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Local Innovations Using Traditional Vegetables to Improve Soil Quality

African traditional or indigenous vegetables are becoming increasingly known for their importance in providing food security to millions of Africans in rural and urban areas (Rubaihayo 2002). Some have been attributed with having medicinal properties. However, little is known about their other properties and their importance in African agriculture. In June 2002 a team of ten Ugandan and South African researchers began research, using RRA and PRA tools, on the use of indigenous knowledge in producing and consuming traditional vegetables in eight parishes in Uganda. During the fieldwork, researchers noted that some farmers actively innovate using the local resources at their disposal in attempts to improve their crop production. Often these innovations were used to compensate for the lack of modern agricultural inputs, such as fertilisers and pesticides. Two examples of local innovations, by farmers in a parish situated some 50 km west of Kampala, that attempt to improve soil quality by using traditional vegetables are discussed here.

Commercialisation

Prior to the 1970s, parish farmers predominantly produced traditional vegetable crops for home consumption. At that time local farmers did not produce exotic vegetables, such as cabbages, carrots, lettuce, etc. which were produced on plantations and mainly consumed by the European and Asian populations, or exported. The vegetables that the rural African population produced for consumption as local foodstuff

were considered traditional vegetables for at least two reasons.

1. While some of these plants were cropped, others were readily available and harvested in their natural habitat, lending some support to the idea of their “indigeneness”, although strictly speaking, many are found worldwide.
2. Many of these plants had been consumed for countless generations, signifying their importance in local culture. In some instances, the fruit, leaves and roots of a plant were consumed.

During the colonial period, farmers had started producing crops such as coffee, oranges and pineapples for commercial purposes. Parish farmers reported that the Amin regime encouraged African farmers to produce exotic vegetables for commercial purposes. This practice still continues and farmers indicated on a trend-line that the cultivation of exotic vegetables as a cash crop is con-

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tinually increasing, with more and more land allocated for their cultivation.

Since independence in 1962, the number of people living in Kampala and other urban centres has increased. Most of these new urban residents came from the rural areas. Their presence brought about a demand for traditional vegetables and resulted in a number of popular varieties being grown as cash crops for the urban markets. This demand was directly related to migrants' preferences and the lower prices charged for traditional vegetables in comparison to prices charged for exotic vegetables. Rubaihayo (2002) indicates that these vegetables are also in demand as a result of their ability to supply consumers with significant amounts of vitamin A, B and C, proteins and minerals that are needed for normal growth. This is vitally important as most of these traditional vegetables are grown by poor rural households or are cheaper to purchase in urban areas in comparison to exotic vegetables, making them an important source of nutrition for the most vulnerable members of the population; the rural and urban poor.

In this particular parish, the farmers grew the traditional vegetables Nakati (*Solanum aethiopicum*), Ebugga (*Amaranthus dubius*), Entula (*Solanum aethiopicum gilo*) and Ejobyoy (*Cleome gynandra*) as cash-crops. A host of other traditional vegetables were grown for household consumption; at least twenty types. Along with exotic vegetables, the proportion of land allocated for traditional vegetables that have a commercial value has steadily increased since the 1970s, although exotic vegetables with their premium prices have greater land allotment.

Minimal resources

Despite selling their exotic and traditional vegetable cash-crops at the market in Kampala, most farmers in the parish indicated that they did not have enough money for agro-chemical inputs, such as fertiliser, pesticides, herbicides and fungicides. The bulk of their income was spent on education, health services, groceries and other commodities that were not produced in the parish. The few farmers who could afford to purchase and apply agro-chemical inputs did so sparingly and predominantly for exotic vegetables. This resulted in farmers having to rely on local resources to perform similar functions as the agro-chemical inputs. However, manure, which is often used as a substitute for chemical fertilizer, was

scarce. The political turmoil and subsequent conflicts that occurred in Uganda during the three decades after independence had decimated the livestock herds in this parish. Farmers reported that although they were busy rebuilding their herds, the numbers of livestock were extremely small. Consequently, manure was scarce and a more readily available local alternative was required.

The farmers indicated that besides using manure, the periodic resting of soil was a good strategy to follow to maintain soil quality and to restore nutrients. However, they seldom practised this method because of their intensive farming systems and the need to maximise the use of their small pieces of land (typically between one and two hectares). After planting exotic vegetables in the 1970s, a number of farmers had investigated ways to improve the soil without involving any resting period. During the fieldwork in this parish, local farmers indicated that the cultivation of traditional vegetables provided benefits to local soils.

Soil improvement innovations

Through a process of experimentation, farmers found that by reworking organic plant matter into the soil after harvest, they improved the nutrient content of the soil, demonstrated by the fact that vegetable crops planted in soil in which organic matter had been reworked had a higher yield than the same crops planted in soil in which no organic matter had been reworked. After further experimentation, the farmers concluded that when the organic matter of traditional vegetable crops was reworked into the soil, the subsequent yield was greater than when organic matter from exotic vegetables or other crops was worked into the soil. However, farmers realised that some harvesting practices (the uprooting of the entire plant, as opposed to the picking of the fruit and leaves) reduced the availability of sufficient organic matter so they needed an alternative solution for some crops.

Farmers pointed out that they rotated various exotic vegetable crops with traditional vegetable crops because they observed that the former crops grew better when this was done. Experimenting with crop rotation led farmers to believe that this activity provided benefits to the soil and improved the yields of crops planted in such a fashion, in comparison to when crops were not rotated. Further experimentation led the farmers to conclude that by rotating specific

exotic vegetable crops with specific traditional vegetable crops, the result was that the exotic vegetable crops grew better and produced a higher yield in comparison to when they were planted in soil that had not previously hosted the specific traditional vegetables. Local farmers gave the example of rotating green beans (*Phaseolus vulgaris*), Ebugga (*Amaranthus dubius*), and tomatoes (*Lycopersicon lycopersicon*) in this order because the Ebugga seemed to add beneficial properties to the soil that made the other two crops grow better. Farmers believed that Ebugga neutralised the soil when it was planted after the green beans, thereby preparing the soil for the tomatoes. They pointed out that some exotic and traditional vegetables extracted nutrients from the soil, which are essential for the continued optimal growth of these crops. The rotation of specific traditional and exotic vegetables seemed to replace lost nutrients, resulting in good yields in comparison to when no such rotation pattern was practised. In some cases, the exotic and traditional vegetables aid one another's mutual development and optimal growth.

Sharing innovations

Parish farmers pointed out that they had no formal network or farmers' association and therefore had no formal means of sharing agricultural information. However, they agreed that agricultural information, including innovations such as those described above, was shared informally. Typically, a farmer would share information with a neighbour, family members or friends who would in turn share this with their neighbours, family members and friends. The presence of an extension officer in the parish, who occasionally convened meetings with farmers, provided them with an opportunity to share information. Some farmers indicated that they had shared information with farmers from other parishes and districts when they met at the Kampala market. The farmers who attended the workshops convened for the purpose of this study indicated that they were all aware of the benefits of the two methods of improving soil quality. Women residents were intrinsically involved in agriculture, usually supplying most of the labour. They reported that they often shared agricultural information during meetings with other women who belonged to the same social groups or clubs.

Some lessons

A few significant lessons can be drawn from the farmers' experiments to improve their soil quality:

- Traditional vegetables are an important resource in promoting food security and also in maintaining soil quality ensuring that agriculture can continue to contribute towards food security;
- By means of experimentation farmers are able to identify important properties of both traditional and exotic vegetables that make combined production mutually beneficial, while improving soil quality;
- Often-expensive modern agricultural inputs do not prevent farmers from farming effectively and producing marketable crops, in fact it encourages them to innovate using local resources;
- Farmers continually innovate to solve problems. In this case farmers could improve the soil by ploughing in organic matter but when organic matter was scarce an alternative method, crop rotation, was identified through means of experimentation.
- While farmers did not have any formal networks for sharing knowledge, exchanges between friends, neighbours and family seem to be effective, as those farmers who attended the workshops indicated their awareness and use of these and other practices.

Future steps

Given the focus of this study the researchers were unable to work with the farmers over an extended period of time in order to scientifically verify the actual ability of the identified crops to do what the farmers claimed. With regard to the crop rotation system described previously, *amaranthus sp.* is known to have some allelopathic effects on other crops whereby its presence in the soil has a direct effect on the soil nutrients and thus on the crops planted in the succeeding season; depending on the crop, these effects can be positive or negative. *Amaranthus sp.* are also known to suppress root-knot nematode populations (a major pest for tomatoes) in the soil. It is clear that farmers observed the effects of the different plants on one another, but what is not clear is what is actually happening in scientific terms – are the crops acting as a fertilizer or a pesticide (biofumigation)? Given that most of these traditional vegetable crops are grown in many

other parts of Uganda (Rubaihayo *et al.*, 2003) and also in a number of countries in sub-Saharan Africa (Chweya and Eyzaguirre, 1999) such a verification process is necessary so that, if warranted, the results can be replicated in these areas, if local farmers are not already using these techniques.

Parish residents pointed out that agricultural extension services only reached them during the mid-1990s and that parish farmers had developed and still continued to develop a number of strategies to improve their cultivation of traditional and exotic vegetables. These and other innovations developed by local residents need to be identified and their usefulness verified. Researchers can then consider how they can collaborate with farmers to improve on these local innovations. However, local innovations should not be regarded merely as parts of a stock of knowledge that can be extracted and simply moved to another site or transferred to another group of farmers. The broader study indicated that the use of many vegetables and the manner in which they were produced involved various rituals and social taboos. Ignorance of these could make the innovations impractical when they are exchanged or “improved” upon by outside agents.

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