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Homegardens - a Neglected Potential for Food Security and Sustainable Land Management in the Communal Lands of Zimbabwe

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Keywords: Zimbabwe, Homegardens, Food Security, Management Strategies, Species Diversity, Soil fertility, Sustainability, Extension, Development

Abstract

Home gardening plays an important role within the overall farming and livelihood system in Southern Zimbabwe in terms of household food security and income generation. Homegardening is an ideal complement to crop production which is mainly concentrated in the off-season.

The paper describes homegardening systems in the semi-arid areas. Major differences between individual gardens and gardens promoted by development agents revealed in terms of species diversity. Whereas 'supported gardens' are geared towards optimal production, multiple and diverse goals are pursued in individual gardens which due to their rich species diversity are a stronghold of biodiversity conservation. This raised the question whether development efforts should not learn from individual gardens and choose different approaches.

The highest potential to improve crop management gardens which were identified were effective water management, biological pest control and intercropping. Promising methods for water harvesting are being tested and practised, but little research on the use of natural biological antagonists for pest control has been done so far. Soil fertility management in gardens was revealed as highly effective. In contrast to the main fields, organic matter is relatively high in the gardens.

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The paper concludes that the support of home gardens would be an important contribution to strengthening food security and biodiversity for ecological stability. Areas needing extension support include: methods of improving water use efficiency, storage and marketing of home garden products. With respect to its contribution to sustainable land use, food security and ecological stability, home gardens should not be addressed in isolation. An integrated approach to improve the security of livelihood making use of the positive complementarity of the field crop production, livestock and gathering of fruits etc. should be aimed for. However, an attitudinal problem needs to be overcome: fruit gathering and many other 'traditional' practices which offer a lot of potential to improve gardening are perceived as 'uncivilised' and 'backward' compared to modern technology like fertiliser and pesticides. These, however, are expensive and few farmers only utilise them in gardens.

1 Introduction

Food availability and reliable access to food are both critical to household food security. Access to food is determined by the available resources for food acquisition (food production and gathering, buying of food) and the social exchange and buffer mechanisms (FRANKENBERGER 1992). While food might be available on markets, many households can hardly afford to buy sufficient food (vegetables in particular) with the limited cash resources available. Thus gardening has a major role in household food security and self sufficiency. The role of home gardens for food security and genetic diversity of vegetable crops attracts increasing attention in the development debate (e.g. LANDAUER & BRAZIL 1990, DRESCHER 1995, 1996; ENDA-ZW 1996). Home gardening combined with awareness campaigns on nutrition can be a viable strategy for improving household food security for at-risk populations (MARSH & TALUKDER 1994). In terms of genetic diversity, home gardens have a high potential to compensate the loss of diversity through monocropping in the fields.

In 1993/94 a survey on the role of homegardens in the livelihood systems was carried out in the Zaka and Gutu Communal Areas of Masvingo Province in Southern Zimbabwe. The objective of the study was to assess the management strategies and related crop husbandry practices in home gardens. Individual gardens and community gardens were to be compared in terms of management and crop diversity in order to identify a potential strategy for development support.

2 Study Area

The observed gardens in Zaka and Gutu Districts of Masvingo Province (Figure 1) are located in the semi-arid areas of Zimbabwe with mean annual rainfalls between 450 and 600 mm. The land is classified as suitable for semi extensive farming (Natural Region IV according to VINCENT & THOMAS 1960).

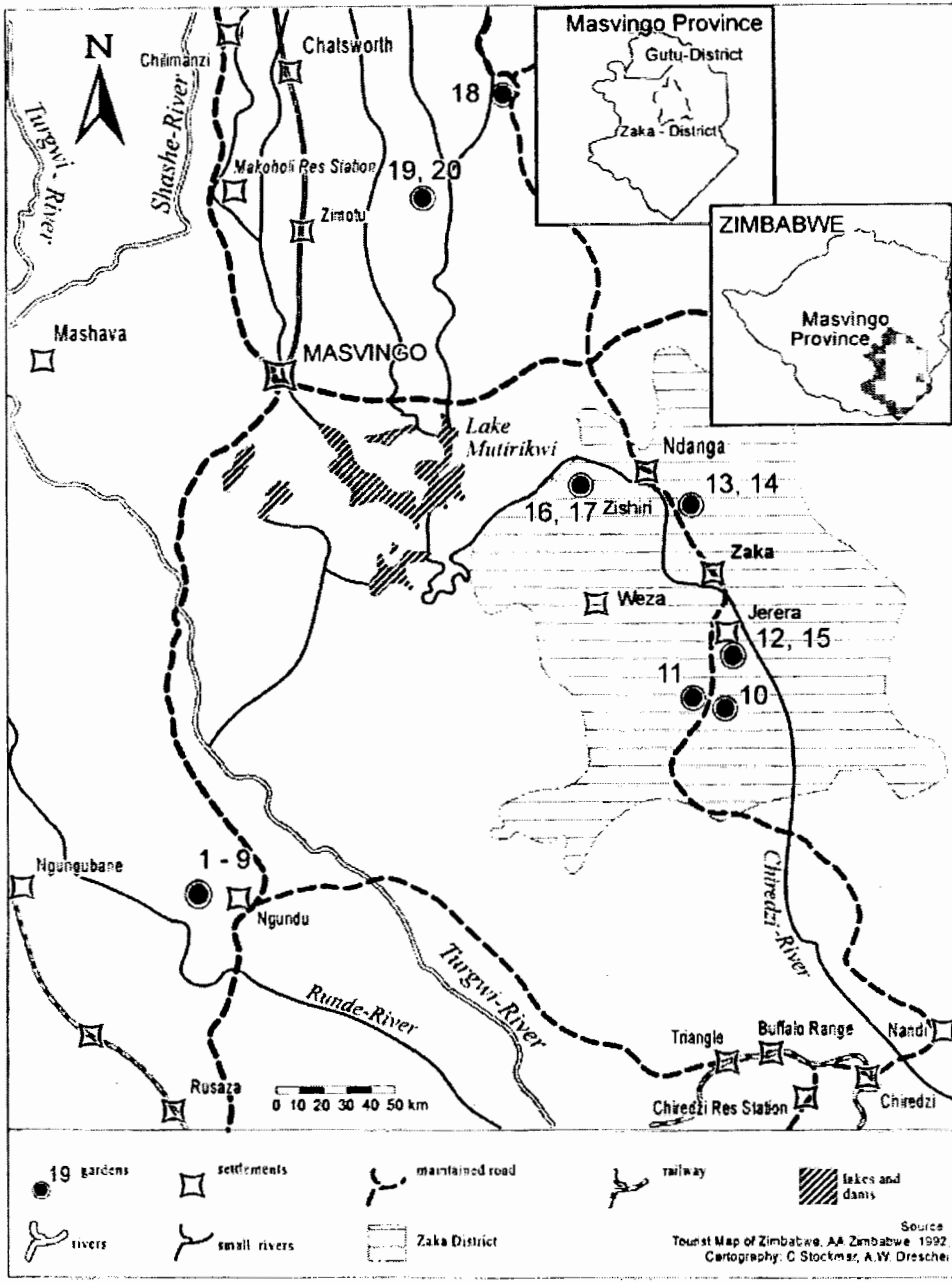

Figure 1: The study area in southern Zimbabwe

Both districts are densely populated regarding their natural potential (e.g. Zaka: 62 persons/km²; CSO 1993). Food security is a major issue in both districts because of an increasing vulnerability to drought and land degradation.

The survey was carried out within the framework of the AGRITEX/GTZ project "Conservation Tillage for Sustainable Crop Production Systems" in Zaka and Gutu. The main distinction between Zaka and Gutu is the extent of wetlands ('dambos' or locally called 'vleis', WHITLOW 1988) which occur more frequent in Gutu. These areas are generally less affected by drought and the number of livestock per household is higher.

Drought is a common feature in both districts. Rainfall occurs between October and April but is highly variable between seasons and within seasons. Gardening is mainly carried out during the dry season from May to October. Crop failures due to drought periods within the cropping seasons are frequent, on average in one out of every five years. Yield reductions due to mid-season droughts are regular features. The area is very marginal for cropping.

3 Methodology

The field research comprised a household garden survey and field measurements during the cropping season 1993/94 and 1994/95. The household garden survey was based on a questionnaire and focused on production-related and socio-economic issues linked to home gardening in the area. In addition, garden sizes were measured and other factors like crop husbandry practices, composition of species, quality of soils and soil management, cropping pattern, plant protection and water management were assessed. Eighteen gardens were surveyed and interviews with the owners held. Soil samples were analysed in terms of soil fertility aspects.

4 Results and Discussions

4.1 Classification of gardens in the areas

Two main categories of home gardens could be distinguished: individual gardens and community gardens (Figure 2). Community gardens were further subdivided into gardens which were initially supported by donor initiatives and the non supported gardens which were installed on the community's own initiative.

Supported community gardens have been financed by the European Union (EU) and the German Development Co-operation (GTZ) through the "Co-ordinated Agricultural and Rural Development Programme" (CARD). Under the auspices of the Department of Agriculture and Technical Extension Services (AGRITEX) CARD initiated the "Taguta - Self Help Garden Project" which supports community gardens. The support package

consists of fencing material, insecticide, seeds for one year, as well as monthly visits by the extension worker and health worker. The community has to apply for a garden and, once accepted, they utilise their own labour to put up the fence and install the vegetable beds. Often the 'community' who applies are just a few families rather than a whole social entity. In this sense they are rather group gardens than community gardens.

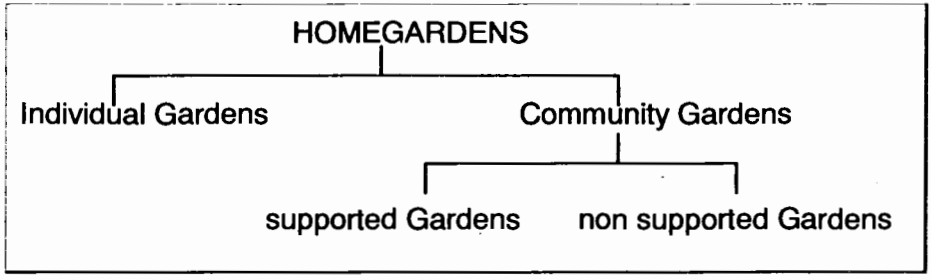

Figure 2: Types of Gardens in Communal Land in Zimbabwe

Recommended sizes for the gardens depend on the number of families involved. An area of 80-140 m² per family is recommended and the maximum garden size is about 2500 m² (ARDA & GTZ 1989). The shape of the areas is recommended to be square or rectangular. Fencing is promoted by purchase of wire and planting of hedges, especially of *Jatropha curcas*, a nut-producing plant originating from West Africa and commonly used in Tropical America for live fencing. Potential garden sites in the research area are restricted due to the availability of water. Some of the observed supported gardens have therefore problems with the water supply. No trees are found in the supported community gardens. According to the management recommendations in the Taguta-Garden Manual the crops to be planted are strongly restricted. The crop pack consist of ten different species and an insecticide. Thus species diversity is automatically reduced to those crops that are recommended by the extension service. These recommendations prescribe planting times, spacing, application of fertilisers and pesticides and are supervised by the extension worker. Intercropping is not common in supported community gardens. It seems that farmers experiment with different practices only occasionally.

The second category, 'non supported community gardens' has not been given much attention. These are areas where people organise themselves in groups of gardeners without any support by projects, government or local authorities. The Zishiri-Irrigation scheme that has been observed during field work is one example. It is located about 30 km north-westerly of the district capital Zaka. Forty families share an area of nearly 7 ha. A highly sophisticated irrigation system brings the water from a natural spring into the gardens where it is distributed along the natural gradient in irrigation channels. One major difference to supported gardens is that integrated parts of the gardens are guava, mango and other fruit trees, but also sugarcane and bananas.

The third category, 'individual gardens' are very common in the research area. The observed gardens have an average size of 308 m², they are much bigger than the recommend "taguta-size". This garden type is rather individualistic, every single garden being different from others. Generally trees are integrated part of the garden, intercropping is very widespread. These gardens are normally not rectangular - mostly they are well adapted to the surrounding landscape and physiogeography. The individual gardens are located as near to the house as possible. In many cases there is no water near by the house, therefore the average distance to the gardens is nearly 500 m. Individual gardens are not focused on by the extension workers and therefore farmers experiment on their own, mostly without advice from extension.

4.2 Socio-economic characteristics

The average age of the gardeners is 57 years. The high age is due to labour migration into towns and cities, where mainly children, women and old people remain in the Communal Areas. Gardening seems to be mainly a woman's activity. Almost 40% of all households in Zaka are headed by women, and in terms of total population of Zaka more than 60% are women (IRDEP 1994). Less than 10% of the men make major contributions. However fencing is still mostly men's work. Forty percent of the respondents own more than one garden.

Beerbrewing and vegetable selling are the most important income sources of women. The additional income from gardens is mainly used by women to buy basic commodities like salt, sugar, soap, tea etc.

In terms of land tenure, community garden sites, individual gardens as well as the "fields" (rainy season plots) underlie the traditional land tenure and are given to individuals or to the community by the leader of the village - the "kraalhead". However, people consider individual gardens and rainy season plots as their own "property" and there is very little concern about losing the plots. Community gardens are community property: each family being allowed to garden on a defined equal part of the whole plot.

4.3 Management strategies and crop husbandry in homegardens

4.3.1 Water management

Eighty percent of the gardeners get their water from wells and 20% from rivers, and vleis (natural seasonal wet grasslands). The average distance to the water source is about 90 meters, this is near to the limit accepted from the people that was observed in the Zambian research areas (DRESCHER 1998) but significantly further than the average in Zambia which was only about 27 m. In some cases people carry water in tins on a wheelbarrow for more than 800 m (sometimes even climbing quite steep slopes) to water their gardens. This is another indication for the shortage of suitable garden sites as many favourable sites in vleis are not allowed to become gardens. Watering is felt to

be the most labour intensive work in gardening (see Figure 6).

To alleviate the water problem, a new water-saving sub-surface irrigation method (Figure 3) using underground clay pipes (approx. 10 cm diameter) has recently been introduced by an ODA-funded community development project (MURATA et al. 1993, MURWIRA 1995).

Water is poured into the pipe through the inlet which is closed thereafter. The slow seepage of water through the clay pipe serves as irrigation water for plants. Root development is centred around the pipe, similar to drip irrigation. Depending on climatic conditions, the pipes need to be filled every day up to only once every three days. Another additional advantage of underground irrigation particularly beneficial in semi-arid environments is the reduction of water losses through evaporation and infiltration. Evaporation can also reduced by mulching. Previously, this has not been very common, but obtains increasing attractiveness in activities geared towards joint technology development with farmers (HAGMANN et. al. 1997). Farmers are experimenting with various materials to be utilised as soil cover (e.g. crop residues, grasses).

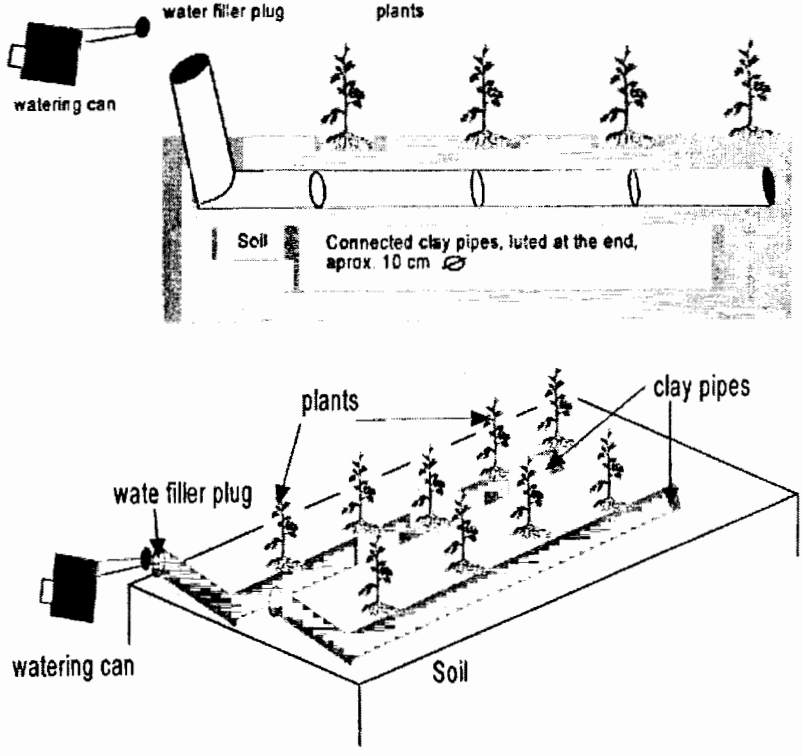

Figure 3: Sub-surface irrigation using clay pipes in gardens (side and top view)

Another method to reduce rapid drainage of water in the sandy soils which is practised by some farmers is where plastic sheets are laid about 50 cm to 1m below the surface (Figure 4)

Water-saving irrigation methods was revealed as one of the most important potential factors to promote gardening. The development of more such methods together with farmers could be the entry point of a strategy to promote gardening in Communal Areas.

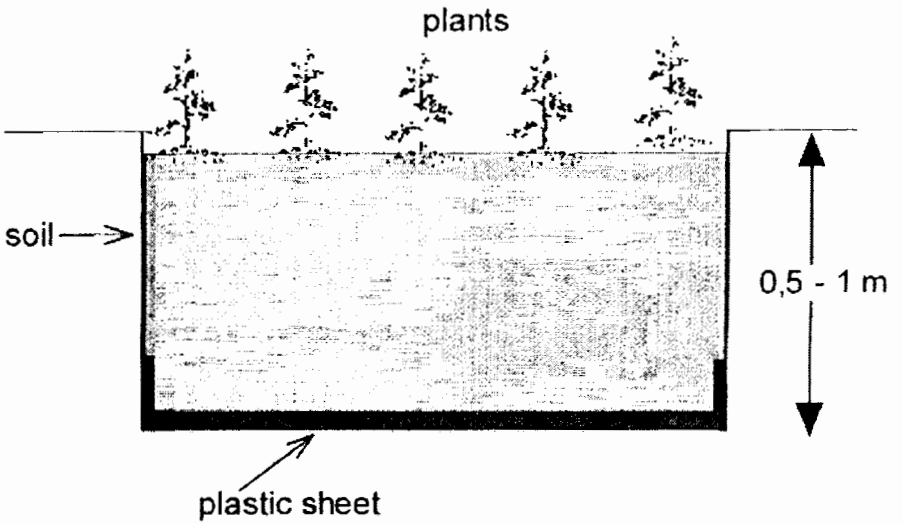

Figure 4: Water saving through prevention of infiltration

4.3.2 Seasonal cropping pattern

Homegardens are being cropped all the year round. During the rainy season labour is short and so, gardens are often treated like fields and planted with maize. At the start of the dry season more labour is available and the operations in the home gardens begin. Figure 5 shows the cropping pattern during the seasonal cycle.

Rape which is a common relish in the traditional dishes and is planted first in early January, while onions and chinese cabbage are planted from early March to late October. Covo, used as a relish, is the only vegetable which is produced the whole year around, planted either in the gardens or together with maize and wheat. The decision what to plant depends on food preferences and particularly on labour availability.

Labour inputs for watering are needed from February and reach a peak in July. Harvesting of staples, e.g. maize and sorghum, starts in April, reaches a first peak in June and a second peak in August. Vegetable growing starts in April, depending on the harvest of staples and the work load to store the harvest (Figure 6).

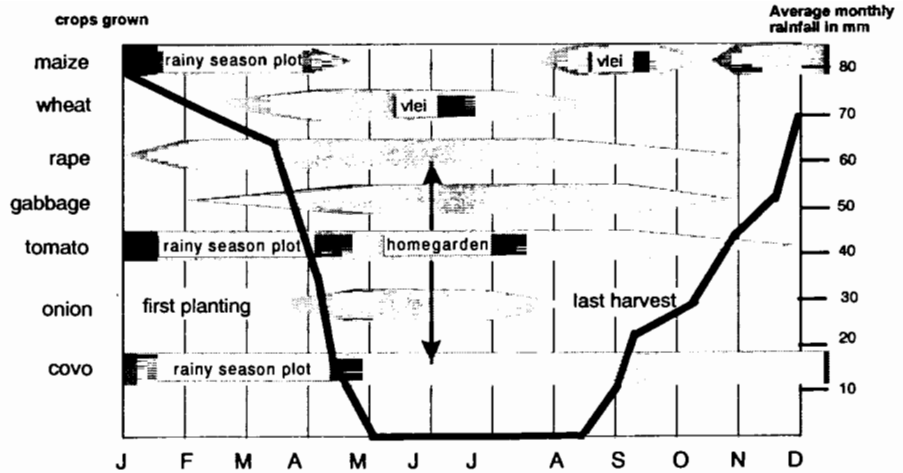

Figure 5: Cropping Pattern and average monthly rainfall distribution

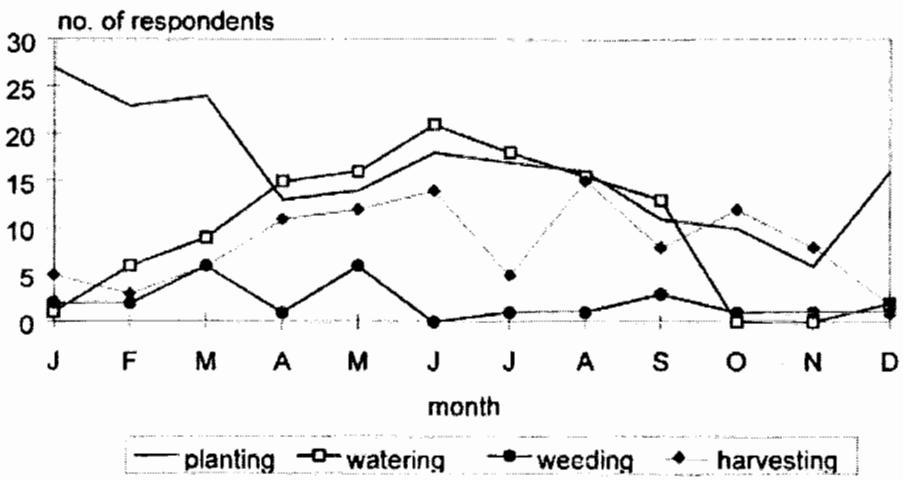

Figure 6: Labour requirements for gardening (Source: DRESCHER 1998)

Comparing labour demands of rain-fed cropping and of gardening, the analysis shows that little overlap of labour demands occurs. Therefore, homegardens need to be considered as an optimal complement to the rain-fed crops in the field as they do not clash with the labour peaks in rainfed cropping. For women, who rarely have other opportunities to generate income during the dry season, this is a viable income generating activity besides the contribution to household food security. Problems with storage and marketing are severe limitations to income generation. Surplus in production can not be sold immediately and get spoiled. To avoid losses of vegetables, some women sun-dry, for example, tomatoes or okra and sell it later in the season. Marketing constraints are also induced through the taguta strategy whereby every community is producing the same products at the same time. This might be optimal for pest control but results in flooded

markets at one time while little produce is available outside the core season. More diversly producing individual gardeners will certainly find their niches if there would be some support. Reducing labour intensive irrigation techniques could substantially contribute to the improvement of homegardening and a more efficient use of the small gardens.

4.3.3 Mixed cropping systems

Mixed cropping is the most common feature in individual homegardens. In supported community-based gardens this practice is greatly discouraged by the extension service and therefore rarely seen. The same applies to species diversity which is very limited in supported community gardens compared to individually owned gardens (Table 3).

According to farmers, intercropping systems are mainly done "by accident" or coincidence. Some of the seeds e.g. the melon type "machado" seemed to be introduced by cow dung into the gardens. Some farmers even apologised for this 'coincidental intercropping'. The fact that intercropping is actively discouraged by the extension service is obvious, although the "taguta-project" tries to promote at least intercropping of maize with beans and pumpkin in gardens. The rationale in discouraging intercropping is based on the assumption that the highest yields can only be achieved through mono-cropping. This might be true if high levels of external inputs are applied, but considering the level of management by the gardeners, it appears more promising to utilise a variety of crops and benefit from positive interactions in terms of soil fertility and pest control. Intercropping is also supported by farmers' strategies to combine the production of staples and vegetables in gardens

4.3.4 Dealing with Pests and Diseases

Pests do not seem to be a major problem in most of the gardens. Most farmers notice problems with aphids. Another pest, red spider mite, occurs particularly in tomatoes. Some farmers complain about crop damages caused by birds.

Lack of markets occasionally aggravates pest problems. The leaves of cabbage, rape etc. are not harvested at once, thus giving a long establishment time to the pests. But under normal circumstances, many pest individuals are removed from the garden site by harvesting of leaves for home consumption which contributes to the reduction of the total pest population.

"Traditional" pest control and natural biological antagonists

One farmer considered the planting of onion as a crop rotation system to control soil born diseases e.g. nematodes. The efficiency of this method could not be verified during fieldwork. The use of ash is very common in homegardens. Either it is applied pure or in water solution to reduce insect pests. Two farmers produced there own insecticide from

the fruits of *Parinaria curatellifolia* (Shona: muchacha). In total, 56 % of the farmers use some kind of "alternative" methods of plant protection, combined with modern methods.

Natural control of insect pests by biological antagonists are completely overlooked by the farmers. In spite of the heavy attack of aphids there is a very efficient natural control of this pest by natural antagonists (parasitic wasps). Good control of aphids in Brassicas was observed in more than 50 % ! of the gardens.

Generally it could be observed that the farmers were not very open with respect to traditional plant protection as this has previously been discouraged. This source of appropriate and low-cost technology, together with other management strategies (DRESCHER 1996), has so far been overlooked in the discussion of sustainability.

Chemical plant protection

All farmers use chemical methods of plant protection. In most of the gardens Dimethoat (Rogor) was used sporadically as an insecticide. The application is a major problem as sprayers are a rarely available or affordable. The simple methods of pesticide application are not very effective (e.g. by using tinctured towels on a stick).

More extension on alternative methods of plant protection is needed. Working together with farmers on the potential of biological antagonists could drastically reduce the use of chemical products in the gardens.

4.3.5 Soil fertility management in homegardens

Homegardens are being cropped continuously over a long period of time. Therefore good soil fertility management is crucial for the productivity of the garden site. Half of the gardeners use compost as fertilisers. Generally the quality of the compost is low because of lack of water, shade and proper organic matter. Thirty-five percent of the respondents use animal manure, mostly chicken manure. The use of cattle manure as a fertiliser was more common before the disastrous drought of 1991/92, when the majority of cattle died. Mineral fertilisers are used by more than 40% of the farmers, but more sporadically and such might not have a very big influence on long term soil fertility. In many cases ash is used as a fertiliser.

Soil analysis (Table 1) showed high phosphorus levels in all of the gardens and is most likely due to the input of manure. In contrast, nitrogen showed a clear deficiency in most gardens. According to ELWELL (1991) these soils of the seasonal tropics have to be valued with respect to their potential fertility, depending on soil texture. This means that a content of 1,1% of total organic C has to be considered as high-level content in sandy soils. The C/N ratio as indicator for humus quality, is 11 on average, which indicates good humus quality.

Table 1: Average results of soil analysis of 19 gardens in Zimbabwe.

Soil Parameters	pH (CaCl2)	P [mg/100g]	N [%]	C [%]	Mg [meq/100g]	K [meq/100g]	No. of samples [n]
Average of all Samples	6.1	5.6	0.1	1.1	1.6	0.2	19

The average values for nitrogen (1.5%) and organic-C (0.1%), are significantly higher than in the fields (N: 0.9%, C: 0.05%), whereby sandy soils and clay soils show considerable differences with respect to total organic carbon. Sandy soils only show an average of 1.1% organic-C, while clay soils show a value of 1.8%.

It is interesting to compare the garden soils with the soils of the neighbouring fields under rain-fed cropping (Table 2). For example, the garden site no. 14 is one part of the field which has been used for several years as a garden site. Organic C and nitrogen are more than double as high in the garden compared to the field. The better organic matter management in the small gardens is obvious.

Comparing the pH-values, total nitrogen and total organic-C, it is evident that in most of the gardens these values are far higher than in the fields. The very narrow C/N-values show the high quality of the humus in gardens and indicates the effect of a more intensive soil fertility management. The higher pH-values in the gardens are a result of using ash.

Table 2: Results of Soil Analysis of differently used sites in Masvingo Province, Zimbabwe

Site	Landuse and Soil Texture	pH ($CaCl_2$)	Organic-C [%]	Nitrogen [%]	C/N
S4	garden (clay)	5.8	0.8	0.08	10
S4	field	4.6	1.4	0.02	70
S5	garden (sand)	6.0	0.6	0.07	9
S5	field	4.8	0.6	0.03	20
S6	garden (sand)	6.0	1.2	0.12	10
S6	field	4.7	1.1	0.05	22
S8	garden (sand)	6.8	1.2	0.13	9
S8	field	5.0	0.6	0.03	20
S10	garden (clay)	7.1	2.9	0.4	7
S10	field	5.1	0.5	0.06	8
S11	garden (sand)	5.8	1.4	0.12	12
S11	field	4.5	0.3	0.08	4
S14	garden (clay)	5.8	1.9	0.10	19
S14	field	5.9	0.9	0.05	18
S15	garden (clay)	6.2	1.6	0.15	11
S15	field	4.2	1.7	0.08	21

These results show the efficiency of soil fertility management in gardens. Homegardens can be considered as models for sustainable management of soil fertility through "small circle recycling of organic matter". Nevertheless improvement of soil management strategies are needed with respect to water conservation (mulching) and more efficient technology of composting the often rare organic residues.

4.3.6 Species Diversity in Home Gardens

In total 27 species were recorded in the surveyed gardens. This does not include several wild fruit trees, which have not been counted. Besides vegetables and fruits, plants for many uses other that food consumption (e.g. like traditional medicine, pesticides) are planted in individual gardens.

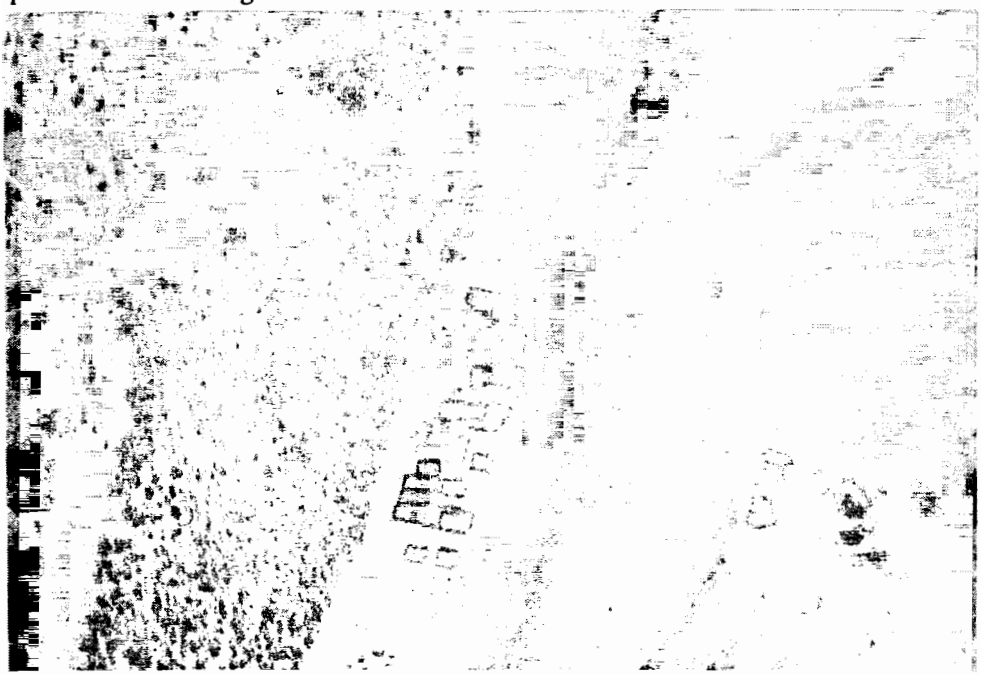

Photo 1: "Islands in the sea of monocultures". Individual home gardens in Masvingo Province (centre of the photo, bottom), above those new community gardens. (Aerial Photo: A. DRESCHER 1992)

In one individual garden more than 24 species were found on an area of about 20 m^2. All of them were purposely planted for a specific use. This highlights the value of individual homegardens for biodiversity conservation.

Among vegetables sweet potato, tomato, onion/shallots, pumpkin, several brassicas (e.g. rape, covo, tsunga) and cabbage were the most common species. Spinach and sunflower occurred in only one garden.

Table 3: Species observed in individual and supported community gardens in Southern Zimbabwe (Source: DRESCHER 1998)

Gardentype	ind	ind	Ind	ind	ind	ind	ind	ind	ind	ind	com	com	com	com
No.	01	03	04	05	06	07	08	09	12	14	02	10	11	13
Crops														
Maize				x	x	x	x			x				
Sweet Potato	x	x	x	x	x	x	x	x	x	x		x		
Tomato	x	x	x	x		x	x	x	x	x	x			x
Cabbage	x	x	x	x	x	x	x		x			x	x	x
Rape	x		x	x	x	x		x		x	x	x	x	x
Covo								x	x	x				
Tsunga		x				x								
Machado				x		x								
Squash		x	x	x			x	x		x			x	x
Sugarcane						x				x				
Sunflower										x				
Bean/Soybean							x		x	x				
Onion	x	x		x		x	x	x	x	x	x	x	x	
Spinach					x									
Morus alba		x				x	x							
Morus nigra		x												
Avocado							x							
Guava		x				x	x							
Banana		x								x				
Peach							x			x				
Papaya							x							
Mango		x					x	x						
Wild Fruit Trees							x			x				
Others		x						piri	piri					

Legend:

Ind. = Individual Garden, Comm. = Community Garden

Sunflower *(Helianthus annuus)*; Bean *(Vigna* sp.) ; Soybean *(Soya hispida)*; Spinach *(Spinacia oleracea)*; *Morus alba, Morus nigra* = Fruittrees; Peach *(Prunus persica)*; piri = Piri Piri *(Capsicum* sp.).

* *Covo* also called *tronchuda* belongs to the *Brassica sp.* It is used similar to rape, but growth larger (MORAN 1992).

** *Tsunga* also called *mustard rape* belongs also to the *Brassica sp.* (MORAN 1992).

*** *Machado* is the Shona name for a *Curcubitaceae* used to produce oil, which can replace groundnut oil in nutrition. The fruit itself is not edible, it looks like a water melon

According to Table 3 individual home gardens show a much higher number of species than community gardens. In the case of a low number of species in individual gardens mostly lack of water was the cause. In community gardens only an average of four species could be observed, with a maximum of 5 and a minimum of 3 species. This means that the observed community gardens carry only half of the species that could be found in individual gardens, which show an average of 8.6 species per garden.

Most of the gardens, except three community gardens, contain sweet potato (*Ipomoea batatas*). Homegardens are the nurseries for sweet potato which are transplanted into rain-fed fields during the rainy season. In community gardens, sweet potato are not in the set of crops recommended by the "taguta"-project as they are considered field crops. The 'taguta' package only includes 10 different vegetable species: okra, spinach, beans, rape, onion, pumpkin, tomato, carrot, cabbage and maize. Other crops like maize, okra, sweet potato, cucumber and pumpkin are recommended for cultivation in the rainy season only (ARDA-GTZ 1989). Therefore hardly any of these crops are found in community gardens, whereas most of the above mentioned crops are found in individual gardens.

Photo 2: Cultivation of Kovo (*Brassica sp.*) in an individual homegarden (Drescher1992)

In community gardens there were no trees at all, not even recently planted ones. For that reason, this garden type looks very artificial. The provision of shade is essential, especially during the dry hot season, to protect the soil from drying out. Reasons for lack of trees might be the communal land ownership as well as lack of promotion by the "taguta"-program.

Species diversity in individual gardens shows the potential of homegardens for *in situ* biodiversity conservation. This aspect has been neglected totally in the official programmes to support gardening. For example, the 'taguta' programme has been reduced to an economically viable vegetable production only. Farmers' objectives in gardening seem to be more complex and diverse as is indicated by the individual gardeners.

5 Conclusions and Recommendations

Home gardening plays an important role within the overall farming system. The fact that nearly every household has a home garden shows that gardening is considered important by farmers and influences labour, household food security and income generation. The contribution of individual gardens to biodiversity conservation in rural areas should not be underestimated. Support of home gardens can therefore be a substantial contribution to strengthening food security and biodiversity for ecological stability.

For support, techniques for improved water use efficiency show high potential. Such technologies are partly available elsewhere but need to be adapted to the local conditions through participatory research and technology development. Storage and marketing of home garden products would also need active support in terms of technology and logistics. The lack of market and demand for vegetables can sometimes be compensated by the alteration of original planting times especially in vlei areas, where the availability of water is guaranteed even though the use of these areas for gardening is forbidden by law.

Strategies for promoting home gardens need further discussion. An production-oriented approach based exclusively on economic viability is doubtful as it only covers one objective of farmers. The widespread use of individual home gardens and the tremendous efforts that people put into the establishment of such gardens, show the self initiative of the rural people in contributing to food security and other objectives they can achieve with homegardens. The establishment of supported community gardens and the activities of the extension service in this field are favourable although the aspect of sustainability is questionable. It should be discussed, whether preference should be given to the support of the already practised use of local resources (individual gardens, local vegetables, indigenous fruit trees) instead of the creation of artificial sites (supported community gardens). If communal gardens are supported, then they could be made more flexible and open in order to address farmers objectives much more. Technologies and integrated tree-crop systems for provision of shade and partly soil fertility which are used in individual gardens could be integrated in communal gardens.

The diversity of crops grown in home gardens contributes to ecological stability. In supported gardens, this diversity is greatly reduced. There is a need to change extension messages for supported gardens towards promotion of diversity and the use of indig-

enous and natural pesticides rather than chemicals

Soil fertility does not appear to be a major problem in home gardens. Management strategies used particularly in individual home gardens appear to lead to sustainability. For example extension for composting and mulching would contribute to maintain soil fertility on a self sustainable basis. Some of these strategies could be extended to the main fields where soil fertility management is a major problem.

The introduction of *Jatropha curcas* as a live fence for community gardens could probably be extended to individual gardens. Further, local species should be explored for the establishment of live fences. Fencing with dry branches of *Acacia* sp. is certainly contributing to the degradation of communal land. Above all, species diversity should not be restricted by offering a certain set of seeds and thus hampering peoples activities and initiatives.

For the overall sustainability, food security and ecological stability, home gardens should not be addressed in isolation. An integrated approach which aims to improve the livelihood security and takes into account the social exchange and buffer mechanisms should be aimed for. While home gardening contributes significantly to food security other measures like wild fruit gathering etc. are equally important and require support. The notion that fruit gathering is considered 'uncivilised' and 'backwards' by extensionists and some farmers is one of the attitudinal problems towards traditional practices which has to be dealt with. The value attributed to indigenous practices needs to change through positive examples

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