Integration and role of planted trees in a bush-fallow cultivation system in central Zambia

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Abstract. The purpose of natural fallow in bush-fallow cultivation systems is to improve soil fertility following a phase of cultivation and to provide useful forest products, including livestock feed. When natural fallow fails to serve these purposes, it can be supplemented or replaced by planted trees. This paper describes the development and function of Acacia fallow in the Soli tribal land of central Zambia and examines the supplementary role of planted trees.

The 31 woody species at five fallow sample sites were dominated by *Acacia polyacantha*. Thirty-nine percent of the species are leguminous and N-fixing while 42% are fodder plants. These species make this Acacia fallow suitable for regeneration of soil fertility and production of fodder. The dominant species, *A. polyacantha*, has an extensive lateral root system and may attain a mean maximum girth at breast height (BH) of 125 cm within 20 years. In the study area *Acacia* fallow regenerates from seed and root-stocks and with a maximum annual stem basal area increment of 0.87 m² ha⁻¹ at BH can accumulate a total of 17.4 m² ha⁻¹ in 20 years.

However, *Acacia* fallow is poor in edible wild fruits and durable construction wood. The scarcity of fruits in the study area has been compensated by widespread planting of exotic fruit trees. Ninety percent of households have fruit trees (mean 2.3 fruit species per household). However, in spite of the scarcity of good construction wood in the Soli tribal land, no local initiative has developed to plant timber trees. A clear opportunity therefore exists to promote timber tree planting. Such a tree planting programme was started in the study area during the 1985/86 planting season (December-February) when 25,100 seedlings of Eucalyptus grandis, Gmelina arborea and Leucaena leucocephala were distributed, free of charge and the programme will continue until 1988. A survey carried out five to seven months after planting revealed that the survival of E. grandis, L. leucocephala and G. arborea seedlings was 65%, 90% and 92%, respectively. The high mortality of E. grandis seedlings was due to termite damage.

Introduction

The majority of traditional farming systems in Zambia involve bush-fallow [1, 2] and of these systems, the chitemene shifting cultivation has been widely described [1, 3, 4, 5]. Bush fallow refers to the uncontrolled spontaneous development of bush regrowth on abandoned cultivation land. Fallow improves the chemical and physical structure of the soil after a phase of cultivation and produces useful by-products such as, poles, firewood and animal feed [6]. Bush-fallow cultivation therefore is a form of agroforestry that involves the sequential production of agricultural crops and natural
bush or woodland on the same piece of land. However, when fallow fails to provide the desired products, farmers and governments resort to tree planting and/or planted fallow [6] in order to supplement the functions of natural fallow.

A growing concern about declining fuelwood resources in Zambia [7, 8, 9] has resulted in a number of tree planting projects. One such project was started in December 1985 among the Soli-Wa-Manyika (plateau Soli) of Lusaka Rural District in central Zambia. The project is managed by the Natural Resources Department in the Ministry of Lands and Natural Resources with financial assistance from Africare. The author was associated with the project until October 1986.

This paper describes the development of *Acacia* fallow and the supplementary role of planted trees among the plateau Soli of central Zambia. The results of the study emphasize the necessity of formulating biomass production strategies which meet the needs of local farmers.

**Materials and methods**

*The study area*

The tribal land for the plateau Soli covers 690 km², between latitude 15° 15'-15° 45' south and longitude 28° 30'-29° 00' east, about 50 km east of Lusaka city in central Zambia (Fig. 1). The present study was confined to an area 488 km² south of the Great East Road (Fig. 1). The area is an extensive flat plateau broken on the east and south by a narrow escarpment that forms part of the Chongwe river valley system. The climate is tropical with alternating dry (April–October) and wet (November–March) seasons. The study area lies within a 700–900 mm annual rainfall belt and mean seasonal (November–March) rainfall at Chalimbana (15° 22' south, 28° 42' east; Fig. 1) was 702 mm for the period 1963–1986.

The plateau has well textured, fertile alluvial clay soils which support a thorn woodland dominated by *Acacia* spp. (see Table 1) with patches of broad-leaved bush dominated by *Combretum* spp. along streams. The escarpment has shallow sandy soils with low fertility that support a *Brachystegia-Julbernardia* (miombo) woodland. Nomenclature of woody plants follows White [10].

**Methods**

Land use and forest resources in the study area were analysed by examin-