



Département amélioration
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Cirad-amis

Mission Report

**Mahangu, sorghum an indigenous fruits
processing and promotion in Namibia.**

Thierry GOLI – Jean-Luc NDIAYE
23 October – 3 November 2000

CIRAD-AMIS-PAA
Equipe SMANA - SEA



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Mahangu, sorghum and indigenous fruits processing and promotion in Namibia.

Mission to Namibia by CIRAD of France, 23 October – 3 November 2000.

Jean-Luc NDIAYE and Thierry GOLI, Agrifood Systems Programme.

Introduction

The Namibian Minister of Agriculture, Water and Rural Development visited the French research institution CIRAD at Montpellier, France, in October 1998 and saw the work done there on small-scale agricultural post-harvest and food processing technology.

Together with the French Co-operation in Namibia, the Minister asked recently to CIRAD to send two consultants to Namibia on a familiarisation and project-identification visit (see terms of reference in app. 1).

The visit has been supported and organised by the Directorate of Agricultural Research and Training (DART) in the Ministry of Agriculture, Water and Rural Development (MAWRD), in conjunction with CRIAA SA-DC, a Namibian-registered consultancy and development NGO with French roots involved for the past three years in efforts to commercialise and add value to indigenous grains (pearl millet or *mahangu* and sorghum), fruits and other botanical resources.

The main purposes of the mission were:

- To provide input from other parts of the world, especially West Africa, into the process of formulating strategies and action plans for the further commercialisation and promotion of indigenous fruit and grain in Namibia.
- To review the strategic planning that has already been done in this regard and, by reference to successes and failures with similar processes elsewhere, advise on how it can be improved and/or adapted to avoid potential pitfalls.
- To assess the food processing technologies available in Namibia in the context of the whole chain from producers to markets, and propose solutions to technology gaps identified.
- To assess the transferability of technologies developed in West Africa or elsewhere, including the possibility of adapting such technologies to local conditions where applicable.
- To suggest possible developments related to other products grown in Namibia. Identify areas in which CIRAD can provide services to Namibia and/or strengthen local capacity.
- To investigate possibilities for technical co-operation between CIRAD and local stakeholders/service providers and, if applicable, propose practicable partnership arrangements.

The mission took place from 23 October to 3 November 2000, and was structured as follows:

- ◆ 8 days in Windhoek, to review key documents, to meet stakeholders and role players in the capital, to brief key stakeholders, including the Service for Co-operation and Cultural Affairs (SCAC) of the French Embassy in Namibia, and to prepare a report.
- ◆ 4 days in the North Central Regions, to meet key stakeholders, to assess socio-economic conditions in the production areas.

1. Executive summary

- ◆ There is an important enthusiasm around the promotion of local products, which has given rise since several years to reflections and initiatives of stakeholders, supported sometimes by authorities.

Thus, several projects have been prepared or were born at the same time within different ministries (government funds – all chains, FAO funds – MHETEC, mahangu and sorghum -, European Union – MTI, all chains).

- ◆ It is vital to co-ordinate the implementation of these projects and action plans in order to avoid duplications, and take the better advantages of the repercussions of the studies, experiments, pilot installations, training programmes and market trails which are foreseen.
- ◆ More recently, national workshops were held to formulate a common strategy and action plan. The set up of task teams to practically implement these action plans in a good initiative provided that:
 - Agreements be concluded at high level between all ministries involved in these food chains, mainly MAWRD, MEHTEC, MTI.
 - The operational agents of each involved institution take an active part at each meeting; and bring back information to their origin institution.
- ◆ The data available on consumption are missing, and this element has been taken little into account in strategy and action plan recently elaborated. A particular effort must be done heading urban markets, in so far as the townsmen are the most likely to consume local added value product: they have the purchasing power, the will to diversify their diet and not to spend too much time to process the raw food by themselves.
- ◆ The local infrastructures of support are weak: no laboratory specialized in consumption sciences, no actual R&D activities in food science and technologies at the University, no specialized institute. No pilot plant for technological and market trials. This is a handicap to set up common projects with mutual benefits, and to conclude partnership with foreign institutions, like CIRAD.
- ◆ On the indigenous fruits, the situations are varied:
 - For Marula, the production is significant (about 1 million of trees), but very scattered.
 - The collection of fresh fruits is not organized. It could be in the future, in particular within the framework of the creation of orchards, but the production

by this way can not be envisaged at short term. It would be interesting to try a fresh fruit market-test initially, in order to test the collection networking capacity, and the interest of the urban consumers for these fruits. The source data on the characterization of the fruits and their technological ability are missing, like on the potential market of the intermediate or finished processed products (juice, pulps, jams, wines, vinegar...).

- For Eembe and Manketti, the same remarks can be made, but these fruits could be dried by the collectors. The development of products processed starting from the dried fruits is to be explored.
 - At present, only a production of almond oil of Marula of high quality is organized (coop Eudafano), for export (cosmetics). The valorization of pulps is artisanal, in the form of juice or of wines or to spirits. When the collection is organized, it will be possible to process these fruits according to simple and inexpensive technologies, (juice, stabilized pulps, jams, wine, etc...) An industrial exploitation will be possible only on installations turning with full mode, because the period of manufacture is short, and the equipment of production of concentrate are heavy.
- ◆ Being the cereal food chain, a significant work was already completed in West Africa and nearby countries on the post-harvest equipments, in particular dehulling, to adapt to the pearl millet. In Namibia, since recently, a significant number of service mills were created, like some commercial mills. The market of the surpluses of millet is limited in Namibia, it thus seems not very probable that a significant number of commercial mills are to be born still. Also, it does not seem to us a priority to design Namibian equipments, but rather to better benefit from those which are available, and are tested for a long time (insist on training programmes, technical assistance).
- Mechanical threshing-machines are manufactured in the country (ROVIC). They seem rather little diffused, and the informations on the performances and robustness are missing. Field work should be done on this point. Models diffused in great number in West Africa for service threshing could be tested in Namibia (hundreds of "Bamba" working on millet in Mali, Burkina Faso, Senegal, Niger and Nigeria).
 - Dehulling: taking into account the size of the grains, a perfect between a good polishing and a good cleaning while authorizing a significant throughput was not found yet, in spite of 30 years of research (Canada, Senegal, Botswana, Zimbabwe, etc...). There is little experience of " commercial " use. In service, batches from 5 to 15 kg are common, and the equipment inspired from PRL brings acceptable solutions, a complementary being carried out if necessary by the customers. Moreover, the dehulling being followed of a steeping (for fermentation), the remaining bran is not a big handicap. To face more significant throughputs (500 kg/hr) in commercial mills, it would be preferable to be directed towards the use of two dehullers in series, which would bring more flexibility and would allow the additional use in service.
 - Fermentation: fermentation is carried out traditionally, and certain commercial mills work out fermented flours to meet the consumers demand. A scientific study of fermentation could result in reducing the durations of soaking in the respect of the desired taste.

- Grinding: the hammer mills were widely disseminated in Namibia. They have been designed for the grinding of products of strong diameter and low moisture content, and little fat. The abrasive mills are more general-purpose. Also, one should not expect high throughputs on millet with medium size hammermills. It seems there is a crucial problem of maintenance of the materials, misused by the operators. Within the context of the commercial mills, one would need as far as possible to dry the fermented grain before grinding.
- ◆ The following proposals, by set of priorities, were elaborated during the mission. They imply a scientific and technical partnership between the CIRAD and Namibian organizations. They aim at reinforcing the capacities of Namibia, and the support with the implementation of the national strategic plan. The fundings should be distributed between the Namibian government (put together with contribution of FAO and EU projects inter alia) and the French institutions (Minister of Foreign Affairs and CIRAD).
 - Project 1: Overall food consumption survey in Namibia.
 - Project 2: Economic survey of the mahangu food chain from producer to consumer
 - Project 3: participation to the second phase of the R&D project "project to increase sorghum and millet consumption in Southern Africa ».
 - Project 4: Improving mahangu post-harvest equipments: trials, eventual improvements, local manufacture of threshers, dehullers, cleaners, mills.
 - Project 5: Establishment of source data on marula and manketti or eembe ability to processing.
 - Project 6: Improving mahangu fermentation systems. Get a better knowledge of the process occurring on during mahangu fermentation.

2. Review of the national strategy and action plans

2.1 General comments

- It is a crucial issue to have a better knowledge of the food consumption habits and trends in Namibia, especially in the cities, and identify the actual market (size, segments, and constraints) and the demand (typology of consumers, quality criteria, food preferences, price acceptability, brand image and reputation) for the different processed products. This food consumption survey will ensure to develop or adapt suitable strategies, including advertising. This issue seem to be neglected in the action plan either for mahangu than for indigenous fruits.
- Post harvest equipments exist all over the world. Some of them have been designed in similar contexts (i.e. in Botswana) Adapt the numerous equipments that already exist from all over the world rather than to embark on the design of new equipments. This action means: trials of available equipments in actual conditions, selection of equipment of various capacity, training of millers in maintenance, advice for operators who would like to buy equipment. Priority should be given to local skills to support stakeholders who already have an experience in testing, maintain and manufacture post-harvest equipments.

- Start with the development of existing traditional uses and products, that are already numerous, and for which a better knowledge on the products and the process is crucial. Instead of developing a wide range of products at the same time, it would be more effective to select a short list of products to be developed, and then concentrate all the efforts on it. The experience acquired at this first stage will be very useful for the development of the other products.
- A series of parallel pending projects seem to exist in different ministries. It is necessary to improve the co-ordination between all these initiatives. The creation of task teams to launch, implement and follow up the actions must imply the effective co-operation between the operational services involved in these fields.

2.2. Comments on the main elements of the strategy and action plan.

2.2.1 Strategy for mahangu and sorghum promotion (see appendix 4)

a) Low and variable primary production

Strategy	Comments
Increase yields by making available and possibly subsidising such inputs as seed of improved varieties, fertilisers, cultivation equipment and by providing extension services to improve farming system	An improvement of the yields is a necessary condition but it will require lots of efforts with limited potential results due to rainfall irregularity. These efforts must be tight to improvement of post-harvest practices, and especially storage methods, to make mahangu more available from one year to another.
Reduce post-harvest losses by improving traditional threshing and storage methods	This point is a priority. Mechanical threshing would reduce the losses and improve the cleanness of grains, thus making more efficient the following steps of post-harvest chain. Very widespread in Senegal, for maize and millet. Reduction of storage losses should concern the type of material used and the pest control techniques. A special focus must be put on metallic containers and pest-control, fumigation for a long term storage should be tested (> 3 years)
Promote new and more lucrative markets in order to provide farmers with an economic incentive to increase production	No action planned for food consumption surveys and market research. No action planned for economic survey of the food chain from producer to consumer
Encourage increased production of mahangu and sorghum by commercial farmers on land where these crops have no traditionally been grown.	Commercial farmers will grow millet and sorghum if there is a profitable market for these grains

b) Limited trade in mahangu and sorghum grain

Strategy	Comments
To provide better market information to sellers and buyers (e.g. MMIU)	<p>MMIU should widen its actions to provide additional information on prices and quantity available in the different places of the production area.</p> <p>This kind of information system has proved itself in the CILSS country, even if it does not guarantee by itself automatic success in millet marketing.</p>
To improve on-farm and village-level storage facilities	Dissemination of metallic containers, which must be manufactured and sold by the private sector. Cheaper than traditional granaries, very widespread in central America (> 150,000 over the 20 past years).
To promote co-operative marketing so as to make larger quantities of grain readily available in more centralised locations	What seems to be a good idea happened to have low success in West Africa. Co-operative business is not an easy thing to manage with. It is more effective to help private traders (and some of them are local farmers) to improve their storage facilities.
To require that a minimum percentage of mahangu based products be included in Government and other institutional food-supply contracts	<p>This action could have a significant impact. However, it must be kept in mind that:</p> <ul style="list-style-type: none"> - not everybody in Namibia is mahangu consumer (that means maintain a low proportion of it in the menu) - make a product compulsory is not the better way to promote it (effects could be worse than the expected results). This action must be by media support to give a good image of the product (<i>pamiblé</i> in Senegal) - however, a financial incentive could be instituted for caterers that effectively processed mahangu (it is necessary to check before funding if they really processed mahangu)
To investigate increased imports of mahangu from southern Angola and new supply sources in West Africa	<p>Trials must be implemented to check the quality of the imported millet (ability to processing) and acceptability by the consumers</p> <p>There are few available quantities of millet on the international market. In west Africa, imports are limited to the neighbouring countries</p>
To buy surplus grain in good years and stockpile to ensure continuity of supply in drought years.	Is it the role of MMIU? Apart from the stocks for food security, this type of organisation is a failure.

c) Limited commercial processing of mahangu and sorghum grain

Strategy	Comments
To provide technical and business training for the small-scale milling sector	<p>Small scale milling activities is a new occupation in Namibia, and there is a lack of professional skills. Inappropriate use and maintenance of equipment will lead to quick wear of the equipments, low yields and poor quality of the product.</p> <p>The main target for mahangu flour is the urban consumer for whom it is important to have high and regular quality. These requirements are based on standard specifications (to be established) and good manufacturing practices.</p>
To source or develop a medium-sized hammermill	<p>It must be noticed that hammermills have not been designed to mill wet grain moreover, high throughput can hardly be obtained with wet millet (due to the small size of the grain). Milling should be done on dry grain and could give high throughput easily, even with small size hammermill. In commercial mills, try to get the drier grain after fermentation.</p> <p>Existing hammermills are still appropriate for service mills, if used correctly (M16 rotating in wrong direction...). More flexibility with two medium size than with one big hammermill.</p>
To source or develop an appropriate mahangu dehuller	<p>Since 1970, numerous equipments have been tested in western Africa, Botswana, Zambia and Zimbabwe to be specifically adapted for millet (PRL, RIIC, Nuhull, ENDA), and have been widely adopted in these countries. A perfect clean grain has never been got due to the small size of the grain. Designing a new dehuller is a complex work because of the several factors that come into account (at least 10*), and will be profitable only if the potential number to be disseminated in the country is high. Adapting, testing and improve the available equipment in Namibia must be done according to a rigorous technological approach.</p>
To provide incentives for pre-cleaning of grain	<p>In order to improve the milling yields and the quality of the final product, it is important to work with a clean grain, especially for the commercial millers, even if it is also possible to do it manually by sieving and winnowing. There is a need to reduce the cost of the available equipments (MAWRD precleaner, this pre-cleaner is manual, with e few mecanical parts, no high speed rotating parts, simple cinematic chain expensive in comparison to available threshers, mills and dehullers)</p>
To develop appropriate equipment for small-scale wet-processing of mahangu grain	<p>There is no need for specific equipment for fermentation (which does not exist). However, the methods could be improved: Fermentation can be accelerated with a starter. The soaking duration must be adapted (longer) to simulate the traditional fermentation. Drying time duration could be reduced with solar drier (tunnel with forced convection) or artificial gas drier (ATESTA or rotating cylinder). But no appropriate solution has been found for cheap and effective drying of flour or grits at this time.</p>

To improve the availability of suitable packaging (and packaging equipment).	Improved packaging could be purchased by Small Millers Association according to the specifications of consumers (example: NGO Abac Geres in Burkina Faso, purchasing printed plastic bags in big quantities for all members. A supplementary personal label is added by each member.)
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*: According to M.W.Bassey and O.G.Schmidt (IDRC, 1989): speed of rotation of the disks, physical characteristics of the disks' surface, number and diameter of the disks, spacing between disks, clearance between the periphery of the disks and the barrel, presence or absence of aspiration, physical characteristics of the inner surface of the barrel, feed rate of grains or quantity/batch, residence time, physical characteristics of the grains.

d) Few value-added mahangu and sorghum products in formal market

Strategy	Comments
Product development	<ul style="list-style-type: none"> - The present demand for traditional products (mahangu flour) should be fulfilled before developing new products - Lot of traditional millet and sorghum based - products remain untapped (oshikundu, omaluvu, epwaka, ovambo bread, whole grain...) - Developing new products require specific attention (good quality of the product, test of acceptability, perception by the consumers, training of the producers, advertising...). Experiences show that a good promotion campaign is essential to launch new products.
Market promotion (generic and brand-specific)	The message should be based on a good knowledge of the consumer's perception of the product. The generic advertising could be carry out by the Small Millers Association (with the support of the government if needed)
Incentive schemes for manufacturers.	It is desirable that the development of products with high value-added market with the capacity (technical skills, suitable equipment, financial resources for promotion...)

2.2.2. Indigenous fruits (see appendix 6)

We don't have any references on commercial processing of fresh, wild fruits in West Africa. The main constraint seem to be the lack of collation network. Moreover, due to the high temperature, the pulpy fruits go off quickly, explaining that only the valorisation of dry pulp or nuts is most of the time carried out. ("*karité*" shea in West Africa for instance)

Another point is the short duration of the production season, making critical the financing of equipments for processing.

The transport from the country to the urban area is another constraint (added-value products in rural production areas is rarely possible)

Dry fruits can easily be put in the market (*Baobab* fruit in Senegal). The dried pulp of the fruits is sometimes separated from the stone and sold as a paste (*Jojoba* in Senegal).

Most of the time the stone contains an oleaginous nut. The oil obtained from this nut is extracted along the year and can constitute cash income for the collectors (*Balanites* and *karité* in West Africa). The processing occurs generally at household level, sometimes at community level (women groups), and rarely at SME level.

Strategy	Comment
Use a consultative and transparent process to establish institutional frameworks that can co-ordinate a promotion programme based on long-term goals shared by stakeholders.	Role of the task team, based on an actual agreement at the highest level (ministers).
Analyse traditional, existing and potential uses of indigenous fruits; identify useful, favoured and/or under-utilised species with agricultural and/or formal market potential.	Focus on two products known for their economic importance and marketing potential (marula and manketti or eembe). Start with the development of existing traditional uses and products, that are already numerous, and for which a better knowledge on the products and the process is crucial. Select preferably products that do not require sophisticated technologies and are easy to store (at room temperature): juice, wine, vinegar, dry pulp, etc...
Organise a trial commercialisation of fruit pre-selected for promotion and monitor the socio-economic and ecological effects, as well as the harvesting and procurement logistics.	A good way to assess the collection and transport networks, and the interest in the urban areas for the fruit itself.
Use wild-harvested fruit obtained during commercialisation trials for essential chemical and nutritional analyses	Add the processing characteristics in technological terms (juice content, texture, flavour, ability to pulp extraction, sensitivity to heating, freezing, etc...)
Conduct processing trials to test processing technologies for, and products from, selected species. Identify and procure/manufacture appropriate material technologies (machines and equipment), test productivity under actual conditions, identify and solve production and management bottlenecks.	Start with test at the laboratory level and then at a pilot scale (10 to 100 kg) before identifying the appropriate technology. This equipment must be then tested in actual conditions. For small-scale level, this equipment is already available. For intermediate level, the available equipments are expensive and often not profitable (more than N\$ 300,000 for 100 kg per hour of pasteurised juice, for less than three months use during the year)
Introduce samples of promising products to appropriate markets to assess response, potential demand and possible prices (phytosanitary and health regulations should be adhered to, especially when targeting the export market). Expand markets for successful products.	
Build the capacity of harvesting communities to organise themselves, to manage the sustainable use of their resources and eventually to take full control of the processing and marketing of their production.	Give priority to basic technologies at household level: pulp drying, juice extraction, pasteurization.
Combine the financial and technical data on raw materials, processing and markets into bankable co-operative and SME business plans backed up by adequate training and institutional support.	

Select high-yielding or otherwise desirable genotypes of species with commercial and cultivation potential and study their propagation, domestication and management; use results of these trials to propagate desirable strains (and crossbreed improved varieties). Encourage farmers to grow selected improved varieties of indigenous fruits with commercial potential.	Considering the long duration for research on high-yielding or desirable genotypes of trees with commercial and cultivation potential, and for the first significant fruit production, this action should start at the beginning. Organoleptic qualities and technological ability (slow ripening in priority) of the fruits should be taken into account.
Use intellectual property rights (IPRs) to maximise benefits to producers.	In this field, one can hardly imagine patent registration, because a lot of research has been done and the technologies are in the public domain. Authenticity, tradition, good manufacturing practices and high quality should be protected through collective brands. This implies the capacity to federate, train and assess/check the producers.
Monitor for results, consequences and deviations and re-plan each of these steps as necessary.	

3. Assessment of food processing technologies available in Namibia.

3.1 Mahangu and sorghum

- **Threshing**

The performance of the only available Namibian machine in, Rovic, must be assessed on rigorous bases. Adaptation could improve the performance of this equipment. In Senegal, the Bamba model has been widely disseminate. Its capacity of 500 kg/hour is well adapted for service threshing, it can be mounted on a tractor in this purpose. This equipment could be tested in Namibia with the help of CIRAD.

- **Storage**

The threshed grain is stored in traditional granaries (baskets) with short life duration and for which the local material (mopane) is expensive, and less available. Metallic containers have been tested and widely disseminated in Central America (more than 100,000 in Honduras over the twenty past years). Among the main qualities are reported: long life (15 years), low cost (N\$ 600 for a 1,8 t container), airtightness allowing fumigation. A project in RDC for dissemination of metallic containers made from corrugated metal sheet is in progress. It seems that these containers are cheaper than traditional ones. In term of pest control, the studies show that the situation is at least similar than with traditional systems. These containers should be tested in actual condition without waiting the results of NRI/MAWRD DART studies. In parallel, a study should be done by MAWRD on the utilisation and performance of the silos disseminated by RDC.

- **Pre-cleaning**

Winnowing and sieving are the two most common methods used in Namibia like elsewhere. This method does not always lead to a very clean product. The cheap vibrating sieves cleaner have not proved any efficiency, and are of short life duration. A lot of cylindrical rotating cleaners are available, but often too

sophisticated or designed for industrial capacities. CRIAA has designed a manual cylindrical cleaner with a capacity of over 300 kg/hr. Economical viability must be assessed in a perspective of dissemination. The selling price of a rotating cylindric precleaner should not exceed N\$ 4,000 (built in series). These equipments could find takers in commercial mills, storage centres, in farms as mobile versions.

- **Dehulling**

All the dehullers are abrasive disk machines, mainly from Botswana. The main shortcoming of the tested models is the difficulty to get a clean grain and to operate (setting of ventilation, feeding rate and processing time). Numerous equipments have been tested in West Africa, Botswana, Zimbabwe, Zambia since 1970 to be adapted for millet (PRL, RIIC, Nuhull, ENDA), and have been widely adopted in this countries. Due to the size of the grains, no perfect compromise has been found between polishing, cleaning and high throughput. For service mills, the low throughput models existing (RIIC) offer a good compromise. In commercial mills context, it would be preferable to use 2 or 3 dehullers in parallel, giving more flexibility, allowing service milling aside. At semi-industrial scale, rice polishers (from India for instance) could be tested.

Adapting, testing and improve the available equipment in Namibia and the equipment operating in West Africa must be done on rigorous bases.

- **Fermentation**

It is a two-step process: soaking of dehulled grain and wet flour fermentation after milling, very common all over Africa. Plastic barrels or concrete tub are used. There is no specific equipment available nor needed, and no special equipment is used in West Africa, as far as we know. But in most of the countries, the fermentation process has been studied, in order to be able to simulate it in industrial plants. Most of the time, heterofermentative fermentation takes place, the main strain being *Lactobacillus plantarum*. Fermentation could be accelerated and stanadardized using with a starter (selected cultures, or an inoculum from previous batch) and maintaining the temperature above 25°C. Overfermentation would allow to dry more completely the dehulled grains before milling, but all these aspects have to be studied.

- **Drying**

Grains and flour are sun dried after being on tarpaulin (on soil or trays). Drying duration could be reduced with solar drier (tunnel with forced convection) or artificial gas drier (ATESTA or rotating cylinder), but none of them are fully satisfying, on a technical or economic point of view. In any case, it would be easier to dry grain than flour. A particular attention must be attached to the prevention of contaminations during sun drying: impurities, like sand can contaminate the flour, cancelling the efforts made in the previous steps to avoid it.

- **Milling**

The milling is mainly made by pounding, even if there are more than 200 hammermills in Namibia. Most of these mills are Drotsky models from South Africa, electric motor powered. Most of the time the mahangu is milled at high moisture content, so the throughput of these mills is much lower than the declared capacity. This capacity could be much even lower when not properly connected, rotating backward. A particular effort has to be devoted to improve the skills of the millers. In commercial mills, trials must be done to try to dry the fermented grains

down to 15% m.c. A solution found by commercial millers in Burkina Faso on maize, using small mills, is to mill the wet dehulled grains with a 3mm screen. After drying, this semolina is milled one more with 0.8 mm screen.

- There is a wide range of industrial manufactured products in which millet could be added with few technical difficulties: fermented beverages (acid or alcoholic), bread, biscuits, dairy products, pasta. Market studies must be done to assess acceptability.

3.2 Indigenous fruits

- **Fruit juice, wine and alcohol**

Like most identified indigenous fruits in Namibia, *manketti* and *eembe* are not very pulpy. These fruits can be sun dried and stored before further use. At household level, the fruits are spread on the ground, the pulp is removed by boiling and pounding. After this, the pulp is usually used for spirit making. A solar drier could be used at SME level, tent or tunnel model, to reduce drying duration and improve the purity of the end products.

No specific equipment is available in Namibia for pulp processing. In West Africa, small manual equipments for pulp extraction are used at small-scale level. All electric power driven pulping equipments have high throughput. In case of difficulties to remove the pulp (fibrous structure), enzymation could be done, but it requires cold storage, rarely compatible with household or SME conditions.

There is no small-scale equipment for processing wine and alcohol. The wine can be distilled in a craft alembic with basic local material. A particular attention must be given to the methanol content in wines and spirits. Training must be organized to avoid the lack of confidence toward craft production.

For juicy fruits like *marula*, the juice is rarely consumed fresh because of quick fermentation into wine. The juice could be stabilised at household or SME level by bulk pasteurisation. No specific equipment is required, except bottle cap or bag sealing machine. In this purpose, see also FAO's documentation on fruits processing.

For semi industrial production (over 50 litres per hour), continuous lines are available in Europe. The price (over N\$ 300,000) is too high for profitability working only one or two months per year. The pulp could be concentrated further as a base of a set of end-products like soft drinks, wine, juice, schnapps, ice cream, jams, fruit paste... Concentration is only viable at industrial level because of the price.

- **Oil extraction.**

Oil extraction is widespread all over Africa. Most of the time, the nut is inside a stone. No specific tool is available to extract the nut and the stones are too hard to be crushed by simple tools like pliers. Hammermills can be used if only the nut represent > 50% of the weight of the nut. A specific tool could be designed to lower the strenuousness of extraction by women. The decorticating blade for *marula* nut designed by CRIAA is a good compromise: it reduces the strenuousness, but gives the guarantee of the value-addition keeping in production area. Mechanical easy nut cracking would be a threat to this important social

activity. Traditionally, the oil is extracted with mortar and pestle, eventually followed by boiling. For small-scale to industrial oil extraction, expellers are available at any size. At small-scale, vertical screw presses with hydraulic jack have been widely tested in West Africa, mainly on karité, and have proved their efficiency and cost-effectiveness. CRIAA has designed a press on this principle, which could be disseminated at village-level.

4. Identification of areas in which CIRAD can provide services and/or strengthen local capacity and proposal for practicable partnership arrangements in technical co-operation between CIRAD and local stakeholders/service providers.

The following proposals result from the analysis of the priorities in the strategy, and the possibilities of CIRAD to support Namibia in implementing the action plan. As far as possible, these actions must benefit to Namibia in terms of building local ability to pursue the experiments and studies.

Project 1: Overall food consumption survey in Namibia

CIRAD could give scientific support to two graduate French students for a one-year stay (2X6 months) in Namibia. Short missions (3X7 days) of CIRAD will provide technical support.

Actions:

- To launch the first food consumption surveys in Namibia (in urban and rural areas);
- To set up a work planning for the coming years;
- To identify the local institutions and researchers, especially at the university (Social Sciences Division, Neudamm College, Polytechnic...) who could be interested in further co-operation in that field;
- To identify and work with Namibian students.

The first trainee will make a qualitative survey (cases studies) and the second one a quantitative survey.

Technical Partners: Social Science Division at UNAM ?

Other Partner: CRIAA

Funding: French Minister Foreign Affairs for CIRAD missions in Namibia, MAWRD for training costs.

Beginning: March 2001

Duration: 12 months.

Budget:

		Cost (N\$)	Number	Total
Cirad	Flights	8 600	3	25 800
	Expertise	2 929	21	61 509
	Per diem	600	21	12 600
Trainees	Allowance	3 000	12	36 000
	Flights	8 600	2	17 200
	Running cost	5 000	2	10 000
			Total (approx.)	165 000

Project 2: Economic survey of the mahangu food chain from producer to consumer

CIRAD could give scientific support to a graduate French student for a six-month stay in Namibia. Short mission (2X7 days) of CIRAD will provide technical support.

Actions:

Economic appraisal of the different food chains for each mahangu product (grain, SME flour, industrial flour, biscuit, beverage, etc.)

Identify the main constraints at different level (production, storage, processing, transport, marketing);

Assessment of price formation.

The CIRAD support mission will occur at the same time of the consumption survey, with an extension of 3 days.

Technical Partners : MAWRD, CRIAA

Funding : French Minister Foreign Affairs for CIRAD missions in Namibia, MAWRD for training costs.

Beginning : March 2001

Duration : 6 months.

Budget :

		Cost (N\$)	Number	Total
Cirad	Flights	8 600	2	0
	Expertise	2 929	3	8 787
	Per diem	600	3	1 800
Trainees	Allowance	3 000	6	18 000
	Flights	8 600	1	8 600
	Running cost	5 000	1	5 000
	Total (approx.)			42 187

Project 3: Regional project on sorghum and millet in Southern Africa

Namibia could participate in the second phase of the project to increase sorghum and millet consumption in Southern Africa. The first phase, which will end in September 2001, is a collaborative project between CIRAD and CSIR in RSA that aimed:

- to identify constraints in consumption of sorghum and millet in the Northern Province
- to perfect a diagnosis method based on participative approach (see Appendix 6).

The second phase, which should include more partners with research and development activities in Southern African countries, will be submitted to SACCAR proposal.

Project 4: Improving mahangu post-harvest equipments.

Trials, eventual improvement, local manufacture of precleaners, threshers, mills, dehullers.

- Precleaners: trials and design reflexion around CRIAA/MAWRD pre-cleaner.
- Treshers: ROVIC and Bourgoin Bamba millet thresher (the most common western Africa)
- RIIC and CIRAD/ELECTRA DMS 500 dehuller.

Actions:

Sending the equipments (Bamba Diesel and DMS 500 Electric version)

Trials of the equipments on the field, listing of the modifications to be done, identification of an equipment builder, implementation of the modifications or prototype building.

Trials, validation, training of the equipment builder.

Technical Partners: CRIAA, ELECTRA, BOURGOIN, CIRAD (2 missions of 2 weeks in Namibia), COSDEC, equipt. Builder.

Funding: Namibian government, French Minister Foreign Affairs CIRAD.

Starting: next mahangu campaign,

Duration: 6-8 months.

Budget:

		Cost (N\$)	Number	Total
Cirad	Flights	8 600	2	17 200
	Expertise	2 929	30	87 870
	Per diem	600	30	18 000
	Equipment 1*	50 000	1	50 000
	Equipment 2*	25 000	1	25 000
			Total (approx.)	200 000

CRIAA's participation, local journeys and travel, transport of equipments not included.

* The cost of this project might be reduce in case: only locally available equipments could be tested for modifications and improvements (pre-cleaner, thresher and dehullers). In this case, equipments 1 and 2 should be withdrawn from the budget.

Project 5: Marula processing.

Establishment of source data on marula and manketti or eembe ability to processing.
To submit samples of fruits to: freezing, pulp extraction, pasteurisation, drying, concentration.

Characterise the products, assess the quality changes, the shelf-life.

Actions:

Sending the samples to France.

Mission of a namibian researcher from UNAM (FSTD) to CIRAD (2 months),

Following of the trials at Neudam, (attachment projects),

Samples preparation for market studies, CRIAA would be in charge of reviewing the works done in Botswana and CSIR on processing of marula juice (travel and meeting with the main stakeholders in this chain in Botswana and South Africa)

Report to the IFTT.

Technical Partners: CIRAD, UNAM, IFTT, CRIAA SA-DC

Funding: MAWRD, French Minister Foreign Affairs

Strating: next marula campaign,

Duration: 4 months.

This implies a strengthening of Neudam facilities and « manpower » (1 more technician).

Budget:

		Cost (N\$)	Number	Total
Cirad	Lab costs/week	4 000	8	32 000
	French trainee/mth	2 000	6	12 000
	Total (approx.)			45 000

It may be possible to get a French grant for the travel and stay of Namibian researcher in France.

Project 6: Improving mahangu fermentation systems

Get a better knowledge of the process occurring on during mahangu fermentation.

Actions:

Sampling Mahangu at different steps,

Analyse of the processing conditions,

Characterisation of the products (microbiology, biochemistry).

Improvement formulation.

Report to MTT/SMA.

Technical Partners: Univ. Nat. of Benin (One mission 1 month of 1 researcher from Benin, one from CIRAD in Benin 1 month), UNAM, CIRAD, COSDEC.

Funding: French Minister Foreign Affairs, MAWRD, MHETEC (FAO).

Beg: end 2001.

Duration: 2 months.

This project could be finalized later provided the interest of Namibian and all other involved partners.

Appendices

APPENDIX 1

TERMS of REFERENCE

DRAFT

Mission to Namibia by CIRAD of France

1) Introduction

The Namibian Minister of Agriculture, Water and Rural Development visited the French research institution CIRAD at Montpellier, France in 1998 and saw the work done there on small-scale agricultural post-harvest and food processing technology. The Minister asked that CIRAD brings selected technologies to Namibia for exhibition and demonstration. In reply CIRAD proposed to send two consultants to Namibia on a familiarisation and project-identification visit.

The visit is supported by French Co-operation in Namibia and organised by the Directorate of Agricultural Research and Training (DART) in the Ministry of Agriculture, Water and Rural Development (MAWRD), in conjunction with CRIAA SA-DC, a Namibian-registered consultancy and development NGO with French roots involved for the past three years in efforts to commercialise and add value to indigenous grains (pearl millet or *mahangu* and sorghum), fruits and other botanical resources.

The purpose of this paper is to set terms of reference for the visit by the two CIRAD consultants.

2) Background

The northern crop-growing parts of Namibia, which are also home to most of the country's indigenous fruit resources, resemble the Sahel region of West Africa in many agro-ecological respects, including some of the staple grains grown and some of the fruits that are indigenous. It is anticipated that CIRAD's experience with post-harvest and food processing in the Sahel will be of great value to similar efforts in Namibia.

2.1) Mahangu and sorghum

Regarding mahangu and sorghum, the most significant development in the ten years of Namibian independence has been the rapid spread of small private-sector hammermills operated as service mills in crop-growing areas - a development stimulated by increased access to credit and rural electrification. This sector has been studied at some length and the conversion of surplus service milling capacity into commercial milling activity is believed to have a key role in the further commercialisation of mahangu, especially if and when it employs a "wet process" to produce the slightly fermented mahangu meal overwhelmingly preferred by Namibian consumers. "Wet processing" has been identified as a priority area for further research.

The technology used by the small-scale mahangu processing sector is predominantly imported from neighbouring countries (mainly South Africa) and consists largely of small and medium sized hammermills, driven by electric motors or diesel engines. A particular problem is the lack of a dehuller specifically designed for mahangu, while adapted sorghum dehullers are slow and have a low extraction rate. Threshing has also been identified as a bottleneck in the post-harvest process. A prototype of a hand-driven, drum-sieve pre-cleaner and grader for mahangu has been produced, but not disseminated yet.

Despite the formation of the Mahangu Marketing Intelligence Unit (MMIU) to bring producers and buyers of mahangu together, and despite private-sector initiatives to market dry-milled mahangu flour or products made from mahangu or sorghum, communal-area grain

producers are still restrained by a lack of ready markets, while the development of markets is restrained by low and uneven production, aggravated by a semi-arid climate with irregular rainfall.

It is estimated that Namibia produces a surplus of mahangu only two years out of ten, which has obvious implications for the on-going viability of mahangu trading and processing ventures, especially since pearl millet is not as readily or cheaply available on the international market as maize. Except in the higher-rainfall Caprivi region (where maize predominates) maize meal produced outside the communal areas is currently indispensable for supplementing the insufficient mahangu and sorghum harvest - not only in the eight years out of ten when there is an absolute grain production deficit, but even in bumper years for many families with insufficient land or labour to produce enough for their subsistence needs.

In the communal crop-growing areas, mahangu trade is currently primarily by informal sale and barter, sometimes on very disadvantageous terms. When surpluses are produced, slow post-harvest processing, inadequate storage and undeveloped markets can translate into on-farm losses as high as 30%.

In response to the lack of marketing opportunities, it has been proposed that Government "kick-starts" the commercialisation of mahangu by requiring that a percentage (still to be decided) of mahangu be included in tenders to supply Government institutions with food. This idea, like others aimed at commercialisation against a background of persistent under-production, pre-supposes (at least until production catches up with the increased demand) that mahangu will be sold out of the communal areas at prices that allow small-scale farmers to substitute maize meal in their diets and derive a profit from the exchange.

Given the strong consumer preference for traditional mahangu over maize, a rapidly urbanising population and a growing cash economy, it is reasonable to assume that mahangu, despite being more expensive, can out-compete maize in certain segments of the Namibian urban market. Concomitantly, the higher the value of the mahangu products brought to formal markets by the commercialisation process, the more favourable the resulting terms of trade will be for mahangu producers.

In Namibia mahangu is mainly consumed as a thick or thin porridge, pancakes, boiled grains or fermented into a variety of traditional alcoholic and non-alcoholic drinks. Sorghum is mainly used to brew traditional beer. Efforts to increase the range and value of mahangu products in Namibia have included a demonstration visit by a group of women from Senegal, who showed a group of Namibians how to prepare alternative foods from mahangu and sorghum (apart from small-scale efforts to produce biscuits from mahangu flour, there have been few tangible results). A major private-sector company has launched a formal-market fermented mahangu drink and while the project continues, it has faced stiff competition from informal-sector brewers and has been slower to capture market share than originally projected. A major milling company recently launched a dry-milled mahangu flour on the formal market.

2.2) Indigenous fruit

As in most parts of rural Africa, favoured indigenous fruit trees are recognised as a valuable resource in Namibia. Certain exclusive ownership and use rights apply to fruit trees growing in or near a family's homestead or fields, while trees on communal grazing or forest land are usually regarded as an open-access, first-come-first-served resource. In some areas there is a tradition of planting indigenous fruit trees in convenient "owned" locations. Certain fruiting species occur in greater abundance than others and when they are in season, most rural communities experience a glut of fruit, a substantial portion of which is not utilised to its full

potential and, in the absence of suitable preservation technologies, often goes to waste. Other species are rarer or harder to collect and can fetch good prices on informal markets.

Indigenous fruits and nuts, especially those that naturally store well, play an important role in food security strategies, of marginalised groups in particular. Some species have for a long time been commercialised to various extents in informal markets. Indigenous fruits also provide the raw materials for a substantial informal (and nominally illegal) distilling industry which produces a range of traditional spirits for sale in the informal market and serves as an important source of cash income for many rural families.

There have so far been few development interventions in Namibia targeting indigenous fruit, apart from some small-scale projects producing jams and jellies. The most notable success has been the Trial Marula Oil Production (TMOP) project, which has over the past three years developed and manufactured technology to cold-press marula (*Sclerocarya birrea*) oil. A high-value, fair-trade market in the European cosmetics industry has been secured for this precious oil, which is also used to make a luxury soap. TMOP is "owned" by the Eudafano Women's Co-operative, which brings together more than a thousand rural women who decorticate marula kernels at home, and is supported by a wide range of Government and private sector funders. The project management and market development have been done by CRIAA SA-DC, who also provided technology development and trial processing services at the workshops of the Katutura Artisans Project (KAP). While TMOP has now proceeded to the commercialisation phase, it is anticipated that Eudafano will require more organisational and technical support before it is ready to take over the entire running of the business. A project is underway with funding from DfID (UK) to facilitate regional (SADC) technical and marketing co-operation between producers of marula oil so as to secure the highest possible return and degree of ownership for primary producers.

Other interventions include:

- The Non-Timber Forest Products (NTFP) project, funded by CARE Austria and implemented by CRIAA SA-DC, which investigated the production of oil from manketti (*Schinziophyton rautanenii*) nuts
- A project funded by the MAWRD and implemented by the Food Science and Technology department at the University of Namibia to investigate the indigenous fruit resources of the Caprivi and produce trial products, including a wine made from eembe (birdplum, *Berchemia discolor*)
- Some projects, including a small commercial scaled one by Yetu Cosmetics, to produce oil from the seeds of indigenous melons

Recognising the immediate value of Namibia's existing indigenous fruit resource endowment, and the long-term agricultural diversification benefits that could accrue from domestication and cultivation of selected fruits, Namibia has recently embarked on efforts to organise a coherent national strategy for the promotion of indigenous fruit (see below). While the process is still at the resource identification and strategising stage, it is aimed at definite action during next year's fruiting season.

3) Recent developments

Some significant recent events in the process of developing strategies for the commercialisation of indigenous grain and fruits in Namibia include:

- A Promotion of Indigenous Fruit (PIF) workshop, and the consequent formation of the Indigenous Fruit Task Team (IFTT), which is developing a strategy envisaged to include species prioritisation and market research, followed by trial purchases for processing R&D in the forthcoming fruiting season (February to April 2001)

- A Workshop to Develop a Strategy for the Multiple Use of Mahangu and Sorghum in Namibia, the outcomes of which are being developed into an action plan that will include primary production, post-harvest processing, product development and marketing aspects
- The funding by FAO of a project of the Ministry of Higher Education, Training and Employment Creation (MHETEC) to develop and disseminate mahangu processing technology through its Community Skills-training and Development Centre (COSDEC) programme
- A proposal to FAO by the Directorate of Forestry (DoF) in the Ministry of Environment and Tourism (MET) to fund a programme for the selection, improvement and domestication of indigenous fruit trees, including processing trials

Also of interest is a proposal for the selection, improvement and domestication of indigenous fruit trees on a regional basis prepared by the SADC Tree Seed Centre Network.

4) Purposes of the CIRAD visit

The proposed mission by CIRAD has the following purposes:

1. Provide input from other parts of the world, especially West Africa, into the process of formulating strategies and action plans for the further commercialisation and promotion of indigenous fruit and grain in Namibia
2. Review the strategic planning that has already been done in this regard and, by reference to successes and failures with similar processes elsewhere, advise on how it can be improved and/or adapted to avoid potential pitfalls
3. Assess the food processing technologies available in Namibia in the context of the whole chain from producers to markets, and propose solutions to technology gaps identified
4. Assess the transferability of technologies developed in West Africa or elsewhere, including the possibility of adapting such technologies to local conditions where applicable
5. Suggest possible developments related to other products grown in Namibia
6. Identify areas in which CIRAD can provide services to Namibia and/or strengthen local capacity
7. Investigate possibilities for technical co-operation between CIRAD and local stakeholders/service providers and, if applicable, propose practicable partnership arrangements

5) Proposed schedule of work

To serve the purposes above, it is proposed that the visit by CIRAD be structured as follows:

- 4 days to travel to Windhoek, review key documents and meet stakeholders and role players in the capital
- 5 days to travel to the North Central Regions, meet key stakeholders, assess socio-economic conditions in the production areas and travel back to Windhoek
- 4 days to further consult stakeholders and prepare a report
- 2 days to brief key stakeholders, including the Service for Co-operation and Cultural Affairs (SCAC) of the French Embassy in Namibia, and to travel back

This gives a total of 15 days. For budgetary reasons, and to allow the input from CIRAD to be incorporated into the fruit project planned for next year, it is proposed that the mission takes place in October. Exact dates will be confirmed subject to availability.

To facilitate the investigations of the team, they will be accompanied to the production regions by a representative from MAWRD and one from CRIAA SA-DC.

It is assumed that, should the mission identify areas of potential co-operation between CIRAD and Namibian stakeholders, CIRAD will prepare on its own time a firm proposal for such further co-operation.

6) Skills required

It is proposed that CIRAD sends a team of two consultants:

- A technologist with appropriate experience of post-harvest and food processing technologies
- A socio-economist with experience of the entire chain from producers to market

The experience of the consultants should enable them to serve the purposes of the mission, as outlined above.

APPENDIX 2
FINAL PROGRAMME

CIRAD MISSION to NAMIBIA, 23 October - 3 November 2000

*CIRAD team accompanied by M. Mallet of CRIAA SA-DC
Tel. (061) 220117 / 225009 - Fax: (061) 232293 - criaawhk@iafrica.com.na
and with S. Ipinge of DART (MAWRD) in the North*

DAY	TIME	ACTIVITY
Mon. 23 October	14:00	- Flight arrival International Airport & transfer to Pension Cela
	16:00	- Briefing and programme with H. Venter (DART), T. Dauplais & M. Mallet
	16:45	- French Embassy - Co-operation & Cultural Affairs Dept: C. Franqueville (with T. Dauplais)
	17:30	- Pick 'n Pay Supermarket (Wernill Park)
Tue. 24	9:00	- CRIAA SA-DC: M. Mallet, P. du Plessis & R. Gamond
	11:00	- DoP (MAWRD): Ms P. Akwenye, B. Rothkegel, B. Bennett, F. Katoma
	12:45	- Lunch at Tristan de Lafond, Head of French Co-operation Department
	15:00	- Katutura Artisans' Project (KAP) with M. Mallet & R. Gamond
	16:00	- Ms S. Rugheimer, UNAM Chemistry Dept/Analytic Laboratory Services
Wed. 25	9:00	- UNAM/MAWRD Food Science & Technology Dept (Neudamm): Prof. T. Ngwira, Dr E. Keya, Dr P. Bille
	12:00	- Visit of Katutura: Soweto Market, Ombili Store, Penduka, ...
	15:00	- National Botanical Research Institute (NBRI): Ms G. Maggs
	16:00	- Ministry of Trade and Industry (MTI): Dr M. Hamp (GTZ)
	19:30	- Dinner at Africa Restaurant (brief discussion with Maila)
Thu. 26	9:00	- Briefing with Hon. Minister Helmut Angula (at MAWRD)
	9:30	- Agricultural Laboratory: Mr M. Kachote (soil lab.)
	10:00	- Hon. Minister Nahas Angula, Dr A. van Kent, A. Uiseb, J. Sifani & E. Thomas (at MHETEC) with R. Gamond
	11:15	- Agricultural Laboratory: Mr W. Gawanab (nutrition lab.)
	12:30	- NAB: J. Hoffmann
	14:00	- Consolidation of results
	+	
Fri. 27	6:30	- Flight departure at Eros Airport (Windhoek)
	8:00	- Arrival at Ondangwa Airport, joined by S. Ipinge (DART) with vehicle
	9:00	- ABC Mill at Onyaanya: Mr Kambonde
	11:00	- Ondangwa open market & discussions with traders
	11:30	- New small-scale Industrial Park (Ondangwa): visit of NDC facilities
	12:00	- COSDEC (Ondangwa): P. Shituula, Ms L. Kambonde & E. Kanyolo
	13:00	- Transfer to Santorini Hotel (Oshakati)
	14:30	- Rural Development Centre (RDC): Ms F. Msati
	15:45	- Mahangu Marketing Unit (MMIU): P. Ipinge & A. Kafula
Sat. 28	8:30	- Okavu Mill (Outapi)
	9:30	- Mahenene: Mrs E. Lechner (WADAM)
		- Visit of NNFSGC facilities with W. Lechner
		- Viewing of mahangu storage trials
		- Viewing of agronomic trials and seeds multiplication with S. Ipinge
	12:00	- Outapi: visit of supermarkets/wholesales & Super Foods Catering Services
	14:00	- Eudafano Women Co-operative (EWC): Tunetu Women Association at Tsandi, discussion with Mrs L. litenge and members, demonstration of marula kernels extraction, Ondjove & Oontanga making
	15:30	- Return to Oshakati through Okahao
	19:30	- Dinner with P. Ipinge (MMIU) & Mrs

Sun. 29	9:00 10:00 13:00 14:00 + 19:00	- Oshakati open market (Omatala) & discussions with traders - Ongwediva Trade Fair: NCCI-North, NNSGFC, FSREU (MAWRD), DoF, RDC, MHETEC, Namib Mills, NamBrew., The Master Kookie, ABC Mill, Rovic, OMT, Agra, traditional oils and fruits stands - Rev. A. Iita (NNFC/NAB/SMA/NNFSGC/...) - Consolidation of results - B. Dayot (NOREESP)
Mon. 30	8:30 9:00 10:00 12:30 19:00	- MAWRD (Ongwediva): Mr Imalwa (DEES) - FSREU & NOREESP: O. Mwanyangapo, B. Dayot & E. Durette - REMP: A. Larsen - Oniipa service mill (ELCIN parish) - Sun Moonlight Mill (at Ongha): Elias Waandja - TS Properties Milling (Ohangwena) - Oshikango border post and open market - Eudafano Women Co-operative (EWC): Lyeendongula Women Association at Ohangwena, Mrs N. Kakonda and members - K Fleissner (DART)
Tue. 31	8:30 10:30 11:30 14:30 16:30 20:00	- Flight departure from Ondangwa - Arrival at Eros Airport, transfer to Pension Cela - Directorate of Forestry (DoF): J. Hailwa - National Cold Storage (at T&C building): K. Kruger, M. Martins - Namib Mills: F. Meyer & P. Göttert - Dinner at T. Dauplais
Wed. 1 Nov.	8:30 10:00 11:00 12:45 14:30 16:00 17:30	- MTI: S. Motinga (DID) - Food Security & Nutrition (MAWRD): Y. Mesfin, A. Jacobs, Ms Munjoro & F. Ifo - Wecke & Voigt supermarkets (Kalahari Sands) - NNFU: P. Vleermuis & JF Nosmas - DECOSA: Mrs L. Figaji - French Co-operation Dept: C. Franqueville - Research Facilitation Services: Mrs E. Keulder & D. Ludik
Thu. 2	8:30 9:45 11:30 13:45 14:30	- DEES (MAWRD): Mr D. Tshikesho - NDC: A. Botes (M. Mallet) - UNAM SSD (MRC): G. van Rooy & B. Fuller (M. Mallet) - FAO: L. Muhigirwa - Shoprite supermarket (Katutura) & Northern Industrial Area - Consolidation of results and preparation of debriefing session
Fri. 3	9:00 10:00 13:00 14:50	- Debriefing to Dr V. Shivute (PS-MAWRD) with T. Dauplais - Debriefing to stakeholders at MAWRD, Main Boardroom - Departure to International Airport - Flight departure

APPENDIX 3
Persons met (sorted by alphabetical order)

Persons met (sorted by alphabetical order)

AKWENYE, Penny T., Deputy Director, MAWRD
 ANGULA, Helmut, Hon. Minister, MAWRD
 ANGULA, Hahas, Hon. Minister, MHETEC
 BENNETT, Ben, T.A. Agricultural Economist, MAWRD
 BILLE, Peter George, Lecturer, UNAM, Faculty of Agriculture
 BOTES André P., Agricultural economist, Special projects, Namibia Development Corporation, NDC.
 DAUPLAIS Thierry, Extension Advisor, Coordinator for the French supported project in rural development, MAWRD.
 DAYOT, Bertrand, Chief Technical Advisor, MAWRD / French Co-operation
 DU PLESSIS, Pierre, Consultant, CRIAA SA-DC
 FIGAJI, Lisa, Managing Director, DECOSA
 FUNDULA YA' NENGHWANYA, Erickson, Head of Centre, Ondangwa COSDEC
 GAMOND, Roger, Consultant, CRIAA SA-DC
 GERVAIS De LAFOND Tristan, Head of Mission, Service de Cooperation et d'Action Culturelle, Ministère Français des Affaires Etrangères.
 HAILLA, Joseph, Ministry of Forestry
 HAMP, Michael, GTZ Advisor on SME Promotion Project, MTI
 HOFFMANN, Jürgen, Manager, Namibian Agronomic Board, NAB.
 IIPINGE, Paully, Project Manager, MMIU
 IMALWA, V.N., Chief Agriculture Extension Officer, MAWRD
 KATOMA, Fillemon N., Chief Co-operative Officer, MAWRD
 KEYA, Erastus L., Senior Lecturer, UNAM, Faculty of Agriculture
 KRUGER, Kobus, Bakery Consultant, T+C National Cold Storage
 LARSEN, Ane, MAWRD
 MAGGS, G., NBRI
 MALLET, Michel, Executive Director, CRIAA SA-DC
 MARTINS, Martin, Divisional Manager, T+C National Cold Storage
 MESFIN, MAWRD
 MEYER, Frans, Manager Operations, Namib Mills
 MOTINGA, Steve, Director, MTI
 MSATI, F., Rural Development Centre
 MWANYANGAPO, Oswald, AEO, MAWRD
 NGWIRA, Timothy N., Head of Department Food Science & Technology, UNAM, Faculty of Agriculture
 ROTHKEGEL, Bernd, Director of Planning, MAWRD
 RUGHEIMER, Silke, Food Technologist,
 SHIVUTE, V, Permanent Secretary, MAWRD
 STRULA, Peter, Mayor, City of Ondangwa
 VENTER, J.P., Deputy Director, MAWRD

APPENDIX 4
Mahangu and sorghum.
Strategy and action planning.
(Elaborated by CRIAA SA-DC)

Strategy and Action Plan: Mahangu and Sorghum Promotion (Elaborated by CRIAA SA-DC)

1) BACKGROUND

A *Workshop to Develop a Strategy for the Multiple Use of Mahangu and Sorghum* was convened by MAWRD at Mokuti Lodge on 27-28 June 2000, with the aim of co-ordinating national efforts to promote increased commercialisation and processing of indigenous grain in Namibia. The main output of the workshop was a large number of priorities for action identified by participants drawn from Government, the private sector (including mahangu growers and processors), NGOs and international organisations.

Due to time constraints, the participants mandated the organisers and facilitators to structure the workshop's recommendations into a draft Strategy and Action Plan, which was circulated with the workshop proceedings for further prioritisation and comments by the participants and other interested parties. The feedback received was used to restructure and re-prioritise the workshop recommendations, which were then discussed with the workshop Steering Committee and used as the foundation of the Strategy and Action Plan presented here.

2) INTRODUCTION

From the large number of potential actions identified and prioritised by the workshop it is clear that there is no single or simple solution to the inadequate commercialisation of traditional staple grains, and that various role players will consequently have to tackle a multitude of problems and restraints in an integrated, co-ordinated and holistic manner across a broad front. This suggests that a selection of the priority interventions recommended by the workshop should be tried simultaneously and their impacts monitored as a basis for planning further action.

2.1) Low and variable primary production

The fundamental problem retarding the commercialisation of indigenous grains is low and uncertain primary productivity, which is directly linked to adverse agro-ecological conditions (low rainfall, poor soils), low yields, low-input farming systems and lack of incentives and/or inputs to increase production. In addition, traditional post-harvest and storage systems result in high losses of grain (estimated at up to 30%), thus further reducing the effective harvest. Consequently Namibia has produced mahangu and sorghum grain in surplus of national consumption needs only once in the decade since Independence.

The main strategies that have been proposed for addressing the problem of low primary production are:

- to increase yields by making available and possibly subsidising such inputs as seed of improved varieties, fertilisers, cultivation equipment (DAP and tractor ploughing), and by providing extension services to improve farming systems

- to reduce post-harvest losses by improving traditional threshing and storage methods
- to promote new and more lucrative markets in order to provide farmers with an economic incentive to increase production
- to encourage increased market-oriented production of mahangu and sorghum on land where these crops have not traditionally been grown.

Traditionally, mahangu and sorghum have been cultivated on marginal soils under a low-input-low-yield production regime - a perfectly rational response by cash-strapped farmers to the risks inherent in higher-input agriculture in an uncertain climate. Modern farming methods and inputs like NPK fertilisers can increase mahangu and sorghum production per unit area dramatically in reasonable agricultural years, but can also result in higher financial losses if the rains fail. Since high-input-high-yield mahangu production is inherently risky under Namibian conditions, care should be taken that key development considerations such as poverty alleviation and increased rural incomes are not negatively affected, or the strategy might end up contributing to the further economic marginalisation of traditional communal-area growers.

2.2) Limited trade in mahangu and sorghum grain

As a result of low primary production, very limited quantities of mahangu and sorghum grain are available nationally for trading, which in turns retards the development of marketing systems and severely restricts the options for secondary processing and value-adding.

In most years, most households do not produce enough mahangu and sorghum to meet their subsistence needs (this generalisation ignores the substantial differences in actual production between small and larger communal-area farmers). When surpluses are produced, the traditional practice is to store grain on-farm as insurance against the failure of the next rainy season and/or to trade small quantities in local markets (often through barter).

Combined with the fact that pearl millet is not readily available on the international market and cannot be imported at a price competitive with maize, the limited trade in traditional grains renders processing businesses (especially small ones) very vulnerable to failure due to an inadequate or interrupted supply of raw material. The grain that is marketed is often of poor and variable quality, resulting in unacceptably high processing losses. These constraints are reflected in the nature of the recent growth that has occurred in the mahangu processing sector: it has primarily been focussed on service milling and in most cases the capital costs of such service mills are paid for and their operation subsidised by income from other economic activities (salaries, retail trading etc.).

On the positive side, there is a very strong consumer preference, and thus demand, for mahangu products, especially the slightly fermented mahangu meal produced by wet processing. Low production and high demand theoretically translate into higher prices, a trend confirmed by the premium price realised by such mahangu meal in urban markets. There is also a market for dry-milled mahangu meal, but at this stage

it is unclear whether demand in this market can sustain a significantly higher price than that of maize meal.

The main strategies that have been suggested as ways to facilitate and support increased trade in (and so facilitate increased processing of) indigenous grains are:

- to provide better market information to sellers and buyers (e.g. MMIU)
- to improve on-farm and village-level storage facilities
- to promote co-operative marketing so as to make larger quantities of grain readily available in more centralised locations
- to require that a minimum percentage of mahangu-based products be included in Government and other institutional food-supply contracts
- to investigate increased imports of mahangu from southern Angola, and new supply sources in West Africa
- to buy surplus grain in good years and stockpile it to ensure supply in drought years.

Given the fact that Namibia's mahangu and sorghum production currently does not meet the consumption needs of most communal-area growers, increasing the trade in these grains necessarily implies (at least until production and/or imports can meet the demand) that producers sell all or part of their mahangu and sorghum harvests at higher prices, buy cheaper staple foods (predominantly maize meal) to eat, and pocket a profit. This means that mahangu must, in the short to medium term, be increasingly consumed as a «luxury» food by more affluent (mostly urban) consumers, in addition to being the preferred traditional staple food in its production areas. The success of this promotion strategy will depend on the price differential between mahangu and its cheapest substitute, maize meal, being large enough to serve as a stimulus for increased production and trade on terms that allow cost-effective substitution of traditional grains in the diets of producers. A major unknown in this equation is the size of the market at various price levels above that of maize meal.

Commercialising subsistence grain crops under conditions of insufficient production potentially poses a threat to household-level food security, in that some farmers may market their on-farm «emergency stocks» and be caught short when, for example, a long drought in southern Africa and/or exchange rate declines raise the price of maize meal substantially. This consideration underscores the importance of increasing primary production as a central part of the promotion strategy, carefully monitoring household-level effects until such time as surplus production becomes routine, and improving on-farm storage.

2.3) Limited commercial processing of mahangu and sorghum grain

The rapid growth of the small-scale milling sector over the past decade has largely been concentrated in the mahangu service-milling sector, with commercial mahangu milling remaining insignificant compared to maize milling, and processing of local sorghum restricted to traditional methods. As pointed out above, commercial processing has been constrained by the limited and unreliable availability of these grains in local markets. On the other hand, the underdeveloped commercial

mahangu and sorghum processing industry has contributed significantly to the absence of a market incentive to increase primary production and trading.

A detailed study of the emerging small-scale milling sector has revealed that most service mills are currently operating at less than half their technical capacity. It has been suggested that this spare capacity can be used for SME commercial milling (thus creating additional local markets for indigenous grains) provided suitable pre-cleaners, mechanical dehullers, packaging and wet-processing equipment, as well as technical and business training, are made available. There is scope to extend the service milling sector by making available a suitable medium-sized hammermill able to run on the 220V earth-return electricity being supplied under rural electrification schemes - this could also free additional household labour for primary production.

The main strategies that have been suggested in this regard are:

- to provide technical and business training for the small-scale milling sector
- to source or develop a medium-sized hammermill (requiring a lower power-source)
- to source or develop an appropriate mahangu dehuller
- to provide incentives for pre-cleaning of grain
- to develop appropriate equipment for small-scale wet-processing of mahangu grain
- to improve the availability of suitable packaging (and packaging equipment).

2.4) Few value-added mahangu and sorghum products in formal markets

Only very limited quantities of Namibian mahangu and sorghum are currently used to make value-added products for formal markets (if mahangu meal is excluded, the quantities are insignificant). It has been suggested that the development of innovative, high-value products will stimulate increased mahangu and sorghum production, marketing and pre-processing, by providing a constant and lucrative market for grain, meal and malt. This approach forms the basis of MHETEC's FAO-funded project. If and when primary production increases over consumption needs, such additional markets will also help to absorb surplus production (especially in bumper years).

The main strategies that have been recommended in this regard are:

- product development
- market promotion (generic and brand-specific)
- incentive schemes for manufacturers.

In pursuing the product-development approach to mahangu and sorghum promotion it is important to guard against disrupting the numerous informal-sector micro-enterprises currently producing traditional beverages and foods from these grains. This can be done by ensuring that the new products are truly innovative and compete in different market segments. The (partial) substitution of mahangu for imported produce like wheat and maize in baked products, and replacing imported sorghum malt with a locally produced equivalent, are possible examples; such import substitution requires that local grains successfully compete with imports in terms of price and quality.

3) ACTION PLAN

3.1) Institutional arrangement: MSTT

The workshop was unable to adequately consider the institutional capacity and resources available to implement its recommendations. It identified potential implementers for some of the actions suggested, but was not able to assign definite and binding institutional responsibility. However, the workshop did identify a clear need for a better institutional arrangement around indigenous grains:

Problem: Poor co-ordination and institutional linkages

Solution: a) Create national co-ordinating body
b) Build linkages between agricultural service organisations and farmers' organisations

It is recommended that a **Mahangu and Sorghum Task Team (MSTT)** be formed, to be convened and provided with secretarial services by the MAWRD. To get such a body constituted and ensure its appropriate empowerment, it is further suggested that the **Hon. Minister of Agriculture** take up the matter with his Cabinet colleagues, secure their support for the body and issue formal invitations to non-governmental institutions.

It is suggested that the following institutions should be invited to nominate senior staff members to represent them on the MSTT:

MAWRD: - DART
- DoP & DCD
- DEES
MHETEC: - DRST
MTI: - DID
NPC
MHSS
MoF: - Tender Board
NAB & MMIU
NDC
Agribank
UNAM: - Faculty of Agriculture
- Department of Food Science and Technology
NNFU
Small Millers' Association
CRIAA SA-DC
Namib Mills
Tunweni Breweries
FAO
EU (ASSP project)

The first tasks of the MSTT should be to define its own Terms of Reference for approval by members. In doing so it should consider whether it needs any additional members, and whether it should establish sub-committees to deal with specific aspects of its work. The member institutions should reflect on the need to establish dedicated sub-committees in their Ministries etc. to ensure that relevant stakeholders and/or role players remain fully informed and that the MSTT draws on the widest possible input in carrying out its work.

Once the MSTT has been properly constituted, its first task should be to assign definite responsibility for the implementation of selected top-priority actions. In doing so, it should give due consideration to the crosscutting linkages between various actions in the same broad areas. As a starting point to this process, it is suggested that the MSTT members use a metaplan approach to fill in the gaps in the Action Plan matrix, which represents a broad (and flexible) framework of responsibility, loosely based on Cabinet Resolution 30th/19.10.99/003.

3.2) Primary agricultural production

The commercialisation of mahangu and sorghum is severely constrained by low primary production of these staple grains in most growing seasons. This is firstly a result of the **low yields** realised by traditional growers, and secondly because these crops are usually not grown on a commercial footing. Increasing primary production is therefore a key strategic area that needs to be addressed. In this regard the workshop recommended:

- 3.2.1) Problem:** Lack of incentives for producers to grow more
Solution: Promote new markets:
 a) GRN institutions to use at least 10% mahangu in meals
 b) Large processors/consumers enter into pre-production agreements with farmers
 c) Large employers (mines, fishing companies etc.) to include at least 10% mahangu in rations
Action: Impact study
- 3.2.2) Problem:** Extension not effective; demonstrations and trials not followed up properly
Action: Demand-driven extension through FSR-E units
- 3.2.3) Problem:** Sub-optimal management practices
Action: Produce «Best Practices Manual» for extension staff and farmers by updating and distributing files already available at ADCs
- 3.2.4) Problem:** Low soil fertility
Action:
 a) Fertiliser demonstrations
 b) Access to credit to buy fertilisers
- 3.2.5) Problem:** Poor rainfall
Action:
 a) Research trials on drought-tolerant varieties
 b) Demonstrations of improved soil-water management
- 3.2.6) Problem:** Lack of access to, and of credit for, agricultural inputs like farmyard manure, chemical fertilisers, improved seeds, etc.
Action: Implement Agricultural Credit Policy in full
- 3.2.7) Problem:** Lack of appropriate technology (DAP, land preparation, weeding etc.)
Solution:
 a) Finance Ongwediva RDC properly
 b) Encourage technology transfer

- Action:**
- a) MAWRD, MWTC, MHETEC, MRLGH to budget accordingly
 - b)
 - i) Source the technology
 - ii) Adapt technology to local conditions
 - iii) Ensure back-up services are available
 - iv) Institutions (such as VTCs) to produce technology for dissemination

3.3) Post-harvest processing and grain storage

Improved post-harvest operations (including storage) can, by preventing spoilage and losses, help to make more grain available for processing – the more primary production increases, the more urgent this need becomes:

- 3.3.1) Problem:**
- a) There has been a lack of post-harvest research in Namibia
 - b) There is a lack of post-harvest extension recommendations
- Solution:** Provide post-harvest extension services
- Action:**
- a) Form post-harvest research sub-group of MSTT
 - b) Develop a work programme for this group
 - c) Conduct post-harvest research
 - d) Formulate post-harvest extension recommendations
 - e) Integrate extension recommendations into programmes of FSRE units.
- 3.3.2) Problem:**
- a) The storage characteristics of new varieties are under-researched
 - b) Storage design and practices are poor, especially for commercial use
 - c) Poor pre-storage handling negatively affects storability
 - d) Insufficient storage is available for bumper crops
 - e) The materials used to make traditional storage baskets have become scarce (a basket can now cost up to N\$800)
 - f) Pests attack stored grain, but little known about this in Namibia
- Solution:** Minimise storage losses
- Action:**
- a) Determine the storage characteristics of traditional varieties
 - b) Determine characteristics of traditional stores, storage practices and pre-storage handling, and recommend improvements
 - c) Investigate regional (SADC) storage solutions
 - d) Research alternative storage solutions and possible incentives (e.g. for local construction) and formulate recommendations in this regard
 - e) Identify pests on-farm and recommend appropriate control measures
- 3.3.3) Problem:**
- a) There has been a lack of research on threshing in Namibia
 - b) There is a lack of appropriate threshing technology
 - c) Variable winds affect traditional basket winnowing
- Solution:** Improve threshing practices
- Action:**
- a) Research current threshing practices
 - b) Recommend improvements and possible technology development

- 3.3.4) Problem:**
- a) Poor quality at the next stage (mill, consumer etc.)
 - b) No premium for quality grain, no system to reward quality
 - c) Very little use of pre-cleaners
- Solution:** Ensure good quality grain reaches the next stage
- Action:**
- a) Implement system(s) of standards suitable for small, medium and large producers as well as consumers/traders
 - b) Design and introduce a payment system/structure that rewards quality (e.g. pre-cleaned grain)
 - c) Provide incentives to acquire pre-cleaners - encourage co-operation, evolve a loan scheme, form users groups, use rewards to promote technology adoption
- 3.3.5) Problem:**
- a) Farmers are not eager to borrow for post-harvest and storage purposes
 - b) Commercial interest rates are high
 - c) Loan procedures are complex
 - d) Farmers have no savings
 - e) There are no credit groups
 - f) There are no appropriate lending institutions
 - g) Farmers have no acceptable collateral
- Solution:** Make financing available for post-harvest activities
- Action:**
- a) Accept mutual assurance as collateral
 - b) Grain banks (stored grain used as collateral)
 - c) Simplify loan procedures
 - d) Encourage savings and the formation of credit groups
 - e) Establish a lender for post-harvest purposes
 - f) Train farmers about post-harvest losses and business opportunities
- 3.3.6) Problem:**
- a) Losses from insufficient drying (fungi, insects etc.)
 - b) No cheap moisture tester
 - c) Shortage of crib building material
 - d) Danger of rain/birds/pests
- Solution:** Minimise drying losses
- Action:**
- a) Research moisture qualities of different varieties
 - b) Identify an affordable moisture tester
 - c) Encourage use of cribs by providing alternative designs and materials; improve traditional cribs; provide incentives to build cribs
- 3.3.7) Problem:** Storage characteristics of sorghum are different from those of mahangu
- Action:** Develop separate recommendations

3.4) Grain marketing

Marketing is an obvious key component of any commercialisation strategy. In the case of mahangu and sorghum, improving the grain marketing system and infrastructure provides the essential link between incentives to increase primary production, and interventions to facilitate and promote increased processing.

- 3.4.1) Problem:**
- a) There is an inconsistent and insufficient supply of grain
 - b) Transport to markets is limited and expensive
 - c) Special measures are needed to deal with occasional bumper harvests
 - d) Farmers feel the price is too low; processors that it is too high
 - e) There is a lack of market information available to buyers and sellers
 - f) The grain wholesaling sector is underdeveloped and there are no physical wholesale grain markets; farmers have a conservative attitude to grain commercialisation
 - g) Processors lack capital and storage to provide a consistent demand
 - h) The co-operative sector is weak and there is little active marketing co-operation among farmers
 - i) Farmers may sell at disadvantageous prices when they urgently need cash
- Solution:** Improved grain marketing
- Action:**
- a) Facilitate better and more storage - see g) below
 - b) Lower post-harvest losses
 - c) Provide market information to buyers and sellers
 - d) Build wholesale markets
 - e) Improve production and post-harvest efficiency to lower prices
 - f) Train farmers in business and marketing skills
 - g) Introduce incentives/loans for millers to provide storage; include loan schemes for post-harvest and marketing in Agricultural Credit
 - h) Encourage post-harvest and marketing co-operation and co-operatives (including transport)
 - i) Encourage multiple uses of DAP and tractors
- 3.4.2) Problem:** High transport costs
- Solution:**
- a) Local processing
 - b) Local depots
- Action:**
- a) Encourage local processing
 - b) Construction of local depots has started (e.g. CRISP)
- 3.4.3) Problem:** Lack of communication between sellers and buyers
- Solution:**
- a) Strengthen MMIU
 - b) Construct feeder roads
- Action:**
- a) Increase budget and give training
 - b) Strengthen food-for-work programme
 - c) Strengthen farmer organisations
 - d) Plan and proclaim strategic roads in formerly neglected areas
- 3.4.4) Problem:** Organisation of marketing not well developed
- Action:**
- a) Support establishment of co-operative marketing system
 - b) Investigate support measures to develop decentralised trading networks

- 3.4.5) Problem:** Ungraded grain; low quality
Action: a) National standards are being introduced
 b) Create awareness of these standards

3.5) Grain processing

Processing grain and marketing the flour or malt provide the strategic links between mahangu and sorghum grain producers and traders, on the one hand, and the consumer market, on the other hand. Promoting the growth of mahangu and sorghum processing therefore plays a crucial role in the development of market demand for grain (by millers) and for commercial mahangu and sorghum products (by consumers).

- 3.5.1) Problem:** Traditional processing methods deliver a preferred product but are not suitable for commercial operations
Action: Research improved or new methods of processing (e.g. soaking, fermenting, drying)
- 3.5.2) Problem:** Dirty grain makes processing inefficient and expensive
Action: Conduct an awareness campaign about the importance of clean grain
- 3.5.3) Problem:** There is no efficient mahangu dehuller
Action: Research, design and construct a Namibian dehuller appropriate for mahangu (with readily available spare parts)
- 3.5.4) Problem:** Available hammermills are too large for cost-efficient service milling
Action: Source (in neighbouring countries) or design and construct a medium-sized hammermill (capacity 200-250 kg/h), especially driven by single-phase electric motors (6-9 kVA)
- 3.5.5) Problem:** The milling sector is not organised
Action: Strengthen the Small Millers' Association
- 3.5.6) Problem:** The milling sector lacks essential technical skills
Action: Provide training for operators, business managers and repairers in the small-scale milling sector, with accompanying training of trainers
- 3.5.7) Problem:** The small-scale milling sector has difficulty sourcing suitable, affordable packaging
Action: Improve packaging of flour by researching bag quality and alternative suppliers; lower packaging costs by ordering in bulk through the Small Millers' Association or MMIU
- 3.5.8) Problem:** The varietal needs of sorghum processors/brewers are not known
Action: Discuss with processors and formulate extension message.

3.6) Value-adding and product development

Since it is not possible to produce mahangu flour cheaper than imported maize meal, there is a need to develop higher-value mahangu and sorghum products that will fetch a premium price in niche markets.

- 3.6.1) Problem:** Existing incentives have not resulted in a viable and active industry manufacturing high-value mahangu products
Action:
- assess existing schemes and shortcomings/gaps
 - propose reforms where needed
 - promote the use of such incentive schemes
- 3.6.2) Problem:** It is not known which value-added products could succeed in the Namibian market
Action: Identify the research already done, the reports available and the gaps in knowledge on
- traditional products and uses
 - new products (Namibia, Africa, worldwide)
- Conduct market research to determine consumer identity and preferences
- for human uses
 - for animal feeds
- Develop new products
- 3.6.3) Problem:** The financial viability of businesses adding value to mahangu flour is not known
Action: Assess the price-setting factors in the mahangu and sorghum (grain and products) supply-and-demand equation that affect costs and prices
- 3.6.4) Problem:** There are no standards for value-added products made from mahangu
Action: Analyses of grain and products -
- nutritional (from literature) and micro-biological
 - to develop standards for products (urgently needed for mahangu meal)
 - for labelling purposes
- 3.6.6) Problem:** a) Lack of economic uses for by-products (bran etc.)
 b) Lack of knowledge and technology for using by-products
Solution: Improved utilisation of by-products
Action: Research alternative uses and make recommendations
- 3.6.7) Problem:** There are as yet no developed formal markets for mahangu products
Action: Market promotion
- generic products; information; awareness
 - specific products, brand names

3.7) Progress review and replanning

Due to the number of unpredictable variables involved in the promotion of indigenous grains, it is essential that the promotion strategy and action plan be reviewed regularly by stakeholders and the MSTT. It is recommended that this process be carried out annually by the MSTT, and that a wider feedback, review and replanning process be conducted with stakeholders every two to three years.

ACTION PLAN MATRIX: MAHANGU AND SORGHUM PROMOTION

BROAD PROBLEM AREAS	SOLUTIONS/ACTIONS	RESPONSIBLE	EST. COST	STAKEHOLDERS	ASSUMPTIONS
1) Poor institutional co-ordination	Mahangu and Sorghum Task Team See 3.1	Minister of Agriculture All institutional stakeholders See 3.1		See 3.1 for suggested membership	
2) Low primary agricultural production	See 3.2	MAWRD (DART, DEES) FSRE units ADCs NNFU		Farmers Traders GRN	
3) Losses caused by inadequate post-harvest processing and storage	See 3.3	MAWRD (DoP) MSTT post-harvest sub-group NASSP (EU)		Farmers Processors Technology developers	
4) Limited grain marketing facilities and activities	See 3.4	MAWRD (DoP) MTI NAB MMIU		Farmers Traders Processors Consumers	
5) Insufficient secondary processing of indigenous grains	See 3.5	MAWRD (DoP, DEES) NAB MMIU RDCs VTCs Small Millers' Association Commercial millers CRIA SA-DC Northern Electricity		Small millers Technology developers and suppliers Downstream processors	
6) Lack of high-value formal market products	See 3.6	MHETEC (FAO project) Entrepreneurs		Millers Consumers	
7) Complex multi-sectoral intervention required to solve problems	Progress review and replanning	MSTT		All	

APPENDIX 5

A Participatory Investigation of Quality requirements and Consumption Trends of Sorghum and Millet in the Northern Province, RSA

A Participatory Investigation of Quality requirements and Consumption Trends of Sorghum and Millet in the Northern Province, RSA

1 - Introduction

This is a collaborative project between the CSIR BIO/CHEMTEK (ex FOODTEK) and CIRAD AMIS, sponsored by the French government. This two years project is aimed at identifying the constraints and opportunities in the utilization of millet and sorghum in South Africa. Research which was done by CSIR in 1997 has shown that the production and consumption of these cereals has been reduced and this has contributed to food insecurity in the region of the Northern Province.

The responsible of the project are the Technology for Development Programme (TfD) of CSIR and the Socio-économie Alimentaire Team of CIRAD AMIS (Agrifood System Programme). TfD was created in 1996 to improve the quality of life of previously disadvantaged communities of South Africa through the transferral of food processing technologies.

2 - Background of the project

2.1 - Economic profile of the Northern Province

The Northern Province is one of the poorest regions of South Africa. With 5 million people (12.6% of South Africa's population), the Northern Province accounts for only 3% of the country gross domestic product (GDP). Per capita GDP is by far the lowest in the country: only the quarter of the national average, but between 6 and 15 times higher in the rest of the province than in the former homelands. Most of the inhabitants (70%) live in rural areas, 20% in informal urban settlements and 10% in proclaimed towns. The population is mostly composed of Black Africans, mainly Pedi (52%), Songa and Venda people. The population is predominantly young (close to 50% in 0-14 age group), with a prevalence of women (60% in 15-64 age group) as a result of high male absenteeism (37% employed outside the province as migrant workers). Most of the Black Africans earn their livelihood by subsistence farming, from pensions (580 rands per month) paid by the government to old persons or through work as migrant labourers. Moreover, the Northern Province has the highest annual population growth rate of the country (3.4%).

The Northern Province is classed as arid to semi-arid with a limited water resource. The climate is generally subtropical with a great diurnal range during winter. The average rainfall varies between 635 and 380 mm per year, but droughts are frequent. The rainy season runs from October to March. The rainfall increases from north to south and from west to east. Only 14% of the territory are arable land.

2.2 - Sorghum and millet in the Northern Province

Generally, farmers in the Northern Province grow sorghum and millet for their own consumption. Sorghum and millet are staple food in the driest part of the Northern Province: the farmers can have it three times a day: for breakfast, lunch and dinner. The main dishes made with these cereals are "bogobe" (a thick porridge made from sorghum or millet flour), "motogo" (a thin soft porridge consumed usually with milk and sugar at breakfast), "mageo" (a fermented beverage made from sorghum flour), "léwa" (a snack made from a mixture of whole sorghum grain and bean grain), and "senkgwa" (sorts of ball shaped breads made from sorghum flour, water and salt).

3 - Purpose of the project

The project is composed of two main features:

3.1 - *Diagnosis of development constraints of millet and sorghum consumption in urban areas*

The project aimed to make a diagnosis of the constraints to the development of millet and sorghum consumption in the urban areas of the Northern Province, South Africa. This diagnosis is made through a consumption study. It will answer two main questions:

- a) What is the present time importance of millet and sorghum consumption in the urban areas of the Northern Province?

Evaluate the present time importance of millet and sorghum consumption in the Northern Province, but also the economic weight these products represent in the economy of the area.

- b) What are the explanatory factors of the poor consumption of millet and sorghum in the urban areas of the Northern Province?

Identify the sources that put a brake on the increase in consumption of millet and sorghum in the towns of the Northern Province, trying to find out if it is due to:

- low availability of the products in time and space
- low diversity of millet-based and sorghum-based products
- low diversity in the recipes made from millet and sorghum
- high prices against the consumers expectations
- inadequate quality to satisfy the consumers' requirements: problems related to the taste, the convenience of use (storage period, painfulness of the proceeding), the uses, the image linked to the products.

The diagnosis concerning the millet and sorghum distribution in town, the marketing of its products between rural and urban areas and the production in rural areas, will be dealt according to the results of the study.

3.2 - *Installation of an agro-food methodology of diagnosis*

Set up an agro-food methodology of diagnosis starting with a consumption study.

This method, enriched by exchange and capitalisation of knowledge between CIRAD-AMIS and CSIR-BIO/CHEMTEK teams, would be at the same time qualitative, quantitative and participative. The project would enable to test the validity of this method (capacity, limits and difficulties).

4 - Contact

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APPENDIX 6
Indigenous fruits.
Strategy and action planning.

DRAFT

[Working version prepared for IFTT meeting on 11 October 2000.]

STRATEGY and ACTION PLAN

for

PROMOTING INDIGENOUS FRUITS in NAMIBIA

Prepared for
Ministry of Agriculture, Water and Rural Development
Directorate of Agricultural Research and Training
Indigenous Fruit Task Team

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Abstract

This paper presents a *Strategy and Action Plan for Promoting Indigenous Fruit in Namibia*. A theoretical model of a promotion strategy is used to structure the recommendations of the Promotion of Indigenous Fruit (PIF) workshop into a logical sequence. Strategic considerations are discussed in view of current conditions in Namibia. Specific actions are proposed for a five-year PIF programme. A logframe analysis of actions, an indicative budget and a time schedule are included.

1 Background

The Ministry of Agriculture, Water and Rural Development (MAWRD), through its Directorate of Agricultural Research and Training (DART), and with assistance from the Namibian Agronomic Board (NAB) and CRIAA SA-DC, organised the Promotion of Indigenous Fruit Workshop in April 2000. This workshop brought together a wide range of national stakeholders, who mandated the formation of the Indigenous Fruit Task Team (IFTT) and charged it with overseeing the development of the *Strategy and Action Plan* - the current document - based on the recommendations of the three working groups at the workshop.

The Institutional Arrangements working group recommended that:

- A national strategy is needed as a matter of priority for the commercialisation of not only indigenous fruit, but also indigenous plants¹
 - the strategy should harmonise with existing policies – agricultural, forestry, food security, wildlife, science and technology etc.
- The strategy should address
 - information, communication and information-sharing
 - co-ordination
 - mobilisation of resources (government, donor, NGO, expertise...)
 - priorities and key areas

To formulate the Strategy, the recommendations of the PIF workshop have been related to a theoretical schematic outline of key steps in the generic process of promoting indigenous botanical resources, in the hope that the result will serve as a combined «roadmap» and «checklist». Key strategic considerations are discussed in some detail, but in view of the complexity of some of the issues, the reader is also referred to the *Summary of Information on Indigenous Fruit in Namibia* prepared for, and the *Proceedings of*, the PIF workshop for a more thorough treatment of some of the topics.

¹ There has been some debate about the extent to which the PIF programme should be limited to indigenous fruit, or alternatively include other non-timber forest and veld products (e.g. medicinal plants, essential oils). The consensus that has emerged in the IFTT is that: a) fruits and fruit products should be the initial focal point, because they are relatively well-known, and their commercialisation, processing and marketing are therefore not as technically complicated as that of e.g. phytomedicines; and b) focusing on fruit as a starting point should not preclude investigating other forest and veld products that can contribute to wider goals such as poverty alleviation, enhanced rural livelihoods, etc.

The Action Plan was formulated by relating the workshop recommendations, as re-prioritised in their theoretical context, to prevailing Namibian realities around indigenous fruit, rural livelihoods systems and development intervention/implementation capacity, and to the little that is currently known about markets for indigenous fruit products. Discussions were initiated with key role players about their potential participation in the programme. On this basis specific actions and agents for their implementation were identified and structured into a five-year programme - the Action Plan - which was then plotted in a logframe format, roughly budgeted and fitted to an indicative timeframe.

Because the situation around indigenous fruit is still inadequately studied and understood, and because of the inherent uncertainties in research/trial situations, it is impossible to predict accurately how the results of one action will influence the implementation of consequent actions. The Action Plan therefore includes a large element of plan-monitor-replan. While this might not be the most convenient and mechanical solution, it is one that enhances the probability of long-term success.²

[Note: Discussions with stakeholders have been initiated, but have also been delayed by the need of potential role players to have a clearer understanding of the programme and the actions/resources/commitments that will be required of them. I therefore decided to draft the Action Plan in a «broad-brush» format so that it can be used as a tool in discussions/ negotiations with role players and hopefully ease these processes by clarifying how each activity fits into the larger programme. The details of implementing each action need to be worked out at the project proposal phase.]

2 Schematic outline of a theoretical strategy

An idealised, theoretical promotion strategy should include at least the following steps:

- a) Use a consultative and transparent process to establish an institutional framework that can co-ordinate a promotion programme based on long-term goals shared by stakeholders.
- b) Analyse traditional, existing and potential uses of indigenous fruits; identify useful, favoured and/or under-utilised species with agricultural and/or formal-market potential.
- c) Organise a trial commercialisation of fruit pre-selected for promotion and monitor the socio-economic and ecological effects, as well as the harvesting and procurement logistics.
- d) Use wild-harvested fruit obtained during commercialisation trials for essential chemical and nutritional analyses.

² Current knowledge about the promotion of indigenous botanical resources is still largely at the level of «ingredients» rather than «recipes» - i.e. there are no prescriptions that can guarantee success. What has become abundantly clear, however, is that interventions succeed or fail on their ability to accommodate and adjust to the actual - and dynamic - sets of conditions pertaining to specific resources in specific circumstances.

- e) Conduct processing trials to test processing technologies for, and products from, selected species. Identify and procure/manufacture appropriate material technologies (machines and equipment), test productivity under actual conditions, identify and solve production and management bottlenecks.
- f) Introduce samples of promising products to appropriate markets to assess response, potential demand and possible prices (phytosanitary and health regulations should be adhered to, especially when targeting the export market). Expand markets for successful products.
- g) Build the capacity of harvesting communities to organise themselves, to manage the sustainable use of their resources and eventually to take full control of the processing and marketing of their production.
- h) Combine the financial and technical data on raw materials, processing and markets into bankable co-operative and SME business plans backed up by adequate training and institutional support.
- i) Select high-yielding or otherwise desirable genotypes of species with commercial and cultivation potential and study their propagation, domestication and management; use results of these trials to propagate desirable strains (and cross-breed improved varieties). Encourage farmers to grow selected improved varieties of indigenous fruits with commercial potential.
- j) Use intellectual property rights (IPRs) to maximise benefits to producers.
- k) Monitor for results, consequences and deviations and re-plan each of these steps as necessary.

These activities are largely, but not necessarily, sequential – to deliver the best possible results as quickly as possible some of them can and must proceed in parallel. Nor are they all equally applicable to the promotion of all resources.

3 PIF workshop recommendations in context

3.1 Institutional framework

Step a) *Use a consultative and transparent process to establish an institutional framework that can co-ordinate a promotion programme based on long-term goals shared by stakeholders.*

The PIF workshop, which was a consultative and transparent process, recommended the following in this regard:

Institutional arrangements working group

- A Task Team should be established
 - comprised of the main stakeholders
 - convened by MAWRD

- The main tasks of the Task Team should be
 - develop a national strategy through a consultative process
 - organise regular workshops for stakeholders to review progress
 - scrutinise and facilitate new strategic intervention for indigenous fruit promotion
 - establish as a high priority a «central information system» for indigenous fruit promotion.

The group identified the following as important institutional components of a promotion strategy:

- Community participation in the project
- IPR issues
- Information, training and support services to project actors
- Pilot/demonstration projects

The **Resources working group**, who were asked to consider community involvement, recommended the following:

- When commercialising indigenous resources, work directly with existing community structures, including traditional leaders. Register harvester (and set household quotas if necessary) to control over-exploitation. Work with those community members who already have an interest in the use and management of a particular resource.

3.1.1 *Strategic considerations*

a) Long-term goals

The purpose of a strategy is to guide actions in a concerted manner towards long-term goals. Successful strategies are characterised by fixed goals and clear guidelines for their attainment, but also by sufficient flexibility to adapt and adopt tactics as and when circumstances might require. To keep a strategy on track despite changing circumstances and tactics it is necessary to have a shared vision of the long-term goals that the strategy is meant to achieve. The following is proposed as such a vision for PIF in Namibia:

Stable and sustainable production systems and long-term markets have been established for a range of indigenous fruits and/or indigenous fruit products, on terms advantageous to the livelihoods and food security of rural harvesters and producers in Namibia. Farmers have an economic incentive to diversify their farming systems, agro-forestry style, towards perennial indigenous crops, while harvesting communities generally have an additional economic reason to protect and extend their communal forest resources. Improved varieties of indigenous fruit, as well as extension support on how to cultivate and care for them, are readily available. A number of producer co-operatives, SMEs and larger private-sector businesses profitably process diverse indigenous fruits into high-value products for various local, regional and international markets. The participation of women and marginalised groups in the industry is affirmatively facilitated and encouraged.

b) IFTT

To coordinate a strategy and oversee its flexible and responsive tactical implementation by a diverse group of stakeholders and service providers, an appropriate institutional framework is needed. The IFTT, which brings together a range of GRN, academic, NGO and private-sector stakeholders in a multi-disciplinary and multi-skilled body, constitutes such an institutional framework (see Appendix A for membership and Terms of Reference of the IFTT).

c) Grassroots representation, organisation and involvement

The central importance of rural producers in the promotion of indigenous botanical resources is obvious. In the IFTT these producers are indirectly represented through the NNFU. However, for the successful implementation of the PIF Strategy and Action Plan, and especially for its socio-economic and ecological sustainability, it is vitally important that the institutional arrangements at grassroots level are sound and effective.

3.2 *Identifying resources with potential for promotion*

Step b) *Analyse traditional, existing and potential uses of indigenous fruits; identify useful, favoured and/or under-utilised species with agricultural and/or formal-market potential.*

3.2.1 *Generating, managing and disseminating information*

To effectively target resources for commercialisation and promotion, information must be gathered about actual and potential uses. This involves managing large and expanding quantities of data. A suitable information management system is needed to organise the data and make it available to stakeholders in a usable format. This information management and exchange function was clearly identified as a priority for the IFTT (see above).

Workshop recommendations in this regard were:

Resources group:

- Establish a database of species potentially suitable for promotion and use the selection criteria outlined to choose a shortlist of resources to promote first (also bearing in mind SADC priorities and work already done in SADC)
- There is a need to formulate effective extension messages on indigenous fruit for use by existing extension services/structures

Technical and processing group:

- There is a lack of information about the available technology options; networking and directed information gathering can help to solve this.
- There is a lack of information about the processing properties of indigenous resources; this can be addressed through literature searches and basic research (trial processing).

- Market research on selected resources and products – national regional and international markets; identify rent-seeking in marketing chain; rank best-prospect products; labelling and packaging - is a short-term priority for action.

Institutional arrangements working group:

- The information system should
 - collect information on what is done by whom in Namibia and the results achieved
 - disseminate information to stakeholders
 - identify gaps in knowledge
 - research and gather information internationally

Cognisant of these recommendations, and of the central importance of its information-exchange role, the IFTT at its first meeting initiated the establishment of the Indigenous Fruit Database (IFDB), created by and based on the records of the NBRI. The on-going development of the IFDB is regarded as an important tool in the PIF process and features prominently in the Action Plan. For the purposes of this Strategy it is important that the information generated and lessons learned at each step along the promotion «road» be incorporated into the IFDB. A major challenge will be to combine the information currently contained in a number of separate databases and/or documents into one accessible and cross-referenced data management tool. It is important that the database at all times be regarded as a tool for the achievement of practical objectives, rather than an end in itself.

3.2.1 Prioritising resources for investigation

There are two basic, complementary approaches to selecting resources to target for promotion:

- **Supply-driven**, which tries to find suitable markets for a particular resource that is already available or can be produced in significant quantities
- **Market-led**, which identifies markets or market niches for products that can potentially be manufactured from indigenous fruits.

It is advisable to use both approaches - resources that have both adequate supplies and markets are obviously priority candidates.

Workshop recommendations in this regard included:

Resources working group:

- To prioritise resources, all or some of the following **selection criteria** should be used:
 - 1 ☐ Cost-benefit analyses of promoting and developing specific resources – do the potential benefits justify the development costs? This is related to the size and potential value of the resource.
 - 2 ☐ Known or potential local markets (could bring quick benefits)
 - 3 ☐ Known or potential international markets (could earn higher returns than local markets)
 - 4 ☐ Does the resource play an important role in subsistence strategies? (If it does and it is plentiful it will be easy to promote; conversely, if it does and it is relatively scarce it could be dangerous to commercialise it.)

- 5□ How widely does the resource occur? (Promoting widespread resources can benefit many people in different regions; promoting very localised resources could benefit specific communities.)
- 6□ For action in the near future choose resources that have potential for immediate development and marketing.
- 7□ The increased harvest and/or use must be sustainable.
- 8□ The existing natural stock should be adequate to allow increased use.
- 9□ The plant should have agricultural potential (at least for medium-term cultivation) but should not necessarily be suitable for large-scale plantations (to prevent large commercial farmers from appropriating promotion efforts at the expense of smaller producers).
- 10□ Commercialisation of a particular resource should not have negative effects on communities that depend on it for a significant part of their livelihoods.
- 11□ Preference should be given to resources that can be processed with available or easily adapted technology.
- 12□ Products that can be stored (to compensate for seasonal/irregular supply) should be preferred.
- 13□ How unique are the products? (Will they have to compete with cheaper agricultural or industrial substitutes?)
- 14□ Can plants from elsewhere in the SADC region be cultivated and used?
- 15□ How many people will benefit? Who will benefit most?

(For the recommendations of the Resource group regarding specific resources, see Appendix B.)

3.2.2 Strategic consideration

Accurately selecting the potential «winners» among indigenous fruits as early as possible in the promotion process can save a lot of wasted effort, time and money. However, the facts needed to make such a selection are not clear at this stage, since much of the required data are unavailable (especially as it relates to processing, products and markets). It is therefore advisable to avoid an over-hasty choice, and to carefully investigate and systematically evaluate the widest possible range of resources for their ability to contribute to the long-term goals. In doing so, the following should be considered (more or less in this order of priority):

- a) Preferential attention should be paid to those resources that are currently available in surplus quantities. Provided they can be marketed successfully and profitably, such under-utilised «resource endowments» potentially offer the quickest return of substantial benefits to producers, at the least risk to existing livelihood strategies.
- b) Increased use and commercialisation must not pose a threat to the ecological sustainability of the resource; if possible it should serve as a stimulus for conserving bio-diversity and planting more trees.
- c) The potential of a resource to become a crop should be considered; species and genotypes with such potential should be identified for early inclusion in selection, domestication and propagation initiatives.
- d) Resources should be prioritised on the potential profitability of the products that can be derived from them. Those that offer higher returns to labour and

- investment (not just higher prices) are more likely to benefit producers and processors immediately and, in the long run, to interest farmers in their cultivation.
- e) Resources that can be processed with existing technology and promoted through existing trade channels should be accorded higher priority than those with similar profit levels but requiring extraordinary technology and/or market development efforts.
 - f) Resources that have potential for multiple uses and/or valuable by-products and/or diverse markets should be preferred over single-use or single-market resources; an important proviso to this criterion is that it is often necessary to enter into an exclusive marketing agreement with one fairly large customer to successfully introduce a novel product to formal markets, especially export markets.
 - g) Preference should be given to resources that offer unique products and/or are unlikely to face serious competition from substitutes in the foreseeable future.
 - h) The ability of a particular resource to contribute variety to possible product ranges, and/or stability to production systems, should be taken into account.

3.3 *Trial commercialisations*

Step c) *Organise a trial commercialisation of fruit pre-selected for promotion and monitor the socio-economic and ecological effects, as well as the harvesting and procurement logistics.*

The law of unintended consequences dictates that indigenous fruit should be commercialised on a trial basis before proceeding to a full-scale commercialisation, to anticipate and prevent adverse socio-economic and ecological/environmental effects. Trial purchases also offer an opportunity to ascertain when, where, in what quantities, and at what price and effort various promising species of indigenous fruits can be procured - essential data for planning sustainable and viable commercialisation and processing.

Relevant workshop recommendations included:

Resources group on environmental considerations:

- The natural gene pool should be conserved at all times (even if breeding and selection make improved cultivars widely available)
- Studies are needed to determine:
 - that sufficient seed banks are left after harvesting
 - the impact of harvesting on ecosystems and on socio-economic systems
 - how regrowth and recruitment are affected by harvesting
 - sustainable harvesting rates and methods
 - how to encourage recruitment (both natural and cultivated)
- To facilitate monitoring the effects of harvesting, the ecological requirements of the plants must be understood (including how environmental variables such as rainfall affect productivity of the resource).

Resources group on socio-economic considerations (ensuring community involvement and benefits:

- In communal areas the questions of resource and land tenure (who has legal access to resources) are key factors in determining the level of community involvement and how benefits are divided between community members
- When commercialising indigenous resources, work directly with existing community structures, including traditional leaders. Register harvester (and set household quotas if necessary) to control over-exploitation. Work with those community members who already have an interest in the use and management of a particular resource.
- Look for solutions to logistics problems and their effects on feasibility (e.g. transport, access to marketing points)
- Pay special attention to the effects on marginalised groups and women

Technical and processing group:

- Promotion is difficult until the products to promote have been selected and are available.
- Identify, as a short-term priority, potential test/pilot communities/projects with under-utilised resources

3.3.1 Strategic considerations

a) Precautionary principle

Indigenous fruits already play a very important role in rural livelihoods and survival strategies - and more so for marginalised groups and the very poor. It would be highly undesirable to disrupt this role without first putting something more viable in its place. Carefully monitored trial commercialisations at a modest scale can help implementors to identify potential problems before they become serious³, and to formulate measure to address them before proceeding to a larger scale. The more uncertain the tenurial situation around a resource, the greater the need for caution.

b) Resource availability and logistics

A very common constraint on the commercialisation of indigenous fruit is the question of harvesting and procurement logistics - a function of the fact that such fruits are typically dispersed in small quantities over wide areas. Unless and until it is shown that people can and will actually harvest a particular resource in commercially relevant quantities at a certain time of the year and make the harvest available at an acceptable price in an accessible place, there is no firm basis from which to plan further commercialisation. Data on seasons, localities, prices and available quantities are needed for financial planning of processing and marketing efforts.

³ The use of indigenous fruit in communal areas is often intertwined with wider issues of resource sharing, gift-exchange, mutual support and co-operative work, and as such governed by complex social customs and labour relations that are themselves key elements of traditional livelihood and survival strategies. Changing the «relations of production» around indigenous fruit can radically alter social relations, with unpredictable consequences. It is therefore highly desirable to involve social scientists (sociologists, anthropologists...) in monitoring the socio-economic effects of commercialisation, and to seek their active collaboration with the PIF programme.

c) *Raw materials for research*

Trial commercialisations provide the raw materials required for the next two steps.

3.4 *Chemical and nutritional analyses*

Step d) *Use wild-harvested fruit obtained during commercialisation trials for essential chemical and nutritional analyses.*

Probably because the role of indigenous crops in food security has been taken as a point of departure, there has been a tendency to over-emphasise routine nutritional analyses. On the other hand, there has been a lack of research, and a lack of publications in cases where research has been done, on the special or unique, economically significant, properties of various indigenous resources. Note that different types of analyses and tests are needed at different stages of the commercialisation process.

Workshop recommendations included:

Resources group:

- How unique are the products? (Will they have to compete with cheaper agricultural or industrial substitutes?)
- The seeds of some species of *Strychnos* might contain strychnine – is this a problem or not?

Technical and processing group:

- There is a lack of information about the processing properties of indigenous resources; this can be addressed through literature searches and basic research.
- Health and safety standards are needed to protect consumers; this can be done through training and awareness-raising, possibly in co-operation with local governments.

3.4.1 *Strategic considerations*

a) Valuable properties, processing characteristics and product development

For strategic purposes it is recommended that laboratory analyses, instead of being done routinely to generate information of dubious practical value, rather be carefully targeted at those properties of a resource that could have a direct bearing on commercialisation (e.g. analysing the fatty acid contents of oils; vitamin contents of fruit juices) or on processing (e.g. sugar, tannin and pectin contents of fruits intended for fermentation and/or preservation; fibre contents of fruits considered for pureeing). Targeted analyses play a key role at three stages of the commercialisation process: product identification and selection; technology and product development; and marketing.

b) Quality control, health and safety

When adapting traditional products or formulating new ones there is an obligation to check for possible anti-nutritional or poisonous substances to avoid ill effects on consumers. Products that have traditionally been used in substantial quantities as

food are most likely safe for human consumption - if there is reason to suspect otherwise relevant test should be done. The basic rules of safety and hygiene should be followed during processing to prevent food contamination. Specific quality-control tests might also be needed to ensure that products meet formal market specifications. In commercial-scale production for formal markets, quality control becomes an essential part of the production routine.

c) Capacity and outsourcing

Namibia's capacity to do laboratory analyses is limited, with a shortage of skilled technicians being the biggest constraint. The PIF programme should be used whenever possible as a way to build local capacity, but this consideration should not preclude outsourcing analyses under certain circumstances, especially when a resource is suspected to have commercially valuable properties that cannot be analysed adequately with the equipment or skills available locally. When more sophisticated analyses are needed for a definite commercial purpose, a reputable foreign service provider with the required facilities and skills must be contracted. In such cases confidentiality agreements must be concluded before samples are dispatched.

3.5 Processing trials and technology development

Step e) *Conduct processing trials to test processing technologies for, and products from, selected species. Identify and procure/manufacture appropriate material technologies (machines and equipment), test productivity under actual conditions, identify and solve production and management bottlenecks.*

Because material technology is so visible, there is a temptation to equate processing technology with machines and equipment, but technology is also, and as importantly, about socio-economic issues, management, processing techniques and equipment maintenance.⁴

Workshop recommendations on processing trials and technology development

Technical and marketing group

- Local processing into a low-volume-high-value product (preservation techniques) is a potential solution to problems such as transport costs, insufficient economies of scale, lack of information about where to market and of infrastructure for marketing.
- There are two distinct aspects to processing: choosing processing technologies, and managing the technologies as part of a processing enterprise.

⁴ E.g. the largest community-based trial commercialisation of indigenous fruit in Southern Africa to date - the marula fruit processing operation of the Gwezotshaa Natural Resource Trust in Botswana - imported a state-of-the-art fruit pureeing machine from the US for about N\$400 000 and had it trailer-mounted in South Africa at considerable additional expense, but then ran into serious problems because a bureaucratic bungle prevented the trailer from being licensed in time for use of a public road. Forced to use the machine as a stationary unit, the project had to contend with unforeseen transport difficulties because of an inadequate fuel supply system, as well as technical problems such as screens cracking under the impact of marula pips, with the upshot being that only 10% of the projected production of 200 tonnes was actually achieved.

Regarding technology development, the working group identified the following constraints and possible solutions:

- Available technologies are not immediately suitable for local fruits or conditions; they must be tested and adapted, possibly by using a partnership approach between Government, producers and service providers.
- Local technology manufacturing/adaptation is constrained by low demand and a lack of basic technical skills; this can be addressed through appropriate training and/or co-operation with other countries. *[Note: Although this observation is true to an extent, Namibia also has quite a sophisticated and skilled light engineering formal sector, which can provide a wide range of specialised technical services that are of use in developing technology for fruit processing.]*
- There is a lack of information about the available technology options; networking and directed information gathering can help to solve this.
- There is a lack of information about the processing properties of indigenous resources; this can be addressed through literature searches and basic research (trial processing).
- There is a lack of national leadership on technology development; this can be addressed through the institutional framework [IFTT] to bring the role players together.

As far as technology/enterprise management is concerned, the technical and marketing working group reported the following constraints and potential solutions:

- There is a shortage of well-developed institutions such as co-ops, SMEs and producer groups; this can be tackled through business orientation training and support packages, and by making a longer-term commitment to develop producer groups.
- There is a lack of maintenance, management and negotiating skills; possible solutions include mentorship and incorporating skills training into business support packages.
- Communities, CBOs, NGOs and other service providers are not aware of the opportunities; a potential answer is to develop a promotional package on opportunities, examples of successful sustainable use and the economic benefits that are possible.
- Some areas lack infrastructure such as roads, electricity and sanitation; a solution is to locate processing where the infrastructure is available (e.g. business clusters).
- The seasonal glut of fruit is a problem for keeping a business working all the year round; possible solutions are product diversification and technologies that can process more than one product (e.g. a marula press that can process juice and oil).

Lending institutions such as NDC and Agribank do not have ways to assess the viability of indigenous fruit processing business plans; this could be overcome through pilot projects using trial production to demonstrate viability – the results could be collated into a range of viable «package deals» that could be demonstrated to both SMEs and financiers.

Resources group

- For action in the near future choose resources that have potential for immediate development and marketing.

- Preference should be given to resources that can be processed with available or easily adapted technology.
- Products that can be stored (to compensate for seasonal/irregular supply) should be preferred.
- Research the technology and logistics requirements of processing marula fruit (the kernels are already used for commercial-scale oil production – promote and increase, taking care that fruit processing does not disrupt the marula kernel supply chain)
- Develop formal market products (e.g. juice, wine, jelly, liqueur, natural flavouring, ice-cream, yoghurt etc.)
- Look for solutions to logistics problems and their effects on feasibility (e.g. transport, access to processing/marketing points)
- Pay special attention to the effects [of technology] on marginalised groups and women
- Help communities to build their organisational capacity and empower themselves [also technologically]

3.5.1 *Strategic considerations*

a) Logistics, prices, localities and seasons

As was pointed out under 3.3.1 above, even when a particular resource is known to be available in large quantities the logistics of buying an adequate supply cannot be taken for granted, but must be quantified through trial purchases, which will also reveal much useful information on prices, localities where surpluses are available, and the duration/timing of the fruiting seasons of various resources. All these factors are of obvious and direct relevance to planning a fruit processing business. Disregarding for the moment the eventual possibility of a processing industry based on the cultivation of indigenous fruit (which will require at least five, and more likely ten plus, years to develop) technology and product development will need to be based on wild-harvested and semi-cultivated fruit in the short to medium term - this underscores the importance of the raw material market and price information gathered during trial purchases, even for planning larger-scale processing trials.

b) Special or unique properties and processing characteristics

As pointed out in 3.4.1 above, the special or unique properties of indigenous fruits are important considerations in product development, and therefore also in processing technology R&D.⁵ In addition to relevant chemical analyses of properties and characteristics, the subjective sensory appeal of fruits and their products should be systematically evaluated; and the physical and mechanical processing characteristics of various fruit should be investigated through systematic trial processing. This suggests a need to conduct smaller-scale processing trials to generate information needed when choosing commercial-scale technology.

⁵ Processing technology should preserve or enhance these valuable properties - e.g. pasteurisation to prevent spoilage and enzymatic browning of purees works well, but can decrease the characteristic taste so that products lack unique sensory appeal.

c) Product development

As observed in 3.2.1 above, the link between resource and market can be viewed from both directions: resource-technology-product-market, or market-product-technology-resource. If product development is approached from the resource angle, the question is: «What is available and what products can it be made into?» From the other side it is a matter of: «What does the market require and which products that can be made from a particular resource might interest it?» In either case processing technology provides an essential link between producers and buyers. Ideally, the products should be high-value, low-bulk, easy to make with simple equipment, non-perishable and profitably saleable in both local and export markets. The following non-exhaustive list of generic product ranges potentially meet these criteria:

- Fruit concentrates
- Fruit preserves (jams, jellies, conserves, pickles, atchars, chutneys etc.)
- Dried fruits (fruit leathers etc.) and other dried plant products
- Wines, spirits and fruit/herb-flavoured liqueurs
- Food, cosmetic and industrial seed and nut oils
- Essential oils and other natural flavours
- Chemical extracts (for use as medicines, dyes, poisons etc.)

The new products that are developed should preferably not push out traditional products already supplied to informal markets in production areas.

d) Selecting and sourcing technology

In many cases traditional processing methods and equipment are perfectly adequate for certain parts of commercial processing, provided they can deliver the quality and quantity of product required by the target market - if they can there are many good reasons to make full use of them in the production chain. At this level there is scope for very simple and cheap technology, and especially technology management, innovations/interventions to improve the productivity of the traditional methods, or otherwise ease their integration into commercial production (e.g. providing bags, scales and record books; minimising contamination).

Internationally, fruit processing technologies have been developed at all scales from household to heavy-duty industrial, for a variety of both fruits and processes. The topic has been extensively documented by international development agencies and NGOs and a targeted technical literature search, informed by the processing characteristics delineated during trial processing, will certainly turn up equipment (to buy or make) and methods to use that are potentially suitable for indigenous fruit processing. In other part of SADC equipment for processing indigenous fruits has mostly been custom-built or adapted from imported machines.

The technology used for initial processing trials can be adapted from existing or traditional equipment, or custom-made, and can be scaled up for commercial trials at a later stage. Once more is known about the processing of a particular resource and some processing methods have been shown to produce products with potential markets, the need arises to disseminate multiple copies of «right-sized» appropriate technologies. When this happens it is highly desirable to manufacture equipment locally so as to stimulate local technical capacity. For imports it is worth looking to neighbouring countries first, not only for reasons of SADC solidarity, but also because spare parts and technical back-up are likely to be more accessible. More

importantly, the current lack of appropriate equipment for processing indigenous fruit, and the growing interest in this form of resource use in other SADC countries, suggests an opportunity for Namibia to manufacture and export such technology.

In many cases, indigenous fruit resources have processing characteristics that necessitate adaptation or adjustment of commercially available processing equipment, which is designed for common agricultural crops. To avoid dissemination of inappropriate technologies, all equipment should be tested and, if necessary, adapted before being made widely available to producers, entrepreneurs etc.

e) Capital-intensive vs labour-intensive technology

Processing and technology development trials should contribute holistically and cost-effectively to the wider development goals of the PIF programme and should not become an end in themselves. This implies that technological solutions should be judged on their ability to improve the livelihoods and income of producers, rather than on their sheer technical ingenuity. It is desirable from the development perspective that as much as possible of the technology comprises household-level and/or labour-intensive processing, because this is the most direct and flexible way to distribute cash income to a large number of beneficiaries, and to actively involve women (who can do «flexi-time» processing at household level inbetween their other family-care, household and agricultural chores).

On the other hand, under certain circumstances centralised processing of a more capital-intensive nature might offer solutions to specific bottlenecks (e.g. unlocking markets that require a high degree of product uniformity and quality control) and «industrial-scale» processing should therefore not be ruled out as a legitimate option. It is especially important to take into account the seasonal availability of labour (many indigenous fruits are in season when crops also need a lot of attention) and to avoid the simplistic assumption that, because national unemployment levels are high, surplus labour is always and everywhere available at low prices in any quantity required.

f) Complexity, reliability and maintenance

Technical maintenance and repair services/skills are in short supply in many parts of rural Namibia,⁶ as are spare parts. It is therefore desirable that technologies intended for dissemination to remote localities are as simple and reliable as possible, and based on spares readily available in most hardware shops. Reliability is doubly important because fruit processing is seasonal and cannot afford «downtime» when the harvest is rolling in (it is not uncommon for large processing plants to work 24-7 during the season). The management of routine maintenance has proven to be a problem in many rural processing enterprises, suggesting that equipment with low and simple maintenance requirements would be more appropriate than complicated machines.

⁶ This statement should be seen in context: while there are very few trained technicians in Namibia who are not formally employed, usually in urban areas, there is no denying the creative ingenuity of any number of «bush mechanics» who regularly perform automotive miracles with old wrecks - such skills can surely be put to good use in the maintenance and repair of processing equipment, provided it is simple enough to be fixed with basic tools.

g) Productivity

The theoretical productivity of a technology is its capacity to produce under optimal conditions. Actual productivity is the effectiveness of productive effort, or production per unit of effort achieved under real conditions - it is largely a function of efficient management and is usually lower than theoretical productivity. The theoretical productivity of fruit processing technologies should strike a balance between resource availability, market demand, capital outlay and management capacity:

- the resource(s) to be processed should be available in large enough quantities to keep the technology working full-time, at least during the season
- the output should not flood the market with products for which there is no demand
- the equipment should be able to repay its own capital costs (and still generate a profit) when operating at considerably less than full theoretical capacity
- technical and business skills training (and back-up management services) should be provided at the required scale of production.

These requirements suggest that a modular approach (many copies of smaller technologies), when it is feasible, is less risky than establishing one huge centralised facility. Additionally, modular production is more resilient (problems with one module do not halt the whole system) flexible (modules can be added as the market grows) and responsive (mobile modules can go to where the resources are available). By lowering the costs of entering the industry, it also potentially spreads the benefits to be derived from processing over a wider area and between more people.

h) Management

It has been remarked that management skills are generally the scarcest development resource. The more complicated an enterprise becomes, the truer this assertion. This problem should be tackled at two levels: keeping the system simple, and providing appropriate training (backed up by mentoring when required). In managing processing technology the key requirement for economic success and financial sustainability is to ensure that the actual productivity of a technology is as high as possible - as an absolute minimum it should reach the break-even point.

i) Peripherals

Fruit processing technology typically consists of «core» equipment (e.g. press, boiler, still...) surrounded by other, peripheral equipment (for fruit handling, washing, packaging...). The efficient design and management of peripheral sub-systems is a key factor in attaining all or most of the theoretical productivity of the central processing equipment. This underscores the need for a holistic «systems» approach to technology design. «Bottlenecks» restricting production flow should be identified and the cost-effectiveness of removing them assessed.

j) Financial data

One key motivation for trial processing is to generate indicative information on the financial expectations of a business based on the trial technology, which can later be used to develop business plans for enterprises. Appropriate data-collection measures should therefore be designed into technology trial methodology and procedures.

3.6 Marketing

Step f) *Introduce samples of promising products to appropriate markets to assess response, potential demand and possible prices (phytosanitary and health regulations should be adhered to, especially when targeting the export market). Expand markets for successful products.*

Marketing is the least «sequential» activity in the theoretical promotion strategy and should be considered at every step along the way. It is placed here because it assumes even greater importance once trial processing has made products available for test marketing. It is impossible to over-emphasise the importance of market identification and liaison in the process of indigenous fruit promotion and commercialisation. Without profitable and relatively secure long-term markets, no amount of propagation, processing, product development or promotion is likely to achieve the desired results.

The following workshop recommendations are relevant to marketing:

Technical and marketing group

A major problem is the lack of market research (on consumer attitudes, domestic markets, regional and international markets, the scope and scale of potential markets) – this means a lack of information to feed into the promotion programme. Information about markets is constrained by a lack of funding, insufficient capacity to conduct market research and the fact that some (potentially major) markets are outside Namibia. Farmers and communities should be able to obtain reliable information about market opportunities and prospects so that they can make informed production decisions. Potential solutions are:

- Generally, to support market research
- Funding provided by Government and/or donors, or earned from trial production
- The Marketing Investigation Unit could contribute capacity
- Specific research could be commissioned on markets outside Namibia for specific products and the information fed back into the institutional framework
- Regional co-operation and networking could also help

Another problem is the perishability of fruits and the distances to markets. This involves high transport costs, insufficient economies of scale, lack of information about where to market and of infrastructure for marketing. Possible solutions are:

- Local processing into a low-volume-high-value product (preservation techniques)
- Improved availability of market information (e.g. marketing facilitation centre)
- Identify and address the bottlenecks in the marketing flow
- Provide simple services to facilitate national marketing (e.g. move indigenous fruit to urban markets at the right time)

As far as promotion is concerned, indigenous fruits could benefit from being clearly identified as indigenous Namibian products. There is potential for regional co-operation around the generic marketing of veld products. However, promotion is difficult until the products to promote have been selected and are available.

There are currently limited industrial markets for indigenous fruits and/or their products, either because their unique qualities have not been identified, or because they must compete with cheaper substitutes and alternatives. If industrial markets develop, there is also a danger that the natural product could be pushed out later by cheaper alternatives (e.g. vanilla). The problem can be addressed through ethical trading (where primary producers are the main beneficiaries of the trade); however, this increases production costs and must be offset by concentrating on lucrative niche markets. These considerations underscore the need to study and understand the market.

- Market research on selected resources and products – national regional and international markets; rent-seeking in marketing chain; best-prospect products; labelling and packaging - is a short-term priority for action
- Identifying private stakeholders for possible co-operation is also a short-term priority
- Establishing a marketing investigation unit – to do market matching, market information, market research - should be investigated in the medium-term
- Bottlenecks in infrastructure/logistics for marketing should be identified
- A generic promotion strategy should be developed
- Quality and standards requirements of markets should be established

Resources group

- The program should consider promoting the use of all indigenous plants with economic potential that could be **cash** crops
- Known or potential local markets could bring quick benefits
- Known or potential international markets could earn higher returns than local markets
- For action in the near future choose resources that have potential for immediate development and marketing

3.6.1 Strategic considerations

a) Funding market development

Adequate funding must be provided for market development work, including liaison with potential buyers; since this work is dynamic, evolutionary and hard to plan in detail and in advance, flexible and responsive mechanisms are needed for apportioning funding and directing its spending.

b) Market sustainability

To be sustainable, markets must be able to absorb a substantial quantity of product(s) at prices high enough to guarantee full cost recovery and a fair profit for producers. This implies that public and development sector funding for market development must not be used for price support – the real on-going costs of producing for and accessing particular markets must be built into prices right from the start.

c) Market requirements

The requirements of specific markets must be researched and taken into full account when developing products; the active collaboration in product development by the potential buyers/clients is highly desirable. Products «custom-made» for suitable market niches are more likely to succeed; conversely, many products that in theory seem perfectly marketable fail because they were not developed with real markets in mind.

d) Marketing fresh produce

Given climatic and infrastructural realities in Namibia, the marketing of fresh fruit and perishable products (with the possible exception of frozen products) is probably best targeted at very local markets; this should not, however, preclude the investigation of more lucrative markets, especially for more expensive fruits with better keeping qualities. If the price is high enough to justify refrigerated transport, urban marketing and exports of fresh «novelty» fruits might be possible. This price equation might benefit from the surplus of refrigerated transport out of the NCAs, where most indigenous fruit is produced (many trucks currently run back empty due to high imports of fresh produce and low or no exports).

e) Marketing value-added products

Whenever possible, markets for value-added products should be preferred. Marketing of raw materials should preferably be restricted to Namibian producers of such value-added products. The export of unprocessed raw materials to industrialised countries is a key contributor to the continuing economic underdevelopment of African countries and such exports should be avoided or used as an absolute last resort.

f) Maximising producer benefits

Maximum use should be made of the potential of vertically integrated co-operatives to optimise benefits to primary producer by controlling products from raw material to market. Such producer-controlled enterprises have good access to «fair trade» markets. Every effort should be made to avoid exploitative marketing, in which «middlemen» profit at the expense of primary producers.

g) Regional market co-operation

Most of the fruits indigenous to Namibia also occur in other SADC countries – full use should be made of opportunities and initiatives for regional co-operation on international marketing. Since these fruits are already known in the region, SADC countries are potentially important markets for Namibian products (including processing technology).

h) Market expansion

When developing markets for new products that are available in limited quantities, care should be taken to strike a balance between supply and demand. It is especially important not to over-estimate the quantities that can be made available quickly at short notice, or there is a risk of raising and dashing expectations, with the result that

markets lose interest.⁷ Conversely, if successful products have been developed from a resource and it is being cultivated in increasing quantities, additional markets should be investigated in good time to prevent a glut from depressing prices. In the short-term, measures to expand markets for traditional products should be investigated - doing so is potentially a simple and direct way to boost income while assessing the real extent of an apparent resource surplus.

3.7 Strengthening grassroots organisation

Step g) *Build the capacity of harvesting communities to organise themselves and to manage the sustainable use of their resources (the role and empowerment of women and marginalised groups must be considered at all stages).*

As pointed out in 3.1.1.c above, community-level institutions have a key role in the sustainable management and utilisation of indigenous fruit. When the new Forests Act is passed and Community Forests become a reality, this role will become even more important. Interventions to commercialise common-access resources can have severe repercussions on both livelihoods and resource sustainability unless the rights of traditional users are jealously safeguarded.

Relevant workshop recommendations included:

Resources group

Ensuring community involvement and benefits:

- In communal areas the questions of resource and land tenure (who has legal access to resources) are key factors in determining the level of community involvement and how benefits are divided between community members
- There is a need to formulate effective extension messages on indigenous fruit for use by existing extension services/structures
- When commercialising indigenous resources, work directly with existing community structures, including traditional leaders. Register harvester (and set household quotas if necessary) to control over-exploitation. Work with those community members who already have an interest in the use and management of a particular resource.
- Make communities aware of their legal rights
- Introduce incentives to stimulate positive community involvement (bearing in mind such factors as entrepreneurial attitudes and cultural practices/taboo)
- Commercialisation of a particular resource should not have negative effects on groups that depend on it for a significant part of their livelihoods. Pay special attention to the effects on marginalised groups and women
- Help communities to build their organisational capacity and empower themselves

⁷ This applies particularly to industrial markets that use indigenous fruits or their semi-processed products as raw material for further processing. Before incurring the risk and expense of product development, such manufacturers want to be absolutely sure that the resource is large enough, and the raw material supply reliable enough, to justify their troubles. Unfortunately there is also an element of once-bitten-twice-shy in this, because of experience with projects that promised more than they could deliver.

- Start investigating the genetic variability of promising resources and collecting germplasm for use in selection and improvement – actively involve farmers and communities in the selection of superior specimens (tie in with DoF project)

Technical and processing group

- There is a shortage of well-developed institutions such as co-ops, SMEs and producer groups; this can be tackled through business orientation training and support packages, and by making a longer-term commitment to develop producer groups.
- There is a lack of maintenance, management and negotiating skills; possible solutions include mentorship and incorporating skills training into business support packages.
- Communities, CBOs, NGOs and other service providers are not aware of the opportunities; a potential answer is to develop a promotional package on opportunities, examples of successful sustainable use and the economic benefits that are possible.
- There are no dedicated financial institutions or mechanisms to support indigenous fruit processing; the pending National Rural Finance policy *[which accepts mutual guarantees as a form of collateral]* could solve this, while a clear national program and an institutional framework for fruit processing could facilitate donor support.
- Many prospective entrepreneurs lack collateral for loans; this could be addressed by demonstrating the financial viability of fruit processing, or by mobilising savings *[possibly through community-level credit associations]*.
- Identify potential test/pilot communities/projects with under-utilised resources.

Institutional arrangements group

- Weak grassroots community institutions are a constraint on the programme, but Government is committed to grassroots development
- SME and co-op support and development services exist

The working group identified the following strategic institutional components:

- Community participation in the project
- IPR issues *[including traditional knowledge]*
- Information, training and support services to project actors *[including farmers/harvesters]*
- Pilot/demonstration projects *[which need grassroots partners]*

3.7.1 Strategic consideration

a) Sustainable resource use

It is widely believed that effective community-level management is a key element of protecting, conserving and sustainably using natural resources, and that interventions to increase community perceptions of the economic value of natural resources will lead to enhanced conservation efforts. However, without strong grassroots institutions to regulate harvesting, there is a danger that the commercialisation of indigenous fruits - especially those harvested under an open-access tenure regime - will lead to over-exploitation, and possibly to conflict. Similarly, without an effective organisation through which to redistribute benefits to all

members of a community, commercialisation, rather than promoting conservation and sustainable use, is more likely to stimulate short-term strategies and thus cause a «tragedy of the commons».

b) Strengthening existing community institutions

Community activation and liaison, especially in remote rural areas, can be very expensive in terms of time and transport. While some costs are unavoidable, it is advisable to contain expenditure by working with, and thus strengthening, existing community-level organisational structures whenever possible. Moreover, given the consensus that exists on the need for an integrated and holistic approach to rural development, it would be counter-productive to create additional single-purpose organisations or institutions especially for the promotion of indigenous fruits. This consideration also applies to indigenous fruit extension services, which are best provided through targeted support to existing agriculture, forestry and NGO extension agents, especially the FSRE units being established in the NCAs.

c) Producer co-operatives

Facilitating grassroots control over commercialised resources can help to spread the economic benefits more equitably between more people. It is therefore strategic to pursue producer control over resources and processing technology by building the capacity of producer co-operatives, using the available small business and co-operative development services in Namibia. Producer control also enables access to lucrative «green» or «fair trade» markets. Furthermore, co-operatives that control their products from field through factory to market secure a larger total share of profits for producers, thus compensating for the low remuneration of primary production, increasing the attractiveness of the undertaking to farmers and enhancing the probability of achieving the long-term development goals.

d) «Community» and inequality

The concept of «community» is problematic in that it tends to gloss over the very real and substantial inequalities that typically prevail among most groups of humans. Putting too much faith in a mythical «community» with supposed convergent interests can result in a failure to protect the interests of the poorest and least powerful. This is especially true of marginalised groups like the San, and of women-headed households in patriarchal societies - the exact groups that currently rely more than their neighbours on indigenous fruit. Likewise, there is a danger that powerful or rich people in the community will appropriate indigenous fruit resources for their own benefit, so that the resulting economic development not only fails to alleviate poverty, but actually deepens inequality. Pro-active measures should be built into promotion interventions to prevent such undesirable effects.

e) Technology transfer

To promote the development of an indigenous fruit industry that eventually functions profitably and sustainably without public-sector support it is necessary that knowledge (e.g. about resource management and markets) and technology be transferred from the public to the private sector. As has been argued above, it is highly desirable from a rural development perspective to target this technology transfer primarily at producer co-operatives, so as to maximise the economic returns

to primary resource users. The need to transfer technology should be a key consideration at all stages of the programme. However, it is risky to disseminate new technology too early, before a market is firmly established and production hitches have been ironed out - doing so can disrupt product supply, undo market development efforts and disillusion both producers and clients. Most importantly, technology should only be transferred completely once the recipients are organisationally strong enough to manage it effectively, i.e. able to maintain the required production, quality and profitability.

3.8 *Business plans*

Step h) *Combine the financial and technical data on raw materials, processing and markets into bankable co-operative and SME business plans backed up by adequate training and institutional support.*

Public-sector support for trial commercialisation and pilot projects will only lead to sustainable economic growth if and when it results in the creation of viable businesses. A key consideration is that financial institutions need reliable data as a basis for granting credit to such businesses.

Relevant workshop recommendations were:

Technical and processing group

- Communities, CBOs, NGOs and other service providers are not aware of the opportunities; a potential answer is to develop a promotional package on opportunities, examples of successful sustainable use and the economic benefits that are possible.
- There are no dedicated financial institutions or mechanisms to support indigenous fruit processing; the pending National Rural Finance policy could solve this, while a clear national program and an institutional framework for fruit processing could facilitate donor support.
- Many prospective entrepreneurs lack collateral for loans; this could be addressed by demonstrating the financial viability of fruit processing, or by mobilising savings.
- Lending institutions such as NDC and Agribank do not have ways to assess the viability of indigenous fruit processing business plans; this could be overcome through pilot projects using trial production to demonstrate viability – the results could be collated into a range of viable «package deals» that could be demonstrated to both SMEs and financiers.

3.8.1 *Strategic considerations*

The specific strategic considerations pertaining to raw materials, processing and markets have been dealt with above. For the purposes of this step in the strategy the main considerations are to consult with providers of finance about their business plan requirements, collect the relevant information in a structured way and include it in the IFDB for later analysis and compilation. While there is a good argument for subsidising business support to producer co-operatives, technology dissemination to private enterprises should be on a full cost-recovery basis.

3.9 Domestication, propagation and genetic improvement

Step i) *Select high-yielding or otherwise desirable genotypes of species with commercial and cultivation potential and study their propagation, domestication and management; use results of these trials to propagate desirable strains (and cross-breed improved varieties). Encourage farmers to grow selected improved varieties of indigenous fruits with commercial potential.*

In the longer term, the sustainability and growth of an indigenous fruit industry will depend on the extent to which preferred species can be domesticated and cultivated as agricultural crops. There has already been a substantial body of work on the selection and propagation of indigenous fruit trees, both in SADC and elsewhere (notably Israel). Namibian genetic material has been included in most of these efforts. This component of the strategy has already started and, because it is long-term, a concerted effort should be made to increase its scope as rapidly as possible.

Applicable workshop recommendations included:

Resources group

- The plant [*selected for promotion*] should have agricultural potential (at least for medium-term cultivation) but should not necessarily be suitable for large-scale plantations (to prevent large commercial farmers from appropriating promotion efforts at the expense of smaller producers).
- Can plants [*or genotypes*] from elsewhere in the SADC region be cultivated and used?
- The natural gene pool should be conserved at all times (even if breeding and selection make improved cultivars widely available)
- Studies are needed to determine:
 - that sufficient seed banks are left after harvesting
 - the impact of harvesting on ecosystems and on socio-economic systems
 - how regrowth and recruitment are affected by harvesting
 - sustainable harvesting rates and methods
 - how to encourage recruitment (both natural and cultivated)
- Appropriate species mixes for diversification/polycultures should be investigated.
- Select marula trees with the most desirable traits (including oil producing characteristics of the seeds/kernels)
- Fresh *Strychnos* fruits are very popular and the resource base is not very large – can production be increased through cultivation? What do other SADC countries know about cultivating *Strychnos*?
- Start investigating the genetic variability of promising resources and collecting germplasm for use in selection and improvement – actively involve farmers and communities in the selection of superior specimens (tie in with DoF project)
- There is a need to formulate effective extension messages on indigenous fruit for use by existing extension services/structures

Technical and processing group

The seasonal glut of fruit is a problem for keeping a business working all the year round; possible solutions are product diversification and technologies that can process more than one product (e.g. the marula press that can process juice and oil).

[Another potential solution is extending the season by making early and late varieties available to farmers.]

Institutional arrangements group

The promotion of indigenous plants should be included in the mandates of FSRE units and agricultural extension service (holistic approach) and closer co-operation with other extension services (e.g. forestry) should be promoted.

3.9.1 Strategic considerations

a) Recruitment

The National Forest Inventory and other sources report insufficient recruitment of most indigenous fruit tree species in most parts of most communal areas. Promoting indigenous fruit on the basis of an ageing natural resource endowment likely to die off in a few decades is not sustainable. If the PIF programme succeeds, the demand for indigenous fruits will increase - it is just as well to anticipate this to prevent set-backs caused by under-supply. Natural recruitment and active planting should be encouraged (as it has been by a variety of actors), even if the very best genetic material is not yet available.

b) DoF/FAO project

The proposed DoF project ***Improvement and Promotion of Selected Indigenous Fruit Trees in Namibia*** is being considered for funding by the FAO. The project is based on a «market-driven, farmer-led» approach to domestication and genetic improvement, which involves target communities directly in the ranking and collection of preferred phenotypes and makes extensive use of on-farm trials and direct dissemination of results to the target audience. Since DoF is the obvious institution - in terms of technical and infrastructural capacity - to undertake such work, it is recommended that the IFTT strongly support this project. The proposal also includes advanced technical and market research development components. If the project is funded, it would be strategic for DoF to adjust these components so that they complement, rather than duplicate, similar work done by other institutions under the auspices of the IFTT.

c) SADC project

The SADC Tree Seed Centre Network (in which DoF is the Namibian partner) has formulated a regional project on domestication of indigenous trees for semi-arid areas of Southern Africa. The TSCN has already done much to exchange germplasm between SADC countries and can facilitate Namibia's access to a wider pool of partially selected genetic material (including provenances originally obtained from Namibia). It is strategic for the PIF programme, through the DoF, to work closely with this project.

d) Selection criteria

The selection methodology favoured by the SADC TSCN and the DoF projects emphasises farmer surveys to determine the most desirable traits to breed into

improved indigenous fruit trees. While this approach has much to commend it - not least the active involvement of farmers - it needs to be supplemented by input on the requirements of various markets and the potential economic value of selecting for specific traits.

e) Propagation and management

Vegetative propagation (e.g. grafting) is the key to multiplying elite genotypes quickly. Grafting also induces earlier fruiting in some species. If at all possible, the propagation and management methods developed should be simple enough to be used, with a minimum of training, by farmers anywhere in rural Namibia. Extension efforts in this regard should be accelerated.

f) Polycultures and diversification

An important reason for promoting indigenous plants is that they are agro-ecologically better adapted and therefore more reliable producers, so that their increased inclusion in farming system will add diversity and resilience to total agricultural production. The more diversified agro-forestry production systems are, the more stable and resistant to extreme climatic conditions and pests or diseases they are. It is therefore desirable to promote diversification by finding creative ways to combine the cultivation of exotic and indigenous crops in complex polycultures. Monocultural cultivation of indigenous trees has been shown to negate many of their inherent pest-resistance advantages; such plantings should be pursued with caution, if at all.

3.10 IPRs and producer benefits

Step j) Use intellectual property rights (IPRs) to maximise benefits to producers.

IPRs can potentially increase the benefits producers derive from indigenous resources. At the moment IPRs based on traditional knowledge are receiving a lot of attention internationally, and while the principle of benefit-sharing is widely accepted in theory, there are as yet few guidelines on practical mechanisms for sharing benefits with the owners of traditional knowledge. This suggests a need to stay proactive in this regard and to contribute actively to the international legal process that is currently hammering out such guidelines.

Of the trade-related intellectual property rights, trade marks and brand names are the easiest to register and protect, while the situation around appellations of origin is fluid. Plant breeder's rights are straightforward though time-consuming to get, but harder to protect and of limited value (except on important crop plants). Patents on novel applications of products are potentially the most lucrative IPRs, but also hardest and most expensive to get, and potentially expensive to defend. Furthermore, there is a strong and growing body of world opinion against «patents on life», which is entangled with the rumpus around genetically modified organisms.

The idea that groups can have collective ownership over, and derive collective financial benefits from, traditional knowledge is novel and largely untested - a complication made worse by the fact that few indigenous fruits are endemic to

Namibia, most also being indigenous to other countries and included in other traditional knowledge systems. Nevertheless, a broad consensus is emerging that at the very least no restrictive rights should be registered over resources identified by reference to traditional knowledge without sharing benefits with the community.

Nationally, nascent legislation to control access to indigenous genetic resources is directly relevant to the strategic need to inform communities of their rights and of national regulations, so that they do not unwittingly co-operate with bio-pirates, and to anticipate and prevent attempts to appropriate traditional knowledge for private gain. However, establishing and defending IPRs is costly and should not be tackled without due consideration of the on-going expense. Legislation enables partnerships (on the basis of prior, informed consent and benefit-sharing) between communities and private enterprise - the options this offers should be evaluated. All the constraints notwithstanding, full use should be made of IPRs where possible, including patents that can overcome the obstacles.

4 Strategy into Action: objective considerations

The aim of this section is to elucidate, within the context of the Strategy outlined above, certain realities, options, opportunities and constraints pertaining to the promotion of indigenous fruit in Namibia over the next five years.

4.1 Monitor and replan

While the initial actions to take in a Namibian PIF programme are fairly clear, the knock-on effects of such interventions over a five-year period render the later stages of the Action Plan much more conditional and uncertain. Monitoring and replanning are therefore very important on-going parts of the Action Plan. It is recommended that:

- IFTT releases funding for the PIF programme in stages after reviewing progress made and lessons learned, and after evaluating proposed activities for their continued relevance to strategic objectives
- IFTT organises at least two expanded meetings, or mini-workshops, a year - one to review work in progress/ share information, and one to set spending priorities for the next funding cycle
- An independent evaluation of the programme is contracted after two years

4.2 Resource endowments

Very little that is commercially relevant is currently known about most indigenous resources, including most fruiting species - this fact was presented in the Strategy as a reason to investigate resources systematically. Since variety is a valuable commodity in itself, it is proposed that trial purchases include (in small quantities) all indigenous fruits that can be bought. In some cases it might even be necessary to collect from the wild interesting fruits that are not traditionally harvested. [Fruits that are traditionally not used because they are unpalatable may nevertheless, with the

addition of enough alcohol, sugar and cream, make good ingredients for liqueurs, or be sources of other interesting products like oils.]

However, certain resources are abundant enough (and well enough known) to present *prima facie* cases for commercialisation trials, and should not have to wait until other resources have been assessed. The fruiting species already known to occur in commercially viable quantities in some areas are (at least) marula, manketti, melons, makalani palm and Inara. The Action Plan therefore pays particular attention to promoting these resources right from the start and treats them in a different way, at a much bigger scale.

Several other fruits, including *Adansonia*, *Berchemia*, *Diospyros*, *Grewia* and *Ximenia* are also potentially available in larger quantities, but the extent of this availability must be ascertained more exactly (e.g. it is known that *Berchemia* fruits sporadically, which could cause severe cash flow difficulties for businesses based on processing it). In addition to small purchases of all fruit available in informal markets, and purchasing larger quantities of priority species, it is therefore recommended that the trial purchases be accompanied by a socio-economic survey of resource availability. Since there are added benefits to be derived from commercialising resources that are not traditional favourites, community identification of available resources must be cross-checked with the Forest Inventory of species occurring in the area, and with data on possible uses.

4.3 *Product/technology/market development*

These three inter-related areas are the crux (if not the alpha and omega) of promoting the commercialisation of indigenous fruits.

4.3.1 *Opportunities suggested by available resources*

In view of the fact that several interesting indigenous fruits are currently and for the foreseeable future only available seasonally and in limited quantities, and since it is desirable from a bio-diversity perspective to commercialise many species simultaneously, it is suggested that the PIF programme as a top priority develops a product range that can accommodate a variable number of resources in limited quantities and with a great deal of storability, marketability and price flexibility. It will be of additional benefit if the products are also recession-proof and highly taxable.

The proposed solution is to focus the initial processing and technology development trials on the development of a range of indigenous fruit-flavoured liqueurs, schnapps, wines and other alcoholic drinks (which could be brought to market relatively quickly at profitable prices) while also systematically assessing a range of other processing characteristics (which can at best lead to priorities for further R&D). It is conceivable that one or two of the products developed might eventually go on to compete with *Amarula*, but the initial marketing focus should be on the niche offered by German tourists who, even if they do not drink schnapps themselves, probably know someone who does who would appreciate an interesting gift from Africa. Ample opportunities for market expansion exist in SADC tourist outlets if the packaging is carefully designed to play up (Southern) Africa rather than Namibia exclusively.

Closely related to the liqueur and schnapps trials is an investigation into the technical and economic feasibility of commercial (and modular) distillation of kashipembe from manketti fruit (one of the resources available in large quantities), combined with improved processing of the nuts that would be a by-product. Depending on the outcome of trials, the kashipembe can be marketed «neat» as an indigenous spirits (at prices too high to be competition for traditional kashipembe in local markets), and/or used as a raw material for other liqueurs. A similar approach is proposed for makalani palms fruits, as well as other resources that might turn out to be available in large enough quantities.

Marula should obviously be included in the above trials, but there is also a large local market for traditional marula wine in the production areas, which not only provides cash income but plays an important social role in e.g. relations with neighbours. Moreover, the marula oil project has just proceeded to commercialisation and it would be unwise at this stage to risk disrupting the kernel supply by concentrating large quantities of processed marula nuts in one area. On the assumption that local demand for marula wine is not yet completely supplied due to a shortage of labour for the very time-consuming traditional processing methods during the fruiting season (which is also agriculturally intensive), the first intervention suggested around marula is to disseminate a number of small hand-operated juice presses to known producers of marula - the member associations of the Eudafano Women Co-operative and, except for the improved technology, to let them get on with production and marketing through traditional channels. This will allow three important considerations to be assessed:

- The extent of the production surplus after local demand has been more fully supplied
- The feasibility of buying juice rather than whole fruit for further processing and marketing
- The practicalities of managing a small fruit processing enterprise under rural conditions

To supplement this quick and basic intervention and provide a basis for comparison, managed trials of the same technology should be conducted under controlled conditions.

Considering that Namibia's total marula production could theoretically be as high as a million or more tons a year, it is believed that local markets cannot absorb the potential production, even if technology were to substantially increase product availability. The Action Plan therefore includes longer-term components to develop a technology for producing marula puree at an appropriate scale, and to develop reliable urban and industrial markets for substantial quantities of puree.

Of all indigenous resources, wild melons are furthest along the road to becoming agricultural crops. In fact, some indigenous varieties of melon are traditional crops and can no longer be regarded as «wild». Being annuals, melons also offer much quicker agricultural development benefits - they are potentially one of very few crops that can be grown on drylands in the Omaheke and some parts of Otjozondjupa. The expansion of melon cultivation is however dependent on the development of suitable markets. At present the most profitable product of this fruit is its seed-oil, while the bitter fruits might be suitable for liqueurs. A number of actors at various scales are already processing melon seed into oil in Namibia. Preliminary trials have shown that

low average oil yields are a constraint, pushing up prices and hampering the development of markets. On the other hand, there is a considerable variation in oil yield between strains, which should be investigated. There is also scope for technological improvements to increase oil extraction rates. Additional market development work is required.

!Nara is one of the few indigenous fruits endemic to Namibia. An estimated eight tons of seeds are annually exported to South Africa, which is the only known market, and there are no formal markets for the fruit pulp. An intervention to formulate new and interesting products for local, tourist and export niche markets could substantially increase the value of the resource to the community. It will also help to make the PIF programme more national in character.

4.3.2 *Product/technology R&D*

This section deals with technology-related activities that are required immediately or in the first two years of the programme. Other technology R&D work might be suggested later by the results of the processing trials. The technologies used for initial trial processing will almost invariably need to be adapted and scaled up before being suitable for wider dissemination.

a) Juice and oil presses

A small imported screw-press designed for pressing grapes has been tested with marula and demonstrated in northern Namibia by CRIAA SA-DC on behalf of MAWRD. The Katutura Artisans' Project (KAP) can manufacture adapted, portable versions of such a press for dissemination in marula producing areas and, if the intervention is successful, train suitable people to manufacture more. For processing trials in which higher pressures are required, the Kapmond cage-and-plate oil press can be used with its optional nickel-plated fruit cage. This press is also ideal for trial processing of seeds and nuts into oil. Given that KAP's experience with processing oils (marula, manketti, melon seed, jatropha, castor bean) it is the obvious institution to do oil processing, and possibly also some fruit pressing for other trials.

b) Fermentation trials

Unam's Department of Food Science and Technology at Neudamm has the equipment (including a sterile, temperature-controlled environment) and experience required for fermentation trials. MAWRD is prepared to re-direct some of the funds still available in DRD's veld products project towards these trials. Initial trials are envisaged at a laboratory scale of 50 litre batches. Scaled-up production of successful products can use technology from the dairy, wine-making or brewing industries.

c) Distillation trials

One of the great advantages of alcoholic spirits is that they can be stored for long periods without losing quality. This makes them ideal products for rural areas with limited transport and refrigeration technology - a fact long recognised by the many rural people who produce kashipembe or ombike as a source of cash income. However, traditional spirits have been known to cause methanol poisoning, and is of

very uneven quality for formal markets. It is suggested that the potential of distillation to add value to indigenous fruits be investigated in two ways: by conducting controlled fermentation and distillation trials at a very small scale to test the quality of the alcohol produced from fermenting and distilling various fruits in various ways, and by setting up a larger still to re-process «raw» traditional spirits purchased from rural «moonshiners» into a uniform product suitable for more formal markets⁸. If this arrangement proves to be workable, there might later be a need to design better, safer and more fuel-efficient stills for use by «first line» distillers in rural areas. Initial distillation trials can be conducted at KAP and/or Neudamm.

d) Liqueurs

Initial trial formulation of liqueurs can be done on a small scale at KAP, Neudamm and/or other participating institutions. The product development work requires only some food grade containers and recycled bottles, but if and when successful products have been identified, the mixing containers will have to be scaled up and higher-capacity bottling equipment will be required.

d) Essential oils and natural flavours

Essential oils and other natural flavours are potentially some of the most valuable products that can be made from indigenous fruits. To identify promising candidates it is suggested that a steam distillation process be used, since it yields a much higher quality product than solvent extraction (which should nevertheless be considered as a cheaper and more cost-efficient alternative where appropriate). A small steam still will be required for initial trials; if successful products are identified, larger stills will have to be purchased or made. Since the distillation of essential oils usually requires a large quantity of raw material, it would be appropriate to use a portable still to conduct the initial trials *in situ*.

e) Concentrated, conserved and dried fruit products

Initial discussion with beverage manufacturers have revealed their keen interest in possibly developing products from indigenous fruits, provided the raw material can be made available reliably and without problems - the most practical way to do this is to process fruit locally into a puree or concentrate that can be transported cost-effectively for further processing at a central facility. There are known and potential markets for unusual preserves, jams, jellies and dried fruit products, which can also be made from puree/concentrate. In this regard it is suggested that general processing trials first be conducted at a very small scale, using kitchen equipment, so as to investigate potential solutions to the key problem of effectively preserving fruit concentrates during storage and transport to the market, and also to make available sample products for market testing. Appropriate equipment can be sourced when more is known about the availability and processing characteristics of fruits for which potential markets have been identified.

On the assumption that the marula resource is probably large enough to support a substantial production of concentrate, it is further suggested that appropriate macerators for making marula puree are investigated early in the programme, so that

⁸ South Africa's famous KWV wine-making co-operative operated in this manner, buying brandy from small on-farm distillers, before motorised transport became widely available.

suitable technology can be sourced in time for much larger production trials during the 2002 marula season. KAP would be a suitable service provider for this work.

Additionally, it is suggested that an appropriate low-cost (probably solar) drier be developed as soon as possible - even if it eventually does not become an important fruit-processing technology for commercial markets, it can make a contribution to food security (by enabling household to store more indigenous fruits for own use). Such a drier will also complement initiatives around the improved utilisation of indigenous «spinach» (part of the Unam project). The drier can be designed and built at KAP.

f) Chemical extracts

A systematic evaluation of all the possible chemical extracts to be derived from Namibian fruits and plants is probably beyond the country's technical capacity at present. However, this should not preclude investigation (with foreign technical assistance if required) of very promising products, or of potentially valuable extracts that can be made with simple methods (e.g. dyes that can be extracted by boiling). Since the identification of such resources falls directly in the ambit of NBRI's Useful Plants project, it is suggested that NBRI leads a targeted literature search to complement its existing information on the subject - this can be a very useful part of the growth and development of the Indigenous Fruit Database.

4.3.3 Market identification, research and liaison: Funding of

Promoting indigenous fruits beyond the household and local informal market levels implies that someone has to spend time on, firstly identifying products that might interest particular markets, secondly investigating the potential clients in those markets and ways of accessing them, thirdly introducing the products to selected clients (meanwhile attending to the shipping and analysis of samples, confidentiality agreements, pricing etc.) and fourthly liaising closely with the clients until such time as the marketing function can be taken over by the producers or some other private sector actor.

In an ideal world the money to be made would serve as an incentive for entrepreneurs to perform these function, but it is high-risk work that has not been stimulated adequately by market mechanisms. Nor has it been adequately funded by donors.⁹ For these reasons, and because successful and profitable marketing is of such strategic importance to the whole PIF programme, the establishment of a mechanism to deliver flexible and responsive market development work is strongly recommended - as a way to unblock probably the single most restrictive bottleneck in the promotion process, it is an ideal opportunity and vehicle for public-sector and donor intervention in the development of indigenous resources.

It is suggested that, especially from the second year on (when samples of a number of promising products will be available), a significant part of the programme budget be set aside for marketing work, to be allocated by the IFTT on the basis of results delivered and further work required. This will allow the IFTT to respond flexibly to the

⁹ This will change if and when the proposed IFAD-funded Southern African veld products marketing project (currently being formulated) becomes a reality.

dynamic realities of on-going negotiations with clients, while maintaining control of how effectively funds are spent.

4.4 *Agents, partners, capacities and roles*

[This is still very much in draft format and subject to discussion, but is intended as an indication of how I see the workload best being matched to the capacity and expertise available from those stakeholder/role players who are either already active around indigenous fruits, or have expressed an interest in getting involved]

IFTT - stakeholder information exchange, project guidance and co-ordination (especially inter-ministerial), allocation of discretionary spending, ...

MAWRD - funding (and possibly transport), project planning and supervision, co-operative development support, extension services, office space, ...

MAWRD (NBRI) - information and database management, expert botanical input (e.g. positive species identification), collection and storage of germplasm, premises and facilities, ...

MHETEC - science and technology policy support, funding for value-adding research(?), premises (COSDECs), ...

MET - natural resource harvesting control and guidance, bio-diversity and indigenous knowledge support, ...

MET (DoF/National Forestry Research Centre) - selection, domestication and propagation of IFTs, collection/storage/exchange of germplasm, policy and financial support for commercialisation trials, Community Forests, Forest Inventory (resource identification), ...

MTI - support to SME and trade aspects, facilitation of legal and licensing requirements for alcohol production (including liaison with MoF re excise), ...

MWACW - support for women producer groups, ...

NDC - enterprise development

Agribank - production and equipment loans

NAB - budget administration and consultancy supervision, ...

Ohangwena Regional Council - (?) might be prepared to provide premises, transport and community liaison services as part of its poverty alleviation project, ...

Unam DFST (Neudamm) - premises, facilities, equipment and expertise for fermentation trials, possible other processing trials, ...

CRIAA SA-DC - consultancy services, project implementation management services, community liaison services, technical literature searches, market identification and liaison, local market development, ...

KAP - cost-effective technology R&D, manufacturing and training; trial processing of oil seeds, technology maintenance and management support, other processing trials (juice, liqueur, preserves etc.), ...

NNFU - liaison with farmers nationwide, ...

DRFN - liaison with Topnaar community trust, database design support, possible resource assessments during Summer Desertification Programme, ...

Topnaar community - traditional owners of !nara resource

Eudafano Women Co-operative and its member associations - major marula stakeholders, community-level partners in harvesting of fruits, commercial marula oil production, trial marula juice production, ...

Ohangwena Forest Trust - community partner (if funded by NNF/SIDA Local Environment Fund)

Omaheke resettlement communities/Oxfams in Namibia/Omaheke Rural Livelihoods Project/Omaheke San Trust - resource users, harvesters, project partners, possibly funding for specific aspects of the work, melon cultivation, oil processing

Traditional distillers - partners in spirits project

Breweries and beverage companies - possible product development partners, distribution and marketing services, potential clients, ...

CIRAD - project evaluation and advice, possible technical assistance, ...

Yetu Cosmetics - melon seed buyer and processor

5 Action Plan outline

[Years 3-5 are still too unsure to plan in detail at this stage]

Year 1 (April 2000 to March 2001)

PIF workshop held

IFTT formed; TORs drafted

IFDB initiated to prioritise resources

Strategy and Action Plan developed

Literature and market surveys done

Trial purchases organised, with socio-economic resource survey

Ten small marula juice presses disseminated

Trial technology researched/procured/manufactured

Trial processing protocols developed

Trial purchases and basic small-scale trial processing of as many resources as possible started (including !nara and melons)

Marula juice and kashipembe/ombike production investigated in more detail

Several promising products developed

Marula puree machine R&D

Extensive community liaison, including pre-publicity for selection of superior genotypes

Indicative calculation of economics of production and processing of various resources

Year 2 (April 2001 to March 2002)

Trial purchases and processing continues (including resources indicated by survey in Year 1)

IFDB grows larger and more complex

Trial medium-scale marula puree production and local marketing

Commercialisation of spirits and liqueurs

Increased manketti oil processing

Local value-adding to !nara scaled up

Systematic evaluation of melon seed oil yields

Major market liaison drive

Project evaluation and major replanning exercise

Appendix B:

Resources working group recommendations: «What to do with specific resources»

The working group selected a few resources it considered candidates for immediate promotion. The selection was partly based on the criteria proposed above, but was also intended to provide a broad coverage of different circumstances, so that more could be learned about specific aspects of the general promotion process.

Marula (*Sclerocarya birrea*)

This resource is already widely used and is a priority species in most parts of SADC where it occurs. In Namibia the resource tenure, traditional use and cultural acceptance issues are not problematic. Producer structures are in place and cultivation efforts are quite advanced.

- Research the technology and logistics requirements of processing the fruit (kernels already used for oil production – promote and increase)
- Develop formal market products (e.g. wine)
- Investigate medicinal use of the bark, bearing in mind effects on productivity, harvesting methods, recovery rates, alternative sources of the active ingredients (e.g. fruit skins)
- Study the effects of increased cultivation on land use patterns
- Select trees with the most desirable traits (including oil producing characteristics of the seeds/kernels)
- Take cognisance of what other countries in the region are doing with and have learned about marula processing

Eembe (*Berchemia discolor*)

The institutions involved with marula could also be used to promote this resource, significantly shortening the lead time involved. Some research has been done on processing, but the potential size and availability of the resource are not known. There is an informal market, but no formal market products have been developed.

- Establish the size and potential availability of the resource
- Develop products and markets
- Look at fruiting times, seasonal variability and accelerating fruiting in young trees

Manketti (*Schinziophyton rautanenii*)

The existing resource endowment is very large. The fruits make an important contribution to the rural economy of the range area (through kashipembe production) and to the survival strategies of marginalised groups and very poor people (nuts). Initial work has been done on commercialisation (oil production). If successfully promoted, the existing resource can contribute significant economic benefits in an underdeveloped region.

- Can kashipembe production be legalised?
- Can brewing/distilling methods and standards be improved (to develop a formal market product and avoid the danger of methanol poisoning)?
- Can promotion efforts proceed immediately despite the security situation in the Kavango region?
- Can products other than kahipembe and oil be developed (e.g. nuts as snacks)?

Monkey Orange (*Strychnos* spp.)

The fruits are more suitable (in appearance and taste) for existing formal markets than most others. Informal trading already takes place. Potential demand possibly exceeds existing supply. Promoting the resource in formal markets will facilitate research into cultivation of indigenous fruits (acceptance by farmers) and the logistics of fresh fruit marketing (fruits transport and keep relatively well).

- The seeds of some species might contain strychnine – will this be a problem or not?
- The fresh fruits are very popular and the resource base is not very large – can production be increased through cultivation? What do other SADC countries know about cultivating *Strychnos*?

***Terminalia* spp.**

There is a known phyto-medicinal market for the rootbark of this abundant genus. No technology development is necessary initially (just harvesting and drying). Trial commercialisation could produce new insights into the (sustainable) use of vegetative parts of indigenous plants and demonstrate the economic potential of non-food products.

- How large is the resource base?
- Study the impact of harvesting rates and methods to ensure sustainable use
- Research existing markets, prices and return to labour
- The wood is a preferred timber in some areas – study the silvicultural aspects of using both rootbark and wood, and possibly cultivating the trees

!Nara (*Acanthosicyos horridus*)

This is a uniquely Namibian plant with an existing (exploitative) market in SA – it represents an opportunity to demonstrate the potential of improved value-adding and marketing efforts.

- Improve local marketing and value adding (packaging) – as curiosity for tourist market
- Develop new products (dried fruit pulp, maybe snackbars with seeds? oil? medicinal use?)
- Increase total seed production (maybe through cultivation?)
- The plant is endemic to one area (Namib coast) and traditionally used by one fairly cohesive group (Topnaar people) – it could therefore be a good test case for IPR issues
- Clarify the resource tenure/ownership issues

Devil's Claw (*Harpagophytum procumbens*)

This is Namibia's best-known indigenous botanical resource. It already supports a large export industry. Sustainable use and securing more value for harvesters and the local economy are the main issues at present. It requires more research into cultivation methods that are suitable for use by traditional harvesters, who are otherwise at risk of being marginalised in an industry based on their traditional knowledge. There are significant opportunities to increase national value-added.

- Co-ordinate with national Devil's Claw working group and Sustainably Harvested Devil's Claw project.

