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PRODUCTION SYSTEMS OF TRADITIONAL LEAFY VEGETABLES: CHALLENGES FOR RESEARCH AND EXTENSION

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ABSTRACT

Traditional leafy vegetables (TLVs) have formed part of rural household food security strategies for generations. The role and production of TLVs (morogo/miroho/imifino) were determined in three culturally and agro-ecologically diverse rural communities in South Africa. A questionnaire survey was combined with qualitative methodologies to access the indigenous or local knowledge associated with the production of these crops. This paper focuses on factors that are unique to TLV production systems. TLV production is dominated by women farmers in an attempt to sustain immediate household food security. The cultural environment within which the women find themselves, their ability to access needed resources and the use of technical knowledge (predominantly local knowledge) are interlinked. Research and extension need to recognize the potential role of TLVs in food security strategies of households and the influence of the cultural environment on this female dominated production system. These factors play a significant role in the women's ability to produce and maintain household food security.

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1. INTRODUCTION

About 80% of the world food energy intake is supplied by 15 species of plants and animals. Many of these are not as nutritious as many of the other available plant and animal species. As these foods became more popular, they replaced many locally produced crops. This has led to the loss of these crops in many communities, as well as the knowledge that was associated with these plants. Decreasing food choices and inadequate prioritisation of balanced nutrition is causing a nutritional dilemma in many countries (Mnzava, 1997), including South Africa. Reliance on introduced crops that are growing at the limits of their distribution increases the risk of famine in times of drought, as they are more likely to fail during such periods than the traditional crops (FAO, 1988). Informal production systems have, and still are, regularly helping overcome disasters (Mooney, 1992).

In the last few decades great changes have taken place in South Africa. Urbanisation, migrant labour, greater access to health care and education, a greater effort to shift farmers from subsistence to cash cropping, increased population pressures and environmental degradation have led to changes in the socio-cultural and natural environments of many people. These changes have severely eroded the indigenous knowledge base (Hart & Vorster, 2007). In an effort to identify the potential of TLVs for food security in vulnerable groups (especially women and children), a situation analysis determining the use, conservation, production and sales of these crops in rural areas was needed to identify the way forward in an effort to use the locally adapted crops to help improve food security for these vulnerable groups. Following from this situational analysis, this paper looks at the production aspects of TLVs and the challenges they present to extension and research.

2. MATERIALS AND METHODS

Three villages representing different agro-ecological zones and ethnic dominance were sampled during the study:

- Arthurstone in Bushbuckridge (Mpumalanga). Sub-tropical conditions with a relatively high rainfall, hot summers and mild

winters. Five ethnic groups are found here, with the Shangaan or Tsonga being the largest ethnic group.

- Mars/Glenroy, two villages in Limpopo Province so close together that they were sampled as one. Hot summers with frost due to the cold winters. Low rainfall places this area in the arid to semi-arid category. The Pedi are the dominant ethnic group.

- Watershed, close to Ladysmith in KwaZulu-Natal at the foothills of the Drakensberg. A semi-arid area with hot summers and very cold winters (including snow). The Zulu are the dominant ethnic group.

Quantitative and qualitative methods were used to identify the factors that influence the production systems in the three villages. Participatory research techniques were used to better understand the area and to help compile a questionnaire. Focus group discussions, key informant interviews and observation formed part of the qualitative methods. Local inhabitants were trained to administer a questionnaire. Lack of a dependable sampling frame led to the use of systematic sampling of households during the questionnaire survey. The University of Pretoria's Statistical Department analysed data on the SAS version 8.2 statistical package. The dominant analysis of data was descriptive statistics.

3. RESULTS AND DISCUSSION

Several factors that influence household production systems of traditional leafy vegetables were identified. This paper highlights the key variants and results from the study.

3.1 Women, culture and traditional leafy vegetables

The utilisation and production of TLVs lie within the domain of the older women, because TLVs play an important role in the food security strategies of many rural households. Seen in combination with the high (54-55%) percentage of *de jure* female-headed households in all three villages (Vorster, 2008) and observed *de facto* female-headed households (men work away from home), this places an important challenge on research and extension. Dixon & Gulliver (2003) stress the role of women in many aspects of farming systems and their contribution to

the evolution of these systems. Aspects such as their role in production, processing, marketing of crops and their domestic responsibilities must not be ignored. Female-headed households have different priorities (domestic chores, child rearing, etc.) and resource (land access, labour, etc) constraints in comparison to male-headed households. Within the *de facto* female-headed household group, there are different types of decision-making processes, depending on the degree of absence and the influence the males have in decision making. These two factors are not correlated and vary considerably (Mettrick, 1997). Females from *de facto* households might be incorrectly labelled as risk averse or laggards when adoption of new technologies is evaluated. This might be due to the lengthy process of decision-making whether to adopt or not to adopt proposed practices and crop choices, since men visit their homes only from time to time. *De jure* households commonly have less access to resources, including adult labour, and are more vulnerable in times of crisis. These households tend to be more risk averse, therefore the introduction of high risk or high resource use technologies into these rural communities will marginalise many of these households.

Cultural beliefs and taboo's associated with agricultural activities varied between the villages and related ethnic groups (Table 1).

Table 1 Beliefs associated with agricultural activities in the three villages

Belief	Arthurstone N=71		Mars/Glenroy N=32		Watershed N=37	
	n	%	n	%	n	%
Beliefs associated with the female fertility cycle	63	89	6	19	12	33
Beliefs associated with death	*	*	15	47	6	16
Beliefs associated with the weather	0	0	17	53	0	0

* *Was reported by at least half of the participants at the group discussions, but was not quantified.*

Amongst the Shangaan (Arthurstone) cultural beliefs associated with agriculture seemed to be more important than with the Pedi (Mars/Glenroy) and the Zulu (Watershed). All three villages reported beliefs and taboos associated with the female fertility cycle (menstruation, pregnancy and lactating women). These beliefs and

taboos have critical effects on availability of labour resources, especially in female-headed households as women can not take part in any agricultural activities during these periods. Beliefs associated with the weather lead to temporary cessation of agricultural work. Females not working in the agricultural fields should not be perceived as 'spare' labour capacity, since many are often fulfilling non-agricultural chores to remain true to the ethnic prescriptions. The type of crop that can be grown by male or female is mainly influenced by cultural beliefs. For instance there is a belief that only women can plant bambara nuts. The Shangaan (15%) and Zulu (5%) villages reported gender sensitivity with regard to the type of crop that can be grown, though these beliefs might be restricted to the older generation.

These cultural practices must be taken into account when agricultural support services are planned and offered. In an effort to assist female-headed households, research and extension should be developing technologies specifically with women and their specific cultural environment in mind. Since the farmers involved with TLV production are relatively old, cultural beliefs, such as gender sensitivity should be taken into consideration when extension and research promote the production of certain TLVs. Irrespective of the crops it is important that cultural beliefs and practices are identified and understood prior to any development or transfer of technology as such technologies and practices may be mutually exclusive to the local culture.

3.2 Technical knowledge, species diversity and production of traditional leafy vegetables

Differences between villages regarding the preferences of TLVs exist due to the availability of certain uncultivated and semi-cultivated TLVs. Climate and indigenous knowledge (IK) associated with TLVs are critical factors influencing consumption preferences. Although a specific TLV may grow in all three villages, it is not necessarily consumed in all three villages, because of the cultural beliefs and practises associated with the utilisation of the TLV. Crops such as nkaka (*Momordica balsamina*) have become part of the Pedi diet through a process called aculturisation, where they were introduced to the crop by the Shangaan. Biodiversity, IK and taste preferences of consumers in an area determine the percentage inclusion of a specific TLV in the daily diet of a rural household. Earlier studies on TLV utilisation showed that

the nutritious amaranth and cleome were fed to the ill and vulnerable groups to improve health and strengthen the body (Fox & Norwood-Young 1982). Although all villagers perceived TLVs to be nutritious, these plants were not actively used amongst vulnerable groups. The loss of associated IK was identified as a possible cause for this.

Various crops are grown in the three villages (Table 2) depending on the biophysical (soil, climate and availability of water) conditions. In Arthurstone and Watershed, where water is available for irrigation, a variety of traditional and exotic vegetables are grown. In Mars/Glenroy water is scarce and traditional vegetables form the basis of home food garden production.

Table 2: Five most important cultivated crops listed by respondents in each of the three villages

Crop	Arthurstone (N=80)		Mars/Glenroy (N=80)		Watershed (N=80)	
	n	%	n	%	n	%
Maize	77	96	80	100	71	89
Pumpkin	74	93	76	95	71	89
Spinach	60	75	0	0	64	80
Tomato	0	0	0	0	62	78
Onion	0	0	0	0	46	58
Cowpea	77	96	54	68	0	0
Momordica balsamina	45	56	0	0	0	0
Calabash	0	0	41	51	0	0
Watermelon	0	0	33	41	0	0

Note: ***T****his was an open question and the percentages reflect the respondents who chose the crop as one of their five most important.*

The softer, herbaceous TLVs (amaranth, purslane, cleome, blackjack, corchorus and nightshade) were generally not cultivated, as they appear readily after the first summer rains. The importance of uncultivated TLVs, specifically due to the fact that they do not affect family resources, must not be ignored. Mars/Glenroy's TLV cropping system was mainly based on maize and several pumpkin types that were more adapted to the dry climate. Maize, pumpkin and cultivated TLVs like spinach and cowpeas, as well as tomatoes characterised TLV

cropping systems in Arthurstone and Watershed where water was more readily available.

The prevailing IK and socio-economic conditions in a village determined the reasons for consuming TLVs, which parts of TLVs (seed, stalks, leaves, growth points, flowers and fruit) were harvested and at which specific growth stage. Multi-purpose crops (i.e. pumpkin, cowpea) that provide more than one product, as determined by the associated IK, are important for women who have to provide food for the household (Hart & Vorster 2006). Harvesting practices of multipurpose crops clearly showed the villagers' awareness of the detrimental effect of over-harvesting of one product (i.e. leaves) on the subsequent product (i.e. seed). Knowledge about crop interactions (i.e. cowpea and pumpkin are never planted together as they affect each other's growth) optimise yields and land use. Pumpkin and cowpea were often intercropped with maize, therefore production practices were linked with the production and management practices of maize. This was also true for herbaceous TLVs that grew within these maize fields.

During times of food shortages, unsustainable harvesting practices prevailed as seedlings were commonly being harvested. The lack of sustainable harvesting mechanisms in villages, combined with declining plant populations, emphasise the need for the development and sustaining of seed systems of uncultivated TLVs. Seed systems, use of plants and biodiversity in an area are interrelated. Nazarea (1998) and Balick and Cox (1996) found that as soon as plants were not used in an area anymore, they became scarce and production became extinct in such areas. Consequently, the IK associated with the use of these plants disappeared.

Declining TLV populations in Arthurstone (66%), Mars/Glenroy (19%) and Watershed 18%) were reported. The possible reasons for the decline in the use of TLVs in the three villages are stated in Table 3.

In general, the consumption of TLVs declined in favour of exotic vegetables promoted by research and extension, and exposure through increased urbanisation. Young people generally perceived TLVs as a 'poverty crop' and this was identified as one of the main reasons for declining utilisation amongst younger people in Mars /Glenroy and

Watershed. The lack of popularity amongst the youth has led to a decline in IK associated with the production and consumption of TLVs. In Arthurstone relatively poor weather conditions, low soil fertility and lack of seed systems restricted the availability of TLVs, and, therefore, consumption of these plants.

Table 3: Reasons listed by respondents for the decline in the use of traditional leafy vegetables in the three villages

Reasons for decline	Arthurstone (N=78)		Mars/Glenroy (N=80)		Watershed (N=61)	
	n	%	n	%	n	%
Drought	74	94.9	2	2.5	6	9.8
Thunderstorms wash away seed	75	96.2	1	1.3	0	0
Erosion	17	21.8	0	0	0	0
Number of people who use TLVs has decreased	0	0	38	47.5	35	57.4

A 'seed system' is "an interrelated set of components including breeding, management, replacement and distribution of seed" (Thiele 1999). A local seed system tends to be integrated and locally organized. Farmers themselves produce, disseminate and access seed from their own harvest, from friends, neighbours, relatives and through local markets. Local seed systems are guided by the available local knowledge and standards, as well as by local social structures. In many areas, especially marginalised areas, these seed systems provide most of the seed used by small farmers (Sperling & Cooper 2003). Uncultivated crops usually self-seed (distribute their own seed) and are very vulnerable to external forces (e.g. erosion, severe periods of drought and flash floods) that can limit the number of plants that reach seed formation. These plants can be severely affected by over-harvesting and poor growing conditions due to drought or soil erosion. Promoting seed systems and broadcasting of uncultivated TLV seed can increase plant populations and make the difference between enough to store for winter or just having enough for summer. Complex, multiple TLV seed systems were found to exist in the three villages. The seed systems for cultivated TLVs were well established while those for uncultivated TLVs were unstructured and, therefore, difficult to analyse. Elderly

women have the knowledge to preserve seed quality when it is stored, though some loss of IK in this practice was evident. Selection of a healthy plant or fruit for seed collection was, however, only found for pumpkin in Watershed. In Arthurstone spreading of scarce TLV seed was not practised by the younger generation. The youth, due to their disinterest in agriculture and 'poverty foods', are not exchanging knowledge on how to preserve local seed systems with the older, more knowledgeable women, therefore leading to a further loss in IK.

Due to the many useful characteristics, including drought tolerance, of many of these plants, the loss of these gene pools, especially in the context of the global warming, could lead to loss of agricultural potential in future crops. Bio-prospecting by global companies has incorporated many genes from local, farmer-kept varieties into currently successful hybrids, when these genes had been lost during the mainly yield oriented breeding, which dominated breeding by public and private research organizations for a few decades. In an effort to help farmers meet the demands they will face with climate change, extension and research need to strengthen a community's sustainability by preserving its biodiversity. The re-introduction of seed custodians and the importance of this must be addressed in an effort to prevent further loss of crop species.

4. CONCLUSIONS

The important role of TLVs in addressing food and nutrient household food security is not fully recognised by extension and research. Food security has spatial and temporal dimensions. The spatial dimension is commonly addressed when farmers' are encouraged to use exotic vegetables, many of which are poorly adapted to the marginal production conditions encountered by many subsistence farmers. With the frequency of dry spells, changing climatic conditions and marginal soils experienced by many poor, TLVs could play an important role in addressing temporal (specific time frame) household food security. This has an important role in addressing both chronic and transitory food security situations. The utilisation of TLVs was influenced by the agro-ecological zones, cultivation practices and the associated level of IK still available in a village. As Hira and Putu (2007) suggest, the local crops and food systems need to be studied as they might provide solutions to problems faced by rural communities.

The cropping systems followed in each community should be thoroughly understood by researchers and extension workers. Ignoring this will lead to the development and promotion of inappropriate and unsustainable technologies. In this regard it is important that gender roles and patterns, along with cultural practices, are clearly understood. Female domination of TLV production and general agricultural practices are often not considered and given importance, leading to the targeting of the wrong groups or working in an insensitive manner (e.g. overlooking taboos) that does not take the multiple roles and tasks of women into account. Agricultural support services should take the socio-economic and cultural circumstances of both women and men into consideration when organising farmer meetings and training sessions. Technologies developed and promoted should incorporate aspects such as labour saving and low resource (human, financial, natural and physical) use. Low risk technologies are extremely important in the group of *de jure* female-headed households who are very vulnerable in times of crisis.

The integration of science with IK could help research, extension and farmers to effectively improve cropping systems together, within the reality of household possibilities and potential. This would also address some of Agenda 21's recommendations on lessening the impact on the environment. In many cases participatory technology development actions will ensure effective results that farmers will be able to apply within their farming systems. Promoting cultivation of TLVs might fail in some areas where labour and land access is low, as successful cultivation requires proper management, access to land and incurs costs. Farmers' reluctance to mention secondary crops (pumpkin, cowpea, TLVs) during discussions with agricultural support services need to be taken into account and they should be specifically incorporated into research methodology when studying intercropping systems. Their continued presence is a reality in many smallholder farming systems and cannot be ignored.

Further research should also identify plants that were lost or became scarce. The associated IK of these plants should be documented in an effort to prevent the loss of biodiversity. Sharing of knowledge between community members should be included in the communication strategy implemented by agricultural support services. Extension can, through close collaboration with research and effective communication with the

farmer, impact on the food security strategies of communities by recognising these crops and the role they play in household livelihoods, and incorporating this knowledge into their extension strategies.

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