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ASSISTANCE TO THE ESSENTIAL OIL INDUSTRY, ZANZIBAR

DP/URT/86/026/11-01

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 B. Gulati, chief technical adviser

Backstopping Officer: T. De Silva, Chemical Industries Branch

United Nations Industrial Development Organization
Vienna

* This document has not been edited.

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A B S T R A C T

The project DP/URT/86/026 " Assistance to the Essential Oils Industry-Zanzibar" entered into second phase with the fielding of the C.T.A. on 13 April 1992 through 12 June 1992. Some of the activities not accomplished earlier are expected to be completed during this phase.

Capacity utilization of the Distillery and production of essential oils improved significantly during the project period. Value of essential oils produced has reached a level of US \$ 400,000 and more per annum as compared to an average of about \$ 110,000 per annum prior to the Project. Simultaneously, exports reached \$ 420,000 during 1990-91 as compared to \$ 112,530 in 1988-89 (average annual export was \$ 66,680 during 1983-89). Further improvement in the production and export of oils is foreseen with the introduction of additional essential oils bearing crops in future.

So far, the Marketing Expert, Quality Control Chemist and the Engineer have completed their missions. Quality Control Laboratory is now well equipped. The Distillery Chemist has been appointed. His training at site as also through Fellowship is well taken care of. Perfumer and Agronomist Experts have yet to complete their missions.

Techno-Economic Feasibility Study for establishing a Processing Facility in Unguja prepared earlier was revised in the light of discussion with the G.M., Z.S.T.C. and the Principal Secretary, M.O.I. on 23, April 1992 in Zanzibar. Revised Feasibility Study Report is now submitted again to the UNIDO.

Training component through Fellowships of the Distillery Chemist and the Marketing/Export Manager of the Z.S.T.C., is planned for this year. Training Programme and Study Tours considered necessary for other National Personnel are also suggested in this Report.

In order to sustain capacity utilization of the Distillery and production of essential oils at a level of \$ 400,000 per annum, some more inputs are needed. These are indicated in this Report.

Marketing of increased production of essential oils on a regular basis needs immediate attention of the Project and the Government of Zanzibar. In this context participation of concerned officials in the International Congress of Essential Oils, Flavours & Fragrances to be held in Vienna in October 1992 and Study Tour of higher authorities of the M.O.I and the Z.S.T.C are expected to improve exports. This will also enable the Z.S.T.C to plan long term strategy.

The Distillery lacks requisite transport facilities for transporting material of essential oils. Corrective measures are called for.

I.

INTRODUCTION:

The Project has now entered into second phase (Extension) as recommended by the T.P.R. meeting held in Zanzibar on 20 June, 1991 and approved by the U.N.D.P. consequently enhancing the budget provision by US \$ 159,000. The Chemical Technologist, Essential oils Distillation Plant Expert (C.T.A) started the current mission from 13 April 1992 through 12 June, 1992. Job Description is attached at Annex. I. Besides the work done as per Job Description, following aspects concerning the Project were also attended to:

- i. Techno - Economic Feasibility Study on the "Establishment of a Processing Facility for Essential Oils in Unguja, Zanzibar" submitted to UNIDO. (Report: 28 January, 1992) was discussed with the Principal Secretary, Ministry of Trade & Industry and the General Manager, Z.S.T.C. on 23 April, 1992 in Zanzibar. The National Project Director (Mr. Omar S. Nasib) was also present. While accepting the Report in substance, it was suggested that the Report may be revised especially with respect to
 - a) Utilisation of Plant capacity may be at levels of 40,60,80 and 100 percent from the first year of operation to the 4th year of operation respectively.
 - b) Since submission of the Report in Jan 1992 there has been further devaluation of T. Shilling to 285 (April 92). In order to take care of further devaluation, the entire data in the Report should be calculated taking value of dollar equivalent to 320.
 - c) While estimated availability of clove stems and buds was considered realistic, availability of 500 tons of limes from 1994, was not considered feasible. It was suggested that availability of about 30 tons of limes in 1994 with small increase in the following years should be taken for processing.

The Report was re-written jointly with Shahid Ahmad, Engineer Expert. The Revised Report (10 May 1992) is again submitted to UNIDO.

- ii. In the absence of an Agronomist the Farm work was also given due attention. Instructions for the proper up keep of the farm were given to the Distillery personnel. Norms were suggested for economical operations to control expenditures and optimum returns.
- iii. The Quality Control Chemist (Q.C.C.) and the Engineer also joined the Project for 2 months and 2 weeks respectively. The Q.C.C. was briefed and plan of work chalked out. The Distillery Chemist was trained in practically all the aspects of analysis of essential oils by the Q.C.C. Work on G.C. was delayed primarily due to non-function of hydrogen generator and no-availability of hydrogen gas cylinders.

Training of national personnel as also Study Tours have been planned in order to complete all the activities listed in the Project Document. (Annex II)

It was observed that while production of clove stem and bud oils has reached a satisfactory level, marketing was neither regular nor up to the production potential. The Z.S.T.C. is fully aware of this problem. Efforts are being made to not only strengthen marketing in Europe but also in other countries. While UNIDO has fielded a Marketing Expert and Marketing/Export Manager, Z.S.T.C. is scheduled to go on a Training Programme, it may be relevant and necessary to send higher authorities like G.M. Z.S.T.C., Principal Secretary, Ministry of Trade and Industry to undertake a Study Tour and plan strategy for regular sale of the existing and enhanced production. This is considered important as otherwise work done so far in Maximising production might not yield the desired results.

Production of clove stem oil declined in the year 1991-92 due to non-availability of the raw material (the entire available stock was processed by July 1991 while the new crop became available only by November - December 1991). However, clove buds processing was increased. Lemongrass production was less due to problems in transportation of the harvested material.

II. MAXIMISING CAPACITY UTILISATION AND PRODUCTION OF ESSENTIAL OILS:

Preliminary basic information on the Distillery capacity and its utilisation has been given in details in earlier Reports of the C.T.A. (please refer to pages 6 - 10 of the Report, 10 March 1992).

It is, however, relevant to give up to date production data on all the three essential oils viz clove stem, bud and lemongrass.

For comparison, data on the production of these oils in the earlier years of Distillery operation is also given.

Processing of clove stems, buds and lemongrass during the pre-project and Project period is summarised in the following table:

Processing of clove Stems, buds & Lemongrass

	Clove			Lemongrass		
	<u>Stems</u>	<u>Oil</u>	<u>Buds</u>	<u>Oil</u>	<u>Grass</u>	<u>Oil</u>
<u>Project Period</u>						
1989 - 1990	1039.50	42.65	54.92	6.14	41.91	119.36
1990 - 1991	1069.95	46.27	99.16	13.73	169.18	424.54
1991 - 1992 (July 91 - May 92) 11 months	552.25	26.34	167.39	22.78	236.98	681.39
<u>Pre- Project Period</u>						
1983 - 1989	2678.92	130.17	7.19	0.96	-	-
Average Annual (5 years and 10 months)	450.78	22.31	-	-	-	-

NB: Quantities in tons except lemongrass oil which is given in litres

Value of Oils Produced

Project Period	US Dollars	1,010,714
Pre - Project Period	" "	660,450

Total Raw Material Processed

Project Period	3420.24 tons
Pre - Project Period	2695.11 tons

Processing and production of clove stem oil in 1991 - 1992 was less primarily due to non - availability of the raw material from August 91 till November 1991. During July 91 i.e beginning of the financial year, only 24.76 tons of the stems were processed. Later on, only 7.43 tons were processed during April 92. Distillery operated for only 2 days during this month. Lemongrass could not be processed during March and May 92 for want of transport and due to heavy rains. In spite of all the bottlenecks the production of essential oils is expected to reach a level of about US \$ 400,000.

As mentioned in earlier Report of the C.T.A., Pemba has a number of problems coming in way of optimum utilisation of the Distillery capacity. Major problems are:

- i. Irregular supply of electricity and thereby of water.
- ii. Inadequate facility for repair and availability of spare parts.
- iii. Inadequate transport facilities. Considering the above in view, it is possible to process and produce essential oils estimated as under:

Processing and Production Potential

<u>Item</u>	<u>Quantity</u>	<u>Oil</u>	<u>Value (US Dollars)</u>
i. Clove Stems	1260 tons	56 tons	280,000
ii. Clove Buds	162 tons	25 tons	250,000
iii. Lemongrass	600 tons	1.5 tons	12,000
Total	<u>2022</u>	<u>82.5 tons</u>	<u>542,000</u>

Calculation of capacity utilisation and processing - production potential is given at Annex III.

III. DIVERSIFICATION OF ESSENTIAL OIL - BEARING CROPS:

Besides Lemongrass, work on three other potential species of essential oil - bearing plants is under progress. These are:

- i. Basil (Methyl Chavicol type)
- ii. Vetiver
- iii. Ceylon cinnamon (Cinnamomum verum)

Upto date progress of work is given as under.

- i. Basil: Present area under basil is about 0.4 acres as area was extended further during September - October 1991. Growth of plants is satisfactory. As mentioned in the last report of the C.T.A. (Report - B. Gulati), crop from an area of 0.2 acres was harvested and distilled. Second harvest has now been taken in May 92 even though the crop was not flowering i.e not mature for distillation. Lower leaves had turned yellow and started falling. Harvesting was necessary to get a proper next harvest.

Crop yield was 350kg. Oil content was 0.28 percent when distilled in the distillery. Oil content is satisfactory. Oil quality from first and second harvest will be studied by the Quality Control Chemist for their physico - chemical constants and composition.

Earlier, 2 distinct morphologically different types of basil were observed. These were distilled in the Laboratory. (Reports B. Gulati) During this mission, a third type was also observed in the plant population. All the three types were again distilled in the Laboratory. These will be studied on the G.C. by the Quality Control Chemist.

More area is proposed to be cleared in the Distillery premises for expanding plantation of basil.

Vetiver: The plants are ready for harvesting. However, there is no satisfactory arrangement for large scale distillation. Efforts are being made for arranging distillation.

Cinnamon: The plants are now about 2 years old. Growth is satisfactory. The plants are proposed to be pruned next year to induce bushy growth.

Bitter (sour) orange tree, growing in Pemba and Nguja is yet another promising essential oil - bearing plant especially for its leaf oil (petitgrain oil). The Quality Control Chemist was asked to study this oil also during his current mission. Leaves were distilled a fresh as also rind of the fruit to study for chemical composition by the C.C.

Even though work done on the diversification is satisfactory, it is necessary to employ a full time Agronomist Supervisor for effective day to day supervision. He can also be trained for taking data on plant growth and performance which is necessary for obtaining optimum yield of the essential oil.

IV . CO-ORDINATING ACTIVITIES OF EXPERTS

Fielding of Experts till March, 1992 was summarised in the last report of the C.T.A. (B. Gulati, Report 10 March 1992 pages 35 - 36, 43). Since then, the Engineer has completed his mission (29 April - 17 May 1992). The Quality Control Chemist will be completing his mission (22 April - 21 June, 1992).

The Engineer was briefed by the C.T.A. on his arrival at the Project site on May, 4, 1992. He along with the C.T.A., completed work on the revision of the Techno - Economic Feasibility Study "Establishment of a Processing Facility for Essential Oils in Unguja, Zanzibar". He worked in the Distillery on various aspects as per his Job Description such as Equipment Maintenance Schedule, need for Spare Parts etc.

The Quality Control Chemist was also briefed by the C.T.A. on his joining the Project on 25 April 1992. Plan of work was discussed. Training of the Distillery Chemist was undertaken by him. He will also prepare list of inputs that may be needed for the Laboratory.

Perfumer and Agronomist are yet to be fielded.

V.

MARKETING

Potential of production in the Distillery has been worked out as under:

Clove Stem Oil	56 tons
Clove Bud Oil	25 tons
Lemongrass Oil	1.5 tons

(The product - mix has been worked out considering realistic availability of the raw materials and their processing).

Even though demand for the above mentioned essential oils exists in the world market, it is imperative that regular and sustained outlet for these essential oils is established. However, such a situation does not seem to exist at the present. Now that processing and production of the oils has been taken care of during the Project work, all possible efforts need to be put for marketing of these oils.

To recapitulate, the Project has assisted the Z.S.T.C. in marketing of the produce as under:

- i. Nominating the Marketing/Export Manager, Z.S.T.C and the Plant Manager to participate in the International Congress of Essential oils, Flavours & Fragrances held in New Delhi in November, 1989.
- ii. Fellowship/Training Programme of the Plant Manager of the Pemba Distillery also included meeting potential buyers of the oils in France and England.
- iii. UNIDO fielded a Marketing Expert to chalk out strategy for marketing clove and other essential oils.
- iv. The Marketing/Export Manager, Z.S.T.C. is scheduled to undertake a "Sales Promotion trip to major present and potential consumers of clove stem oil (and bud, Lemongrass and basil oil) leading to increased exports (Immediate Objective - 3; Output No. 2).

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However, in order to make the Project completely successful, both the Z.S.T.C. and the U N D P need to put concerted efforts for successful marketing. Higher authorities of the Z.S.T.C. and the Ministry of Trade and Industry should also get actively involved by undertaking Study Tours and take spot decisions to enhance exports. U N D P/UNIDO should also consider favourably any request for assistance in this vital aspect as and when received from the Government of Zanzibar.

VI. FUTURE INPUTS REQUIREMENT OF THE DISTILLERY

The Distillery, with the assistance of UNDP/UNIDO, has improved significantly in its capacity utilisation. However, for sustaining production some more inputs and efforts are required. Some additional important inputs are listed below:

1. Spare Parts for Equipment:

Essential spare parts were procured earlier during the initial period of the Project. The Engineer Expert during his current mission (April - May 1991) has evaluated the need for spare parts for Distillery Equipment, Generators and Repair & Maintenance workshop. The list of inputs will be incorporated in his Report.

The requirement was discussed by him with the Plant Manager and the Production Manager.

2. Quality Control Laboratory:

The Quality Control Laboratory is well equipped for analysis of essential oils. A Gas Chromatograph has also been installed. The Quality Control Expert has also brought with him a special column much used for essential oils examination as this was not supplied by the supplier.

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This purchase was duly authorised by the C.T.A. earlier in New Delhi when its need was explained by the Q.C.C. during briefing.

Future requirement for chemicals, solvents and glass-ware is not much. List of these has been prepared and will be submitted by the Q.C.C.

Besides the above, there is a need for a Fractionation Assembly of 10 litres capacity in order to standardise preparation of value added products from clove stem and Black - oil (Report B. Gulati, C.T.A., 10 March 1992, p. 17)

3. Pilot scale Distillation Unit:

The Distillery has undertaken work on the diversification of essential oil bearing crops. Before undertaking large scale cultivation of the selected species, it is necessary to undertake pilot scale cultivation trials. The Distillery does not possess facilities for distilling crops from these trials. It is necessary to have a steam distillation unit of capacity of about 150 litres.

4. Vehicles (Lorry):

One of the constraints in optimum capacity utilisation of the Distillery is lack of vehicles for transportation of fuel wood, harvested materials etc. (Report B. Gulati C.T.A., 10 March 1992, p. 39).

Two lorries were recommended as absolute necessity; one each to be provided by the Project and the Z.S.T.C. The General Manager, Z.S.T.C has asked his Dy. G. M., Pemba, to spare one lorry as and when needed by the Distillery.

Purchase of a lorry was incorporated in the Project Document (Activity 1.1.4 of Output 1.1). This could not be done earlier. It is now strongly recommended that a Tata truck of 10 ton capacity may be purchased. This item is now included among other items at Annex. IV.

VII. RECOMMENDATIONS

Following recommendations are listed for consideration and implementations.

1. There is urgent need for 2 lorries to
 - i. Transport lemongrass harvest from the fields in order to derive maximum possible benefit.
 - ii. Transport fuel wood for distillation of clove buds.
If possible 2 lorries, one each from the Project and Distillery resources may be purchased. In any case one lorry must be purchased as early as possible.
2. Road leading to the Magome Farm becomes impassible in patches during rains resulting in loss of harvest of lemongrass. The Government of Zanzibar may be impressed to repair it in order to enable smooth transport of the material to the Distillery for processing.
3. a) There is urgent need for a full time Farm Incharge (Agronomist) to look after the Farm work on day to day basis.
b) International Agronomist may be selected and fielded to complete the mission no sooner the Distillery/ ZSTC is ready to receive him.

JOB DESCRIPTION

DP/JRT 86/026/11-01

Post title Chemical Technologist - Essential Oil Distillation Plant Expert (CTA)

Duration 2 months 2.0 w/m

Date required 16 March 1992

Duty station Chake Chake (Pemba)

Purpose of project Maximizing the capacity utilization of the Clove Distillery in
Chake Chake (Pemba)

Duties The Chemical Technologist will be responsible for activities connected with the modernization of the Chake Chake Distillery, Optimisation of its present capability and introduction of an appropriate production programme. Specifically the expert in collaboration with local personnel will be expected to carry out the following:

- a) Utilizing spare parts ordered by UNIDO following recommendation of the Essential Oil distillation consultancy (11-51) the expert will formulate and implement a comprehensive plan for better utilization of existing installation thus bringing the plant into two shift operation and recommend additional hardware and other requirements.
- b) The expert will co-ordinate the activities of the experts and will be specifically involved in the "In plant training" Programme by means of lectures or seminars or any other period of instruction that may be required.

The expert will embody his observations and recommendations in report which he will be expected to finalise and present to UNIDO upon completion of each of his mission.

Training/ Fellowship and Study Tours

Training programme planned and accomplished till March 1992 was given in the last report of the C.T.A. (B. Gulati, Report: 10 March 1992, pp 18-19)

Following programme is now planned/suggested:

i) Marketing/ Export Manager, Z.S.T.C:

Sales Promotion Trip of the Marketing/Export Manager, Z.S.T.C to major present and potential consumers of clove oils is planned as under:

- a) Visit I.T.C. Geneva in order to get upto date information on the demand, supply and price levels of various essential oils.
- b) Paris and Grasse (Cannes), France, to meet the potential buyers (traders and consumers).
- c) London: to meet the existing buyers and other potential dealers.

Duration: Three weeks

ii) Chemist -

For training in various aspects of essential oils especially analysis by chemical and instrumentation techniques and olfactory evaluation.

Duration: Six weeks at the following Institutes

- a) Institute of Medicinal Plants, Poznan - Poland
- b) Pollena Aroma, Warszawa - Poland

- iii) Production Manager involved in production and also maintenance needs exposure in these fields of activity. It is suggested that he may be sent to Turkey to work in the Processing Unit established by the U.N.I.D.O. He should also visit essential oils distillation centres operated by private people.

Duration: Four weeks

- iv) Considering the need of and problems in marketing of clove and other oils, the General Manager, Z.S.T.C. and the Principal Secretary, Ministry of Trade and Industry, Government of Zanzibar should jointly undertake a study tour to get first hand information and decide on spot steps to be taken for increased and sustained marketing of the oils produced.

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This study tour is expected to enable the Government of Zanzibar to formulate a long range policy for improved and regular marketing of essential oils.

Duration: Two weeks

- v) Participation of the following in the International Congress of Essential oils, Flavours and Fragrances to be held in Vienna in October, 1992 is strongly recommended:
- a) Marketing / Export Manager, Z.S.T.C.
 - b) Plant Manager, Distillery, Chake Chake, Pemba.
 - c) General Manager, Z.S.T.C.
 - d) Principal Secretary/Director Trade of Ministry of Trade & Industry, Government of Zanzibar.

The Congress affords a unique opportunity to meet consumers, and traders of essential oils from all over the world.

Capacity Utilisation: Potential ofProcessing in the Distillery:

The Distillery has 10 distillation units of 3000 litres capacity each. Out of these one is reserved exclusively for distillation of material giving essential oils lighter than water. For calculation purposes, out of the balance 9 units, only 8 are considered operational at any time of the year.

Utilisation of the distillation units to process the estimated available materials is as under:

Distillation of

a) Clove Stems	5 distillation units
b) Clove Buds	3 distillation units
c) Lemongrass etc	1 distillation unit

With the 3 - shifts operation of the Distillery, 200 working days are considered practical. However, due to various factors such as electricity, water, transportation problems actual working of the Distillery is taken as 60 percent of the 200 - operational days: based on these factors, the processing capacity of the Distillery has been worked out as under:

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Capacity Utilisation Calculation

- Material to be Processed	<u>Clove Stems</u>	<u>Clove Buds</u>	<u>Lemongrass</u>
- Unit to be used for Processing	5	3	1
- Material for 3 shifts	10.5 tons	1.35 tons or 2.70 tons/ 2 days	5.0 tons
- Processing capacity			
a) For 200 days	2100 tons	270 tons	1000 tons
b) For 120 days (60 % of (a))	1260 tons	162 tons	600 tons
- Oil Produced (for 120 days working)	55 tons	25 tons	1.5 tons
- Export value of the Oils (U S Dollars)	275,000	250,000	12,000
 Total Material Processed		2022 tons	
Total Oil Produced		81.5 tons	
Total Export value (U S Dollars)		537,000	

Note: i) While required quantity of clove buds (distillation grade) are expected to be available, to get 1260 tons of stems will need concerted efforts. An area of 90 acres under cultivation of lemongrass can easily yield estimated quantity of the material.

ii) Distillation time, including loading & unloading of the materials is:

For Clove Stems	8 hours
Clove Buds	48 hours
Lemongrass	4 hours

iii) Export Price of the oils is:

Clove Stem	\$ 5/ Kg
Clove Bud	\$ 10/ Kg
Lemongrass	\$ 8/ Kg

List of Inputs Needed For the Distillery

1. Spare Parts:

Need for spares for the Distillery Equipment, Generators and Repair & Maintenance workshop was evaluated by the Engineer Expert. List will be incorporated in his Mission Report.

2. Quality Control Laboratory

List of Chemicals, solvents and glass - ware has been prepared and will be given by the Quality Control Chemist in his Mission Report.

3. Fractionation - Rectification Assembly,
Capacity 10 litres

The Assembly will essentially comprise of:

- i. Three - necked round bottom flask with bottom discharge; stop cock or teflon valve of 1.5 cm. diam. Thermometer pocket charging port (B-29) and on air leak tube with B - 29 joint.
- ii. Columns 120 cm (one) and 30 cm. (one) diam 5 cm. Glass helics/tubes as packing material.
- iii. Reflux divider, automatic reflux control, condenser, product cooler, receiver flask one - litre and 5 litres capacity, vacuum make - break 3 way stop - cock, connecting tubes for vacuum connections.
- iv. Heating mantle with bottom discharge arrangement for the flask.
- v. Vacuum - pump - double stage with 200 litres/minute air displacement capacity, vacuum gauge (McLeod) 0 - 10 mm (one) and 0-1 mm (one), vacuum trap for vapours.

The Assembly will be complete in all its essential parts and with support structure.

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iv. Pilot Scale Steam Distillation Unit:

Capacity 150 litres.

The unit will be made of stainless steel to work with steam and capable of withstanding pressure of 2 bars. Complete with tubular condenser and 2 florentine receivers; one each for separating oils lighter than water and one for oils heavier than water.

The unit will have both open coil for steam and closed coil for heating accumulated water if need arises.

Arrangement for cohobation is also to be provided.

For loading and unloading of the material a cage with handle to be provided.

v. Vehicle:

One Tata truck, complete with open body, capacity 10 tons

Following essential spares to be ordered along with the lorry:

1. Nozzles	12 pieces
2. Repair kit wheel cylinder	4 sets
3. Shock absorbers	2 pieces
4. Engine overhaul gasket	1 piece
5. Fuel filter	4 pieces
6. Oil filter	4 pieces
7. Tie rods (left & right)	1 set
8. Wheel bearing (rear and front)	8 pieces
9. Compression rings	1 set
10. Cross joints	2 pieces

List of Books and Periodicals

<u>Sr.No.</u>	<u>Authors & Title of the Book</u>	<u>Publisher</u>
1.	Yoshiro Masada "Analysis of Essential oils by Gas Chromatography and Mass Spectrometry"	Halsted Press Book, J. Wiley & Sons Inc. New York, 1976
2.	F. Formacek & K.H. Kubeczka "Essential Oils Analysis by Capillary Gas Chromatography and Carbon - 13 N M R Spectroscopy	J. Wiley & Sons Inc. New York, 1982
3.	R.L. Grob "Modern Practice of Gas Chromatography"	- do -
4.	Flavour & Fragrance Materials (Latest Edition.) Price: US \$ 89 + 820 postage	Allured Publishing Co, Box 318, Wheaton, Illinois, 60189 - 0318 USA
5.	Brian Lawrance "Essential Oils 1976 - 78 " " 1979 - 80 " " 1981 - 86	- do -
	Price \$ 148 for set of 3 volumes plus \$ 22 each for postage Total \$ 214	
6.	Steffan Arctander a) Perfume & Flavor Material of Natural Origin Price \$ 195 net pre-paid b) Perfume & Flavour Chemicals Vol I & II Price US \$ 335 net pre paid	Mrs Maria G. Arctander 6665 Valley View Blvd, Los Vegas Nevada 89118 U S A

Contd....

- | <u>Sr.No.</u> | <u>Authors & Title of the Book</u> | <u>Publisher</u> |
|--|--|---|
| 7. | E. Guenther
"The Essential Oils" Vol 1 - 6 | D. Van Nostrand
Inc. New York |
| 8. | Bauver, Kurt & Garbe
"Common Fragrance & Flavor
Materials" | V.C.H. Publishers
1985 |
| 9. | B M Lawrance, B D Mukherjee &
B.J. wills
"Flavour & Fragrances: A world
Perspective | Elsevier Science
Publishing B.V.
Amsterdam, 1988 |
| 10. | C.R.C. : Hand Book of Chemistry
& Physics | Chemical Rubber
Co, 18901. Cranwood
Parkway,
Cleveland, Ohio.
44128 - U S A |
| 11. | A.I. Vogel
Practical Organic Chemistry | |
| Journals & Periodicals
(To subscribe for 3 years) | | |
| 1. | Cosmetic world News (Bi-monthly)
130 Wignore St.
London, WIH O A T | |
| 2. | Perfumer & Flavorist (Bimonthly)
Allured Publishing Corp. P.C.Box 318
Wheaton, IL. 60189 - 0318 USA | |
| 3. | Indian Perfumer (Quarterly)
Essential oils Assoc. of India
Dua complex 24 Veer Savarkar Block
Shakarpur, Vikas Marg,
New Delhi - 110092 - India. | |
| Annual subscription \$ 60 | | |

List of Persons Met

1. Government of Zanzibar:

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|------------------------|---|
| - Mr. Issa S. Machano | - Principal Secretary
Ministry of Trade & Industry |
| - Mr. Kasim K. Songoro | - Director, Industry |

Zanzibar State Trading Corporation:

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|--------------------------|----------------------------|
| - Mr. Abdulrahman Rashid | - General Manager |
| - Mr. Shaib Ali Mossi | - Economic Adviser |
| - Mr. Suleiman J. Jongo | - Marketing/Export Manager |
| - Mr. Henry Kaleza | - Marketing Section |
| - Mrs. Fatma A. Mwinyi | - Chief Accountant |

U N D P/ UNIDO Dar-es-Salaam

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|---------------------|--------------------------|
| - Mr. A. Krassiakov | - Unido Country Director |
| - Mr. Akim | - UNIDO |

Counterpart Staff:

- | | |
|-------------------------|---|
| - Mr. Omar S. Nasib | - Plant Manager, Clove Stem
Oil Distillery Chake Chake |
| - Mr. Feruz Ramadhani | - Production Manager |
| - Mr. Salim Rashid Juma | - Chemist |

T. De Silva/jbg
1 July 1992

**Backstopping Officer's Technical Comments
based on the work of Mr. B. Gulati
DP/URT/86/026/11-01**

The report contains the activities undertaken by the expert together with a initial evaluation of the problems and recommendations for solving some of them. Part of his time has been spent on revising the feasibility report thus affecting his contribution to project activities.

Two major problems have been highlighted by the Consultant namely the need for marketing strategies and the difficulties in the transport of raw materials, lemon grass in particular. Part solutions to those have been suggested. Procurement of a lorry should be considered as an urgent necessity and requisitioned immediately. The nomination forms for study tours should be sent soon as arrangements for these take time.

The Consultant has also worked out how to maximize the utilization of the pilot plant to reach the target outputs for the year. The projected amounts may not be achievable unless the plant is used as proposed by the consultant.

The activities of the project in the agronomical area have been postponed due to lack of counterpart staff. There is an urgent need to fill this posts on a priority basis if the outputs of the project are to be fully realized. The fielding of the Agronomy expert is also unduly delayed.

The Consultant has coordinated the activities of two experts. Backstopping Officer agrees with the recommendations made by the consultant and hopes that the counterpart authorities will take immediate action to implement the recommendations.