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Ute Sass Q243

Application of dendrochronology to sustainable forest management in Ethiopia

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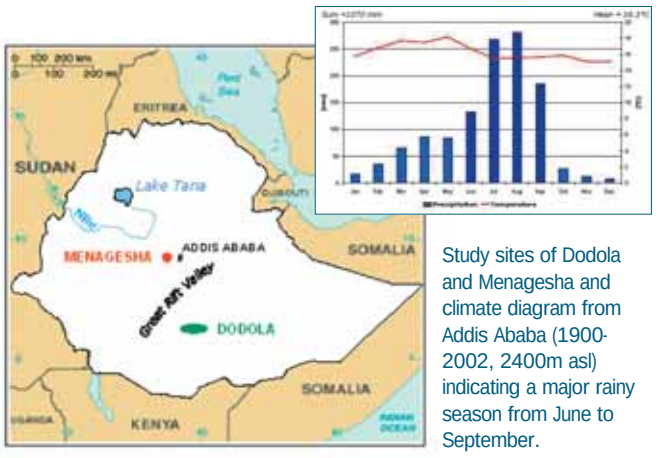
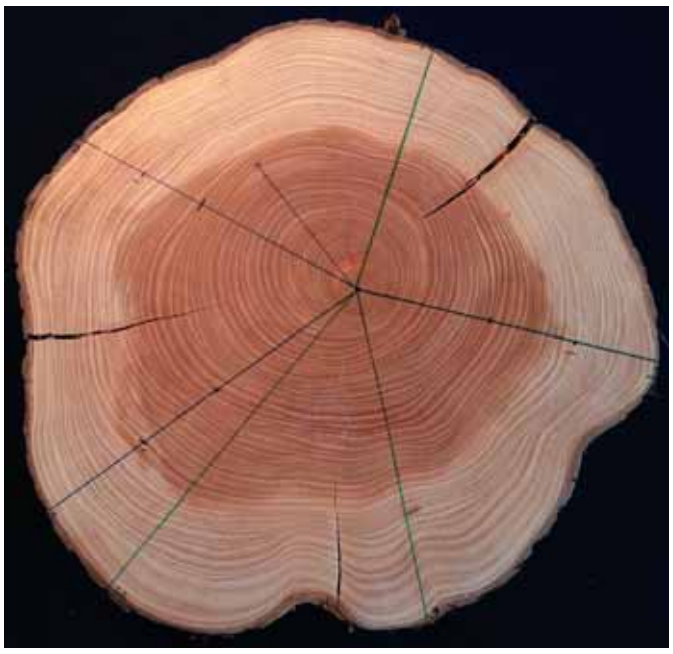


Study sites of Dodola and Menagesha and climate diagram from Addis Ababa (1900-2002, 2400m asl) indicating a major rainy season from June to September.

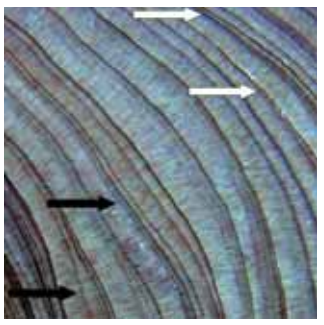
Introduction

In Ethiopia, the dry highland forest cover dropped from 40% to 2.7% in the last century, mainly due to the increasing need of local populations for agricultural land, pasture, fuel wood and building material. Frequent droughts during the last decennia form an additional problem.

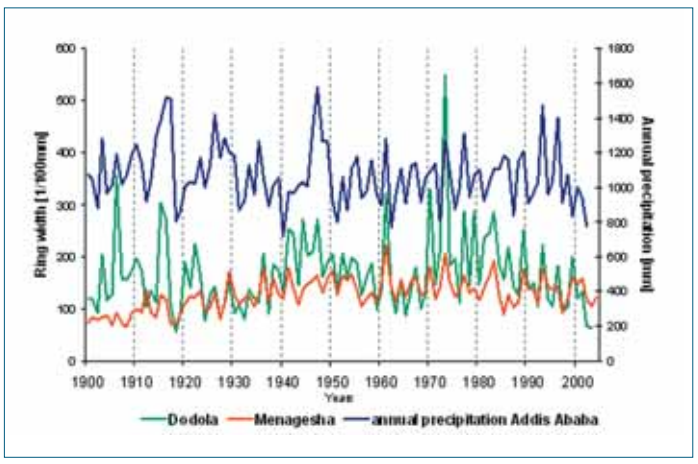
Juniper dominated dry afromontane forest and local forest use



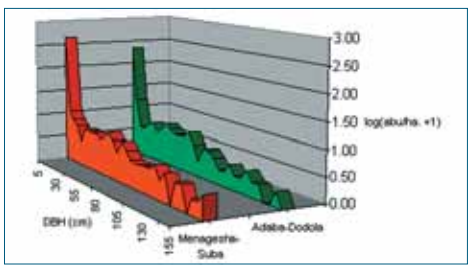
Juniperus procera is a dominant species of the dry afromontane forests. Wood formation is irregular around the stem circumference.



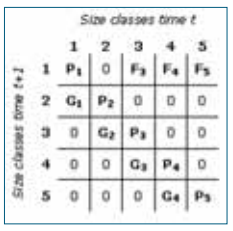
Tree rings are distinct but (partly) missing rings (white arrows) and intra-annual density variations (black arrows) obscure measurement and crossdating of the tree-ring series.



The site chronologies from Dodola (11 trees) and Menagesha (24 trees) are very similar to each other (r=0,6) and to the annual precipitation (r= 0,5; r= 0,3)



Inventories in permanent sample plots indicate similar size-classes distributions: high numbers of small individuals, obvious lack of individuals between 10 and 40 cm DBH (diameter at breast height) and steady decrease toward higher DBH.

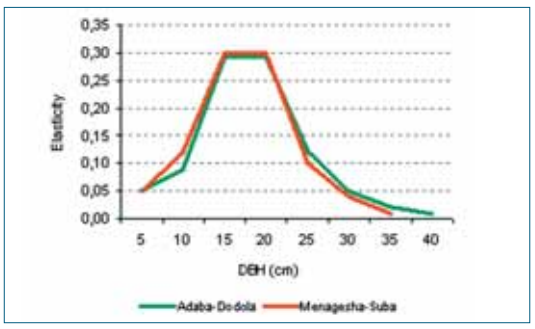


Size classes time t

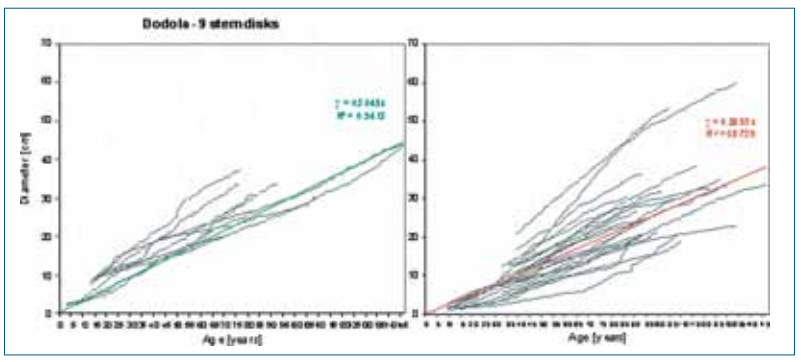
Size classes time t+1	1	2	3	4	5
1	P_1	0	F_3	F_4	F_5
2	G_1	P_2	0	0	0
3	0	G_2	P_3	0	0
4	0	0	G_3	P_4	0
5	0	0	0	G_4	P_5

Matrix models project the structure of a population in time. The transition matrix contains vital rates of the individual trees during a fixed time interval (survival Pi, fertility Fi growth Gi), derived from:

- the present size-class distribution
- dendrochronological analysis



The matrix model shows the high importance of trees with DBH of 10 to 40 cm to the overall population growth rate of juniper.



Dendrochronology allows assessing the age and annual growth rate of the juniper population in the two forest areas, to parameterise the matrix model.

Conclusion

The matrix model results incite to protect particularly junipers of 10 to 40 cm DBH in forest management interventions. The high correlation of juniper growth with precipitation on both sites proves the strong potential for dendroclimatological studies in the afromontane forests of Ethiopia. Hence it can be an efficient tool to assess the implications of future climate changes on tree growth in this area.

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