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Traditional management of wild fruit trees by farmers in southern Ecuador

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Abstract. In the Andean part of southern Ecuador, traditional agropastoral farming combines subsistence crops and small-scale cattle farming with cash crops such as coffee, maize, sugarcane and peanuts. Wild plant resources have been integrated within the agricultural systems, where they are often being managed. Managed native fruit trees are found in home gardens, fields, coffee groves, pastures and hedges. *Inga* spp. and *Annona cherimola* often provide shade for coffee. Various Myrtaceae species are frequently tolerated in pastures and *Vasconcellea* spp. and *Annona cherimola* are the native trees most frequently found in home gardens. Trees are actively sown or (trans)planted and spontaneously grown trees are tolerated. Many trees are managed purely for their fruits, whereas others are for multiple reasons, such as fuel, timber, soil fertility, shade, fodder and fencing. Sometimes the edibility is only a side use. The fruits of several managed tree species are sold at local markets. *Annona cherimola*, *Vasconcellea* spp., *Juglans neotropica* and *Pouteria lucuma* are marketed most abundantly. Their fruits derive mainly from managed wild to semi-domesticated trees.

Key words: Andes, Ecuador, Edible plant, Fruit tree, Management

Introduction

Recent work in ethnobotany and anthropology has challenged conventional distinctions between cultivated and non-cultivated, domesticated and non-domesticated plants, and what we mean by "wild". It is now clear that many of the seemingly wild plants and natural ecosystems are actually managed and have been so for a long time (Balée 1989; Gómez-Pompa 1996; Posey 1985). In Mexico, for example, an estimated 5000 to 7000 "wild" useful plant species are managed by local people. Managed plants can play an important role in rural livelihoods (Caballero 1994; Casas *et al.* 1996; High & Shackleton 2000).

Plants can be managed in their natural environment (Posey 1985) or within agroecosystems. The best-known examples of the integration and management of "wild" plant species within agricultural systems in the tropics are traditional home gardens. Plants are also found to be managed in grazing areas, fields and hedges. Management criteria can be utility, value and traditional beliefs (Campbell *et al.* 1991; Gajaseni & Gajaseni 1999; Haverkort & Millar 1994).

The management of plant resources has been studied widely amongst indigenous people in the humid tropics. Less attention has been paid to non-indigenous populations, such as mestizos or immigrants. However, one study amongst non-indigenous communities in Amazonian Peru shows that they manage a large variety of wild plants within their home gardens and that many management practices are similar to indigenous practices, despite common beliefs that acculturation may lead to loss of plant knowledge and interest (Padoch *et al.* 1985; Padoch & de Jong 1991).

The management of plant resources can be an important tool for combining conservation with production. Increasingly, conservationists realise that protecting areas by excluding people is not viable. People can contribute significantly to conserving plants and sustaining biodiversity by the ways in which they use and manage plants (Haverkort & Millar 1994). Studies in Mexico have shown that small, scattered forest patches, managed by indigenous people within agro-

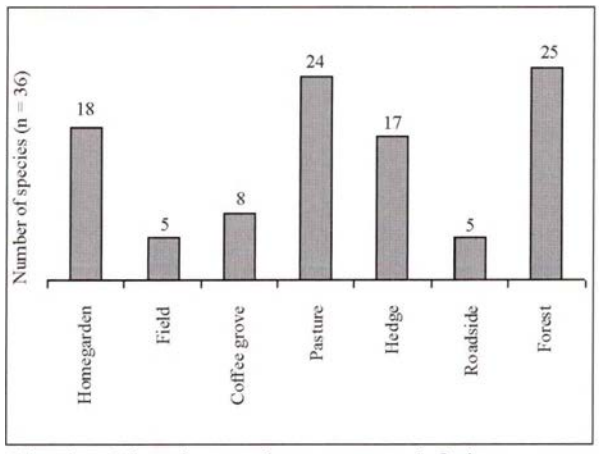

Fig. 1 - The places where managed fruit trees are found.

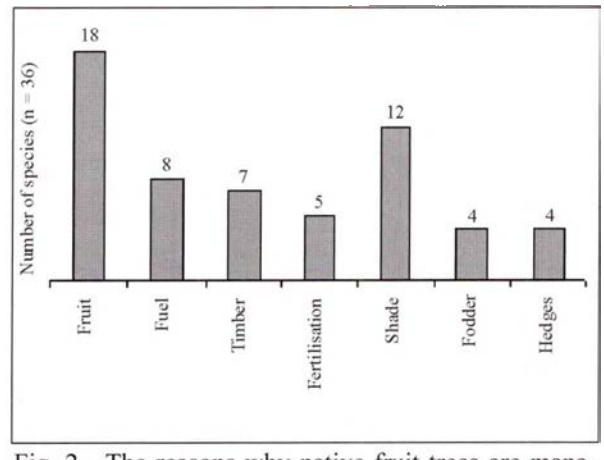

Fig. 2 - The reasons why native fruit trees are managed.

ecosystems, contain an important part of the original biodiversity of the area (TOLEDO *et al.* 1994). Also, traditional managed shaded coffee systems in Mexico were found to be important areas for plant and animal biodiversity (containing for example more bird species than most native forest types) (MOGUEL & TOLEDO 1999).

During an inventory of "wild" edible plants in southern Ecuador, it soon became clear that a number of the wild plants were actually managed and were often found near the villages. When informants guided us around to collect plant specimens, many plants could be collected in someone's garden or field. It thus became obvious that many of the wild plants found near the villages are there for a reason. When vegetation is cleared, useful or interesting wild plants are left or tolerated. People also transfer wild plants to their gardens (VAN DEN EYNDEN *et al.* 2003).

Data were then collected on the management of wild edible plants in the Andean part of southern Ecuador, above 1500 m. Politically this is the provinces of Loja and El Oro. The population here is mainly mestizo, of mixed indigenous and European descent. In this area traditional agropastoral farming combines subsistence crops with cash crops (coffee, maize, sugarcane and peanut) and small-scale cattle farming (CATER 1996; PIETRI-LEVY 1993). The long history of agriculture has resulted in the disappearance of most native forests, leaving only small remaining patches, often on inaccessible slopes or around water catchment areas (VAN DEN EYNDEN *et al.* 1999).

Data on plant management were extracted from ethnobotanical information on all wild edible plants in southern Ecuador, which had been collected from 1994 to 1997. More detailed information was collected through semi-structured interviews with random informants, as well as through field observations in 17 communities spread over the different ecological areas. The aim was, when considering the entire set of native edible plant resources used, to find out why, where and how certain plant species are managed and what the criteria for their selection are. Which particular management systems and techniques do farmers apply and which plant species correspond to each of them. Botanical samples of all plants concerned were collected, identified and deposited in the national Ecuadorian herbaria (LOJA, QCA and QCNE). The results presented here concern only trees.

RESULTS

Of a total of 354 species of wild edible plants that were recorded for southern Ecuador (VAN DEN EYNDEN *et al.* 2003) 189 are trees. In the Andean area (altitude > 1500 m) 64 wild fruit trees are found, of which 36 are managed in one way or another. Where, how and why these 36 trees are managed will be discussed here. It is important to remember that all the trees considered have edible fruits, but that may be of little importance for their management in comparison to other values the trees may have.

In the Andean area of southern Ecuador, managed fruit trees are found in different parts of the

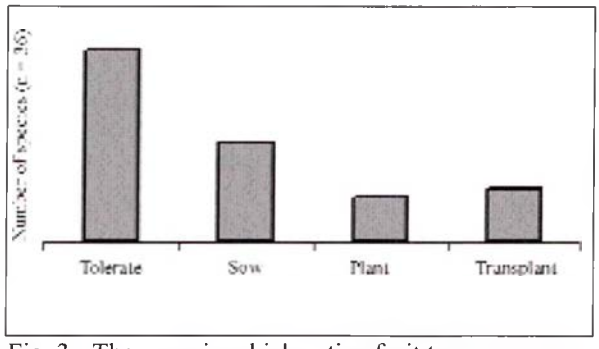

Fig. 3 - The ways in which native fruit trees are managed.

agricultural system, i.e. in home gardens, fields, coffee groves, pastures, hedges and along road sides or paths (Fig. 1 and 4).

Coffee groves, found in the drier parts of southern Ecuador at altitudes up to 2000 m, are an agricultural system in which traditionally many wild species are used to provide shade for coffee. In coffee growing areas, the coffee grove is often part of the home garden. Wild fruit trees frequently found here include various species of *Inga*, such as *I. fendleriana, I. oerstediana, I. spectabilis* and *I. striata*. The latter is said to provide the best shade. Besides providing shade, *Inga* species also fix nitrogen, thus improving soil fertility, and the pods have an edible aril around the seeds. *Inga* trees are often the main source of shade for coffee shrubs. *Annona cherimola* is also often found in coffee groves, providing both shade and valuable fruits. *Juglans neotropica* is often removed from coffee groves, because the leaves can allegedly damage the coffee. Trees are either tolerated in coffee groves (spontaneously germinated plants are not removed) or are actively introduced to the site by sowing or (trans)planting.

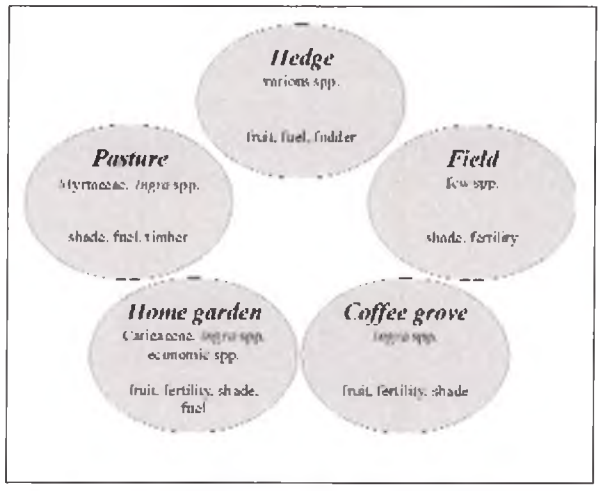

Fig. 4 - Schematic representation of the management of wild fruit trees within the agricultural system in Andean southern Ecuador.

The majority of managed wild fruit trees are found in pastures (24 species), where they are all being tolerated for their specific values. No trees are actively introduced to pastures. Many species of the Myrtaceae family grow here, belonging mainly to the genera *Eugenia, Myrcia, Myrcianthes* and *Psidium*. They are managed to provide fuel, timber and shade for cattle, rather than for their fruits, which are usually small and have quite a strong flavour. Also many *Inga* species are found in pastures, where again they provide shade, this time for cattle, and improve soil fertility. Economic species like *Annona cherimola, Vasconcellea* spp., *Juglans neotropica* and *Pouteria lucuma* are also sometimes tolerated in pastures.

These same economic species are frequently found in home gardens. *Vasconcellea candicans*, *V. monoica, V. pubescens* and *V.* x *heilbornii* are managed solely for their fruits, which are prepared in preserves and sometimes sold at local markets. They are either tolerated, sown or planted via cuttings. *Annona cherimola* is the most important economic species of the area, frequently sold at local and regional markets and through middlemen (SCHELDEMAN *et al.* 2001). It is tolerated or sown. The fruits of *Juglans neotropica* and *Pouteria lucuma* are also sold at markets. These trees also provide good timber. The former is only tolerated, whereas the latter may also be sown. Several *Inga* species are managed in gardens in order to improve soil fertility, for shade, fuel and edible fruits. They are sown, transplanted from the wild or tolerated. A total of 18 different managed fruit trees occur in home gardens, several being found only in narrow ecological localities. They provide fruits, fuel, shade and fertility.

Few wild trees are found in fields (5). On one occasion an inter-cropping system of *Annona cherimola* and maize was seen. Sometimes *Inga* species are tolerated in fields for their ability to fix nitrogen.

Seventeen species of wild trees occur in hedgerows. They are either planted or tolerated. Around pastures they may provide fodder for cat-

tle, as in the case of *Erythrina edulis* and *Inga striata.* Hedgerow trees also provide fruits and fuel. *Acnistus arborescens, Myrcianthes* spp. and *Psidium guineense* are frequently found in hedgerows.

Annona cherimola, Inga striata, Inga oerstediana, Vasconcellea x *heilbornii, Vasconcellea pubescens, Pouteria lucuma, Inga fendleriana* and *Erythrina edulis* are found in at least three different agricultural systems as managed species. Twenty-five species are also found in the wild, in forest patches or shrub land. The other species are either not found in the wild, which might mean they should be considered as semi-domesticates, or it is not known whether they occur in the wild or not.

No cultural operations like pruning, pest control or fertilisation are performed on native fruit trees, not even on the economically important species like *Annona cherimola, Vasconcellea* x *heilbornii, Vasconcellea pubescens, Juglans neotropica* and *Pouteria lucuma* (SCHELDEMAN *et al.* 2001).

When considering why the trees concerned are managed, it appeared that only half of the fruit species (50%) are actually managed for their fruits (Fig. 2). Other important management criteria are shade (33%), fuel (22%) and timber (19%). A species may be managed for various reasons. *Inga oerstediana* and *Inga striata* are managed for their fruits, fuel, for shade and for soil fertility improvement. *Pouteria lucuma* is managed for fruits, fuel, timber and shade.

The majority of trees (25) are simply tolerated (Fig. 3). This means they germinate and grow spontaneously and are not removed. Thirteen species are actively sown, six are planted from cuttings and seven transplanted from the wild as seedlings.

DISCUSSION

Plant management is relatively important in southern Ecuador. Many of the wild trees which farmers use can be found near the villages or houses. They are managed within certain parts of the agricultural system to provide fuel, timber and fruits for people, fodder and shade for cattle and shade and fertility for the benefit of crops. When vegetation is cleared for new fields or pastures, useful wild trees are left or tolerated. Farmers also transfer wild trees to their gardens, their fields and to create hedgerows. These trees form a well-integrated part of the agricultural system in the Andean part of southern Ecuador. This may have important consequences for the conservation of the trees concerned, or maybe more importantly for the species not concerned.

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