

Commercialization of underutilized plants in Uganda: An analysis of the market chains of *Cyphomandra betacea* L. in Uganda

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Introduction

Fruit trees are capable of contributing to household food security, nutrition and income, and are known to increase on farm biodiversity of plant species. *Cyphomandra betacea* L. is one of the fruit tree species of importance in local and national markets, and is beginning to have a certain presence in global markets (Clarke *et al.*, 2011).

C. betacea is a fast-growing fruit tree species belonging to the Solanaceae family. It is believed to have originated from the Andean region but has since been introduced and naturalized to tropical Africa (Lim, 2013).

The plant is reported to be widely cultivated in Colombia, Sri Lanka, India, Ecuador and New Zealand where it is used as fresh fruit and in food processing industry (Jaramillo *et al.*, 2011; Lim, 2013). In Africa, tree tomato is reported to grow naturally and on cultivated fields in Zambia, Zimbabwe and Uganda (Prohens *et al.*, 1996; Jaramillo *et al.*, 2011).

The plant is of increasing economic importance mainly due to its fruits (Prohens *et al.*, 1996; Lim, 2013). Fruits are sold fresh, but can also be processed into jams, jellies and chutneys, or can be boiled or pureed to add flavour to drinks or for use in the food processing industry (Clarke *et al.*, 2011).

Fresh tree tomato fruits are highly nutritious with high contents of proteins (1.5-2g/100g), vitamin C (30-45mg/100g), vitamin E (1.86mg/100g), provitamin A, useful minerals including potassium and iron and low carbohydrate content (7.7g/100g) and caloric value (28cal/100g) (McCane & Widdowson, 1992). The plant also contains antioxidant compounds that can be used in improvement of human health (Hurtado *et al.*, 2009).

Promoting commercialization of plant species without clear understanding of their value chains has been reported to result in heavily distorted and biased markets (Agea *et al.*, 2005). Market research is a first step in determining the feasibility of a fruit enterprise. Fruit producers need to have a good understanding of consumers, markets, prices and demand, quality and quantity of both fresh and processed fruits (Clarke *et al.*, 2011).

C. betacea has been identified in Uganda as a candidate species for value chain improvement aimed at livelihood enhancement (Akankwasah *et al.*, 2012). However, there is hardly any scientific information on the structure and functioning of *C. betacea* market chain, demand and supply in Uganda (Baldascini, 2002; Akankwasah *et al.*, 2012).

The objectives of this study therefore, were to: (1) document and characterize value chains of *Cyphomandra betacea* in Uganda, (2) assess its market demand and supply; and (3) evaluate the economic viability of its trade in Uganda.

Methods

Study Area

The study was conducted in 6 major markets of Kampala City. The Uganda's capital.

Data collection

A two weeks reconnaissance market survey aimed at pretesting questionnaires and gaining rapport and confidence of the traders was conducted in Owino, Kalerwe and Nateete markets in June 2011.

Prior informed consent of respondents was obtained before interviews.

A market survey questionnaire consisting of open and closed questions was administered to tree tomato traders in face-to-face interviews between July 2011 and May 2012.

Snowball's sampling method as described in Giuliani & Padulosi (2005) and De Caluwe (2011) was used in selecting tree tomato traders for face-to-face interviews. A total of 62 respondents were interviewed in this study.

Focus group discussions and key informant interviews were also held with key players in the tree tomato market chain to supplement survey data.

Data analysis

Socio-economic characteristics were summarized into frequency percentage tables. Some data was however used descriptively without coding in accordance with Agea *et al.* (2013).

The value chain was mapped by identifying actors and then using a box-and-arrow diagram to show their linkages in line with De Caluwe (2011).

Perceived demand and supply ratings of tree tomato products on a scale of 1-5 and weekly sales were reduced to aggregate percentages.

Parametric correlations were calculated using Spearman's rank correlation. Kendall's tau_b was used for calculation of non-parametric correlation at 95% levels of confidence.

The marketing margins were computed using the formulae: Gatherers/Farmers' Margin (GM) = (GP/RP) x 100%; Retailers' Margin (RM) = (RP-GP)/RP x 100%; Exporters' Margin (EM) = (EP-GP)/EP x 100%, where GP is the Gatherers/farmers' Price; RP is the Retailers' Price and EP is the Exporters' Price (Agea *et al.*, 2008).

Content analysis, coding system and analytical comparisons were used to analyze data emanating from focus group discussions and key informant interviews (Agea *et al.*, 2011).

Results

Table 1: Age, education and gender of *C. betacea* market chain actors (n=62)

| Variable | % |
|------------------------|----|
| Age | |
| < 20 years | 16 |
| 21-30 years | 31 |
| 31-40 years | 20 |
| 41-50 years | 25 |
| > 50 years | 10 |
| Sex | |
| Male | 26 |
| Female | 36 |
| Education | |
| No formal education | 10 |
| Primary (PR1) | 39 |
| Primary level (LXCE) | 25 |
| Advanced level (LXACE) | 18 |
| University | 10 |

Chain actors in the tree tomato market chain to be farmers/collectors, wholesalers, retailers, processors, transporters, exporters and consumers.

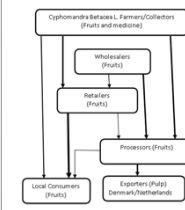


Figure 1: The tree tomato market chain map for Uganda (the thicker the lines, the more significant the product flow)

Table 2: Demand rating of tree tomato by market chain actors

| Demand (Rating) | % |
|---------------------------|----|
| Very Low (1) <td>3</td> | 3 |
| Low (2) <td>3</td> | 3 |
| Moderate (3) <td>33</td> | 33 |
| High (4) <td>16</td> | 16 |
| Very High (5) <td>39</td> | 39 |

Table 3: Supply rating of tree tomato by market chain actors

| Supply (rating) | % |
|---------------------------|----|
| Very Low (1) <td>11</td> | 11 |
| Low (2) <td>34</td> | 34 |
| Moderate (3) <td>20</td> | 20 |
| High (4) <td>21</td> | 21 |
| Very High (5) <td>13</td> | 13 |

Table 4: Economic importance rating of tree tomato by market chain actors

| Economic importance (rating) | % |
|------------------------------|----|
| Very low (1) | 17 |
| Low (2) | 12 |
| Moderate (3) | 20 |
| High (4) | 31 |
| Very high (5) | 20 |

Table 5: Average prices of 1 kg of tree tomato fruits along the market chain

| Market chain node | Price (US\$) | Price (UGSh) | Marketing Margin (%) |
|-----------------------------------|--------------|--------------|----------------------|
| Farm gate (Farmer) | 1,125 | 0.45 | 69 |
| Wholesaler | 1,500 | 0.60 | 25 |
| Retailer (Ordinary markets) | 1,825 | 0.85 | 31 |
| Retail (Supermarkets) | 2,800 | 1.12 | 60 |
| Processed pulp | 4,500 | 1.80 | 75 |
| Equivalent of 1kg of fresh fruits | | | |

Farmers cultivate tree tomato on small-scale tilled household farms of up to 0.4ha while others collect the fruits from fallows where the plant grows naturally. Wild collections are being phased out due to poor quality.

A controlled seed supply system was not established on the market. Farmers retain fruits for future seed recovery. Wholesalers buy tree tomato fruits from farmers/collectors and distribute to retailers.

Retailers comprise of supermarkets, vendors with market stalls and mobile vendors. Processors are mainly companies who export pulp to Europe.

On average, a trader sold 48kg of tree tomato fruits in a week. Export of pulp was recorded at 20 tonnes annually.

Exporters were failing to fulfill purchase orders due to limited supply of the fruits.

Supply was significantly positively correlated with the number of years a tree tomato trader had spent in trade (Pearson correlation=0.389, p=0.002)

Average weekly net profits from tree tomatoe fruits trade was recorded at UShs 18,670 ± 47,937 (US\$ 7.50) accounting for 10% contribution to traders' incomes.

Table 6: Challenges identified in the tree tomato market chain

| Challenge | % |
|---|----|
| Lack of appropriate processing technologies | 34 |
| Lack of extension and advisory services | 40 |
| Limited market information | 34 |
| High organic certification costs | 02 |
| Limited appropriate storage facilities | 45 |
| High transport costs | 10 |
| Inadequate affordable credit facilities | 27 |

Conclusions

C. betacea is a plant whose value chain in Uganda is fairly long with farmers, wholesalers, retailers, transporters, processors, exporters and consumers as the major actors. Fruits are domestically the only product with a market chain but internationally, there is demand for tree tomato pulp and other derivative products.

The demand for *C. betacea* products is high in Uganda and is emerging in Europe. The supply however is still low and insufficient to meet the current demand.

Trade in tree tomato products contribute 10% to the traders' cash income and gross margins for value chain actors along the chain segments range between 25%-75% once commercialized, the plant has potential to contribute to livelihood enhancement and poverty reduction in Uganda.

The value chain lacks smooth flow of market information, appropriate agro-processing technologies and market chain actors organisation.

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