



Enhancing household food and income security through crop diversification in the Nzoia and Mumias sugarbelts in Kenya

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ABSTRACT

Objective: Competition for land use among crops in the Nzoia and Mumias sugarbelts has tended to favour sugarcane and maize at the expense of indigenous food crops such as onions, tomatoes, cassava and sweet potatoes. This in part explains the persistent food insecurity situation in these regions. This study investigated the income potential of diverse crops as a basis of encouraging farmers in the area to diversify their sources of livelihoods.

Methodology and results: An income analysis based on a social survey research was conducted in Webuye and Matungu-Mumias areas in western Kenya. The survey involved 45 farmers from Nzoia and 43 from Matungu. In both sites respondents were selected randomly from farmers lists obtained from the local ministry of agriculture offices. Data were collected through use of questionnaires, interviews and Participatory Rural Appraisals targeting the selected sugarcane farmers and key respondents, mainly the local ministry of agriculture officers. The results indicated that sugarcane and maize have less potential to contribute to increased household incomes as compared to other ecologically suitable crops. This is particularly true for smallholder farmers. Crops with potentially high income included onions, tomatoes, indigenous vegetables, cassava, sweet potatoes, pineapples and groundnuts. To enhance household food and income security, farmers need to invest in these high income crops based on an entrepreneurial culture with institutionalised value-addition practices along the value-chain. Sustainability of such crop production systems is however hinged upon farmers' competences in agricultural entrepreneurship, availability of ready markets for their products, and ready access to value-addition technology and infrastructure.

Conclusion and application of findings: Opportunities for crop diversification in the Nzoia and Mumias sugarbelts are enormous. To maximise benefits from these opportunities requires an attitude change on the part of farmers away from sugarcane and maize. This calls for the implementation of aggressive farmer-centred integrated extension services, involving strategic partnership with government, private sector and civil society organisations working within the agricultural sector in the sugar belt.

Key words: Livelihoods, sugarcane, agricultural markets, Lake Victoria Basin

INTRODUCTION

Globally about 880 million poor people in developing countries live on less than US \$ 1 per day and depend on agriculture for their livelihoods (World Development Report, 2008). Currently,

Kenya is facing the triple problems of water scarcity, food insecurity and energy shortages. Food insecurity in particular is locality specific and influenced by various factors ranging from climatic variations, mainly drought; socio-cultural issues, economic policies and national politics. For instance while farmers can harvest between 25-30 bags of maize per acre in Kitale in Rift Valley province, yields per acre in Nyanza province tend to be as low as only 8 bags (DD, *Crop Production MoA, personal comm.,2008*). Besides water scarcity, use of most land for sugarcane farming is emerging as a key driver of the low productivity (Waswa et al., 2009).

To date, Nyanza and Western provinces have some of the highest levels of poverty and the lowest human development indices in Kenya (SID, 2004), indicating that commercial sugarcane farming, though popular, has had little or no significant positive impact on the livelihoods of small-scale farmers. That notwithstanding, the Ministry of Agriculture has initiated various programmes to boost food security across the country (Republic of Kenya, 2006a). These include value-addition along the production and processing chain, facilitating farmers with inputs through the National Accelerated Agricultural Input Programme (NAAIP) (inputs through voucher systems) and implementation of the "Orphan Crops Programme" (i.e. deliberate investment in the production of neglected crops like millet, sorghum, cassava, sweet potatoes, Irish potatoes, cowpeas, pigeon peas, green grams and beans). These crops are generally ecologically suitable in the medium potential zones like Western and Nyanza provinces (Jaetzold & Schmidt, 1983), but their acreage is threatened by contract sugarcane

farming for sugar processing. With limited capacity to import food stocks, the livelihoods of most farmers in these regions, is likely to remain threatened unless alternative survival mechanisms are implemented.

As an example, the Integrated Agricultural Research for Development programme of the Sub-Saharan Africa Challenge Programme (FARA, 2004), is emphasising improving productivity, profitability, market linkages and public-private efforts to promote collective action and build the technical capacity of farmers to meet new market demands and enhance sustainability of smallholder farming as the main pathways out of poverty and into development. Value-addition of agricultural products is also gaining importance as a means of income maximisation, particularly as demand for ready-to-cook and ready-to-eat foods in urban areas increases (Gulati et al., 2007). In Ghana, farmers particularly women have benefited from new markets for cassava products like flour, baking products and plywood adhesives. In Colombo cassava chips for animal feed industry have been instrumental in changing livelihoods (World Bank, 2006).

In Kenya, the concept of value addition is gaining momentum in various parts of the country through partnerships that include government, Civil Society Organizations, private sector and national research institutions (Republic of Kenya, 2006a). Linked to this, the purpose of this study was to determine the income potential from other crops, besides sugarcane and maize, as a basis of encouraging farmers to diversify their sources of livelihoods to other potentially rewarding yet orphaned crops in Nzoia and Mumias sugarbelts in western Kenya.

MATERIALS AND METHODS

A social survey approach using questionnaires, interviews, Participatory Rural Appraisal and transect surveys was used to collect data from 45 and 43 individual sugarcane farmers from Nzoia and Matunga-Mumias sugarbelts respectively. Additional data were obtained from key respondents mainly local ministry of

agriculture officers. Nzoia and Mumias sugar belts lie in the Lake Victoria basin within western province (Figure 1). Western province in general has the most evenly rainfall distribution in Kenya. The annual averages range from 900 and 2200 mm. The first rainy season occurs from March to May. The normally long dry

season (June to October) receives heavy rains too with a peak in August to September. A wide variety of soils occur, which are however low in fertility. The Mumias and Nzoia sugar belts lie mainly in Agro-ecological zone (AEZ) lower mid land 2 (LM2). Though suitable for sugarcane farming, yields from this crop are low due to declining fertility and increasing effects of population pressure, particularly land sub-divisions (Jaetzold et al., 2005). The scenario for the future points to the need to diversify livelihoods from sugarcane, which tends to guarantee farmers better yields on large land sizes

(Waswa et al., 2009). Both qualitative and quantitative methods were used in data management and analysis. Cluster analysis using Microsoft Excel software was used to group crops grown into priority categories based on actual annual income per unit area. Cluster analysis assumes that each crop belongs to a separate non-overlapping income group (Hair et al., 1998). The means all the crops in each belt were separately ranked in descending order. They were thereafter separated into significantly different clusters i.e. very high income, high income, middle income, and low income groups, using their respective standard errors

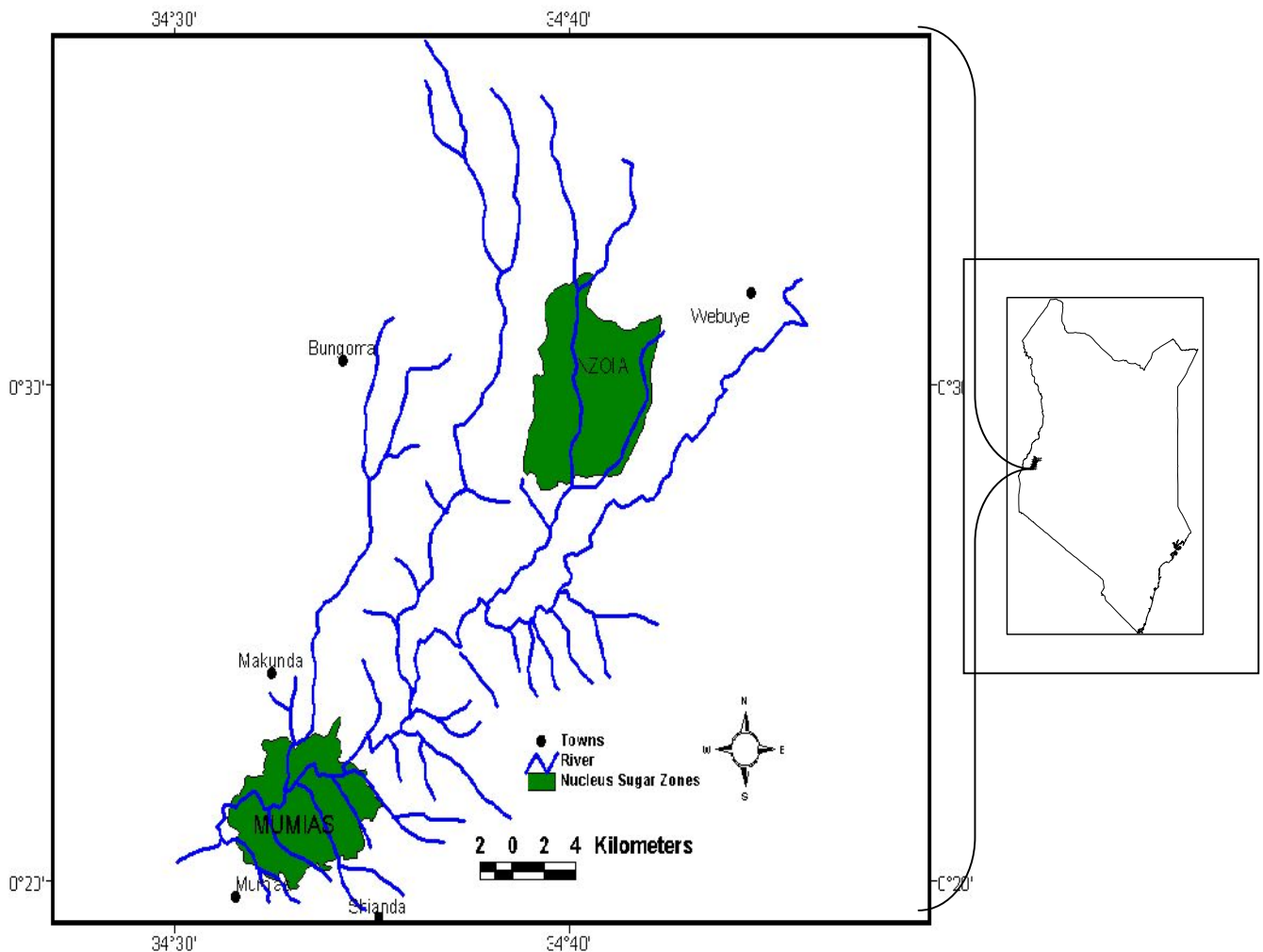


Figure 1: Location of Mumias and Nzoia Sugar belts. The shaded colour represents the nucleus estate of the sugar companies. Out growers (contract farmers) occupy the vast areas in between and around the nucleus estates

RESULTS AND DISCUSSION

Sugarcane farming and traditional crops: Before sugarcane farming was introduced in the Nzoia and Mumias sugar belts in the mid 1970s, farmers grew a wide variety of subsistence crops, which is indicative of the high potential for crop diversification in the area today (Figure 2). Presently, sugarcane is the most widely grown commercial crop, having replaced most

indigenous crops and vegetables, despite their ecological suitability and high nutritive and income value. Where farmers are growing these indigenous crops the yields are generally low (Figure 3). This could be attributed to poor crop husbandry occasioned by the preferential treatment given to sugarcane.

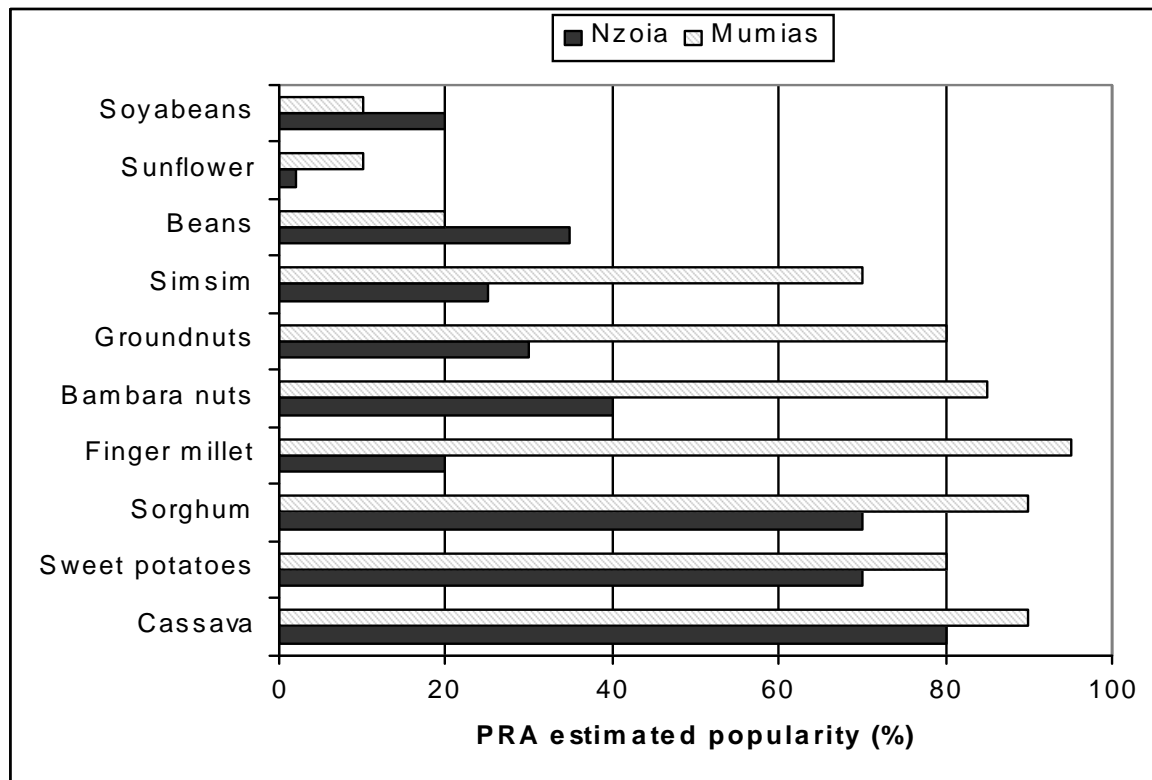


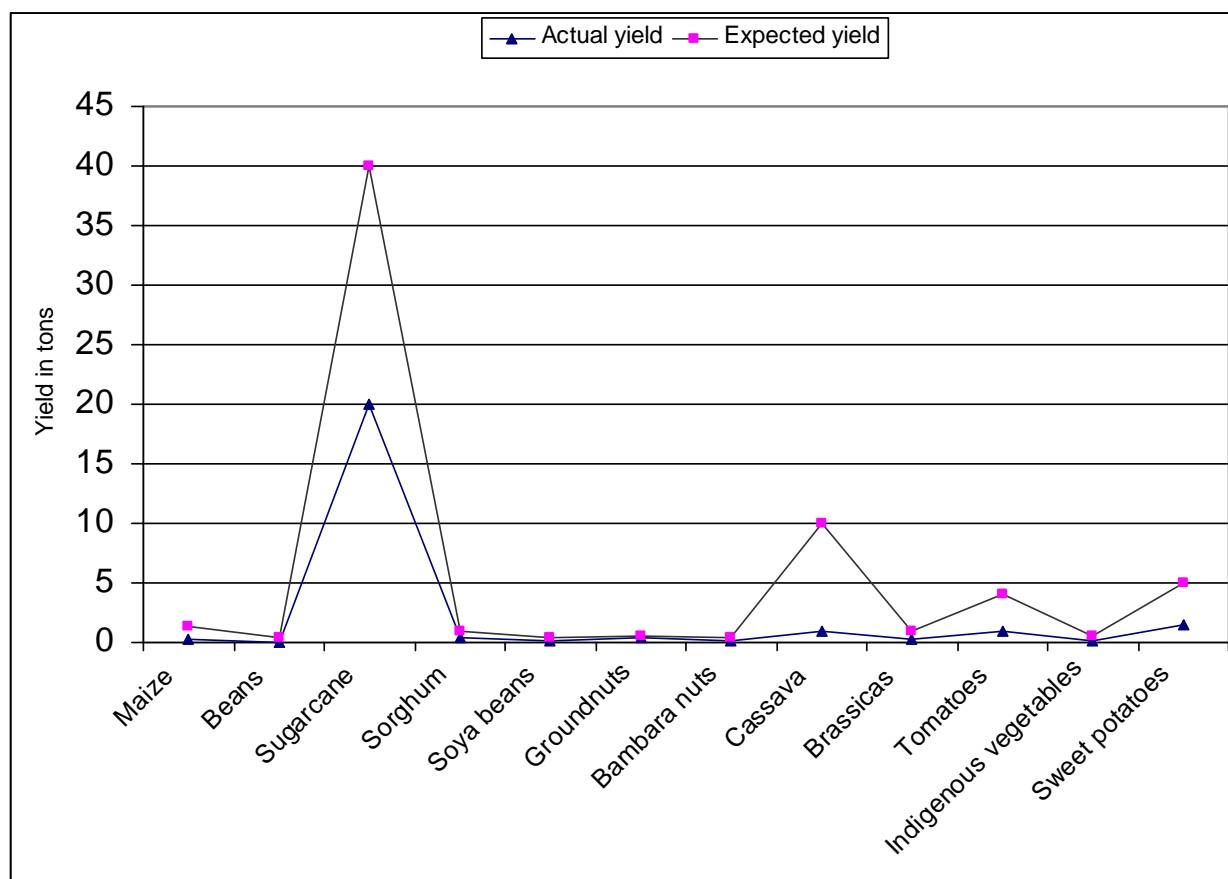
Figure 2: Some indigenous crops grown in Nzoia and Mumias sugar belts before introduction of sugarcane in the 1970s (Source: PRA Data, 2007-2008).

On average, most farmers in Matunga-Mumias have put at least 56% of their total land area under sugarcane (Table 1). If the homestead area is accounted for, the actual land area devoted to food crops would be much lower than 50%. Although data on land area devoted to sugarcane per household for Nzoia was not available, transect surveys indicated that the trend is similar to that of Matunga-Mumias. It follows that the risk of hunger and famine in this region is particularly high given the long cropping cycle of sugarcane and its low net income as demonstrated by Waswa *et al.* (2009).

Potential for Crop Diversification: Official records from Nzoia and Matungu indicate that a wide range of ecologically suitable crops are available (Tables 2 a and b). Root and tuber crops and oil plants seem to be marginalized yet their potential for value addition is high (Republic of Kenya, 2006a). Interviews with farmers showed that a major constraint in agri-business with these crops was lack of ready markets. Further, farmers growing maize commercially particularly on small plots (one acre or less) under conventional management regimes are likely to make losses from their investment (Table 3).

Table 1: Average land size devoted to sugarcane in Matungu Division of Mumias (N=36).

	Estimated total land area (ha)	Household land area under sugarcane (ha)	As proportion of total land area (%)
Mean	1.4789	0.7344	56.5278
Median	1.2000	0.5900	58.0000
Std. Deviation	1.11859	0.39245	
Range	0.60–6.80	0.18–1.70	

**Figure 3:** Expected and actual yields of indigenous crops grown in Matungu Division, Mumias, Kenya. (Expected yield data was obtained from Koyonzo - Mumias Divisional office, Ministry of Agriculture, 2008)

For instance under standard conditions, one acre may yield about 20 bags of maize, each 90kg at a net loss of about Kenya shillings 2150 (US \$ 28) to the farmers who sell their maize through brokers. Those who sell their maize to the National Cereals and Produce Board (NCPB) could make a net income of KES 5820 (or US \$ 77). This later option is not popular with small-scale farmers due to the bureaucracy involved and the long time it takes to be paid by NCPB. In reality, the incomes realised are much lower because very few farmers

attain yields of 20 bags per acre. Net income is further depressed by hidden costs often ignored by farmers such as unaccounted for family labour, losses due to bad weather, pests (thieves and monkeys) and diseases (farmers hardly invest in disease control) and post-harvest losses particularly during storage. Similar observations in western Kenya have been made and discussed by Ndufa *et al.*, (2007) in their paradigm of "maize-focussed poverty".

Table 2a: Yield and income of selected crops suitable for Nzoia area, Kenya (in Kenya Shillings)

CROP	Yield (90 kg bags or tons) per ha	Mean Farm gate price per kg	Mean Retail Price/kg	Est. income per ha/yr	Est. income per ha/month
Maize	50 bags	16.00	18.00	72,000	6,000
Finger millet	16 bags	25.00	30.00	36,000	3,000
Sorghum	14 bags	20.00	25.00	50,400	4,200
Beans	10 bags	40.00	45.00	72,000	6,000
Soya beans	16 bags	65.00	70.00	93,600	7,800
Sweet potatoes	12tonnes	5.00	10.00	120,000	10,000
Groundnuts	15 bags	70.00	80.00	189,000	15,750
Green grams	7 bags	70.00	80.00	88,200	7,350
Bananas	15 tonnes	10.00	15.00	150,000	12,500
Pineapples	25 tonnes	8.00	10.00	200,000	16,666
Tomatoes	25 tonnes	15.00	20.00	375,000	31,250
Onions	25 tonnes	20.00	25.00	500,000	41,666
Indigenous vegetables	15 tonnes	10.00	15.00	300,000	25,000

Where: kg: kilogram, ha: Hectare; 1 ha = 2.5 acres; Est.: Estimated; 1 US \$ = 76 Kenya Shillings. Source: Ministry of Agriculture (2007)

Table 2b Actual yields of common crops in Matungu-Mumias (Source MoA 2009)

Crop	Yield/acre	Yield in Kg	Unit measure	Price/kg	Income/acre/year
Maize	15 bags	1350	2kgs	40	54000
Beans	5 bags	450	2kgs	75	33750
Sorghum	10 bags	900	2kgs	35	31500
Finger millet	5 bags	450	2kgs	70	31500
Cassava chips	10 tons	10000	2kgs	25	250000
Sweet potatoes	5 tons	5000	4-5 roots (1.5kg)	20	100000
Arrow roots	3 tons	3000	4 roots (5kg)	20	60000
Cowpeas(*)	1 bag	90	2kgs	60	16200
Groundnuts	6 bags	540	2kgs	120	64800
Avocados	3 tons	3000	1 fruit (0.5kg)	20	60000
Onions	6 tons	6000	3 bulbs (0.33kg)	33	198000
Green grams	3 bags	270	2kgs	75	20250
Simsim	2 bags	180	2kgs	125	22500
Tomatoes	4 tons	4000	3 fruits (0.6kg)	16	64000
Bambara nuts	4 bags	360	2kgs	200	72000
Soya beans	5 bags	450	2kgs	90	40500
Mangoes	2 tons	2000	1 fruit (0.2kg)	25	50000
Pawpaws	3 tons	3000	1 fruit (1kg)	15	45000
Brassicas	1 ton	1000	1 head (1kg)	20	20000

(*) Income for cowpeas was based on 3 harvests per year. Income for all other crops was based on 1 harvest per year. 1 bag = 90 kg; 2 Avocados = 1kg; 10 Onions = 1 kg; 5 Tomatoes = 1kg; 5 Mangos = 1 kg; 3 potatoes = 1 kg

Table 3: Cost implications of planting maize under ideal conditions on 1 acre in Nzoia area

Activity	Unit Cost (KES)	Total Cost (KES)
1. First tillage	2000	2000
2. Farrowing by oxen	800	800
3. DAP 2 bags (Planting)	2500	5000
4. Urea 1 bag (Top dressing)	2500	2500
5. Seed (10 kg bag)	1300	1450
6. Planting labour	600	600
7. Fertiliser application labour	500	500
8. Weeding labour (3 times)	1000	3000
9. Cutting and staking (9 Man-days)	100	900
10. De-husking and loading for direct shelling		1000
11. Shelling each bag	40	800
12. Shelling crew costs		500
13. Gunny bags	30	600
14. Miscellaneous		500
Total Cost for standard yield/acre (i.e. 20 bags)		20150
Expected income based on NCPB prices		26000
Net income based on NCPB		5820
Expected income based on middlemen price	-	18000
Net income based on middlemen prices	-	-2150

Notes: 1 US \$ = KES 76. Source: Contact farmer records and data validated by area extension officer (2007) Income per bag was KES 1300 (NCPB) or 900 (Middlemen). These prices applied in 2007 and have since improved to KES 2300 in 2009, though also production costs have gone up significantly.

The continued popularity of maize farming particularly in Nzoia (Table 4) is however hinged upon the crop being a staple, having a short cropping cycle, and allowing for intercropping during the early stages of crop growth. Similarly, a recent study by the author

(Waswa et al., 2009) has shown that though a popular crop among farmers, income from small-scale sugarcane farming is very low and reliance on this crop is contributing to persistent poverty in the region.

Table 4: Relative importance of crop varieties in the Nzoia sugar belt in the 1970s and 2000s

Crop	Main use	Relative importance the early 1970s	Current relative popularity (2007)
Maize	Subsistence	++	++++
Millet	Subsistence	+++	+
Sweet Potatoes	Subsistence	+	+++
Bananas	Subsistence	+	++
Traditional vegetables	Subsistence	+++	+
Simsim	Subsistence	+++	+
Groundnuts	Subsistence	+	+
Beans	Subsistence	+	+++
Cassava	Subsistence	+++	+
Sorghum	Subsistence	++	+
Sugarcane	Commercial	-	+++++

Where: The number of pluses indicates the perceived popularity of the crop. (Source: PRA data Bokoli Nzoia 2007)

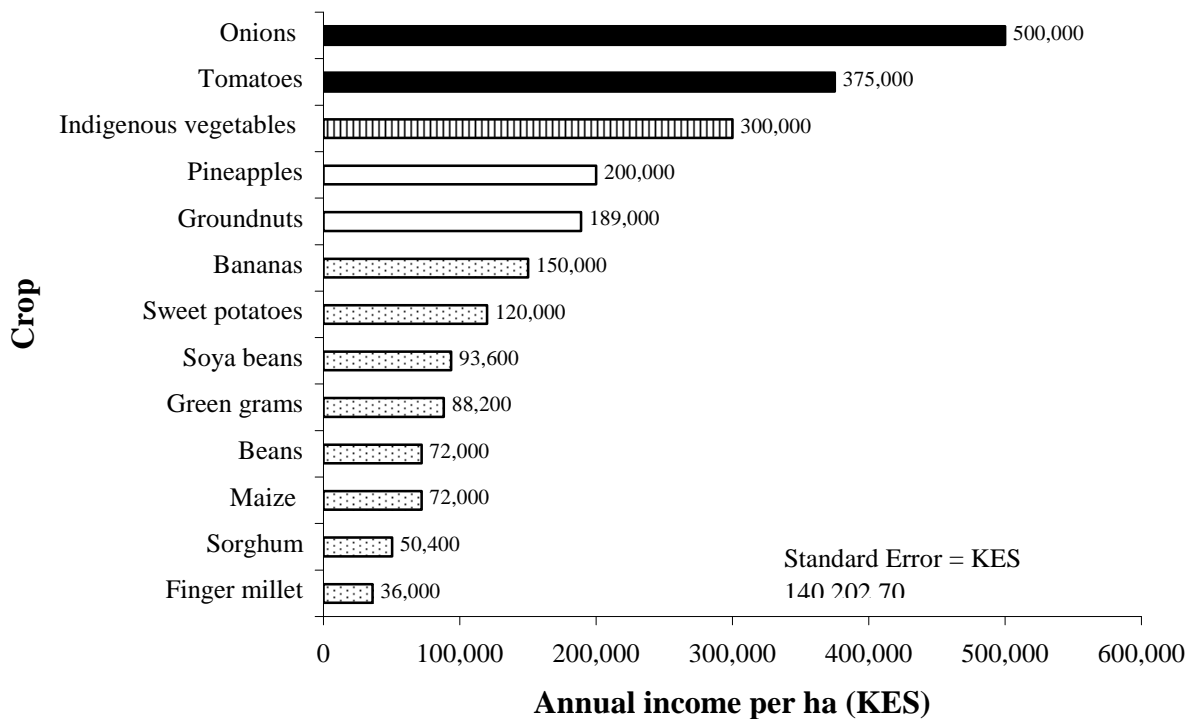


Figure 4: Crop enterprise clusters in Nzoia area based on actual level of income accrued in 2007-2008

An income-based cluster analysis of the traditional crops grown in Nzoia (Table 2a) categorised them into four groups with the income potential of the crops in descending order, as presented in Figure 4. The value at the end of each bar is the mean annual income per unit area. The very high income group consists of onions and tomatoes while indigenous vegetables form the high income group. Pineapples and groundnuts constitute the middle income group. In contrast, maize, sorghum, and finger millet have a low income potential. A similar cluster analysis for crops grown in Matungu-Mumias showed that very high income potential was found in cassava and onions. Sweet potatoes seem to be distinct from all the other commodities and singularly constitute the high income group. Groundnuts, fruits and maize form the middle income group. Legumes and indigenous cereals were categorised in the low income bracket (Figure 5).

The apparently high income attributed to cassava in Matungu-Mumias may be directly linked to the prevailing scarcity of the crop in the region due to cassava mosaic disease. Crop classifications for both regions based on income potential provided a wide range of crop diversification options. What is needed

now is an aggressive and entrepreneurial-based extension service designed to help farmers to change their attitudes about sugarcane in favour of other crops as sources of household income.

To maximise benefits from crop diversification options, investment in value-addition particularly post harvest agro-processing to take advantage of changing consumption patterns in Kenya's expanding urban centres remains crucial. A recent government survey targeting small to medium-scale enterprises in Central, Coast, Eastern, Nyanza and Western Provinces (Republic of Kenya, 2006b) showed that it is feasible at small to medium-scale levels to process common crops into new products. However agro-processors in Kenya are faced by among others the following challenges:

- Lack of appropriate training in agro-processing on the part of extension staff and hence their limited capacity to provide technical training and advice to farmers.
- General lack of entrepreneurial culture, which restricts farming to subsistence level.

- Inadequate infrastructure to access markets, which makes marketing of small-scale processed food products largely informal, of low amounts and unreliable.
- High poverty levels among farmers, which complicates farmers' abilities to mobilize financial capital (micro-finances) for agricultural development along the value chain.
- Limited access to electricity and common utilities such as tap water in most rural areas, which are important inputs in agro-processing.

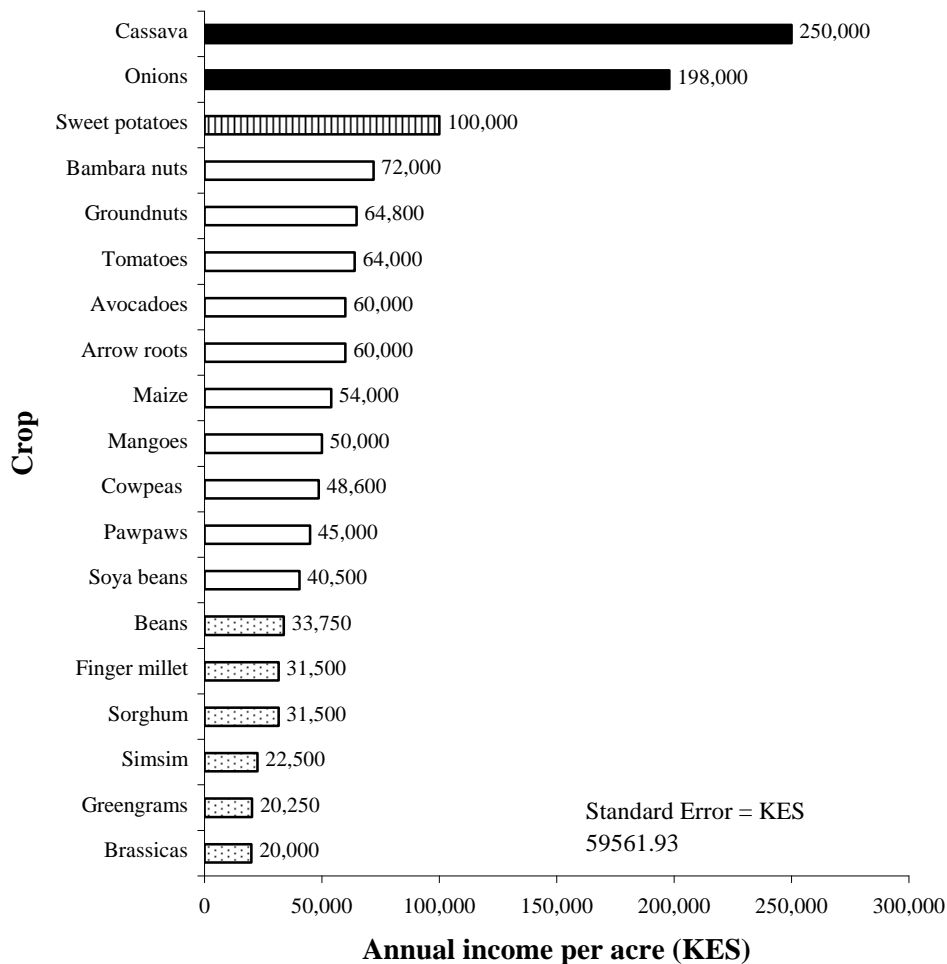


Figure 5: Crop enterprise clusters based on actual level of income accrued in Matungu area, Mumias, Kenya (KES: Kenya Shillings)

CONCLUSIONS AND RECOMMENDATIONS

Trends in available data suggest that maize and sugarcane farming may not be the best commercial land use options for small-scale farmers in the Nzoia and Mumias sugar belts, when viewed from an income and food security perspective. As an alternative, there is high income potential in space saving and locally suited crops like onions, tomatoes, indigenous

vegetables; cassava, sweet potatoes, pineapples and groundnuts. Crop diversification in favour of these crops has potential to improve household incomes and food security if deliberate efforts are made to increase yields per unit area, increase accessibility to ready markets, and adding value through technological and infrastructure investments.

To sustain increased farm productivity and returns, farmers need to be protected from middlemen-driven exploitation and poverty-driven distress sales. Strengthening of farmer institutions will also enhance their bargaining power and ability to engage external stakeholders on the market supply and demand chain as equal partners. These new frontiers call for aggressive farmer-centred extension services,

packaged along entrepreneurial principles. Due to limited capacity for service delivery on the part of government-based extension service, strategic partnerships can be explored and developed between public extension service and agriculture-based civil society organisations (NGOs and CBOs) working closely with farmers.

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