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ASSISTANCE TO LAUREL OIL FACTORY IN SILIFKE, ICEL

SI/TUR/88/803

TURKEY

Technical report: Assessment of the economic requirements and conditions for installation and operation of a semi-installed laurel oil factory in Silifke (Icel)*

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

Based on the work of Dr. Hubert Schlemmer,
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United Nations Industrial Development Organization
Vienna

* This document has not been edited.

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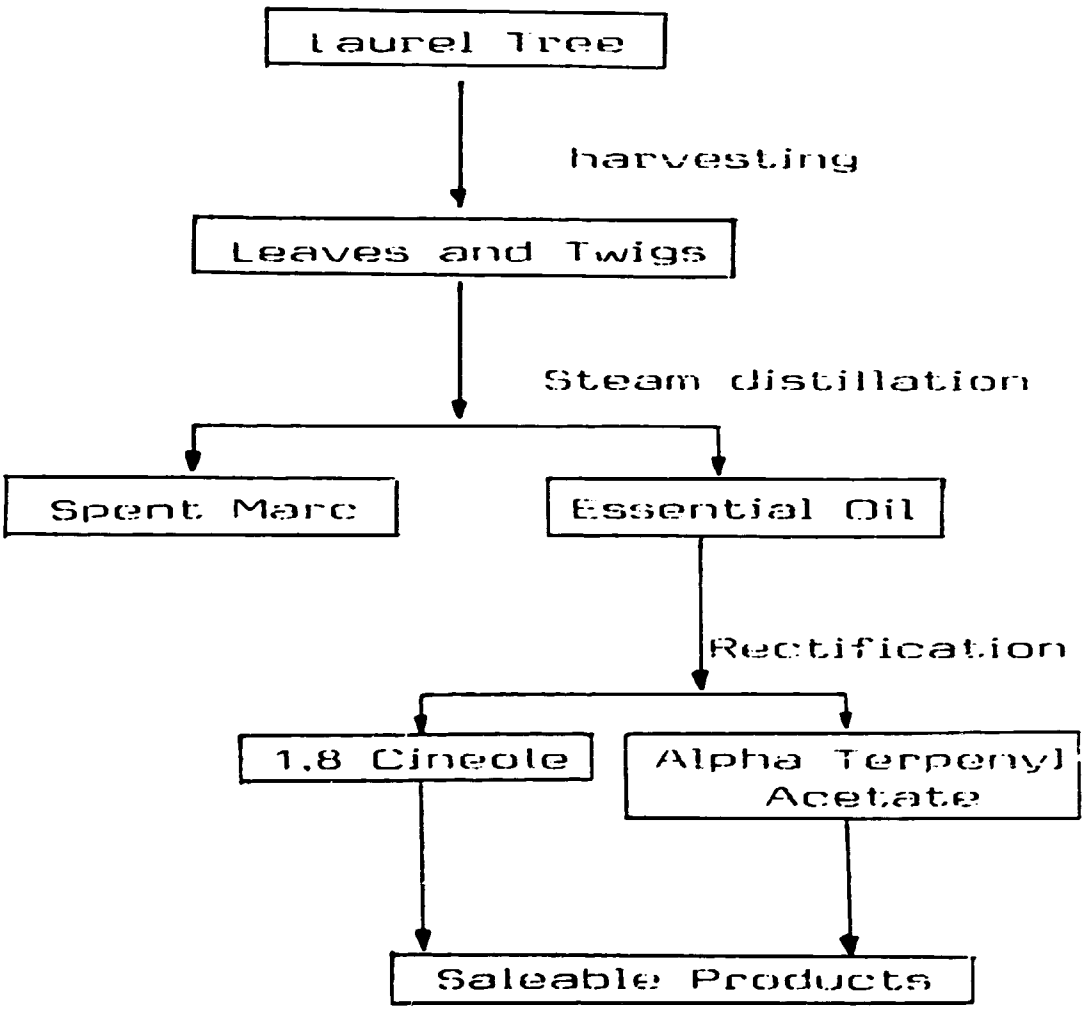


1. INTRODUCTION

The consultant undertook his mission to Turkey and ITC Geneva between 9 February and 24 February 1989.
The job description (as attached per Annex I) forsees, that the consultant will assess the economic requirements and conditions for installation and operation of a semi-installed laurel oil factory in Silifke (Icel).

During the briefing session at UNIDO Vienna it was further decided that the consultant would contact the Department of Marketing at ITC Geneva to get accurate data on the world market situation of laurel leaf oil.

After being briefed by the UNIDO SIDFA in Ankara and the Medicinal Plants Research Centre in Eskisehir, it was clear, that the trial running of the plant was postponed to beginning March 1989.
After reaching the plant site the consultant found that this delay was mainly caused due to the scarce availability of skilled labour which was demanded for setting-up the plant.

Faced by this new situation, data-collection for the cost calculation became a very difficult exercise because of many unknown parameters. However, the consultant discussed in-depth with M.B.Narasimha, members of the cooperative, the technical staff at the Medicinal Plants Research Centre, the Department of Forestry in Silifke.
Further he visited one village where laurel leaves are harvested and collected, to get a thorough picture on the unknown parameters. Still the calculation shown in the report reflects a theoretical exercise rather more than a cost and return calculation based on facts.

Because it will take some time to develop the tight market for laurel leaf oil and to train future appointed staff in the proper running of the plant and because it will be difficult to hire qualified labour in the Silifke district, the consultant came to the overall view, that for a running-in periode of 4 - 5 months the plant should be operated only at 8 hours (one shift) per day. Although the plant is designed for 24 hours processing and full running will also be considerable more viable, full productivity can only be reached after some time.

Because the harvesting season of the leavesstarts in July the plant could start processing at one shift in August 1989 and as long as it is operated on only one shift the raw material supply covered by the cooperative will be sufficient.

This first conclusion, to operate the plant in 1989 only at 8 hours per day is reflected in the calculations undertaken in chapter III.3. Cost Factors involved.
Calculations for full running of the plant at 24 hours per day are shown in Annex VI and Annex VII.

II. SUMMARY

The report describes the analysis of the production costs for laurel leaf oil in an essential oil factory in Silifke, Turkey, and a practical assessment of market funds for laurel leaf oil.

Turkey is facing today an overheated economy with high inflation and to small foreign exchange earnings. The Laurus Nobilis Tree is growing abundantly wild in Turkey especially in the coastal regions. Turkey is exporting annually more than 2.000 tons of dried leaves. The laurel oil factory will process laurel leaves to laurel leaf oil which is mainly for export. This means that this products will achieve a higher surplus and more foreign exchange earnings for Turkey.

The report finds that the laurel oil factory in Silifke is economic viable although the existing market for laurel leaf oil is rather thin. This means that product mix processing also other essential oils has to be developed as well as the existing market for laurel leaf oil.

Finally, the report shows some possible strategies for the market development of laurel leaf oil and gives some recommendations on the future management of the plant.

III. FINDINGS AND OBSERVATIONS

III.1. Laurus Nobilis

Laurus nobilis tree (or bay tree) an evergreen tree or shrub, is growing in some temperate and warm parts of the world, particularly in the countries bordering the Mediterranean. In ancient Greece and Rome its leaves and branchlets were used as garlands to bestowed upon heroes on festive occassions. The dried leaves, also called "sweet bay" are esteemed as a flavoring material in culinary perparations. They contain an essential oil of aromatic, spicy odor and flavor, which can be isolated by steam distallation.

This laurel leaf oil is a valuable adjunct in the flavoring of all kinds or food products. The oil is also used for medical purposes in antirheumatic medicines as an analgesic, and in the composition of soaps having good cleansing effect and the properties to clean and cure pimples and wounds.

The Laurus Nobilis Tree is growing abundantly wild in the coastal regions of Turkey between an altitude of 300 - 700 metres. On the turkish mediterranean coast the tree grows wild on a strip of approxiametly 500 kilometers length and 10 to 20 kilometers width. It grows also near the coast of the Marmaris and Black Sea.

The harvesting of the leaves is done by cutting the branches with the leaves, whereby in Turkey the harvesting season is between July and September. The Ministry of Agriculture, Forestry and Rural Development allows cutting of the same tree every third year so that the laurus nobilis plant can not be badly effected. However, the harvesting farmers have recognised that fact and are taking care on the plants properly.

The Medicinal Plants Research Centre of the University of Anatolia in Eskisehir has done considerable research on the quality of the dried laurel leaves of various regions in Turkey. The leaves harvested in Silifke district showed the highest yields of essential oil and the highest cineol contents (see Annex III).

The local Department of Forestry estimated the annual yield for the Silifke district to about 300 tons of dried leaves. The best testing results for the extraction of essential oil were achieved by using shadow-dried leaves, whereby the drying periode various from 15 - 20 days. There are two varieties of trees; for the essential oil production only the leaves of the non-berries trees are used, hence for the fixed oil production the fruits of the berries carring trees are used. Four tons of fresh harvested green leaves give around one ton of dried leaves.

III.2. Forest Villages Development Cooperative

The Laurel Oil Factory at Silifke is owned by the Forest Villages Development Cooperative (ORKÖY Orman Köylerini Kalkindirma Kooperatifi) which has 1,050 members from seven villages in the vicinity of the factory. The cooperative was established in 1969 through he initiative of ORKÖY, an organization of the Ministry of Agriculture, Forestry and Rural Affairs. The cooperative planned to set up a factory to process laurel berries for fixed oil and laurel leaves for essential oil using the raw material from the wild growing laurus nobilis plants.

As an incentive to encourage this activities, the Government offered a softloan at 1 % interest. With a loan of TL 140 million and a grant of TL 45 million the construction of the plant started in 1975. The members of the cooperative contributed in addition approxiametly TL 15 million. The construction

work stopped in 1983 due to the death of the constructor leaving uncompleted building and partly installed machinery.

Since then, the situation remained the same, however the size of debt kept growing to reach TL 600 million, including the TL 45 million grant which was withdrawn since it was linked with the running of the plant before 1985. During the last months the Governor of Mersin financed TL 35 million loan (at 28 % interest) for conservation and rehabilitation of the plant. UNIDO's rehabilitation project SI/TUR/88/803 provided US $ 64.000 and the members of the cooperative contributed TL 3 million in 1988/89.

The cooperative is trying to get interest free conditions for the repayment of the loan from the Governor of Mersin.
At the same time they are negotiating with the Ministry of Agriculture, Forestry and Rural Affairs to write-off the interest part of the soft loan (TL 410 million) and to schedule the repayment of the loan over 10 years.
Final results of this negotiations are expected in April 1989.

III.3. Cost Factors Involved

Because the trial running of the plant is postponed to beginning March 1989, most of the investigated direct costs are based on the best estimates of the author. However, the calculated costs may differ quite considerable from later production costs also because of the high inflation (7 - 8 % per month) Turkey is facing today. The calculated direct costs reflect therefore my best estimates based on February 1989 prices.
For the investigation of the overhead costs the used calculation figures become even weaker because it is not known which investment expenditures were undertakten in which year.

The Turkish Lira depreciated enormouse since 1975 against major currencies (see Annex IV). However, I have assumed linear progression for the investment costs to get at least an idea on the actual investment costs (see Annex V).

For depreciation purposes I have updated the value of the total investment and assumed an average life time of 15 years for the total plant. This again reflects only my best knowledge and may vary from the real life time of some of the equipment. However, it reflects an average figure of the various investments undertaken.

III.3.1. Direct Costs

a) Raw Material

The cooperative arranged collection of 7 tons of dried leaves for the trial running during the last months. The occured costs were TL 400,000 per ton for the dried leaves (including small branches), TL 30,000 per ton for transport to the factory and TL 30,000 per ton for separation of leaves and branches. Collection, transport and separation was done by hired members of the cooperative.

Although more laboratoy testing on dried leaves with branches (up to 5 mm diameter) has to be done, the first results of the Medicinal Plants Research Centre show, that procession of dried leaves with small branches could result in an economic viable production with good quality.

For the next harvesting season the cooperative will suggest a price of TL 480.000 to TL 500,000 per ton dried leaves (including transport to the factory site). It should be stressed at this point, that the cooperative was found reliable to arrange collection and transport of the dried leaves within

the Silifke district. However, once processing of leaves starts on a large scale (more than 300 tons per annum) additional collection and transport costs will occur.

In 1989 a levy of TL 80 per kg of dried leaves has to be paid to the Local Forestry Department in Silifke.

Because drying facilities at the factory site are not yet completed, part of the leaves will have to be dried in the villages.
For calculation purposes I have used costs of TL 580,000 per ton of dried leaves at factory site. It was further assumed that 2.5 tons of dried leaves can be processed within an eight hours working day.

b) Energy and Water Costs

Accurate data on electricity, coal and water consumption will be available once the plant is running. However, a first idea on the future consumption will be received after commissioning and trial running of the plant is completed.

Coal price:		TL 65,000	per ton
	+	TL 30,000	(transport from Konya to plant site)
		TL 95,000	per ton

estimated consumption: 500 kg for starting and one ton of coal per ton processed material.

Electricity: TL 180 per KW hour
The installed consumption capacity at the essential oil unit is approxiamotly 90 KWH. For processing laurel leaves a consumption of 60 KWHs was estimated.

Water Costs:
Two pumps are installed at the dwell house and the actual electricity bill and water consumption will be shared with the

Village Affairs Department of Silifke. Because some more costs may occur by bringing the water to the water tank (1.5 kilometers) and distributing the water at the plant adequately it seems wise to use for calculation purposes the official water price in Silifke district, which is TL 660 per cubic meter (including 10 % tax).
Estimated water consumption: 20 cubic meters per 8 hours working day

c) Direct Labour Costs

According to my preliminary recommendation, to run the plant in the first months only at one shift per day, the labour cost calculated at this part of the report reflects this view. However, the changes of the labour costs once the plant is operated three shifts per day is shown in Annex VI.

For calculation purposes the overhead costs for labour (insurance, tax, pension, paid leave, 4 x 50 % salary bonus per annum, etc.) were estimated at 100 % on top of the net salaries. The labour requirement was suggested by UNIDO expert M.B. Narasimha.

	net salary per month	total costs per month
1 chemical engineer	TL 400,000	TL 800,000
3 semi-skilled workers	TL 150,000	TL 900,000
1 boiler operator	TL 220,000	TL 440,000
1 boiler assistant	TL 150,000	TL 300,000

Total Labour Costs per month TL 2,440,000

Direct Cost Calculation (per month)

It was estimated that 20 working days per month are used for processing, while 1 - 2 working days are left for cleaning the machinery.

Raw Material (TL 580,000 per ton)		
2.5 tons x 20 days x TL 580,000	TL	29.000,000
Coal: 3 tons x 20 days x TL 95,000	TL	5,700,000
Electricity: 60 KW x 8 hrs x 20 days x TL 180	TL	1,728,000
Water: 20 m³ x 20 days x TL 660	TL	264,000
Labour	TL	2,440,000
Total Direct Costs per month	TL	39.132.000

III.3.2. Overhead Costs

As mentioned before, the calculation of the overhead costs is based on pure assumptions, which reflect the authors best estimates.
However, if we take the total investment costs (calculation see Annex V) for the essential oil unit and update the value we get the equivalent of US $ 2.954,000.

a) Depreciation

Before starting with the calculations for depreciation one has to consider, that the plant is designed to be runned on three shifts per day. If decided now, to run the essential oil unit in the first months only on one shift per day, it will also effect the wearing of the equipment. For calculation purpose I assume that the equipment is only weared to one third compared to a full capacity running.

The live time of the various investments will be quite different. The two coal boilers will have a life-time of 4 to 7 years, the technical equipment will last for 10 - 15 years and the construction work can last 40 to 50 years. For calculation the depreciation I assume an average life time of 15 years for all investmencs. which gives an annual depreciation rate of 6.67 %.

US $ 2.954.000 x TL 1,911 = TL 5,645,094.000 (value today)

annual depreciation (3 shifts):	TL 376,339,600
monthly depreciation (3 shifts):	TL 31,361,633
annual depreciation (1 shift):	TL 125,446,535
monthly depreciation (1 shift):	TL 10,453,878

b) Administrative Overhead Costs:

It is foreseen, that the total plant will be managed by a professional manager (+ 1 secretary). However, nothing is known on future administrative costs. At the same time, the future maintenance, packaging, transport (next port is Mersin) costs and possible commission payments for selling the product are unknown. Because the author emphasizes to get at least an idea of the total cost for processing laurel leaf oil, mark-up pricing is used for the estimation of the remaining costs.
To allow some room for the real administrative costs, I estimated a total mark-up of 30 percent on the costs occured so far for the essential oil unit.
Once production with the fixed oil unit starts, this mark-up rate might decrease to 20 - 25 percent as overall mark-up for the total plant.

III.3.3. Total Costs

Considering all calculated costs wet get now following picture:

Total Costs for 1 month production (1 shift)

Raw material	TL 29,000,000	
Coal	TL 5,700,000	
Electricity	TL 1,728,000	
Water	TL 264,000	
Labour	TL 2,440,000	
	Direct Costs	TL 39,132,000
	+ monthly depreciation	TL 10,453,878
		TL 49,585,878
	+ 30 % (administrative overhead)	TL 14,875,763
	TOTAL COSTS	TL 64,461,641

For calculation of 3-shifts running see Annex VII.
It should be noted that the above cost calculation does not include any capital costs (repayment of loan, contribution to company share holders, etc.)

However, as long as the plant operates at only one shift per working day, it will be very difficult to bear any capital costs (see also V. CONCLUSIONS AND RECOMMENDATIONS)

For evaluating the revenue situation of the plant the author assumes that the industrial processing of laurel leaves with

small branches will drop the oil yield to 1.6 percent. For the price estimation it was learned from the turkish trade statistics that small quantities of turkish laurel leaf oil were sold to Austria (100 kg) and France (150 kg) in 1988. More elaboration was not possible because the statistics show in many cases the total of sold fixed and essential oil.

The prices for the oil sold to Austria and France achieved US $ 43, US $ 52 and US $ 62 per kilogram.
However, taking 1.6. percent yield of oil and a price of US $ 43 per kilogram expresses a minimum revenue calculation, because a yield of 1.8 - 2 percent and a price of US $ 62 or even higher seem also to be possible.
Comparing now the calculated returns with our cost calculation shows following:

<u>One shift per day:</u>

50 tons x 1.6 % x $ 43 x TL 1,911	(800 l oil)	TL 65,738,400
	- Total Costs	TL 64,461,641
	surplus 1	TL 1,276,759

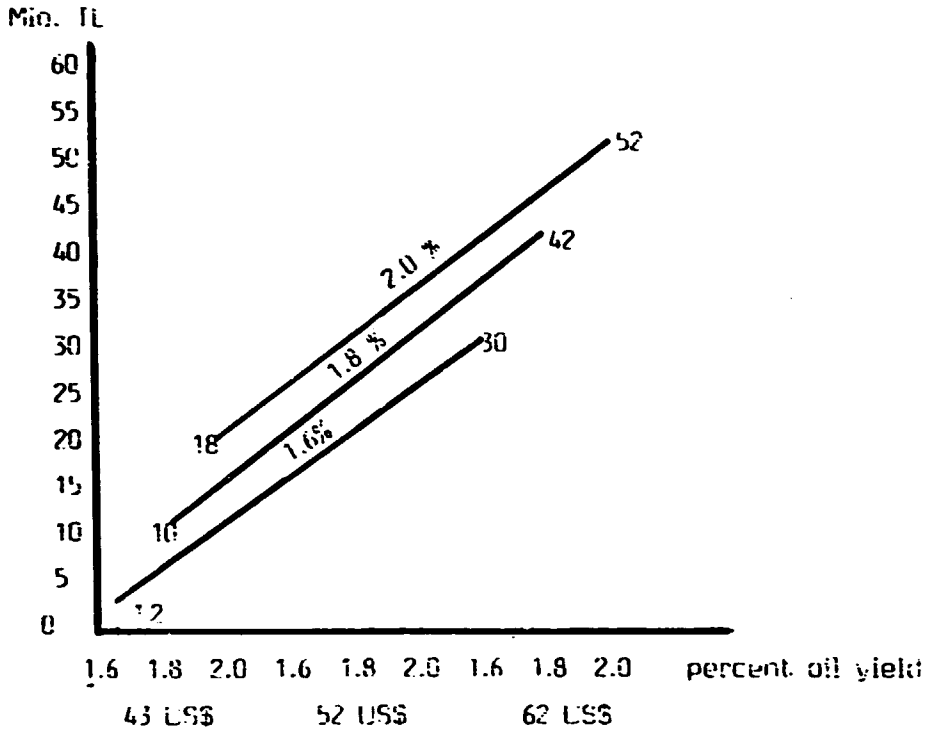
<u>Three shifts per day:</u>

150 tons x 1.6 % x $ 43 x TL 1,911	(2,400 l oil)	TL 197,215,200
	- Total Costs	TL 173,833,960
	surplus 2	TL 23,381,240

Surplus means that capital costs and tax are not included

Above calculations show, that the margin for 8 hours running per day remains very small. The calculation for 24 hours operating the plant indicates that this is considerable more viable and leaves also some room to bear repayments of the loans.

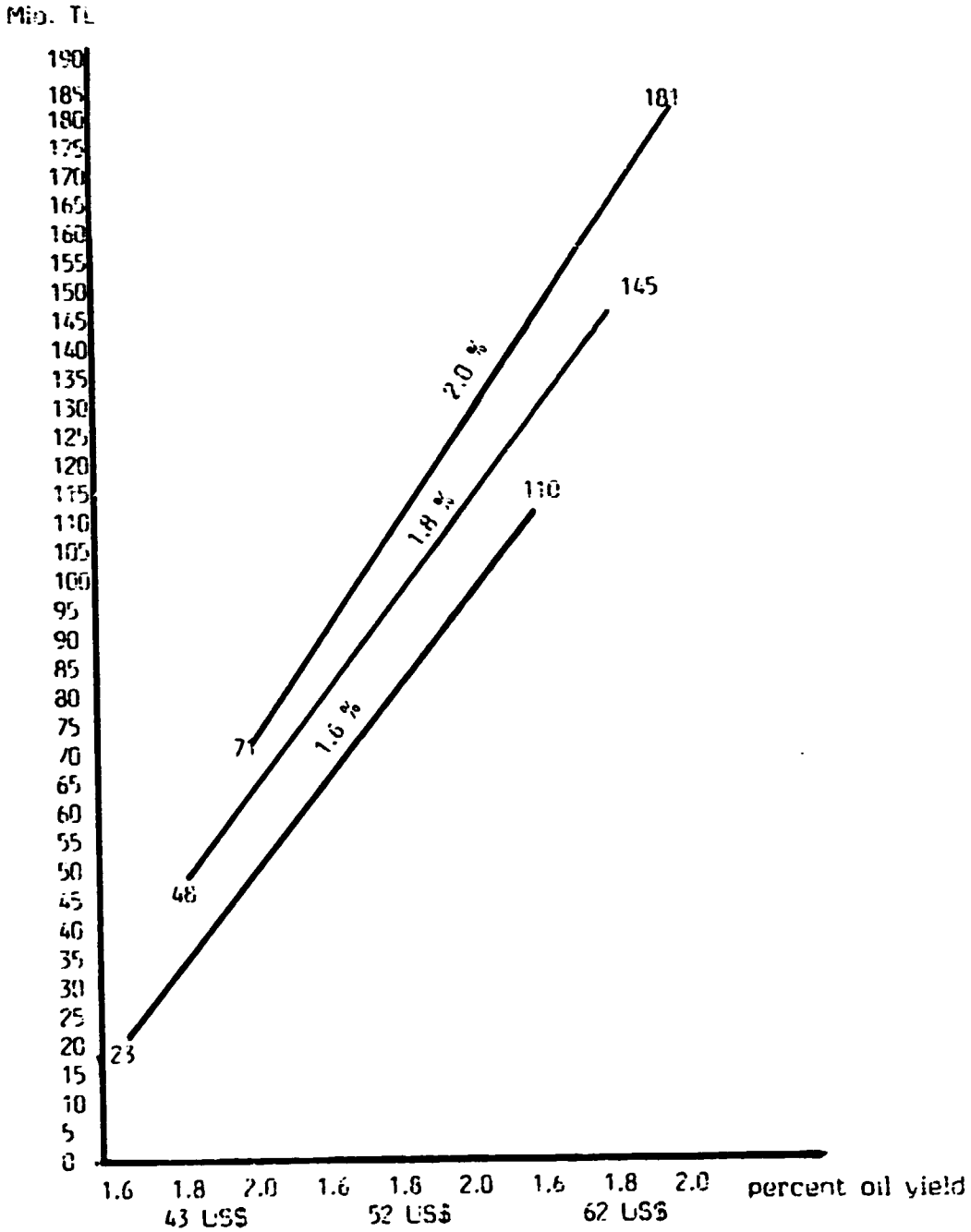
Surplus-trends for one shift per day



Remarks:

Above graphic representations show a calculated minimum surplus (assumption: 1.6. % oil yield sold for US$ 43) of TL 1.2 million and a calculated maximum surplus (assumption: 2.0 % oil yield sold for US $ 62) of TL 52 million. However, the real surplus will be somewhere between this range.

Surplus-trends for three shifts per day



Remarks:

Above graphic representations show a calculated minimum surplus (assumption: 1.6 % oil yield sold for US$ 43) of TL 23 million and a calculated maximum surplus (assumption:2.0 % oil yield sold for US$ 62) of TL 180 million. However, the real surplus will be somewhere between this range.

III.4. MARKET RESEARCH

Small quantities of laurel leaf oil are produced in some mediterranean countries, among them Morocco, Spain, Italy, Portugal, Greece, Yugoslavia, Albania and Turkey.

The total annual known production of the oil seems to be in a range of 3 to 5 tons. After discussing with ITC it was found, that this 3 - 5 tons annual production mainly represents the demand of the oil from the parfume and pharmaceutical industries.

Because there is a huge demand for dried laurel leaves, it is supposed that most of the dried leaves are used in the food processing sector. Turkey for example is exporting 2.000 tons of dried laurel leaves per year.
Presumably some of this exported leaves are processed to laurel oil, but these amounts are not recorded by the international trade statistics. Also presumably is, that many food processors still use dried leaves because they dont know the advantages and availability of laurel leaf oil.

However, it will be the responsibility of the future management of the plant to investigate and develop the market for laurel leaf oil.

A lot of promotion and information work should focus on the food processing industry.

As mentioned in chapter III.3.3. Total Costs - laurel leaf oil fetched a price of $ 43 to $ 62 per kg in Turkey in 1988. It should also be noted that the retailer price of the product in Europe is $ 100 to $ 130 per kg. This should indicate, that possible orders from european users of the product (for some contact addresses see Annex VIII) could achieve an extra

profit for the laurel oil factory in Silifke.

Firmenich, Geneva and Dragoco Vienna have expressed their interest to get samples of the laurel leaf oil produced in Silifke. A careful pricing of the product will make it possible to enter the market of perfume and pharmaceutical industries. In the perfume industries the increasing trend for mens toilet articles give another good outlook for an increasing demand for laurel leaf oil.

IV. CONCLUSIONS AND RECOMMENDATIONS

1. The future management of the factory has to be done by highly professional qualified managers. International market development for laurel leaf oil and identification of product mix processed in the factory (anise seed oil, oregano oil, lemon leaf oil, etc.) demand professional management.

2. It was recorded from the Governor of Mersin, the Medicinal Plants Research Centre of Eskisehir and the Forest Villages Development Cooperative that all this mentioned parties intend to form a commercial company which should operate the plant. The author endorses this intention and expresses the importance of a commercial running of the plant and a overall guidance for the future management of the plant.
However a future company will need a cash requirement of approxiametly TL 150 million (one shift) to TL 500 million (three shifts) to settle initial payments for raw material and labour before first sales achieve returns.

3. The author stresses that the drying unit has to be completed soonest so that the company can dry part of the laurel leaves. This will not only reduce the costs for the raw material but also avoid future bottle necks of raw material supply. The construction of a small coal hut would allow a higher storage of coal (presently only 25 - 30 tons of inside coal storage are available) which could result in avoiding inflationary price increases due a coordinated purchasing policy.

4. The author recommends that the Medicinal Plants Research Centre in Eskisehir assists the future company with quality control and in the recruitment and training of the future staff of the factory.

5. The author recommends further that the Ministry of Agriculture Forestry and Rural Affairs writes-off the interest part of the loan and changes the loan to a soft loan with a repayment period of 10 years. The repayment of the loan could start soonest in

1990. It should be stressed at this point that future repayment of the loan at commercial conditions (appr. 90 % interest) would jeopardize the economic survival of the factory.

6. To reduce the high overhead costs and to make full advantage of the investment the semi-installed fixed oil unit should become operational soonest.

7. Because of the short harvesting season for the laurel leaves the existing storage facility (appr. 150 - 200 tons) has to be used completely. The future managment of the plant has to investigate if the existing storage facility is sufficient once it comes to a production mix.

8. The factory will produce 50 to 150 tons of extracted leaves per month. So far no economic use for this by-product has been identified. However the owner of the plant has to investigate possible economic benefit of this by-product. Possibilities like to produce fuel substitute, to use the extracted leaves as natural fertilizer or as animal feed for mountain goats (they like green laurel leaves) have to be investigated before large scale processing start.

V. ACKNOWLEDGEMENTS

I would like to take the opportunity to express my sincere gratitude to Dr. M. Kamal Hussein, Senior Industrial Development Field Adviser of UNIDO in Ankara, for his valuable assistance to my mission.

Likewise I would like to express the pleasure I took in working together with Prof. Dr. K. Hüsnü Can Baser, Director of the Medicinal Plants Research Centre of the University of Anatolia in Eskisehir and National Project Coordinator of DP/TUR/86/001 Pharmaceutical Materials from Medicinal Plants, whose cooperation was very much appreciated.

Mr. Sedat H. Beis, Chemical Project Engineer of the Medicinal Plants Research Centre and Mr. M.B. Narasimha, UNIDO Expert, Chemical Engineer have also contributed to my work, by means of fruitful cooperation and discussions we had on the economic parameters of the factory.

I would also like to thank Dr. Ali Su, Chairman of the Forest Villages Development Cooperative and all other involved cooperative members, and last but not least the staff of UNIDO Vienna and ITC Geneva for the assistance rendered.

PART B

I. INTRODUCTION

During his debriefing with the Medicinal Plants Research Centre of the University of Anatolia, the consultant was requested by the National Project Coordinator of DP/TUR/88/801 Pharmaceutical Materials from Medicinal Plants, Prof. Dr. K. Hüsnü Can Baser to assist the Research Centre in the calculation of the unit costs for the steam distillation unit, the rectification and the extraction unit.

Because time was available and because the calculation of the unit costs for steam distillation was an interesting exercise to proof the estimated parameters for the Silifke factory the consultant prepared all requested calculations although this was not a requirement of his job description.

II. UNIT COST CALCULATIONS

II.1. For Steam Distillation

Assumption: 100 kg of undefined material should be steam distillated. Testing time: 4 hours

a) Energy and water costs:

Oil: 20 l for starting
+ 10 l x 4 hrs* = 40 l + 20 l = 60 l x TL 350
TL 21,000

* 0.1 l oil per kg/h of material)

Electricity: 10 kwh x 4 hrs = 40 kwhrs x TL 160 =	TL 6,400
Water: 2,000 l x 4 hrs = 8,000 l x TL 0.2 =	TL 1,600
Total Energy and Water Costs	TL 29,000

b) Labour Costs

	net salary	gross costs
1 engineer	TL 400,000	TL 800,000
2 semi-skilled workers	TL 200,000	TL 800,000
Costs per months		TL 1,600,000
costs per hour (150 working hours per month)		TL 10,700
labour costs for 4 hours		TL 42,800

c) Laboratory Costs: TL 100,000 per test

d) Investment Costs and Depreciation:

Oil boiler: TL 6,000,000 (value 1989)
Tournaire Unit: 40.000 US$ in 1986 = TL 76.400,000 (value 1989)
Fittings and Pipings: 500,000 TL in 1986 = TL 1,400,000 (value 89)
Building: TL 100 million (value 1989)

Utilisation Costs of Building, Fittings and Pipings per Unit:

	Building	Fittings & Pipings
Tournaire	20 %	50 %
KB (Narasimha)	20 %	10 %
Fractionation Colume	20 %	20 %
Chem-Reactor	20 %	10 %
Percolators	20 %	10 %

Oil Boiler can be used for two different Units at the same time (= utilisation costs 50 %)

Calculation of Depreciation:

	costs	years	dep.rate	annual depreciation
Oil Boiler	6,000,000	10	10 %	TL 600.000
Tournaire	76,400,000	15	6.67 %	TL 5,095,880
Fittings	1,400,000	10	10 %	TL 140,000
Building	100,000,000	50	2 %	TL 2,000,000
	Total annual depreciation			TL 7,835,880

Utilisation Costs for Tournaire Unit:

Boiler (50 %)	TL 300,000
Tournaire Unit (100%)	TL 5.095,880
Fittings (50 %)	TL 70,000
Building (20 %)	TL 400,000
Depreciation for running Tournaire Unit	TL 5.865,880
depreciation per month	TL 488,820
depreciation per day	TL 23.277

e) Total Cost calculation
(without cleaning costs)

Energy and water:	TL 29,000
Labour	TL 42.800
Laboratory Test	TL100,000
Depreciation	TL 11,640
	TL 183,440

Cost calculation (including cleaning cost):

Two days are required for cleaning. Labour: 1 engineer and one semi-skilled worker. The unit is not operational for two days.

Total costs from above	TL 183.440
Labour for cleaning	TL 127,200
depreciation	TL 46,550
water and energy	TL 15,000
	TL 372.190

II.2. For Rectification

Assumption: 80 kg of oil should be fractionated for 5 hours.

a) Energy and water costs

Oil: 20 l + 25 l = 45 l x TL 350	TL 15,750
Electricity: 17 kwhrs x 5 = 85 kwhrs x TL 160	TL 13,600
Water: 1,000 l x 5 = 5,000 l x TL 0.2	TL 1,000
	TL 30,350

b) Labour:

1 engineer + 1 semi-skilled worker x 5 hrs	TL 39,750

c) Laboratory costs: TL 100,000

d) depreciation

Fractionation Columne: TL 3,690,000 (value 89)
used over 10 years (depreciation rate 10 %)

Boiler (50 %)	TL	300,000
Fract.Columne (100%)	TL	369,000
Pipings (20%)	TL	28,000
Building (20 %	TL	400,000
annual depreciation	TL	1,097,000
depreciation per month	TL	91,420
depreciation per day	TL	4,350
utilisation for 5 hours	TL	2,719

e) Total cost calculation
(without cleaning)

Energy and water	TL	30,350
Labour	TL	39,750
Laboratory	TL	100,000
depreciaton	TL	2,719
	TL	172,819

Cost calculation (including cleaning cost)

Two days of cleaning are required by 1 engineer and 1 semi-skilled. The unit remains non-operational for two days.

Total costs from above	TL 172,819
Labour	TL 127,200
Alcohol (15 l x TL 3,000)	TL 45,000
depreciation	TL 6,700
water and energy	TL 15,000
Total Costs	TL 368,719

II.3. For Extraction

60 kg of material should be extracted for 12 hours

a) energy and water costs:

Oil: 2 hrs x 10 l/h + 20 l + 12 x 10 l/h = 160 l	TL 56,000
water: 180 l + 2,000 l/h= 25,000 l	TL 5,000
electricity: 5 kwh x 4 + 1,5 x 12 = 38 kwhrs	TL 6,080
Total energy and water costs	TL 67,080

b) Labour: 1 engineer and 1 semi-skilled worker x 12 hours TL 95,400

c) depreciaton

Chem-reactor: TL 89,195,000 (value 89)
used over 10 years (depreciaton rate 10 %)

Boiler (50 %)	TL 300,000
Tournaire (100%)	TL 5,095,880
Fittings (50%)	TL 70,000
Building (40%)	TL 800,000
Chem-reactor (100%)	TL 8,919,500
Total annual depreciation	TL 15,185,380
monthly depreciaton	TL 1,265,500
daily depreciaton/utilisation	TL 60,259

e) Total cost calculation

(without cleaning)

Energy and water	TL 67,080
Alcohol (30 l)	TL 90,000
Labour	TL 95,400
utilisation	TL 90,390
Total Costs	TL 342,870

Cost calculation (including cleaning costs)

Half day of cleaning required. 4 hours by a semi-skilled worker and 2 hours supervison by an engineer.

Total costs from above	TL 342.870
Labour	TL 21.200
water,energy	TL 15.000
depreciaton 1/2 day	TL 30.000
Total Costs	TL 409.070

ANNEX I

R.O.B. Wijnsekera/1.a
K. Dierbeck/1.a
April 1985

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Project in the Republic of
Turkey

JOB DESCRIPTION

11-52

ist title	Economist
uration	1.0 m/m
ate required	ASAP (to coincide with first visit of Chemical Technologist)
uty station	Silifke (Icel) and Eskisehir
urpose of project	To assess economic requirements and conditions for installation and operation of a semi-installed laurel oil factory in Silifke (Icel).
Duties	The expert will work in close collaboration with the direction and staff of University of Anatolia, Medicinal Plants Research Centre (MPRC) in the assessment of the economic feasibility of the Laurel Oil Factory situated in Silifke, Icel. The factory is designed to produce fixed oil from Laurel Berries and essential oil from Laurel leaves. The expert is specially required to investigate the productivity problems of the factory and to assess the economic viability of the procurement of the raw material. The consultant will join a group of experts who would be studying the present state of the industry on site and assist him with economic marketing inputs. The expert will also be required to prepare a final report, setting out the findings of the mission and recommendations to the Government on further action to be taken.

Applications and communications regarding this Job Description should be sent to

Qualifications: Degree in Economics with experience in economic studies on agro-based industrial projects in developing countries.

Language: English

Background information

Since 1968 Turkey has been exporting dried laurel leaves from the Laurus nobilis tree (common name bay tree) of quantities more than 1500 t/a. The Coastal States of Turkey which have an altitude of 700 meters have significant quantities of laurel trees.

The Laurel Oil Factory situated in Silifke, Icel is owned by the Forest Villages Development Cooperative which has 1050 members from several villages in the vicinity of the Factory. These members also constitute the main collectors of raw materials to be processed by the factory.

The cooperative was established in 1969 through an initiative of ORKOY, an organization of the Ministry of Agriculture, Forestry and Rural Affairs and is the owner of the plant.

The cooperative planned to set up a factory to process Laurel Berries for fixed oil and Laurel Leaves for essential oil using raw materials collected from the Laurus nobilis tree growing wild in the region.

Setting up the factory was subcontracted to a firm who, favoring italian technology began to establish the desired factory in 1975 with the aim to complete it in 1978. However, construction work could not be completed as scheduled and untimely death of the constructor in 1983 hlated all activities at the factory site. Since then, half-installed machinery and equipment were left as such inside the factory building which was 90% completed. The plant site is situated in an area of 10,000m^2 which comprises factory building, warehouse, administration and social buildings and canals.

Due to several financial and legal disputes between the cooperative and ORKOY (loaner to this project) nothing could be done so far to complete and operate the factory. A few years ago ORKOY was abolished. Recently, the newly elected executive board of the Cooperative has approached the MPRC for assistance directed towards UNIDO, in the form of international expertise.

The factory was designed to process 2000 tons/year leaves for distillation of essential oil and 5000 tons/year fruits for extraction of fixed oil. There is no shortage of raw materials for processing. The tree grows wild abundantly along the coastal line of Turkey stretching from Sinop in Black Sea to Antakya in Eastern Mediterranean. The leaves constitute a major export commodity and they are not, at present, processed for essential oils in Turkey. MPRC has carried out several pilot plant experiements for the distillation of essential oil and established quality control methods.

ANNEX II

Persons and Institutions contacted

UNIDO Ankara:	
Dr. M. K. Hussein	SIDFA
M.B. Narasimha	UNIDO-Expert (Silifke)
Medicinal Plants Research Centre, Eskesihir	
Prof. Dr. H.K.C. Baser	Director
S.H.Beis	Chemical Project Engineer
T. Özek	Chemical Project Engineer
Ö.M. Kocker	Chemical Engineer
Forest Villages Development Cooperative	
Dr. A. Su	Chairman
M. Tepe	member
T. Tol	board member
Department of Forestry, Silifke	
M. Aksoy	Director
International Trade Centre, Geneva	
A. Paradies	Head, Information Supply Unit
P.J.H. Slessor	Senior Marketing Officer
P. Schwob	ITC Expert for Essential Oils
Firmenich, Geneva	
J.H. Challen	Director
N. Rozat	Purchasing Director

ANNEX III

Some Composition Values of Laurel Leaves Oils
by different Turkish Regions

	Silifke	Izmir	Marmaris	Bursa
Oil yields - leaves (laboratory)	3 - 3.8 %	2.2%	3.3 %	1.5 %
Oil yields - Leaves with branches 5 - 6 mm diameter (laboratory)	2.4 %			
Oil yields - leaves (pilot plant)	2.3 - 3.9 %	1.1-2.1 %		
1.8-cineole (laboratory)	57.9 -62.7 %		44.02 %	47.2 %
1.8-cineole (pilot plant)	55.3-62.3 %	42-53.1 %		
alpha-terpinyl acetate (lab.)	7 - 8.4 %		8.13 %	
alpha-terpinyl acetate (pilot plant)	5.8 - 9.9 %	8.2 - 12.42 %		

Source: Testing results provided by the Medicinal Plants Research Centre of the University of Anatolia in Eskisehir

ANNEX IV

Dollar exchange rate of
the Turkish Lira
(annual averages)

TL per US $

1975	TL 14.5	1982	TL 163
1976	TL 16	1983	TL 225
1977	TL 18	1984	TL 367
1978	TL 25	1985	TL 522
1979	TL 33	1986	TL 675
1980	TL 80	1987	TL 857
1981	TL 110	1988	TL 1.450

16 February 1989 (middle rate): 1 US $ = TL 1,911

Source: derived from International Monetary Fund.
International Statistics

ANNEX V

Investment Cost Calculation

Soft Loan	TL 145,000,000
Grant	TL 45,000,000
cooperative contribution	TL 15,000,000
	TL 200,000,000

TL 200,000,000 were invested between 1975 and 1984

Investment Costs*

Year	TL per US $	Investment in TL	Investment (US $ equiv.)
1975	14.5	20,000,000	1,379,000
1976	16	20,000,000	1,250,000
1977	18	20,000,000	1,111,000
1978	25	20,000,000	800,000
1979	33	20,000,000	606,000
1980	80	20,000,000	250,000
1981	110	20,000,000	182,000
1982	163	20,000,000	123,000
1983	225	20,000,000	89,000
1984	367	20,000,000	54,000
		TL 200,000,000	US $ 5,844,000

* Assumption: linear progressive distribution of investment costs

The equivalent of US $ 5,844,000 was so far invested up to 1984. Since then following investment costs occured:

Loan (Governor of Mersin)	TL 35,000,000
cooperative contribution	TL 3,000,000
	TL 38,000,000

ANNEX V

Now, evaluating this cost from 1988 and 1989 in US Dollar equivalent, gives following picture:

1988:	TL 25,000,000	TL 1,450 = 1 $	$ 17,240
1989	TL 13,000,000	TL 1,900 = 1 $	$ 6,840
			$ 24,080

Per February 1989 the total investment for the plant was approxiametly the equivalent of US $ 5,868,000. Now assuming that the costs for the fixed oil unit (including infrastructure costs) was half of this total investment, we get US $ 2,934,000 as investment costs for the essential oil unit.

It should be considered that some investment (completion and rehabilitation of the drying facilities and construction of a coal hut) has to be done in the neat future, to make full economic use of the plant. However, this future investment costs are unknown, for calculation purpose I assume the equivalent of US $ 20,000.

Now I arrive on total investment costs for the essential oil unit of US $ 2,954,000

ANNEX VI

Direct Costs for Three Shifts per day

Raw Material: 7.5 tons x 20 days x TL 80,000	TL 67,000,000
Coal: 8 tons x 20 days x TL 95,000	TL 15,200,000
Electricity: 50 KW x 24 hours x 20 days x TL 180	TL 4,320,000
Water: 50 m³ x 20 days x TL 660	TL 660,000
Labour: (see below)	TL 6,320,000
Total direct costs per month	TL 113,500,000

Labour Costs for three shifts production

	net per person	total costs/month
1 chemical engineer (for overall supervision)	TL 400,000	TL 800,000
3 Foremen	TL 250,000	TL 1,500,000
9 semi-skilled workers	TL 150,000	TL 2,700,000
3 boiler operators	TL 220,000	TL 1,320,000
Total labour costs per month		TL 6,320,000

ANNEX VII

Total Costs for Thee Shifts Running per month

Raw material	TL	67,000,000
Coal	TL	15,200,000
Electricity	TL	4,320,000
Water	TL	660,000
Labour	TL	6,320,000

Total direct costs	TL 113,500,000
+ monthly depreciation	TL 31,361,633
	TL 144,861,633
+ 20 % overhead costs*	TL 28.972,327
TOTAL COSTS PER MONTH	TL 173,833,960

* For the estimated 20 percent mark-up of the overhead costs, it was considered that part of this costs will not rise proportional (administrative labour costs), whereby one part of the costs will increase proportional (commission, packaging, transport). However, it also reflects an estimation that once the plant is running at full capacity this mark-up will lower to 20 percent.

ANNEX VIII

Some Contact addresses of possible importers of Laurel Leaf Oil

Austria:

Pflege Louise & Co, Heizhausgasse,
A-5500 Bischofshofen
Tel.No. 06462/2260-0 — Processor (parfume)

DRAGOCO Austria
Director Dr. Wilhelm Mathes
Tel.No. 0222/867615-0 — Processor/Importer

APOKA - Produktions- und Handels GesmbH
A-1210 Wien
Mr. M. Zimmermann
Tel.No. 0222/385295 — Importer

France:

Ets. Marseillaise d' Importation — Importer/Agent
17 rue Mires
13003 Marseilles

Industrie Biologique Francaise
35 Quai du Moulin-de-Cage
92 Gennevilliers — Processor

Germany:

Vereinigung der am Drogen und Chemikalien
Gross und Aussenhandel beteiligten Firmen
(Drogen- und Chemikalienverein)
Director Mr. E. Eggers
G Odden Strasse 21
D-2000 Hamburg
Tel.No. 040/360160 — Importer

Alfred Zwintscher Fabrik pharm Präparate GmbH
Postfach 29 40
7500 Karlsruhe 1 — Processor/Importer

Geberding und Co - DRAGOCO
Dragocostrasse
D-3450 Holzminden — Processor

Haarmann und Reimer Gmbh
An den Teichen 2
D-3450 Holzminden — Processor

ANNEX VIII

Canada:	
Drug Trading Co ltd. 15 Ontario Street, Toronto ON M5W 1E4	Importer
ANCA Laboratories, 111 Consumer Drive Whitby ON, L1N 5Z5	Processor
Netherlands:	
P.P.F. International B. Westkanaaldijk 6, P.O. Box 84 3600 AB MAARSSEN Tel.No.: (0)30-435934	Supplier of Food industries
Naarden Internationaal Holland B.V. Huizerstraatweg 28 P.O.Box 2 1400 CA BUSSUM Tel.No.: (0)2159-99111 Tlx.: 43050	
Pembroek B.V. Industrieweg 3-22 P.O.Box 34 1230 AA LOOSDRECHT Tel.No. (0)2158-1355 Tlx. 43215	processor/importer
Vermeer Agenturen Engelandlaan 276 P.O.Box 3012 2001 DA HAARLEM Tel. (0)23-340511	agents/essential oils
Switzerland:	
Firmenich & Cie La Jonction Purchasing Director Mr. Rozat Geneva	processor/user
L.Givaudan & Cie S.A. Vernier-Geneva	processor/user

ANNEX VIII

United Kingdom:

Andard-Mount (international) ltd. 24/28 London Road Wembley, Middlesex HA9 7HD	processor
William Ransom & Son ltd. Hitchin/Herts SG5 1LY	processor

United States:

E.L.Scott & Company, inc. One World Trade Centre, Suite 1313 New York, N.Y.10048 Tel.No. (212)432-0100 Telex: 12-6681 Cable: "elscotco"	Agents & Brokers in essential oils
International Flavors and Fragrances Inc. 521 West 61st Street, New York, N.Y.10019	processor/user