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Dialogue and Policy Implementation (RAPID)



**MARKET ANALYSIS AND FEASIBILITY OF
SORGHUM GRAIN STANDARDS FOR
SOUTHERN AFRICA'S INDUSTRIAL PROCESSORS**

**UNITED STATES AGENCY FOR INTERNATIONAL
DEVELOPMENT TASK ORDER No. 4.1**

**DEVELOPMENT OF SIMPLE, COMMON GRAIN QUALITY
STANDARDS FOR SORGHUM, TO FACILITATE GRAIN
TRADE IN SOUTHERN AFRICA**

Dr. Floyd Niernberger
Chemonics International

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SUMMARY

Work was carried out under Task Order No. 4.1 of IQC No 690-1-00-00-00149-00 by Chemonics International, Inc. as an activity for USAID. The task was to develop simple common grain quality standards for sorghum to facilitate grain trade in southern Africa.

This market analysis and feasibility technical report on sorghum grain standards for southern Africa's industrial processors covers the activity related to the economic aspect of the project. Section 1 is an introduction of the sorghum commercial marketing system, grades and standards and the proposed quality methods.

Section 2 provides information on the sorghum industry in the countries of Botswana, South Africa, Tanzania and Zimbabwe. It contains interview responses and results of a survey of persons in the sorghum community conducted during the period February to April 2001. Interviewees in Botswana were primarily concerned with increasing domestic production for trading, improving the transportation infrastructure to efficiently move sorghum from rural areas into the commercial marketing system, and improvement of sorghum quality. Persons interviewed in South Africa favored better methods of determining sorghum quality, improvement in sorghum grain quality (particularly white sorghum), and community development programs to assist small-scale farmers to increase production and enter into the commercial market. Tanzania interviewees felt reliable suppliers were lacking, cleanliness and quality of sorghum required improvement, and action was needed to improve deteriorating transportation infrastructure. Persons surveyed in Zimbabwe felt that a reliable supply and improved sorghum cleanliness and purity were necessary to increase trading. Most interviewees of the four countries were satisfied with progress in moving to a free market system and the phase out of government grain boards. Few thought that government assistance was needed to facilitate increased sorghum trading.

Section 3 evaluates the survey information and provides an estimate of 128,000 MT or 45% potential increase over current use for the commercial marketing system following the implementation of the proposed quality methods. Individual country potentials were estimated at 50% for Botswana; 34% for South Africa; 1500% for Tanzania and 88% for Zimbabwe. Export potential is 26,000 to 47,000 MT more than present estimates with exports from Tanzania expected to increase, Zimbabwe to resume exporting, and South Africa to greatly increase exports quantities if the VAT on sorghum grain is removed.

Section 4 provides an assessment of each country's physical and facilitating marketing system functions. Traders are expected to handle most of the potential increase of sorghum marketings when proposed sorghum standards are implemented and quality can be identified at the farm-gate. The estimated economic gain for small-scale farmers in Tanzania and Zimbabwe in the second year after implementation of these proposed quality methods was about US\$ 400,000.

Section 5 discusses the participation and role of private industry in the proposed standards. Industry persons interviewed felt it was possible to implement the standards

without additional government involvement. The government's role was assessed to be that of addressing issues through the Bureau's of Standards in each country and continuing with current authority for health, food quality, and safety. Tariff barriers were not an issue by grain traders and processors. The major non-tariff barrier to trade between countries was poor sorghum quality.

Section 6 identifies the need for sorghum supply and utilization balance sheets and suggests the use of one similar to that developed by the South African Grain Information Service. A need for market information and marketing margins to keep all participants informed of changing marketing conditions and structure was also identified. Finally, suggested action and information to facilitate implementing the proposed standards was suggested to be carried out by the "Working Group on Grades and Standards" to be established during the workshop to review results of research on the proposed quality methods and standards.

1. INTRODUCTION

The overall objectives of this USAID sponsored project, "Development of simple, common grain quality standards for sorghum, to facilitate grain trade in southern Africa" taken from the task order are reproduced in Appendix 1 of this report.

This Technical Report #1, "Market analysis and feasibility of sorghum grain standards for southern Africa's industrial processors" covers that portion of the activity related to the economic aspects of the project. Technical Report #2, "Methods to be used to identify and specify characteristics desired by industrial processors that use sorghum as an input" described the aspects of the investigative activity related to development of methods to determine sorghum grain quality. It was completed in May, 2001 by Professor J R N Taylor, Food Scientist. There were five methods developed as a result of the research. These were: Detection of high-tannin sorghum grain, grain color, grain hardness, germinability, and grain purity. The methods will be evaluated by the Ring trial procedure and validation conducted. A workshop to review the Technical Reports will be held after validation is completed. An expected outcome will be to set up a grades and standards working group of interested parties in the southern Africa region to propose activities to carry out means of introducing use of the methods by sorghum traders and processors. A final report on the sorghum grades and standards activity will be prepared at the conclusion of the process.

The project team consisted of an agricultural economist and food scientist. The interaction of the two disciplines proved invaluable in conducting the interviews and discussions about the information provided by interviewees. The effectiveness of the partnership resulted in consideration of Grades and Standards issues that might have been overlooked without the thoughtful analysis of the other concerning the consequences on either food science or economic prospects.

Governments in southern Africa now recognize the importance of liberalizing grain markets. From state marketing board control, countries starting in the 1990's turned to free-markets and began promotion of market-orientated economic activities carried out by the resurging private grain sector. Unfortunately, money for this purpose is often unavailable and any undertaking limited.

There are two major southern Africa trade blocs that are implementing free-trade agreements among members: The Southern Africa Development Community (SADC) free-trade area and the Common Market for Eastern and Southern Africa (COMESA). Both trade actions foresee the removal of tariff and non-tariff barriers to trade among members. Two of southern Africa's largest producers of sorghum (South Africa and Tanzania) are not active participants in COMESA. Passage of the US Africa Trade Act last fall allows products from sub-saharan Africa, preferential access to the US market. Because the US itself is a major producer and world exporter of sorghum, this Act will have little impact on the likelihood of sorghum products from southern Africa, even duty free, finding a market in the US. In the case of sorghum grain, SADC offers the most opportunity for increasing trade in southern Africa.

This Technical Report #1 addresses issues that USAID felt needed investigation before consideration of the introduction of quality methods in the sorghum marketing system. The reports covers:

- Approximate potential for sorghum grain use in the food and feed grain industries in Botswana, South Africa, Zimbabwe and Tanzania
- Estimates of commercial marketing flow changes due to implementing proposed sorghum grain quality grades and standards for selected criteria
- Analysis of expected price changes due to implementing proposed sorghum grades and standards including approximate economic gain to small-farmers in the four countries
- Analysis of tariff and non-tariff conditions affecting trading between the four countries
- Assessment of the likelihood of the sorghum industry's ability to manage use of proposed grades and standards; and likelihood of Government participation in standards management
- Identification of information needed to further evaluate sorghum marketing within and between countries in SADC

1.1 SORGHUM COMMERCIAL MARKETING SYSTEM ANALYSIS

A way to evaluate the impact of the proposed quality methods on the sorghum food and feed grain complex is to consider that the marketing process as an interrelated system and that quality effects in one sector pass forward and backward throughout it. One marketing classification could be to consider all decisions and transactions from farm until final sale to consumers . For purposes of this analysis, the sorghum commercial marketing system was interpreted as beginning at the farm gate as sorghum moved into commercial channels and ends after sorghum is made into products at the processor (wholesalers and retailers of product are not considered). The focus is on commercial activities because a large percentage of sorghum grown in southern Africa is for subsistence use where grown or used in the local area. There are several main ways this takes place. One is, local consumption by the farmer either by direct home use (hand preparation into meal) or by taking sorghum grain into a village mill operation (hammermill) and bringing the ground meal back home for consumption. Another local use is the farmer selling sorghum grain to villagers where it is ground into meal and returned to the purchaser or the farmer selling directly to the miller. A third use is that sorghum is sold to a village traditional brewer where the product is made and sold for drinking at or around the facility where it is made. Sorghum for all of these purposes was considered local use and not commercial marketing. The reasoning is that this sector of sorghum consumption is not thought to

have potential for significant increase and movement into marketing until the commercial marketing system first expands and then demands additional production. Population growth is low; migration to urban areas from farms is significant, and the subsistence growers will by necessity consume what they can produce.

Elements of the commercial sorghum marketing system can be identified by physical functions of assembly, storage, transportation and processing. Also to consider are facilitating functions of market information and commodity exchanges, grades and standards, financing activities, and Government policy/research/extension. There can be other processes included, but these categories are familiar to grain marketing participants. The development and expansion of commercial marketing can contribute greatly to the commercialization of subsistence farmers because it will provide outlets and incentives for increased production.

1.2 GRADES AND STANDARDS

Grades and Standards (G & S) are considered a facilitating service function in the above marketing system. G & S define in a uniform manner what quality factors are considered important by the country approving them, with limits/defined values for these factors and identification of the methods used for determining the factor values. The value of G & S is in providing information to enable participants who wish to trade sorghum a recognized base so that they can communicate effectively and contracts or price can be negotiated. Using a standard allows trade to progress beyond the necessity of visually and physically handling the sorghum to viewing the G & S results. Uniformity in the application of G & S is essential if buyers and sellers are to have confidence in the measurement and interpretation of results. A central organization is thought to be necessary to achieve uniformity of testing application and reporting. Also, many feel adherence to proper procedures requires regulation and enforcement by a central body. Standards are generally developed by industry participants through Government support and usually regulated by the Government. Usually the Government attempts to recover partial or entire costs by some type of user fee or assessment for services. In the case of a grain standard this often consists of inspection and license fees, laboratory charges, certificate fee, appeal fee, and so forth. The imposition of additional costs of G & S on a developing free-market system where costs at most stages are already high because of small volume and inadequate infrastructure could result in little participation or use by private industry.

Botswana, South Africa, Tanzania and Zimbabwe are subscriber members of the International Organization for Standardization (ISO), one of the associated groups of the United Nations International Development Organization (UNIDO) dedicated to a worldwide awareness of necessary activities for development. Each country has a Bureau of Standards (BOS) organization within the Government that follows the requirements and guidelines for ISO membership. Requirements include procedures for use of approved quality methods and accredited testing laboratories. The review of sorghum grain standards reported in Technical Report #2, reported that South Africa and Zimbabwe have sorghum grain quality standards (grades), with Botswana

currently reviewing proposed standards. It is expected that any sorghum grain quality methods developed as a result of this USAID study would follow the ISO procedures for standards development. This would involve sorghum industry members requesting the Agricultural and Food Standards Committee in a country to consider the proposed methods and possible standards. There follows a defined series of reviews and meetings between industry committee members and BOS, with eventual public involvement in the process. Recommendations are submitted by the committee to BOS for approval/disapproval that can culminate in published standards for the country.

1.3 QUALITY METHODS CONCEPT

A few simple qualitative criteria of sorghum characteristics may be all that is needed to facilitate initial classification of southern Africa production into desired groupings for industrial processors. It was proposed that methods to identify the quality characteristics be simple, inexpensive, and not require laboratory conditions or trained personnel to conduct them.

Use of the methods is primarily for grain differentiation at the beginning stages of the marketing system, although they can be used throughout. This could allow users to identify sorghum offered for sale at the assembly stage, then to maintain separation in desired quality categories until processing. By doing this, the current difficulty in gathering small amounts of differing quality sorghum from farmers into economically sized transport loads which results in mixed quality of the cargo can be avoided. By the buyer selecting the quality desired and pricing the offering accordingly, the price signal is transparent to the grower as to the quality desired in the commercial market.

2. SURVEY OF COMMERCIAL SORGHUM MARKETING IN SELECTED SOUTHERN AFRICAN COUNTRIES

An assessment of proposed sorghum quality methods and standard impact on the marketing system of four southern Africa countries was undertaken in each country during the period February to April 2001. Interviews with persons working in the sorghum sector were conducted in Botswana, South Africa, Zimbabwe and Tanzania. The observations, results of a survey taken, and data obtained during the assessment are reported in this section of the report.

2.1 BOTSWANA

BACKGROUND

Botswana is located in southern Africa with country boundaries comprising Namibia, South Africa, and Zimbabwe and has no coastline. The approximate land area is 585,000 sq km of which about 1% is arable. Climate is semiarid with warm winters and hot summers. The terrain is mostly flat with gently rolling hills and the Kalahari Desert in the southwest part of the country. There are periodic droughts and seasonal winds carrying sand and dust across the country.

Population is estimated at about 1.6 million with a low estimated growth rate of about $\frac{3}{4}$ percent. The capital is Gaborone, the largest city. Botswana celebrates 30 September 1966 as Independence Day. The Government type is parliamentary republic and English is the official language.

INTERVIEWS

Interviews in Botswana began March 12 and continued through March 15, additionally several interviews took place later in the month, when team members were in Botswana on travel. Interviews were done jointly with Dr. John Taylor in the listed time except for two done by Dr. Taylor on other visits.

The marketing sector description, job title, and company type for each interview is listed in Table B-1.

Table B-1. Listing of Botswana interviewees by sector, job title and company type.

Sorghum Marketing Sector	Job Title	Company Type
Government	Deputy General Manager	Grain Marketing Board
Government	Director Ag Plan & Stat	Ministry of Agriculture
Processor (Serowe)	Food Products	Food Products
Government (Kanye)	Director Research Center	Food Research
Government	Senior Standards Officer	Bureau of Standards
University	Head, Dept of Economics	Economic Research
Processor	Technical Manager	Brewery
Processor	Managing Director	Food Products

Source: Personal interviews, March, 2001.

Role of Quality in Sorghum Marketing

The interviewees were asked to rank the 5 sorghum quality criteria in order of importance in their decision-making on sales or purchases of sorghum and to name other quality characteristics they felt were important. Dr. Taylor reported the ranking results in Technical Report #2 (May 2001).

Facilitating Marketing Services to Increase Sorghum Trading

Respondents were asked to select from a list of marketing considerations, factors (up to a maximum of 3) that would in their opinion increase the overall usage of sorghum. Responses are listed in Table B-2.

Table B-2. Factors that could increase sorghum trading.

Factor Selected	Number Responded
Improve transportation infrastructure/lower cost	3
Cleanliness of grain	3
Overall quality of grain	2
Reliable supply/supplier	2
Uniformity of shipment	1
Government: assist price information availability	1
: assist seed improvement efforts	1
: financial incentives for processors	1

Considering that most of the sorghum being processed in Botswana is imported, factors selected seemed to be those that could lead to increased quantities of sorghum being produced domestically and moving into the market. Respondents were concerned that sorghum yields are much lower than in neighboring countries; good roads are lacking to markets from smallholder producing areas; and processors lack capital/or interest to build facilities to store domestically produced sorghum between harvests.

All respondents were asked if there were: (1) Government policies in effect that restricted sorghum marketing; and, (2) To identify any additional Government policies or services that could be provided to facilitate sorghum marketing. Most answered that they were satisfied with the open purchase import policy that has allowed them to obtain sorghum at a competitive price and assured a consistent supply. One respondent felt that the current Government policy of free trade with South Africa and preferential agreement on trade with Zimbabwe meant sorghum could be imported at less cost than cost of sorghum grown by farmers in Botswana. Most felt that if costs of producing sorghum locally were much higher than neighboring countries, the prudent action was to not subsidize farmers to the extent of making sorghum non-competitive as a food product in the market, because of price. Some suggested that the Government could assist farmers by implementing already available improved seeds and perhaps work-for-food programs of road maintenance and extension into growing regions. Another opinion was that

(Botswana Agricultural Marketing Board (BAMB) actions to achieve profitability were forcing a low price on small farmers, which resulted in farmers now only planting enough sorghum for home use.

Interviewees were asked if they felt the industry could manage to work with a program of quality methods such as were being proposed, or if government involvement was needed. The food processors felt they had enough experience with buying sorghum using contracts from South Africa and Zimbabwe that any quality problems could be addressed between parties. Several shipments from these countries to Botswana had not met contract requirements and been rejected or negotiated without government involvement. The farmers have been selling to BAMB at prices with grade specifications for many years and this process is well laid out. However, the Ministry of Agriculture (M of A) respondent felt there are issues of phytosanitary concerns that would require government regulation and enforcement. A problem had recently taken place where a shipment of sorghum containing noxious weeds had been milled and sold and people had become ill and died. The BAMB official had a similar concern and suggested an agency should have oversight over G & S health issues. After further discussion it was discovered that health issues were regulated by an existing agency. The sorghum quality methods being proposed were useful to screen sorghum quality for marketing purposes and health and food concerns could be handled by existing agencies.

SORGHUM MARKETING INFORMATION GATHERED FROM INTERVIEWS AND DATA SOURCES

The initial effort by the Government in the 1970's to develop agriculture from animal grazing to grain and crop production carried with it many incentives and support actions to economically make it feasible to produce grains. These incentives have disappeared in the movement to a free market economy in the 1990's. The result is that without incentives, sorghum production by the small-scale farms has little or no return to labor expended and for large-scale farms, other crops provide much greater returns to inputs than sorghum. Thus the area devoted to sorghum production has greatly declined over the past 5 years.

The Botswana Agricultural Marketing Board was established in 1974. Its main function was to stabilize market prices for a number of basic commodities for both producers and customers. The country only produces a small percentage of its consumption of sorghum. Botswana sorghum marketing was generally decontrolled starting in 1992. The BAMB prior to 1992 controlled all movement of sorghum entering or leaving the country and bought and marketed most of the domestically produced grain. Importing of sorghum from countries by traders and processors is now allowed through import permits. For food security purposes, BAMB still has responsibility for sorghum it purchases from farmers or imports. The Board also manages the Botswana Government Strategic Grain Reserve (SGR), but over the past several years has disposed of most of the accumulated stocks due to quality deterioration and length of time kept in storage.

Consumption of sorghum is mainly as meal in the urban areas where it is purchased from supermarkets and shops. Numerous brands were available in the supermarkets as there are many millers and prices seemed to be lower than at a general dealer. In urban areas it is doubtful that any consumers dehull at home and pound sorghum into meal. In rural areas, sorghum may also be consumed as a beverage. Either by using purchased malt flour to make the product or buying directly from the local small scale brewer. Although opaque beer produced by a large brewery is sold throughout Botswana, sorghum use in the process is limited to imported sorghum malt. Vitamin enriched precooked blends of sorghum and soybean meal are also produced and sold, mostly through Government feeding programs.

Production Areas and Supplies Relative to Consumption Requirements

Only about 1% of Botswana is arable and this is in mostly semiarid climate. Sorghum should grow better than most cereals in this climate, but drought has caused greatly varying yearly production. Most sorghum that moved into marketing channels formerly came from commercial farms in Pandamtenga and the Barolong District. The most recent 3-year average production is 13,200 MT (Table B-3). The crop year is from April 1 through March 31.

Table B-3. Sorghum production, imports, and amount (000) purchased by BAMB.

Crop Year	Production	BAMB Purchases	Percent Total	Imports	BAMB Purchases	Percent Total
1997/98	16.8	2.0	12	31.2	15.5	48
1998/99	9.3	1.2	13	43.8	25.0	57
1999/00 1/	13.7	2.0	15	36.3	20.0	55
1997/00 average	13.2	1.7	13	37.1	20.2	54

Source: Agricultural Planning & Statistics, Ministry of Agriculture and BAMB
1/ Estimates by respondents.

A working paper “Commercialization of Sorghum Milling in Botswana: Trends and Prospects”, by D. Rohrbach, K. Mupanda, and T Seleka contained 1999 survey results of sorghum millers. In the paper estimated quantities of imports were much larger for 1998 and total demand for sorghum grain by millers was estimated to be approximately 60,000 MT. BAMB had been reducing surplus stocks since large domestic purchases were made during the excellent crop year of 1995/96, but not in sufficient quantities to account for the difference. BAMB reported almost no sorghum was in SGR at the end of the 1998/99 marketing year. BAMB and M of A respondents estimated 70,000-80,000 MT of sorghum are probably used in the country. Official published sorghum data used for Table B-4 are lower. The M of A official said the data is being reviewed and may be revised at a later date. Data from South Africa export statistics indicates Rohrbach’s estimate is more likely to be correct. It is unclear why the Government data are not accurate because all imported sorghum is required to have a permit and domestic

production accounts for less than a third of usage. Error could be in unaccounted production at the farm, underreporting of imports, or sorghum not being reported as food use that is being made into local brew. Less than 4,000 tons of yearly disappearance was estimated for feed, losses, or other uses.

Yearly balance sheets and per capita consumption estimates by the M of A are also questionable. Data for crop years 1997/98 and 1998/99 are not reasonable. As an example for 198/99, the population estimate used was 1,541,000 and per capita consumption of sorghum was reported at 24 kg/yr, much lower than per capita consumption over the past decade. There were large amounts of wheat and rice coming into the country as food aid during the period. Also there were large amounts of maize imported as commercial purchases, but considering reported amounts of sorghum being milled by Rohrbach, the per capita figure seems in error (60,000 MT @ 80% extraction rate = 48,000 MT of meal versus 1.541 pop x 24 kg = 36,984,000 kg /1,000 kg/MT = approximately 37,000 MT) or over 22 percent unaccounted for.

Table B-4 was developed from reported usage by interviewees and data sources other than Government figures, to provide an estimate of the commercial marketing flow of sorghum.

Table B-4. Sorghum flow estimates (MT) 1998/99, developed from interviews and data.

Amount Available	Commercial Market	Processors	Feed and Food Uses
Production -10,000	Traders -35,000	Food -59,000	Sorghum meal
Imports -44,000	BAMB -23,000		Fortified foods
Error - 6,000	Contracts - 2,000		Sorghum malt flour
		Feed - 1,000	Poultry feed
		Brewery- 0	
Total -60,000	-60,000	-60,000	

Note: BAMB import purchases were from private traders with only local purchases from farmers delivering at depots.

The sorghum meal processors interviewed said they preferred to buy from commercial farmers in Botswana. However the past few years, because of lower production they were only able to buy a small portion of what they needed. Because farm supply is so uncertain, buyers don't use much forward contracting, generally doing monthly purchasing after the initial harvest surge. One food processor did do some contracting with farmers the previous crop year. The other food processor bought directly from farmers, but did not use contracts.

One food processor made sorghum malt flour for sale to local brew makers and households (2,000 MT) and vitamin enriched precooked sorghum blended products (8,000 MT) for Government feeding programs.

The brewery used sorghum malt (4,000 MT) to produce opaque beer, but the malt is imported from South Africa. Sorghum was not used in the process as an adjunct.

Assembly, Storage and Processing

Costs of gathering sorghum grain stocks into loads for transport were not considered to be a barrier to purchasing from farmers as almost all domestically grown sorghum bought by processors was being purchased from commercial farmers. But cost to transport the sorghum from the white sorghum growing area located 400 kilometers away from the large food processors, was a concern. Larger mills have their own trucks for pick up and delivery while smaller mills pay transport from the point of purchase or the BAMB depot to their mill. Importing red sorghum from South Africa in large truckloads was felt to be a better overall value when taking purchase price and transport costs into consideration.

The largest owner of storage facilities is BAMB with capacity in excess of 132,000 MT. There are 15 depots of which 3 have silo installations, and all 15 have flat bag-type warehouses. This storage was built to provide farm commodity support and for food security purposes. The government policy change to an open market and import deregulation combined with much lower domestic production, has left BAMB capacity largely underutilized. The next largest storage units are owned by the lager and opaque beer breweries. Their capacity is mostly used for the storage of maize, the main adjunct in the brewing processes. The only sorghum presently used by breweries is imported sorghum malt for the production of opaque beer. Other cereal processors have both silo and flat warehouse storage. The larger sorghum food processors have some storage to use for seasonal purchases at harvest when prices are lower, but most small sorghum processors have little storage capacity.

The technology and structure of sorghum meal milling in Botswana is described in the working paper by Rohrbach. The sorghum milling process can be simply described as cleaning the incoming grain, dehulling for removal of the outer seed coat, passing the dehulled grain through a hammermill to reduce the kernels into meal, and packaging the meal. The number of hammermills in use is over 160. The large commercial and medium size processors use multiple hammermills while small operators may only have one dehuller and hammermill. There was extensive support by the Government to: (1) develop the dehuller and supporting equipment and parts through a parastatal technology development agency, Rural Industries Innovation Centre (RIIC); and, (2) provide financial support to small scale projects such as small sorghum mills which are initiated by entrepreneurs.

Price and Marketing Margins

BAMB issues sorghum producer prices based on landed cost (Import Parity) of imported sorghum. A base price is first calculated next the zone or region prices are determined by adding transport costs to the base price. Purchase price for sorghum (red and white) for the 1998/99 marketing season, was a base price of Pula 485.71 in Regions 1 and 2. In Regions 3 through 5 the adjusted price was Pula 505.71 for a MT of Grade 1 sorghum. Millers felt the transport cost of Pula 20 was low and not a representative of actual cost. The release price by BAMB at a depot is the base price adjusted by marketing margins

and representative transport cost. It is adjusted periodically during the marketing year. At the start of the season release prices were much greater between regions. The price in Region 1 was Pula 725 while in Region 5 it was Pula 834.29 including cost of a new bag. The food producers felt the present BAMB policy of low producer price discouraged farmers from producing more sorghum.

Rohrbach reported in his paper: that in the smallholder sector, returns to labor for sorghum production were generally lower than the rural wage rate. At the same time, in the commercial farm sector, farmers were shifting land use from sorghum into more profitable crops. Overall, growing sorghum is a marginal source of income for most farm households.

As long as sorghum producers in South Africa and surrounding countries can produce and transport sorghum to Botswana mills at a lower price than it is profitable to purchase sorghum within Botswana, with the same or better quality characteristics, importation will continue.

Retail prices of sorghum meal and products were compared with competing cereals and breakfast items at several supermarkets in Gaborone. Attempts were made to use comparable quality of products where possible. The price of the 2.5 kg bag of maize meal was the same as sorghum meal. Maize meal in larger sized bags was the same price or slightly higher (Pula 0.5 difference) than sorghum meal. For other cereal breakfast foods Jungle oats price was about twice the cost for the same size of Morvite. One food processor said competition between maize and sorghum meal is basically open and prices are mostly competitive except for special products or grades or where one brand dominates. One supermarket said they sold more sorghum meal than maize because some customers like a traditional method of preparation that uses fermented sorghum flour paste for a semi-stiff porridge, a preparation they can't do with maize meal.

2.2 SOUTH AFRICA

BACKGROUND

South Africa is located at the southern tip of the continent of Africa with country boundaries comprising Botswana, Lesotho, Mozambique, Namibia, Swaziland and Zimbabwe. Its coastline extends 2,798 kilometers from the south Atlantic ocean on the east to the Indian ocean on the west. The approximate land area is 1,220,000 sq km of which 10% is arable. Climate is mostly semiarid with subtropical along the east coast. The terrain consists of a vast interior plateau rimmed by hills and narrow coastal plain. The area is subject to prolonged drought and water conservation is a major issue.

Population is estimated at about 44 million with a low growth rate of ½ %. The capital is Pretoria with Johannesburg, Cape Town and Durban the largest cities. South Africa celebrates 31 May 1910 as Independence Day. The Government type is republic with a political change to black majority rule beginning in the 1990's.

INTERVIEWS

Interviews and data gathering began in Pretoria, South Africa on February 27 and continued there and in several other locations (shown in Table SA-1) through March 8. Dr. John Taylor participated in most of the interviews during that time and also did a final interview on April 26. The marketing sector, job title, and company type for each interviewee is listed below. Several of the people were interviewed by telephone because of time constraints or office location.

Table SA-1. Listing of South African interviewees by sector, job title and company type.

Sorghum Marketing Sector	Job Title	Company Type
Farmer	Co-Owner of farm	Farm
Trader, Exporter	Manager	Grain Trading
Processor (Conf@Sun City)	Manager, Purchasing	Brewery
Government	Chairperson, NAMC	Mkt & Research M of A
Processor (Potchefstroom)	Manager, R&D, Inst. Sales	Food Products
Processor	GM, Technical Services	Brewery
Processor	Managing Director	Food Products
Government	General Manager	SA Grain Statistics
Farmer Association	Secretary, Information Ser	Research & Information
Government	Assistant Director, PH&Q	Grain Quality Inspection
Trader, Exporter	Head, Trading Services	Grain Trading
Processor Association	Executive Director, AFMA	Animal Feeds
Government/Industry	Dep Director, Grains Crop I	Research
Private Laboratory Services	Laboratory Mgr, SGS	Grain Inspection
Trader, Exporter	Head, Commodity Trading	Grain Trading

Source: Personal interviews, Feb/Mar/Apr, 2001.

Role of Quality in Sorghum Marketing

The interviewees were asked to rank 5 sorghum quality criteria (Germinability, Grain color, Grain purity, Hardness degree, High/Low Tannin) in order of importance in their decision making on sales and purchases of sorghum. They were also asked to name any additional quality methods that should be considered. Dr. Taylor reported the ranking results in Technical Report #2 (May 2001).

Facilitating Marketing Services to Increase Sorghum Trading

Those interviewed were asked what needed to be done to increase the production and marketing of sorghum. Suggestions are listed by factors important to marketing and identified as needing improvement or assistance.

The most suggestions came for better measures of quality of sorghum. Sorghum standards and grades have been used in South Africa (RSA) for a number of years so this is surprising. The explanation appeared to be that while standards for sorghum were

adequate for the brewing industry, the needs of milling for food use had been neglected. Inadequate grain quality standards for food use led to recent problems when sorghum was exported to Botswana because shipments of white sorghum had mixed grain hardness and were rejected. The supply of good milling quality hard white sorghum varieties to meet demand is insufficient according to several interviewees.

Table SA-2. Suggestions by respondents to increase sorghum trading.

Respondents Suggestions	Number Responded
Better measures of quality of sorghum	6
Improvement in overall quality of sorghum	4
Community development programs for small scale farmers	3
Reliable supply/suppliers	2
Organizations/Associations provide price & market information	1
Government: eliminate VAT tax on sorghum	5
: training in marketing sorghum in a free market	4
: training small-scale farmers in farm management	4
: assist more and faster seed variety development	3
: more research money for sorghum marketing	3
: support small-scale milling enterprise program	1

The second most frequent issue was that of the VAT tax on sorghum. There is no VAT on maize or imported rice. This appears to be an issue of past practice to discourage sorghum moving into marketing channels for food use other than brewing. Recent efforts to eliminate the VAT tax have not been successful. A suspected side effect of the VAT tax is the underreporting of sorghum being exported into Botswana as indicated by RSA export statistics. One interviewee said the domestic use data may also be underreported. There can be an economic advantage to round down for VAT reporting. When a large processing firm reports direct purchases from farmers and the same firm reports products, there could be underreporting.

The effect of the free trade action taken by the government has impacted how the small-scale and medium-size farmers market their grain. Several respondents said many of these growers have become discouraged and no longer grow sorghum. First, the gradual weakening of the Cooperatives as a viable farm organization and then the dissolution of the Marketing Board along with other actions left farmers unprepared to deal with free market conditions. They were not familiar with contract law, unaware of the need to obtain price information to compare offers for purchase of their crop, could not understand the supply and demand issues that led to large price swings, had no previous need for storage facilities or knowledge of how to properly store grain and in general were left to cope on their own to market their crop.

There were many suggestions for increased government involvement in facilitating sorghum marketing, from farmer support to small-scale enterprise support for millers. It is doubtful that increased government support for sorghum production and marketing will take place in the near future given the on-going reluctance to eliminate the detrimental

effect of the VAT tax. The efforts of Community Development Programs started for maize farmers through a cooperative effort of private and some government agency support seems to offer the possibility for adoption by sorghum industry groups.

SORGHUM MARKETING INFORMATION GATHERED FROM INTERVIEWS AND DATA SOURCES

In 1996 Parliament passed the Marketing of Agricultural Products Act. This new act replaced the Marketing Act of 1968 and brought about deregulation in the South African agricultural industry. In order to implement the provisions of the Act, the National Agricultural Marketing Council (NAMC) was established in January 1997. The NAMC is a statutory body established in accordance with the Act to advise the Minister of Agriculture and the South African agricultural industry on matters relating to the marketing of agricultural products.

After the control boards had been disbanded, some structures were put in place to serve the agricultural industry. The Sorghum Board was disbanded on September 8, 1997, with 2 organizations taking over the functions performed previously by the Board. The Sorghum Forum representing directly affected groups recommends research and marketing activities. The Sorghum Trust holds and administers funds collected by levy (The 2001 levy was 3.1 R/MT sorghum, excluding VAT) from the sorghum industry. A major expense of the Sorghum Trust is to partially fund collection and dissemination of information about sorghum.

When the grain boards were phased out, it was recognized that valuable agricultural information retained over the years would have been lost and no new information gathered. To fill this need for commodity information, four industries (maize, sorghum, winter grains and oilseeds) designated an organization to operate and continue the information function. The South African Information Service (SAGIS) was established in late 1997. It is funded through the Trusts of the four commodity groups. The primary objective of SAGIS is to gather and process domestic grain and oilseed information and make this data and other domestic and international information available to interested parties.

South Africa has a viable grain industry and has dealt in international trade of maize and wheat for many years. A commodity exchange, called South African Futures Exchange (SAFEX) began an agricultural products program in 1995 as deregulation was proposed. In March of 1998, agricultural products options were introduced. SAFEX established contract trading in maize, wheat and sunflower. Contracts designate Randfontein as the basis location, with registered silos at other locations acceptable for delivery at fixed additional charge. The exchange has members from the major processors, trading firms and interested parties. Domestic trading and international prices are available for the crops actively traded. Although sorghum contracts are not traded on SAFEX, the exchange information on maize is a valuable source of current grain pricing. In May 2001, SAFEX members voted to accept an offer to merge with the Johannesburg Security Exchange (JSE) on July 1.

An import parity price of sorghum can be calculated using a prescribed format. For example, on February 23, 2001 using March futures for sorghum at Gulf points of 100.60 \$/ton FOB it could be calculated that a cost of delivery at Randfontein was 1,152.26 R/ton. Included in the estimate is a tariff for sorghum fixed at 3% of the FOB price at Gulf points. For April 30, 2001 the calculated cost increased to 1,170.0 R/t. If compared to a similar procedure for maize, the calculated cost for the same period was about 30 R/t less.

The markets have also developed a standardized contract form (SAGOS contract form) that can be used between trading parties. A silo receipt system is in use that is similar to the warehouse receipt system used in the United States. Private international inspection and grading services with analytical laboratories are located domestically to service the industry. Several associations specifically service production and processing sectors of the sorghum industry, some service sorghum interests along with other grains and oilseeds.

Production Areas and Supplies Relative to Consumption Requirements

In the last 5 marketing years (May1 through April 30), the average annual production of sorghum was almost 315,000 MT from an average of 141,300 hectares giving a yield of 2.23 MT/ha (Table SA-3). During 1999/00 production was about 50% of the 1996/01 5-year average, leading to price disturbances for much of the year.

Table SA-3. Sorghum area, production, and yield, 1996-2001.

Marketing Year	Area (000 Ha)	Production (000 MT)	Yield (MT/Ha)
1996/97	174.1	445.0	2.56
1997/98	160.1	355.0	2.21
1998/99	131.2	264.6	2.02
1999/00	98.9	156.0	1.58
2000/01	142.2	352.5	2.48
1995/01 Average	141.3	314.6	2.23

Source: South African Grain Information Service (SAGIS)

The yields in South Africa are much greater than the other 3 countries surveyed for this project (Botswana, Tanzania and Zimbabwe) because more sorghum is being grown on commercial farms with more inputs applied. Sorghum is often used in rotation with other grain and oilseed crops grown by these farmers with crop management techniques applied to the unit. This results in larger quantities of sorghum available per farmer. Because other grains are also grown, grain harvesting machinery is economically feasible and bulk handling of the crop is done. The sorghum is freer of contamination of other materials and can be handled at lower cost by assemblers or purchasers than sorghum grown traditionally on small-scale farms. The end result is that sorghum can move into both processing and export channels at low marketing costs.

It was mentioned in the section on Botswana that surveys and estimates by interviewees of the amount of sorghum milled into meal and otherwise utilized were much larger than reported availability of sorghum. Most estimated sorghum quantities imported into Botswana at a minimum of 60,000 Mt in the last year, with 90% or greater coming from South African shipments. Estimates by traders in South Africa that shipped sorghum into Botswana were also in the 60,000 to 70,000 MT. Estimates for all export of sorghum from South Africa published by SAGIS are shown in Table SA-4.

Table SA-4. Sorghum exports from South Africa, 1996-2001 reported by SAGIS.

Mkt. Year	1996/97	1997/98	1998/99	1999/00	2000/01
Quantity (000 MT)	110.7	57.1	58.1	23.5	33.8

Source: SAGIS website.

The 1999/00 and 2000/01 export data is suspect. In the interview with SAGIS, it was acknowledged that others felt there was a problem with the quantity reported and increased staff were to be assigned to obtain data at entry points into Botswana. It was undecided if adjustments to export quantities were going to be made for these years. A simplified consumption and use table was prepared using SAGIS data for the 1999/00 and 2000/01 marketing years, Table SA-6. Only major categories were included.

Table SA-6. Availability and disappearance of sorghum, 1999/00 and 2000/01.

Category Description	1999/00	2000/01
Opening stocks	73.3	24.0
Deliveries directly from farms	177.8	386.0
Imports	53.0	0.0
Quantity available for use	304.1	410.0
Human consumption	173.9	128.5
Animal feed	36.4	12.3
Exports	23.5	33.8
Closing stocks	24.4	205.1
Quantity accounted for	258.2	379.8
Difference	45.9	30.2
SAGIS Withdrawn by producers/end consumers	33.5	29.2

Source: SAGIS website

The SAGIS category “withdrawn by producers and released to end consumers” is listed under the total utilization category and may be where some of the otherwise unreported exports to Botswana are coming from. Another problem about utilization was that the interviewee from the Animal Feed Manufacturers Association (AMFA) said the usage of their members alone accounted for most of the yearly SAGIS reported usage although their membership was only about 60% of the total industry. An estimate was given that

the feedlot and smaller processors not in the AFMA would increase sorghum usage by 25% to 30% more than shown in SAGIS sorghum animal feed use.

Table SA-6 was developed from reported usage by interviewees and data sources to provide an estimate of the marketing flow of sorghum.

Table SA-6. Sorghum flow (000 MT), 2000/01 estimates.

Amount Available	Commercial Marketings	Processors Usage
Beginning stocks- 24	Contracts- 80	Malt - 85
Production -386	Traders - 65	Meal - 40
Imports - 0	Subtotal-145	Grits/brew - 3
Subtotal -410		Animal feed- 17
	Exports - 34	
Ending stocks -205	Error - 26	Total -145
	Subtotal - 60	
Total -205	Total -205	

Source: Interviewees and SAGIS data

This flow estimates at least 26,000 MT more moved into export and 5,000 MT more for animal feed use. Contracting percent is probably increasing each year because of the many advantages including price secrecy between parties. The current projection for sorghum acreage in marketing year, 2001/02 is only about 100,000 hectares. If the SAGIS ending stock figure of 205,000 is accurate there should be enough production and stocks to met requirements. But, if more sorghum disappeared than SAGIS reported, stocks may be drawn down sufficiency to where sorghum price increases.

Assembly, Storage and Processing

Interviewees purchased from large-scale commercial farmers saying that the cost of assembly of grain was one of the reasons they avoided small-scale growers. Most processors now use bulk handling for incoming grain. It is more costly with their present facilities to handle bags.

Storage facilities are owned by: associations (formerly cooperatives restructured to Limited status), processors and traders. Because many cooperatives are no longer viable operations, less grain is being handled by the restructured associations now than in the past when they dominated the scene. Facilities include silos and bulk storage type with some older flat bag type storage still in place. The storage is generally in good condition to adequately store sorghum through the marketing year and into the next if need be.

Most large-size human food processors use direct contracting with farmers for purchasing sorghum grain. The direct contract process provides several advantages. The quality of sorghum purchased can be controlled was maintained by specifying varieties and specific quality factors. The quantity contracted and specified delivery date provides inventory control of supply and storage. The contract price can be concealed between parties. The

contract price can be used to hedge against future price movements by forward sale of products. The direct link with the producers gave vertical integration economies to the processor so as to take advantage of the overall profit opportunity.

The animal feed manufactures purchased primarily from traders. Some feedlots did contract directly with farmers, in order to get a uniform supply in large enough quantity. Feedlots can substitute sorghum for maize more easily and frequently as an ingredient in a feeding ration because they know use will be limited to the animals currently in the pens on the finishing cycle. A formula feed processor must produce feeds with uniform taste and consistency so that a number of purchasers over time are satisfied with the animals' consumption of the product. Even if the price between the two ingredients was favorable for sorghum (10-15% less) there is a reluctance for animal feed processors to switch to sorghum unless a large uniform supply is available at the lower price.

Several processors expressed the desire to buy more from small-scale farmers, but found that uncertain supply, high assembly costs of gathering small parcels, and variability in quality due to seed used and storage conditions made purchases difficult. One milling firm described a Community Development Program that they participated in and bought grain from. Small-scale farmers were given extension training on crop production and provided improved seed at subsidized cost if they sold the crop to the group. Support services for production loan provisions and other inputs (fertilizer, herbicide), assembly, transport and storage were available and scheduled for use. The grain was stored in proper facilities as soon as possible after harvest to maintain quality and have it available as the processor required. In the scheme described for the Northern Province there were seed, fertilizer, cooperative, Land Bank, University, M of A, and research organizations involved.

Currently a few processing and trading firms dominate the South African sorghum industry. These firms are often subsidiaries of larger firms in South Africa. They purchase most of the sorghum processed into food products and for the export trade. Many are increasing direct contracting with farmers to guarantee supply and the quality needed for their requirements.

Price and Marketing Margins

Sorghum is not traded on SAFEX and most sorghum used for domestic food processing is purchased on contract. A trading condition of "open discovery" or price transparency is non-existent for sorghum at this time. Estimates are made for average prices and reported on at least one weekly farm association television program. Maize contract trades at SAFEX and the international sorghum futures market provide the price guide most traders use to estimate general sorghum price movement.

The average domestic price of sorghum for marketing year 2001 was reported as 750 R/MT. Calculated import cost price at Randfontein in April was about 1,150 R/MT. Domestic futures price (SAFEX) for white maize March 2001 contract was about 825

R/MT. As sorghum was slightly above maize price much of the year, the probable contract price for average quality may have been about 850 R/MT.

Retail shelf price of several sorghum products and competing items of comparable grade are shown in Table SA-7 at two stores visited in Pretoria in early March. The maize meal brand was Super Sun Super, sorghum meal brand was Nola Monanti Super Fine, and the rice was Tastic premium. The cereals were the type that required cooking and are served hot.

Table SA-7. Retail price of selected grain products, 2 Pretoria locations.

Store Type	Product	Type/Weight	Price in Rand
Local Urban Center	Maize meal	Plastic/10 kg	25
	Sorghum meal	Plastic/10 kg	30
	Maize meal	Plastic/ 1kg	3.60
	Sorghum meal	Plastic/ 1 kg	3.65
	Tastic Rice	Plastic/ 1kg	6.95
	S Maltabella cereal	Box/ 1kg	8.50
	M Creamy cereal	Box/ 1kg	8.50
	Jungle Oats cereal	Box/ 1 kg	9.95
Pick & Pay Hypermarket	Maize meal	Plastic/ 2.5 kg	5.95
	Sorghum meal	Plastic/ 2 kg	5.99
	Tastic Rice	Plastic/ 2 kg	10.99
	S Maltabela cereal	Box/ 1kg	9.19
	M Creamy cereal	Box/ 1 kg	9.19
	Jungle Oats cereal	Box/ 1kg	9.75

Source: Visits to Pretoria stores in early March 2001.

The sorghum and maize prices for the ones listed and others not shown here were about the same for the hot cereals except for the oat product that was always higher. In the meal products, sorghum was the same price or slightly higher, especially in the larger quantity packages. Sorghum processors felt that in the retail market, sorghum meal is considered a higher value product than maize meal by customers and is priced accordingly. Rice price was much higher for the premium product listed. Price specials were lower on other brands and quality differences were evident between the premium and discount brands.

2.3 TANZANIA

BACKGROUND

Tanzania is located in eastern Africa and borders Burundi, Kenya, Malawi, Mozambique, Rwanda, Uganda and Zambia and the Indian Ocean. The approximate land area is 886,000 sq km of which only 3% is arable. Climate is tropical along the coast varying to temperate in the highlands. There are two rainy seasons in what is called the bimodal rainfall regions with a short (vuli) season starting in October and the long season

beginning in March (masika). The terrain is comprised of plains along the coast with a central plateau and rising to highlands in both the north and south.

Population is estimated to be about 35 million with a growth rate of about 2.5 percent. The capital is Dar es Salaam. After independence from the UK in 1961, the country merged with Zanzibar in 1964 to form the current republic structure. The country is heavily dependent on agriculture, which accounts for about half of its GDP.

INTERVIEWS

Interviews and data gathering began in Arusha on March 30 and continued into Dar es Salaam through April 6. The interviews were set up through ICRISAT and Dr David Rohrbach participated in some interviews. A recent study “Commercialization Prospects for Sorghum and Pearl Millet in Tanzania”, conducted in by D. Rohrbach and J. A. B. Kiriwaggulu was used as a source of background information for selection of interviewees (For a detailed description and analysis of the commercialization prospects for sorghum and pearl millet in Tanzania, please refer to the study). The marketing sector description, job title, and company type for each interviewee is listed in Table T-1.

Table T-1. Listing of Tanzania interviewees by sector, job title and company type.

Sorghum Marketing Sector	Job Title	Company Type
Processor (Arusha)	Owner	Food Products
Processor (Arusha)	Manager	Animal Products
Government	Director of Marketing	Agriculture Ministry
Processor	Managing Director	Food Products
Government	Agri. Section Leader	Bureau of Standards
Processor	General Manager	Brewery
Trader, Exporter	General Manager	Grain trading
Government	Manager	Food Security & Storage
Government	Head, Food Quality Section	Quality Testing Lab
Government	Food Technologist	Research

Source: Personal interviews, March 30 through April 6, 2001.

The long rainy season had just begun (late) on our arrival and concern about how the dry spell affected the grain-filling stage of the sorghum was expressed in some of the interviews.

Role of Quality in Sorghum Marketing

The interviewees were asked to rank 5 sorghum quality criteria in order of importance in their decision-making on sales and purchases of sorghum and to name other quality characteristics they felt were important. Dr. Taylor reported the ranking results in Technical Report #2 (May 2001).

Facilitating Marketing Services to Increase Sorghum Trading

Respondents were asked to select from a list of marketing considerations factors (up to a maximum of 3) that would in their opinion increase the overall usage of sorghum. Responses are listed in Table-2

Table T-2 Factors that could increase sorghum trading.

Factor Selected	Number Responded
Reliable supply/supplier	3
Cleanliness of grain	2
Improve assembly and storage/lower cost	2
Improve transportation infrastructure/lower cost	2
Overall quality of grain	1
Uniformity of shipment	1

Rankings support the information in Rohrbach's study that sorghum availability is limited and there is an identified need for greater availability quality clean grain.

Additionally, all respondents were asked if there were: (1) Government policies in effect that restricted sorghum marketing, and (2) To identify any additional Government policies or services that could be provided to facilitate sorghum marketing. All processors and the trader felt the 20% VAT on sorghum products was excessive and restricted greater sales. Also the two small millers felt there were too many types of taxes for a business. This included bribes to get most necessary licenses processed or even forms handled in a timely manner. Some taxes mentioned were: licenses (product, trading, township, revenue, refuse collection, city, local agent), premises inspections, 2% stamp duty, corporation, workers compensation and medical. Identified actions the Government could take to improve sorghum production and commercial usage were: promotion of sorghum food products for schools, donation programs, relief programs, institutions, etc.; expand on nutrition value additives to sorghum products (vitamin supplements); promotion of eggs and milk (e.g. animal feeds containing sorghum); promote sorghum production continuously (need reliable information to growers routinely versus infrequent information only when drought occurs); and, an acceptable standard for sorghum grain.

Interviewees were asked if the five proposed quality methods were adopted would the industry be able to handle disputes on quality and resolve them without new Government procedures in place. Both the Manager of Food Security and the Head of Food Quality Section Testing Lab said the sample procedure for disagreements between parties is presently satisfactory. The SGS in-country office was contacted and the manager said the Chemist Laboratory Agency was used for all of their sample testing. No one said that additional Government services or involvement was needed to support quality methods resolution.

SORGHUM MARKETING INFORMATION GATHERED FROM INTERVIEWS AND DATA SOURCES

Trade liberalization in grain started in the 1990's and is continuing. There is still export restriction on grain when security stocks are low or production is below certain amounts in regions. Other than that, grain amounts in excess of home consumption needs, are sold by farmers to traders and small processors. Contracting and agreements for purchase of grains are increasing between farmers and the larger processing firms, as the firms try to establish reliable and uniform quality supplies for their operations.

There have been four consecutive years of food deficit in Tanzania, resulting in food insecurity in some regions. There is widespread stress on farmers not producing enough for their home needs and unable to manage insufficient resources to cope with consecutive crop failures. Sorghum areas have been particularly hard hit with both widespread and localized droughts, variable seasonal rains, rainfall amounts causing localized flooding, and a road infrastructure decline making roads impassable. Because of these problems farming areas and rural markets are not adequately supplied with food which results in greatly fluctuating sorghum prices between even short distances.

Interviews revealed that the small food processors have difficulty in obtaining enough capital to modernize their facilities for production of better quality products. For example, sorghum from farms contains dirt, sand, stones, large pieces of trash material, and seeds or grains other than sorghum. Neither small processor visited had grain-cleaning equipment to remove the non-grain material or separate out other grains from sorghum. Hand-washing with water was used to separate the sorghum from dirt and sand but washed grain had to be open-air floor dried as no mechanical drying equipment was available. Sorghum dehullers were not available to remove the outer surface of the kernel prior to the process of reduction into meal. Hammermills were used to reduce kernels into meal when roller mill reduction of sorghum after dehulling will produce a higher extraction rate and better ratio of meal to flour. The processors had planned to purchase equipment but were unable to obtain a loan of the necessary amount. The ceiling on loan amounts for small processors is so low that even basic equipment exceeds the amount. The problem is further compounded because there is no manufacturer within the country of the types of cleaning and milling equipment needed and the process to import cleaning and milling equipment is costly and lengthy. Extensive and excessive bribes are required at each level to process an import document and the process involves many agencies. These agencies are often at cross-purposes and final approval can take years after initial submission. Some of the needed equipment is manufactured in Botswana and all of it is available in South Africa.

The government is not adequately serving the sorghum industry in two other major areas. Increased effort and support is needed to distribute improved seed varieties. Most sorghum is still sown to traditional unimproved varieties. With food security concerns and sorghum stocks depleted at the farm level, an improved sorghum seed distribution program would have reasonably quick returns to improve both farmer income stability and food reserves given normal weather patterns. There is a food for work program in

rural areas to repair and improve local roads. The food for work program could include improved seed distribution in the rural areas. If road infrastructure improvement is carried out and seed distribution becomes part of the food for work program, then not only can production increase but it can be moved out of the surplus area to deficit regions. Improved roads would enable traders to economically market sorghum between surplus and deficit areas thus, encouraging farmers who have little incentive to adopt better farming practices to increase production and quality of harvested grain.

Productions Areas and Supplies Relative to Consumption Requirements

About 60% of sorghum produced in Tanzania is grown in 4 semi-arid regions: Mwanza, Shinyanga, Dodoma, and Singida. These regions combined with others in the central area produce most of the sorghum produced. The interviewees who had purchased sorghum the past year bought from producers and suppliers in these regions. For the most recent 5 crop years (July 1-June 30) for which data is available, the average production of sorghum was 564,000 MT (Table T-3).

Table T-3. Sorghum, millet, and maize production, 1995-2000, (000 MT).

Crop Year	----- Sorghum	Production Millet	----- Maize
1995/96	872	367	2,663
1996/97	499	347	1,832
1997/98	673	126	2,750
1998/99	384	164	2,745
1999/00	392	154	2,254
1995/00 Average	564	232	2,449
1999/00 % diff. from average	- 30	- 34	- 8

Source: 1998/99 & 1999/00, FEWS, July 2000

Remaining years, Food Security Dept., Min. of Agri.

Low crop production in 1996/97 reflects severe drought in major producing areas. Sorghum production was also very low in both 1998/99 and 1999/00 while maize production was above average. The latter year estimates are from Famine Early Warning System (FEWS) data and sorghum production may have been underestimated. The Food Security Department (FSD) combined millet and sorghum projections for 1998/99 and 1999/00 were 207,000 and 278,000 MT more than the FEWS estimates. The actual quantities produced in these last 2 years could not be resolved. One reason for the difference was thought to be the difficulty in moving the sorghum crop out of fields with heavy untimely rain, flooding and deteriorated roads. Possibly more sorghum was produced than FEWS estimates, but losses may have been greater and the FSD projections overstate what was available for consumption.

In the interview, FSD personnel said maize is stored for security purposes, but that the agency has not stored sorghum for security needs. In years of shortfall of cereal grains,

maize is considered as a food substitute for sorghum and along with rice, may be imported. Sorghum has not been imported by the agency for a number of years. The National food balance sheet shows total food requirements, not as separate values by crop such as sorghum. Table T-4 contains estimates for the 2000/01 marketing year (June 2000-July 2001).

Table T-4. National food balance sheet for 2000/01 marketing year, (000 MT).

Item	Metric Tons
A Opening stocks (SGR, Commercial, on-farm)	403
B Domestic production	7,080
C Domestic availability without SGR (A+B-F)	7,403
D Domestic requirement	7,743
E SGR annual target	150
F SGR current stock	80
G Domestic balance with opening stock (C-D)	-340
H Planned commercial imports	150
I Expected food aid	66
J Exports	0
K Import gap without SGR (G-H-I)	124
L Required to replenish SGR (F-E)	70

Source: Rapid Assessment Mission, FEWS, July 2000.

Using these estimates, imports were planned and exports were restricted.

A 1999 estimate by Rohrbach of the sorghum crop moving into commercial markets was less than 2%. Table T-5 was developed from reported usage by interviewees and other data sources to provide an estimated commercial marketing flow of sorghum.

Table T-5. Sorghum flow estimates developed from interviews and data, 1999/00 (MT).

Amount Available	Commercial Market	Processors	Food Uses
Production- 550,000	Contracts - 342	Breweries - 300	Opaque beer/malt
Imports - 0	Traders - 200	Food - 242	Whole sorghum
	Subtotal - 542		Sorghum meal
		Animal feed- 0	
	Exports - 400		
Total - 550,000	Total -942	- 542	

Note. The estimates only account for 0.2% of sorghum production. Rohrbach surveyed additional commercial processors in 1999, but the total amount is not thought to be much larger. Remaining breweries have much less capacity than the one visited and did not use sorghum in 1999. In Dar es Salaam, there was another small food processor of sorghum who could not be found at the time of the survey. In Arusha, a religious sponsored firm was using some sorghum in a vitamin fortified meal product. Millers of food products in other areas did not have products in the Dar es Salaam and Arusha markets and would be

limited to local area consumption. Other animal feed manufacturers than the one visited were thought to be using maize in rations because the sorghum price was not at the discount level to substitute for maize in formulas. Also the 20% VAT tax on sorghum and prohibition of exported maize had forced most to reduce amounts produced. The discrepancy is unknown but may be explained in how commercial marketings are defined, as other estimates may include traders selling to local brew markets and leftover bags on the truck to small country markets. Regardless, not much sorghum is commercially marketed, as the Government has none in security stocks, breweries use only minor amounts in opaque beer malting and adjunct, and the only size of sorghum meal seen produced or in the retail market was the 1 kg bag.

There is a large local brew market in rural areas and smaller villages. There are numerous hammermill units there that accept delivery by local farmers or buy from local traders and process the sorghum grain into meal. The meal may be returned to farmers but most is believed sold to local brew makers. One interviewee explained that the subsistence level farmers will hand pound their sorghum (maybe mixing the meal with cassava, maize, or millet) for variety. Those who can afford to use the services of a hammermill operator seem to prefer maize meal over sorghum and will sell the sorghum or trade for maize. In Rohrbach’s report hammermill operators interviewed in the rural areas said they ground both grains. Perhaps most of the sorghum ground by the millers was destined for brewing use and not food use as porridge.

When estimating requirements for food security needs, the FSD uses per capita consumption estimates for individual crops. Table 6 lists sorghum per capita requirements and production uses for the National level and also for the Kibondo district. The FSD estimates maize per capita consumption needs at 74.5 kg or about 4 times that of sorghum.

Table T-6. FSD sorghum per capita and use estimates to develop food requirements.

Area	Per Capita kg consum	Seed %	Feed %	Losses %	Trade %	Local Brew %
National	15.5	1.5	0.6	8.5	Na	Na
Kibondo	10.0	5.0	30.0	20.0	25.0	20.0

Source: Food Security Department, Ministry of Agriculture, January 2000 data

The FSD data used for National requirements does not estimate trade or other uses. Kibondo district is not a large sorghum producing area but estimates indicate sorghum is fed locally to animals and also used for local brew. An estimated 25% enters trade.

Assembly, Storage and Processing

Storage facilities (silos and flat bag-type) are located in the major population areas of Tanzania. Most of this storage is used to store maize, rice, pulses and wheat. Because only small amounts of sorghum enter commercial marketing, little is stored except at the opaque beer brewery and small millers.

The Government Strategic Grain Reserve (SGR) consists of maize stored in bag warehouses. The current operating strategy of the FSD calls for reserves to be of maize and no sorghum has been kept in SGR storage facilities for several years.

Sorghum as grain is delivered in small amounts to the wholesale and retail markets in the larger cities according to Rohrbach. Most urban dwellers prefer to eat maize instead of sorghum as porridge. Some purchase whole maize sufficient for family consumption for 6 to 8 weeks. It may be washed, tempered for a period of time and then taken to a neighborhood hammermill operator to be ground into meal. Few urban households apparently do this for sorghum. Other consumers will purchase maize meal at the retail market or grocery store. Some do this for sorghum meal, but the demand is small and the price for the small 1 kg package is higher in most markets than maize meal. Some will reduce sorghum kernels to meal at home for special occasions.

Home consumption of porridge and local brew account for almost all sorghum food use. Adequate storage to maintain quality is lacking and amounts that can be stored are minimal. The per capita use figure of 15.5 kg would require a family of 6 to only keep several bags or containers of sorghum for use. It was reported that most hammermill operators and local brew makers keep a 2 to 3 weeks supply, preferring to purchase frequently in small quantities over the marketing year from local farmers or suppliers.

The small processors of sorghum grain into meal that were visited contract with farmers or have agreements with one or two traders. Sorghum is brought from the farm to the facility as soon as possible after harvest, often then cleaned, put into better quality bags and kept on the premises. This is done because farm storage is poor and grain quality declines because of contamination if stored there. If a trader is used, the grain may be cleaned at the trader's warehouse, re-bagged and delivered later in the season as farm purchased stocks are depleted.

The opaque beer brewer, that used sorghum as malt and some for adjunct, had silos and sufficient warehouse space for storage of sorghum as it becomes available. Quality of sorghum is a prime concern, especially for malting (germination), so every effort is made to store the sorghum adequately at their facilities until it can be used.

The commodity trader who was engaged in countrywide trading and import and export had extensive flat bag-type storage warehouses where commodities were brought in and prepared for sale or to meet contract specifications. Cleaning and processing equipment for grinding grains and processing paddy rice was available on site. An estimate of the quantity of sorghum that could be sold or was already contracted for sale was projected for the marketing year. Then employees were sent to growing areas to estimate the amount available and when the variety/type of sorghum would be harvested. As the sorghum was harvested, employees would be sent to the arranged areas with trucks, bags, and scales to purchase immediately from farmers, paying cash when grain was loaded on the truck. This method used the firm's own employees to select, purchase, assemble and transport sorghum to the storage area, enabling control of the price, quality and delivery. This procedure was especially useful for ensuring specific quality requirements for select

markets, such as the large size white sorghum used during fasting periods of certain religions.

All processors and traders interviewed said assembly costs were high, but transportation costs were a great obstacle. A recent purchase of sorghum (last fall) in one of the major growing areas incurred transport cost twice that of the cost of the sorghum (the road past Dodoma is almost impossible). Roads in the major growing regions have deteriorated due to flooding, traffic in rainy season and poor maintenance and repair.

Price and Marketing Margins

Interviewees who either processed or traded sorghum were asked about costs of purchasing sorghum, sales prices, processing margins and general market conditions that affected their costs of processing or trading. Their responses were looked at in the light of data and observations in the 1999 report on “Commercialization Prospects for Sorghum and Pearl Millet in Tanzania.

The 1999 report contained an extensive analysis of sorghum prices including: wholesale grain prices over several years in Tanzania’s largest markets, seasonality and storage costs, farm-gate purchases, wholesale versus retail grain prices in Dar es Salaam, and comparison of the sorghum data with maize data. A broad summary of the information is that sorghum prices did not follow the dominant grain marketed, maize (generally considered a close substitute for many end uses) as closely as one might expect. This is true for both domestic and international market prices. Sorghum prices varied greatly being from both the lower and higher side of maize price across markets and distance and within and between crop seasons. Reasons for price fluctuations and some underlying issues were given in the report. Responses by interviewees in this study and observations about price effects and marketing conditions of the current marketing year were similar to the information in the report. It was apparent the same issues and price circumstances are still present. A summary of these issues follows:

1. Almost all sorghum production is either consumed by the household growing the crop or is traded in the local area. Commercial markets handle a very small percentage (1-2%) of annual production. Consequently their influence on price is minor. Because of the small amount traded in the market and absence of quality specifications, there is a lack of price transparency.
2. In rural areas, the traditional small-scale brewer is the largest off-farm user of sorghum and has a direct impact on local market price. The traditional brew uses sorghum for the customer preferred flavor and maize is not substitutable for any period of time. When sorghum supply is limited, the brewer will bid up the price regardless of maize price and availability. Brew operators usually have little storage space or capacity to stockpile, requiring frequent purchasing of small quantities in order to satisfy customers on a daily basis regardless of upward price direction.
3. The amount and availability of local supply greatly influences price as it is now almost a closed system. Price variability takes place as growing/harvesting conditions change. The deteriorating road/transport

conditions further restrict sorghum flow from surplus to deficit production regions. If government reserve grain or donor supplies are brought in to a deficit region, chances are it will not be sorghum and demand will still be unsatisfied.

4. The government strategic grain reserve program implicitly assumes total substitutability of maize for sorghum in stock reserves and imports. The decision may be cost effective for the entire program but contributes to sorghum price increase in areas of sorghum shortage because of local brewers use of sorghum.
5. Because of low quality of hand threshed sorghum (dirt, sand, stones, etc.) cleaning costs prior to processing are incurred. Together with higher assembly costs because of smaller amounts marketed in a growing area, the marketing spread is greater and farm price will be lower. The lower price effectively places sorghum growers at a disadvantage to maize where cost of production is not greatly different. Even among sorghum growers, a 1994/95 cost of sorghum production survey showed costs of inputs did not differ greatly between the regions of Dodoma, Singida and Mwanza but the open market price in Mwanza was much lower in comparison to the other two regions. Mwanza farmers growing sorghum would have had very little return for their labor based on survey costs and prices at that time.

The largest sorghum meal processor at the time of the visit in April said it costs 50 percent more for his firm to produce sorghum meal instead of maize meal. The increased cost was incurred in cleaning and extra handling of the sorghum before the hammermill operation and packaging and handling costs of the 1 kg package. The quoted price for sorghum meal in the 1 kg bag at the retail shop of the processor varied between TS450 to 500. At the market near the center of town and at a grocery store the same product label and size was priced at TS1000.

The sorghum meal processor in Arusha said it cost about TS450 to mill sorghum into meal. The retailer would add maybe TS100 for markup (The grocery store visited did not have any sorghum meal for sale but maize meal was TS1600 for 2 kg package). The large difference between producer and retail price cannot be explained except one processor's comment that with a high price relative to maize meal, consumers feel they are consuming a quality specialty product. Some consumers add sorghum to maize meal at times to vary the taste of eating the maize meal. Considering that only about 40 tons of sorghum was milled into meal versus 300,000 tons of maize in the crop year ended, the strategy does not seem to have increased sales of sorghum meal.

Wholesale prices at several markets (reported by the Ministry of Cooperatives and Marketing, Market Development Division) over the January-March 2001 period averaged the following in TS:

Arusha - Maize	13,000	Sorghum	10,000
Dodoma-	9,000		8,500 (January)
	11,800		11,200 (March)
Mwanza	11,000		13,000 (January)
	12,000		12,000 (March)

As reported in the Rohrbach study, there is large variability in prices among markets, probably influenced by local supply fluctuations. Sorghum prices were about the same as maize except in Mwanza for January.

INCRISAT did several sorghum product market promotions in the Dar es Salaam area during the past crop year. Arrangements were made with the opaque beer brewery to purchase sorghum from a trader in the semi-arid sorghum production region. The sorghum was purchased from farmers who agreed to use a specified white improved variety of sorghum and sell to the trader. An overall agreement was made to supply 300 mt or more from the growing area to the brewer at an agreed price. The beer (MWAMBA) made from imported red sorghum malt and white sorghum used as the adjunct sold well. However, only about the same usage quantity of white sorghum is planned this year, as sales in the semi-arid growing area are not profitable. This is because of rising transportation costs, inability to raise the beer price because of competition with price of local brews in the area, and general margin squeeze on most processors in Tanzania, with taxes, petro fuel, imported parts and machinery, etc rapidly increasing.

A second project involved a price promotion on sorghum meal in the Dar es Salaam along with market promotion and information on sorghum meal at grocery stores. About 40 tons of sorghum was to be purchased from a trader who agreed to clean the sorghum and remove the contaminants through screening. There were problems in the cleanliness of the sorghum purchased from the trader requiring the processor again to clean some of the grain and incur extra costs. The discounted sorghum meal sold well in grocery stores at a cost TS500 per 1 kg bag. Since price promotion ended the price has increased to TS1000, and sales have declined to about the amount before promotion. The processor does not feel the market will support sorghum meal sales at a 40 ton amount at the T1,000 price nor can that amount of sorghum be cleaned by hand in the facility. Currently, the processor is looking for equipment to mechanically clean sorghum.

The trader was able to purchase surplus amounts of the white improved variety sorghum from farmers who grew it for the brewery project. It was cleaned and sized for sale as a specialty item in Zanzibar and Dar es Salaam at the Moslem fasting period. It appears there is demand for sorghum products if sorghum grain can be produced in sufficient quantities having the quality characteristics desired by processors and traders. The proposed quality methods should be effective to differentiate sorghum to meet these needs.

2.4 ZIMBABWE

BACKGROUND

Zimbabwe is located in southern Africa with country boundaries comprising Botswana, Mozambique, South Africa and Zambia. It has no coastline. The land area is about 387,000 sq km of which about 7% is arable. The climate is tropical but moderated by altitude, with rainy season November to March. The terrain is mostly high plateau, but somewhat higher in the central region and mountains to the east. There are recurring droughts and occasional flooding around river basins in the north.

The Population is estimated about 12.5 million with a low estimated growth rate of about ¼ percent. The capital is Harare, the largest city, and next in size is Bulawayo. Zimbabwe celebrates 18 April 1980 as Independence Day from the UK and has a parliamentary democratic Government.

INTERVIEWS

Interviews in the Harare and Bulawayo areas began March 19 and data gathering continued through March 27. The interviews were set up through ICRISAT and either Dr David Rohrbach or Justin Mupeti from ICRISAT also participated. A recent study, "Commercialization of Sorghum and Pearl Millet in Zimbabwe" by D. Rohrbach, was used as a source of background information for selection of interviewees (For a detailed description and analysis of the sorghum and pearl millet commercial markets refer to this study). The rainy season drew to a close at the end of the interviews and several people interviewed voiced concerns about its effects on the sorghum crop. The marketing year was also drawing to a close (March 31) and people we met with were unaware of any sorghum purchases or sales at this time of the year.

The marketing sector description, job title, and company type for each interviewee is listed in Table Z-1.

Table Z-1. Listing of Zimbabwe interviewees by sector, job title and company type.

Sorghum Marketing Sector	Job Title	Company Type
Government	Marketing Officer	Grain Marketing Board
Commodity Exchange	Administrator	Agri Commodity Exchange
Processor	Procurement Manager	Animal Feed
Processor	Procurement Manager	Animal Feed, Food Products
Processor	Raw Materials Manager	Brewery
Processor	Mkt & Sales Manager	Food Products
Processor	General Manager	Brewery
Processor	Technical Services Mgr	Animal Feed
Processor	Finance Manager	Food Products

Source: Personal interviews, March 19 through March 27, 2001.

Role of Quality in Sorghum Marketing

It is believed the lack of a coherent grading system for sorghum is inhibiting the production and usage of sorghum in southern Africa according to this Task Order No. 4.1. Although Zimbabwe has two grading classifications for sorghum grain that can be used, GMB and Zimbabwe Agricultural Commodity Exchange (ZIMACE), additional quality factors are still employed in most contracts with farmers. Questions were asked in the interviews to discover if five rapid quality methods would be satisfactory for sellers and purchasers of sorghum and if additional quality measures were believed important to grade sorghum for most uses. The interviewees were asked to rank the 5 sorghum quality criteria in order of importance in their decision-making on sales or purchases of sorghum and to name other quality characteristics they felt were important. Dr. Taylor reported the ranking results in Technical Report #2 (May 2001).

Facilitating Marketing Services to Increase Sorghum Marketing

Respondents were asked to select from a list of marketing consideration factors (up to a maximum of 3) which would in their opinion increase the overall usage of sorghum (Table Z-2). Most chose factors that indicated a perceived need to improve supply in the areas of reliability, cost, and cleanliness of the sorghum. The two individuals who selected better price information for growers stated the information was lacking at the smaller commercial and communal farms, but believed it was because of poor dissemination or lack of interest by some farm organizations and extension personnel.

Table Z-2. Factors that could increase sorghum trading.

Factor Selected	Number Responded
Reliable supply/supplier	4
Improve assembly and storage/lower cost	3
Cleanliness of grain	3
Better price information to growers	2
Uniformity of shipment	2
Overall quality of grain	2
Price	1
Government agencies assistance	0

Additionally, all were asked if there were: 1). Government policies in effect that restricted sorghum marketing, and 2). To identify any additional Government policies or services that could be provided to facilitate sorghum marketing. Most answered that there were no Government policies lacking or services needed. The processors seemed satisfied to operate as is.

Respondents were asked if the proposed quality methods were accepted and adopted for marketing use, would the industry be able to handle disputes on quality and resolve them without undue difficulty. Also, would it be necessary for the Government to take a regulatory role in the use of the methods and possible grades. All felt there were procedures and organizations already

in place to resolve disputes. There was ZIMACE, private analytical laboratories, and impartial experts available to handle any problems without need to have Government involvement.

SORGHUM MARKETING INFORMATION GATHERED FROM INTERVIEWS AND DATA SOURCES

Zimbabwe grain marketing has been undergoing transition over the past decade from almost complete control by a Government Marketing Board (GMB) to a freer market economy. The GMB still exists, although its purpose now focuses on food security and emphasis is mostly on maize, rice, coffee, and groundnuts.

A floor or purchase price for sorghum grades is still issued annually by GMB for buying at depots and storage facilities. As a practical matter purchases are minimal as the announced price is generally under the local market price and producers sell to GMB only as a last resort. Stocks by the GMB are purchased shortly after harvest and held in storage until later, when private firm's inventories are depleted and sales can be made to empty space before the next harvest. The stocks in storage may become damaged over time by various factors including insects, molds, and excess moisture, consequently, it is often difficult to obtain high quality sorghum to be used in food products in the last months prior to the next harvest.

Strides have been made in the transition to a free market economy. There is an agricultural commodity exchange ZIMACE to facilitate open trading information on sorghum. ZIMACE also handles transferable silo certificates for sorghum with specified grade quality factors to facilitate storage loans and trades. Forward sale contracts between farmers and processors are being used and increasing in volume, with quality requirements specified in the contract. Often the quality factors are the GMB or ZIMACE grade with perhaps a sorghum variety included. Some deficiencies still need to be addressed in the transition to a free market. These include uniform grading requirements and methods to better identify end user wants for processing; information to better inform communal farmers and small commercial producers on markets, contract understanding and, income benefits from storage as prices normally rise after harvest movements are exhausted; and, higher limits on loans for small processors to obtain equipment to adequately process sorghum grain into quality meal products to compete with maize meal. It is questionable that sorghum can be effectively marketed to compete with maize in Zimbabwe without these issues receiving attention.

Production Areas and Supplies Relative to Consumption Requirements

Most sorghum is grown in the semi-arid regions of the country receiving 400 to 800 mm of yearly rainfall. In recent years, the average annual production of sorghum is almost 100,000 tons from an average 170,700 hectares with a yield of 579 kilograms per hectare (Table Z-3). The communal percentage of total area averaged about 97% and production averaged 85% of total over 1995/00. The yearly area planted to sorghum and the resultant production has varied, but estimates for this harvest year are the lowest by far. The preliminary production estimate for the current crop year, 2000/01 is only 28 % of the previous 5-year average, indicating probable sorghum shortages unless crop conditions improve in the remaining months before harvest.

Table Z-3. Sorghum area, production, yield, and percent communal sector, 1995-2001.

Crop Year	Area (000 Ha)	Production (000 MT)	Yield (kg/ha)	% CA of total Area 1/	% CA of total Production
1995/96	193.8	107.5	555	97	82
1996/97	194.4	130.1	669	98	88
1997/98	140.1	71.8	512	96	85
1998/99	150.2	85.6	570	96	85
1999/00	175.2	103.3	590	97	82
2000/01 2/	109.0	27.3	250	96	58
1995/00 Ave.	170.7	99.7	579	97	85

Source: Crop Forecasting Committee, Zimbabwe National Early Warning Unit

1/ CA refers to communal, resettlement, small scale commercial, small scale irrigation and urban areas.

2/ Zimbabwe National Early Warning Unit, March 2001 estimates.

Drought and the farmers decision to plant less area following a prior year low sorghum price were two explanations given for previous yearly variation in acreage and production. The estimates for this year are based on more unusual conditions resulting from a combination of moisture stress, pests and diseases early in the season followed by excess moisture and flooding. Other reasons given for a reduction in the sorghum area this year were greater than normal bird population; low prices in relation to maize; and, generally better marketing access of maize in many areas. Also, conditions within the country appear to have contributed to a general decline in cultivated areas in all sectors.

Table Z-4. Maize and Millet (includes sorghum) Food Balance Sheet for 2001/02 M.Y.

	Maize	Millet (includes sorghum)
Potential Availability	1,662,454	52,515
Opening stocks (4/2001)	380,000	880
Gross Harvest Production	1,222,454	48,635
Farmers & Others estimate	60,000	3,000
Annual Requirements	2,008,491	165,045
Gross consumption	1,523,491	165,045
Livestock, other uses, losses	485,000	-
Domestic Balance	(346,037)	(112,530)
Cross Substitution	(112,530)	112,530
Forecasted closing stocks	(458,567)	-
Strategic Reserve Require'nt	500,000	-
Imports Required	958.567	-
Assumptions		
Est. mid-year population	12,695,758	12,695,758
Est. human annual Consumption (kg/per)	120	13

Source: Zimbabwe National Early Warning Unit

The food balance sheet for the 2001/02 marketing year (April 1, 2001 to March 31, 2002) provides estimates of the human annual consumption of sorghum and all millets at 13 kg/person (112,500 MT). It does not provide any sorghum usage estimates for livestock, other uses or losses and shows no sorghum imports are contemplated (Table Z-4). Most of the sorghum produced in the communal area (about 85 % of total production) does not enter commercial marketings, it is being consumed where grown. It is estimated that about one-half of producers in this sector do not produce enough to meet family needs, and must either reduce their grain consumption or purchase other food substitutes. In years of less sorghum production than needed for home consumption, maize is the grain most often substituted. When there isn't enough maize for this need then maize has been imported. In recent years, sorghum has not been imported to meet sorghum deficits but instead maize importation was done to provide "cross substitution" as classified in the food balance sheet.

Rohrbach estimated that the 1998 crop moving into the commercial marketing was about 23 percent. This percentage is higher than generally estimated by others over the latter 1990's with declines in sorghum usage by each of the three commercial processing industries of brewing, milling, and animal feed. Based on the percentage of production by communal area farmers, there may only be about 15 percent of production currently entering commercial markets. Using reported usage by those firms interviewed (all major users except Premier Milling Company and an animal feed manufacturer whose usage was estimated at 20-30 MT) a commercial marketing flow table was prepared (Table Z-5).

Table Z-5. Sorghum flow estimates developed from interviews and data, 1999/00 (000 MT).

Amount Available	Commercial Markets	Processors	Food & Feed Uses
Production - 103	Contracts - 13	Breweries - 14	Opaque Beer
Imports - 0	Traders - 2	Food - 0.1	Sorghum meal
	GMB - 1	Animal Feed - 2	Poultry Feed
			Mixed Grain Feed
Total - 103	Total - 16	Total - 16.1	

Note. Some sorghum grain may be sold by traders into larger urban markets for purchase by consumers to be ground into meal, but the amount is not believed significant. The amount in smaller urban areas (CA) used in this manner was not considered as commercial marketing.

Assembly and Storage

The GMB assembles, stores and markets sorghum to private traders and firms. It has seasonal buying stations, permanent depots, and regional flat and silo warehouses used for other grains as well as sorghum. In past years it initiated farmer support schemes like seed distribution for commitment to return harvested sorghum, subsidized local assembly at buying stations, quality grading, and input items below market price. With emphasis on cost reduction, GMB did not carry out any incentive schemes for sorghum in 2000/01. Furthermore, GMB was late in announcing its sorghum purchase price for the past season and purchased smaller than normal quantities of sorghum from farmers. GMB's assembly costs for sorghum are relatively high because of the small amount of grain from each farmer brought to their sites. These numerous small parcels also make it uneconomic to clean incoming sorghum at the buying stations and smaller depots.

Most processors now contract for the majority of their sorghum requirements. This allows them better control over assembly costs by concentrating purchases in one or two growing areas, commonality of quality for commingling, scheduling pick-up or delivery times, and general efficiencies of labor and transport expenses. The larger processors have grain storage facilities to handle 4 to 6 months supply. Because opaque beer and animal feed processors use greater quantities of other grains than sorghum, the amount of sorghum stored at any time will vary according to other grain crop conditions and prices. Processors felt by purchasing sorghum early in the season and storing it, the quality remained higher until use than when others had it in storage. In past years, sorghum required later in the year was purchased from GMB. Smaller processors managed to find sufficient storage to take delivery of contracted sorghum as their experience in finding sorghum later in the season of the quality needed had not generally been satisfactory.

Traders can contract with farmers in advance of harvest. Mostly it is done by those with delivery orders immediately following harvest. Few traders up to now, have found it profitable to carry sorghum stocks in storage because in the past GMB absorbed costs of storage over time, and sorghum prices later in the season did not reflect costs of storage. Sorghum price changes were more a function of dislocation of supply and seasonal transport difficulties with costs of storage not reflected in the price later in the marketing season. Traders today, seem to find it more profitable to go to a communal or small commercial farming area with their own vehicle during harvest and individually bargain with farmers for available sorghum, then leaving the area after making enough purchases to load the vehicle to capacity.

Processing

The opaque beer industry is the major commercial user of sorghum. The estimate made from interviews for the marketing year ending March 31, 2001 was 14,000 MT (Table Z-5). Rohrbach, using surveys, had earlier estimated about 18,750 MT were used in the 1998/89 marketing year. The decline is probably due to the two breweries no longer using sorghum as an adjunct in the brewing process, preferring to use maize. Sorghum is used only for malting purposes in their process. Both breweries indicated that their preference was to contract for procurement of sorghum. Only certain varieties were contracted. In order to obtain sufficient contracts for yearly needs, sometimes seed was made available at reduced cost. The contracts also included quality specifications for moisture, germination and physical damage. Receipts were sampled and laboratory tests made at delivery of sorghum to the storage facility.

Animal feed manufacturers bought small quantities of sorghum for ingredient use, mostly for several types of poultry meal and mixed grain feed. The two companies interviewed had a general policy of considering use of sorghum in certain rations when the price relationship to maize was at 80 to 85%. However, to substitute sorghum for corn the purchasing agents felt that this required the availability of uniform quality in quantities of 20 ton minimum to guard against nutrient variation in label guarantees. One, also mentioned the price difference was needed to balance the additional processing costs when changing between maize and sorghum ingredient use. The main problem seemed to be obtaining a recurring uniform quality supply of sorghum from the commercial marketing system to justify scheduling changes of a major ingredient in their process.

Small quantities of sorghum were used in food processing. Sorghum meal was the only product made by the two interviewees (A large manufacturer of food and animal feeds had stopped producing sorghum meal in this marketing year). One processor had only produced sorghum meal for an earlier marketing project testing market response and the test was finished. The other processor produced sorghum meal on an intermittent basis. The processor had difficulty in obtaining quality supplies and the facility did not have storage space to purchase sufficient quantities at harvest. Maize meal was also manufactured by this facility and those interviewed said it was easier to make maize meal for sale at this time of year rather than sorghum meal. As part of the data gathering process on sorghum price relationships, a number of retail shops were visited in Harare and Bulawayo. No sorghum meal of either processor visited was found on the shelves. Sorghum meal was for sale in only 1 of the shops visited in both cities. The brand was that of the firm (National Foods) that said it no longer was in the business of manufacturing sorghum meal. The product was undated but appeared old and the price relationship to maize meal was discounted to a larger degree than price relationships in other countries. If there was demand for sorghum meal by customers of these retail stores, it was not being satisfied. There were several Zimbabwe produced sorghum malt products for sale at some of the stores for and also the Maltabella (RSA) imported breakfast product.

Prices and Marketing Margins

Sorghum pricing is based on maize marketing conditions which are controlled to a large degree by the GMB through price announcements for each marketing season, buying intervention, maintenance of security stock levels, and import and export controls. The largest brewery uses the maize price as a variable to consider in the cost production model it uses to develop a contract price for sorghum. In practice, most sorghum grain is priced at a traditional discount relative to maize regardless of its nutritional or economic value.

The marketing system lacks effective time-series sorghum grain price reporting at the farm and at both wholesale and retail points. The price reporting is also at a disadvantage because much of sorghum marketing is done by private contract between buyer and seller. Even the ZIMACE sorghum quotes represent only a small percentage of commercial marketings as most trading is still done off board between members. The GMB purchased only a small amount of sorghum this past marketing year and its purchase price is more of a floor price. But the purchase price can be further discounted because of grade and also transportation cost from the grower point to the GMB depot needs to be deducted from the GMB published price quote. The asking offers by GMB to ZIMAC are often not accepted, because most traders feel the quote is too high for the sorghum quality. The brewery contracts probably reflect the highest quality sorghum being purchased and the GMB actual sales, the price for the lowest quality sorghum in commercial channels.

GMB set the 2000/01 white sorghum price past normal posting date at Z\$4,000 MT, but this March quoted a price for delivery at the largest silos of Z\$5,000 for grade A and Z\$4,000 for grade B, but little was actually purchased. By contrast, the largest brewer said they offered pre-planting contracts for red sorghum for the season at Z\$5,700, with a later adjustment to Z\$6000 as price increased due to lower production estimates. This brewer uses a farm production budget model to develop its price offer with price adjustments made on inputs as cross commodities for

each model run. The brewery contract had more stringent quality requirements such as limited identified variety to be accepted and more stringent grain purity than does the GMB Grade.

Rohrbach reported that given the limited formal trade for white sorghum there is not a benchmark price to use, while for red sorghum the brewer price is a benchmark. Private traders are probably offering a lower price to communal farmers (unable to confirm since no grain was being purchased in March), planning to buy well below the GMB price by providing assembly and transport within the price offer. Also, the lower quality grain (sand, dirt, stone, insect, open to other contamination) would further incur a discounted offer. It would seem that there is little incentive for these producers to plant sorghum in excess of their own food needs without a better measure of the true value of the sorghum. The high cost of assembly and little processor demand for the lower quality of sorghum offered for sale, are two major reasons the communal farmer production does not enter commercial marketing channels.

Price relationships or spreads at different marketing stages were not estimated.

3. APPROXIMATE POTENTIAL FOR SORGHUM GRAIN USE IN THE FOOD AND ANIMAL FEED INDUSTRIES

Traditional, transitional, and market orientated are names of stages often used to classify the development of a marketing system 1/. After completing the interviews and reviewing data it was felt that Botswana and Zimbabwe were at the traditional stage in the smallholder farm sector but both were in the transitional stage in the commercial farming sector. Tanzania was traditional in most of the production areas but a small transitional sector provided all the sorghum moving into commercial marketing. Although South Africa is mostly market-orientated there is the sector of smallholder farmers where land redistribution took place. A summary of the four countries by marketing system stage, recent average production, percent estimate of marketed production and production conditions is shown in Table 1.

Table 1. Marketing system category, average production, production marketed, and production conditions, by country.

Country	Marketing System Stage/Sector 1/	Production (000 MT)	Production Marketed	Productions Conditions
Botswana	Traditional- smallholder	13.2 (1997/00) Ave.	Less 5%	yields low; return labor low; production decline migration out of agric
	Transitional-commercial		Greater 50%	
South Africa	Market-Oriented	314.5 (1996/01) Ave.	Greater 50%	yields high; returns less than maize; lack of good white milling varieties grown
Tanzania	Traditional	564.0 (1995/00) Ave.	Less 2%	yields medium; poor threshing practices/dirt & stones; mixing of varieties not suitable for processors
Zimbabwe	Traditional- smallholder	99.7 (1995/00) Ave.	Less 5%	yields low; threshing on ground/dirt & stones; mixing of varieties not suitable for processors
	Transitional-commercial		Greater 50%	

1/ Traditional is characterized by narrow product flow (separation) between producer and consumer. Typical marketing problems are lack of market understanding, lack of price information (transparency), and resources to enter market (subsistence level).

Transitional is characterized by widening product flow (separation) between producer and consumer. Typical marketing problems are physical functions such as assembly, transportation and storage; and facilitating functions of quality grading, market access and transparent prices.

Market-Oriented is characterized by wide product flow between producer and consumer. Typical marketing problems are physical functions such as food processing, packaging and distribution; and facilitating functions of credit, capitol, commodity exchanges, marketing services and consumer research.

The implications of the greatly differing marketing systems are that market understanding is lacking at the traditional stage and extension type education is needed not only for production practice improvement but marketing skill as well. In Botswana and Zimbabwe, smallholder farmers grow a large quantity of sorghum that is consumed locally and does not enter commercial marketing. In Tanzania, the largest sorghum producer of the four, almost all production is consumed locally. Although potential for increased sorghum production may be significant in a traditional stage country smallholder farmer participation in marketing can remain static. That is why private sector commercial marketing interests are necessary to participate in education and adoption of facilitating marketing functions.

The estimated potential for increased sorghum grain usage based on the interviews and review of literature is discussed by country. An overall estimate for trade between the four countries is also given but one should be careful to assure that estimates of sorghum grain exported from South Africa and Zimbabwe are not again counted as increases when processed by the importing country. Also, sorghum grain, sorghum meal, other sorghum products and animal feed products were mentioned in interviews with traders and processors as exports to other southern African countries. The potential estimates for increased usage, especially for animal feeds, include these in the accounting.

3.1 BOTSWANA

There is potential for urban consumption of sorghum meal and specialty products to continue to increase with increased migration from rural areas and overall financial condition. Acceptance of meal by consumers is good. More types of breakfast, weaning and nutritional sorghum products are becoming available at retail (both imported and domestically produced). This convenience and choice appeals to urban workers. Sorghum for domestic milling production is most likely to come from South Africa with a small amount from Zimbabwe. There is some potential for use of sorghum grain as an adjunct in opaque beer brewing. This would be a result of reliable supplies so that product quality and taste can be uniform over time and not simply a consideration of cross commodity price substitution with maize. Sorghum use in animal feed rations is not projected to increase because the cost of production is high relative to nearby countries. It would probably be more economical to import finished animal feeds from other countries than import sorghum and then manufacture it into animal feed. The approximate estimate is 90,000 MT yearly use of grain sorghum by processors in Botswana.

3.2 SOUTH AFRICA

All sorghum grain and products (processed meal, specialty products, malt products and processed animal feeds) have potential for increased export to southern African countries. New sorghum products are coming on the market . These include breakfast, nutritional and weaning products, (mostly as pre cooked powder type to be mixed with liquid).

The commercial processing sector is dominated by large firms and their subsidiaries. The firms have access to credit and a willingness to expand to meet demand. Most sorghum grain destined for export is handled by three firms. Demand by Botswana for white sorghum grain for milling into meal is increasing. The transportation system remains in satisfactory condition so grain can be moved at reasonable cost to other countries in southern Africa. Some domestic increase in usage is possible for sorghum used as breakfast, energy and nutritional convenience foods. Price of sorghum grain in relation to maize is at a disadvantage because of the VAT imposed on sorghum grain and not on maize. The potential for sorghum to substitute for maize as an ingredient in processed animal feed use is good if the VAT on grain is removed. Also implementation of marketing schemes in smallholder production areas combined with adoption of the proposed quality methods has potential to provide additional sorghum production. With known quality the additional production could satisfy demand for local sorghum grain production from the local feedlots and smaller animal feed firms. Also the VAT removal would make sorghum more competitive with maize as an adjunct in the opaque beer brewing process. With these changes the estimate is 275,000 MT yearly use of grain sorghum in the commercial marketing system. Production from the smallholder sector will need to increase and begin to enter the commercial marketing channels to help supply sorghum grain for the processing and export market.

3.3 TANZANIA

Tanzania is the largest producer of sorghum of the four countries but has the smallest amount of sorghum moving into commercial marketing channels. Most sorghum production is by subsistence growers. It was thought that stimulation of market promotion efforts would increase sorghum meal demand in the urban areas, but this has not yet had a discernable effect. Quite likely retail demand will be uncertain until consumers can have confidence in a reliable quality product at a price which is competitive with maize meal. Although many urban dwellers have consumed sorghum meal before moving to the city, most now prefer maize meal. Also, many still prefer to buy maize as grain in the market and take it to a nearby local mill for grinding into meal rather than purchase the meal directly in a retail store. The potential for use of sorghum as an ingredient in processed animal feed may be realized this year. The VAT tax on sorghum in products such as animal feed is supposed to be removed, which will reduce ingredient cost. Use of sorghum in opaque beer brewing had success in a trial this past year. If an adequate amount of the sorghum quality needed can be purchased at reasonable cost, there is a potential for increased production as acceptance of the product was good. Production is sufficient for potential use if the transportation infrastructure can be improved from the major production areas to urban centers. Transport costs are increasing rapidly with road deterioration. If transport problems can be worked out there is also some potential for export to nearby countries.

There is a growing specialty export market for large kernel whole grain white sorghum to Zanzibar and countries with large Moslem populations. There also is demand by Moslems for a non-alcoholic drink made from sorghum but both quality and distribution need improvement. The changeover to the free market system from Government

management seems to have taken longer than in the other countries, but processors and traders we visited were optimistic about sorghum use. The main concern was poor quality (grain purity) and lack of adequate supply because of problems caused by weather. If grain quality and transportation can be improved, an approximate potential is that 14,000 MT could move through commercial marketing channels. This amount is far greater than what is believed to be marketed today.

3.4 ZIMBABWE

There is potential for milling, brewing, animal feed processing and export use increases. Availability of clean white milling quality sorghum would allow domestic milling production for retail markets to increase. Also Botswana is a potential export market for the same clean white milling quality sorghum. Use of quality methods would allow classification so that sufficient quantities of clean and low tannin sorghum could be available as a steady supply for use by the processed feed industry. Demand for animal feed exports is increasing. Sorghum would have an advantage over maize in years of grain production shortfall as there are no security stock restrictions on sorghum as with maize. There is similar potential for sorghum use relative to maize as an adjunct in opaque beer processing. Also sorghum as malt is used in the brewing process. There should be a gradual increase in production of sorghum with smallholder production increasing, as improved varieties are adopted. There is an approximate potential for 30,000 MT to move through commercial marketing channels.

3.5 SUMMARY OF APPROXIMATE POTENTIAL FOR SORGHUM GRAIN USE

Estimated yearly sorghum grain use and exports by country is listed in Table 2. The potential use is based on the likely projection for marketing year 2004, assuming the proposed methods are adopted in 2002. Due to the variability of sorghum crop production there is the possibility that a shortfall in grain production could take place in any year. Shortage of food grains would result in more sorghum being consumed where grown and less sorghum to be commercially marketed than the potential shown.

Table 2. Summary of yearly approximate commercial sorghum grain use and exports, recent and potential.

Country	Current Use (MT)	Potential Use (MT)	Percent Increase	Current Exports (MT)	Potential Exports (MT)
Botswana	60,000	90,000	50	0	0
South Africa	205,000	275,000	34	60,000	80-90,000
Tanzania	1,000	15,000	1500	400	3-10,000
Zimbabwe	16,000	30,000	88	0	3- 7,000
Total	282,000	410,000	45	60,400	86-107,000

Two considerations are necessary when reviewing the estimates in Table 2:

1. Many of the processors said that they exported products to other nearby African countries and several non-African countries. Zambia, Namibia, Mozambique, and Malawi were mentioned most often and probably have the most potential for significant sorghum importing after Botswana. Data and interview quantities used for current exports include amounts that were reported as exported to all countries. The potential for sorghum exports include import estimates for Botswana and shipments to other countries but import demand studies for other countries were not done. The potential is based on substitution of sorghum for maize in animal feeds being exported to other countries and increased demand for specialty white sorghum markets for Moslem population use.

2. Grades and Standards perform a facilitating function in the marketing system. Increased sorghum grain use potential by use of the five proposed quality methods to perform the function of grain segregation for specific market demand won't be possible without production increases. The adoption of the simple quality methods by traders and processors to use for farm-gate purchases should help to increase commercial marketings from small-scale farms and the traditional sector in the four countries.

4. ESTIMATES OF COMMERCIAL SORGHUM MARKETING FLOW AND EXPECTED PRICE CHANGES

A description of the marketing condition in each country prepared from interviews and data was provided in section 2, of this report. A summary of country findings in each of the commercial physical function marketing areas is shown in Table 3.

Table 3. Assessment of commercial marketings, by physical function, by country.

Country	Assembly	Transportation	Storage	Processing
Botswana	domestic costs high & quantities ltd; bag & bulk handling	costs med/high due to wide dispersion; bag & bulk hdlg; import transport costs reasonable	excess capacity @ BAMB sites; bag & bulk hdlg; not sufficient capacity @ small mills	mills underutilized seasonally; local supply uncertain poor quality late in marketing year
South Africa	reasonable costs; bulk handling	reasonable costs; bulk hdlg; access to most production areas	adequate for needs & condition good;	dominated by few firms each product; direct contract with farm/trader for sufficient supply
Tanzania	costs very high; bag hdlg; difficult reach growing areas; trader or processor directly buys and picks-up	costs high because few feeder roads & often impassable in growing areas; bag handling	adequate for stocks for food security department needs; bag handling except for brewery	mill/animal feed capacity under-used; uncertain supply & quality poor w dirt/stones
Zimbabwe	costs high; bag hdlg	costs high because outlying growing areas; low density; bag handling	excess capacity @ GMB sites; bulk/ bag hdlg processor facilities	few meal millers; direct contract with farm/trader due to uncertain supply & poor quality w dirt

Table 4 on the following page shows information for the facilitating functions. This information was used as a basis for estimates of sorghum marketing flow changes when the proposed quality methods are implemented.

The G & S overall situation for implementation of the proposed quality methods is good. Each of the four countries is a contributing member of the ISO and has established an agency within its Government (Bureau of Standards) to address the processing, packaging, shipping, health and environmental issues involved in commercial trading within and between countries. Written procedures are provided for development of a commodity standard. The procedure has been tested and refined throughout many years of ISO existence. Consequently the proposed quality methods, written in an acceptable format, tested and accepted by the industry can be used in the outline of actions necessary to be ISO compliant. At the same time, G & S regulations can be started for each country to address local country issues. Quality methods when developed can be submitted to the Association for Cereal Science and Technology for review and adoption. The Bureau of

Standards in each country can assist industry and other Government agencies in the process to develop uniform country standards that then can be used for trading throughout southern Africa.

Table 4. Assessment of commercial marketings, by facilitating function, by country.

Country	Grades and Standard (sorghum grain)	Financing	Grain Exchange Market Information	Research and Extension
Botswana	ISO member; B of S org; developing G&S for milling use	Financial Asstan'ce policy new mills; capitol/loan needed for small operator storage/inventory	No exchange; need price transparency as most trades are direct contracts	White varieties for millers needed; management & market training for smallholders
South Africa	ISO member; B of S org; standards and grades of sorghum	Land redistribution & land bank prog; no small mill loan program	No sorghum traded on SAFEX; need price transparency as most trades are direct contracts	Ag Res Council; varieties for mill products needed; eliminate VAT on sorghum
Tanzania	ISO member; B of S org; no G&S; poor farm quality with excess foreign and other material	Low loan ceiling on capital to buy cleaning equipment to remove foreign material and build storage	No exchange; thin market/little trade; wide price differ'ce time and location; better understand mkt price spreads	Eliminate VAT on processed products educate animal feed processors on nutritive value as feed ingredient
Zimbabwe	ISO member; B of S org; grade regulations by ZGMB; poor farm quality with excess foreign/other mater'l	No small-scale mill financial incentive gov program; need loans for cleaning equipment	Few contracts are traded on ZIMACE most trades are direct contracts; transparency need	Yield and quality improvement at INCRISAT; feed processors need nutritive value info

In preparing estimates for increases for country trading changes two assumptions were made. One was that the movement to free trading in grains would continue and Government purchase and sale of sorghum in domestic, import and export markets would no longer take place and no stocks be held. Also, sorghum would not be considered a security stock and held or imported for food balance needs if production was below the threshold (Maize would continue to be the primary food grain used for this purpose). Second, processors would directly contract for sorghum with farmers within their own country, leaving importation to be solely done by traders.

4.1 Marketing Changes After Proposed Methods Implementation

Sorghum commercial marketing is projected to undergo significant trading change from the current market flow to the increased flow estimated in section 3.

Traders could be handling half or more of sorghum moving in commercial marketing channels in the four countries in the near future as quantities being marketed increase

because of implementing proposed quality methods and G & S. Trading in sorghum grain between southern Africa countries will be handled by traders. Sorghum products will continue to be distributed by the processors. Zimbabwe and South Africa have commodity exchanges that can construct or revise trading contracts for sorghum to include use of the proposed G & S to facilitate traders. Except for South Africa, the processing sector appeared to be short of working capital to finance expanded direct farm contracting within the remaining countries, so it is expected traders will step in. Because South Africa in most years produces more than it needs for domestic utilization, traders will continue to move sorghum grain to the other countries. Competition for grain with desired quality characteristics should be a level playing field between processors and traders. By using the proposed quality methods, both traders and employees of processors who contract with farmers will have the ability to classify desired sorghum quality.

Table 5. Projected country trading changes by marketing type, when proposed quality changes are implemented.

Market Type	Time	Botswana %	South Africa %	Tanzania %	Zimbabwe %
Trader	Current	58	55	95	8
	Estimate	94	66	95	58
Processor	Current	3	43	5	85
	Estimate	4	31	4	40
Government	Current	38	0	0	6
	Estimate	0	0	0	0
Other 1/	Current	1	2	0	1
	Estimate	2	3	2	3

Source: Estimates based on information gathered for sorghum flows in Section 2, Country Profiles and Section 3, Table 2.

1/ Marketings from traditional farmers belonging to development projects and direct delivery by farmers without contracts to local processors.

The processors direct contracting efforts are expected to decline as a percent of total, because the export increases are projected to be greater than processing increases (except Botswana). Also, medium and small size processors will, by necessity, shift to buying from traders because the Government will no longer have stocks for sale to them. The quality selection contracts process used by large processors in Zimbabwe and Tanzania is expensive. The method arose from necessity because it seemed the only way to obtain enough sorghum of quality needed (sorghum grain for sale by traders and in the local markets was of poor quality due to hand threshing). The cost advantage should shift to traders supplying a greater percentage of their needs when the proposed quality methods are implemented.

As mentioned earlier, Government purchasing, storage and trading of sorghum was assumed to end (estimate shown to be zero) as movement to a free market system continues.

A small increase of Other market type trade is projected. It will take time for farmers to change from traditional varieties to improved varieties having characteristics desired by processors. Traditional farmers, however, should see an immediate demand by traders for sorghum that is relatively clean (free from contaminants). Farmers with sorghum for sale that has been threshed with care or hand cleaned after threshing to remove dirt and stones will have more opportunity for sale. Market growth in some traditional areas will increase slowly as traders will first seek out areas that have the greatest concentration of growers, because of higher assembly costs in thinly populated farming areas.

4.2 Price Premiums for Quality Sorghum

Supply and demand determines price and premiums for quality. In any country, the year of good growing conditions for both yield and crop quality will see price decline and little or no premium for quality with demand constant. Fortunately, demand for increased quantities of better quality sorghum is large in the four countries. G & S are a means to quantify and separate production to meet different demands and bring a higher overall return to farmers than returns from the average quality crop. A major concern, voiced in the interviews conducted in all four countries, was the shortage of reliable sorghum suppliers throughout the year to satisfy their processing specifications. The larger processors (mills and brewers) set about to manage the problem by contracting with growers for yearly quantities of specified quality characteristics of sorghum. The animal feed processors choose instead to use maize as an ingredient, except for a few poultry feed formulas, unless the price ratio between the two grains favored sorghum by about 15-20%.

In Zimbabwe, the quality premium paid by GMB and the largest opaque beer brewer for the last few marketing years was about 20%. The commodity exchange ZIMACE traded only a few sorghum contracts this past year (most with GMB as seller) but reported a rough figure of 20%. The brewer contract price is based on a cost of production calculation, but its contract price differential between the lower GMB grade and the higher quality was 25% at the start of the season declining to about 17% as GMB raised their price later in the year.

In South Africa, the base price of sorghum is linked to the maize price, which is actively traded on SAFEX. Maize price is tied to the world market price through use of an import parity calculated price. If there sorghum production is forecast less than expected, price can rise above maize price, as was the case earlier in the year. Official sorghum classifications (GM, GH, and GL) were set up for brewing use and have only minor relevance to milling use. Most sorghum for malting use is contracted with additional specifications on germination percent and grain variety. An estimate was provided of about 25% difference between an acceptable malting or milling contract and GL (feed) or GH (bitter) class.

In Botswana, the BAMB imposes buying discounts for sorghum from the base Grade 1 price. Because of concern about the quality of Grade 1 from BAMB stocks and the high release price in comparison to the buying price, larger processors prefer to buy sorghum

directly by contracting from farmers or from traders bringing in sorghum (red) from South Africa. The price is basically the South Africa (similar premium) price plus transportation. It was reported in interviews that the premium for local white sorghum would be about 20%. In comparison BAMB release price for Grade 1 was about 45% above the buying price in 1999. The high release price allowed larger processors to seek and pay premiums for good quality sorghum. An estimate of 20 to 25% premium for quality sorghum would seem reasonable, as long as demand continues to be greatly in excess of supply.

There is so little sorghum moving in commercial marketing in Tanzania that accessible good quality sorghum for brewing or specialty export use commands a high price. A problem is the limited supply because the transport infrastructure from the better growing areas has deteriorated. It was estimated by one trader that 30 to 40% premiums are paid. The same trader said recent transport costs for a shipment were twice that of the cost of sorghum. Growers near Dar es Salaam, the port where the specialty sorghum grain exporting is taking place, could see premiums of 50% for large kernel varieties that are free of contaminants.

A general estimate of price premium in the southern African region after implementation of quality methods would be: 25% for milling and specialty products, 15-20% for brewing use and little change for animal feed use when compared to un-graded trade at present. Use of the quality methods should increase potential use of sorghum as a substitute for maize in animal feeds formulations because quality would be known (tannin present, purity known). However, substitution for maize would probably only take place when sorghum is from 5-15% less in price than maize.

4.3 Approximate Economic Gain for Small Farmers in Tanzania and Zimbabwe

There is presently only a small amount of sorghum offered for sale by small-scale farmers in Tanzania and Zimbabwe that ends up in commercial channels. The reason is because sorghum quality is poor and doesn't meet processors requirements. The quantity of sorghum for sale by a farmer is the surplus over his family needs and with poor yield and frequency of bad growing conditions may only be a few bags. A traditional variety is usually grown which probably does not contain the quality characteristics desired by processors. The sorghum is hand threshed on the ground which when swept up contains soil including sand and stones in the mixture offered for sale. Sale opportunity is often only to a touring trader assembling a vehicle load to transport to a nearby city market or sale to a village small scale brewer. Because of the less desirable quality and high cost of assembly by the trader the price for purchase can be less than half of the price reported for the local area. There is little price incentive to increase production or improve quality.

In contrast, there is unfilled demand within the two countries for sorghum of quality characteristics that can be exported to specialty markets or economically processed into food products or used as an ingredient in animal feed. Processors are risk adverse when it comes to satisfying customers and building customer brand preference. None care to risk

producing an off flavor product because of contaminants in purchased sorghum or bitter taste of high tannin sorghum that may be mixed with “sweet” sorghum in a purchase.

If the proposed quality methods and standards were implemented, the approximate economic gain to small farmers in the two target countries of Tanzania and Zimbabwe is shown in Table 6. The yearly value is estimated for the period after use of the quality methods at about US\$ 400,000.

Table 6. Estimated economic gain for small farmers in Tanzania and Zimbabwe.

Country	Production (000 MT)	Potential Sales (MT)	Farm Price Current (US\$/MT)	Farm Price Estimate (US\$/MT)	Economic Gain (US\$)
Tanzania	564	11.3	25	55	339,000
Zimbabwe	99.7	2.0	25	55	60,000
Total		13.3			399,000

Note. Production data are from Table 4 and potential sales are from Table 5. Calculation was made using estimates from Table 5 that a 2 % increase in commercial marketings would come from small farmers (Other Market Type) in the countries, see discussion in section 4.1 for reasons. The farm gate price was estimated from interviews and data gathered.

5. PARTICIPATION AND ROLE OF PRIVATE INDUSTRY AND GOVERNMENT IN IMPLEMENTING SORGHUM STANDARDS

Establishing a G & S program in developing countries is difficult. There are problems in obtaining representative samples for analysis from bags in a shipment that can be made up of an aggregate of only several bags in each lot from many different farms or sources. There is need for trained personnel with specialized skills, expensive instruments, analytical chemicals, and laboratory conditions to carry out testing of samples. For many tests of quality considerable time elapses between the time the sample is taken and the time results are known and communicated. It is difficult to delay the assembly and storage process to wait on the results so that sorghum with desired quality differences can be separated from that with less desirable quality characteristics.

There are administrative problems in allocating costs of inspection and testing services, regulatory costs and research costs for G & S changes and improvements. In a developed economy, usually service costs are borne by the industry through user fees charged for service. The regulatory and research costs are paid out of general budget of the Government. It is unlikely to expect that a developing country with normally high physical function costs within the marketing system can absorb user fee costs for a facilitating service without major difficulties. One probable result would be little use of G & S in the marketing system by private industry so as to avoid incurring additional costs. Also, the overall demand for Government resources in other areas of need such as health, education, transportation and basic human services would take precedent over funding for a market facilitating service.

The quality methods and standards identified in Technical Report # 2, if adopted will serve to avoid the problems described above. The five proposed methods should classify the quality of sorghum sufficiently for most traders and processors in SADC. The methods are simple. They do not require: skilled people to perform the testing; expensive equipment or chemicals; and, laboratory type conditions to carry out testing of sorghum. Methods can be used to test at the point of purchase. The costs are minimal. The trader or buyer can realize monetary benefit from classifying sorghum purchases at the first point of purchase (before it is commingled in a shipment or storage). It would be to the trader's advantage to use the proposed quality methods and incur the cost whenever there is a premium in the market for these quality characteristics.

The idea of industry absorbing the G & S costs for service by balancing them against any price premiums for quality characteristics is not new. But the concept of each individual trader incurring his own G & S costs without paying user fees for Government services is different. This proposal is for quality methods and standards to be done by private industry. Government involvement in G & S would be through existing services and no new costs or need for staffing is suggested. The role of Government involvement in G & S is discussed later in section 5.2.

5.1 ASSESSMENT OF PRIVATE INDUSTRY'S ABILITY TO MANAGE AND OPERATE PROPOSED QUALITY METHODS AND STANDARDS

Sorghum industry members interviewed in each country were asked their opinion about implementing the proposed quality methods and about any problems they thought might come up during or after implementation. They were also asked if the industry could self regulate quality standards without Government involvement.

The responses by private industry people were generally that they did not anticipate any specific problems and could not see a need that would require Government becoming involved. There was a sense of staying the course of free markets for sorghum marketing and not to request additional Government involvement in the marketing system. Interviewees brought up several points to support why they felt the proposed G & S could be operated by private industry:

- Most have traded sorghum and other grain in their country for many years, even those years with Grain Marketing Boards. When they use contracts, the quality requirements are listed and any specific ones added if needed. Dispute procedures are also listed in general trading contracts. Few, if any disputes arose in their experience. Most of these disputes were simply settled by price adjustment. A few followed contract guides and were adjudged by private laboratories or third party experts. In their opinion, the system used is one followed throughout the world in grain trading and the current procedure to resolve disputes is satisfactory.
- They felt that since the proposed quality methods take little time any quality issues can be addressed at the time of purchase rather than after the sale. Because the quality methods are simple and inexpensive, quality questions could be resolved almost immediately by another test. The processors and traders thought this advantage would make it possible to reach agreement on disputes without further delay.
- Private industry interviewees were concerned that Government involvement be limited to the smallest possible role in G & S. Several said past experience with Grain Board operations was unfavorable because sorghum quality classes were not uniformly determined throughout the marketing year. Strict adherence to grade limits was made when purchasing early in the marketing year but loose grading was done late in the year to dispose of deteriorated stocks.

The responses by Government interviewees on whether private industry can be expected to operate a G & S program focused on two issues.

- Phytosanitary concerns about sorghum grain could not be addressed by private industry as it was a matter of domestic health and international trading requirements.
- Some felt that G & S required Government regulation and compliance oversight. These required that authority reside in a Government agency.

To guide implementation of proposed quality methods, a "Working Group on Grades and Standards" is to be established as part of this task order. Members would be millers,

maltsters, traders and other appropriate private sector, donor and government representatives. The group would be expected to propose appropriate actions and monitor progress of the implementation of the proposed methods in SADC countries by private industry and government. Members would be expected to bring issues and problems before sorghum organizations and affected associations within the country they are from.

Workshop participants will be given the proposed methods written in the format for standard methods of the International Association for Cereal Science and Technology (ICC). A hands-on session will take place whereby participants will follow the methods to evaluate sorghum samples. Discussion of the trial procedure and results by participants will take place and recommendations for further action a proposed. If workshop participants recommend the proposed methods be implemented, then the group will develop a workplan for implementing the proposed sorghum grain standards in the region's sorghum commercial marketing system.

The Working Group on Grades and Standards would provide private industry in each country with information to implement use of the quality methods. It is expected that private industry participants of the workshop and those interviewed who expressed interest in the proposed standards will start to try using them in their business operation. Other users of sorghum grain will be informed of actions taken and also provided information on request. Interested traders and processors can begin using the quality methods by the target date of 2002.

5.2 VIEW OF NATIONAL GOVERNMENTS ROLE IN THE PROPOSED QUALITY METHODS AND STANDARDS

The proposed sorghum grain quality methods are planned to be implemented without need for additional government funding.

The workplan of the workshop participants is expected to include a section that involves contacting each country's Bureau of Standards (B of S) with a request to consider having a preliminary meeting to consider publishing sorghum grain standards including the proposed methods. The proposed quality methods (ICC format), workshop proceedings and research results would be submitted along with the request for the meeting. The B of S in each country would follow the regular ISO procedure to publish an agricultural standard. During the B of S standards proposal process, present agencies within a country that are involved with G & S are expected to consider the proposed standards impact on their present operation and discuss any problems.

There are government agencies and organizations that have authority for commodity inspection, export inspection and requirements, analytical laboratories operation, food quality and safety, phytosanitary concerns and other issues that can be addressed through the B of S process. The general expectation is that the proposed quality methods do not infringe on agencies authority and would not require additional effort or expenditure by them if published within a sorghum grain standard.

5.3 TARIFF AND NON TARIFF BARRIERS TO REGIONAL TRADE OF SORGHUM GRAIN

There were surprisingly few tariff barriers or issues of government restriction on regional trade of sorghum grain brought up by interviewees. Trade restrictions, were either those of food security and food balance concerns or internal monetary concerns brought about by VAT and other taxes and foreign exchange expenditure reduction efforts. VAT concern in South Africa on sorghum grain and concern in Tanzania about high VAT rate on animal feeds were being already addressed by the sorghum industry within the countries. Elimination of the VAT on sorghum grain would allow a level playing field with maize in price substitution decisions of the two grains by processors. The effects of this should lead to increased trade.

The non tariff barrier to trade of sorghum grain between the four countries that was consistently mentioned as a problem by the large traders and processors was concern about sorghum quality. Most said there were insufficient quantities of good quality white sorghum being grown by farmers to satisfy the potential demand. Several said they quit purchasing grain from Zimbabwe to trade in other countries because of consistent poor quality.

6. INFORMATIONAL GAPS AND NEEDS FOR FURTHER ANALYSES

Information and data needs to implement the proposed quality methods and standards and then assess changes in sorghum marketing and trade are discussed in this section. It is recognized that monies to gather, prepare and make information available is scarce in a developing economy. But, it appears that some of the information is already available although not timely or well coordinated with other information release. A national supply and utilization balance sheet is required. Those agencies providing input information must be coordinated by a responsible group to address issues of timing data release, standardizing the categories and coefficient estimates. Also, the commercial processing sectors will have, after implementation of quality standards, information on grain color and tannin classification that is not presently available. It is suggested this information be included in the utilization section where appropriate.

6.1 SORGHUM SUPPLY AND UTILIZATION BALANCE SHEET

Sorghum use data will be needed to assess the impact and rate of adoption of implementing quality methods in the marketing system. There are problems with the omission and accuracy of relevant utilization data encountered in the surveyed countries. Food balance sheets are available for the countries but are of a general nature and do not meet the need for identifying classes of utilization in a marketing system. Also the sorghum information was combined with other grains or was estimated and residual consumption reported. The SAGIS sorghum information data effort has evolved to a degree where categories and data reporting sources could be used as a model for other countries.

The farm production information in the balance sheets is not sufficiently detailed for further analysis of impacts and change. Production could be reported as two types: small scale and commercial to provide data to estimate effects of marketing improvements. Or alternatively, using the Famine Early Warning System production data estimates, an index might be developed for the two categories until better market information could be gathered. Another useful category division could be sorghum color by white and non-white. This might be estimated at the same time when gathering production information. SAGIS uses the categories sweet and bitter to report the low tannin and high tannin production end use. As improved varieties are adopted by small-scale farmers and more of their production enters commercial marketing channels, the color category will become more important for food use. Other useful production information would be coefficients to estimate seed usage and losses. These could be provided in a footnote to the table.

Under utilization categories, after adoption of the quality methods, the processors could report use by grain color and tannin category. The grain color could allow analyses of the extent of white sorghum supply shortage reported by food processors in Botswana, Tanzania and Zimbabwe. Data on amount used could be incorporated in promotion of improved varieties and used to analyze the adoption rate of improved white varieties. Sorghum color categories for exports and imports between SADC countries would be

useful to determine the type of quality of sorghum being traded and to determine shifts in food sector quality requirements.

6.2 MARKET INFORMATION AND MARKETING MARGINS

Supply, demand, and price information in the sorghum industry is valuable to all market participants-producers, private traders, processors, and government agencies. In all free market countries equitable and efficient sorghum marketing cannot take place without adequate market information. Three concerns are that the information must be complete, accurate, and timely. A fourth concern, skillful interpretation, can only be developed through experience and education.

As the country information and interviews were reviewed it was evident that several market information areas could be developed more fully. There are two particular areas where market information would be valuable if it were more complete: (1) sorghum moving off-farm where grown, and (2) marketing margins or spreads.

SORGHUM MOVEMENT

Information is lacking on the movements of off-farm sorghum. This is to be expected with change to less government involvement in sorghum (privatization), the resultant change from Marketing Board record keeping, the rapid expansion of grain traders in the marketing system, and growth of small processing operations (and elimination of government milling in some countries). Estimates are being made on sorghum production, but assessing where and how much of the sorghum moves off-farm and at what time of the year is difficult to estimate from available data. There are many ways to estimate the amounts of sorghum moving off-farm, including farmer surveys, reporting of sorghum grain when sold (VAT), reporting of source of sorghum when bought, reporting of sorghum products sold (VAT), Delphi-type estimates by private industry and government individuals involved in the sorghum industry, etc.

Because the interest is focused at this time on commercial marketing use it is suggested that the agency responsible for preparation of sorghum use in each country consider requiring monthly reports from food processors, animal feed processors, maltsters, brewers, and any trader having a sorghum trading permit to trade import and export. Much of this information is already gathered or reported, but it remains to be assembled by a group. SAGIS performs this function in South Africa but it probably remains for a government or parastatal agency to do so in the other three countries.

SORGHUM MARKETING MARGINS

The second need for sorghum marketing system information is determining marketing margins or spreads. With the expansion of grain traders and reduction of the role of Marketing Boards, market information being gathered in Botswana, Tanzania, and Zimbabwe is no longer representative of sorghum traded because the percentage of the total markets on which data is still being collected is much smaller. Also the thrust of

information gathered by the Marketing Boards was geared to their activities. Product and input prices did not have allocative functions, only accounting functions. The food balance sheet is such an example. In a market-oriented economy, consumers, farmers, and elected representatives want to know what causes grain prices to change. Sorghum and product prices can vary much more in this type of economy. Previously under the Marketing Board's control: farm-gate, mill, other processor input prices, and certain retail prices were set by the government.

Sorghum marketing margins are needed to estimate the efficiency of the free market system and assess the premium being returned to farmers for producing the desired quality. Estimates of the premium resulting from use of quality methods would be useful to evaluate their effectiveness and impact. Components of farm-to-retail sorghum spreads such as farm-gate price or farm value and price paid by consumers or retail value could also be used with food processing, wholesaling, and retailing costs to calculate marketing margins. At a minimum the farm-gate price, price paid by processors, and price paid by consumers should be gathered and margins calculated. The effort should be coordinated so that data used for calculations are gathered in one place to avoid duplicating work or differing estimates being prepared and published. A working group within statistics and agriculture to be charged with development of a comprehensive strategy to collect and disseminate agricultural statistics should be considered. The reason is that most grains and commodities are undergoing changes as a result of the elimination or reduced role of Grain Boards and reliable information is more difficult to obtain.

6.3 INFORMATION REQUIRED TO FACILITATE IMPLEMENTING PROPOSED STANDARDS

A "Working Group on Grades and Standards" is to be established during the workshop to review results of research on the proposed quality methods and standards. The initial objectives are to determine how recommendations from workshop participants can be incorporated into existing or proposed grades and standards; and to develop a work plan for the implementation of these grades and standards by the region's sorghum industry, beginning in 2002. For the working group to function effectively, it will be necessary to develop an outline of actions to be submitted to a donor group interested with furthering this sorghum quality standards activity. The following issues and actions need to be addressed.

- A central point or unit should be designated and assigned responsibility to keep the working group informed of completed actions, progress to date, and actions for consideration.
- General information on quality methods, training in the use of the methods and research information needs to be made available to private industry and governments of SADC countries.
- Requirements for performing quality methods, instructions for performing tests, and preparation of any method revisions are necessary actions.

- Consideration of a field evaluation program to resolve difficulties, assess effectiveness of methods, and preparation of field notices to private industry and governments.
- Consider arrangements between associations and organizations in SADC countries to address sorghum quality issues in commercial marketing channels that are impacted by the proposed methods.

It is expected further action considerations and proposed tasks will arise as a result of research information and ring trial results presented at the workshop. To proceed with the introduction of the proposed quality methods in 2002 a concerted effort by the workgroup is required.

7. REFERENCES AND AUTHOR CONTACT DETAILS

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Author Contact Details

Dr. Floyd F. Niernberger, Consultant
Chemonics International, Inc.
1133 20th St, NW, Suite 600
Washington D. C. 20036-4129

12033 Hayes Lane, Suite 82
Overland Park, KS 66213-4129
Tel 913-327-7539
E-mail FNIERN@EARTHLINK.NET

APPENDIX 1: OBJECTIVES OF PROJECT

The purpose of the activity described in this task order is to facilitate grain trade, particularly sorghum, in Southern Africa. This will be accomplished by developing simple, grain quality grades and standards for sorghum. Common grain quality grades and standards are a prerequisite to increase the trade and marketing of this crop, particularly trade between countries within SADC. Under this task order, a simple set of standards for sorghum grain quality will be validated by the region's grain traders and the region's food and feed sorghum grain processing industry. An economic and institutional analysis will be carried out to estimate if the price premium that could be paid for sorghum of a particular quality for flour and beverages is sufficiently profitable to offset the costs of implementation to industry and governments. The analysis will also evaluate if these quality grades and standards establish price signals sufficiently strong to increase production. Regional grades and standards implemented by industry in SADC may also be endorsed by the International Association for Cereal Science and Technology (ICC), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and SADC.