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Plant Species Diversity of Home Gardens in El Obeid, Central Sudan

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Abstract

Home gardens are very common in El Obeid, but information about plant species diversity and its significance for household food supply is not available. To analyse this, cultivated plants of 81 home gardens were surveyed. The plants studied in the home gardens included those for human consumption such as fruit trees, wild fruit trees and vegetables. In total, 32 plant species were found in the study gardens. The range of species was found, because irrigation is used under semiarid conditions. However, the lack of continuous sufficient irrigation water is the main factor which prevents an increase in species number and species diversity. In general, home garden products are mainly used as supplemental food in households and not sold on local markets.

Keywords: fruit trees, household gardens, Kordofan, multipurpose trees, semiarid, vegetables

لتنوع النباتي للحدائق المنزليه في مدينه الابيض بوسط السودان

الخلاصة:

تعتبر الحدائق المنزلية أمراً عادياً في مدينه الابيض ، ولكن المعلومات عن التنوع النباتي ومغزاها لدعم غذاء الأسرة غير متاح. ولكي نتعرف علي هذا، فإنه قد تمت دراسه مسحيه للنباتات المزروعة في ٨١ حديقة منزليه. تلك النباتات التي تمت دراستها في الحدائق النزليه تتضمن النباتات المستهلكة من قبل الإنسان مثل أشجار الفاكهة ، أشجار الفاكهة البرية والخضروات. إجمالاً، فقد وجد أن هناك ٣٢ نوعاً من الاصناف النباتية في تلك الحدائق التي خضعت للدراسة. مدى التنوع النباتي الذي وجدّ، اعتمد اساساً علي نظام الري المستخدم تحت الظروف الشبه صحراويه، وعليه فإن نقص الري المائي المستديم هو العامل الأساسي الذي يمنع زياده عدد الاصناف والتنوع فيها. عموما فأن منتجات الحدائق المنزلية تستخدم كعامل إضافي لتغذية الأسرة ولا تباع في السوق المحلي.

مفاتيح:

أشجار فاكهة ، حدائق منزلية ، كردفان ، أشجار متعددة الأغراض ، شبه صحراوي ، خضروات.

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1 Introduction

In many parts of the world home garden systems provide supplementary food, fuel, fodder (Brownrigg, 1985) and serve as a recovery area for the people. Home gardens in the tropics vary greatly in species, species richness, structural complexity and size (Gillespie *et al.*, 1993). Most of them display different vegetation layers making them typical agroforestry systems. Home gardens in the humid tropics have been studied by many authors (e.g. Alvarez-Buylla Roces *et al.* (1989); Jensen (1993); Esquivel and Hammer (1992); Lamont *et al.* (1999); Teklehaimanot *et al.* (2001)), but little information is available about home gardens in semiarid areas such as Central Sudan.

El Obeid is the biggest town in Central Sudan. Houses with a surrounding garden are a very common feature. However, no information is available about plant species diversity and its significance for household food supply. To gather information a survey was conducted on species diversity and uses of plants in home gardens of El Obeid.

2 Materials and Methods

The study was conducted in March and April 2004 in El Obeid. The town is the capital of the North Kordofan State and located in Central Sudan (latitude 13° 20' N, longitude 30° 15' E, 570 m above sea level). El Obeid has approximately 300,000 to 500,000 inhabitants. The semiarid area of North Kordofan receives an annual precipitation of about 280 – 450 mm in the months from July to September. Temperature is generally high averaging 37°C in the summer and 18°C in the winter. The most important soil types according to the FAO-classification are Cambisols and Regosols. In Kordofan rainfed agriculture is the traditional farming system (Bashir, 2001). The natural vegetation cover of the surrounding area of El Obeid is scarce (Fadl and Gebauer, 2004) and consists mostly of shrubs (e.g. *Boscia senegalensis*, *Calotropis procera*, *Ziziphus spina-christi*) and a few scattered trees (e.g. *Acacia albida*, *Adansonia digitata*, *Balanites aegyptiaca*).

For the study 81 home gardens were visited in El Obeid and plant species growing in the households noted. The survey was mainly carried out in a district called El Ghalaa in the north of El Obeid. The El Ghalaa area is characterised by houses with a surrounding garden.

In addition to the plant survey, occurrence of domestic animals kept in the home gardens was also documented. Information about size of home gardens and households, profession of the owners, plant origin and cultural practices was also collected.

3 Results

Home gardens in El Obeid are traditionally surrounded by a approximately 2 m high wall. The size of the home gardens varied between 40 m^2 to 150 m^2. The average household consists of seven household members. Most of the male home garden owners (68%) are labourers working as drivers, road or railway constructors or in the field of agriculture. 15% are teachers in school, 10% are working as research assistants in the close by Agricultural Research Corporation and the remaining 7% are merchants. Women mainly stay at home with the family.

In total 32 different plant species and eight animal species were identified, which are grouped in Table 1. Each home garden contained an average of 3 plants for human consumption. However, in five out of the studied home gardens no plant species were found.

Fruit trees were the predominant horticultural crop in the home gardens. In 76 out of 81 home gardens fruit trees were cultivated. The five most common fruit trees were lime (*Citrus aurantifolia*), guava (*Psidium guajava*), mango (*Mangifera indica*), date palm (*Phoenix dactylifera*) and grapefruit (*Citrus paradisi*). Sugar apple (*Annona squamosa*), pomegranate (*Punica granatum*), sweet banana (*Musa x paradisiaca*) and grape vine (*Vitis vinifera*) were found to a lesser degree. Only in one or two home gardens the species papaya (*Carica papaya*), black mulberry (*Morus nigra*), sweet orange (*Citrus sinensis*) and fig (*Ficus carica*) occurred.

Interesting was the presence of several wild trees and shrubs with edible fruits. These trees/shrubs are grown in the home gardens for different purposes like food, construction materials, fodder, firewood, medicinal uses, amenity and for providing shade.

Beside the uses of the fruits the ginger bread palm (*Hyphaene thebaica*) and the manila tamarind (*Pithecellobium dulce*) are mainly used for construction materials, the white crossberry (*Grewia tenax*) for fodder, the christ thorn (*Ziziphus spina-christi*) and the desert date (*Balanites aegyptiaca*) for firewood, the bark of the baobab (*Adansonia digitata*) for fibres, the toothbrush tree (*Salvadora persica*) for medicinal purposes and the neem (*Azadirachta indica*), the tamarind (*Tamarindus indica*) and the horse radish tree (*Moringa oleifera*) for amenity and shade.

Vegetables such as pigeon pea (*Cajanus cajan*), chilli (*Capsicum annuum*), eggplant (*Solanum melongena*) and tomato (*Lycopersicon esculentum*) were rarely planted.

In more than 50% of the home gardens ornamentals were present. Ornamental plants most frequently found in different home gardens were bougainvillea (*Bougainvillea glabra*), christ plant (*Euphorbia milii*), sand olive (*Dodonaea angustifolia*), oleander (*Nerium oleander*) and shrub verbena (*Lantana camara*). The shrub sand olive was mainly used as a hedge plant to separate different parts within the home gardens.

Domestic animals kept at the compound were chickens (*Gallus gallus*), pigeons (*Columba livia*), goats (*Capra hircus*), ducks (*Anas platyrhynchos*), geese (*Anser anser*), rabbits (*Oryctolagus cuniculus*), one donkey (*Equus africanus*) and one dog (*Canis (lupus) familiaris*) in the home garden surveyed. In some cases the animals were kept exclusively within the home garden, in other cases they had the possibility to roam outside the garden.

Most plant products are exclusively used for self-consumption or as animal fodder. Only in few years with excess yields, fruits were given away to neighbours or relatives. Nobody reported to sell their own products on the local markets.

Irrigation of the horticultural plants is essential in all home gardens. Fruit trees are irrigated on average every two to tree days. However, wild fruit trees and shrubs are not irrigated or to lesser extent. No chemical fertilisers or insecticides are used in any of the studied home gardens. Pruning of the trees and shrubs is also not practised. 67% of the households reported that they bought the fruit trees as juvenile plants from local nurseries. However, knowledge about varieties was very low. The remaining 33%

Table 1: Used plant species and domestic animals in home gardens of El Obeid.

Scientific name	*Species presence (%)*	*Local name*	*Family*
	Fruit trees		
Citrus aurantifolia	51.85	lemon	Rutaceae
Psidium guajava	50.62	guava	Myrtaceae
Mangifera indica	19.75	manga	Anacardiaceae
Phoenix dactylifera	16.05	nachal	Palmae
Citrus paradisi	9.88	grapefruit	Rutaceae
Annona squamosa	8.64	gishta	Annonaceae
Punica granatum	4.94	roman	Punicaceae
Musa × *paradisiaca*	3.70	mouse	Musaceae
Vitis vinifera	3.70	enab	Vitaceae
Carica papaya	2.47	babaj	Caricaceae
Morus nigra	2.47	tuthe	Moraceae
Citrus sinensis	1.23	burtugal	Rutaceae
Ficus carica	1.23	tin	Moraceae
	Wild fruit trees/shrubs		
Ziziphus spina-christi	12.35	siddir	Rhamnaceae
Grewia tenax	11.11	gudiem	Tiliaceae
Azadirachta indica	4.94	neem	Meliaceae
Hyphaene thebaica	4.94	dome	Palmae
Adansonia digitata	3.70	tebaldi	Bombacaceae
Balanites aegyptiaca	3.70	heglig	Balanitaceae
Pithecellobium dulce	2.47	tamar-hindi	Mimosaceae
Tamarindus indica	2.47	aradeb	Caesalpiniaceae
Moringa oleifera	1.24	rawag	Moringaceae
Salvadora persica	1.24	arak	Salvadoraceae
	Vegetables		
Cajanus cajan	4.97	lubia adasi	Fabaceae
Capsicum annuum	2.47	shatta	Solanaceae
Solanum melongena	1.23	aswad	Solanaceae
Lycopersicon esculentum	1.23	tamatim	Solanaceae
	Ornamentals		
Bougainvillea glabra	27.16	jahanamia	Nyctaginaceae
Euphorbia milii	19.75	subbar	Euphorbiaceae
Dodonaea angustifolia	17.11	akawit	Sapindaceae
Nerium oleander	11.88	ward el hameer	Apocynaceae
Lantana camara	8.94	lantana	Verbenaceae
	Domestic animals		
Gallus gallus	11.11	gedad	Phasianidae
Columba livia	4.94	hamam	Columbidae
Capra hircus	2.47	mahiz	Bovidae
Anas platyrhynchos	1.23	bat	Anatidae
Anser anser	1.23	wissin	Anatidae
Oryctolagus cuniculus	1.23	arnab	Leporidae
Equus africanus	1.23	humar	Equidae
Canis (lupus) familiaris	1.23	kalib	Canidae

of the households said that they raised the fruit trees by themselves from seeds. Most multipurpose trees/shrubs grow spontaneously in the home gardens and were rarely planted.

4 Discussion

The total number of 32 different plant species found in the 81 home gardens is rather low compared with other home garden surveys in different parts of the world (De Clerck and Negreros-Castillo, 2000; Kehlenbeck and Maass, 2004; Wezel and Bender, 2003). However, in dry areas, gardens are often limited in diversity and complexity. In general potential garden complexity is often a function of climate, more specifically water and evaportranspirational balance, just as for forest ecosystems structure and function (Gillespie *et al.*, 1993).

26 species out of 32 plants surveyed in the home gardens of this study are woody perennial species. Only papaya, sweet banana, pigeon pea, chilli, eggplant and tomato are herbaceous crops. In the surveyed gardens no cereals, herbs, medicinal plants, tubers or spices are cultivated. A vegetative soil cover was also not found in any of the home gardens.

Fruit trees were the predominant horticultural crop. Fruits like lime, guava and mango are very popular in Sudan (Gebauer and Osman, 2004). 31% of the species found in the home gardens were wild fruit trees and shrubs. The value of the multipurpose uses beside the edible fruits was well recognised by the home garden owners. Species like the baobab, the christ thorn, the desert date, the ginger bread palm, the tamarind and the white crossberry are indigenous trees/shrubs and are also found in the rural areas outside town. They are well adapted to the harsh environmental conditions and can grow without irrigation. These arboreal species play also an important role in the diet of rural people in the Kordofan area especially during famines and food shortages (Gebauer *et al.*, 2002; El-Tahir and Gebauer, 2004).

All listed horticultural crops are not able to grow in this dry climate without frequent irrigation. However, in El Obeid especially in the dry season water is still scarce and irrigation sometimes not possible. Particularly in the years 1983 and 1984 annual rainfall was very low and water from the town reservoirs limited. During these years a lot of fruit trees died due to the lack of irrigation. In the last years the situation in El Obeid improved to some extend and in most home gardens new fruit trees were planted. However, today still the lack of sufficient irrigation water in some periods prevents the expansion of species number and species diversity.

In the study area vegetables were found only in six home gardens. The main reason for the low vegetable production is the lack of sufficient irrigation water since vegetables have a high demand of water.

It was evident that the home garden owners earn no additional income from the selling of home garden products, in contrast to the observations by Wezel and Bender (2003) in Cuba. Because of the low levels of salaries home gardens are used as an source of supplemental food for the family. However, the degree to which home gardens contribute to the provision of the household is rather low due to the small number of food plants per home garden. In addition yields are normally low as well. Beside the

scantiness of water, further reasons for the low yields are the lack of superior varieties, the low fertility of the sandy soil and the lack of cultural practices like fertilisation and pruning (Gebauer and Osman, 2004).

5 Conclusions

Plant species are very important components in El Obeid home gardens. Crop products are used for supplemental food in the households. Irrigation is necessary due to the semiarid conditions. However, water is also the factor limiting an increase in species number and species diversity in home gardens, because water is not always sufficiently available.

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