

**Regional Activity to Promote Integration
Through Dialogue and Policy
Implementation (RAPID)**



RAPID Task Order 4.1 Activity

Workshop Proceedings:

**Development of Simple, Common Grain Quality
Standards for Sorghum to Facilitate Grain Trade in
Southern Africa**

12-14 September 2001

Submitted by:

Chemonics International, Inc.

Submitted to:

**Regional Center for Southern Africa,
U.S. Agency for International Development**

Gaborone, Botswana

USAID Contract No. 690-I-00-00-00149-00

P.O. Box 602090 ▲ Plot 2914, Ext.10 ▲ Pudulogo Crescent ▲ Gaborone, Botswana ▲ Phone (267) 300 884 ▲ Fax (267) 301 027 ▲ Email rapid@botsnet.bw

Chemonics International Inc ▲ Africa Resources Trust ▲ Business Research and Information Group ▲ Complete Software Solutions Ltd ▲ Consilium Legis (Pty) Ltd ▲
Crown Agents Consultancy Inc ▲ Dewey Ballantine LLP ▲ ECOFIN (Pvt) Ltd ▲ Economic Resources Ltd ▲ Independent Management Consulting Services

▲ Macroeconomic & Financial Management Institute of Eastern and Southern Africa ▲ Manyaka Greyling Meiring Ltd ▲ Mercosur Consulting Group Ltd

▲ New Africa Advisors ▲ Resolve Inc ▲ Sigma One Corporation ▲ TechnoServe ▲ Transportation and Economic Research Associates Inc

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PURPOSE OF THIS DOCUMENT

This document records the proceedings of an USAID-sponsored workshop, attended by 26 participants representing relevant components of the sorghum industry in the four SADC countries, Botswana, South Africa, Tanzania and Zimbabwe including millers, maltsters/brewers, other processors, producers and traders, together with standards institutions and government departments.

The workshop was convened to consider the proposed development of simple, common grain quality standards for sorghum grain, to facilitate grain trade in Southern Africa.

The workshop was held from 12 to 14 November 2001 at the Holiday Inn Garden Court, Johannesburg International Airport, South Africa.

COMMENTS AND ENQUIRIES

Mr Godwin Punungwe

USAID/Regional Center for Southern Africa (USAID/RCSA)

P O Box 2427

GABORONE

BOTSWANA

Telephone: +267 324 449

Facsimile: +267 324 404

Email:

Prepared by: Manyaka Greyling Meiring (Pty) Ltd, PO Box 95823, Waterkloof 0145, Pretoria, South Africa. Tel: 027-12-362-0848; Fax: 027-12-362-0869; Email: liaison@liaison.co.za

Submitted by: Chemonics International Inc.

LIST OF ACRONYMS AND ABBREVIATIONS

BAMB	Botswana Agricultural Marketing Board
B of S	Bureau of Standards
Codex	Joint Codex Alimentarius Commission of the FAO and WHO
CSIR	Council for Scientific and Industrial Research
DP	Diastatic Power
FAO	Food and Agriculture Organisation of the United Nations
G&S	Grading and Standards
GMB	Grain Marketing Board
GM(O)	Genetically modified organisms
ICC	International Association for Cereal Science and Technology
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ISO	International Standards Organisation
MGM	Manyaka Greyling Meiring
NGO	Non Governmental Organisation
RAPID	Regional Activity to Promote Integration Through Dialogue and Policy Implementation
RH	Relative humidity
SACCAR	Southern African Centre for Cooperation in Agricultural and Natural Resources
SADC	Southern African Development Community
SAFEX	South African Futures Exchange
SD	Standard Deviation
SMIP	Sorghum and Millet Improvement Programme
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VAT	Value added tax
WFP	World Food Programme
WHO	World Health Organisation of the United Nations
WTO	World Trade Organisation
ZIMACE	Zimbabwe Agricultural Commodities Exchange

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EXECUTIVE SUMMARY

A workshop for the development of simple, common grain quality standards for sorghum to facilitate grain trade in southern Africa was held on 12 to 14 September 2001 at the Holiday Inn Garden Court, Johannesburg International Airport, South Africa. Delegates represented the four SADC countries Botswana, South Africa, Tanzania and Zimbabwe. The workshop was sponsored by USAID.

The scene for the workshop was set with presentations and discussions on the results of surveys on the current sorghum grain trade and the status of sorghum grain standards in the four countries.

The marketing survey revealed a number of needs and constraints in the sorghum grain industry, manifesting themselves in different ways in the very different production, processing and trading circumstances of the four countries. With the introduction of sorghum grain grades and standards and the resolution of some of these problems, it was estimated that sorghum use and trading would increase, to a greater or lesser extent, in the four countries.

Uniform grain grades and standards were expected to become important as they would support an agricultural marketing system through improved efficiency of the pricing and trading processes. Grades and standards would allow producers to grow and processors and traders to select the correct type of grain for the processes and products. The implementation of grades and standards would not, however, eliminate poor quality grain which would only be achieved through effective breeding, cultural practices, harvesting, storage and handling.

Projected marketing changes after the implementation of the proposed grades and standards include 1) Traders handling most of commercially-marketed sorghum grain, 2) Market liberalisation with little-to-no government trading involvement, 3) Increased export movement between SADC countries and present buyers and 4) Decline in direct processor contracts with growers as sorghum grain quality improves and trader reliability increases. Increased emphasis needed to be given to the smaller producers and their entry into commercial trading channels.

The grain standards survey showed that the five most important sorghum grain quality criteria in southern Africa were tannin/non-tannin content, grain colour, grain hardness, germinability and grain purity. Grain colour, hardness and tannin/non-tannin were the most important for milling while germinability was critically important for malting. Cultivar was also considered to be important. Grain purity was considered generally important.

Simple test methods to determine the five sorghum grain quality criteria were presented to workshop delegates. The methods had been developed or adapted to meet the basic criteria of simplicity, no requirement for specialised equipment, chemicals readily available, quick, performed easily and inexpensive. All five methods had been tested against and compared well with standard grain quality tests. Evaluated in ring trials undertaken by 26 participants from the sorghum industry in 11 countries in southern Africa, USA and Europe, the results obtained provided statistical validation and acceptance for all five test methods.

The modified test methods are described in Table S.1

Table S.1: Modified simple test methods for sorghum grain quality

Test	Method
Detection of high-tannin sorghum grain	High-tannin grains turn black when soaked in sodium hydroxide solution. USA Chlorox Bleach Test modified by using commercially-available caustic soda and carried out at room temperature.
Grain colour	Visual classification into white or coloured grain.
Grain hardness	Modification of Rooney and Miller's visual test in which the texture of the grain endosperm indicates its hardness (the more vitreous endosperm, the harder). The modified test distinguishes between hard, medium and soft endosperm.
Grain germinability	The modified CSIR standard germination test includes testing at room temperature, using a polystyrene cooler box instead of an incubator and using newspaper instead of specified filter paper.
Grain purity	The defects test methods of the South Africa grain standards and Codex Alimentarius are modified by replacing sieving, sorting and weighing to entirely manual processes.

Delegates obtained hands-on familiarisation of the five test methods after which they provided valuable feed-back, suggestions and discussion.

The later sessions of the workshop concentrated on agreement on the sorghum grain grades and standards, the strategy for implementing them and the process to take the initiative forward to implementation. The outcomes and actions agreed by the workshop are summarised.

The recommended sorghum grain quality grades and standards are given in Table S.2.

Table S.2: Recommended sorghum grain quality grades and standards

Grain characteristic	Standard/Grade
Tannin (high-tannin) sorghum grain	Batches containing $\geq 95\%$ tannin or non-tannin sorghum be classified as Tannin or Non-tannin Sorghum respectively.
	Where batches contain $< 95\%$ tannin (or non-tannin) sorghum and $> 5\%$ non-tannin (or tannin) sorghum, the batch be classified as Mixed Tannin and Non-tannin Sorghum and that the percentage tannin sorghum be given.
Sorghum grain colour	Batches containing $\geq 95\%$ white (or coloured) sorghum be classified as White (or Coloured) Sorghum respectively.
	Where batches contain $< 95\%$ white (or coloured) sorghum and $> 5\%$ coloured (or white) sorghum, the batch be classified as Mixed White and Coloured Sorghum and that the percentage coloured sorghum be given.
Sorghum grain hardness	Batches containing 100% hard plus medium sorghum be classified as Medium Hardness Sorghum .
	Batches containing $\geq 90\%$ soft sorghum be classified as Soft Sorghum .
	Where batches contain $< 100\%$ hard plus medium sorghum or $< 90\%$ soft sorghum, the batch be classified as Mixed Medium Hardness and Soft Sorghum and the percentage soft sorghum be given.
Germinative Energy of sorghum grain (germinability)	Sorghum grain for malting should have a Germinative Energy at 72 hours of $\geq 90\%$.
Total defects in sorghum grain (grain purity)	The maximum permissible total defects in sorghum grain for human consumption should not exceed 8%, as specified by Codex Alimentarius.

Sorghum grain quality grades and standards:

- Recommended the acceptance of the five test methods and the associated grades and standards.
- Feedback from industry will be obtained prior to implementation.
- Consideration will be given to standards/specifications/methodology for weathering, mould, moisture content and endosperm colour.

Stakeholder involvement:

- Stakeholder groups are identified as breeders, government (research, national departments, statutory organisations), industries (milling, brewing, stockfeed, seed), traders and farmers.
- Regional organisations (eg: SADC, ICRISAT) should be included to ensure broad SADC involvement.
- Governments' roles are acknowledged although the process should be industry-led.

Institutional:

- SADC is recognised as a potentially important role player in the project and ways should be determined to increase its role, starting by specifically informing it of the workshop outcomes and the intended proposal to RAPID.

Structure:

- The Sorghum and Millet Improvement Programme (SMIP) which is implemented by, ICRISAT, will provide the coordination and secretariat support for the *ad hoc* Working Group and the ongoing process (including preparation of the RAPID proposal).
- Membership of the *ad hoc* Working Group will, for the initial term, be eight members, two representatives drawn from each of the four countries represented at the workshop.

Taking the process forward:

- The sorghum grain grades and standards should be adopted. They will be utilised initially on a voluntary basis, usually by trade contract between buyer and seller.
- National Bureaux of Standards (or equivalent) should be encouraged to recognise these standards but initially without the formality of regulation.
- The *ad hoc* Working Group will monitor the implementation of the grades and standards. Tasks of the *ad hoc* Working Group in this respect should include technical advice, linkages to national structures and promotion of regional sorghum trade.
- The secretariat to the *ad hoc* Working Group will provide administrative support, including coordination of activities, databases (traders, producers etc), information sharing, monitoring, implementation processes.
- A proposal to RAPID is required to take the project forward to implementation. The secretariat to the *ad hoc* Working Group will coordinate proposal preparation, deadline end-November 2001, based on the Workshop proceedings and with input from Working Group members who would ensure involvement of their respective countries. It will arrange presentation to RAPID.

Training:

- Training initiatives should focus on grades and standards and will not be involved with other sorghum issues (eg: production).
- Suggested that a decentralised (country-by-country) approach be considered to meet the individual diverse national infrastructural situations.

- Training modules and materials will be required for each component of the grades and standards. These should incorporate specific training programmes, *ad hoc* training options and “add-on” modules. Funding will be required.
- The development of training modules, training implementation and funding thereof will be included in the proposal to RAPID. Accepted that, in principle, funding should be a joint responsibility
- The *ad hoc* Working Group should investigate funding for training and incorporate it in the proposal to RAPID.

Appointment of members of the *ad hoc* Working Group:

- Botswana
 - Mr Joseph Jagwer (Industry, Foods Botswana (Pty) Ltd)
 - Mr Molefe Bannyaditse (Government, Botswana Bureau of Standards)
- South Africa
 - Mr Piet Skinner (Industry, Sorghum SA)
 - Mr Samuel Kgafane (Producer, Sorghum Trust)
- Tanzania
 - Mrs Anna Temu (Industry, Power Foods)
 - Mr Syed Risvi (Industry, Fidahusseini & Company Ltd)
- Zimbabwe
 - Mr Leo Mpofo (Government, Department of Research and Specialist Services)
 - Mr Roland Murengwa (Industry, Chibuku Breweries)

The way forward:

Actions required leading to the *ad hoc* Working Group’s formative meeting by end-March 2002:

- Press release (framework agreed at workshop)
- Workshop Proceedings preparation and distribution to delegates
- Workshop Proceedings distribution to stakeholders in participating countries (*ad hoc* Working Group to assist)
- Preparation of proposal, including training and additional research requirements
- Finalisation of outstanding issues for grades and standards specifications
- Working Group formative meeting

1. INTRODUCTION AND OPENING

The facilitator, Mr David Cooper (Manyaka Greyling Meiring), introduced himself and welcomed delegates to South Africa, Johannesburg and the Workshop.

He introduced Dr Laurie Kitch, representing FAO and based in Harare, Zimbabwe, and asked him to address the workshop on behalf of the FAO.

1.1 OPENING REMARKS: DR LAURIE KITCH

Dr Kitch thanked the workshop organisers for inviting the FAO to participate in the workshop. He explained that he was attending on behalf of his colleague, Mr Georges Cojia, FAO Food and Nutrition Officer for Southern and Eastern Africa, who had indicated that it was important for FAO to be represented at the Workshop. He and Mr Cojia were located in the FAO regional office in Harare, together with 23 technical officers, responsible for technical assistance in 21 member countries in southern Africa.

Dr Kitch said that he appreciated the importance of grain quality in the marketing of any crop. He was continuously involved in preparing agricultural development projects from which it was clear that the major issue was always what crops could be grown and sold for a profit. In other words, all farmers and governments were continuously searching for ways to locate and exploit market opportunities.

Dr Kitch applauded the workshop organisers who, he said, were taking significant steps to ensure the improved marketability of sorghum, a significant food security crop in the semi-arid areas of the region. He believed the workshop objectives to be well-formulated and, with the technical reports laying a strong foundation for discussion, should lead to progress and tangible results during the workshop. He was particularly pleased to see Dr Taylor's technical report on simple, common grain quality standards which, he believed, were required as a first step in developing a more market-oriented approach in African agriculture.

The FAO was involved with setting food quality standards through the joint FAO/WHO Food Standards Programme and Codex Alimentarius Commission. Other FAO divisions were involved with various aspects of food quality and nutrition, commodities and agricultural marketing, including post-harvest issues. FAO's mandate also included distribution marketing as one of the five major areas of the organisation's concern. He advised that most of these services could be accessed through FAO's sub-regional office in Harare.

In closing, Dr Kitch assured delegates that Mr Cojia would be briefed on the Workshop's deliberations and outcomes and follow-up made where the FAO could assist. He wished delegated a productive workshop and declared proceedings open.

The facilitator then introduced Ms Susan Corning, representing RAPID, an USAID-sponsored project, based in Gaborone, Botswana, and asked her to make opening remarks on behalf of the project.

1.2 OPENING REMARKS: MS SUSAN CORNING

Ms Corning explained that the overall RAPID project, with SADC as the client, was of five years duration, valued at \$38 million. Its objective was to attain a SADC goal of market integration, firstly enhancing intra-regional trade and secondly, enhancing international trade (SADC – rest of world).

In its first year, the project focussed on tariff issues to facilitate and enhance regional trade. In its second year, the current year, this work continued but the greater focus was now on non-tariff issues to facilitate trade which, for agriculture, included sanitary and phytosanitary issues and grades and standards. More work can be expected in these areas in the future as an important aspect of stimulating trade, both intra-regionally and internationally.

Ms Corning closed by indicating that the World Bank acknowledged the importance of non-tariff issues, that it was keenly interested in this particular initiative and that they were looking forward to enhanced follow-on of this activity.

Following the opening remarks, the facilitator commented that the project would benefit by having the support of the FAO and international organisations, especially when national trade within SADC and international trade with the rest of the world were being formulated. He said that it was also important that liaison with SADC trade initiatives would ensure that the findings of the workshop would be integrated into national and regional policies.

The facilitator acknowledged delegates' sacrifice of time in providing valued contribution to the workshop objectives and hoped that they would find the proceedings both beneficial and enjoyable. He then asked delegates to introduce themselves.

1.3 WORKSHOP PROGRAMME

The facilitator outlined the workshop programme:

Thursday 13 September 2001 –

Morning, Session 1: Sorghum grain trade in southern Africa – the current context

- Market analysis of current sorghum grain trade (Dr Floyd Niernberger, Chemonics International Inc.)
- Results of survey on standards (Prof John Taylor, University of Pretoria)
- Simple methods to determine sorghum grain quality (Prof John Taylor)

Questions and discussion

Afternoon, Session 2: Simple methods ring trial and familiarisation

- Results of ring trial (Prof John Taylor)
- Working groups: Familiarisation of the five methods
- Working groups report back to plenary

Discussion

- Consideration on use of methods (Dr Floyd Niernberger)

Questions

Friday 14 September 2001 –

Morning, Session 3: Implementation of standards and methods

- Summary and key points of Day 1 and workshop process for Day 2
- Possible strategies to implement standards and methods (Dr Floyd Niernberger)
- Working groups: Determine possible ways to implement standards and methods into existing or proposed grades and standards
- Working groups report back to plenary

Morning, Session 4: The way forward

- Discussion: Strategy for implementing standards and methods into existing grades and standards
- Process to take forward on sorghum grades and standards including election of *ad hoc* Working Group

1.4 WORKSHOP OBJECTIVES

The facilitator outlined the workshop objectives to give delegates the opportunity of clarification or addition at the outset of the workshop.

- 1) To report on a study of the cost-benefit and feasibility of sorghum grain standards in southern Africa's food industry.
- 2) To report on a survey of the requirements for specific sorghum grain quality standards in southern Africa.
- 3) To report on the development and evaluation by ring trial of simple methods for the determination of sorghum grain quality:
 - Determination of defects in sorghum grain
 - Detection of tannin sorghum
 - Classification of sorghum according to grain colour
 - Estimation of sorghum grain hardness
 - Determination of sorghum grain germinability
- 4) Familiarisation of the methods developed by participating in hands-on testing of sorghum grain samples.
- 5) To discuss the results of the ring-trail and hands-on testing for the purpose of proposing recommendations on the methods.
- 6) To appoint an *ad hoc* Working Group on implementing sorghum grades and standards in southern Africa.

1.5 DISCUSSION

- Objective 4 is a familiarisation exercise rather than scientific evaluation which had already been undertaken.
- Objective 6 is suggestive rather than prescriptive, the objective being for delegates to decide on the best way forward for the project.
- One of the desired outcomes of the project is to take the recommendations forward to the international arena. If the test methods were approved by workshop delegates, then they would be submitted to the International Association for Cereal Science and Technology (ICC), the world body for standards and methods of analysis for cereals. There are many test methods for other cereal crops but none for sorghum.

It was AGREED that, as a desired outcome of the project, this would become an additional workshop objective: "To take the recommended grades and standards for sorghum grain forward to the international arena."

- As the real consequence is how the test methods can best be applied, it was AGREED that Objective 5 would be extended to include, "... and how the methods can be applied in the southern African context":
- To discuss the results of the ring-trail and hands-on testing for the purpose of proposing recommendations on the methods and how the methods can be applied in the southern African context.

Following these two modifications, delegates AGREED to the workshop objectives.

Session 1: Sorghum grain trade in southern Africa – the current context

2. MARKET ANALYSIS OF CURRENT SORGHUM GRAIN TRADE

Dr Floyd Niernberger is from the central region of the USA where he was raised and educated. He graduated from Kansas State University with degrees in Grain Science and Agricultural Economics. He initially lectured and conducted research at the University and later joined the USDA, specialising in grains and fibres with the Economic Research Service and the Federal Grain Inspection Service. Retiring from the USDA in 1996, Dr Niernberger continues to undertake grain marketing and standards projects in a number of countries.

2.1 MARKET ANALYSIS

The market survey, undertaken by interview, took place during the period February to April 2001 and included the SADC countries Botswana, South Africa, Tanzania and Zimbabwe. Reference was made to studies undertaken by Dr David Rohrbach including, “Commercialisation of sorghum milling in Botswana” (2000), “Commercialisation of sorghum and pearl millet in Zimbabwe” (2000) and “Commercialisation prospects for sorghum and pearl millet in Tanzania” (1999).

The marketing issues studied included:

- Survey of current commercial sorghum marketing flows
- Assess current sorghum quality/grades and standards
- Potential for sorghum grain use in the four countries
- Estimates of commercial marketing changes if the proposed sorghum quality methods are implemented
- Assess the participation and role of private industry in implementing the proposed sorghum quality methods
- Evaluate the role and support of governments to monitor industry self-regulation of the proposed sorghum quality methods and standards

Grain trading is tending to shift from marketing boards to private industry and market-oriented activities are being promoted by the private grain sector itself. Uniform grain grades and standards therefore become important as they facilitate the operation of an agricultural marketing system that leads to an improvement in the efficiency of the pricing process and the entire system. To do this, grades and standards must supply information about grain in the market in a manner that is easily understood by the persons concerned. The implementation of grain standards will not eliminate poor quality grain which will only be achieved through breeding, cultural practices, harvesting, storage, handling etc. Standards do, however, allow markets to select the correct type of grain to suit the processes and products.

What grain grades and standards imply:

- Identification of methods used to determine criteria
- Defined values and limits for quality classification
- Procedures to obtain samples and handle and prepare samples for testing
- Procedures to report test results
- Procedures for the appeal of results

An overview of grain sorghum production in the four countries is given in Table 1.

Table 1. Overview of grain sorghum production

Country	Production ('000 tonnes, 5-year av.)	Conditions
Botswana	13.2	Low yields; return to labour low; production decline; migration out of agriculture
South Africa	314.5	High yields; returns less than maize; lack of quality white milling varieties for market
Tanzania	564.0	Medium yields; threshing practices poor; mixing varieties in marketing not desired by processors
Zimbabwe	99.7	Low yields; threshing practices poor; mixing varieties in marketing not desired by processors

The marketing survey revealed the following requirements and constraints for the four countries.

Botswana:

- Improve rural transportation infrastructure
- Cleanliness of sorghum marketed
- Quality of sorghum marketed
- Reliable domestic and imported supply and suppliers
- Assistance to small-scale producers to increase domestic production

South Africa:

- Better and quicker methods to determine sorghum quality (previously brewing standards and for food security objectives)
- Better availability of white sorghum improved varieties cost/distribution to small-scale farmers
- Programmes to increase development of small-scale farmers' production/marketing skills
- Eliminate VAT on sorghum grain to place maize and sorghum in the same marketing position – substitutability

Tanzania:

- Deteriorated transportation infrastructure
- Cleanliness of sorghum marketed
- Reliable supply and suppliers (quantity)
- Mostly unimproved varieties grown and mixed when assembled; need better distribution of improved varieties and similar quality for mills
- Lack of loan availability for storage and cleaning, drying equipment for small processors
- Burdensome taxation for processors at all government levels

Zimbabwe:

- Reliable supply and suppliers (quantity; fairly large stockfeed industry; difficulty of handling small lots and maintaining quality supply in the longer term)
- Poor cleanliness of sorghum marketed

- Procurement by small processors from GMB sorghum supplies to private traders difficult (quality deterioration in late season leads to lower quality product)
- Lack of cleaning equipment and storage facilities at small processors
- Dissemination of sorghum price information from markets to small-scale growers is insufficient to stimulate production

Estimates of future (2004) sorghum use for the four countries are given in Table 2.

Table 2. Sorghum current and potential use (2004) estimates

Country	Current use	Potential use 2004	Potential increase	Current exports	Potential exports
	'000 tonnes				
Botswana	60	90	30	0	0
South Africa	205	275	70	60	80-90
Tanzania	1	15	14	0.4	3-10
Zimbabwe	16	30	14	0	3-7
TOTAL	282	410	128	60.4	86-107

Botswana's potentially increased use will be hampered by declining production. There is potential for increased exports from South Africa and Tanzania. Zimbabwe has the potential for increased use but probably not for export.

A greater proportion of the sorghum marketed should, in future, come from the smaller producers in all countries. There is therefore a need to organise farmers so that they can move their grain in commercial channels. The survey showed that both sorghum grain and derived products were being exported to other countries in the region.

The indicated conditions of marketing physical and facilitating functions in each of the four countries are given in Tables 3 and 4.

Table 3. Conditions of marketing physical functions

Country	Assembly	Transport	Storage	Processing
Botswana	Domestic costs high with scarce supplies; bag and bulk handling	Costs medium/high due to wide dispersion; importing transport costs reasonable	Excess capacity at BAMB sites; insufficient at small mills	Mills underutilised; local supply uncertain; poor quality late in marketing year
South Africa	Reasonable costs; mostly bulk handling	Reasonable costs; bulk handling; access to most production areas	Adequate for needs and conditions good	Dominated by a few processing firms; contract both farms and traders
Tanzania	Costs very high; bag handling; roads poor in growing areas; trader/processor buys directly and pick-up from farm	Costs high due to few feeder roads to main roads and often impassable in growing areas; bag handling	Adequate facilities for government food security stock needs; bag handling except for breweries	Underutilised mill and animal feed capacity; uncertain supply; poor quality with dirt, stones etc
Zimbabwe	Costs high; mostly bag handling	Costs high due to distant growing areas and low density; mostly bag	Excess capacity at GMB sites; bag and bulk handling	Few large mills; direct contracting farms/traders due to uncertain supply; poor quality with dirt, stones etc

Table 4. Conditions of marketing facilitating functions

Country	Grades and standards	Financing	Grain Exchange market information	Research and extension
Botswana	ISO member; B of S organisation; presently developing G&S for milling use	Financial assistance policy for mills; loans are needed for small operators for storage and inventory	No commodity/grain exchange; need price transparency as most trades are direct farm to processing contract	White varieties for mills needed; management and market training for smallholders needed
South Africa	ISO member; B of S organisation; have grades and standards for sorghum grain	Land redistribution and Land Bank programme; no small mill loan programme	No sorghum traded on SAFEX; need price transparency as most trades are direct contracts	Agricultural Research Council need white varieties for mill products; need to eliminate VAT on sorghum
Tanzania	ISO member; B of S organisation; no grades and standards; poor farm quality with excess foreign and other material	Inadequate loan ceiling to purchase cleaning equipment to remove foreign material, drying equipment and storage	No grain exchange; thin market/little trade; large price difference in time and location; need information on price margins/spreads	Educate animal feed processors on value of sorghum as nutritive ingredient; need information on cleaning equipment/ operation
Zimbabwe	ISO member; B of S organisation; grades by GMB; poor farm quality with excess foreign material	No government small-scale mill financial incentive programme; need loan availability for cleaning equipment	Few sorghum contracts traded on ZIMACE; most trades direct contract; price transparency needed	Yield and quality improvements done at ICRISAT; feed processors need information on nutritive value

The projected marketing changes after the implementation of the proposed sorghum grain quality grades and standards are:

- Significant changes expected with traders handling most of commercially-marketed sorghum grain.
- Government trading involvement declines to little-or-none, with continued movement to market liberalisation.
- Much of the projected commercial marketing increase is in export movement between SADC countries and present buyers.
- Decline in number and amount of direct processor contracts with growers as quality of sorghum marketed improves and trader reliability increases.
- Increase in commercial sorghum marketing from smallholders with improved varieties grown, quality separated at farm gate and impact of marketing development projects.

If production is going to be stimulated, especially by the smaller producer, then the farmer needs to know in advance the value of the sorghum grain that he will produce.

Responses to the survey gave some indication of the sorghum industry's ability to self-regulate grades and standards:

- Few problems are anticipated in implementing the proposed methods and there is no need for a Government inspection programme to administer operation if the methods are simple, rapid and standardised.
- Most interviewees have traded/processed sorghum/other grains for many years. Contracts with farmers, traders, other sellers and buyers usually specify quality requirements in any event.

- Worldwide grain trading use of international contracts has resulted in grain trading partners awareness of quality specifications, including specified procedures of the handling of disagreements.
- Quality results dispute procedures are specified in grain contracts and incidents are usually settled by price adjustment. The remainder follow contract guidelines and are normally resolved by private laboratory results or third party experts. Few disputes require court resolution.

Government representatives indicated concern about associated health and phytosanitary controls. However, procedures to handle such issues are available in the countries and could be deferred to, rather than developing overlapping facilities.

The FAO's stated views on agricultural marketing are:

- Efficient market system is essential for the development of the agricultural sector
- Markets should provide outlets and incentives for increased production - which contributes to commercialisation of subsistence farmers
- Government role in promoting private-sector market systems. Examine present policies with a view to minimise conflict with the private sector. Be an informed partner in constructive dialogue with them.
- Government should promote:
 - Transparency in the market and post-harvest systems through information and research. On-going studies of the market system for specific commodities. Effective market information services.
 - Cooperation as a result of constructive dialogue between private sector and government. Commodity associations, trade sector groups, users of the private market and marketing exchanges. Coordinating existing institutions to promote dialogue and follow-up decisions taken at meetings with the private sector, Bureaux of Standards, Grain Inspection, private associations.

The Government's role in infrastructural provision for grain marketing is seen to be:

- Transport facilities
- Communication facilities
- Public utility supply
- Fiscal and trade administration
- Information and extension services
- Public storage and market facilities

The three principles for organising support facilities and services are:

- Cost effectiveness
- Simplicity
- Sustainability

It is clear that the goals of FAO, SADC and this particular project are very similar.

2.2 QUESTIONS/DISCUSSION

- Where does the large amount of sorghum exported from South Africa go to? What are the limiting factors?

Sorghum grain is exported to Botswana and speciality products move throughout the region. Declining production in neighbouring countries allows South Africa its export

opportunities. The sorghum processing industry and its products are now quite sophisticated and these products move to neighbouring countries. Changing trading patterns, including export markets, are brought on by the marketing system changes in the sub-region and other changing circumstances such as costs (eg: transport).

- Reference is made to the technical report for detailed marketing discussion.

The full technical report, Report No. 1, entitled, "Market analysis and feasibility of sorghum grain standards for southern Africa's industrial processors", dated June 2001, can be made available upon request.

- In the knowledge that there is a range of factors other than grades and standards influencing the expansion of sorghum production, to what extent are grades and standards the primary constraint to expansion? In estimating growth potential, does one assume that other constraints (eg: VAT in South Africa, transport in Tanzania) are relieved?

Other constraints will also influence growth potential but these are recognised and there is generally little reason why these cannot be removed or reduced as constraints (eg: introduction of improved varieties). However, neither the introduction of grades and standards nor any other contributing factor (eg: increased production) will, by themselves, influence expansion. The workshop should therefore work towards targeting the grades and standards to have the greatest possible impact.

- What is the potential for export outside the region (eg: Australia)?

Speciality markets (eg: Muslim countries with specific product requirements) do exist. Assembly of sufficient quantities of the right quality grain at a competitive price is problematic. Production can be built up (eg: Thailand) but this requires markets to trade into. There are both intra-SADC and international market opportunities which SADC should address in terms of promoting trade (eg: export incentives).

- In targeting small-scale farmers for increased production, there is a need to address their financial circumstances, a major constraint. Banks do not handle risky loans and subsidised loans are not desirable, leading to unfair trade. As an alternative to financing farmers directly, consideration can be given to the support of storage, inventory and infrastructure, preferably at the local level, supporting the assembly of crops locally but off the farm.
- Producers do not provide the quality of sorghum that the buyer requires. There is difficulty in finding out what grain quality is required.
- Quality standards for sorghum grain will make a difference. Some 20 years ago, 70% of the input into sorghum beer was maize. Now, it is 80% and, in some countries, 100%. Brewers indicate that they would like to use sorghum but cannot obtain the right quality.

3. RESULTS OF SURVEY ON STANDARDS

Prof John Taylor is Professor of Food Science at the University of Pretoria and is Chairman of the International Association for Cereal Science and Technology Study Group on Sorghum, Millets, Legumes and Composite Flours. He has undertaken sorghum food science and technology research and development for more than 20 years. He is the specialist food scientist on this sorghum grain quality grades and standards project.

3.1 SURVEY ON SORGHUM GRAIN QUALITY STANDARDS IN SOUTHERN AFRICA

The survey was carried out in parallel with the marketing survey and consisted of a review of currently used standards in the region and views on the requirements for the proposed standards.

3.1.1 Review of current sorghum grain standards

Botswana:

- Standards are being developed.
- Latest development proposes four classes based on end-use quality – food, feed, malting and other – with sub-classes differentiating grain colour and tannin level

South Africa:

- Standards promulgated in Government Gazette
- The three classes are end-use orientated, geared to malting, the predominant commercial use.
- The three classes are based on varietal malting quality (level of amylase activity). Each class contains a group of approved cultivars appropriate to the class specification.
- Class GH – grain sorghum, high tannin, high amylase activity (high DP)
- Class GM – grain sorghum, malting quality, low/no tannin, high amylase activity
- Class GL – grain sorghum, low/no tannin, low amylase activity, feed quality
- Example: DC99 is classed GH, being a high tannin / high amylase variety
- There are grades within classes based on various defects (eg: foreign grains, other classes, damaged grains)

Zimbabwe:

- There are specifications that can be used in contracts
- Four grades, A, B, C and D, grade the sorghum into red/white, horny/floury endosperm and high tannin (birdproof) types. There are specifications for germination level and milling quality within the grades
- The methods are not prescribed

Tanzania:

- No standards

3.1.2 Sorghum grain quality criteria

During the survey, five criteria were presented to the participants for consideration. These five criteria were derived from agreements made at a regional workshop on sorghum grain quality assessment held by the International Collaborative Research Support Program in Sorghum and Millets held some three years ago in South Africa.

1) High tannin or non-tannin grain type

High tannin is not suitable for porridge; high tannin is not appropriate for traditional or small-scale beverages but can be used for industrial malting; high tannin would have to be chemically treated if used for anything other than industrial malting.

2) Grain colour

Brown and red grain are generally preferred for home brewing; most communities in southern Africa prefer white grain for porridge but some prefer red; commercially-available sorghum meals are usually made from red sorghum.

3) Grain hardness

Grain must be hard for machine milling; hardness is related to the endosperm type.

4) Germinability

For malting purposes, all the grain must germinate; amylase activity (diastatic power, DP), essential to the brewing process, only develops during the malting (germination) process.

5) Grain purity

Consumer preference demands that food products are free of foreign matter (eg: sand in flour); foreign matter damages milling machinery; may have to invest in cleaning equipment.

3.1.3 Countries selected for the survey and respondents

The four countries were selected for the following reasons:

- Botswana. Highest per capita sorghum consumption
- South Africa. Most developed sorghum processing industry
- Tanzania. Largest sorghum production
- Zimbabwe. Considerable potential to increase sorghum production and processing

There were 38 respondents in the following national split - Botswana (9), South Africa (16), Tanzania (5) and Zimbabwe (8). The industry was broadly represented by brewer, maltster, miller, stockfeed, trader, scientist and government/parastatal.

3.1.4 The survey and responses

The survey was conducted on a one-to-one basis mainly by interview and sometimes by telephone. Participants were given the five criteria and asked to rank them by importance and, if appropriate, consider them by end-use.

The respondent's importance of sorghum grain quality criteria with respect to country and to end-use is given in Tables 5 and 6 respectively. These are reported in terms of percentage respondents and importance rating.

Table 5. Relative importance of the sorghum grain quality criteria with respect to country

	Quality criteria				
	High/non-tannin	Grain colour	Hardness	Germinability	Grain purity
	All countries (Botswana, South Africa, Tanzania, Zimbabwe) (38 respondents)				
% Respondents	53	58	42	39	66
Importance	67	53	59	83	59
	Botswana (9 respondents)				
% Respondents	78	56	56	33	67
Importance	91	63	45	77	43
	South Africa (16 respondents)				
% Respondents	75	33	38	50	38
Importance	67	50	83	91	56
	Tanzania (5 respondents)				
% Respondents	20	40	0	20	80
Importance	33	67	0	100	77
	Zimbabwe (8 respondents)				
% Respondents	0	75	50	38	88
Importance	0	45	50	77	63

Table 6. Relative importance of the sorghum grain quality criteria with respect to end-use

	Quality criteria				
	High/non-tannin	Grain colour	Hardness	Germinability	Grain purity
	All data				
% Respondents	51	56	41	38	64
Importance	67	53	58	83	63
Milling					
% Respondents	50	72	72	0	67
Importance	83	50	67	0	67
Malting					
% Respondents	63	59	0	83	42
Importance	56	44	0	94	50
Not specified					
% Respondents	50	50	40	0	83
Importance	40	40	40	0	100

The importance and rating of the quality criteria with respect to country and end-use is summarised in Table 7:

Table 7. The importance of quality criteria with respect to country and end-use

Country/ End-use	Quality criteria									
	Tannin		Grain colour		Hardness		Germinability		Grain purity	
	Most	Highest	Most	Highest	Most	Highest	Most	Highest	Most	Highest
All countries	[[[[
Botswana	[[
South Africa	[[[
Tanzania								[[[
Zimbabwe			[[[
All end-uses								[[
Milling		[[[[
Malting							[[
Unspecified									[[

Most = Most respondents Highest = Highest rating

Most respondents cited grain purity as an important quality criterion. Only few respondents cited germinability, but where it attracted the most respondents, they gave it the highest rating. Germinability had the highest rating of all data.

Country differences were evident, with tannin, colour and germinability the most important overall. Grain purity attracted most respondents in Tanzania and Zimbabwe, probably because of their less developed infrastructures and more problems with grain purity. Most respondents in Botswana and South Africa highlighted tannins.

Strong quality preferences were shown by respondents in respect of end-uses. Respondents showed a preference for hardness for milling purposes but none for germinability. Malting attracted both a preference and the highest rating for germinability. High tannins were rated important for milling. With no specified end-use, grain purity was rated highly important.

Respondents also considered other quality criteria to be of importance, including cultivar, amylase activity (DP) of malt, grain size, moisture content, nutritional value, presence of noxious seeds and

weather staining of grain. Of these additional criteria, cultivar was the most frequently cited. It was noted that, in open trade, it was almost impossible to keep cultivars separate.

While there were country and end-use differences in importance, all five quality criteria were considered to be of importance overall.

The following conclusions were drawn from the survey:

- The sorghum community in southern Africa considers that all five of the selected quality criteria - tannin/non-tannin, grain colour, hardness, germinability and grain purity - are important
- Cultivar is also considered to be important
- For milling, grain colour, hardness, tannin/non-tannin are the most important
- For malting, germinability is critically important
- Grain purity is considered generally important

3.2 QUESTIONS/DISCUSSION

- The Zimbabwe brewer, Chibuku, uses its own standards but these are similar to those of the GMB. The desired quality for brewing is obtained by contracting production using two specific high-tannin varieties. For malting purposes, there is a need to consider endosperm type.
- There are no standards for milling quality (in South Africa). This is an omission in the current grading system which needs attention, especially as the market for milling sorghum has grown significantly.
- South Africans report on milling characteristics based on available cultivars. There are, however, variations within cultivars due to growing, harvesting and storage conditions. Testing should be based on the product itself.
- The Botswana Bureau of Standards provides for the setting of standards.
- Country standards exist but how much are they actually applied in the marketplace?

In general, where they are available, standards are applied but they do not necessarily meet product and process requirements. Thus, the milling industry is using standards applicable to another industry, the brewing industry, with different grain specification requirements.

- In addition to the official standards, the Zimbabwe brewer considers a set of maximum standards (eg: waste, chipped) and minimum germination.

The brewing industry therefore has clearer specifications on what is required and these are applied at the purchase point. Such standards are not defined for the milling industry which applies standards set for malting, a mis-application of standards.

- Foods Botswana, which processes sorghum for both malting and milling, finds that most delivered grain is a mixture of cultivars and is not uniform. The processor relies on the producer to provide consistency of quality, especially through single cultivar production.
- In South Africa, sorghum is used for animal feed. How does this tie in with high tannins?

Sorghum is not used much for animal feed in South Africa, but more for mixed poultry feed. Feedlots probably buy in sorghum under contract, but there is little movement in the formal trade.

- Are the South African classes, GH, GM and GL, for malting qualities mostly related to cultivar?

Yes. High/low tannin and amylase activity (DP) are genetically-based but germinability is an environment issue (eg: handling).

- Were producers involved in the survey? Producers requirements can differ from those of processors. Was this taken into account?

The survey was based on end-use grain qualities and producer issues were not involved. Producers do not necessarily understand standards and commonly do not understand why their crops are downgraded. Simpler grading standards should facilitate this understanding and their involvement will be essential in the future.

- For the countries where standards exist (eg: Zimbabwe, South Africa), were the standards compared? For example, did the survey ask the Zimbabwe respondents whether they understood the South African malting standards?

No, the survey was set at a more basic level where each country situation was considered separately.

4. THE DEVELOPMENT OF SIMPLE METHODS TO DETERMINE SORGHUM GRAIN QUALITY

Prof John Taylor

4.1 CRITERIA FOR METHOD SELECTION AND DEVELOPMENT

The methods developed or adapted to measure the five selected grain quality criteria must meet the following guidelines:

- The methods must be simple to perform
- The methods must not require the use of specialised equipment or instruments
- Any chemicals required to perform the analyses must be readily available
- The methods should, ideally, be rapid
- The methods should be such that they can be performed by those in the sorghum trade
- The methods should be inexpensive in terms of both equipment and consumables

4.2 DETECTION OF HIGH-TANNIN SORGHUM GRAIN

A modification of the USA Chlorox Bleach Test is proposed. When a grain sample is soaked in a sodium hydroxide (NaOH) solution, the high-tannin grains turn black. Grain tannin level cannot be determined by simple observation.

The modifications introduced are:

- Use of commercial caustic soda instead of NaOH
- Carry out test at room temperature instead of in an oven at 70°C

Examples of the stained grains of high- and low-tannin sorghum cultivars that have undergone the modified bleach test are illustrated in Figure 1.



Figure 1. Examples of high- and low-tannin sorghum cultivars that have undergone the bleach test

The modified bleach test was compared with the standard CSIR method and a quantitative chemical analysis over a range of cultivars (Table 8). The comparison showed that the results of the simplified bleach test agreed closely with those of the standard test and also with the quantitative analysis.

Table 8. High-tannin sorghum determined by the Modified Bleach Test, The CSIR Bleach Test and the Vanillin HCl Method

Sorghum Sample	Modified Bleach Test (% completely black grains)	CSIR Bleach Test (% completely black grains)	Tannin content (mg catechin equivalents/100 mg)
NK 283 (non-tannin std)	0	1	0.07
DC 99 (high-tannin std)	100	100	5.73
KAT 369	0	0	0.09
GM ex Nola 97	1	2	0.06
Barnard Red	4	5	0.22
SSK52	96	96	6.44
SNK3377	0	1	0.06
GH ex Nola 93	1	1	0.07
BR 9	1	2	0.10
GH ex Nola 97	91	94	7.75
PAN 8564 (1)	0	0	0.07
PAN 8564 (2)	0	0	0.02
SNK 3640	92	93	11.02
NK 304	0	0	0.07
GH ex Nola 91	91	94	14.09
Mozambique	0	0	0.19
Mapira	0	1	0.05

4.3 GRAIN COLOUR

This test is a simple visual classification into white or coloured grain. Two colour groups eliminates the need to distinguish the many variations between white, brown and red.

This method was compared with two instrumental methods, Tristimulus colorimeter and Agtron (ICRISAT-recommended). The methods agreed well, showing the wide range of browns and reds and the two white-classified cultivars showing up clearly in the instrument tests. The test results are given in Table 9.

Table 9. Sorghum grain colour determined by the developed visual method and the Tristimulus and Agtron instruments

Sorghum Sample	Visual colour (% white grains)	Tristimulus L values	Agtron values
NK 283	1	36.4	30.3
KAT 369	100	46.6	40.6
DC 99	0	28.4	13.4
GM ex Nola 97	0	32.5	21.2
Barnard Red	0	37.1	27.3
SSK 52	0	33.3	22.0
SNK 377	0	34.9	23.3
GH ex Nola 93	0	33.5	25.6
BR 9	1	34.8	25.6
GH ex Nola 97	0	28.1	17.8
PAN 8564 (1)	0	33.9	26.4
PAN 8564 (2)	0	34.8	26.0
SNK 3640	0	26.7	10.9
NK 304	1	35.5	24.5
GH ex Nola 91	0	37.1	26.7
Mozambique	100	51.1	35.9
Mapira	0	31.8	24.9

4.4 GRAIN HARDNESS

Grain hardness relates to the resistance to crushing the grain which is difficult to measure without instrumentation. A modification of the sorghum endosperm texture method of Rooney and Miller (1982) is therefore proposed. The principle of this visual test is that the larger the proportion of vitreous (horny) endosperm, the harder it is. The test consists of cutting the grain longitudinally and visually assessing the proportion of vitreous to floury endosperm. The modified test distinguishes between hard, medium and soft endosperm, with the following definitions:

- Hard: Endosperm is totally corneous (translucent) or most (>50%) is translucent.
- Medium: The outer, corneous endosperm is continuous but less than 50% of the total endosperm, the inner part being floury (chalky).
- Soft: Endosperm is totally floury or the outer, corneous endosperm is very narrow and incomplete.

Typical hard, medium and soft endosperm types are illustrated in Figure 2.

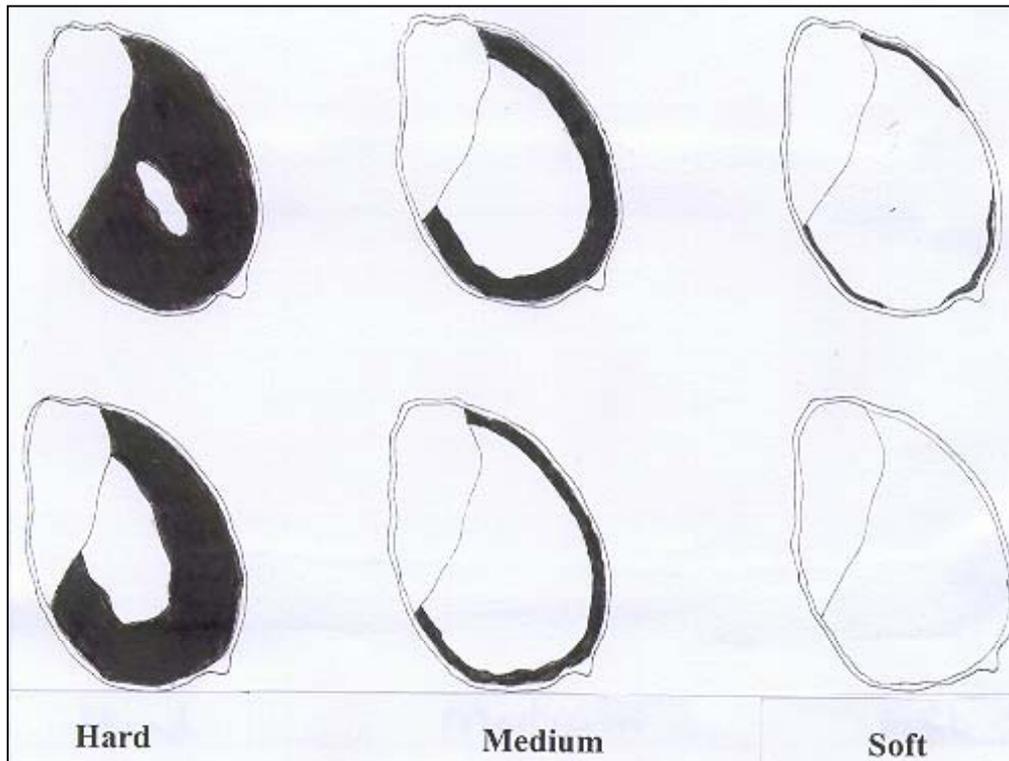


Figure 2. Illustrations for the visual estimation of grain hardness

This modified visual assessment compares well with the Rooney and Miller numerical system, giving a good statistical correlation ($R^2 = 0.81$) (Figure 3).

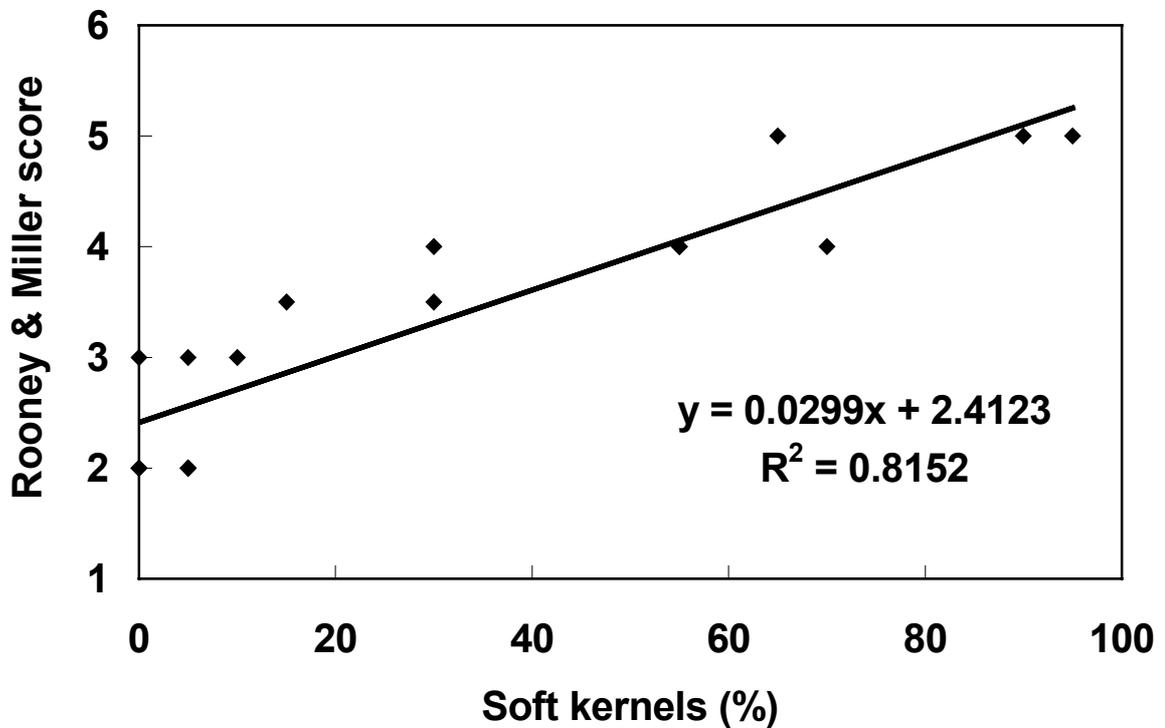


Figure 3. Comparison of the modified visual assessment of grain hardness with Rooney & Miller's method

4.5 GRAIN GERMINABILITY

The proposed test method modifies the CSIR standard method of germination testing by eliminating the requirements for temperature and humidity control in an incubator. The modifications include:

- Carry out the test at room temperature instead of 25°C
- Use of polystyrene cooler box to maintain relative humidity, instead of an incubator
- Use of newspaper circles to provide water to grains in a petri or other dish, instead of the specified filter paper

Comparative tests were undertaken at 20°C, 25°C and 30°C comparing cooler box with incubator and newspaper with filter paper circles. The modified test compared well with the standard test, with a good correlation of $R^2 = 0.9$ (Figure 4).

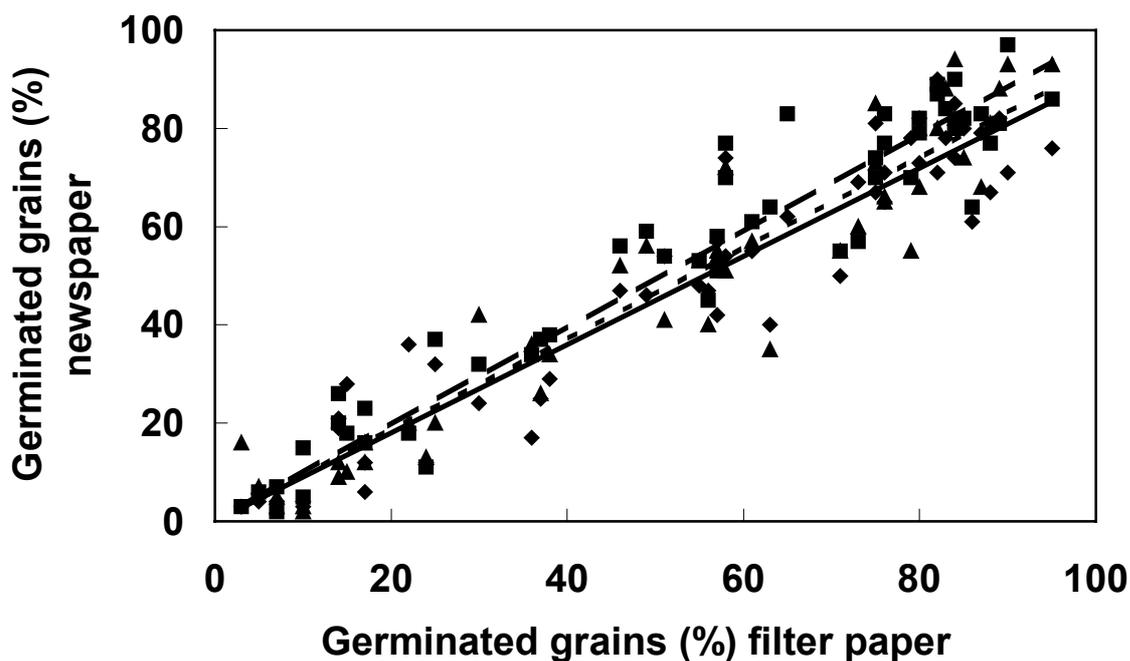


Figure 4. Comparison of germinability tests, modified vs standard

4.6 GRAIN PURITY

The proposed grain purity tests are based on SA Sorghum Grain Standards and Definitions of Defects and those of Codex Alimentarius. These methods are based on systems of sieving, sorting and weighing and, in simplification, it is proposed to adapt them to entirely manual processes:

- Defects sorted manually, avoiding any requirement for sieving
- Use of an area grid (Figure 5), replacing weighing and avoiding the requirement for a balance

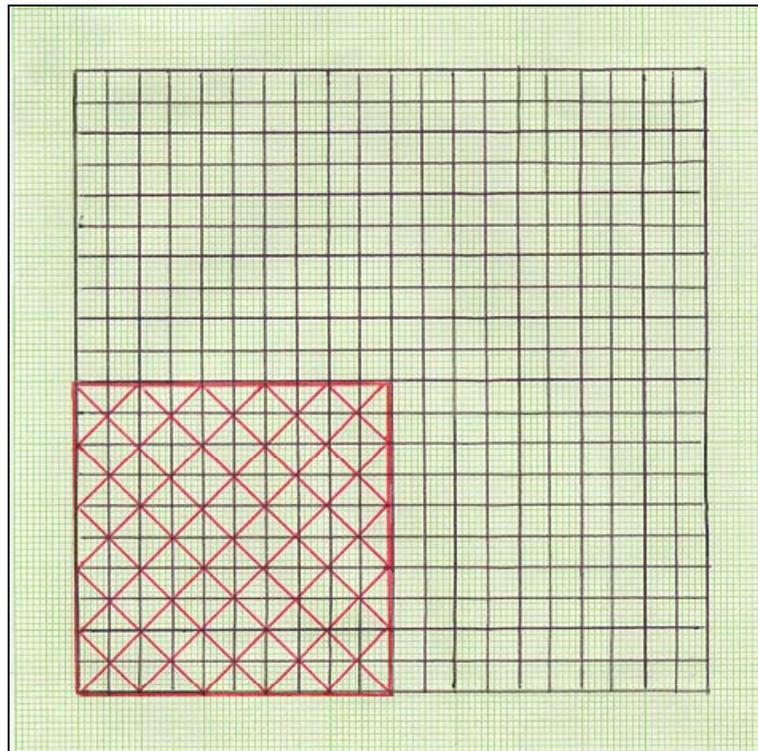


Figure 5. A 20 x 20 cm square grid for sorting total defects from sound whole sorghum grains, with a 10 x 10 cm insert for checking sample size

On the grid, the area of whole grain is sorted out from the area of defects. A simple relationship exists between area of defects and mass of defects and the statistical relationship between purity by area and purity by weight is very good at $R^2 = 0.93$ (Figure 6).

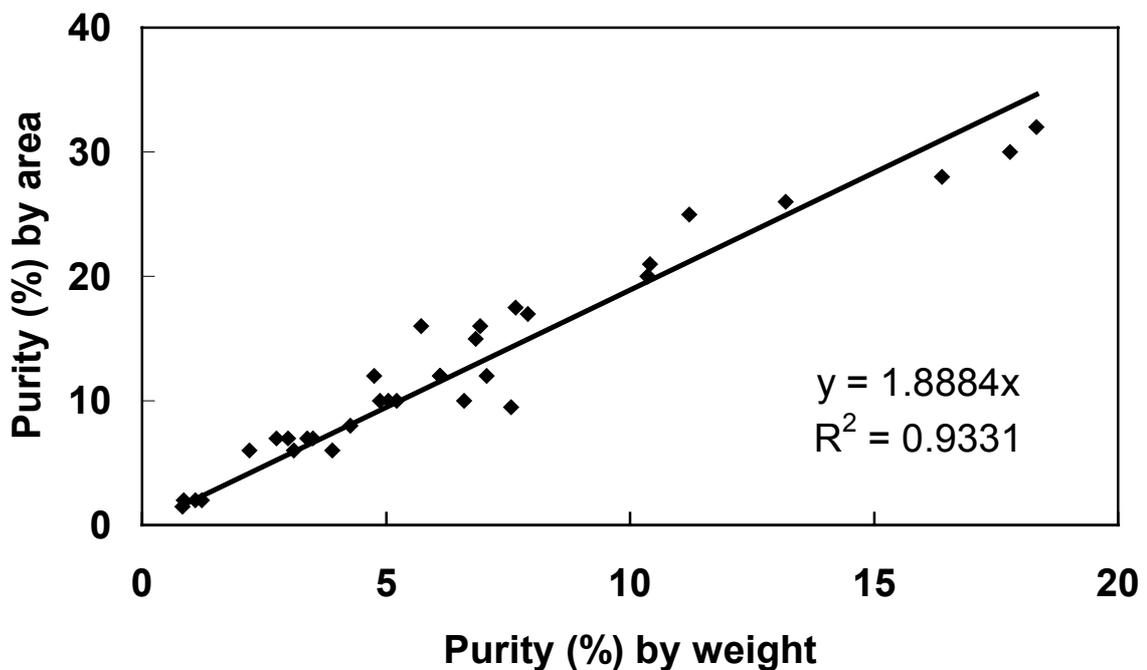


Figure 6. Relationship between grain purity assessed by area and by weight

In this method, the impurities are assumed to be normal (eg: broken kernels, unthreshed grain, weed seeds, sand, stones). It is accepted that abnormal or unusual impurities (eg: large stones, bolts, bottle tops) may cause complications.

4.7 RECOMMENDED STANDARDS

The recommended standards for the five sorghum grain quality criteria - tannin, colour, hardness, Germinative Energy and purity - are as follows.

4.7.1 Tannin (high-tannin) sorghum grain

- Batches containing $\geq 95\%$ tannin or non-tannin sorghum be classified as **Tannin** or **Non-tannin Sorghum** respectively.
- Where batches contain $< 95\%$ tannin (or non-tannin) sorghum and $> 5\%$ non-tannin (or tannin) sorghum, the batch be classified as **Mixed Tannin and Non-tannin Sorghum** and that the percentage tannin sorghum be given.

4.7.2 Sorghum grain colour

- Batches containing $\geq 95\%$ white (or coloured) sorghum be classified as **White (or Coloured) Sorghum** respectively.
- Where batches contain $< 95\%$ white (or coloured) sorghum and $> 5\%$ coloured (or white) sorghum, the batch be classified as **Mixed White and Coloured Sorghum** and that the percentage coloured sorghum be given.

4.7.3 Sorghum grain hardness

- Batches containing $\geq 90\%$ hard (or medium or soft) sorghum grains be classified as **Hard (or Medium or Soft) Hardness Sorghum**.
- Batches containing 100% hard plus medium sorghum be classified as **Medium Hardness Sorghum**.
- Batches containing $>10\%$ and $< 90\%$ soft, medium or hard should be classified as **Mixed Hardness Sorghum** and the percentages of Hard, Medium and Soft Sorghum must be given.

4.7.4 Germinative Energy of sorghum grain (germinability)

- Sorghum grain for malting should have a Germinative Energy at 72 hours of $\geq 90\%$ (barley equivalent is 95%).

4.7.5 Total defects in sorghum grain (grain purity)

- The maximum permissible total defects in sorghum grain for human consumption should not exceed 8%, as specified by Codex Alimentarius.

4.8 QUESTIONS/DISCUSSION

- Are the Codex and South African standards similar?

The South African standards for sorghum are “softer” than Codex. If a Grade 1 is close to Codex, then Grade 2 becomes problematic because the processor would then need to clean Grade 2 batches up, at cost, to conform with the Codex standard. It would be unwise to specify standards below Codex as it would attract poor quality grain.

- Would the tests detect cases of tannin adulteration where, say, tannin grades are purposely mixed with non-tannin grades and sold as non-tannin sorghum?

In a mixed sample, the proposed tannin test clearly distinguishes between those grains that are tannin grades those that are not. The standard scrape test is not only laborious but it is very subjective (due to blotching), opening up possibilities for adulteration.

- Have sample-taking methods been taken into account? Are the methods simple?

No. They must conform to internationally-accepted standards. A recommendation has, however, been made to replace the sample divider with a simple hand method.

- The 'crush-and-smell' test may give a different result on assessing grade in respect of non-visual defects (eg: mouldiness, odour). How should these be interpreted?

Mouldiness/odour is covered in the Codex and South African standards which state that the grain should not have an objectionable odour. A smell test is therefore part of the grading process.

- There are large differences in the white grain colour – whites, tans, yellows – and this also includes endosperm colour. Some sorghums appear white but are actually brown. There is often confusion between a true white and some reds with incomplete hulling. Milling losses are much higher with red sorghums than with white and the cost of dehulling is a major economic issue.

These colour issues need to be taken into consideration.

- Although Codex standards appear to be preferred, would it be reasonable for phytosanitary issues to set the standards for inter-regional trade at slightly less than Codex? Codex standards are tough and lower standards might stimulate trade. Perhaps, inter-regional trade could be considered like this as a first step prior to international trade.

It would be a mistake to drop lower than Codex for international trade. Many international standards, in contract terms, are higher than Codex, so Codex standards are required as a minimum for international acceptance. The quality and safety components of the standards can be differentiated; the safety/health components (eg: impurities) should not drop below Codex standards. All SADC trade protocol needs to be WTO compliant.

The possible differentiation of sorghum grain standards between inter-regional trade and international trade was held over for discussion at a later date.

- How is moisture content handled in the standards?

Preferable to actual standards are recommendations to farmers concerning the time period between rain and harvest/storage. Grain drying and moisture meters are outside most producers capabilities, particularly financially. There is no simple objective test method.

- The presence of aflatoxin on moist grain causes downgrading. Can this be considered in the standards?

A better approach would be to recommend good farming practices to producers (eg: processes to ensure delivery of dry, mould-free grain). While mouldy grains may be picked up during purity tests, reliable analytical tests on the grain surface are difficult. For example, aflatoxin tests on groundnuts for peanut butter are prohibitively expensive. Producers and processors need to know whether or not aflatoxin is a risk with grain sorghum in their own country circumstances. If necessary, consideration could then be given to adopting additional tests.

There is a need to differentiate between levels of testing. The tests under consideration are for farm and local level testing. Regional and international trading will require levels of objective testing at higher levels.

- Is there a correlation between the colour of the grain and the colour of the porridge?

While there is some correlation, the physical appearance, colour, of the grain is only an indication of the cooked colour. White sorghum may cook darker. Cultivars can vary in their cooked colour. This is an area of insufficient knowledge.

- Will the quality tests provide understanding and agreement on sorghum grades between buyer and producer?

This is a real practical problem which the tests, grades and standards should positively assist.

- There is a close correlation between grain hardness, grain vitreousness and ultimately, meal yield.

Session 2: Simple methods ring trial and familiarisation

5. RING TRIAL OF SIMPLE METHODS TO DETERMINE SORGHUM GRAIN QUALITY

Prof. John Taylor

In the ring trial, participants tested the five proposed methods for determining sorghum grain quality – tannin, colour, hardness, germinability and defects – and provided results for the statistical analysis of the trial. Interest and enthusiasm were shown by the participants and they obviously believed that it was worthwhile for the sorghum industry.

5.1 PARTICIPANTS

The ring trial had 26 participants from some 11 different countries including South Africa, Zimbabwe, Botswana, Tanzania, USA and several European countries.

Participants represented important aspects of the sorghum industry including millers, maltsters, brewers, traders and scientists.

5.2 STATISTICAL APPROACH

Statistical validation was achieved through two concepts:

- **Repeatability:** The same person analyses the same sample using the same reagents and apparatus
- **Reproducibility:** Different people analyse the same sample using different reagents and apparatus

Two statistical results are important in an analysis of test methods:

- Mean repeatability and mean reproducibility – in good test methods, these should be the same.
- Repeatability standard deviation (SD) and reproducibility standard deviation (SD) – in good test methods, the reproducibility SD should be two to three times the repeatability SD.

5.3 RESULTS: DETECTION OF TANNIN GRAIN

Table 10. Results, grain tannin

	Sample A (Tannin)	Sample B (Non-tannin)
Mean: Repeatability	96.0	99.3
Repeatability SD (s_r)	1.2	0.7
Repeatability relative SD (RSD _r , %)	1.2	0.7
Mean: Reproducibility	92.7	97.0
Reproducibility SD (S_R)	15.2	2.8
Reproducibility relative SD (RSD _R , %)	16.4	2.9

Note: In all the tables, the analysis was of all the valid results, that is, no extreme values were removed.

Interpretation:

- Means: Good
- Standard deviations: Acceptable

Summary of participants' comments:

- Simple technique, method easy
- Difficult in some cases to purchase drain cleaner/caustic soda and commercial bleach of correct concentration
- Some indication of volume needed, easy to use too much reagent and get peeling of seed coat

5.4 RESULTS: COLOUR DETERMINATION

Table 11. Results, grain colour

	Sample C (Coloured)	Sample D (White, weather-damaged)
Mean: Repeatability	99.9	99.6
Repeatability SD (s_r)	0.4	0.5
Repeatability relative SD (RSD _r , %)	0.4	0.5
Mean: Reproducibility	99.3	90.7
Reproducibility SD (S_R)	1.9	23.5
Reproducibility relative SD (RSD _R , %)	1.9	26.0

Interpretation:

- Means: Good agreement
- Standard deviations: Sample C, good; sample D, large difference, participants had difficulty seeing the white grain due to weather damage

Summary of participants' comments:

- Problem defining white, especially for classifying yellow sorghums
- Weathering and mould caused problems determining colour
- Removal of glumes before analysis suggested

5.5 RESULTS: GRAIN HARDNESS

Table 12. Results, grain hardness

	Sample E (White)		
	Hard	Medium	Soft
Mean: Repeatability	41.1	56.1	2.8
Repeatability SD (s_r)	17.1	16.5	3.6
Repeatability relative SD (RSD _r , %)	41.6	29.5	130.8
Mean: Reproducibility	71.8	23.2	5.1
Reproducibility SD (S_R)	25.6	20.6	11.2
Reproducibility relative SD (RSD _R , %)	35.7	88.9	219.5

	Sample F (Coloured)		
	Hard	Medium	Soft
Mean: Repeatability	1.7	88.3	10.0
Repeatability SD (s_r)	5.0	8.7	7.1
Repeatability relative SD (RSDr, %)	299.9	9.8	70.7
Mean: Reproducibility	34.2	47.3	17.8
Reproducibility SD (S_R)	24.3	21.0	18.6
Reproducibility relative SD (RSDR, %)	71.2	44.4	104.2

	Sample E (White)		Sample F (Coloured)	
	Hard & medium	Soft	Hard & medium	Soft
Mean: Repeatability	97.2	2.8	90.0	10.0
Repeatability SD (s_r)	3.6	3.6	7.1	7.1
Repeatability relative SD (RSDr, %)	3.7	131	7.9	70.7
Mean: Reproducibility	94.9	5.1	81.7	17.8
Reproducibility SD (S_R)	11.2	11.2	18.7	18.6
Reproducibility relative SD (RSDR, %)	11.7	220	22.9	105

Interpretation:

- For both mediums and hards, means were wide apart and standard deviations were high
- Participants could therefore not distinguish between the mediums and the hards
- For the softs, both means and standard deviations were acceptable
- When hard and medium were combined, then repeatability and reproducibility relationships became acceptable.
- The results therefore indicate the adoption of two hardness groups (hard/medium and soft) rather than three (hard, medium and soft).

Summary of participants comments:

- Subjective, drawings not sufficiently clear, difficult to differentiate between hard and medium grain
- Easier to do assessment on coloured paper, if available
- Magnifying glass helps, if available
- Forceps suggested for holding grain
- Emphasis needed on 'sharp' blade

5.6 RESULTS: GERMINATIVE ENERGY

Table 13. Results, Germinative Energy

	Sample G (Tannin)	Sample H (Tannin)
Mean: Repeatability	82.4	53.4
Repeatability SD (s_r)	5.4	3.9
Repeatability relative SD (RSDr, %)	6.6	7.2
Mean: Reproducibility	86.2	55.7
Reproducibility SD (S_R)	6.6	15.7
Reproducibility relative SD (RSDR, %)	7.6	24.2

Interpretation:

- Means: Good agreement
- Standard deviations: Most acceptable

Summary of participants comments:

- Room temperature below 20°C in parts of Africa during the winter, affects germination rate
- Method for calculating cumulative germination needs clarifying
- Suggest adding newspaper to water rather than other way around
- Use of any polystyrene box with lid
- Serious mould infestation at 72h, suggest disinfecting seeds prior to test
- Some problems with maintenance of high RH over 72h, use of newspaper rather than cotton cloths

5.7 RESULTS: TOTAL DEFECTS

Table 14. Results, total defects

	Sample X (Ex marketplace, Zimbabwe)	Sample Y (Cultivar ex breeder)
Mean: Repeatability	18.2	2.6
Repeatability SD (S_r)	2.0	0.8
Repeatability relative SD (RSD _r , %)	11.1	30.3
Mean: Reproducibility	27.2	5.5
Reproducibility SD (S_R)	10.9	4.0
Reproducibility relative SD (RSD _R , %)	40.2	73.1

Interpretation:

- Sample X had a high level of defects
- Mean repeatability < mean reproducibility
- Standard deviations are acceptable
- The area method does distinguish between samples with high and low levels of defects

Summary of participants comments:

- Time-consuming and labour intensive
- When film pot is used, different grain sizes cover different total number of squares
- Area method not accurate with highly defective samples
- Suggest use of balance if available

5.8 CONCLUSIONS AND RECOMMENDATIONS

- Detection of tannin sorghum grain – acceptable
- Grain colour – acceptable, possible problem with weather-stained grain
- Grain hardness – suggest combining hard and medium categories, two grades only
- Germinative Energy – acceptable, problem with minimum temperature
- Total defects – acceptable (surprisingly)

6. WORKING GROUPS: FAMILIARISATION OF THE FIVE TEST METHODS

Workshop delegates were split into three working groups for a hands-on familiarisation of the five test methods. Assistants were available for guidance within each group. Each group appointed a recorder and spokesperson so that all observations and comments could be reported back to the workshop at the following plenary session.

6.1 WORKING GROUP REPORT-BACK

Table 15. Test methods: summary of Working Group report-back

Test	Observation/Comment		
	Group Orange	Group Blue	Group Red
Colour	Endosperm colour not specified in method, important for milling	Test easy and simple	Subjective test, colour seen differently by different people
	Pato, Piriraz and Mozambique are 100% white	SNK3640 – red – 99% Pato – white – 100% PAN8564 – coloured – 100% Piri 2 – white – 100% SNK33 – coloured – 100%	Need better definition of white grain, confusion with weathered and mouldy grain
	Glume colour leached to the seed coat in Piriraz, affecting colour and possibly milling quality		
Tannin	<i>Just</i> cover the seed with reagent	Test easy and simple	Useful to state quantity of reagent to use rather than just covering grain (split view)
		Sometimes difficult to decide how black the grain has turned	Issue marketing kit explaining tests
			Use Jik only, economical
Hardness	Hard to distinguish between medium and hard	Test easy and simple	
	Mozambique, hard; NK283, medium hard; DC99, soft	Agreed combine hard and medium	Difficult to distinguish between medium and hard
		Magnifying glass required	Test too technical for the farmer, may get used to it
		Variability within a variety	Variations within a variety and problem of grain mixtures
Germinability	Use plastic wrap instead of foil for sealing container	Test easy and simple	Test easy to undertake
		Two samples, one without and one with bleach, to control contamination	Facilities to undertake the test both at the farm and the mill
Defects	Need to separate small grains out, define how to separate from rest of sample	Do defects testing before germination (done on sound grain)	Suggest numbering the squares on the grid to avoid counting.
	Some batches may be discarded on visual inspection without the need for testing as the defects are too high	Sampling technique should ensure sample is truly representative	Provide hand-out of grid as part of marketing
		Do defects and purity measurements together	Farmers require training on what defects are
		Difficult if there is mixed white and coloured grain	
General		Methods are good for the producer, user and farmer	Drawing of samples should be in presence of farmer to avoid dispute
		Tests should be done together with the farmer, will avoid misunderstandings	All levels of user require training prior to introduction of tests; may look simple but need understanding
		Methods could be used by breeders to characterise varieties	Advantage of the tests is farmer education
		Importance and relevance of each standard in each country	

6.2 QUESTIONS/DISCUSSION

- There has been much reference to the involvement of farmers.

It is important that farmers are involved and the training and support initiative for them should be comprehensive. The focus on farmers should continue through to the *ad hoc* Working Group which should include farmer representation.

- The problem of varietal admixture is a major issue in respect of the quality standards.
- If grades and standards are adopted, then it is important to involve the breeders in the grading and standards process, incorporating their regional input (eg: varietal selection for end use and marketability). The significantly involved groups are breeders, processors, traders and farmers.
- Should test procedures be different for mixed seed batches (eg: out of contract, group of farmers)? The acceptability of mixed batches depends on what the processor wants to buy, its end use and what he is prepared to buy. The buyer will decide which of the five tests he will actually use (eg: germinability for seed producers and maltsters).
- If mould is found during the germination test, this is indicative that the whole consignment may be infected. Scope for an investigation?
- How standard should grain quality standard testing be?

Some leeway with the test procedures (eg: selection of reagents) may make it more practical and workable. While it is desirable for the region to adopt a single set of standards, it is likely that countries (and end users) will use only those standards which are applicable to their own circumstances.

- Could standards be extended to incorporate organic and genetically modified (GM) quality certification?

This process does not address this issue at all. Countries in the region are involved in exercises concerning bio-safety standards. Whether grown organically or by GM methods or not, South African produce for export would be graded using the same standards. Identification by labeling organic or non-GM produce could be considered. To provide an 'organic' guarantee, every link in the chain, from field to supermarket, would have to provide certification of the process.

- If quality standards become an issue in sorghum trading, then it will be necessary for the producer to understand the relationship between these standards and pricing structures.

The South African sorghum grain trade is moving from import parity to export parity. The price of sorghum surpluses is linked to the yellow maize price and is discounted by 15%. This is a market-determined effect.

- The adoption of grades and standards provides a platform for buyers and sellers to trade successfully.

Supply and trading situations, however, may arise (eg: shortages) where the grades and standards may be set aside.

- Are there any other sorghum grain quality standards that should be considered?

Example: Further colour tests for discoloration. Producers may need to know whether their white grain will be downgraded for discoloration.

- The workshop needs to be confident that each of the test methods is really useful and then to identify any practical difficulties in the application of the standards.

7. CONSIDERATIONS ON USING THE TEST METHODS

Dr Floyd Niernberger

7.1 CONSIDERATIONS

These notes are aimed at assisting participants with the upcoming consideration of how best to proceed and implement the test methods and standards, based on workshop experiences and conclusions to date.

- Make available general information on the quality test methods, training and up-to-date research on the methods.
- Requirements for performing the quality test methods, testing instructions and dissemination of method revisions.
- Possible field evaluation programme to assess the effectiveness of the test methods, resolve difficulties that may arise and provide direction and action on emerging issues.
- Would be helpful to have a central facility to keep interested parties informed of completed actions, progress to date and actions to be considered.
- The role of governments and statutory organisations.
- Arrangements between associations and organisations in SADC countries to promote sorghum quality issues in commercial marketing channels that are impacted by use of the proposed methods.

7.2 QUESTIONS/DISCUSSION

- Industry must buy in to the implementation of this initiative and take the leadership, while institutions such as universities and research could play a useful facilitating role. The major industries are milling, brewing and seed, and possibly stockfeed. Implementation strategies should consider how the standards can best be promoted and implemented in each of the industries.

The stockfeed industry should be included. Being able to identify the tannin status of grain would be valuable to the industry.

- Upon a suggestion that the upcoming working groups be based on end use categories, the workshop agreed to retain the mixed groups. The seed industry was considered to be a somewhat different use category, with no representation at the workshop. The work groups would concentrate on key grades and standards issues in the milling, malting and stockfeed industries, and the seed industry if it arises, and how they link with the producer.

Participants were reminded not to lose sight of the basic working group objective – “Determine possible ways to implement standards and methods into existing or proposed grades and standards”.

- Two issues for discussion: 1) Establishment of an agreed set of standards and 2) Implementation in the field after establishment. From previous discussion, the latter is the more critical.
- A press release on the workshop will be prepared and circulated to delegates and USAID for approval prior to release. Media circulation suggestions were requested. The press release will be useful to promote the initiative and to attract further participation.
- Upon departure, Ms Susan Corning thanked all delegates and participants for their involvement and practical interest. Two technical reports will be made available shortly for general distribution.

Session 3. Implementation of standards and methods

8. SUMMARY/KEY POINTS OF DAY 1 AND WORKSHOP PROCESS FOR DAY 2

During the familiarisation process of the test methods and standards in Sessions 1 and 2, many questions were aimed more at how the standards would be implemented. The task for Session 3 would therefore be a consideration of the process for the way forward. Industry itself should be directly involved with standards implementation and a joint process between producer and processor (eg: miller/brewer) will need to be examined.

A workshop objective is to set up an *ad hoc* Working Group and to elect representative members to take forward the process of implementing sorghum grain grades and standards in southern Africa. A target for Session 3 should therefore be to examine terms of reference for the *ad hoc* Working Group and to agree on its composition from workshop delegates who would lead the process.

Consideration should also be given to ongoing funding and its possible sources, significant role players (eg: industry, governments), the involvement of SADC, ICRISAT and other regional bodies and a possible ongoing relationship with RAPID/USAID. Strategy approaches could possibly consider initiatives such as the industry “cluster” approach, useful during periods of rapid transformation.

In considering the implementation of sorghum grain grades and standards, the broader goal of increasing trade in the SADC region and southern Africa should be borne in mind.

The Workshop agreed on the following outputs for the session's working groups:

- Confirmation of the tests, grades and standards for sorghum grain
- Key issues for taking the process forward
- Organisational/institutional structure for taking the process forward. National structures or one regional structure; structure of working group or sub-group of existing structure
- Selection of Workshop delegates to take the process forward as the *ad hoc* Working Group
- Terms of reference for the *ad hoc* Working Group. Report-back procedures; Working Group coordination; funding; additional members; relationship with and role of RAPID.
- Agenda and timetable.

9. SUMMARY OF WORKSHOP COMMENTS ON TEST METHODS

Prof John Taylor

9.1 SUMMARY

Table 16. Summary of comments on test methods

Test	Comment on method
Detection of tannin sorghum grain	<ul style="list-style-type: none">• Method OK• Suggestions for slight modifications• Possibly investigate use of bleach on its own• Idea of marketing kit
Classification of sorghum grain according to colour	<ul style="list-style-type: none">• Method OK• Suggestion for grades of weather-stained and mouldy grains – to be done in purity test• Suggest look at issue of endosperm colour
Estimation of sorghum grain hardness	<ul style="list-style-type: none">• General method OK• Proposed to combine Hard and Medium categories
Determination of Germinative Energy of sorghum grain	<ul style="list-style-type: none">• Method OK• Suggestions for slight modifications• Investigate whether method is a good way of estimating mouldy grains
Determination of total defects in sorghum grain	<ul style="list-style-type: none">• Method OK• Suggestions for slight modifications• Issue of small grains• Use procedure to determine weather-stained and mouldy grains and to generate sound grains for germination test

9.2 QUESTIONS/DISCUSSION

- Mouldy grain due to weathering is more of an issue of colour than of physical purity. Grading is based on colour trait, with white grain being graded higher than less white grain, although still white. Physical purity should not be confused with the weathering issue.

Colour is a genetic factor. Due to its high dehulling losses, red sorghum is disadvantaged for milling purposes.

The issue is that weathering causes discoloration within the white grade as opposed to whether the grain is white or red/coloured.

This year's South African sorghum crop is a good crop but is badly weather-stained. Due to high processing losses, millers are turning crops down and canceling contracts, not because it is red but because of weather-staining.

Consideration could be given to an additional test to provide a measure of weathering within colour grades.

Weathering is a defect built into the South African regulations.

10. WORKING GROUPS: DETERMINE POSSIBLE WAYS TO IMPLEMENT STANDARDS AND METHODS INTO EXISTING OR PROPOSED GRADES AND STANDARDS

Similar to the first working group session, workshop delegates were split into three groups. Assistants were available for guidance within each group. Each group appointed a recorder and spokesperson so that all observations and comments could be reported back to the workshop at the following plenary session.

Delegates were provided with a summary of the proposed sorghum grain quality standards that had evolved from the workshop to date.

10.1 PROPOSED SORGHUM GRAIN QUALITY STANDARDS

10.1.1 Tannin (high-tannin) sorghum grain

It is recommended that:

- Batches containing $\geq 95\%$ tannin or non-tannin sorghum be classified as **Tannin** or **Non-tannin Sorghum** respectively.
- Where batches contain $< 95\%$ tannin (or non-tannin) sorghum and $> 5\%$ non-tannin (or tannin) sorghum, the batch be classified as **Mixed Tannin and Non-tannin Sorghum** and that the percentage tannin sorghum be given.

10.1.2 Sorghum grain colour

It is recommended that:

- Batches containing $\geq 95\%$ white (or coloured) sorghum be classified as **White (or Coloured) Sorghum** respectively.
- Where batches contain $< 95\%$ white (or coloured) sorghum and $> 5\%$ coloured (or white) sorghum, the batch be classified as **Mixed White and Coloured Sorghum** and that the percentage coloured sorghum be given.

10.1.3 Sorghum grain hardness

It is recommended that:

- Batches containing 100% hard plus medium sorghum be classified as **Medium Hardness Sorghum**.
- Batches containing $\geq 90\%$ soft sorghum be classified as **Soft Sorghum**.
- Where batches contain $< 100\%$ hard plus medium sorghum or $< 90\%$ soft sorghum, the batch be classified as **Mixed Medium Hardness and Soft Sorghum** and the percentage soft sorghum be given.

10.1.4 Germinative energy of sorghum grain (germinability)

It is recommended that:

- Sorghum grain for malting should have a Germinative Energy at 72 hours of $\geq 90\%$.

10.1.5 Total defects in sorghum grain (grain purity)

It is recommended that:

- The maximum permissible total defects in sorghum grain for human consumption should not exceed 8%, as specified by Codex Alimentarius.

10.2 WORKING GROUP REPORT-BACK

10.2.1 Working Group report back, Group Blue

Table 17. Summary of Group Blue report back

Issue	Report
Organisational/ institutional	<p>At the national level:</p> <ul style="list-style-type: none"> • Bureau of Standards recognise the methods and standards; guidance • Establish national committee comprising producers, millers, brewers, seed companies, farmers, university, research, breeders <p>At the regional level:</p> <ul style="list-style-type: none"> • Establish regional committee comprising SADC, RAPID, SACCAR, ICRISAT and relevant NGOs (eg: World Vision)
Terms of reference	<ul style="list-style-type: none"> • Establish training workshop • Educate extension workers (for farmers) and all stakeholders • Establish regional database of producers and traders • Establish national coordinator in each country to help stakeholders maintain progress, address problems and attend to trade matters
Funding	<ul style="list-style-type: none"> • Regional – RAPID (stakeholders) • National – Bureau of Standards (time, education, method adoption) • Private companies and associations (participation)
Timetable	<ul style="list-style-type: none"> • Educate and get interested people on board (3 months) • Training workshop at national and regional level to educate all stakeholders • May 2002 – implementation and grade new crop using the new standards

10.2.2 Working Group report back, Group Orange

Table 18. Summary of Group Orange report back

Issue	Report
Standards	<ul style="list-style-type: none"> • Proposed standards should be referred back to industry for comment, especially tannin (maltsters/millers), hardness (millers) • Additional grades and standards should be listed – weathering, endosperm colour – and millers to define and decide
Forward process	<ul style="list-style-type: none"> • Press release (soonest) • Determine stakeholders. Countries may differ • Appoint national delegates. Only where there is a sorghum industry; probably not government official • Delegates should have authority. Mandate to involve other stakeholders in the implementation phase • Integration and implementation: <ul style="list-style-type: none"> - Formalisation and registration of grades and standards, implemented as broad industry standards for the region - Training of all participants in the chain
Structure	<ul style="list-style-type: none"> • Should be finite (ie: has an end) • Secretariat (eg: based at SMIP, ICRISAT) with database etc • Executive, tasked to complete the implementation process • Delegates, part-time, reporting to executive
Stakeholders	<ul style="list-style-type: none"> • Producers, industry/manufacturers • Government (research, national departments, statutory bodies (eg: Bureau of Standards) • SADC, WFP, FAO, ICRISAT, SMIP • Industry forums (in South Africa, this already exists, may be problem elsewhere) • Donors, potential donors
Timetable	<ul style="list-style-type: none"> • November, 2001. Secretariat (SMIP) to write proposal, for presentation to RAPID, on promotion of intra-regional sorghum trade by setting of grades and standards • 1st quarter 2002. First Working Group meeting • End 2003. Integrated set of tasks to be completed; end of tenure of working group

10.2.3 Working Group report back, Group Red

Table 19. Summary of Group Red report back

Issue	Report
Standards	<ul style="list-style-type: none"> • Tannin/colour. Clarify classes of grading (editorial) (eg: Tannin \geq95%, Non-tannin \leq5%, Mixed 5-95%) • Hardness/germination. Accepted. • Defects. Create separate standard for weather-stained grain • Moisture standard. Should be introduced. • Review by the Working Group. Also, industry.
Issues for Regional Working Group	<ul style="list-style-type: none"> • Stakeholders targeted for implementation. Breeders, government, industries, traders, farmers, SADC; involve in process but not necessarily part of Working Group • Potential users should be informed and trained in the application of grades and standards • Role of government. Inform relevant regulatory bodies of the proposal to introduce the grades and standards, particularly as voluntary standards • Funding. External funding required to support Working Group activities and implementation • Trading. Promote sorghum trading in SADC region (broader mandate)
Institutional	<ul style="list-style-type: none"> • Inform SADC agricultural sector of the proposal to establish sorghum trade standards. Encourage them to attend Working Group meetings; SADC support important for USAID funding • This initiative can be viewed as an example for harmonised regional trade standards • Encourage use of the standards in resolving trade grading disputes • Working Group should monitor implementation of the standards and review them for possible revision from time to time. Possible longer-term mandate than 1-2 years
Membership	<ul style="list-style-type: none"> • Preliminary Working Group (year 1) with membership drawn from Workshop delegates, two from each country, plus one representative each from industry and another sector • Expand over time to include representatives from other SADC countries • Invite technical experts (eg: SADC, ICRISAT, Universities) to attend meetings
Administrative	<ul style="list-style-type: none"> • Working Group should report to stakeholders, including industry, donors, traders and farmers. Mechanism required. • Facilitator required to coordinate activities during and between meetings.
Terms of reference	<ul style="list-style-type: none"> • Implement the agreed way forward
Funding timetable	<ul style="list-style-type: none"> • 31 December 2001. Develop proposal for RAPID. • March 2002. First formal Working Group meeting.

Session 4: The way forward

11. DISCUSSION: STRATEGY FOR IMPLEMENTING STANDARDS AND METHODS INTO EXISTING GRADES AND STANDARDS. PROCESS FOR THE WAY FORWARD ON SORGHUM GRADES AND STANDARDS

11.1 PROPOSED GRADES AND STANDARDS

- It was AGREED that the workshop should recommend the acceptance of the five sorghum grain quality test methods and the associated grades and standards.
- It was AGREED that feedback from industry on the proposed grades and standards should be obtained prior to implementation.
- It was AGREED that consideration should be given to standards/specifications/ methodology for weathering, mould, moisture content and endosperm colour. Weathering should be a stand-alone assessment and not part of 'defects'. The research and development work required would form part of, and be motivated and costed in, the proposal to RAPID.

11.2 STAKEHOLDERS

- Broad AGREEMENT was reached on stakeholder identity. Stakeholder groups should include breeders, government (research, national departments, statutory organisations), industries (milling, brewing, stockfeed, seed), traders and farmers.
- Regional organisations such as SADC and ICRISAT should be included to ensure broad involvement of the full SADC country membership.
- Governments' role is acknowledged even though the process is to be industry-led.

11.3 PUBLICITY OF THE PROCESS

- A national information and dissemination process is required in each country. For example, a sorghum forum already exists in South Africa.
- A clear communication strategy, efficient and cost-effective, is required to inform stakeholders of the workshop, its outcome and the ongoing process of implementation.

11.4 INSTITUTIONAL

- SADC is aware of this project and the workshop and is supportive of it. It should be informed of progress made at the workshop, the outcomes and the intended proposal.
- RAPID's objective is to promote trade in the region and, as RAPID works closely with SADC, it is appropriate to involve SADC. SADC, in liaison with organisations such as the World Bank and the FAO and various donors, can assist in focussing attention and donors on projects.
- SADC is thus recognised as an important role player in the project and ways should be determined to increase SADC's potential role in its implementation.

11.5 STRUCTURE

- It was AGREED that the Sorghum and Millet Improvement Programme (SMIP), which is implemented by ICRISAT, should be asked to take on the role of coordinator/ secretariat for the ongoing process. While SMIP would be able to prepare a proposal in the short-term, internal discussions would be required by ICRISAT to assess its capability to perform an ongoing facilitation role. Funding would be required for the coordination role.
- It was AGREED that membership of the *ad hoc* Working Group would be one or two representatives from each of the four countries drawn from the workshop delegates.
- Unlike Botswana, South Africa and Zimbabwe, Tanzania does not have appropriate institutional structures, such as a sorghum forum/association, to accommodate reporting procedures. Its delegates' role would initially be to set up such structures.

11.6 TAKING THE PROCESS FORWARD

- It was AGREED that the sorghum grain grades and standards would be adopted and that, initially, they would be utilised on a voluntary basis, usually by trade contract between buyer and seller.
- It was also AGREED that national Bureaux of Standards (or equivalent national regulatory body, eg: South African Department of Agriculture) should be encouraged to recognise these standards but initially without the formality of regulation.
- It was AGREED that the *ad hoc* Working Group should monitor the implementation of the grades and standards. Tasks of the *ad hoc* Working Group would include:
 - Technical advisory to ensure implementation of grades and standards
 - Linkage to the national structures
 - Promotion of regional sorghum trade
- The secretariat to the *ad hoc* Working Group (SMIP) would provide administrative support, including coordination of activities, databases (traders, producers etc), information sharing, monitoring, implementation

11.7 TRAINING

- It was AGREED that training initiatives should focus on grades and standards and not be involved with other sorghum issues (eg: production).
- General discussion indicated that the circumstances for introducing training differed in each country and that any plan or proposal would need to reflect these differences. It was therefore suggested that a decentralised (country-by-country) approach be considered to meet the individual situations.
 - South Africa. Private training centre (ex Sorghum Board) undertakes practical training, including cross-border. Training programmes could also be organised through the Extension Officer network.
 - Tanzania. Training would be difficult to implement, although training of extension workers and forming interest groups around the traders are possibilities. Successes with the cocoa bean and cashew industries were cited and the sorghum industry would play its part.
 - Zimbabwe. Suggested first referring the proposal back to the industry stakeholders, then setting up a trade forum through which multi-stakeholder training could be undertaken (where trading actually occurs).

- Series of separate modules and training materials would be required for each component of grades and standards. This should incorporate both specific training programmes and *ad hoc* training options. Funding would be required for both.
- Training modules could be developed as “add-ons” to existing training programmes.
- If there were to be a pledge of much-needed training materials, the South African sorghum industry would play its part in the funding/provision of training, possibly on a shared basis.
- In view of the need for training on the ground, it was AGREED that the development of training modules, training implementation and funding thereof be included in the proposal. It was accepted that, in principle, funding should be a joint responsibility with cost-sharing between local resources and possible sponsors. It was AGREED that the *ad hoc* Working Group investigate the funding process and take it forward with the proposal.

11.8 NOMINATION OF MEMBERS OF *AD HOC* WORKING GROUP

- In order to ensure project continuity and progress and report-back to the four countries, it was AGREED that membership of the *ad hoc* Working Group should be nominated from the delegates of the Workshop. This would be for the initial term of the Working Group. Two members per country were AGREED.
- Membership of the Working Group would be for an initial term during which period members, together with the secretariat, would:
 - Prepare the proposal(s) and present to RAPID
 - Assist with the dissemination of the Workshop information in the four countries
 - Participate in the initial actions of implementation
- Following a short caucus in country groups, the following nominations for membership of the *ad hoc* Working Group were made and APPROVED:
 - Botswana
 - Mr Joseph Jagwer (Industry, Foods Botswana)
 - Mr Molefe Bannyaditse (Government, Botswana Bureau of Standards)
 - South Africa
 - Mr Piet Skinner (Industry, Sorghum SA)
 - Mr Samuel Kgafane (Producer, Sorghum Trust)
 - Tanzania
 - Mrs Anna Temu (Industry, Power Foods)
 - Mr Syed Risvi (Industry, Fidahusseini & Company)
 - Zimbabwe
 - Mr Leo Mpofu (Government, Department of Research and Specialist Services)
 - Mr Roland Murengwa (Industry, Chibuku Breweries)

The first members of the *ad hoc* Working Group were congratulated.

- It was CONFIRMED that SMIP (ICRISAT), through Dr David Rohrbach, would provide the secretariat support services for the *ad hoc* Working Group.

11.9 THE WAY FORWARD

- The way forward was summarised by the following actions, in sequence:
 1. Press release, widely based, MGM media database
 2. Workshop proceedings, vetted by core team and then to delegates (4 weeks)
 3. Dissemination of report to stakeholders in participating countries
 4. Preparation of proposal, including additional research requirements
 5. Finalisation of grades and standards specifications outstanding issues
 6. *Ad hoc* Working Group formative meeting (by end-March 2002)
- SMIP (ICRISAT) AGREED to coordinate proposal preparation, deadline end-November 2001, based on the Workshop proceedings and with input from Working Group members who would ensure involvement of their respective countries.
- With regard to SADC involvement, it would be productive to meet directly with SADC and hold discussions rather than merely provide Workshop proceedings. This would have to be undertaken without funding.

11.10 PRESS RELEASE

- In addition to the draft press release format presented, the following points were discussed for inclusion:
 - Broad agreement on simplified, common, voluntary methods for sorghum grain quality grades and standards
 - Further information may be obtained from Prof John Taylor (address)
 - Information on sorghum market potential in the SADC region
- The text of the final draft of the press release is given in Annexure 1.

12. ACKNOWLEDGEMENTS AND WORKSHOP CLOSURE

- Dr David Rohrbach confirmed that ICRISAT would willingly provide a facilitating role but would prefer the leadership to come from members of the Working Group and the sorghum industry, critical to the success of the project.
- The Tanzanian delegates requested information on the organisation of sorghum forums (eg: constitution) (South African delegate).
- The formulation of simple and practical standards was different to the usual formal regulatory perspective. This approach may be worthy of consideration for other commodities.
- A revised address list would be circulated shortly after the Workshop.
- It was mooted that sorghum quality, the sorghum trade and regional trade should benefit from this initiative. It was a beneficial workshop for all SADC countries.
- Dr Floyd Niernberger thanked all participants and delegates for sharing their time and information at the workshop which was most enjoyable and a 100% job well done.
- Dr Lawrie Kitch said that the Workshop was both well done and enjoyable. He added that, through its mandated activities such as technical assistance, the FAO was ready to play a role with the SADC group in terms of “seed” funds, other role players and project support. The facilitator thanked Dr Kitch for his attendance and support.
- Prof John Taylor thanked all participants in the regional survey and the ring trials for their input and time. He also thanked Workshop delegates for their constructive comments on

the test methods. He commented that, in the real world, the team was always better than the individual.

- Delegates in general thanked the facilitator, technical contributors, workshop organisers/initiators, workshop administrators and all participants for a worthwhile and enjoyable workshop.
- Those delegates who brought products for display were thanked.
- The facilitator brought proceedings to a conclusion by thanking the Workshop administrators, Vanessa and Renata of MGM, for their excellent organisation and Keith Sanderson for the Workshop proceedings. He especially thanked Prof John Taylor and Dr Floyd Niernberger for their extensive technical contributions.
- The facilitator closed the Workshop at 13:10.

Annexure 1

Press Release

Title: SADC Regional Sorghum Trade Cooperation

Text:

A regional workshop was held in Johannesburg on 13 & 14 September 2001 as part of a process to help stimulate the sorghum grain trade within and between the trading countries of southern Africa, specifically the SADC countries.

Participating in the workshop were delegates from four sorghum-producing SADC countries, Mozambique, South Africa, Tanzania and Zimbabwe. Delegates represented important components of the sorghum industry, including millers, brewers/maltsters, producers and marketers, together with standards institutions and government departments.

The specific objective of the workshop was to facilitate the process of developing simple and common sorghum grain quality standards for use by SADC's sorghum trading countries – a process of regional harmonisation.

Following an analysis of the current sorghum grain trade and the results of a survey on current sorghum grain standards in the four countries, delegates were familiarised with details of simple test methods developed to determine sorghum grain quality. Delegates gave consideration not only to actual grades and standards but also to the strategies to be adopted to introduce and implement these in the region.

Workshop achievements included:

- Broad agreement on a simple, common and voluntary approach to sorghum grain grading and standards.
- Broad agreement on the grades and standards to be adopted.
- Agreement on the process for the way forward, including a working committee of national representation.
- Appreciation of the market potential for grain sorghum trading in southern Africa.

Delegates set targets and milestones into early 2002 to ensure that the momentum of the initiative is maintained and its purpose eventually achieved.

Further information on the sorghum grain quality grades and standards can be obtained from Prof, John Taylor, Department of Food Science, University of Pretoria, Pretoria 0002, South Africa.