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ASSISTANCE TO THE ESSENTIAL OIL INDUSTRY,
ZANZIBAR

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UNITED REPUBLIC OF TANZANIA

Technical report: Maximizing the capacity utilization
of the clove stem oil distillery, Chake Chake*

Prepared for the Government of the United Republic of Tanzania
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of G. Guet, agronomist

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Vienna

* This document has not been edited.

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EXPLANATORY NOTES

US\$1 is equivalent to 458 TSh on 24 September 1993.

ODA - Overseas Development Administration, London U.K. (branch of the Tropical Development and Research Institute)

ZCCFS - Zanzibar Cash Crop Farming System

botanical terms of plants indicated

Cinnamon	<i>Cinnamomum zeylanicum</i>
Lemon grass	<i>Cymbopogon flexosus</i>
Vetiver	<i>Vetiveria zizanioides</i>
Eucalyptus	<i>Eucalyptus citriodora</i>
Clove	<i>Eugenia caryophyllus</i>

ABSTRACT

REPORT OF MISSION IN TANZANIA, ISLE OF PEMBA,
17 SEPT - 27 OCT 1993

1. According to the job description, the main activities have been:
 - a) to help start and improve the training of the new manager of the experimental Magome Farm;
 - b) to determine some objectives and priorities for the farm, where 36 ha lemon grass, 0,8 ha cinnamon, 0,8 ha eucalyptus and 1,1 ha vetiver have been planted 2-3 years' ago, but without permanent attendance or registration of data;
 - c) to introduce organic methods, according to Z.S.T.C. decision of March 1993, and prepare documents giving evidence of a conformity with the rules, in view of a certification.
2. The objectives proposed take into account the very limited resources and equipment available and the lack of training of the personnel. For instance, the heaps of compost (about 100 cubic metres) had to be done with bare hands, due to the lack of forks on the island; the new farm manager was a teacher.
3. Some difficult technical problems developed on the farm :
 - a) termites on eucalyptus destroyed more than half the trees;
 - b) scales on cinnamon provoke a very strong permanent sooty mould (black leaves);
 - c) some very weak patches on the fields of lemon-grass, due to late planting during the rainy season, to lack of weeding, and absence of any fertilisation.

Different measures have been taken, or tested, or planned against these difficulties.
 - d) vetiver grows without problem.
4. Due to this situation, the other objective proposed, i.e. to introduce new crops, has been put aside temporarily. It is strongly recommended to concentrate the work on the 4 existing crops, on the existing farm, until the major technical and organizational gaps are solved, some data can be collected, and the organic market tested. This might necessitate one year at least.

5. About 100 cubic metres of distilled leaves have been piled for composting. 30 t of ashes have been spread. Plans have been made for production of lemon-grass and for experimentation on all 4 crops. A copy book for registration of data has been opened. The farm manager has been associated with all initiatives and discussions. Proper contacts with people from ZCCFS and distillery have been established for coordination of work.
6. There is an urgent need for material not available locally; can UNIDO adopt some emergency procedure to send them?

50 sickles - 15 sharpening tools - 10 dung forks - 10 hay rakes (handles not needed).
7. All the proposed techniques are of general interest for the island, and not limited to the certified organic production.
8. It is wished by the local counterparts to continue the present mission for the 15 budgeted remaining days, by a new visit of the expert in March 94.

These provisional conclusions have been previously submitted to Mr. Said Nyanga, farm manager, and Mr. Nasib Omar, distillery manager.

TABLE OF CONTENTS

Explanatory notes	
Abstract	
Introduction	1
I. Initial inventory for certification	2
II. Resumé of objectives for the Magome Farm	3
III. Composting and using leaves of lemon grass	4
IV. Use of local wood ashes for fertilisation	6
V. Use of leguminous plants as cover crops	7
VI. Organic cinnamon	8
VII. Organic lemon grass	10
VIII. Organic eucalyptus	11
IX. Organic vetiver	14
X. Conclusions	15
XI. Recommendations for UNIDO	16
XII. Recommendations for certification body	17
XIII. Recommendations for ZSTC	17
XIV. Recommendations for Farm manager	19
ANNEXES	
1. Job description	20
2. Request for permission to use local lime (certification)	21
3. List of persons met	22
4. Bibliography	23
5. Backstopping Officer's Technical Comments	24

INTRODUCTION

Cloves are the major production of the Zanzibar islands. Due to a permanent crisis on prices and to some recent phytosanitary problems, the government decided to improve productivity and to diversify production of essential oils, with the assistance of UNIDO. In 1989 on the farm of Magame/Wavi near Chake Chake, Pemba Island, the following crops were introduced: lemon grass (25 Ha) , cinnamon (0,75 Ha), eucalyptus citriodora (0,7 Ha, in 3 patches on Magome, on Mtakata, on Vitongosi (Coral rag), vetiver (1,1 Ha).

During this time, a farm manager worked on the farm 2 days per week; as a consequence, maintenance suffered irregularities.

After a mission by Birgitt Boor and Elizabeth Ruegg from BIOHERB (Germany) in March 1993, the general manager of ZSTC, Mr. Abdulrahman Rashid Mohammed, decided to convert the production of oils originating from Wavi farm to organic standards. The main reason is that there is a market not satisfied, with better prices; this market allows work on smaller quantities than on the normal world market. A permanent farm manager was appointed to the farm in July 1993.

The mission justifying the present report began on 17 September 1993 and ended on 27 October 1993. The main objective of the mission was, in coordination with the existing authorities, and in particular the distillery manager and the farm manager, to make recommendations for improving cultivation and yield, for cultivating organically on the farm, and with some contracted volunteer growers around it eventually; to train them accordingly; and to prepare the farm in view of a certification.

The mission of the consultant, an agronomist specialised in organic production, began 17 September in Vienna and ended 27 October. This was shorter than initially planned (1,8 M/m) because of delays.

Due to the short time, to the poor state of the farm, and the inexperience of the new farm manager, it was decided to concentrate work on the farm as it is and to leave aside point J (introduce new species of

aromatic plants) as the priority is to re-establish and develop the four existing aromatic plants before introducing others; and to set up a proper general organisation and equipment first. All this might take one year, before other crops can be introduced for experiment.

There was a lot of concern about privatization in Tanzania before and during my visit: a document prepared by Mr. Andic from UNIDO, dated August 1993, occupied public attention in Dar-es-Salaam. This is a factor of uncertainty for all people working in state companies, including Pemba distillery and Wavi farm. Speaking of middle or long term as is usually done for organic production is not very appealing to people who are preoccupied about their job within a few years.

100 to 120 tons of compost have been prepared, from the used leaves of cinnamon; the ashes from the distillery have been spread; the technical problems have been approached, the results are pending; a register has been opened, and widely negotiated with the farm manager, with two parts: 1) production (lemon grass); 2) experimentation (vetiver, cinnamon, eucalyptus, 7 patches of lemon grass). A list of basic equipment needed has been established (urgent). All this has been discussed and explained to the new farm manager. All work done on the farm, inputs, dates of harvest and yield, will be registered. This will give some concrete data, which are crucially missing, 3 years after the first plantations. In addition, this register will be used in order to give evidence to the inspectors/certifiers of the work done in accordance with the standards of organic farming.

I. INITIAL INVENTORY OF THE MAGOME FARM, FOR CERTIFICATION PURPOSES

The farm is in generally poor condition, 3 years after the first plantings; of the four crops, three have a major technical problem; the fourth one, vetiver, has no technical problem, but the field is nearly three years' old, and normal harvest is done from one to one and a half years after planting. We will not be able to draw any conclusion from the first harvest of vetiver. On the three other crops, the major problems are:

- eucalyptus: termites destroyed more than half the trees
- cinnamon: big damage by scale - sooty mould - ants
- lemon grass: some very weak patches in places, probably due to late

planting, late weeding, no fertilising.

It is important to distinguish the causes why the farm did not meet its goals which it was expected to achieve, in order to take steps for a proper correction:

- . a part-time manager up to April 93 (he came two days per week);
- . lack of incentive for the workers. In that case, they should be more closely checked, this was not the case;
- . unclear objectives, sometimes conflicting: is the farm experimental or commercial?
- . unclear definition of responsibilities, shared between ZSTC, distillery, ZCCFS, UNIDO, experts;
- . crisis in the international market of essential oils, with a decrease in prices, reducing interest;
- . lack of local references on the new crops introduced on the farm partly explain the insufficient technical results;
- . predominance of the trade sector on the production sector, which tends to be neglected as a general rule.

II. RESUME OF OBJECTIVES FOR THE MAGOME FARM

Factors affecting quality of an essential oil:

- . quality and purity of raw material
- . correct stage of harvesting
- . post-harvest treatment
- . distillation techniques
- . packaging and storage of finished product

Among these five factors, the first three depend on work done on the farm, the two latter on work done in the distillery.

Factors affecting production of an essential oil

- . surface cultivated, quality of the soil
- . correct cultivation (timing, fertilising, weeding, protection against pests)
- . correct stage and techniques of harvesting

- . choice of good yielding varieties
- . distillation techniques

Among these five factors, the first four depend on work done on the farm.

Factors affecting success in organic production at farm level

- . management and personnel have to know, understand, and accept the principles of organic farming, and implement them strongly
- . availability of a cheap local source of organic material and proper use of it
- . sound rotation including leguminous plants
- . work done in time
- . proper technical assistance the first years
- . for four years most of the accent has been put on the distillery

notes: proper timing comes under the three categories of factors: quality, production, success. Timing is the critical point on the Magome Farm.

III. COMPOSTING AND USING DISTILLED LEAVES OF LEMON GRASS

Initial situation

The distilled leaves of lemon grass from the last two years have been stocked in random piles, about 0,5 to 1 m. high. In fact, five types of leaves have been met with (October 93):

- a) top of pile, very dry
- b) medium part brown, dry, partly fermented
- c) bottom part sometimes in paste, but without smell
- d) bottom part sometimes wet and compacted, fermented like silage, with typical smell and clear colour
- e) some black, earthlike, completely composted leaves.

Mr. Said Nyanga, the farm manager, had begun to make proper piles, alternating layers of leaves and some dry cow manure. Manipulations have to be done by hand, because no fork is available on the island.

Due to the extensive use of compost on lemon grass (about 2t/ha) and the need to activate life in the soil, no turning of the piles is suggested. After 2 months (to be verified) piles will be taken straight to the fields and spread. The date limit for spreading compost is end November because rains are in November-December, and humidity is needed after spreading in order to have fermentation continuing in the soil. IF NOT POSSIBLE, WAIT UNTIL THE BEGINNING OF THE NEXT RAINY SEASON.

material available:

- . used leaves of lemon grass from distillery
- . wood ashes from distillery
- . cow manure purchased 60 TSh/kg (expensive)
- . locally made lime. 400 TSh/50 kg bag (use of this latter to be confirmed)
- . water

Total 10 cubic metres per pile.

- a) The triangular shape aims to protect the pile from excess of water during the rainy season.
- b) The pole on the middle is for temperature estimation
- c) Fermentation will last two months
- d) no turning needed for our type of crops
- e) some dry leaves are added, uncompacted, on the top. for protection against dessication and rain.

how to proceed for composting	approx needs for 10 cubic m.
a) put 1 layer of leaves about 20 cm high	sufficient
b) 10 spades ashes	100 kg
c) 10 spades dry cow manure	50 kg
d) 5 spades of lime (to be confirmed)	50 kg
e) water while stepping on the pile	sufficient

Then repeat again in the same order, until 1,5 m high. Wait 1 to 2 months (until the volume diminishes and temperature goes down).

how to use it

- a) remove the cover of dry leaves from the top of the pile, for composting.
- b) spread compost 1 to 2 months after making the piles.
- c) Indian sources indicate 2 tons/ha of compost on lemon grass.
- d) all the compost produced at the distillery will be used; if there is more it will be better.
- e) depending on quantity available, the input of compost will be done every year or alternated every 2 years, on lemon grass.
- f) register number of field, date, and quantity spread.

IV. USE OF LOCAL WOOD ASHES FOR FERTILISATION**a) existing origins**

- 1. distillery
- 2. burnt rice hulls from shelling rice plants
- 3. bakeries; other to be seen.

Conditions: ashes accessible by tractor/truck.

b) interest

Ashes constitute an excellent fertiliser, as indicated in several previous reports, and verified again during the present mission on lemon grass and eucalyptus: where bushes have been burnt, plants grow better and bigger. Up to now, ashes are not utilised at all on the island. They are local, free, efficient, recommended in organic farming.

c) use of ashes

Ashes can be used either mixed with leaves when making heaps of compost (maximum 10% in weight); or spread directly on the field at the dose of 2 t/ha, then covered by compost; or mixed with earth in the plantation hole of eucalyptus and cinnamon: approximately 1 kg per spreading of ashes and compost will be followed by a weeding, in order to incorporate to the topsoil.

d) experiments pending with ashes (see register for details)

- . on lemon grass: 2 t/ha alone
- 2 t/ha + compost 2 t/ha
- 2 t/ha + compost 2 t/ha + cow manure 2 t/ha
- Control

on eucalyptus on coral rag aged 6 months:

1 kg/plant alone

1 kg/plant + legume as cover crop: kudzu

2 k/plant alone

Control

V. USE OF LEGUMINOUS PLANTS AS COVER CROPS IN PEMBA

4 classical well established species are known, available and used in Pemba:

Crotalaria crotalaria

Kudzu (Pueraria)

Cow peas

Ground nuts.

There are many other legumes, but as a principle stick to the simplest for a start. Crotalaria and cow peas are available on the farm.

The two others are in Pemba. Legumes have several roles in agriculture:

a) Improve the content of nitrogen in the soil, by fixing it from the air. This nitrogen will then be used by other, non leguminous plants.

b) Cover the ground, thus reducing erosion, and limiting increase of temperature in hot seasons.

c) Improve content of organic matter when incorporated in the soil, and improve the microbial activity.

d) In addition, ground nuts and cow peas give a production which can be sold on the local market.

use of leguminous plants at the Magome Farm

For lemon grass, try cow peas, or ground nuts on a small scale as intercrop

. These plants stay low, and so do not disturb the low plants of lemon grass. Their weeding is useful for both crops. For practical reasons (bird damage) cow pea seems preferable as a start. Intercropping is indicated in Indian literature as being done on lemon grass, with ground nuts.

For eucalyptus, kudzu, as fast growing, good covering, plant seems the best fitted. Kudzu seeds can be collected in large quantities in a plantation of heveas where it has been introduced as cover crop (15 km from Chake): seeds were beginning to be ripe at the moment of this visit (6 October). About 5 kg or more have to be collected as a start. Kudzu can be a creeping plant. It will be sown only where eucalyptus are more than 1 m high; and the trees should be regularly protected/checked. A minimum of half a sq. metre around the trunk will be kept free of cover crop, and mulched.

For cinnamon, try both kudzu and crotalaria in alternate rows, to see which fits best. Yet keep the base of trees mulched without any cover crop, on a radius of 40 cm minimum.

For vetiver, due to its high density, no intercropping will be tried. When vetiver is pulled out, logically it should be replanted in a different place, after a leguminous plant. After harvesting, levelling, and if possible adding some ashes and/or manure, any of the 4 indicated legumes could be sown, depending on the use needed, after vetiver.

The seeds of the small field of crotalaria will have to be recuperated in good time.

By associating leguminous plants, compost and ashes, we get the basis of a good fertilisation, at little or no purchase price, and entirely originating from Pemba. All these advantages will show after 2 or 3 years; they are not limited to the organic farms.

VI. ORGANIC CINNAMON

PROBLEM OF SOOTY MOULD/SCALES/ANTS ON THE CINNAMON PLANTATION

description

These three pests are present together, and always associated, on more than half the plantation of cinnamon; the attack of sooty mould is very strong, leaves and trunks of cinnamon are black. Ants transport and

protect scales, because they feed on their excreta. Scales puncture the leaves for food, weakening the trees. Sooty mould develops on the sap. The combination of the three is a classical one.

passive methods

- Suppress ants on the trees, by putting tangle glue on the trunk. Then scales won't be transported and protected by ants. Natural controls by ladybirds (seen) will become possible.
- Add compost in order to strengthen the growth
- Sow alternate rows of kudzu and crotalaria, both available locally, in order to attract/fix beneficial insects.

effective treatments accepted in organic farming

- Spray mineral oil at the dose of 1,5% (not available in Pemba) mixed with copper oxychloride. Mineral oil acts against young scale larva, and copper against sooty mould. Try first on 2 trees in order to verify acceptance by cinnamon, and wait 3 days. Probably to be repeated, after 15 days, after the rainy season has begun, in order to avoid spraying plants under drought stress. The effect will be neither spectacular, nor immediate. Yet the treatment proposed is a verified classical and efficient one.

how to operate with tangle glue

- The aim is to prevent ants from climbing the trees. Tangle glue is available in Chake Chake. 400 TSh per tube of 250 g. 10 tubes are needed for the whole field.
 - a. cut the low branches touching the ground, to about 40 cm from the ground;
 - b. clean all climbing weeds in order to avoid any "bridge" for ants;
 - c. spread tangle glue around the trunks (1 to 3 in general) at a height of 30-40 cm, in a complete circle, but economizing it. 1 tube can do for about 50 trees;
 - d. weed around foot of tree on a radius of about 0,5m. Leave

cut weeds on the spot, but keeping clear 10 cm radius approximately around the trunk. As it rained, we did not fear dust, which otherwise would saturate the glue;

e. check periodically and react if necessary; glue is effective for about 3 months.

other

Replace missing trees; mix 1 kg ashes/hole before replanting. The result will be seen after a few months only.

VII. ORGANIC LEMON GRASS

INDICATIVE PROGRAMME OF WORK FOR PRODUCTION OF LEMON GRASS (OCT.93)

The observations on the farm, particularly of its weak parts and of their causes, give us an idea of the 4 key points, from now on:

4 key points

1. Planting and replanting in good time (at the beginning of a rainy season). If you are too late, it is better to delay planting or replanting until the next rainy season.
2. After any planting, importance of replacing the missing plants at the next rainy season, because we want a quick full occupation of the ground: a) production is improved; b) it reduces the pressure of weeds, and time for weeding; c) it protects the ground from direct sun and rain.
3. Timely weeding is important; it is capital the first year.
4. Adequate improvement of the soil fertility. See separate document: ashes, compost, rotation with leguminous plants or intercropping.

fertilization: ideally done once a year; if not possible, do it once every 2 years. The ideal sequence is: harvest - spread ashes - spread compost - weed. If not possible: spreading of ashes and compost must be made enough in advance of harvest, in order to give time to the rain for washing the leaves before harvest.

replacing the missing plants:

This will be done as first priority on the experimental plots. This will be done as second priority on parts where missing plants do not exceed 30%.

This will be done as third priority on parts where missing plants are 30-50%. If more than 50% of plants are missing, the remaining 50% generally are weak: in that case, it is better to clear the patch completely, to make a pile of residues for composting, to spread ashes and compost, weed, then replant entirely.

weeding: Weeding is better done on small weeds because they are easier to suppress, than big ones; they have no time to compete with the crop.

Attention must be given in order to avoid damaging the lemon-grass plants (and others) during weeding. Explanations and periodical verifications to be done by the farm manager.

VIII. ORGANIC EUCALYPTUS

Until the termite problem is solved, it is advised to leave the Magome plot as it is, and to concentrate efforts on the other plot on the coral rag where there is no termite problem.

starting situation

Trees of eucalyptus are 8 months' old. The soil is very rocky. The earth is poor, but has good structure. The missing trees have been replaced twice. Now very few trees are missing (estimated under 2%) healthy looking trees at first visit (end September 93); no termite problem. Yet very irregular growth. The best trees are where the bushes have been burnt, because ashes were introduced in the soil. Trees are 1,50m high on these spots; 40 to 60 cm on other spots without ashes.

Suggestion

- a) bring ashes from the distillery, at 2 doses, on 1/2 sq m around the tree, then incorporate in the surface soil. Try 1 kg/tree and 2 kg/tree (see below). Ashes localised on 1/2 sq. m at the foot of the trees, then incorporated by a weeding (to be done in November). Yet this solution will probably be limited by a shortage of ashes. See

below problem of fertilising.

- b) experiment intermediate leguminous plants: try Crotalaria and Kudzu.
- c) Try increased density: in India they recommend planting at a distance of 90 x 75 cm, after repeated experiments, for production of oils.

Proposed first experiment on eucalyptus, on the coral rag

It is proposed to experiment there, because a) there is no termite problem, b) there is land available and c) some trees grow very well.

The aim of the experiment is to verify if an addition of ashes and sowing of a leguminous plant can bring the small trees to the same level of growth as the big ones.

It has been observed that the big trees are where bushes have been burned, and ashes left on the ground.

Identify 4 patches of 7 x 7 eucalyptus trees :

Control - E.A. Kudzu sown M'suka rains 94 - E.B. Ashes 1 kg/tree + Kudzu sown May 94 - E.C. Ashes 1 kg/tree - E.D. ashes 2 kg/tree - Control

- Ashes will be added only on trees situated out of the burning places, around the trees on 1/2 sq.m. approximately. Then weed, in order to incorporate ashes.
- Kudzu will be sown later, when trees are at least 1 m. high, in order to avoid creeping. (Beginning of M'sika rains). Then replace kudzu if needed, and protect young trees.

For termites at the Magome Farm, the local recipes have been discarded, after consideration, because not applicable to that case: a) raise chickens, which feed on termites; but they cannot go into the big nests, under the ground. b) put powdered sugar around the termite nests in order to attract small black ants which feed on termites, but only if there is an entrance hole.

We tried the used waters from the distillery, but unsuccessfully, at different doses (20 to 50 l for small nest, up to 100 l for big one. We will try again with more concentrated waters.

problem of fertilising eucalyptus on the coral rag

A visit on 19 October showed the symptoms of a mineral deficiency on eucalyptus: older leaves get yellow, then brown, then dry, on the end on about 1/4 to 1/3 of the surface of the leaf. That makes one think of a deficiency in magnesia. These symptoms did not show at the first visit (end September 93).

A sample of earth has been taken for analysis, in order to check. Yet we have young trees, at the end of the dry season, and having had little attention. It will be interesting to observe the evolution after the rains.

If the deficiency in magnesia is confirmed, the fertiliser required would be preferably PATENTKALI, a double sulphate of potash and magnesia, containing 28% potash and 8% magnesia. The problem is that it would need to be imported from Germany where it is made.

The other solution would be to see if sulphate of potash and sulphate of magnesia are available separately in Dar-es-Salaam.

All three fertilizers are accepted in organic production, when need is proved. Quantity per tree to be indicated after getting the results of soil analysis (and calculation of cost). Fertilizer to be incorporated and mixed in the hole, during transplanting. The question is: is it worth it?

problem of transportation of wood and leaves to the distillery

Due to the distance of the distillery, 6 km, to the poor condition of the road and vehicles, proper attention shall be given to the proposal of GREEN, to set up a simplified distillation unit on the coral rag. This is for economical reasons, and has nothing specific to the organic production. The unit would be installed near a permanent water supply.

IX. ORGANIC VETIVER

ADVANTAGES IN DEVELOPING VETIVER IN PEMBA

Extract of report DP/1D/SERA/129 dated July 1990 by ABEYSSINGHE

1. It already exists in Pemba.
2. It can be erosion-preventing if properly planted: it can grow to a dense hedge, which filters sedimented surface runoff (very important in Pemba); its roots, deep and fibrous, fix the soil well.
3. It is a long lived perennial; it yields after 1 year, but keeps its qualities if harvested later (up to 18 months).
4. It grows only where planted, it can never become a weed.
5. It is not eaten by cattle, and is not attacked by a pest or disease. This, with other qualities, makes it the suitable cash crop for smallholders.
6. It is very resistant to moisture or drought stress.
7. Vetiver is a traditional basic perfume of quality; it is difficult to reproduce with chemical formulations; therefore, the use of its oil is expected to continue.

comments: Technically, agronomically, ecologically, socially, vetiver is very interesting; yet at processing/marketing levels, Z.S.T.C. has to be very aware of the recent trends which slackened the main exporter of vetiver, Haiti, for the following 4 major reasons:

- a) endemic communication problems
- b) high officially fixed price levels
- c) lapses in the standard trading procedures
- d) occasional tendency for consignment not matching the corresponding samples.

According to Abeyssinghe, these problems in Haiti created an opportunity for a new supplier like Zanzibar, if it could maintain regular supplies and build up a reputation with the trade.

The same author discusses then the case of Indonesia, equivalent first producer of vetiver, with about 100 tons average exported per annum.

Indonesian oil is reputed for its variable quality, depending on the amount of care taken over the distillation process. The problems are:

- a) burnt odour
- b) low vetiveral content
- c) high acidity
- d) presence of foreign matter and contaminants.

These gaps from Haiti and Indonesia give a clear indication on the key-points for a production of vetiver in Pemba to obtain stable access to the market.

X. CONCLUSIONS

Organic production

The problems indicated are not limited or linked to organic production; they came previously. It is clearly stated that the recovery of the Magome Farm and its success in organic production will not depend only on providing suitable machinery, fertilizers and pest control, accepted by a standard book and verified by an inspector. The necessary skills have to exist, the management must not be paralysed by bureaucracy, the distillery has to work properly, the general quality and productivity have to be good, technical assistance must have some continuity.

Organic technical issues are second to these. Relying only on higher prices for organic production in order to compensate weaknesses in other parts would lead to misunderstanding and disappointment.

Until some in-depth structural modifications are carried out, it is expected that in an unchanged context, problems will continue unchanged. The danger would be to attribute these problems to the changes for organic production at the level of Pemba; or to attribute delays and liabilities with customers to the organic production. The prices announced are for organic products of good quality, quick and regular availability to customers. There is no substitute to these criteria in modern trade. The high prices announced are not guaranteed for long, they must not distract from reducing cost prices.

The organic methods proposed are just plain good farming, with a major use of local inputs. No doubt that they are feasible, interesting and efficient in Magome Farm. Yet work has to be done on time, and one year's delay minimum is needed to see a result. The interest of organic farming is of much wider interest in Tanzania, than just a production certified for a special market.

In a few words, the decision to turn the farm organic is valid; yet the final economic result will depend mostly on factors not directly related to organic methods.

Synoptic indicative instant market situation for organic essences from Pemba (October 93)

Product	Approx. known market	Expected Price/kg	Expected Yield t/ha	Approx. t/ha	Ha needed	Comments
Vetiver	100	130	20	0,88-18	7	need increase surfaces
Lemon grass	900	30	50-60	0,58	15	need more buyers
Cinnamon leaf	280	18		0,5-1,88		need increase surfaces
Cinnamon bark	70	300		0,4-0,88		
Eucalyptus citr.	110	25	150	18	1	need more buyers in the future
Sweet basil	50	240				

Table according to Bioherb 4

Subject to requirements on quality, continuity, certification, proper timing; and subject to good technical results on the Magome Farm.

XI. RECOMMENDATIONS FOR UNIDO

a) Material needed for the farm URGENT:

- 50 sickles for harvesting lemon-grass
- 15 sharpening tools
- 10 dung forks

note: for forks, no need of handles.

None of these tools are available locally.

b) E.E.C. (C.O.L.E.A.C.P.) organises in Tanzania, beginning 94, a seminar on export of products. It would be useful to finance attendance of the distillery manager and of the farm manager, or at least the latter (address of distillery has been given to C.O.L.E.A.C.P.).

c) In addition, the farm manager could be sent to a training course in Kenya, organised by the local association of organic farming.

- d) a new visit of the undersigned is wished for in March 94, in order to confirm and comfort the work done and planned during the first visit (the remaining 15 days budgeted).

XII. RECOMMENDATIONS FOR THE CERTIFICATION BODY (I.M.O.)

1. **Duration of the conversion period :** Due : a) to the absence of inputs since plantation, 3 years' ago; b) to the efforts started in consultancy, soil improvement, experimentation; c) to the absence of direct competitor on the proposed market; d) to the whole farm being organic; e) to the absence of risk of accidental mix with non-organic production; f) to non-use of solvent for the distillation.

It is suggested to be liberal in interpreting the duration of the conversion period.

2. **Information - education:** During visits, the inspector will insist on this part of the work.
3. **Coordination :** continue to keep contact with Z.C.C.F.S.P.: they are the permanent technical element here; and continuity is needed very much.
4. **Smallholders certification :** Imagine a simplified procedure for the certification of smallholders' production of vetiver: type of Nature et Progrès' "collective certification" for instance. No phytosanitary problem exists up to now on vetiver, and the sole input would be ashes and manure.
5. **Restricted use :** permission be requested to use local lime as additional starter/neutraliser in compost. See Annex I.

XIII. RECOMMENDATIONS TO Z.S.T.C. / DISTILLERY IN PEMBA - ABOUT THE FARM

1. **Continuity** The arrival of a permanent farm manager, Mr. Said Nyanga, will allow for more continuity in the collection of local data, which are missing for a proper planification and recommendations. Most of his time must be dedicated to the farm, as the latter is his full time assignment. He must not be considered as an assistant of the distillery manager for general puposes. Continuity and proper timing are key points for him.
2. **Look for local solutions/supplies** whenever possible: locally available, and still better locally made. The simpler the better. Ex: wood ashes, lime, manure, ox-driven carts, tangle glue available in Pemba. There are both economical, social, ecological reasons. But we will have to import sickles and forks.
3. **Use of the adjacent ex-state dairy farm:** During one year at least, from now on, no increase in surfaces is advised, until we get some data (1 year minimum). Yet a conservative measure for the distillery would be, if possible, to have the ex-dairy farm reserved for future plantings: a) it is near the distillery; b) the bush has already been

cut; c) after grazing, initial fertility should be correct.

4. **Supply of wood-eucalyptus** : A problem which might appear soon and has been raised in the last Z.C.C.F.S.P. report (Woods - Fox), is the scarcity of wood as fuel for the distillery, and increasing distance to obtain it. In that sense, eucalyptus would have a double interest: supply of essence, and supply of wood.
5. **Vetiver** comes at the same level of priority, for the many reasons indicated elsewhere and in Woods' and Fox's report 1993 if partial mechanisation of harvest can be achieved (tractor + disc) that would allow bigger patches to be proposed for individual smallholders, thus permitting a better rationalisation of the whole process of extension / harvest / transportation.
6. **Lemon grass** is already planted. A programme was made to improve productivity, collect data, test the market. One year is needed before deciding on the future.
7. **Cinnamon** is in a poor condition on the farm. One has to wait for the result of the measures taken (tangle glue on trunks) against the problem sooty mould / scales / ants. That might take 6 months.
8. **Put all smallholders of vetiver on the certification process**: as according to BIOHRB there is a market for 100 kg of essential oil.

How to proceed for a certification of smallholders as organic:

- a) prepare a list of growers, including name, place, address, date of planting, surface, production estimated.
- b) resumé of techniques of production, stating the absence of risk of use of non-authorized products during growing but beware of storage at village barns. Make sure there is no indirect risk, like storage of roots near beans treated with lindane, for instance.
- c) enclose a map of the area, a model of contract with growers if existing. In that case, add in them a reference to the organic production.
- d) describe the type of assistance to growers (visits...)
- e) when the inspector comes, make sure that he does not limit his dossier to the Magame Farm, but includes smallholders.
- f) and all evidence justifying an application for a certification as organic.
- g) it will be simpler for everyone, and for general credibility, if all vetiver distilled in Pemba is certified.
- h) at harvest time: keep a separate register of origins and quantities.
9. **before trying any treatment against termites**, wait until consultant sends you some documentation from California about least toxic products. Here, too, it would be easier and more credible if all

eucalyptus could be certified (termites are the sole pending problem for that).

10. employ the temporary foreman, Mohamed Ali, as a permanent worker. Due to the possible absences of Mr. Nyanga (for training, for emergency in distillery, for illness or any personal reasons...) the confirmation of the temporary foreman, Mohamed Ali, as permanent employee would be a recognition of his capacities and good will and would assure continuity of work on the farm.

XIV. RECOMMENDATIONS FOR THE FARM MANAGER

1. A register has been opened for the work done on the farm: it will stay under his responsibility. After discussions and explanations, this register has been divided into two parts:

- A) Experimentation: eucalyptus, vetiver, lemon grass (7 small patches), cinnamon.
- B) Production: the remainder of the farm, planted with lemon grass.

You will have to update the register permanently: it will be the basis for further decisions and improvements.

2. In case of technical problems, ask Mr. Rupert Woods, from Z.C.C.F.S. or write to me, you have my address. Yet most of your problems will probably be about organisation.
3. A key point in farming and a weak one up to now is : work to be done on time. If you see you will be short of time, the solution is to take more workers, either by delaying some other work less urgent, or by having extra persons.

In any case, don't start work that you would do under bad conditions, like planting too late in the rainy season, or spreading ashes/manure without weeding soon after for a superficial incorporation, and without impending rains.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

JOB DESCRIPTION
DP/URT/86/026/11-56

Post Title: Agronomist

Duration: 1.8 w/m

Date Required: September 1993

Duty Station: Chake, Chake, Pemba

Purpose of Project: Maximising the capacity of the Clove Distillery in Chake, Chake

Duties: The expert is expected to carry out the following in collaboration with the CTA, NPD and the counterpart staff:

- i) Advise the distillery and State Trading Company about high yielding varieties and new species of aromatic plants which can be cultivated in the region.
- ii) Based on available information and experience, work out the economics of the cultivation of aromatic plants.
- iii) Recommend plans for changing to organic cultivation practices including use of compost, green manure, etc
- iv) Advise and train counterpart staff on organically produced aromatic plants.
- v) Initiate propagation of selected varieties using appropriate agrotechnology.
- vi) Train counterparts in agronomical methods for management, harvesting techniques and post harvest technology.
- vii) Recommend any further steps to be taken for the improvement of the cultivation of aromatic plants.

At the conclusion of his field work, the expert will be expected to furnish UNIDO with a fully prepared report detailing his findings and recommendations.

.... / ...

Applications and communications regarding this Job Description should be sent to:

Project Personnel Recruitment Section, Industrial Operations Division
 UNIDO, VIENNA INTERNATIONAL CENTRE, P.O. Box 300, Vienna, Austria

Qualifications: An agronomist with a Bachelors or Masters degree in a subject related to plant propagation with intensive practical experience in the organization, management of orgnically grown essential oil crops and in allied research and development.

Language: English

Background Information: Cloves (Eugenia caryophyllata) are the major crop in the Zanzibar Islands, which include Unguja and Pemba and are traditionally called the Clove Islands.

There are two major facilities for the distillation of clove buds and clove stem under the control of the Zanzibar State Trading Company (ZSTC). One is an almost obsolete plant, nevertheless with a considerable production capacity situated at Malindi in Unguja Island. The other is a modern plant at Chake Chake in Pemba Island.

In Pemba here is an established capacity but ensurement of maintenance is important.

Attuned to the distillation capacity of the plant the ensurement of timely collection and organized drying of raw materials is crucial.

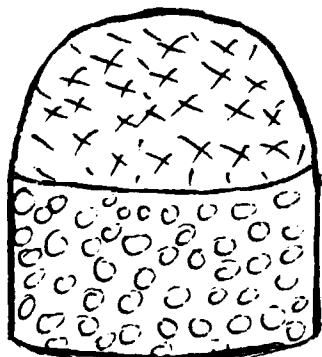
The Government expects UNIDO to provide support to enhance the economic, commercial and technological structure to modernise the industry and diversify products in Zanzibar.

REQUEST FOR PERMISSION TO USE LOCAL LIME (I.M.O. certification)

The normally permitted products for reduction of acidity are: powdered seaweed, ground limestone, or rock phosphate. None is available on the island. The soil is very acid on the Magome Farm (pH 5,5 to 6); a part of the leaves, the most wet and compacted, that we put to composting had a previous fermentation silage type, with the characteristic smell and it was necessary to neutralise this acid product in order to have a good start of composting. Local lime is available, at 400 Tsh per bag of 50kg. Permission be asked to use lime, as a neutraliser/starter, during the making of piles of compost, at the dose of 50 kg/pile of 10 cubic m., added to the other starters, cow manure and ashes. This seems by far the best ecological / economical / technical / social / solution in the case of Pemba: due to the economical situation of the country and the availability of cheap local lime, importation of ground limestone or powdered seaweed or rock phosphate, the formally accepted solutions, would be less satisfactory, regarding the above indicated criteria; and would require at least 8-10 months to be concretely implemented.

MAKING OF LOCAL LIME

(seen place of making) 3 km from the distillery, after barracks



Coral limestone
from the coral rag
about 2 cubic m.

Big logs of wood

Ground level

- a) A circular pile of wood is made, 3 m diameter, 1 m high, big logs;
- b) broken limestone from the coral rag is put on top (about 2 cubic m.)
- c) wood is burnt.
- d) Limestone gets transformed into lime.

The lime is in fact mixed with the ashes of the wood used to burn it. Its only use is for building. We used it as a starter/neutraliser for composting the used leaves of lemon-grass from the distillery (1 bag of 50 kg/pile of about 10 cubic m.) in addition to ashes 100 kg and dry cow manure 50 kg.

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**Backstopping Officer's Technical Comments
based on the work of G. Guet, DP/URT/86/026/11-56**

The report contains an assessment of the current situation with respect to farming of selected aromatic plants and measures to improve farming methods and remedy some of the problems encountered. Specific recommendations have been made which have to be followed up in order to initiate and continue viable organic farming.

Advice has been rendered on the preparation and application of compost and use of wood ashes and leguminous plants to enrich the soil. Maintenance of records have been stressed.

Backstopping Officer hopes that the recommendations will be implemented on an urgent basis in order to capture the presently available market for organic products.