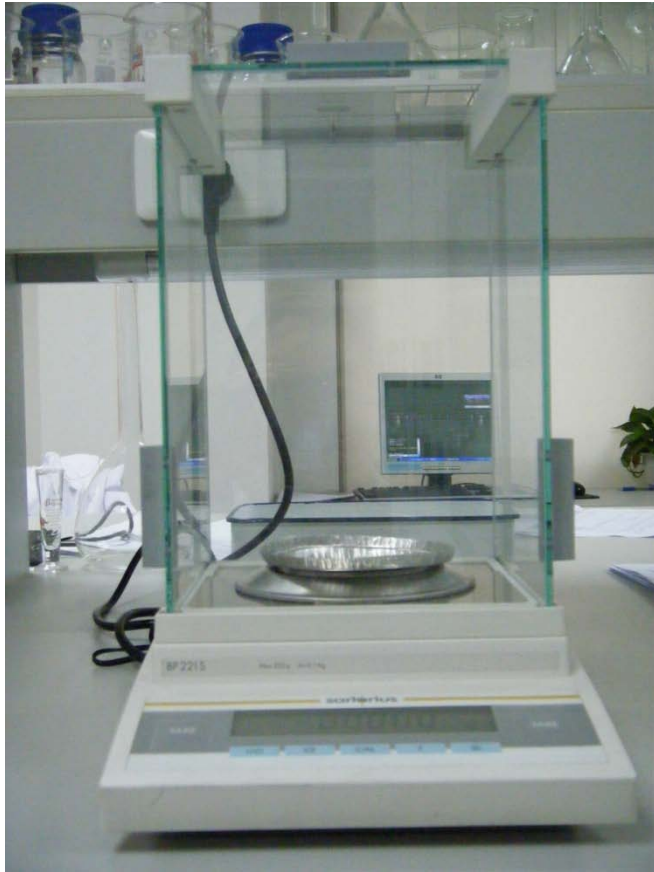
max. load= 350 N





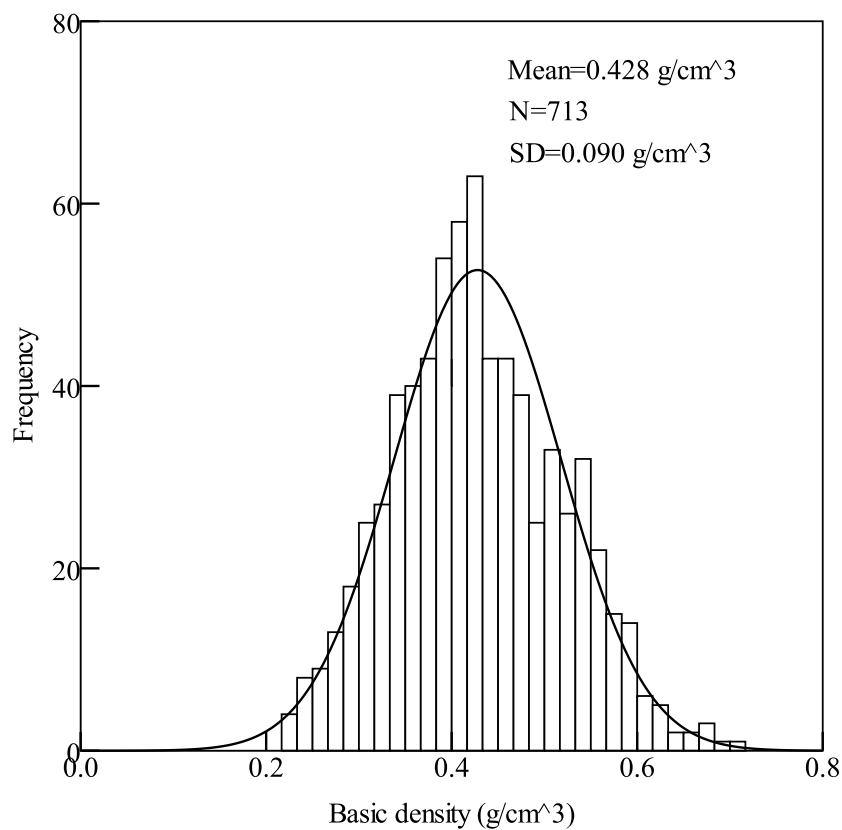
Measurement of density

Gravimetric method

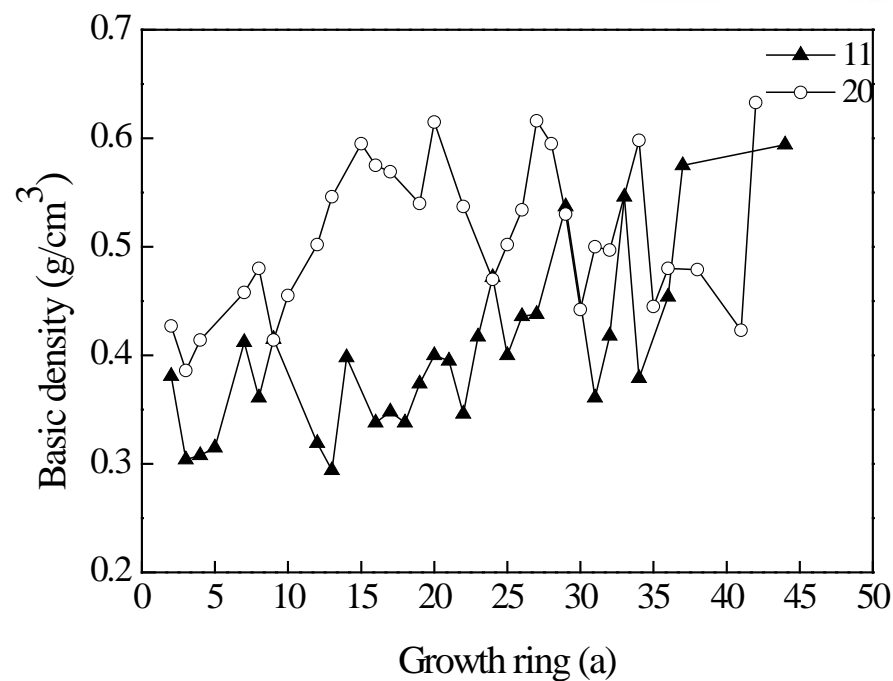




Results of basic density

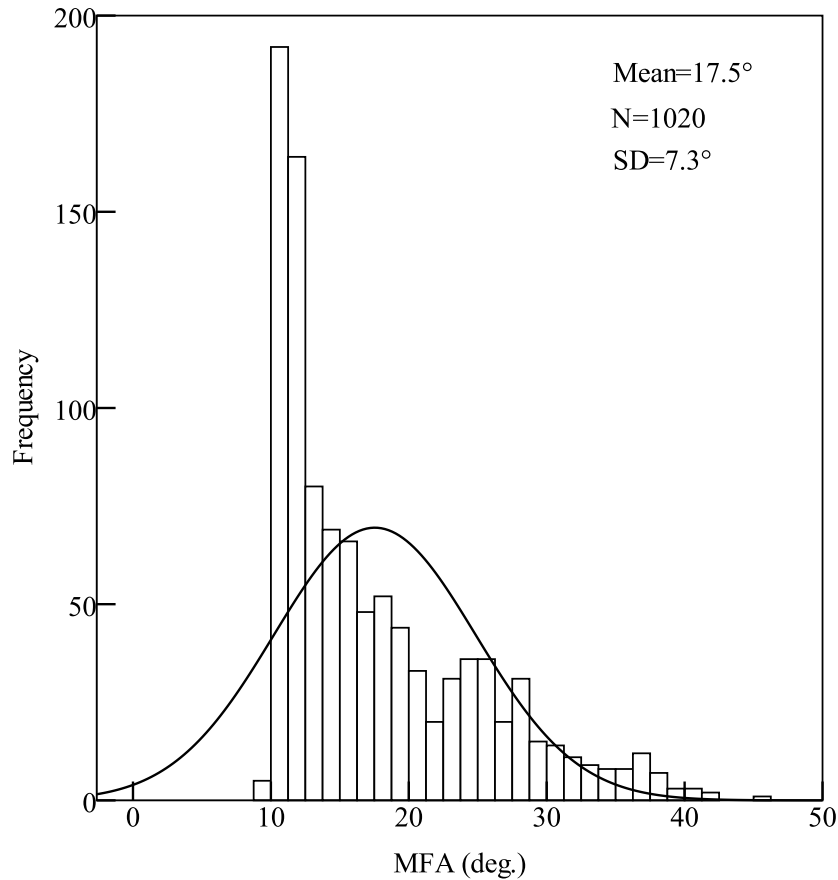


lowest near the pith,
increasing outwards

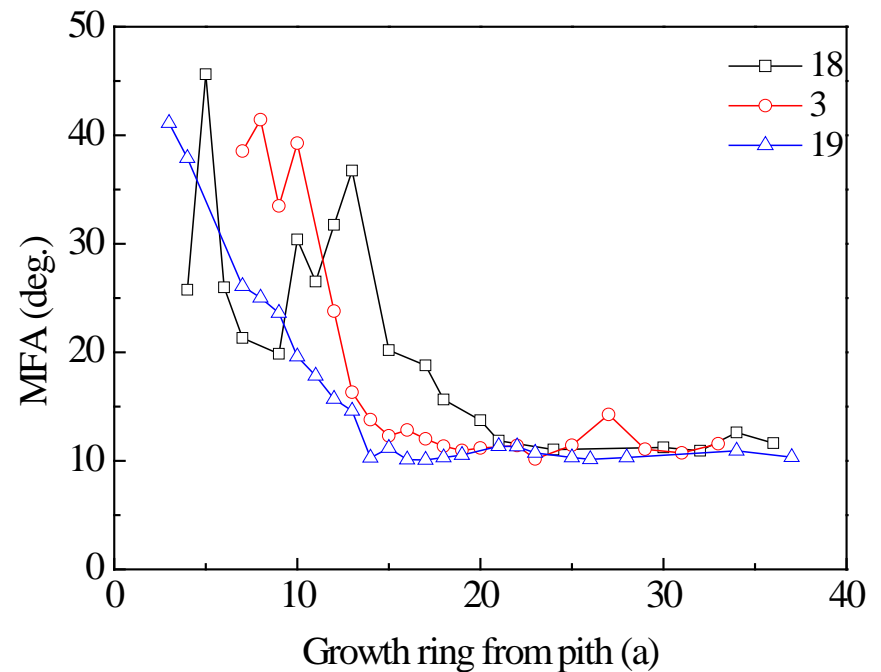




Results of MFA



decrease from pith to about 20th ring and then to remain stable in all trees

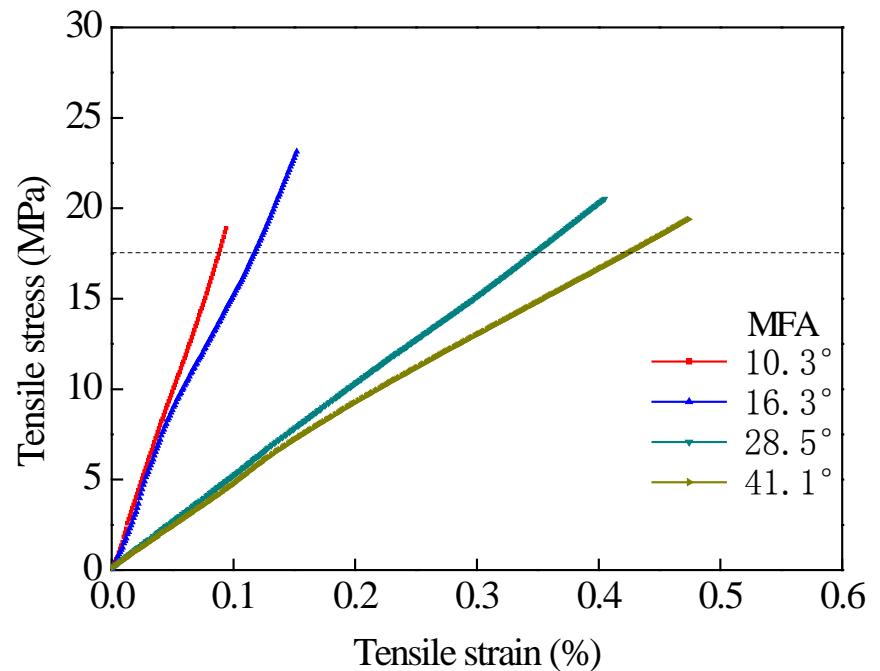




Results of tensile E_L

Average of 11.2 Gpa, corresponding COV of 48%

Longitudinal strain increases
from 0.08% to 0.4%
as MFA increases
from 10.3° to 41.1°
when the stress is 17 MPa.





Conclusion

It is the first time to experimentally determine the E_L in China.

The average wood basic density, MFA and tensile E_L at 14% MC
0.428 g/cm³, 17.5° and 11.2 GPa.

These data may serve as a basis for the efficient utilization.

This study has important basic and practical meanings.



Thanks for your attentions!