

CULTIVATION AND COMMERCIALISATION OF INDEGENOUS FRUIT TREES TO IMPROVE HOUSEHOLD FOOD SECURITY IN DRY REGIONS OF BUHERA ZIMBABWE

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ABSTRACT

The harvesting of indigenous fruit trees (IFTs) from the forests pre-dated settled agriculture and presents a valuable source of livelihood enhancement, food supplement, and cash income for the rural poor. Despite the importance of indigenous fruit trees there has been lack of will to promote their domestication and commercialisation. In Buhera, the marginalisation of IFTs has resulted in the collapse of traditional seed banks, reduced farm biodiversity, poorer diets, decreased food security, and declining cultural tradition. Deforestation and increasing population in the study area is causing IFTs to recede with serious environmental and socio-economic consequences on the availability of wild fruits, medicinal plants and other plant products. This has exposed the most vulnerable segment of the population, especially women, the aged, the poor and children to malnutrition and reduced income, as traditionally their livelihoods partly depend on these forest products. The research utilised both qualitative and quantitative research methodologies. The research noted that the contribution of IFTs to many farmers' livelihood is often not acknowledged in either local or national level poverty reduction strategies. Current agricultural data tend to focus on a narrow range of exotic fruits such as citrus, avocado, guava and mango. Existing information on IFTs are often not presented in income related terms used in policy debates, nor are they linked to simple policy recommendations. The role of IFTs could be enhanced if improved varieties and production, harvesting, and storage techniques could be made available to the rural poor. There is need for consideration in which it is possible to identify traditional fruits which are becoming marginalised; how much diversity occurs within them; and evaluate their productive and genetic potentials, postharvest requirements, processing and marketing potentials. A large amount of knowledge on the opportunities, challenges, knowledge gaps, and constraints of IFTs should be gathered and this information will assist to devise strategies necessary to meet food requirements of people through IFTs. Thus, increased emphasis should be placed on tree domestication strategies product development, commercialisation and marketing of agro-forestry tree products.

Keywords: Indigenous Fruit Trees, Edible Fruits, Species Diversity, Agro-Forestry, Zimbabwe

BACKGROUND OF THE STUDY

Buhera receives very hostile climatic conditions, characterised by high temperatures, variable, and poor soils. The area is characterised by lack of credit and financial support, lack of information about new technologies and farming practices, distorted land rights, policy disincentive to invest in dry regions and farmers are dispersed, isolated, rarely asked their views, vulnerable and powerless, frequently masked by others, selectively perceived and differential. The decrease in productivity has heightened the vulnerability of farmers, thereby resulting in increased household food insecurity. The food production capacity in Buhera is being pushed to the limit, with resulting over cultivation of fragile soils and loss of

soil quality. Periodic droughts aggravate the situation, but even in years of favourable rainfall, most families cannot produce enough food to feed themselves. The food situation in Buhera has brought to the fore the value of domesticating and commercialisation of IFTs as an alternative option.

The gathering of IFTs from the wild has a long history which started before settled agriculture and represents an important food supplement and cash income for rural people. There is glaring evidence that IFTs can contribute to household income. (Akinnifesi and others, 2007; Magasela and others, 2001; Gram, 2001), and is a major opportunity for asset building for small holder farmers. Emphasis on exotic crops such as sweet potatoes, groundnuts, beans and cassava has displaced the indigenous fruits. The marginalisation of IFTs in Buhera has resulted in the collapse of traditional seed bank, wanton cutting down of IFTs, reduced farm diversity, increase in poor diets, decreased food security, and declining cultural tradition. Surprisingly, the demand for indigenous fruits is increasing in neighbouring urban centres, such as Murambinda and Mutare town because indigenous small grains, pulses, fruits and leafy green vegetables are both tasty and nutritious. However, often these foods are not readily available.

Despite the importance of IFTs, the study area has not witnessed a deliberate attempt to enhance the role of IFTs through capacitating the rural poor with improved varieties and production, harvesting and storage techniques. In most villages, participatory domestication of IFTs has alienated the rural poor by adopting top-down approaches of conventional breeding and forestry. Poor methodology has caused earlier domestication programmes to fail to identify IFTs which are marginalised, diversity which occur within them, postharvest requirements, processing and marketing potential. Thus, without accumulating a large amount of knowledge on opportunities, challenges, knowledge gaps, and constraints of IFTs, the study area will continue to experience household food shortages. Unless concerted effort to explore opportunities to meet food requirements of the rural poor through IFTs, increase emphasis on tree domestication strategies, product development, and commercialisation and marketing, farmers will remain vulnerable to food insecurity, thereby derailing the future development efforts in Buhera.

THE STUDY AREA

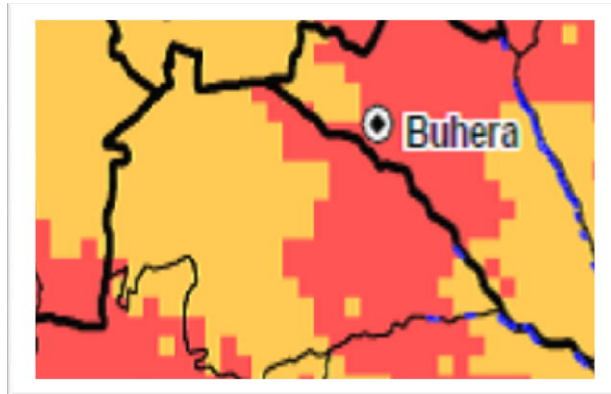
Buhera is situated on the southern part of the country. The area has a population of 69 948 and the area covers approximately 35 835 hectares (Central Statistic Office, 2011). The study area is in the agro ecological region 4, which receives 250-350 millimetres of yearly rainfall. The area's main habitats are agricultural lands and rangelands that are home to 130 villages. The farming systems in Buhera are dry-land; rain fed, and mixed crop livestock and pastoral as defined by Vogel and O'Brien (2006). Households rely on both off and on farm income and over the past decade, households' coping strategies have included diversifying livelihood strategies, intensifying agriculture, exiting agriculture and gathering of wild fruits.

A worsening crisis in the availability of food for the fast growing population is unfolding in ward 29 and the food capacity is being pushed to the limit, with resulting over cultivation of fragile soils and loss of soil quality. Periodic droughts have aggravated the situation, but even in years of favourable rainfall; most of the families cannot produce enough food to feed themselves. Thus, the prevailing climatic conditions have forced many households to rely on the exploitation of fruit trees as a coping strategy in times of drought and famine.

Land use activities in Buhera have caused a net loss of thousands of square kilometres of forests in the past 30 years and IFTs have not been spared. Forests in the study area are diminishing and it is difficult to find certain species in the forests. Many land use practices (such as fuel wood collection, forest grazing, and road expansion) have degraded forest ecosystem conditions, in term of availability and productivity of IFTs, stand structure and species composition. Thus,

land use activities are degrading the local environment in ways that ultimately undermine ecosystem services, human welfare, and long term sustainability of local societies. The following figure 1 show the boundaries of Buhera, where the study was carried out.

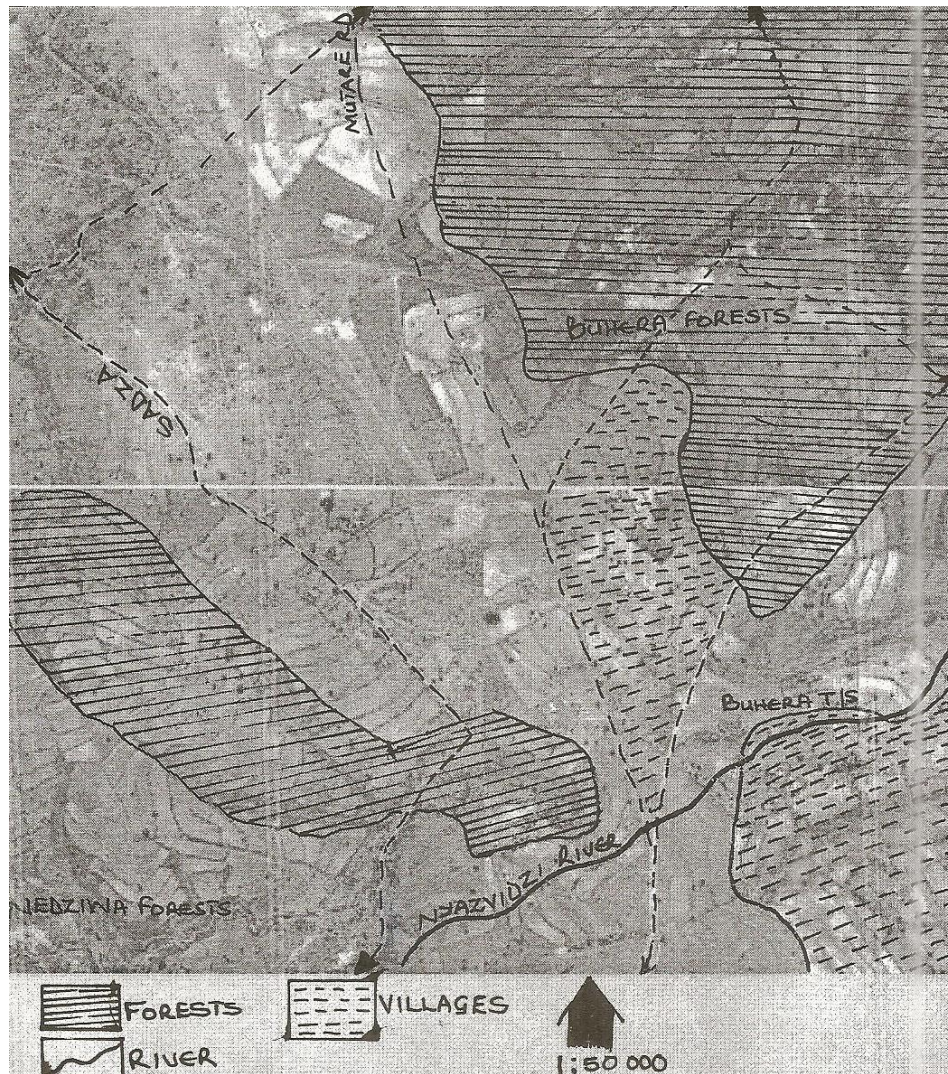
Figure 1: A Map Showing the Boundaries of Buhera Rural.



Source: Buhera Local Authority Operations Manual, (2011)

Habitat modification, road construction and increased proximity of people and livestock have modified the transmission of infectious diseases and often result in outbreaks. For instance, in 2011, increasing deforestation coincided with an upsurge of malaria and its vectors (Chifamba,. The combined effects of land use and excessive climatic events in Buhera have serious impacts,. Both on direct health outcomes (such as heat mortality, injuries, and fatalities) and on ecologically mediated diseases. For instance, hurricane Elina, which hit the study area in 1997, exhibited these characteristics: 97 people perished, widespread water and vector-borne diseases ensued, and 1 thousand people were left homeless (Chifamba and Mashavira, 2011). Most areas in the study area with extensive deforestation and limited IFTs suffered the greatest morbidity and mortality. The prevailing climatic conditions and unstable ecosystems make it difficult to reduce the negative environmental impact of land use while maintaining economic and social benefits. Thus, domestication and cultivation of IFTs is one viable option that can contribute to household food security. Figure 2 shows the forests and villages where the study was carried out.

Figure 2: Buhera Rural Area. The striped areas indicate the forests under study.



Source: Mukandawire (2010)

STATEMENT OF THE PROBLEM

The study area is experiencing acute food shortages and nutritional crisis compounded by widespread increase of diseases and environmental degradation. The area has experienced a change in forest cover resulting in the loss of biodiversity. Fewer trees mean less forest derived foods and medicine for local people in Buhera. The prevailing environmental conditions have caused households to rely more on natural resources for sustenance. The utilisation and commercialisation of IFTs is being overlooked by government, non-governmental organisations and local authorities because of a contemporary misconception that they do not play a major role in contributing to rural household food security. Without urgent prioritisation of domestication of IFTs and restocking of natural forests with IFTs, the local communities will remain deprived of valuable medicines, food and income which can be derived from sustainable exploitation on IFTs.

JUSTIFICATION

The research gathered information on the cultivation and commercialisation of indigenous fruit trees to improve household food security in Buhera. The information will assist to create awareness on the opportunities available to reduce vulnerability of household to food insecurity. The research provided recommendations for scaling up domestication and marketing of IFTs. The information is important to stakeholders in food security. These stakeholders include farmers, agricultural extension officers, Non- Governmental Organisations (NGOs) and district councils.

AIM AND OBJECTIVES

Aim

To assess the role of indigenous fruit trees in improving the livelihoods of resource poor farmers in Buhera

Specific Objectives

The following specific objectives guide discussion in this study: assessing the role of indigenous fruit trees in sustaining the livelihood of farmers in order to improve household food security; establishing emerging problems in the management and harvesting of IFTs with the overall intentions of reducing and reversing overexploitation of IFTs in order to sustain healthy communities; and generating recommendations for stakeholders which will assist in better understanding of and support for IFTs, resolving production and harvesting bottlenecks and promote broader use of conservation methods.

MATERIAL AND METHODS

Semi- structured questionnaires were administered to a total of 120 randomly selected respondents. The purpose was to capture socio-economic data and information on IFTs. The study area was stratified into ten administration units and respondents from each unit were selected systematically for the interview. The number of respondents selected from each unit ranged from 10-12, which was relative to the size of its population. Furthermore on farm walks were conducted in two units. Thirty farms (each estimated to be about 2 hectares) were randomly sampled and surveyed. The objective of the farm walk was to observe and record IFTs on the farms and access visually the proportion of farmland under IFTs cultivation. Furthermore focus group discussions were used in seven selected units and information obtained from group interviews was analysed at the spot by recording consensus conclusions from participants.

Statistical package for social sciences (SPSS) software programme was used to analyse the questionnaire responses. Shannon-Wiener's diversity index (HE) was used to analyse on-farm diversity of IFTs. The higher the value of the index, the more diverse the farms are in terms of IFTs and vice versa. The generated statistics tables and associated graphs were used in the interpretation of the results

RESEARCH FINDINGS

Age – Sex

The research utilized respondents from both sexes but females constituted the majority compared to their male counterparts (66% as compared to 34%). Their ages ranged slightly below 30 years to 60 years. Data was drawn from participants who are economically active and no respondent was in the retirement age group of a minor. The 51-60 years age group was the largest that constituted 36% and the 31- 40 years age group, was the second largest constituting 28%. The 41- 50 years age group constituted 23% and those below 30 years were 19 % of the total respondents. Thus, the

research targeted respondents who use natural resources and intervention programmes should also target these age groups. The table 1 below shows the age – sex profile of respondents.

Table 1: Age – Sex Profile of Respondents

Age group	Males	Females
Below 30 years	8	11
31-40	5	23
41-50	7	16
51-60	14	14
Total	34	66

Source: Survey, 2011

Academic Qualifications of Respondents

Respondents were drawn from varying educational background. It included those who had no formal education, those with elementary education, to holders of tertiary education. Generally, the research showed that a number of respondents had acquired formal education, as 86% of them acquired either vocational training after primary education or Zimbabwe junior certificate level of education; 49% had attained ordinary level. Only a few had no formal education (14%) which shows that the majority of respondents could read and write. However the majority of participants who were illiterate were females. These people can be trained to run intervention projects if the programs are planned well. Some of them who had tertiary education could be trained to take positions of responsibility so that they can lead community based programmes. These are the local resources that can be used by local people to develop local structures that could be the leading institutions in building local capacity. The outside assistance should be channelled to develop these resources so as to build local skills, thereby empowering them to govern local resources.

Marital Status of Respondents

Respondents were also drawn from varied marital status, which ranged from married, widowed, divorced, and single. The majority of respondents were married (48%) and the single constituted a significant percentage (27%), of which males were the majority (20%). The widowed and the divorced constituted a combined 25% (13% and 12% respectively). The study showed a general pattern between poverty and marital status in the study area. The proportion of people from households with income below the total consumption poverty line (TCPL) was highest among those not in unions such as widowed, singled and divorced. Thus, intervention programmes should capacitate these groups because exploitation of natural resources is a function of poverty. The higher the levels of poverty the more a household rely on natural environments for sustenance.

THE ROLE OF INDEGENOUS FRUIT TREES IN IMPROVING RURAL LIVELIHOODS IN BUHERA

The research revealed that IFTs provide food, fuel, fodder, herbs and income to farmers in Buhera. In the dry region of Buhera, where rainfall is low and its distribution erratic, the products obtained from IFTs have been critical elements in the livelihood and survival of many households, particularly in times of drought. The collection of leaves, fruits and twigs from forest have long been a method of assuring household subsistence during droughts and in resolving imbalances in the diets of rural households (Adger, 2000; Ballance and others, 2001; Akinnifesi and others, 2007). In

Buhera, droughts usually occur with shock or sudden changes in economic, social or climatic environments in which households exist and function. In dry years when maize and millet (*pennisetum glaucum*) crop failed, fruit trees such as *Boscia senegalensis* and *Ziziphuis Mauritania* were collected and pounded into flour that was used to prepare different kinds of food. Similarly, the leaves of *Maerua crassifolia*, a tree that remains green all year round, are often eaten to relieve hunger.

Participants also noted that wild fruits provide an important component of the diet, particularly for children. Wild fruits contribute to diet quality rather than quantity, another important component characteristic of some wild fruits is their storage capacity. In Buhera a 'hungry season proceeds the first rains in October, when the busiest time of fields preparation and planting normally begins. The fresh fruits of *Uapaca Kirkiana* contribute significantly to diet during this period; whilst the sale of fruits generates much needed cash for farm inputs and other household requirements. Although there is little information on the yields obtainable from wild fruits trees, it is probable that because they are highly adapted to variable climatic conditions and in particular drought, their fruits have an extremely important function in times of drought induced nutritional stress (Bishop, 1998, Campbell and others, 2002). Therefore, although yields may be low compared to exotic fruits, the ability of IFTs to withstand harsh conditions is of over-riding importance, and a major factor in their conservation and preservation by farmers.

The research noted that up to over 80 percent of farmers in the study area rely on traditional medicine for primary health care (Chifamba and Mashavira, 2011). The survey on the value of IFTs specifically for medicine showed that over 65 percent of farmers use IFTs for medicinal purposes. The tree parts which are usually used for medicinal purposes are usually the roots, leaves, fruits and the barks. The use of IFTs for medicine is widespread due to poor health services which are not often stocked with drugs. Traditional medicine is preferred as local farmers consider it to be cost effective and efficient (Campbell, 1996). The knowledge of use is passed through generations.

The research further noted that there is safety net dimension of ordinary daily use of IFTs as an integral aspect of direct household provisioning. Being able to collect and use wild fruits to meet daily needs for food, shelter, energy and medicines allows cash scarce households to use available little resources to secure other household requirements and attempt to accumulate the necessary asset base for a more secure livelihood (Dovie and others, 2002, Falconer, 1990). This includes education of children, investment in agricultural tools, and capital for income generation activities. Commercialisation of IFTs has been adopted as a safety net and livelihood option. The research revealed that a proportion of farmers selling IFTs are increasing and this practice has been driven by shortage of cash from farming due to changes in climate. In Buhera, a greater proportion of households were found to engage in selling of IFTs as a means of cash generation and income earned represents a greater contribution to total household income. Most farmers in the study area brew *Marula* beer for sale by fermenting the juice of *Sclerocarya birrea* and *caffra* fruits. It has been brewed by farmers whenever the species occur, and is associated with a number of cultural traditions and rituals. More importantly, the incomes comes at a time of the year when there is high demand for cash for school fees, books and uniforms, but when reserves are low following the Christmas holidays.

It is important to note that farmers in Buhera have managed to secure a livelihood for themselves, albeit marginal, with little support from Buhera District Authority. Despite hostile climatic conditions prevailing in the study area, which

render farming unprofitable, farmers have been able to look after their families. For this reason, it is fundamental not to underestimate the role of IFTs in easing poverty and providing additional options for income generation or in meeting specific cash needs such as school fees (Koziell and Saunders, 2001). The people involved in the harvesting, and selling of IFTs have an independent source of income, they have their pride and dignity in able to provide for themselves and their families, they have developed skills that commands the respect of others (such as brewing Marula beer), that perpetuates tradition and that can be applied in other areas of their lives. The challenge really is whether these activities can be made to contribute more and create more sustainable options for farmers in the study area.

EMERGING PROBLEMS IN THE MANAGEMENT AND UTILISATION OF IFTs

The research revealed that with respect to access, management and use rights, the Communal Land Tenure Act of 1982 vests all land authority and resources with the District councils, which in turn delegates authority to traditional leaders and Village Development Committees (VIDCO) and Ward Development Committees (WADCO), creating convoluted institutional framework. The extent to which these lower tier institutions have been able to dispense their functions is unclear (Magasela and others, 2001). They have been caught in the throes of conflict with other existing institutions at that level, wanting to assert their own authority over IFTs, especially the chiefs, headmen, and kraal-heads. In essence, VIDCOs and WADCOs are not legally constituted and they are not resource utilisation units nor do they correspond in any way to resource use patterns in their areas (Koziell and Saunders, 2001). The complicated access process, management and use rights, has often created a vacuum permitting a few daring individuals to be primary beneficiaries.

The study noted that exploitation of IFTs is affected by two common characteristics of common pool resources, which are excludability and subtractability. The first characteristic (difficult of exclusion) arises from several factors including the cost of parcelling or fencing IFTs and the cost of designing and enforcing property rights to control access to the resource. The second attribute (subtractability) has created rivalry between different users. The resource units (indigenous fruits) that one user extracts from a common pool resource (indigenous fruit trees) are not available to other users. Thus, each user is capable of subtracting from the benefits that others derive from indigenous fruit trees. Because of these characteristics, IFTs in the study area are subjected to over- exploitation and depletion (Hassan and Haveman, 1997) A broad challenge in the management of IFTs is how to co-ordinate use by individuals as population grows in order to prevent over-exploitation.

The absence of rules regarding the harvesting of IFTs is a constraint to sustainable usage. The study revealed that there are no norms, either community based or traditional, on harvesting of IFTs in the study area. In some villages, such as Chapwanya, IFTs are viewed as a common property. The free access and consequent exploitation of common resources such as IFTs has been termed by Hardin (1968) as the 'tragedy of the common'. This is due to the fact that unrestricted demand for a finite resources causes exploitation of the resource as each user's aim is to maximise individual benefits. This might be attributed to the fact that there are no incentives to act in a socially altruistic way (Hardin 1968). It is therefore prudent to come up with IFTs policies that will empower community groups to manage the IFTs in open areas.

The study further revealed that climatic, demographic and economic changes are threatening the existence and long term sustainability of IFTs in the study area. Although, Buhera has always experience wide variation in annual rainfall, available evidence indicates that rainfall has been consistently below the long term average every year from 1998-2011 (Chifamba and Mashavira, 2011). At the same time, the area has experienced a rapid population growth of about two percent per annum (Central Statistic Office, 2011). The combination of aridity, drought and population pressure has

resulted in substantial shift in land use and put pressure on forests. In the absence of sufficiently rapid and widespread technological changes, population growth and declining rainfall have led to the expansion of area under cultivation. Since 1990, the area farmed in Buhera has increased by thousands of hectares. This expansion has involved mainly the conversion of large areas of IFTs into cropland, with farmers overriding and ignoring the traditional use rights of other people to these IFTs.

Institutions regulating the utilization of IFTs lack inclusiveness and equity. Powerful stakeholders such as local leaders and war veterans have shaped institutions in their favour. Thus, institutions have been shaped by power relations and politics. Current formal institutions are being defined in top-down processes and do not take account of social structures and of existing traditional institutions within a specific context. Institutions have failed to organise, and include the marginalised, poor and less powerful stakeholders in an equitable way that govern the use of IFTs. These institutions are not credible in the eyes of the local people and ignore key stakeholders (Falconer, 1990). Therefore, these groups are not committed to compliance and conflict over control and use usually emerges.

Furthermore, the state has frequently undermined the capability of customary institutions and organisations to manage IFTs by transferring authority to government agencies and by imposing tight controls that conflict with traditional use patterns. This intervention is viewed as legitimate, and even necessary, to prevent the degradation of IFTs that would result if users were left to their own devices. However, this intervention has arisen from an insufficient understanding of the intricacies of customary institutions with their emphasis on differentiated access rights and the often subtle, but important, sanctions that are utilised to regulate harvesting and utilisation of indigenous fruits (Campbell, 1987; Gram, 2001).

The research also noted that resources such as IFTs are not privately owned or controlled, especially if they are not within the fields of households, hence they are susceptible to overexploitation because individual IFTs users gain the full benefits of using the resource but only bear a portion of the costs of overuse (Campbell and others, 1987). It has become difficult for traditional authority to control use or impact caused by actors. As population increase, pressure on IFTs has also increased and there is concern about the sustainability of IFTs. The research revealed that IFTs management systems tend to go through cycles of crisis and recovery and institutional renewal. Focus group discussions indicated that societies in Buhera are rarely, if ever, in balance with their IFTs, and commons institutions are rarely stable for long.

LESSONS LEARNED AND ISSUES FOR PROMOTING DOMESTICATION AND UTILISATION OF IFTs

The study indicated that new and effective institutional arrangements are needed to improve the long term management of IFTs in Buhera. A growing recognition of this need is evident in the region. In most countries, state property regimes in which government officials exercise exclusive decision making powers on use of indigenous fruits are being de-emphasised in favour of decentralised and participatory management of IFTs. In Zambia, it has taken the form of a legislative reform of land tenure and natural resources management policy conducted over a ten-year period from 1985 to 1994 (Cooks and Wiersum, 2003). In South Africa and Botswana, land –use planning based on the concept of ‘village territories’ has become very popular (Gram, 2001). In all cases, governments have sought to clarify tenure issues and reinforce the rights of local communities to manage their resources through granting of legal recognition and decision making authority. While experience with implementing these new programmes is still limited, they nevertheless present a

departure from the top- down, centralised resource management of the past. However, simply assigning authority to local users, without ascertaining the range of uses of IFTs, the diversity of interest among users and the capabilities of existing local institutions to take on additional responsibilities, will only complicate rather than solve problems associated with the appropriation and management of IFTs.

The study noted that the IFTs in the study area have multiple functions and are exploited by a wide variety of user groups. These heterogeneous users have different objectives, production strategies and priorities in the use of IFTs. In general, differing scales of exploitation, overlapping rights, and frequent contestation and negotiation of access rules characterise the use of IFTs. In this situation the devolution of power must be conducted cognisant of the spatial and temporal aspects of existing formal and informal usufruct rights (Cocks and Wiersum, 2003). Failure to recognise the rights of existing users will lead to the appropriation of key IFTs by powerful groups, which may eventually result in social conflicts or inefficient utilisation of the diverse set of IFTs.

More importantly, governance arrangements for complex, multiple-use IFTs need to recognise and make use of institutions and organisations available at different levels (Hassan, 1997; Falconer, 1990). Both local level and wider scale institutions have important roles to fulfil. Local level institutions have comparative advantage in dealing with issues related to use and preservation of IFTs at community level. Thus, detailed provisions for access, use and management of IFTs are best handled by mixed associations of local user groups. However, local associations vary widely in their organisational and management capabilities. Given that some potential local organisations may not form at all even when given formal authority, state institutions will need to provide support for the formation or strengthening of local organisations where they are non-existent or are weak (Shackleton, 2002).

Furthermore, institutions facilitating sustainable management of IFTs must fit with the characteristics and dynamics of human ecosystem interactions and meet socio-cultural and economic objectives. A comprehensive understanding of values, norms and the social structure of stakeholders and actors at play, and historical dynamics and trends, is crucial to assess the implications of institutional change and orient it towards sustainable development (Melnik and Bell, 1996). Bearing in mind the challenges in shaping the institutions for management of IFTs, it becomes clear that institutional regimes that are tailored specifically to the context will be more likely to succeed. This can better tackle over-exploitation of IFTs, foresee and prevent social conflicts, and detect barriers and potential to enhance livelihood of farmers in the study area.

Adoption of agro-forest is not a simple direct relationship of only technological characteristics; it is a matrix of several groups of factors that include household and community level factors, institutions, and the socio economic constraints and incentives that farmers face. As a result, rather than technology change alone, the development of IFTs in Buhera should place emphasis on the economics, the people, and the institutional and policy context under which farmers operate.

One way IFTs could be scaled up in the study area and mainstreamed into stakeholders' thinking is to proactively create awareness and raise the profile of the contribution of IFTS during policy debates and in development intervention programmes. IFTs should be treated as cultivatable crops instead of intangible forest products from the wild. This

realisation should assist in formulating regulations that will ensure that IFT exploitation, processing, commercialisation, and on farm cultivation do not result in socio-economic and environmental threats which can affect conservation of IFTs. The most fundamental way to scale up domestication and commercialisation of IFTs is to involve farmers in the entire process of participatory selection, propagation, nursery and tree establishment (Shackleton and others, 2000a; Dovie and others, 2002). Involvement of farmers will dramatically shorten the time required to produce and disseminate planting materials from centralised nurseries to farmers. It is vital to provide farmers in Buhera with high quality germplasm and to make it in a timely manner. Farmers in the study area can be organised and capacitated to produce high quality seed, and seedlings, as evidenced in small scale nursery enterprises managed by farmer groups in Peru (Akinnifesi and others, 2007).

Most of the fruits from IFTs in Buhera are still being harvested from the wild and traditional crop and fruits play a valuable role in supporting household food security. However, this role could be significantly enhanced if improved varieties, production, harvesting and storage techniques could be made available to the rural poor. Effort to prioritize , select and cultivate superior cultivars of IFTs using participatory strategy should emphasise on postharvest handling, product development, and prospecting of IFT products; application of farmer centred, market led approaches involving careful participatory selection of the right species and elite cultivars; development of low cost simple propagation techniques, and establishment of management practices in cooperation with farmers; and effort should be directed towards promoting market research, enterprise development and commercialisation of IFTs (Shackleton and Shackleton, 2000; Mander, 1998; Bishop, 1998).

Valuing the role of IFTs to the national economy is long overdue, and investment resources should be devoted to their development. Very few cases of IFTs have been documented in the study area. Cross collaboration and knowledge exchange need to be fostered among the villages where species are harvested, cultivated, used, or traded. Indicators and tools for assessing effects should be developed and investment in priority IFTs should be increased.

It is vital to note that the development and dissemination of IFT systems must continue to emphasise practices that require little capital and intermediate methods of scaling up improved processes and techniques to wider communities. Such low cost techniques include small scale nursery operations, negative propagation, use of organic manures and tree management. Furthermore, second- generation issues, such as the potential occurrence of new pests following the introduction of new trees, must be carefully investigated as IFTs are domesticated, and improved germplasm is selected. Concerted effort should be directed towards research and development of IFTs, and this will eventually assist in bringing about improvements in cultivation, scaling up, markets, and small scale enterprises in the study area. The improved performance of the markets for agro-forest tree products would stimulate growth in the rural economy. It is also important to note that adoption of agro-forestry is not a simple direct relationship of only technological characteristic; it is a matrix of several groups of factors that include household and community level factors, institutions, and the socio-economic constraints and incentives that farmers face (Magasela and others, 2001). As a result, rather than technology change alone, the development of IFTs should place a balanced emphasis on the economics, the people, and the institutional and policy context under which famers operate.

Emphasis should be placed on the identification, improvement, conservation and promotion of traditional crops and fruits as a means of improving their seed systems and markets. This will in the long run assist in making IFTs more attractive to farmers in the study area. Attention should be directed towards better understanding of indigenous fruits which are becoming marginalised and explore ways for their revitalisation. This will further assist farmers to explore opportunities for preservation and processing of indigenous fruits in a way that make them more attractive and easily consumed by the rural poor. There is also urgent need to explore opportunities for processing indigenous fruits in ways that make them more attractive and easily prepared by both urban and rural consumers, thereby strengthening their demand and markets. Breakthroughs in improving tree precocity will be a major incentive for growing IFTs and catalyse their adoption by farmers. To develop both the markets and processing fruit qualities, superior phenotypes growing in semi-domesticated environments or in the wild should be selected and managed as orchard crops. The soil and water requirements should not be seen as different from other known exotics such as guava and mangoes. Selection of early and late fruiting clones would help to extend the period of fruit availability.

Furthermore the research indicated that drought and changes in climate affect fruiting potential, cycles, and seasonal variability and cause severe reduction in fruit production and quality. Thus, stakeholders should examine how tree planting affects climate change, on one hand, and how trees can be affected by climate change on the other hand. This will guarantee that sufficient resilience is built into tree domestication effort. Again, measures to speed the multiplication of improved planting materials are necessary. They include the application of biotechnology and tissue culture techniques in germplasm multiplication. Investment needs for wider domestication and cultivation of IFTS should include establishment of facilities for micro-propagation centres for rapid multiplication of specialised propagules (Akinnifesi and others, 2007; Adger, 2000).

The study also noted that although there is slight appreciation of the importance of wild fruits, still little is known about their importance in sustaining households in periods of climatic, nutritional and financial stress. This means that higher social and economic values should be ascribed to the highly diverse environment supported by these IFTs. The association between agriculture and trees needs to be understood and supported, rather than ignoring the extensive local knowledge and technology development that exist in the communities.

The research further noted that stakeholders in Buhera should search for environmentally appealing, economically sufficient, and socially just and forward looking ways of increasing the food basket through research, extension and formulation of policies. It is paramount to note that improved domestication through, cultivation, utilisation and marketing of indigenous trees are ventures worth investigating and supporting by stakeholders and policy makers. Supportive policies can help to influence the direction of local programmes and projects in order to optimize their impact on food security. This will entail modifying existing institutional approaches and arrangements, especially the traditional focus on forestry training, such that efforts can address the task of improving household income and meeting food and nutritional security objectives through IFTs.

CONCLUSION

By emphasising on environmentally conscious strategies, farmers in Buhera can promote sustainable utilisation of indigenous fruit trees and effectively linking strategies to rural development. One way IFTs could be scaled up and

mainstreamed into local and other stakeholders' development agenda is through proactively creating awareness and raising the profile of the contribution of IFTs in sustaining rural livelihoods. Such activities will require a long term investment and an appraisal of policies governing land and tree tenure in the study area so that institutional constraints to tree planting can be minimized. Regulations should be enacted that will ensure that IFT exploitation, processing, commercialisation and farm cultivation does not pose a threat to their conservation. Regulations must be promulgated to ensure that intellectual property rights of poor farmers (such as farmer breeders and community custodians), are well protected. Since increasing concentration of carbon dioxide in the atmosphere is responsible for global warming, conservation of fruit trees, which photosynthesis, would help to check the global warming. Improved systematic data gathering is needed to update local knowledge on the contribution of IFTs to household, community, and livelihood strategy. This information is vital because it will enhance the potential opportunities for policy makers and development organisations to use IFTs as an intervention strategy for reducing poverty in rural areas. To conserve IFTs, communities in Buhera should judiciously use their indigenous knowledge systems and creativities while enhancing rural economic opportunities and sustainable livelihoods.

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