

Conserve and screen premium value indigenous plant biodiversity and products on smallholder farming systems of Lake Victoria Basin in East Africa

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Abstract

Indigenous plants (IPs) particularly African Indigenous Vegetables (AIVs) have been neglected in East Africa despite their food and nutritional value. This project was therefore initiated to promote cultivation and conservation of AIVs. The specific project objectives were to: 1) enhance smallholders' farmers' capacity in Jinja (Uganda) and Vihiga (Kenya) toward a premium-value driven (PVD) conservation and utilisation of indigenous vegetables relative to selected exotic vegetables; and (2) assess the extent to which a PVD production unit (referred to as a Premium Influenced Land Use unit or 'PILAU' structure) can entrench a cultivation niche of indigenous vegetables. A survey was undertaken to assess the on-farm smallholder producers' perception of the innovation in relation to the market potential and/or value of the specially produced vegetables, and their indigenous knowledge. In Jinja, farmers selected two exotic vegetables *Coriandrum sativum*, and *Spinacia oleracea* L., and three indigenous species- *Cleome gyandra*, (saga, eiyoby/ejobyo), *Amaranthus dubius* (dodo) and *Solanum scarbrum* (black night shade). In Vihiga, *Solanum melongenum* (egg plant) and *Capsicum annuum* (sweet pepper) were the exotic inclusions while *Cleome gyandra*, (saga/ejobyo), *Solanum scarbrum* (black night shade) and *Amaranthus caryophyllales* (livogoi/grain amaranth) were the indigenous species. The need for both gender participation and involvement in construction, maintenance and management of the PILAUs was noted. Findings of the ongoing two graduate students research are presented separately. Generally the following are the lessons learnt: (1) Farmers identified positions for the placement of PILAU gardens in non-test crops competing for space; and (2) The fixed PILAU gardens appeared to prompt a re-use interest in planning a next crop as a way of increasing a cropping intensity (CI).

Key words: Exotic, indigenous, Premium Influenced Land Use, smallholder farmer, vegetable

Résumé

Les plantes indigènes (PI), notamment les légumes indigènes africains (AIVS) ont été négligés en Afrique, en dépit de leur valeur alimentaire et nutritionnelle. Ce projet a donc été lancé pour promouvoir la culture et la conservation des AIVS. Les objectifs spécifiques du projet étaient les suivants: 1) renforcer la capacité des petits exploitants «agriculteurs» à Jinja (Ouganda) et Vihiga (Kenya) vers une meilleure valeur entraînée (PVD), la conservation et l'utilisation des légumes indigènes relatifs à certains légumes exotiques, et (2) évaluer la mesure dans laquelle une unité de production PVD (référence à une Meilleure Unité de l'utilisation de terres préparées ou la structure « PILAU ») peut enraciner une culture de niche des légumes indigènes. Une enquête a été menée afin d'évaluer la perception qu'ont les petits producteurs à la ferme de l'innovation en ce qui concerne le potentiel du marché et / ou la valeur des légumes spécialement produits, et leurs connaissances autochtones. A Jinja, les agriculteurs ont sélectionné deux légumes exotiques *Coriandrum sativum* et *Spinacia oleracea* L., et trois espèces indigènes *Cleome gyandra*, (saga, eiyoby / ejobyo), *Amaranthus dubius* (dodo) et *Solanum scarbrum* (« black night shade »). En Vihiga, *Solanum melongenum* (aubergine) et *Capsicum annuum* (poivron), sont les inclusions exotiques tandis que *Cleomegyandra*, (saga / ejobyo), *Solanum scarbrum* (« black night shade ») et *Amaranthus caryophyllales* (livogoi / amarante) étaient les espèces indigènes. La nécessité d'une participation et implication de deux genres dans la construction, l'entretien et la gestion des « PILAU » a été noté. Les résultats de deux projets de recherche en cours des étudiants diplômés sont présentés séparément. En général, ce qui suit, ce sont les leçons apprises: (1) Les agriculteurs ont identifié les positions pour la mise en place de jardins PILAU en non-test cultures concurrentes pour l'espace, et (2) Les jardins fixe PILAU semblaient susciter un intérêt de réutilisation dans la planification d'une prochaine récolte comme un moyen d'augmenter une intensité culturelle (CI).

Mots clés: exotique, indigène, meilleure utilisation des terres préparées, des petits exploitants agricoles, végétales

Background

Indigenous plants (IPs) are important in the agricultural sector in East Africa. IPs particularly African Indigenous Vegetables (AIVs) are unfortunately accorded 'low value' status due to small acreages, productions and insignificant marketing. Thus IPs have gradually been replaced by market-driven crops (Babu,

2000). Loss of IPs is also in part attributed to farmer land use practices which emphasize utilization rather than conservation since seed of farmer preferred plants can always be acquired from elsewhere. AIVs provide vitamins, are a source of medicines and contribute towards food security. Therefore, mainstreaming indigenous vegetables into national programmes is critical (Njugi *et al.*, 2006).

This project therefore focusses on promoting cultivation of two vegetable categories, i.e., AIVs and the exotics, which project farmers are already producing. The overall project objective was to enhance smallholder farmers' capacity, in target Lake Victoria Basin sites, to conserve the indigenous plants, and provide a basis for policy formulation on promoting those with a potential market value. The specific project objectives were to: 1) enhance smallholders' farmers' capacity in Jinja (Uganda) and Vihiga (Kenya) toward a premium-value driven (PVD) conservation and utilisation of indigenous vegetables relative to selected exotic vegetables; and (2) assess the extent to which a PVD production unit (referred to as a Premium Influenced Land Use unit or 'PILAU' structure) can entrench a cultivation niche of indigenous vegetables. The anticipated project outcome is to establish vegetable value chains involving farmers who have contributed to characterising the premium value. Project activities are centered on farmer kitchen vegetable trial demonstration gardens based on researcher guidelines and the implications for management and maintenance of the gardens.

Literature Summary

Research activities and findings from related work of the Lake Victoria Basin (LVB) research initiative have shown that women activities/ operations are dominant across the nine land-use types/ plot-use types (Akundabweni *et al.*, 2009). East African communities value traditional foods and retain knowledge of their use and cultural importance (Johns and Eyzaguirre, 2006). However, a number of factors have been attributed to the declining production of African indigenous plants: (i) erosion of culture and breakdown of traditional systems of plant resources management; (ii) the world market has been tailored to focus on only a few crops, which has resulted to the global industrial growth globally to be dependent on continued supply of these few crops at the expense of the traditional varieties; (iii) deforestation, salinisation, desert encroachment and soil erosion lead to land degradation with concomitant loss of the plant genetic resources that the land supports; (iv) natural disasters, including droughts, floods, pests, and diseases, which have led

to widespread losses of plant diversity from both farmers' fields and natural habitats; (v) climatic changes have posed a threat to diversity as many plants are unable to adapt; (vi) the research mandates of most institutions focus on the routinely cultivated species at the expense of the indigenous species; (vii) African governments are not making adequate investment in conservation of their indigenous plants heritage; and (ix) the ever-increasing population, greater competition for natural resources and some interplay of natural resources (CTDT, 2006). Mainstreaming indigenous vegetables into national programmes is critical for food security and for promoting vegetables that provide vitamins and contain medicinal properties (Njugi *et al.*, 2006). Biodiversity conservation includes landscapes used for farming. Importantly, rural communities use and manage plant biodiversity for sustainability of their livelihoods and maintenance of natural and modified ecosystems (Eilu *et al.*, 2003).

Study Description

The project has been implemented at two fronts, first through graduate training, where two students were involved. Secondly, the information collected is to be packaged as tailor-made messages for different audiences. Each student has obtained data pertaining to their research studies across the two project study sites (Jinja in Uganda and Vihiga in Kenya). The first student investigated the viability of PILAU structures in production of quality indigenous vegetables. The second student concentrated on assessing community indigenous knowledge and phyto-nutrient analyses of selected African indigenous vegetables in the Lake Victoria Basin.

The project conducted structured interview surveys and focused group discussions in each of the project sites to capture farmers' value and farming and management practices of IPs. Analytical methods being used for on-going laboratory analyses are Energy Dispersive X-ray Fluorescence Spectroscopy (XRF) for mineral profiling of vegetable germplasm and PILAU soils and Spectroscopy for total pro-vitamin A carotenoid content and antioxidant activity.

Research Application

A premium-influenced land use (PILAU) structure is a specially raised bed, adopted from a Rwanda model, upon which selected indigenous vegetable crops were raised. The experimental PILAU structures were a novelty in the study sites. Upon their introduction, they were used to assess the agronomic performance of the vegetables in comparison to the non-PILAU produced ones.

Figures 1 and 2 are representations of PILAU structures being investigated as a model for production of quality vegetables. The project is also establishing the value of the indigenous vegetables in comparison to the exotic vegetables hence establishing their premium value.



Figure 1. Representative Vihiga smallholder farmer *Solanum scarbrum* vegetable gardens. *Left* - The control garden. *Right* - PILAU modal garden, i.e., the raised bed plot garden (Short rains 2011).



Figure 2. Representative Jinja smallholder farmer PILAU gardens. *Left* – *Solanum scarbrum* produced on a lowland terrain. *Right* - *Cleome gyandra* produced on an upland terrain (Long rains 2012).

From the survey, farmers in Jinja selected two exotic vegetables- *Coriandrum sativum*, dhanian and *Spinacia oleracea* L., Spinach and three indigenous species- *Cleome gyandra*, Saga, Eiyobyoy/Ejjobyoy; *Amaranthus Dubius*, dodo; *Solanum scarbrum*, black night shade. In Vihiga-Kenya, *Solanum melongenum*, egg plant and *Capsicum annum*, sweet pepper were the exotic inclusions while *Cleome gyandra*, saga/ ejjobyoy; *Solanum scarbrum*, black night shade and *Amaranthus caryophyllales*, livogoi/grain amaranth were the indigenous species. Two terrains for the placement of the PILAU gardens were Low and Upland lying fields. The project noted the need for both gender participation and involvement

in construction, maintenance and management of the PILAUs so as to foster ownership and pave way for project exit. Findings of the ongoing graduate student researches are presented separately. Generally the following are the lessons learnt: (1) Farmers identified positions for the placement of PILAU gardens in non-test crops competing for space; (2) The fixed PILAU gardens appeared to prompt a re-use interest in planning a next crop as a way of increasing a cropping intensity (CI). and (3) the Uganda and Kenya graduate students crisscrossed borders to work together under contrasting cultural languages and settings in Jinja and Vihiga and the joint supervision by the senior investigators from Makerere University and University of Nairobi are lessons the project noted.

One of the lessons learnt was the need for both gender participation and involvement in construction, maintenance and management of the PILAUs so as to foster ownership and pave way for project exit. Also noted was that farmers identified positions for the placement of PILAU gardens in non-test crops which were competing for space. The fixed PILAU gardens prompted re-use for the next season crops, thus increasing a cropping intensity (CI) over time given the promising agronomic performance, the sheer uniqueness in morphology of the structures and the mere fact that they were something new and 'interestingly worthwhile despite the initial costs of construction'. In Vihiga, participating farmers preferred to position the vegetables in homestead compounds possibly for security reasons.

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