Assessing Potential for Small-scale Sweetener and Energy Production Systems by Small-Holders in Southern Africa.

A. Project Background and Commodity Strategy

This project is a direct output from the recently completed CFC/ISO13 Zimbabwe Sweet Sorghum project 'Demonstrating Increased Resource Use Efficiency in the Sugar Industry of Southern Africa Through Environmentally Sustainable Energy Production.' A major conclusion from this project coming out of the end of project workshop in September 2002, was that there is an urgent need to evaluate the potential for small holder production and diversification of sweetener and energy production in the southern African region.

In conjunction with Themba Technology Ltd., the ISO secretariat has developed this fast track initiative to take forward the key recommendations of CFC/ISO13.

The project is consistent with the ISO's commodity development strategy for sugar and the broader aims of sustainable development. It is a diversification initiative aimed directly at the rural poor.

B. Project Objectives and Rationale

The objective is to assess the potential benefits of establishing small-scale sugar and energy production systems at the village or small-holder level in rural areas of southern Africa.

The rationale for this project, as indicated above, is to build on the success of the previous CFC/ISO13 project and take forward the outputs to address poverty alleviation issues in the southern African region through sweetener and energy diversification. Because a number of appropriate technologies and systems exist both in Africa and elsewhere, the R&D lessons from both the development of these systems and the CFC/ISO13 project can be applied at minimal cost and adding value to local production systems.

The Tanzanian participant at the terminal workshop of CFC/ISO13 confirmed that small scale conversion systems have been developed and are being used in the rural areas of Tanzania in a similar model to the Indian 'Gur' making model. Participants were also aware that development and demonstration work is underway on different models of small-holder production of sugar in India and China. A further conclusion of the

project is that whilst commercial large scale production and processing of sweet sorghum may be feasible with further development and refining of varieties and practices, the potential for poverty alleviation and diversification at the small holder scale in rural areas urgently needed further attention. Further more, this evaluation needed to build on existing work around the world by assessing and if necessary adopting existing systems to the local conditions found in the region.

The success of these systems elsewhere results from strong local markets for affordable, locally produced sweeteners. These sweeteners are lower cost alternatives to mass produced refined sugar. Furthermore, there is also the possibility that sugar mills would be keen to purchase the sweetener to refine to higher standard sucrose.

Because these small scale processing systems are inherently 'affordable' there is good scope for a 'fast track' project to carry out an initial evaluation and demonstration of these technologies prior to a full-scale demonstration and development project.

C. Project Components

Component 1. Establish regional partners

Objective:

Identify and establish agreements with regional partners to implement the project.

Output:

Sign MOUs

Activities:

i) Contact potential partners.

ii) Identification of willing small holders for sweet sorghum and sugarcane production and processing at these scales.

iii) Ascertain capacity of the partners to monitor the agronomic production and conversion systems.

Component 2. Technology Evaluation and Procurement

Objective:

Survey existing systems around the world e.g. India, China and Tanzania applicable to the processing of sweet sorghum and sugarcane at these scales, namely:

- crushing (juice extraction)
- crystallisation (purification and crystallisation)
- energy for boiling, clarification and crystallisation / drying - conventional combustion and gasification

Output:

Suitable systems for regional evaluation identified and purchased.

Activities:

i) literature review and industry survey to identify practical systems suitable for the regional environment.
ii) contact potential suppliers of small-scale processing equipment in active countries including: India, China and Tanzania.
iii) Consultant(s) to visit each country to evaluate potential for systems
iv) Purchase two systems: one system from Africa and one from Asia.
v) Establish input requirements for conversion systems.

Component 3. Small Holder Production of Sweet Sorghum

Objective:

To produce sufficient sweet sorghum on small-holder plots in Zambia to:

Supply the conversion systems with biomass and demonstrate the agronomic quality of the sweet sorghum crop.

Output:

Production of sweet sorghum.

Activities:

i) Selection of suitable small holders by local project partners
ii) Obtain sufficient seed for production
iii) Planting and crop maintenance
iv) Harvesting and transport

Component 4. Small Holder Conversion

Objective:

To produce sweetener using the systems identified and purchased in component 2 using crop residues to supply the energy input requirements.

Output:

Production of sweetener (sweet syrup or ‘gur’ like raw sugar).

Activities:

i) Install and test conversion systems at appropriate locations and scales.
ii) Process sweet sorghum to sweetener.

Component 5. Evaluation of Small-Scale Sweetener and Energy Production Systems

Objective:

To assess the success of the trials from the perspective of the agronomic productivity, quality, harvesting and conversion perspectives.

Output:

Produce a report on the techno-economic capacity of these novel systems (to the region).

Activities:

i) Collate and summarise data collected by local partners
ii) Evaluate the performance of the agronomic systems.

iii) Evaluate the performance of the conversion systems

iv) Identify issues determining the local market for the sweeteners produced

v) Identify key factors in the sale of the sweetener to sugar mills for upgrading.

vi) Assess the energy requirements for the production of the sweetener and the potential improvements in efficiency and technologies.

vii) Assess the energy, financial and carbon benefits of the systems.

viii) Assess the social impacts, including employment benefits.

ix) Financial evaluation.

x) From the above, make recommendations regarding the suitability of the systems for wider adoption and use.

D. Implementation Arrangements and Management

A team of regional partners in Zambia (Prof. Yamba, CEEZ), Kenya (Moi University), Tanzania (Sugar Development Corporation), Mozambique (CBNRM/CEF) and Malawi (to be identified) will be responsible for the production of the sweet sorghum, the installation and running of the conversion systems in collaboration with the local small-holders. These partners are being identified by Themba Technology Ltd. (UK) which has long term experience in sweet sorghum and energy projects in the region. Themba Technology will be responsible for the project outputs and is run by Dr. Jeremy Woods who was involved in CFC/ISO13 and have extensive experience in the region from both academic and practical implementation perspectives.

E. Beneficiaries and Benefits

The intended beneficiaries are the local populations of the southern African region who are predominantly rural and some of the poorest people on the earth. The benefits will be realised to the wider population, who will get access to cheaper and more appropriate sweeteners and to the producers who will benefit from the development of a successful small-scale industry.

The local project partners will benefit from participating in the project through south-south technology exchange and the potential for future full-scale projects in further developing this exiting area.

Narrative Summary	**Objectively Verifiable Indicators**	**Means of Verification**	**Important Assumptions**
<u>Programme Goal:</u> Assess the potential benefits of establishing small-scale sugar and energy production systems at the village or small-holder level in rural areas of southern Africa.	1. Sweet Sorghum Successfully produced and processed 2. Sweeteners sold in local markets 3. Commitments by local participants to continue producing sweeteners from sweet sorghum	1. Quantity of sweetener produced is verified 2. Local partners monitor and quantify returns from sales. 3. Local partners confirm that local small holders intend to continue in the following season	No catastrophic failure of crops and processing equipment. Local market can be developed for sales of sweetener.
<u>Project Purpose:</u> i) Establish regional partners ii) Technology Evaluation and Procurement iii) Small Holder Production of Sweet Sorghum iv) Small Holder Conversion v) Evaluation of Small-Scale Sweetener and Energy Production Systems	<u>Conditions that will indicate that purpose has been achieved:</u> 1. Signed MOUs with partners 2. Identify valid conversion systems and suppliers. 3. Sweet sorghum produced 4. Sweetener is produced 5. Evaluation is carried out.	1. MOUs 2. Equipment purchased and delivered 3. c. 750 tonnes of sweet sorghum stems produced 4. 0.5 tonnes of sweetener is produced 5. Report is produced on evaluation	1. partners remain committed 2. Suitable equipment is available. 3. Suitable seasonal conditions (no cyclones or drought) 4. Market exists for sweetener. 5. Data is sufficient quality to carry out the evaluation.
<u>Outputs:</u> i) Sign MOUs ii) Suitable systems for regional evaluation identified and purchased	<u>Magnitude of Outputs Necessary and Sufficient to Achieve Purpose:</u> 1. At least one regional partner signs MOU 2. At lest one suitable conversion	1. MOU signed by one regional partner. 2. Conversion system installed in at least one location. 3. 30 ha of land planted to sweet	As above.

iii) Production of sweet sorghum iv) Production of sweetener (sweet syrup or 'gur' like raw sugar). v) Report on the techno-economic capacity of these novel systems (to the region).	technology system is available 3. Sufficient seeds and land are available. 4. Sweetener is marketed at remunerative price. 5. Report concludes that similar systems would be successful elsewhere in the region.	sorghum. 4. X $ earned from sales of sweetener. 5. Detailed analysis of costs and benefits concludes that markets are available and technology is suitable.	
<u>Inputs: Activities and types of resources:</u> 1: personnel time for Themba and local partners 2: Personnel time and travel costs and capital and installation costs of equipment 3: contracting costs for small-holder farmers and personnel costs for local partners. 4: consumables and contingency 5: personnel time; Themba and local partners		<u>Project Progress Reports, on-site visits and partner feedback:</u> • Project Audit Report • Site visit reports • End of project report	<u>Financing from CFC is made on timely basis:</u> • Partners coordinate and execute project tasks effectively. • Partners remain committed. • No catastrophic climatic events