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Potential of cassava in Zimbabwe: a case study for the southern Africa region

Potentialités du manioc au Zimbabwe : une étude de cas pour les régions du sud de l'Afrique

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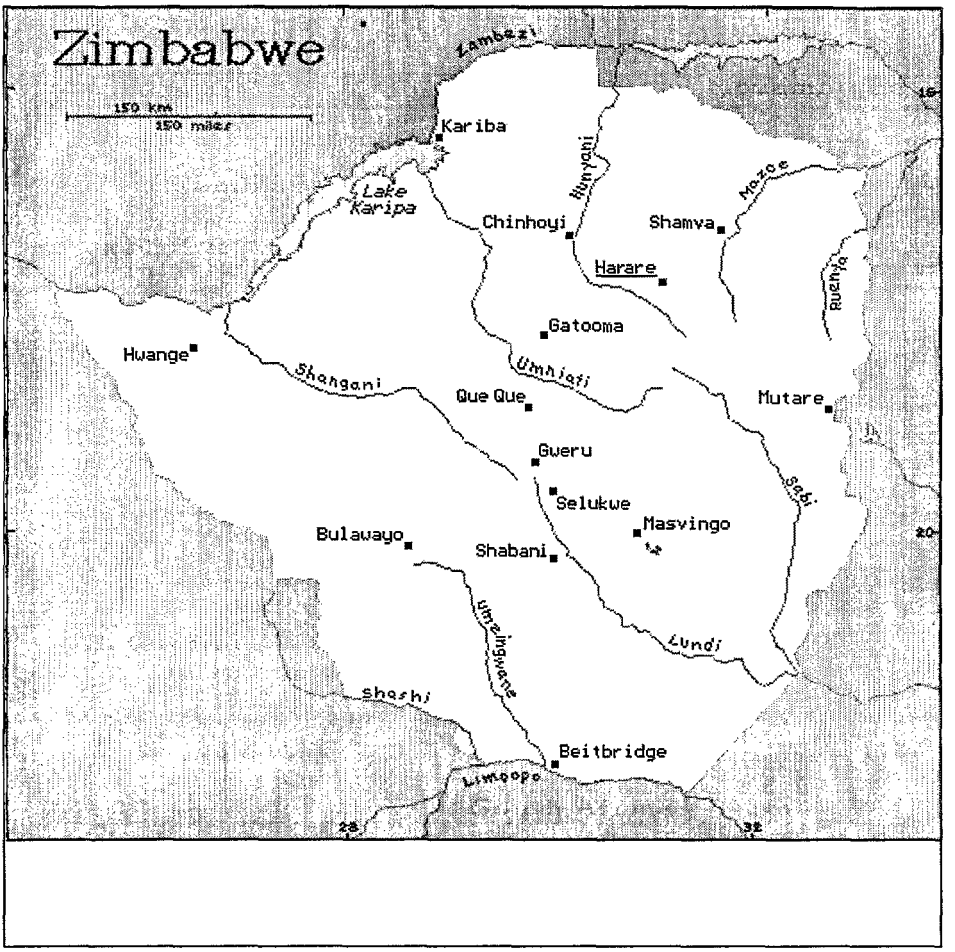
- Abstract -

This paper is based on a study which was initiated to identify the potential of cassava as a food security and cash crop in Zimbabwe. Data collection was based on a market survey and a Rapid Rural Appraisal exercise. The findings of the study show that there is immediate demand from the stockfeed sector for dried cassava as a raw material. Aside from the cash crop option, farmers are also interested in cassava as a food security crop. Partial crop budgets show that cassava can compete against other crops in marginal areas of Zimbabwe provided appropriate genotypes and recommended agricultural practices are used. It appears that during the first few years of a project, chips production should be based on manually driven machines and motorized chipping should only be considered once a larger scale Zimbabwean cassava production is established.

- Résumé -

Cet article a été réalisé à partir des résultats d'une étude initiée pour identifier les potentialités du manioc à contribuer à la sécurité alimentaire et à être une culture de rente au Zimbabwe.

Le recueil des données a été réalisé au cours d'une enquête sur les marchés et d'une évaluation selon une procédure d'Appréciation Rapide en milieu Rural (RRA). Les informations recueillies montrent qu'il y a une demande pressante de la part du secteur de l'alimentation pour le bétail pour du manioc séché considéré comme matière première. En plus de l'option culture de rente, les fermiers sont aussi intéressés par l'utilisation du manioc comme production permettant d'assurer la sécurité alimentaire. L'élaboration de comptes d'exploitation prévisionnels montre que le manioc peut concurrencer les autres productions dans les zones marginales du Zimbabwe à condition que des génotypes appropriés et des pratiques culturales recommandées soient utilisés. Il est apparu que pendant les premières années d'un projet, la production de cossettes devait être réalisée avec des équipements non motorisés et que leur motorisation ne pouvait être envisagée que si la production de manioc au Zimbabwe était réalisée à une plus large échelle.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Introduction

At present, cassava production in Zimbabwe only takes place on a very limited scale. The crop was identified as having potential for increasing diversification in Zimbabwean agriculture. Although, due to its drought resistance, cassava could be of interest for Zimbabwe as a food security crop, it was also felt that industrial demand would be a prerequisite for large scale expansion of the crop.

The study was initiated at the request of the Commonwealth Science Council (based in London), and the Biomass Users Network (based in Harare) during a workshop in Harare in May 1993 in which national and international cassava experts participated. Its primary objective was to identify potential markets for cassava products and assess the viability of producing the crop in marginal areas of Zimbabwe. The strategy to be developed was supposed to provide guide-lines for a national project for cassava.

The terms of reference for the study were to determine the market demands for dried cassava chips and other cassava products including the volume of demand, quality of product required and prices; determine the likely costs of production, processing and marketing of identified products; determine suitable areas for cassava production and likely costs of production; undertake sensitivity analyses of production, processing and marketing; make recommendations on the location of the identified small-scale pilot processing plants; determine the potential for savings in foreign exchange brought about by the project; and carry out a Rapid Rural Appraisal (RRA) to determine farmers' motivations to grow cassava and identify potential constraints to agricultural production.

Methodology

The field survey was carried out during three visits to Zimbabwe: 1-15 June, 20 July-24 August and 4-24 October 1993. During the first two visits emphasis was put on marketing aspects whereas the third visit concentrated on the Rapid Rural Appraisal.

1. Marketing Study

The marketing survey's main objective was to identify potential industrial users of dried cassava chips and other cassava products. The major stockfeed millers, starch producers and users, flour producers and users, brewers, and ethanol producers were identified as the principal possible markets for cassava as a raw material.

Two main methods were applied for data collection: the use of secondary information already available form previous workshops and studies, and informal techniques for the collection of primary data.

The primary data were obtained in the course of visits to the considered industries in Harare, Bulawayo, and Triangle. Interview check-lists, which could be adapted according to individual requirements, served as the principal tool to lead discussions. Due to the relatively small number of industries potentially using cassava as a raw material, there was no pressing need to embark on a formal sample survey. The discussions, in which usually the companies' marketing directors participated, allowed for the inclusion of additional points and information which were raised in the course of the meetings. This informal technique provided a better understanding of the different groups' main motivations for using cassava, compared with the potential quality of information that could have been obtained through sample surveys.

The interview check-lists included questions focusing on the potential volume of demand for dried cassava chips or other products, quality requirements, prices possibly paid by the industries, products to be replaced by cassava, rates of inclusion, potential distribution channels, medium- to long-term perspectives, etc. The check-lists were laid out in a way to allow for the inclusion of additional points where appropriate.

2. Rapid Rural Appraisal

The RRA was carried out in about three weeks during which 13 villages were visited in Mashonaland East (Mutoko and Mudzi Districts), Manicaland (Chipinge District) and Masvingo Province (Gutu and Chivi Districts). These locations were chosen because they had some exposure to cassava in the past and have some potential in the future. Certain Provinces, especially Matabeleland South and North, could not be visited due to time constraints. It is recommended that these Provinces are covered at a later stage.

Instead of concentrating the RRA on a few selected villages, it was agreed to visit more areas with a view to identifying sites where a cassava programme could start in communal areas. Although this meant that some of the typical RRA tools could not be fully applied due to time constraints, given the objectives of the study, this seemed the best way to proceed. It was appropriate to carry out a rather rapid informal survey in more villages instead of spending more (possibly too much) time in a few locations, because of the lack of information about cassava in Zimbabwe.

The RRA team was relatively large: 4-5 team members plus local extension staff, compared with an ideal team size of 2-3. Therefore, at times, the mobility of the team was somewhat limited. Obviously, it is easier to co-ordinate the roles and

interventions of fewer team members, and farmers also find it easier to accommodate a smaller group of researchers. The group discussions with farmers were carried out in the local language *Shona* and therefore the author relied on the translation services of the other team members. Evening sessions after the meetings served to summarize the main findings of the discussions.

The survey concentrated on the following points: farmers' motivations to produce cassava; crops produced at present in the areas considered; and major constraints to agricultural production in general and cassava production in particular. Semi-structured group interviews were the principal tool of information collection used in the RRA. Whereas at the beginning of the survey the contents of the interview check-lists were closely followed, after a few sessions the team had internalised the key questions and the check-lists became unnecessary.

Before being asked to rank reasons that might motivate them to grow cassava, farmers were given the following three options: cassava as food crop, cash crops or animal fodder. Different tools were used in the course of the ranking and scoring exercises: chalk and blackboard, stones, symbols (eg. money representing the cash option) and on several occasions voting. Verbal ranking proved to be easy due to its low time requirements but, on the other hand, it did not always reveal the relative importance given to a certain option. On a few occasions scoring with stones was successfully applied to obtain more detailed information on this matter. However, scoring exercises can become more difficult when group sizes become large (ie. exceeding about 15 members) or when the interviewees feel intimidated by the use of certain tools. In the course of this RRA exercise, the author participated in all the meetings with villagers and key informants, such as local extension staff.

Results

1. Potential Industrial Demand

The stockfeed industry was identified as the largest immediate market for cassava in Zimbabwe. About 20 to 25 years ago, cassava meal was imported from Malawi for inclusion in animal feed. However, supply from this country became erratic leading to imports being stopped. Seasonal demand for beef fattening rations is highest between June and October which is when climatic conditions for sun-drying of fresh roots are best in the country. The stockfeed industry offers about Z$ 500 per ton of dried cassava (US$ 1 = Z$ 6.5, Sept. 1993).

Demand from other industries such as starch manufacturing, flour processing, brewing and fuel production may only arise once a self-sustaining cassava economy producing considerable quantities of raw material is established.

Table 1
Demand for Cassava Products in Zimbabwe

Sector	Quantity and product required	Fresh roots equivalent	Comments
Stockfeed	20,000 tonnes of dried chips or meal in the short-term; 115,000 - 118,000 tonnes of dried chips or meal in the medium- and long-term.	54,000 tons 310,000 - 508,000 tons	There is an immediate demand for dried cassava from the stockfeed manufacturers in Harare, Bulawayo, Gweru and Triangle. Thus, this is the main market to get cassava production underway. Besides the large manufacturers, dried cassava can also be sold to commercial farmers and ranches, as well as to communal livestock schemes. Export potential to Botswana exists but demand levels are not known exactly.
Starch	7,700 tonnes of dried chips from peeled roots.	23,000 tons	Demand is not certain and may only occur medium to long-term. The major manufacturer indicated that they prefer to concentrate on maize based starch for at least the next five years. Dry matter input is preferred.
Flour	500 tonnes of high quality root meal.	2,000 tons	Demand is not certain and may only occur in the long-term. The fact that Zimbabwean food processors and bakers do not have any experience with cassava represents a major obstacle.
Brewing	10,000 tonnes of dried chips from peeled roots.	30,000 tons	Demand is not certain and may only occur in the medium- or long-term. Doubts about toxicity appear to be the main obstacle to the use of cassava in the brewing industry.
Ethanol	240,000 tonnes of fresh roots, or equivalent in dried chips from peeled roots.	240,000 tons	Demand is not certain and may only occur in the long-term once a large-scale Zimbabwean cassava economy is established. In addition, cheaper processing technologies would be required. 240,000 tonnes of cassava could produce about 40 million litres of ethanol corresponding to about 13% of the current petrol consumption.
Summary:	Potential short-term demand (< 5 yrs):		54,000 tons of fresh roots;
	Possible medium-term demand (5-8 yrs):		310,000 - 508,000 tons of fresh roots;
	Possible long-term demand (> 8 yrs):		605,000 - 803,000 tons of fresh roots.

Table summarizes the findings and gives details of size and particulars of each potential market.

The net foreign exchange savings due to the utilisation of 20,000 tons of dry cassava in stockfeed are of the order of US$ 1.5 million per annum.

2. Profitability of growing Cassava

In the course of the RRA exercise in communal areas of Masvingo, Mashonaland East and Manicaland Provinces, very little cassava was seen. Food security and cash were identified as the farmers' main motivations to engage in cassava production. Farmers would like to try out the crop on small plots before embarking on a larger scale production (ie. on more than one acre). Drought resistance and the possibility of growing the crop on marginal soils were considered the main advantages of producing cassava.

The main constraints to agricultural production are, besides low rainfall, lack of funds to purchase inputs and lack of draught power. Fencing is a particular necessity for cassava since the crop requires protection against domestic and wild animals during the dry season when it would be the only green vegetation present.

Lack of land is a constraint in-so-far as communal farmers on average only have about 3 to 4 hectares of arable land. This leaves farmers with little room to experiment and try out the new crop during the early stages of a project. Medium to long-term, the uptake of cassava will depend a lot on what the yields are and how constraints such as fencing can be solved. Labour may be less of a problem, in particular if the main cassava related activities such as harvesting and processing can be carried out during the dry season when the agricultural work-load is reduced.

Partial crop budget calculations show that cassava can compete against other cash crops in communal lands. Cotton, which is the main competing crop, is more profitable on a net income per season basis but less if income per labour day is used as an indicator. Other cash crops (mainly groundnuts and sunflowers) and the subsistence crops maize and small grains are less profitable using both indicators.

The cassava budget calculations outlined in Table 2 for Masvingo Province, Natural Region IV, are based on the following main assumptions:

- Due to low and unreliable rainfall patterns, rainfed cassava must be looked upon as a biennial crop in communal lands of Zimbabwe.
- Potential average yield: 15 tons of fresh roots per hectare after 18 months of growth (pers. comm. Marcio Porto, CIAT/IITA).
- Price: Z$ 500 per ton of dried cassava chips.

Results for Natural Regions III and V of Masvingo Province are similar, with cotton remaining the main competitor for cassava. Masvingo Province was chosen

Table 2
Masvingo Province, Natural Region IV Estimated Crop Budgets (for 1 hectare)

	Units	Crops					
		Cassava*	Maize	Small Grains	Cotton	Shelled*** Groundnuts	Sunflower
Income							
Yield	t / ha	15.00	0.50	0.50	0.65	0.50	0.50
Price	Z$ / t	185	900	600	2,900	1,800	1,400
Gross income	Z$	2,775	450	300	1,885	900	700
Production costs							
Fencing**	Z$	456					
Soil preparation (hired animal draught power)	Z$	75	75	75	75	75	75
Small tools	Z$	20	20	20	20	20	20
Seeds	Z$	0	82	30	58	90	43
Fertilizer	Z$	0	154	0	154	88	61
Chemicals	Z$	0	20	0	500	0	0
Transport of inputs ($3 / bag)	Z$	0	9	0	9	6	3
Transport of fresh roots ($10/ton	Z$	150					
Chipping and drying, fixed costs	Z$	124					
Chipping and drying, variable costs	Z$	125					
Packing of produce	Z$	30	4	4	10	6	4
Transport of output ($2-4/bag)	Z$	222	20	20	30	20	20
Seasonal interest on variable costs (10% real)	Z$	62	38	15	86	31	23
Contingency allowance (5%)	Z$	63	21	8	47	17	12
Total:	Z$	1,327	443	172	989	352	261
Net income****	Z$	1,448	7	128	896	548	439
Cropping seasons	Seasons	2	1	1	1	1	1
Net income/season	Z$/season	724	7	128	896	548	439
Labour requirements	Man-days	138	78	87	131	147	110
Net income/labour day	Z$/day	10,49	0,09	1,47	6,84	3,73	3,99

Explanations:
* The price of cassava corresponds to Z$500 per ton of dried chips converted into fresh root equivalent by using a conversion factor of 2.7 (2.7 tons of fresh roots 9 1 ton of dried chips).
** Fencing costs are annualised.
*** It is assumed that farmers will use their own groundnut seeds, for which an opportunity cost is put.
****The term "Gross Margin" was not used because part of the cassava production and processing costs are fixed costs.

for the comparative calculation of crop budgets because of the location of Triangle Ltd and the company's commitment as potential buyer of dried cassava chips. In addition, Triangle Ltd also offered to facilitate transport of dried cassava.

To obtain the yields indicated it is essential that good (drought resistant and, as far as possible, high yielding) varieties and the recommended agricultural practices are used. It is important to base the crop's expansion on low cyanogenic potential varieties since it might serve both as a food security and cash crop.

A sensitivity analysis shows that cassava may not be competitive as a cash crop if dried root prices were of the order of Z$ 400 or if average yields dropped below 12 tons per hectare. Nevertheless, aside from the cash crop option, farmers also showed interest in growing cassava as a food security crop. However, only on-farm trials will lead to a better understanding of whether or not surplus production in the form of dried chips will be sold to feed millers.

Production of cassava based animal fodder by communal farmers is another option to be considered. Small-scale dairy schemes administered by ARDA (Agricultural and Rural Development Authority) and cassava growers in Binga have been identified as possible producers and users of cassava based stockfeed.

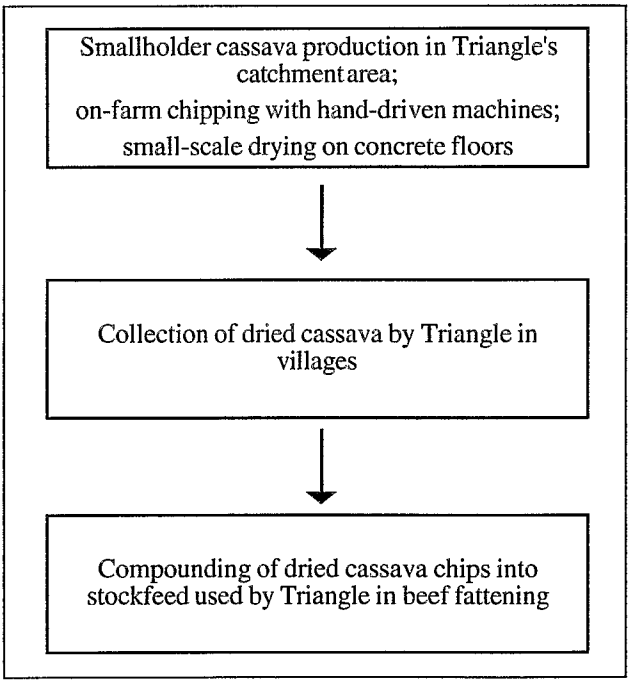

Figure 1
Short-term cassava marketing strategy

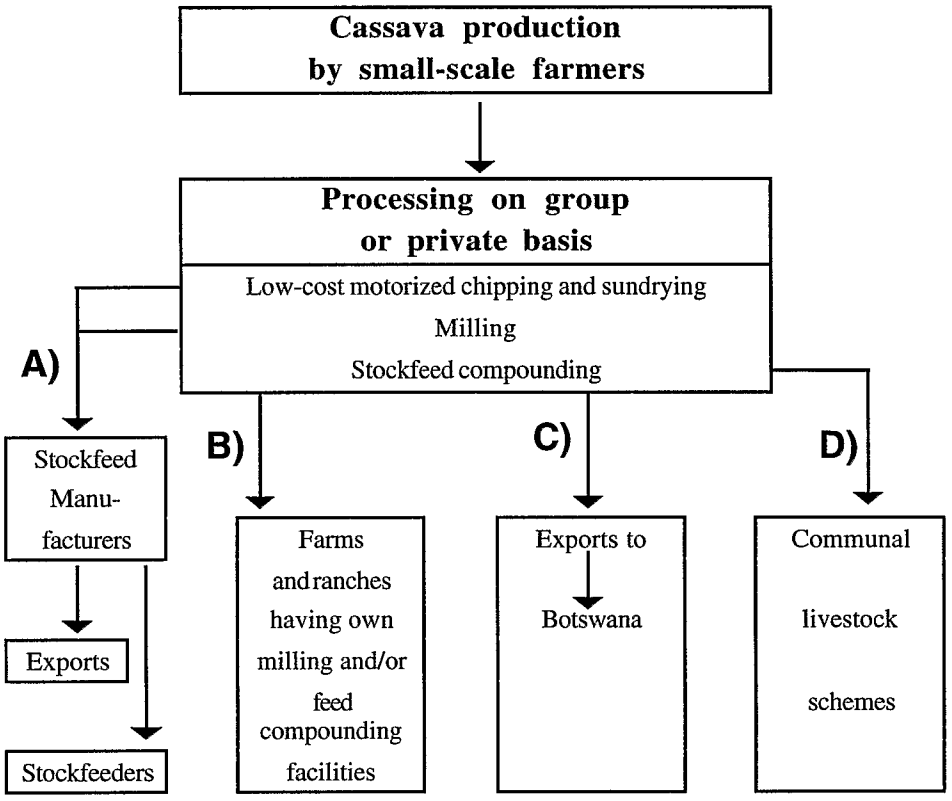

Figure 2
Possible medium- to long-term cassava marketing strategy

Note:
A): Demand is certain, however supply depends on factors such as yields and prices paid by feed millers.
B): Demand will only develop if ranchers and farmers see the benefit of cassava based feed-stuffs.
C): Export potential exists, but crop has to be well established before this option can be envisaged.
D): There is an immediate potential demand for cassava in communal dairy schemes, however only trials can show to what extent the crop can replace other feed-stuffs.

3. Processing technologies

The following two options for mechanised cassava processing have been identified:

- on-farm chipping with manually operated machines and sun-drying on small concrete drying floors;
- small-scale entrepreneurs running processing units at village level including motorized chippers, 500 m² drying floors, and, if required, feed mixing facilities.

The cost calculations show that processing by motorized chippers would only be more profitable than hand-driven machines if at least 250 tons of fresh cassava were available per processing unit per annum. It is unlikely that villages in communal areas will produce such an amount of roots within the next three years owing to, among other things, lack of planting material.

Over the next three to four years, manually-operated chippers which are shared by 5 to 10 farmers are the most appropriate technology where cassava is produced for cash. Chipping the roots with hand-knives appears to be suitable where farmers will only produce small quantities of cassava for on-farm consumption.

Conclusion

Cassava has the potential for increasing diversification in Zimbabwean agriculture. The crop has two major advantages. Firstly, it can be used as a food security crop due to its drought resistance and ability to grow on marginal soils. Secondly, there is industrial demand for dried cassava chips (principally from the stockfeed sector), which is a prerequisite for accelerated expansion of the crop on a larger scale.

Cassava can compete against other crops from the farmer's viewpoint provided the recommended cultural practices and drought resistant genotypes are used. Since cassava might serve a dual purpose in Zimbabwe (ie. food security and cash crop) - it is recommended that the crop's expansion be based on low cyanogenic potential varieties.

As far as processing is concerned, it appears more appropriate to use manually driven chippers during the first few years because of the low levels of production. Motorized chipping can only be of interest once a self sustaining larger scale Zimbabwean cassava production is established. Then, other options based on various outlets in the stockfeed sector, and perhaps other industries as well, could be envisaged.

The combination of a marketing study and a Rapid Rural Appraisal provides a valuable means of assessing the feasibility of introducing or expanding production and processing of crops. The approach used might well be applicable in other countries in Southern Africa.

Acknowledgements

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