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STRENGTHENING THE ROYAL DRUG RESEARCH LABORATORY

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NEPAL

Technical report: Processing of Medicinal Plants cultivated and collected in Nepal; Analysis of cultivation costs and market trends*

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

Based on the work of Mr. Walter J. De Boeck,
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ABSTRACT

The report describes the analysis of the cultivation costs for a selected group of medicinal and aromatic plants grwon in Nepal, and a practical assessment of market funds for products.

The report finds that although a good base exists for an export industry based on botanicals, several problems have to be overcome. These are based on certain present limitations of the Herbs Production and Processing Company (HPPC) which puts it at a disadvantage in comparison between the large scale production of a few profitable items and the need to expand the national potential for a botanicals based industry.

From present crops Palmarosa offers the highest profitability for Nepal, while Mentha Cetronella and lemon grass will not offer good prospects until production costs are lowered.

Belladonna could offer prospects in the Indian market only while crude drugs of quality can be made to compete internationally. The HPPCL could develop a local market for supplying raw material for Ayarvedic drugs. Improvements in Technology and Management are needed.

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Explanatory note

1 US$ = 20.9 Nepali Rupees (24/4/1986).

FAO = Food and Agricultural Organization of the United Nations.

HPPCL = Herbs Production and Processing Company Limited.

UNDP = United Nations Development Programme.

UNIDO = United Nations Industrial Development Organisation.

I. SUMMARY

The consultant undertook his mission for a three month period between 19 January and 18 April 1986.

As this was the first part of split mission, the job description (as attached per Annex IX) for this part was more clearly spelled out (in a telex to UNIDO on 29/1/1986) as follows, and agreed upon by all concerned parties:

"1. Investigate cultivation, collection and field distillation costs of products taken up in the programme.

2. Assemble data on company overhead costs.

3. Undertake market research for products taken up in the work programme (this activity will be undertaken jointly with Mr. Sitaram).

4. Market evaluation based on available standards and samples produced and contacting possible market outlets."

Since the arival of most of the equipment purchased under the project was still awaited, processing cost analysis was not taken up in the work programme.

For the assignment, three HPPCL staff (planning, cost-accounting and sales officers) were associated with the consultant for on-the-job training in the relevant spheres.

Since the emphasis was on cultivation cost analysis, assistance was also provided by staff from the UNDP/FAO NEP/79/007 project ("Cultivation of Medicinal and Aromatic Plants") and from staff of HPPCL's Tamagadhi Herbal Farm.

In the process of undertaking cost-benefit analysis, it is essential that the 'cost of the analysis should not outweigh the benefits derived from it". In other words, one should be careful that the analysis should not be more elaborate than the basic data allow. This basic rule was adhered to, and the emphasis was on a down-to-earth approach aiming at finding practicable means of improving the efficiency of the operation. The methodology used, and the results obtained in this regard were subsequently transferred to the relevant HPPCL staff.

In the field of market research the work programme was co-ordinated with the one of the marketing consultant, and the emphasis was on practical follow-up on market trends and potential customers, in as far as this was possible from Nepal. Extension of the first part of the mission by one month has been agreed to in order to explore the potential for exporting herbal extracts to European markets. The sales officer was closely associated with this part of the work programme.

In the course of the assignment, it was also beneficial to develop an improved management information system for the company, so as to help streamline its operation. This proposal was discussed in a general staff meeting, and management has accepted it after some modifications.

It is felt that the second part of the mission (that will concentrate on processing cost analysis) should be carried out after equipment has been installed, and trial runs for the different products have been made, so that the required data are available to undertake processing cost analysis.

II. GENERAL CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

1. There is no doubt that an important potential exists in Nepal for the development of an industry based on botanicals. However, developing such an industry is not an easy task, because of the many steps involved from the collection/cultivation up to the marketing stage.

2. The Herbs Production and Processing Company Ltd. (HPPCL), being a public corporation, has certain limitations in its mode of operation that, from a business point of view, puts it in a position of relative disadvantage as compared to private enterprises. The company has to combine the need to play its role as a catalyst for the development of this type of industry in Nepal, with the necessity to become a profitable venture. To strike the balance between these two objectives is not always easy.

The above problem can be illustrated by the choice the company has to make between large scale production of a few items with given profitability and assured markets, and the development of new products in order to expand the potential for a botanicals-based industry in Nepal.

3. In order to be profitable, the Tamagadhi Herbal Farm branch of the company needs expansion to a size of at least 100 ha. under cultivation, without increasing the overheads incurred in production. Moreover, further efforts have to be made to reduce direct production costs.

4. From the crops cultivated on the farm, palmarosa cultivation offers the highest profitability, given production costs and world market prices. The company experiences no difficulty in marketing this product, because of its high quality and low price. Given an annual world production of 55 tons (see Annex VII.), mainly accounted for by India, increasing the Nepalese production up to an annual quantity of 5 tons should pose no severe sales problems.

5. Although there is large, and increasing world wide demand for mentha oil (see Annex VII.), at present production of mentha oil at Tamagadhi is not competitive, nor in the international market, nor in the Indian market. Cultivation by small farmers in the private sector will be more competetive, once the extension programme covers a larger cultivation area. From the farmers view point, mentha is an attractive cash crop.

6. The present variety of lemongrass grown at Tamagadhi does not offer scope for international marketing, mainly due to the high production costs encountered. Although the product would be marginally competetive vis-a-vis Indian prices, it is difinitely more expensive than lemongrass produced in Guatemala or China.

7. With regards to citronella, a similar conclusion was reached. Production costs are too high to market the product internationally. With regards to Indian prices, the product would be marginally competitive.

8. Belladonna cultivation for sale as a crude drug, would not be competetive internationally. CIF prices in Hamburg are only marginally higher than the cost HPPCL is incurring to obtain the product from private farmers. Some scope exists in marketing the crude drug in India, since Indian prices are higher than world market prices.

However, the main potential may lay in producing and marketing belladonna extract, as well for the local, regional and international markets.

9. With regard to trade in crude herbs from Nepal, the HPPCL has a relative price disadvantage regarding the existing trade channels, were less overhead expenditures (such as transport, storage and staffing) are incurred. The potential here lies in developing a reputation for quality and reliability towards overseas customers, so that this relative price-disadvantage can be compensated for. The other potential outlet for this line of products, is the supply of crude drugs (and possibly intermediary products) to the local ayurvedic drug industry. However, the realisation of this last potential hinges upon the establishment of a modern ayurvedic drug producing company in Nepal, whose management is willing to co-operate with HPPCL in this regard.

B. Recommendations

1. It is essential for the HPPCL to strike the right balance between its role as a public company, and the need to at least break-even as a business venture.

This requires a clear distinction in programming and budgetting, between actual production and development work. Given the present financial status of the company, the efforts on development work(1) should be nominal in terms of expenditures.

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(1) i.e. development of new products for introduction in the regular production programme.

2. The production programme should then concentrate on those items with proven profitability and market acceptance, and efforts should be made to increase the profit margin in these, so as be able to sponsor the development of a larger range of new products.

3. The company should interact as much as possible with the private sector, in terms of technology transfer and providing market intellengence. In many cases, private enterprises will proove to be more cost efficient in the exploration of new product-lines developed by HPPCL.

4. Tamagadhi farm should be made a profit center within HPPCL or at least decision making should be even more decentralised, in order to improve the cost efficiency of the farm.

5. In the product mix of the farm, the main emphasis should be on palmarosa cultivation, this for the reasons mentioned under 4 above. Since the crop can be cultivated in an extensive manner, it lends itself most to large scale, semi-mechanised cultivation.

6. Given the high percentage of labour costs incurred in mentha cultivation, and the interest shown by private farmers in this crop, the emphasis should go to cultivation in the private sector. As far as marketing of mentha is concerned, the emphasis should be on import-substitution for mentha derived products (menthol, Demonthol(sed oil), where a higher value added can also be achieved.

7. The production of citronella and lemongrass oil should not be expanded at this stage. Efforts should just be made to improve the cost-competitiveness, through the introduction of improved varieties and cultivation practices. In general however, we feel that the potential of Nepal lies more in the development of those products were the country enjoys a comparative advantage (such as palmarosa or sugandha kokila oil), rather than those products (such as lemongrass and citronella) that are produced world wide on a massive scale, and where price competition is extremely fierce.

8. The possibility for exporting some form of belladonna extract should be explored in greater detail. In this regard it would be best to sell directly to end users of these products, in order to be competitive. Regional markets should also be explored.

9. To improve the overall efficiency of the company, it is essential to introduce a management information system similar to the one proposed in Annex IX.).

III. BODY OF THE REPORT

A. Cultivation and Field Distillation Costs at Tamagadhi Herbal Farm

Two field visits were undertaken to Tamagadhi Herbal Farm, in order to investigate direct cultivation costs for products grown at the farm, as well as farm overheads.

Tamagadhi Herbal Farm is situated in the Nepalese Terai at approximately 12 Km. south of the village of Nijgadh. Although the farm has a total surface area of approximately 325 ha, only about 50 ha. has so far been brought under cultivation. The rest of the area is covered bu bush and jungle. At present the remaining area is being cleared by bull dozer.

Following plants are grown at the farm on surface larger than one ha.

- palmarosa grass (Cymbopogon martinii).
- japanese mint (Mentha arvensis).
- citronella grass (Cymbopogon winterianus)
- lemongrass (Cymbopogon flexuoses)
- vetiver (Vetiveria zizanoides).

Out of these, vetiver cultivation (on an area 7 ha.) has so far proven to be uneconomical, due to unsuitable soil condition, which renders harvesting expensive. Therefore, the cost analysis concentrated on the three Cymbopogons and on Mentha arvensis.

The starting point for the analysis was the data gathered by the farm manager on direct costs incurred. This was supplemented with direct observation and discussions with the farm manager and the CTA of the FAO Project - NEP/79/007 "Cultivation of Medicinal and Aromatic Plants".

1. Cost factors involved

a. Labour costs: Labour at the farm is employed on a daily wage basis. Male workers are paid 10 NC Rs. a day, whereas female labourers receive 9 NC Rs./day. The difference can be explained by traditional social factors. For the ease of calculation, we have applied a standard rate of 10 NC Rs./labour day.

b. Seed and planting material costs: Most of the seeds and planting material are produced at the farm itself. Direct costs for producing these have also been calculated.

c. Work by tractor: For work at the farm, four tractors are available. Two older tractors are mostly used for transportation. A 100 HP. tractor is presently used for heavy duty work (first Ploughing, harrowing), after the land is cleared by the bulldozer.

A fourth tractor (45 HP.) is mostly employed for regular cultivation work. The cost inputation for tractor work was based on the latter tractor. The fuel consumption of the tractor was found to be approximately 3.5 litres of diesel per tractor hour. Consumption of lubricant is estimated to be 1.25 litre per 100 litre of diesel. Direct costs for one tractor hour are thus calculated as follows:

3.5 litres diesel at 7.25 NC Rs./litre	25.375 NC Rs.
0.044 litres of lubricant at 48 NC Rs./litre	2.112 NC Rs.
	27.112 NC Rs.

Say 28 NC Rs./tractor-hour.

The salary for the driver, depreciation, repair and maintenance costs are part of farm overheads.

d. Bullock costs: Some work on the farm is done by bullocks (mostly weeding). A pair of bullocks can be hired for 25 NC Rs./day, together with the "bullock-man".

e. Irrigation costs: The irrigation system in operation at the farm is very similar to the one used for flood irrigation in paddy cultivation with water supplied from shallow wells by means of of diesel pumps. Irrigation canals are earthern, and therefore more maintenance is required, and rather high losses occure due to seepage. Because of the presentshortage in working capital (for buying diesel), only minimal irrigation is provided. However, no data were available on the effect of increased irrigation on yields, and as such present irrigation practices were used as the basis for calculation. Direct costs consist of:

- diesel for running the water pumps.
- lubricant for the water pumps.
- labour to operate the irrigation system.

Depreciation, repair and maintenance costs for the pumps and wells are part of farm overheads.

f. Compost: Natural compost is used for maintaining the soil fertility. The compost is purchased from cattle herdsmen in the jungle area at the rate of 20 NC Rs./ton. The compost is transported by tractor, and was found to cost about 200 NC Rs. for 6 tons of compost (33 NC Rs./ton). Labour costs incurred in collecting and distributing the compost comes to about 50 NC Rs./ton(5 labour days per ton).

The cost of one ton of compost is thus estimated to be approximately 100 NC Rs.

g. Distillation costs: Distillation is done by two distillation units with a capacity of 800 kg. of material each. Steam is produced in a boiler fired by firewood and spent grasses. The consumption of fuelwood is approximately 640 kg./charge. Although fuelwood at present can be obtained at minimal cost due to the clearing of the jungle, it was considered safe to apply the local rate for fuelwood. Even if, as it is hoped, the farm will remain self-sufficient in fuelwood when leaving about 20% of the forest intact on the farm, and afforestation with fast growing species at the border, it will take effort and money for afforestation, cutting and transportation of fuelwood.

The local price for fuelwood is 15 NC Rs./"maund", or about 37.5 NC Rs./100 kg.

The fuelwood consumption for one charge thus comes to 240 NC Rs.

The cost of water for condensation is minimal, and can be considered as farm overheads.

Other overhead expenditures related to irrigation are personnel, depreciation and repair and maintenance.

2. Direct costs

For the tabulation of direct costs, see Annex I.

a. Palmarosa oil: The direct costs come at 164.3 NC Rs. per kg. of oil produced.

Direct costs are composed of:

	NC Rs./ha.	Percentage
- Land preparation	276	0.8%
- Irrigation	6,072	17.6%
- Compost	4,795	13.9%
- Fertilizer	1,414	4.1%
- Weeding	5,554	16.1%
- Seeds	60	0.2%
- Nursery work	600	2.0%
- Plantation	900	2.6%
- Harvesting and transport.	4,933	14.3%
- Distillation	9,840	28.4%

Labour costs as a percentage of total directs costs:(1) 31.9%

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(1) Whereby 12 Rs./day is estimated to be the labour cost for the bullockman and half of the compost cost in also calculated as labour.

b. Mentha arvensis oil: The direct production cost at the farm comes to 174 NC Rs./kg.

Direct costs are composed of:

	NC Rs./ha.	Percentage
- Suckers	675	6%
- Land preparation	1,530	13.5%
- Compost	1,400	12.4%
- Plantation	940	8.3%
- Fertilizer	861	7.6%
- Mulching and weeding	1,660	14.7%
- Pesticide	100	0.9%
- Irrigation	1,890	16.7%
- Harvesting and transport.	594	5.2%
- Distillation	1,680	14.8%

Labour costs as percentage of total direct costs:(2) 39.3.

c. Lemongrass: Direct production costs come to 100 Rs./kg.

Direct costs are composed of:

	NC Rs./ha	Percentage
- Planting material	688	2.1%
- Land preparation	280	0.9%
- Plantation	1,300	4.1%
- Irrigation	5,447	17%
- Fertilizer	384	1.2%
- Compost	4,800	15%
- Weeding	11,100	3.4%
- Harvesting	5,703	17.8%
- Distillation	12,015	37.5%
- uprooting of plantation	310	1.0%

Labour costs (3) as percentage of total direct costs: 29.6

d. Citronella (Java): Direct production costs come to 81 Rs./kg.

Direct costs are composed of:

	NC Rs./ha.	Percentage
- Planting material	1,375	4.1%
- Land preparation	280	0.8%
- Plantation	1,500	4.5%
- Irrigation	5,439	16.3%

(2) Whereby half of the compost cost is also calculated as labour.

		NC Rs./ha	Percentage
-	Fertilizer	1,502	4.5%
-	Compost	4,805	14.4%
-	Weeding	2,102	6.3%
-	Harvesting	7,475	22.4%
-	Distillation	8,877	26.6%
-	Uprooting of plantation	368	1.1%

Labour cost (1) as percentage of total direct costs: 36.3%

3. Farm overhead costs

a. General remarks: Although farm overheads are known, considerable difficulties were experienced in attributing these overheads to the different items produced at the farm, because of three reasons:

- The present area under cultivation is approximately 50 ha., whereas the planned area for cultivation is approximately 250 ha. It seemed clear from our visits that overheads don't have to expand at the same rate as area under cultivation. As such, it should be possible to reap the benefit of economics of scale. Nevertheless, there will be a limit to the area that can be covered with, especially, the available machinery (distillation unit, tractors, farm equipment).

- As the company is still not fully matured markets have not been secured as yet for several products, and new products are still under investigation to check the feasibility of growing them on the farm. As such it remains difficult to chalk out a long term farming plan, allocating the total planned cultivation area to the different products.

- At present, many of the equipment items were purchased by the UNDP/FAO NEP/79/007 Project ("Cultivation of Medicinal and Aromatic Plants"), and as such are not taken up in the HPPCL accounts. Nevertheless, after the termination of this project, especially depreciation costs for these equipment items will have to be taken up in the accounts of the company.

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(1) Whereby 12 Rs./day is estimated to be the labour cost for the bullockman, and half of the compost cost is also calculated as labour.

b. Methodology used for allocating farm overheads:

i. The present cultivation pattern was taken as the starting point.

However, after discussing with the CTA of the UNDP/FAO NEP/79/007 Project, it was found that the present supervisory manpower and machinery would be sufficient to run a hundred ha. farm (for a more detailed discussion of this, see Annex II.).

As far as the expansion of the farm up to a size of hundred ha. is concerned, it was found that with the present progress in land clearing and land preparation, this would probably be possible before this year's monsoon (July 1986). Several factors led to the proposition that most of this expanded area would be cultivated with palmarosa;

- palmarosa has good market potential, and as such the sale of an extra few tons should not pose a problem, given a total annual world production of 55 tons(1), given the fact that HPPCL's sales price is well below world prices, and also given the customer's ready acceptance of HPPCL's quality of palmarosa oil.
- from the cost analysis, it follows that production of palmarosa oil gives a good margin to the company.
- the agro-technology for cultivating palmarosa is rather well mastered by the farm personnel.
- some practical resons: it is too late to plant more Mentha arvensis before the monsoon, enough seeds of palmarosa are available, and agro-technology, planting material, cost benefit analysis and market research for new products that could be produced on the farm, still require further work.

As such we come to a land distribution pattern that would look as follows:

- Lemongrass	: 11 ha.	- Palmarosa (existing)	: 6 ha.
- Mentha	: 12 ha.	- Palmarosa (new)	: 57 ha.
- Citronella	: 4 ha.		
		Total	: 100 ha.

(1) Figure compiled by "PAFAI" (Perfumery and and Flavours Association of India).

The 7 ha. under vetiver cultivation are not considered, because of the harvesting problem mentioned before.

ii. Amortization of investment expenditures for expanding the farm area were not considered in the overheads, for following reasons:

- a master plan for development of the farm is still under preparation(1) and as such little is known about the investment expenditures to be incurred in the farm's expansion(2).

- developing the farm will drastically increase the value of it, and as such land development investments may not require depreciation in an area where land becomes more and more scarce, and prices of land therefore, increase year by year.

It was considered that, besides the bulldozer, the 100 HP. tractor will be employed fully in expanding the farm area (first ploughing, levelling), and as such the depreciation of this tractor does not come under overheads incurred for production.

iii. As the FAO Project will terminate sooner or later, at one point the FAO equipment will be handed over to the company, and normal HMG rules for depreciation will have to be followed. Therefore, overhead costs that at present are still borne by FAO, were also taken up in the overheads calculation.

c. Farm overhead costs: The calculation of farm overheads is presented as Annex III. The main cost factor in these is machinery depreciation, mainly as a result of recent investments made in machinery under the UNDP/FAO/NEP/79/007 Project.

The distribution of overheads is as follows:

Machinery depreciation	420.534 NC Rs.
Personnel costs	205.688 NCRs.
Other overheads	36.200 NCRs.
	669.422 NC Rs.

If we take the average of direct costs, based on our farm plan, we arrive at a yearly total figure of 889.483 NC Rs.

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(1) By the "Agricultural Projects Services Center" (APROSC), a semi-governmental institute.

(2) As it is clear that providing irrigation facilities will be the main cost factor involved in this expansion it is very important to choose the right irrigation technology. In this regard, it follows from our preliminary analysis that a gravity flow system would by far be the cheapest solution (although the investment cost would be higher), and that all efforts should be made to investigate the technical feasibility of such a system for Tamaga-dhi.

Total overhead costs thus amount to 74.5% of total direct costs (see Annex IV.). If calculated as percentage of total costs , we arrive at a figure of 41.9%.

The importance of the different overheads in total costs, can then be calculated as follows:

Machinery depreciation	:	27.1%
Farm personnel costs(1)	:	13.3%
Other overheads	:	2.3%

Among, the machinery depreciation, the distillation unit depreciation represents 9.9% of total costs, and the tractors'. depreciation 6.8% of total costs(2).

4. Total cost prices for the essential oils produced at Tamagadhi Herbal Farm.

With overhead costs at 74.5% of direct costs, direct costs per kg. of oil produced should be multiplied by 1.745 in order to arrive at the total ex-farm cost price.

It should be reiterated that these costs are based on a 100 ha. farm, whereas the present area under cultivation is approximately 50 ha., and it has been assumed that overhead expenditures will not increase as the farm area doubles.

It should also be stressed, that these cost prices are strictly ex-farm and do not include:

- Packing
- Transport to Kathmandu
- Quality control expenditures
- Central administrative overheads
- Sales expenditures.

5. Conclusions and recommendations for production of essential oils at the Tamagadhi Branch

Comparing the cost analysis to the available market information (Annex VII.), the conclusion is that only one out of the four items, produced at Tamagadhi, at present leaves a clear margin to the company, namely palmarosa oil. This can be explained by the fact that the farm is still in a development stage. Nevertheless, it is crucial to reduce the overall costs involved in the operation. This will have to be done both in a general manner, as in a product-specific manner.

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(1) Of course, excluding daily wage labourers.

(2) However, here it should be mentioned that only two tractors were supplied by the FAO, and for the other two tractors no depreciation cost computation was done since they were taken over from the Department of Medicinal Plants.

a. General:

i. It is suggested that Tamagadhi Herbal Farm be transferred into a profit center within the HPPCL. This would involve that a yearly production programme is negotiated between the central office and the farm management, and following this the farm management can decide on their own how to achieve the production targets in the most cost efficient manner. The farm will be paid for its output by the central office, based on prices that are 20 or 25% (exact figure to be decided by HPPCL) below HPPCL's sales prices for these products. This will without any doubt improve the cost-efficiency of the operation. If this suggestion is not practicable at least a separate profit and loss account should be kept for the farm.

ii. One of the most important factors that has an impact on the cost of production is the quantity of oil obtained from a certain quantity of raw material. Only scanty data are available from research undertaken in Nepal. Therefore, it is a strongly recommended that the Department of Medicinal Plants provides HPPCL with research data on how to maximise the oil yields of standard quality.

iii. The product mix should be chosen in such a manner that the main emphasis is on the item that gives the highest returns, in this case palmarosa. Also care should be taken to take up those items for which the Terai offergood natural growing conditions. This is not the case e.g. for the variety of lemongrass produced at Tamagadhi.

iv. New products (e.g. davana oil, coriander oil) should just be tried out on a small area (say one acre), and should go through all product development steps(1), before they are taken up for larger scale production. Likewise, the company should decide what percentage of its resources it can spare for producing these new items, in order not to jeopardise overall profitability.

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(1) Such as market research, trial production, cost-benefit analysis, quality control and market acceptability research.

v. Given the sizeable investment made in machinery at the farm, it must be clear that a mechanised way of production was opted for. This makes it essential to save on labour costs involved in on-farm production. This can be done in two manners:

- changing cultivation practices to make them less labour-intensive (suggestions will be provided on a product by product basis).

- leaving the most labour intensive crops (e.g. mentha) for production in the extension programme, or for production on the company's land to be divided among small and landless farmers(1).

On the farm, optimal use will then have to be made of available machinery, in order to put these to use in the most cost efficient manner.

vi. An important cost factor involved is the depreciation of the distillation unit. Calculated on a 100 ha. farm, the depreciation of this unit comes to 9.9% of total production costs, and this over a 10 year period. Therefore, it would be advisable, when selecting new crops, to take those crops that can be distilled outside the main distillation season, so as to spread the depreciation costs over a higher output. This would be the case for e.g. davana.

Also fuelwood is an important cost factor. In distillation both from an economic as ecological point of view, it is crucial that the farm, after its expansion, remains self sufficient in fuelwood. Tree plantation should, therefore, be undertaken in a planned manner.

vii. Another important cost factor is the cost for irrigating the crops. (around 17% of direct production costs). A careful investigation should be made regarding all possible options for irrigation at the farm. Although initial investment costs would be higher, in the medium term, it would certainly be cheaper to build a gravity flow irrigation system, if such a system in technically feasible.

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(1) The HPPCL envisages a scheme whereby approx. 100 ha. will be cultivated directly by the Tamagadhi branch, and the remaining 150 ha. will be devided among small and landless farmers for a more labour intensive type of production. Farmers will then be paid for their output in raw material, as is the case in the extension programme.

The best and most cost-efficient long term solution should be chosen, not the solution with the lowest initial investment cost.

viii. Mulching also reduces the need for irrigation and at the same time it reduces the need for weeding. It is recommended that this cost-saving practice be continued.

Since few data are available in Nepal on the effect of irrigation on herb and oil yields, it is suggested that the department of Medicinal Plants takes this up as a research activity.

The cost for compost is also high (at present around 15% of direct production costs.)

Since applying sufficient manure is essential to maintain land fertility it is however, necessary to continue applying the same amounts of compost.

Ideally, the farm should become a more mixed farming operation, involving milk and compost production by cattle. If this may not be possible on the 100 ha. to be taken care of by the farm itself, it could certainly become a possibility in the project to develop the remaining 150 ha. to small and landless farmers.

b. Product specific conclusions and recommendations:

i. Palmarosa: Although the production costs for palmarosa oil compare favourably with world market prices, there is still room for reducing costs incurred.

- nursery and plantation costs (4.6% of direct costs) could be reduced by sowing directly in the rows. It is suggested that this method is tried out in this year's plantation of palmarosa.

- weeding (16.1% of direct costs) could be reduced by mulching after germination.

- harvesting costs (12.7% of direct costs) may be reduced by mechanical harvesting (mower), especially if a large area is to be covered with palmarosa grass.

ii. Mentha: For mentha cultivation, a drastic change in the cultivation practices are required to make the operation more cost efficient. In our view, it would be best to leave mentha cultivation to private growers (whether on company land or outside), since labour costs constitute almost 40% of total direct costs, and the experience with private sector cultivation has been rather favourable so far.

iii. Lemongrass: The present variety of lemongrass at Tamagadhi comes from South India, where natural growing conditions are more favourable to this variety due to higher rainfall and a warmer climate year-around.

Therefore, if the company chooses to continue growing lemongrass, it would be advisable to introduce a North Indian variety of lemongrass(1), that would be better suited to the Terai area. Cultivation costs could be reduced by mechanical harvesting (mowing).

As the forestry department in the area interested in growing lemongrass under agro-forestry condition, this may very well proove to be a more economical mode of products. A trial should be made in this regard.

The highest single cost factor in direct costs is distillation (37.5% of direct cost) which leads to the conclusion that especially for this crop it is necessary that the company continues to have a cheap source for fuelwood (i.e. from the farm itself).

iv. Citronella: In the case of citronella, harvesting costs are the most important in direct cultivation costs. Mechanical harvesting would provide a good alternative here.

B. Cultivation of mentha and belladonna under the extension programme

Atropa belladonna and mentha arvensis are taken up under the extension programme of HPPCL.

Belladonna cultivation started approximately 5 years ago in the Panauti area, 30 Km. from Kathmandu.

Last year, about 180 farmers were involved, producing a total of 7.3 tonnes of dried belladonna leaves on an area of approximately 17 ha. (average yield of 429 Kg. of dried leaves per ha.). Belladonna is grown as a yearly winter crop, in rotation with paddy. The cultivation of belladonna thus competes with wheat or potato growing.

Mentha cultivation started about two years back in the variety of Tamagadhi herbal farm last year approximately 300 kg. of oil were produced, on an area of 7 ha. including about 35 farmers. In the Terai belt, mentha is grown in lieu of wheat or corn.

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(1) Cymbopogon Bendulas

Due to the short span of time available for this mission, it was impossible to carry out a detailed survey on farmer's production costs and their income from these crops. Nevertheless, some mentha growers were visited, and data were also gathered from a previous report(1). It is also understood that some surveys on production costs and yields will be carried out, so the results may be available by the time of the second part of the consultant's mission.

1. Belladonna growing

a. Farmer's view point: As a winter crop, the financial return obtained by farmers compares favourably with wheat cultivation, whereas its feasibility compared with potatoes is less certain, and requires closer investigation.

Apparently, yields vary a lot from farmer to farmer and as such the calculation may vary considerably from the viewpoint of each farmer. A good test in this regard is probably the production and number of farmers engaged in belladonna growing. The area under cultivation for this year has not, or only marginally, increased compared to last year's.

b. Company's view point: The HPPCL pays farmers 21 Rs. NC per Kg. of dried leaves of belladonna. Last years' crop was 7.3 tons, involving a direct expenditure of 153,300 Rs. NC. Since the whole harvest can be transported in two or three truckloads, we have estimated the transportation costs to the factory at 730 Rs. NC (or 1 Rs. NC/Kg.).

Two extension workers are employed to stimulate and guide farmers in belladonna cultivation. The yearly cost involved in maintaining extension worker is calculated in Annex V. The cost price for the extension work for belladonna is 82,935 NC Rs.

HPPCL's cost for acquiring dried belladonna leaves can then be calculated as follows:

	Total cost for 73 tons	Cost per kg. (NC Rs.)	Percentage of cost
Paid to farmers	153,300 NC Rs.	21	63.1
Transport	730 NC Rs.	1	3
Extension work	82,935 NC Rs.	11.3	33.9
Total	236,965 NC Rs.	33.3	100

(1) M.S. Bista, W.J. Boeck, Belladonna Cultivation in Panauti area, preliminary report, 30 March 1982.

2. Mentha growing

a. Farmer's view point: Most farmers interviewed were quite satisfied with the financial returns from this crop. It can be grown in crop rotation with rice and mustard seed. Since it is a labour intensive crop, most of the production costs for private farmers are related to labour input. In the mentha growing period (February - June), labour is usually available in abundance, and farmers don't value their and their family members labour at a high cost. As such, the gross return they obtain from mentha is their main interest. Mentha compares favourably with wheat or corn in this regard.

b. Company's view point: The company pays farmers for their raw produce, not for the oil obtained from it (1). Farmers are paid 0.65 NC Rs. per kg. of herb produced. This is calculated on the basis of herb wilted for 24 hours, which if of course difficult to ascertain. Last year the herb material produced by private farmers was a total of 54.8 tons. This yielded 346 litres, or 306 kg. of oil. The oil percentages thus comes at 0.56%, somewhat lower than the yield obtained at the farm.

Farmers were paid a total of 35,620 NC Rs. Transportation costs for the grasses are quite high for this low value product. About 80% of the mentha grass was produced in the area of Nijgadh, close to the road. Due to the high cost of fuelwood, the lack of a continious water supply in the area, and the absence of a proper distillation unit, the raw material had to be brought by tractor/trailer for about 15 Km. through the jungle. It can be estimated that one round trip costs about 150 Rs. As 1500 kg. of herb can be transported in one load, this adds 0.1 NC Rs./kg. to the cost of the raw material.

The costs for maintaining an extension worker were calculated in annex II, and come to 41,467 NC Rs. per year.

The costs for distillation can be calculated as follows:

- fuelwood : 240 NC Rs./charge (see page 1)
- depreciation costs: 151.400 NC Rs. per year. (at 7 charges per day during 150 working days(2), this comes to approximately 14.5 NC Rs. per charge).
- manpower is provided by the farm, and can be assumed to be part of farm overheads.

Per charge, distillation costs thus amount to 385 NC Rs. A total of about 36 charges were necessary, adding 13,860 NC Rs. to the total cost price of the oil produced.

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(1) This in view of the difficulties that are expected to arrive in mixing the produce of several farmers produce in the same distillation charge, and attributing the oil obtained among the different farmers.

(2) As noted before, the "distillation season" is quite concentrated around the monsoon period.

	Total cost for 306 kg. (NCRs.)	Cost per kg. (NC Rs.)	Percentage of total cost.
Paid to farmers	35,620	116.4	37
Transport	5,400	17.6	5.6
Distillation	13,860	45.3	14.4
Extension programme	41,467	135.5	43
Total	96,347	314.8	100.00

3. Conclusions and recommendations

a. General:

i. The production of both belladonna and mentha, are still insufficient to cover the cost of the extension programme. The extension programme's costs is almost 66% of the amount paid to farmers for their produce.

ii. In order to reduce the cost of the extension programme vis-a-vis the output produced, three recommendations can be made.

- the extension workers should be posted permanently in their area, so as to devote maximum time to field work.
- in order not to disperse limited resources, it is advisable to concentrate in a certain geographical area, rather than spreading out over many areas.
- the idea of working with "farmer-out growers" who take up most of the practical work under the guidance of the extension worker, should be put into practice.

b. Belladonna:

i. It is still not clear whether belladonna or potatoes is a more attractive cash crop to farmers in the area around Kathmandu. If potatoes prove to be more attractive, the recent stagnation in the area under cultivation by belladonna may be explained by this . One disadvantage with potato is its vulnerability to pests, which may cause severe financial loss to the farmers. In any case it would be required to investigate this manner, in order to realistically judge the scope for belladonna cultivation in these areas.

ii. Average yields of belladonna leaves are still too low, and vary too much from farmer to farmer. This suggests that the technical assistance provided to farmers should be strengthened.

c. Mentha:

i. It can be noticed that the extension programme for mentha is still in a very early stage. This largely explains the high cost of the extension programme as compared to the output.

ii. It is clear that mentha in the vicinity of Tamagadhi is an interesting cash crop for small farmers, if enough care is taken to the crop, and if sufficient water is available for irrigation.

iii. From this year onward, the main emphasis has come on cultivation in the villages neighbouring Tamagadhi farm, rather than in the Nijgadh area. This is a positive development, which should reduce the high costs involved in transporting the raw material.

iv. From the company's view point, cultivation under the extension programme will definitely be cheaper than on-farm cultivation, once the extension programme has come in full swing. However, measures should be taken to raise the oil percentage to the level obtained at the farm (proper cutting, proper cultivation practices).

C. Collection costs for HPPCL raw materials

The HPPCL presently buys all its requirements of collected raw materials (except pine resin), on the open market in various herb trading basaars.

Although in principle, the company pays the prevailing market price, some rigidity in operating procedures, puts it at a relative disadvantage to private herb traders, who are mainly engaged in export to India. In Annex VI, an overview of availability and prices for the most common herbs are provided.

The main collected item for HPPCL is pine resin, which is obtained from the Lamidanda forest area in Makwanpur district.

The forest area contains approximately 80,000 chir pine trees (pinus Roxburghei). Out of these about 35,000 are presently being tapped by about 60 "apers"(1). Since an acid solution is used to increase the yield per tree, a production of 3 kg. per blaze is reached every season. This gives a present production of approximately 100 tons of resin per season. The potential of this area can be estimated at 150 tons of resin per season.

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(1) See ITC/UNCTAD/GATT: "Nepal, An Opportunity Study of the Production of Turpentine and Rosin for export", 11 March 1985.

The cost for collecting the resin can be estimated as follows:

-	wage for aper: 12.5 Rs./day, each one collects about 5 kg. of resin per day ..... collection cost	2.5 Rs./kg.
-	Can container	0.25 Rs./kg.
-	Tin container per kg. of resin	0.75 Rs./kg.
-	Acid/Chemicals per kg of resin	0.10 Rs./kg.
-	Collection staff expenditures HPPCL	0.50 Rs./kg.
-	Royalty to be paid to forest department	0.75 Rs./kg.
-	Transportation to Kathmandu	0.52 Rs./kg.
D.	Market research Total	5.37 Rs./kg.

This part of the work programme of the economist was formulated as item 3 in the job description. "Study international market prospects and their potential for the purpose of future programming. After the arrival of the consultant, this activity was formulated more explicitely as":

"Undertake market research for products taken up in the work programme Market evaluation based on available standards and samples produced and contacting possible market outlets"(1).

It was agreed that the work of the economist in this field should be complementary to the work of the Marketing Consultant, who will concentrate on developing a marketing strategy and providing policy guidelines to HMG on the development of medicinal and aromatic plants exports, as well as on the export of their derivates.

From the data gathered, it must be clear that only a limited number of plants will have some scope for marketing outside the sub-continent. Most of the herbs traded in Nepal, find their market in India, some of these being processed in to Ayurvedic medicines that are re-imported into Nepal.

This aspect of the investigation will be left to the marketing consultant.

Our work concentrated on:

1. Initiating a continuous follow up on international market prices, as published as "the chemical marketing reporter and "the public ledger". An overview of prices from the first publication is provided as Annex VII. Regarding essential oil prices, further information was obtained from price lists of some of the leading French Perfumery and Flavour houses.

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(1) Telex to UNIDO, dated 30/1/86.

Besides, through the good services of the marketing consultant, current prices in India were obtained (see also Annex VII.).

2. Introducing practical ways of approaching customers in the west. Given the distant communication lines, this is not an easy task. It is very important to follow a procedure of market approach that is generally accepted in the west i.e.:

- obtain European standards for the products and produce accordingly.(1)
- present the potential customer with a list of available products.
- indicate realistic available quantities and prices for these products.
- if interest is aroused, present the potential customer with a sample from available stock.
- if an order is forthcoming, make sure the delivery date is met, and the product is up to standard.
- after several orders have been secured from the same company, some kind of a longer term purchase arrangement can be negotiated.

The main product line that presents a difficulty for HPPCL to enter into the European market, are formed by herbal extracts. So far it was not possible for the company to market any of its extracts outside Nepal.

Several factors may account for this:

- crude herb material is often in cheap and abundant supply in Europe, so local manufactures of extracts have the same, or even better, access to the required raw material.
- the European companies that provide the pharmaceutical industry with the required extracts are well established, and their qualities and prices are known and accepted.
- HPPCL lacks information on the standards and mode of preparation of the extracts required in Europe.
- many industries using medicinal plants are not interested in buying total herbal extracts (HPPCL's main area of interest) but rather buy the isolated active principles on isolate these themselves.

It is felt highly desirable that an in depth market study is made on the products that can be produced by HPPCL to find out their market prospects, potential customers and means for entering the market.

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(1) Two issues of the German pharmacopea, which sets most of the standards for herbal extracts acceptable in Europe, have been purchased. It is also recommended that the latest issue of the European pharmacopoea be purchased.

Although the world market for diosgenin does not look very promising(1) the HPPCL managed to conclude a contract with a British company for a long term supply agreement for diosgenin. So far however, no diosgenin was produced at the company.

As far as rosin and turpentine are concerned, the potential market for this product lies both within Nepal (mainly soap, paint and polishes industries), as in India. The market for good quality rosin and turpentine oil is vast in Nepal and India, with periodic scarcities for both materials. In Nepal alone, the market for rosin was estimated at 550 tons per year, whereas the market for turpentine oil was estimated at 50 tons per year(2). An overview of sales by HPPCL during this fiscal year as per 8 April 1986 is provided as Annex VIII.

E. Management information system

As stated in the project document (under activities for output) a management information system was to be developed for the HPPCL. The need for such a system is obvious to any company, but is especially strong for the line of business in which the HPPCL is engaging. This is so because of the following reasons:

- most of the raw materials are not readily available on the open market. They either have to be purchased during specific collection seasons, or have to be cultivated.

  In both cases it is difficult to predict accurately how much raw material will be available at what price.

- supply of solvents and other chemicals is irregular in Nepal.

- the equipment to be installed is of a multipurpose nature, and has to handle several products. Production planning is thus required.

- the envisaged market often lies outside Nepal, and in many cases even overseas. Especially overseas buyers are very strict about delivery dates.

This makes the planning and management of the company a difficult task.

For these seasons a simple management information system was conceived in order to improve the overall profitability of the venture by limiting bottle necks in supply, storage or sales. The proposal was discussed at an in-house seminar, and, after some modifications, approved by the management for implementation. The discussion paper that served as the background for the seminar, presented as Annex IX.

(1) See ITC/UNCTAD/GATT, Markets for selected medicinal plants and their derivates, Geneva 1982, p 132.
(2) ITC, UNCTAD/GATT, An opportunity study of the production of turpentine and rosin for export.

IV. ACKNOWLEDGEMENT

I would like to take the opportunity to express my sincere gratitude to Dr. Asfaq Sheak, General Manager of Herbs Production and Processing Company Limited, for his valuable assistance in my mission.

Likewise I would like to express the pleasure I took in working together with Dr. B. Gulati, Chief Technical Adviser to the Project, whose overall guidance was very much appreciated.

Since the first part of this mission was mainly concerned with cultivation cost analysis, I am indebted to Mr. V. Dupont, Chief Technical Adviser of the UNDP/FAO NEP/79/007 Project, and Mr. R.B. Rawal, Branch Manager of Tamagadhi Herbal Farm, for the co-operation in the field of cultivation cost analysis.

Mr. V. Sitaram, Marketing Consultant, has also contributed to my work, by means of the fruitful discussions we had on market research.

I would also like to thank staff at the UNDP office in Kathmandu, UNIDO Vienna, and last but not least all HPPCL staff for the assistance rendered.

ANNEX - I.

Tabulation of direct costs of essential oils produced at Tamagadhi Herbal Farm

I. Palmarosa

A. Seed Costs

Seeds were grown on an area of 0.77 ha.

52 litres of diesel were consumed at 7.25 Rs./litre	...	377 Rs.
1 litre of lubricant at 48 Rs./litre	...	48 Rs.

Labour for land preparation and plantation

123 labour days at 10 Rs./day.	1,230 Rs.

Irrigation

36 litres of diesel at 7.25 Rs./litre	261 Rs.
18 labour day at 10 Rs./day.	180 Rs.

Weeding

67 labour days at 10 Rs./day.	670 Rs.

Harvesting

74 labour day at 10 Rs./day.	740 Rs.

Tractor

7 litre diesel at 7.25 Rs./litre	51 Rs.
Total	3,557 Rs.

Seed production was 250 kg.

Direct cost of seed per kg. 14.2 Rs.

In order to account for overhead costs, we have estimated seed production costs at 20 Rs./kg.

B. Cultivation Costs in First Year

Input/Activity	Unit	Quantity	Rate (NC Rs.)	Costs (NC Rs.)
Seeds	Kg.	3	20	60
Nursery	Labour days	60	10	600
Land preparation				
- Harrowing	Tractor hours	5	28	140
- Ploughing	Tractor hours	5	28	140
Irrigation				
- Diesel	Litres	174	7.25	1,261
- Lubricant	Litres	2	48	96
- Labour	Labour days	17	10	170
Compost	Tons	12	100	1,200
Fertilizer				
- Urea	Kg.	75	3.70	278
- Complex	Kg.	25	2.90	72
Plantation	Labour days	90	10	900
Weeding				
- Manually (once)	Labour days	60	10	600
- Bullock (twice)	Bullock days	33	25	825
Crop harvesting	Labour days	95	10	950
Transport of raw material	Tractor hours	5	28	140
Distillation	Charges	5	240	1,200
	Total direct costs (first year)			8,632 NC Rs.

C. Cultivation Costs in Second, Third and Fourth Year:

Input/Activity	Unit	Quantity	Rate	Cost (NC Rs.)
Weeding (5 times)	Bullock days	55	25	1,375
Irrigation				
- Diesel	Litre	174	7.25	1,261
- Lubricant	Litre	2	48	96
- Labour	Labour days	17	10	170
Compost	Tons	12	100	1,200
Fertilizer				
- Urea	Kg.	75	3.70	278
- Complex	Kg.	25	2.90	72
Harvesting	Labour days	115	10	1,150
Transport of raw material	Tractor hours	5	28	140
Distillation	Charges	12	240	2,880
			Total Rs.	8,622

Total direct costs per ha. over 4 year : 34.498 NC Rs.

Total oil production over 4 years : - Year 1: 25 kg.
Year 2: 60 kg.
Year 3: 65 kg.
Year 4: 60 kg.
210 kg.

Direct cost of oil produced : 164 NC Rs./kg.

II. Mentha arvensis

A. Direct Costs of Sucker Production

Based on cultivation of 1,48 ha.

Land preparation

875 litre diesel at 725 Rs./litre	=	634 Rs.
1 litre lubricant at 48 Rs./litre	=	48 Rs.
180 labour days at 10 Rs./day	=	1,800 Rs.

Plantation

312 labour days at 10 Rs./day	=	3,120 Rs.

Irrigation

225 litre kerosene at 5.55 Rs./litres	=	1,249 Rs.
42 labour days at 10 Rs./day	=	420 Rs.

Weeding and harvesting

392 labour days at 10 Rs./day	=	3,920 Rs.

Compost

6 tons at 100 Rs./ton	=	2,600 Rs.
Pesticide	=	100 Rs.
		11,891 Rs.

12,580 kg. suckers produced
Direct cost price: 0.95 Rs./kg.

If we take into account the fact that not all suckers could be used (in view of the difficulty to predict accurately, the area under mentha in the extension programme), we can assume the cost price of the suckers to be 1.50 Rs./kg.

B. Direct Cultivation Costs

Input/Activity	Unit	Quantity	Rate (NC Rs.)	Cost (NC Rs.)
Suckers	Kg.	450	1.50	675
Land preparation				
- Ploughing/harrowing	Tractor hours	10	28	280
- Labour/weeding	Labour days	125	10	1,250
Compost	Tons	14	100	1,400
Plantation	Labour days	94	10	940
Fertilizer				
- Urea	Kg.	130	3.70	481
- DAP	Kg.	80	2.62	210
- K	Kg.	80	2.00	160
- Labour	Labour days	1	10	10
Irrigation				
- Diesel	Litres	200	7.25	1,450
- Lubricant	Litres	2.5	48	120
- Labour	Labour days	32	10	320
Mulching	Labour days	46	10	460
Weeding	Labour days	120	10	1,200
Pesticide				100
Harvesting	Labour days	51	10	510
Transport	Tractor hours	3	28	84
Distillation	Charges	7	240	1,680
			Total direct costs:	11,330 NC Rs.

The oil yield per ha. is found to be 65 kg. on average.
Direct production costs thus amount to approx. 174 NC Rs./Kg.

III. Lemongrass

Lemongrass was established on the farm several years ago. No new plantation was made since the HPPCL tookover the farm from the department of medicinal plants. As such it was difficult to collect data on cultivation practices such as poantation time etc.

It was felt however that the costs for planting lemongrass are similar to the costs incurred for palmarosa plantation:

A. First Year Direct Costs

Input/Activity	Unit	Quantity	Rate (NC Rs.)	Cost (NC Rs.)
Slips	1000	27.5	25	688
Land preparation				
- Ploughing	Tractor hours	5	28	140
- Harrowing	Tractor hours	5	28	140
Plantation	Labour days	130	10	1,300
Irrigation (twice)				
- Diesel	Litres	174	7.25	1,262
- Lubricant	Litres	2	48	96
Compost	Tons	12	100	1,200
Fertilizer				
- Urea	Kg.	25	3.70	93
- Labour	Labour days	1	10	10
Weeding				
- Manually	Labour days	60	10	600
- By bullock	Bullock days	5	25	125

Harvesting

- Harvesting	Labour days	119	10	1,190
- Transport	Tractor days	6.5	28	182
Distillation	Charges	12	240	1,880
			Total Rs.	9,906

B. Second, Third and Fourth Year Direct Costs

Input/Activity	Unit	Quantity	Rate (NC Rs.)	Cost (NC Rs.)
Irrigation (twice)				
- Diesel	Litres	174	7.25	1,262
- Lubricant	Litres	2	48	96
Compost	Tons	12	100	1,200
Fertilizer				
- Urea	Kg.	25	3.70	93
	Labour days	1	10	10
Weeding	Bullock days	5	25	125
Harvesting	Labour days	135	10	1,350
- Transport	Tractor hours	8	28	224
Distillation	Charges	14	240	3,360
			Total Rs.	7,720

C. Fourth Year Direct Costs

Same as second and third year, except:

- harvesting 100 labour days at 10 Rs. = 1,000 Rs. (-350 Rs.)
- transport 6 tractor hour at 28 Rs. = 168 Rs. (- 56 Rs.)
- distillation 10 charges at 240 Rs. = 2,400 Rs. (-960 Rs.)

-1,366 Rs.

- Add: 5 tractor hours for uprooting the plantation + 340 Rs.
  + 20 labour days.

-1,026 Rs.

Oil production: First year 72 Kg. 6,694 Rs.
Second and third year 80 Kg.
Fourth year 60 Kg.
292 Kg.

Total direct costs : 32,040 Rs.

Direct costs per kg. of oil produced approx. 110 Rs./Kg.

IV. Citronella Grass

Regarding plantation costs, same remark applies to citronella grass as made for lemongrass:

A. First Year Direct Costs

Input/Activity	Unit	Quantity	Rate (NC Rs.)	Cost (NC Rs.)
Slips	'000	275	50	1,375
Land preparation				
- Ploughing	Tractor hours	5	28	140
- Harrowing	Tractor hours	5	28	140
Plantations	Labour days	150	10	1,500
Irrigation (twice)				
- Diesel	Litres	174	7.25	1,262
- Lubricant	Litres	2	48	96
Compost	Tons	12	100	1,200
Fertilizer				
- Urea	Kg.	75	3.70	273
- Labour	Labour days	1	10	10
Weeding				
- Labour	Labour days	60	10	600
- Bullock	Bullock days	15	25	375
Harvesting				
- Labour	Labour days	144	10	1,440
- Transport	Tractor hours	5	28	140
Distillation	Charges	7	240	1,680
			Total Rs.	10,236

B. Second, Third and Fourth Year Direct Costs

Input/Activity	Unit	Quantity	Rate (NC Rs.)	Cost (NC Rs.)
Irrigation (Twice)				
- Diesel	Litres	174	7.25	1,262
- Lubricant	Litres	12	48	96
Compost	Tons	12	100	1,200
Fertilizer				
- Urea	Kg.	75	3.70	278
- Labour	Labour days	1	10	10
Weeding				
- Bullock	Bullock days	15	25	375
Harvesting	Labour days	180	10	1,800
- Transport	Tractor hours	6	28	168
Distillation	Charges	10	240	2,400
			Total Direct Costs	7,589 NC Rs.

C: Fourth Year : Add:

Uprooting plantation	Tractor hours	5	28	168
	Labour hours	20	10	200
				368 NC Rs.

Total direct cultivation and distillation costs: 33,371 NC Rs.

Total oil production : First year : 80 kg.

Second, Third and Fourth year. : 100 Kg.

410 Kg.

Direct production costs per kg. 81 NC Rs.

ANNEX - II.

Analysis of capacity of available equipment at Tamagadhi Herbal Farm

Distillation capacity

The average or percentages experienced for each of the products to be distilled are as follows (on weight/weight basis).

- Palmarosa : 0.4%
- Mentha : 0.65%
- Lemongrass : 0.4%
- Citronella : 0.7%

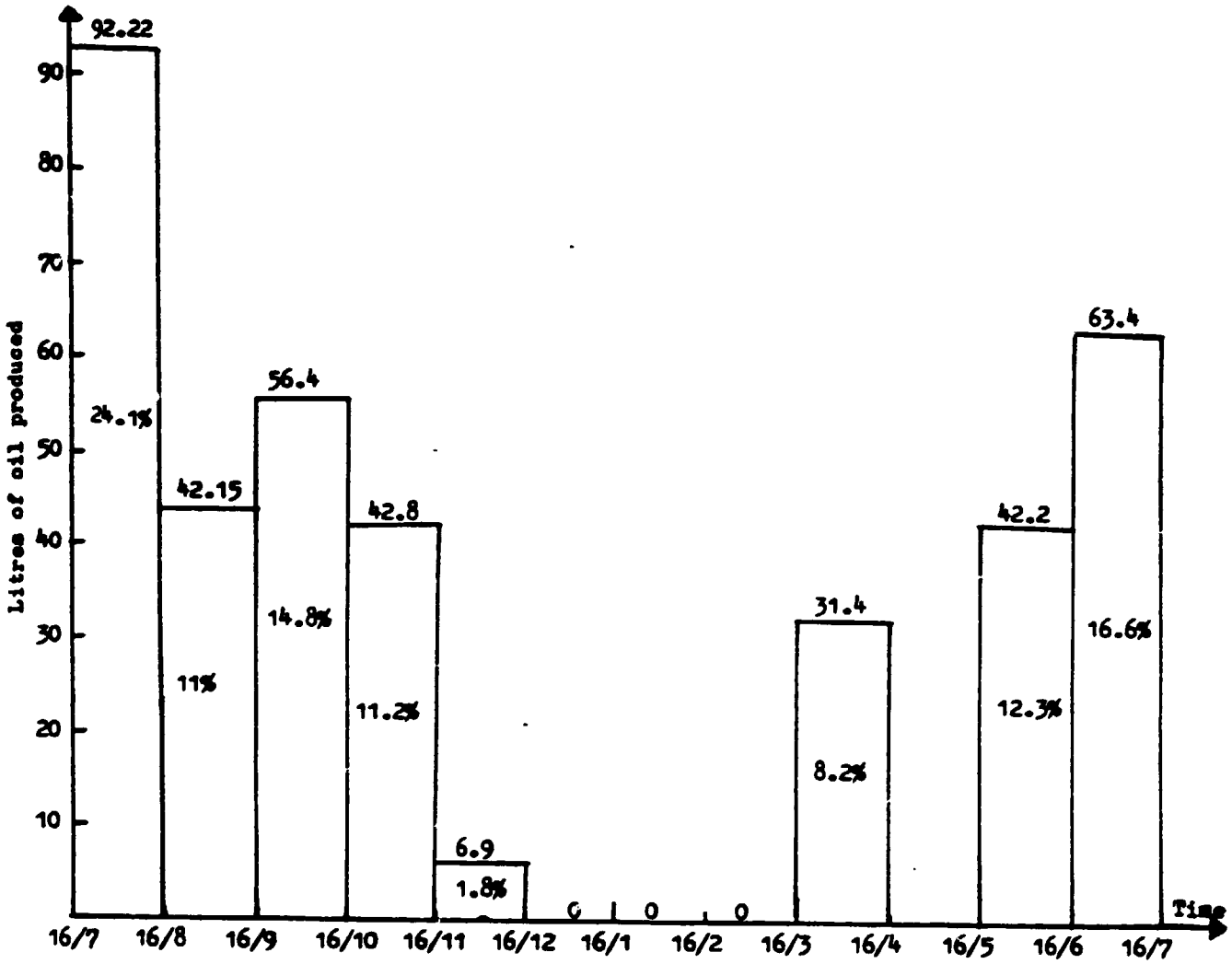
If we calculate the average of yearly yields for the different crops, and we relate these to the crresponding weights of herbs to be distilled, we get following average weight of herb to be distilled per ha./per year for each crop.

- Palmarosa : 13,125 kg.
- Mentha : 10,000 kg.
- Lemongrass : 18,250 kg.
- Citronella : 14,645 kg.

The distribution of the harvest over the months differs from crop to crop, but is usually quite concentrated around the monsoon period.

For palmarosa, the pattern looks as follows[1].

GRAPH



Although this harvesting pattern may also be influenced by management constraints (unavailability of manpower, priority given to other activities), it can be assumed to give a fair indication of it's normal distribution over the year.

The harvesting pattern for lemongrass and citronella is similar, whereas almost the whole mentha crop will need to be distilled in the period between 16/6 and 16/7.

---

(1) Data provided by farm manager, based on last year's oil yield.

As such, the distillation capacity will have to be sufficient to cope with the workload in the main harvesting season, which are the months of June to August.

The capacity of the distillation unit is approximately 1,500 Kg. per charge, distributed over two stills of 750 Kg. each.

If properly managed, up to 10 charges could be distilled per day in a round the clock operation. We have assumed a practicable figure of 7 charges per day, giving a distillation capacity of approximately 10,000 Kg. per day during 30 days, or 300 tons of herb per month.

To calculate the peak workload, we have multiplied the surface area of planned cultivation with the amount of herb harvested for each crop, during the peak months.

16/6 - 16/7	Mentha	: 10 tons per ha. x 12 ha.	- 120 tons
	Palmarosa	: 13,125 tons per ha. x 73 ha. x 16.6%	- 159 tons
	Lemongrass	: 18,225 tons per ha. x 11 ha. x 16.6%	- 33 tons
	Citronella	: 14,645 tons per ha. x 4 ha. x 16.6%	- 10 tons
			322 tons
16/7 - 16/8	Palmarosa	: 13,125 tons per ha. x 73 ha. x 24.2%	- 230 tons
	Lemongrass	: 18,25 tons per ha. x 19 ha. x 24.2%	- 48 tons
	Citronella	: 14,645 tons per ha. x 4 ha. x 24.1%	- 14 tons
			292 tons

If the distillation of mentha can be spread out some what outside the period between 16/6 and 16/7, the present distillation capacity will thus be just sufficient to cover an area of 100 ha., given the assumed distribution of crops.

As far as the requirement for tractor and tmailers is concerned we obtain the following pircure for the peak month:

The loading capacity of one trailer is 1500 kg. of herb.

For the period between 16/6 and 16/7, 322 tons of herb need to be transported to the distillation shed, which is the equivalent of approximately 215 trailer loads. Over 25 working days, this gives a workload of 8.6 trailerloads per day. The experience at Tamagadhi shows that 5 loads per day is about what one tractor can handle. However, with cultivation and farm expansion work practically reduced to nihil during this monsoon much, two tractors and two trailers can handle this workload.

If the main emphasis is on palmarosa cultivation, the 55 HP tractor can handle the total cultivation work on the 100 ha. farm(1), whereas the available farm equipment would also be sufficient for a 100 ha. farm.

As such, we can spread the depreciation and repair and maintenance costs for the FAO equipment over a farm area of 100 ha.

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(1) As can be seen from Annex 1, tractor is only used for cultivation work in the first year for palmarosa, lemongrass and citronella.

ANNEX - III.

Calculation of farm overheads

1. Depreciation

As far as depreciation rates are concerned, HMG's rules on depreciation will be applied. These maintain a linear depreciation whereby the percentage differs according to the type of investment.

a. HPPCL investment

There has been no proper evaluation as yet of the value of the farm as it was at the time of takeover by the HPPCL from HMG's department of medicinal plants. In 1979, a figure of 1,600,000 Rs. was put forward, but this was not applied.

Since the main asset handed over by the department was land (and need not depreciated), we will not take depreciation into account for the farm at the time of take over by HPPCL. Since then, HPPCL has made following investments for the farm. Depreciation percentages are mentioned at the side of these.

Item	Investment Value.	Depreciation Rate	Year Depreciation
- Distillation Units	175,000 Rs.	10%	17,500 Rs.
- Bush cutting machine	12,500 Rs.	15%	1,875 Rs.
- Other farm implements	5,000 Rs.	15%	750 Rs.
- Water tank	4,000 Rs.	10%	400 Rs.
- Wells for irrigation	25,000 Rs.	10%	2,500 Rs.
- Shed for distillation	17,350 Rs.	2%	347 Rs.
Totals	2,38,850 Rs.		23,372 Rs.

Other investments still required

In order to expand the farm up to a size of 100 ha. the minimum requirement for investment in irrigation, is one well and one irrigation pump per 8 ha.

As such, seven wells will have to be constructed, and, seven pumps purchased and installed.

Item	Investment Value	Number	Total NC Rs.
Wells	5,000 Rs.	7	35,000
Pumps	15,000 Rs.	7	1,05,000
		Total Rs.	1,40,000

As wells will have to be depreciated at the rate of 10% per year and pumps at the rate of 15% per year, this adds 10,250 NC Rs. to the depreciation total. Total yearly depreciation total for HPPCL investment thus becomes 42,622 NC Rs.

b. FAO technical assistance equipment

For Tamagadhi Herbal Farm, following equipment items were purchased by FAO.

Item	Value (NC Rs.)	Depreciation Rate	Total (NC Rs.)
Motor cycle	15,250	15%	2,288
Tractor	5,20,380	20%	1,04,076
Monkey gubber	36,353	15%	5,453
Plough	35,812	15%	5,372
Disk harrow	42,252	15%	7,388
Irrigation pumps (three)	41,517	15%	6,228
Trailer (two)	58,290	15%	8,744
Distillation unit (1)	15,14,000	10%	1,51,400

(1) Including freight, customs, clearing, installation and auxillary equipment.

Item	Value (NC Rs.)	Depreciation Rate	Total (NC Rs.)
Electricity generator	35,490	15%	5,324
Offset disk harrow	95,277	15%	14,292
Leveller	25,000	15%	3,750
Automatic level	33,600	15%	5,040
Miscellaneous farm equipment	21,000	15%	3,150
		Total Rs.	3,22,505

Other equipment orders have been made, or will be made in the near future.

Item	Value (NC Rs.)	Depreciation Rate	Total (NC Rs.)
Radio equipment	1,69,120	5%	8,496
Irrigation equipment	1,85,838	15%	27,876
Nursery sprinkler system	56,400	15%	8,460
Sub-soiler	70,500	15%	10,575
		Total	55,407

The total yearly depreciation on the investment made for Tamagadhi Herbal Farm, thus comes at.

- HPPCL on investment already made : 23,372 NC Rs.
- HPPCL on investment yet to be made: 19,250 NC Rs.
- FAO on investment already made : 3,22,505 NC Rs.
- FAO on investment yet to be made : 55,407 NC Rs.

Total 4,20,534 NC Rs.

2. Overhead personnel costs[1]

Salaries	1,75,910 NC Rs.
Allowances	27,278 NC Rs.
Travelling Allowances	2,500 NC Rs.
Total	2,05,688 NC Rs.

3. Other overhead expenditures[1]

Telegram, telephone	200 NC Rs.
Office rent (Nijgadh)	3,600 NC Rs.
Stationery	1,500 NC Rs.
Petrol	6,000 NC Rs.
Maintenance	21,000 NC Rs.
Entertainment	1,000 NC Rs.
Royalties and taxes	1,500 NC Rs.
Magazines	400 NC Rs.
Unexpected expenses	1,000 NC Rs.
Total	36,200 NC Rs.

Total farm overhead costs

Machinery depreciation	:	4,20,534 NC Rs.
Personnel costs	:	2,05,688 NC Rs.
Other overheads	:	36,200 NC Rs.
Total		6,62,422 NC Rs.

(1) Source: This fiscal year's farm budget.

ANNEX - IV

Relating farm overhead costs to farm direct cost

Farm plan

Mentha	12 ha.	Lemongrass	11 ha.
Palmarosa	73 ha.	Citronella	4 ha.

Total direct cost

Year	Citronella	Lemongrass	Mentha	Palmarosa
Year 1	10,236	2,906	11,330	8,632
Year 2	7,589	7,720	11,330	8,622
Year 3	7,589	7,720	11,330	8,622
Year 4	7,589	7,720	11,330	8,622

Year	Citronella (4 ha.)	Lemongrass (11 ha.)	Mentha (12 ha.)	Palmarosa (73 ha.)	Total (NCRs.)
Year 1	40,944	1,08,966	1,35,960	6,30,136	9,16,006
Year 2	30,356	84,920	1,35,960	6,29,406	8,80,642
Year 3	30,356	84,920	1,35,960	6,29,406	8,80,642
Year 4	30,356	84,920	1,35,960	6,29,406	8,80,642
			4 year total NC Rs.		35,57,932

Yearly average direct costs over 4 years : 889,483 NC Rs.

Yearly overhead costs : 662,422 NC Rs.

% of overhead costs as compared to direct costs: 74.5%.

ANNEX - V.

Yearly costs of extension programme

Presently three extension workers are employed by the HPPCL. Host of the cost for this is borne by HPPCL, part of it by the UNDP/FAO Project NEP/79/007. (Purchase and maintenance of motorbikes).

The yearly cost for the extension programme may be calculated as follows:

1.	Salaries	63,687 NC Rs.
2.	Allowances	18,000 NC Rs.
3.	House rent	3,000 NC Rs.
4.	Fuel for motorbike	11,772 NC Rs.
5.	Depreciation of motorbikes	7,087 NC Rs.
6.	Maintenance of motorbikes	15,456 NC Rs.
7.	Other expenditures	4,800 NC Rs.
		1,24,402 NC Rs.

The cost for one extensionists thus comes to 41,467 NC Rs. per year.

ANNEX - VI.

A. Availability and prices for crude herbs from Nepal

Plant name	Nepal	Market	Collection Season	Quantity available	Price/Kg (NC Rs.
Acorus calamus	Bojho	Gorkha/ Charikot	December - April	10 tons	6 - 8
Adhatoda Vasika	Vasaka/ Asuro	All markets	October - June	Very big supply	4 -
Cinnamomum polyandrum	Sugandh kokila	Dang	November - March	50 - 100 tons	10 -
Dioscorea Deltoidea	Vyakur	Banepa a.o.	December - April	200 tons	8 - 10
Nardostachys Jatamansi	Jatamansi	Gorkha, Lamjung, Trishuli, Pokhara, Nepalgunj.	November - May	40 - 50 tons	26 -
Rauwolfia serpentina	Sarpagandha	Dharan		1 ton	20 - 40
Rheum emodi wall	Padamchal	Palpa, Trishuli, Gorkha.	December - June	50 tons	6 - 10
Valeriana	Sugandhawal	Dang, Nepalgunj, Dharan, Dhanakuta, Lamjung a.o.	October - June	25 tons	28
Zanthoxylum alatum	Timur	Dang	November - May	20 tons	18

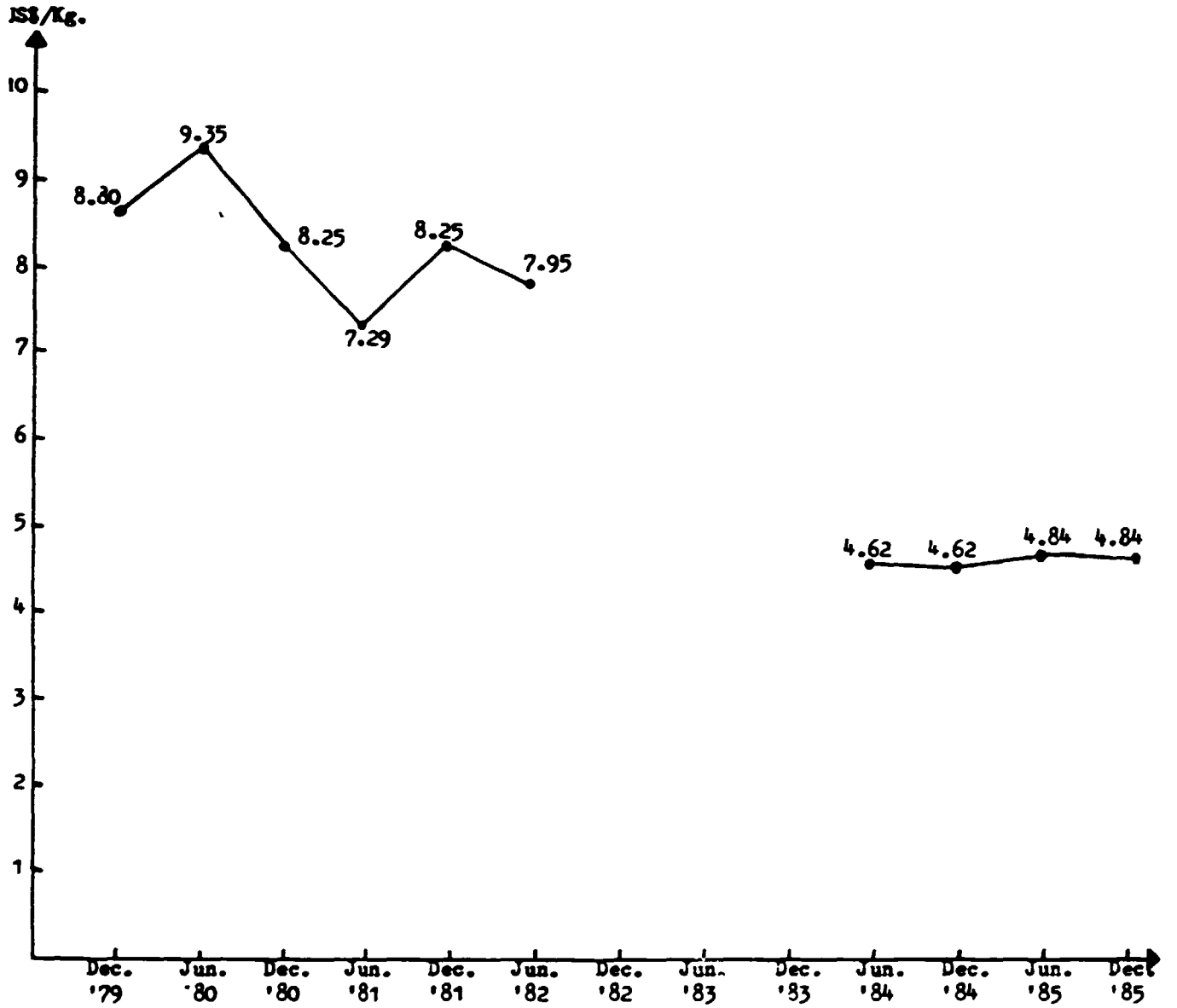
ANNEX - VII.

Latest price information on products of interest to HPPCL

A. International market prices[1].

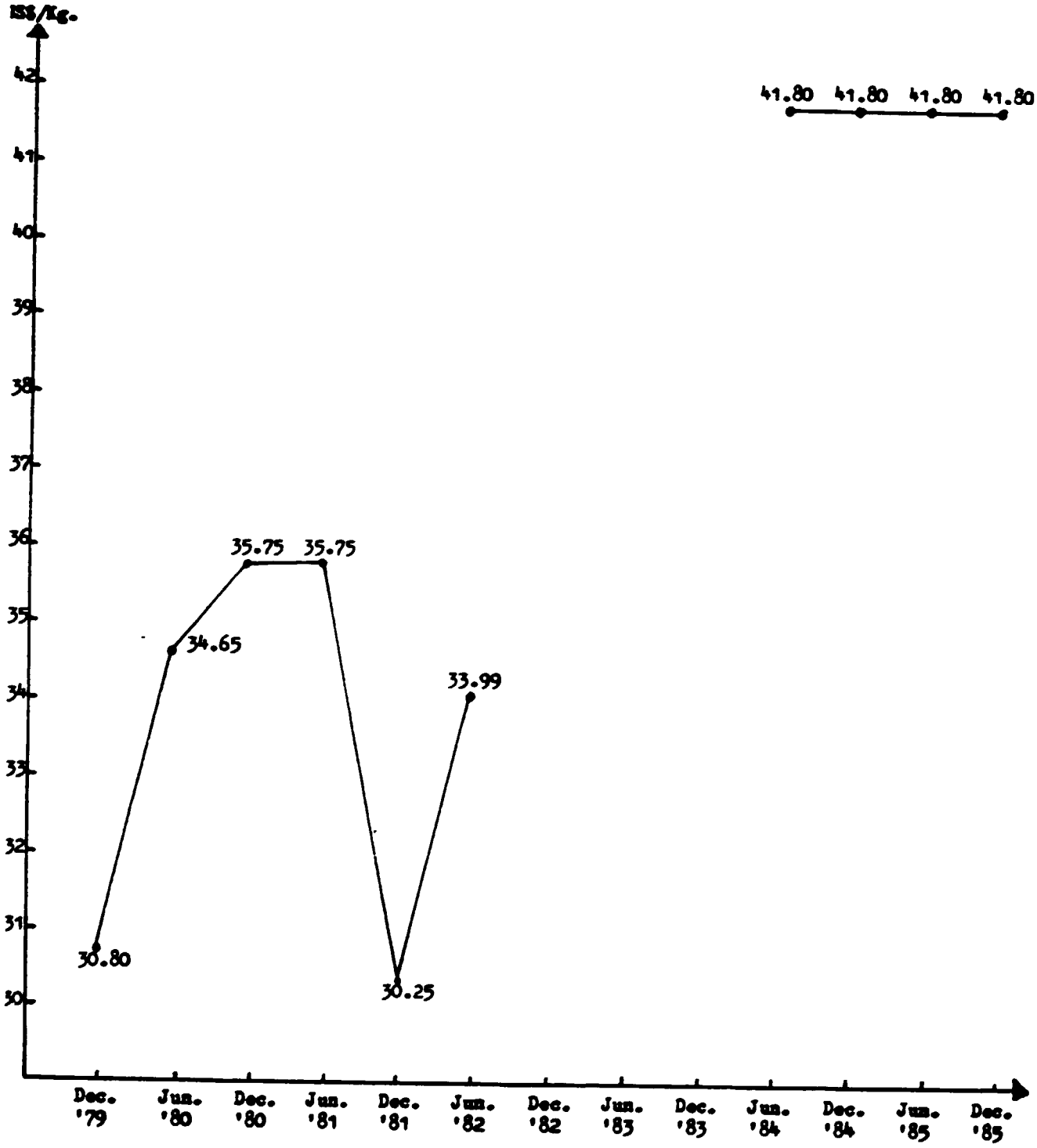
(1) The information, unless otherwise stated, has been obtained from the Chemical Marketing Reporter, New York. The prices mentioned are spot quotations and/or list prices of suppliers on a New York or other indicated basis. Price information was obtained from suppliers.

1. **Citronella (Java) Oil[1].**

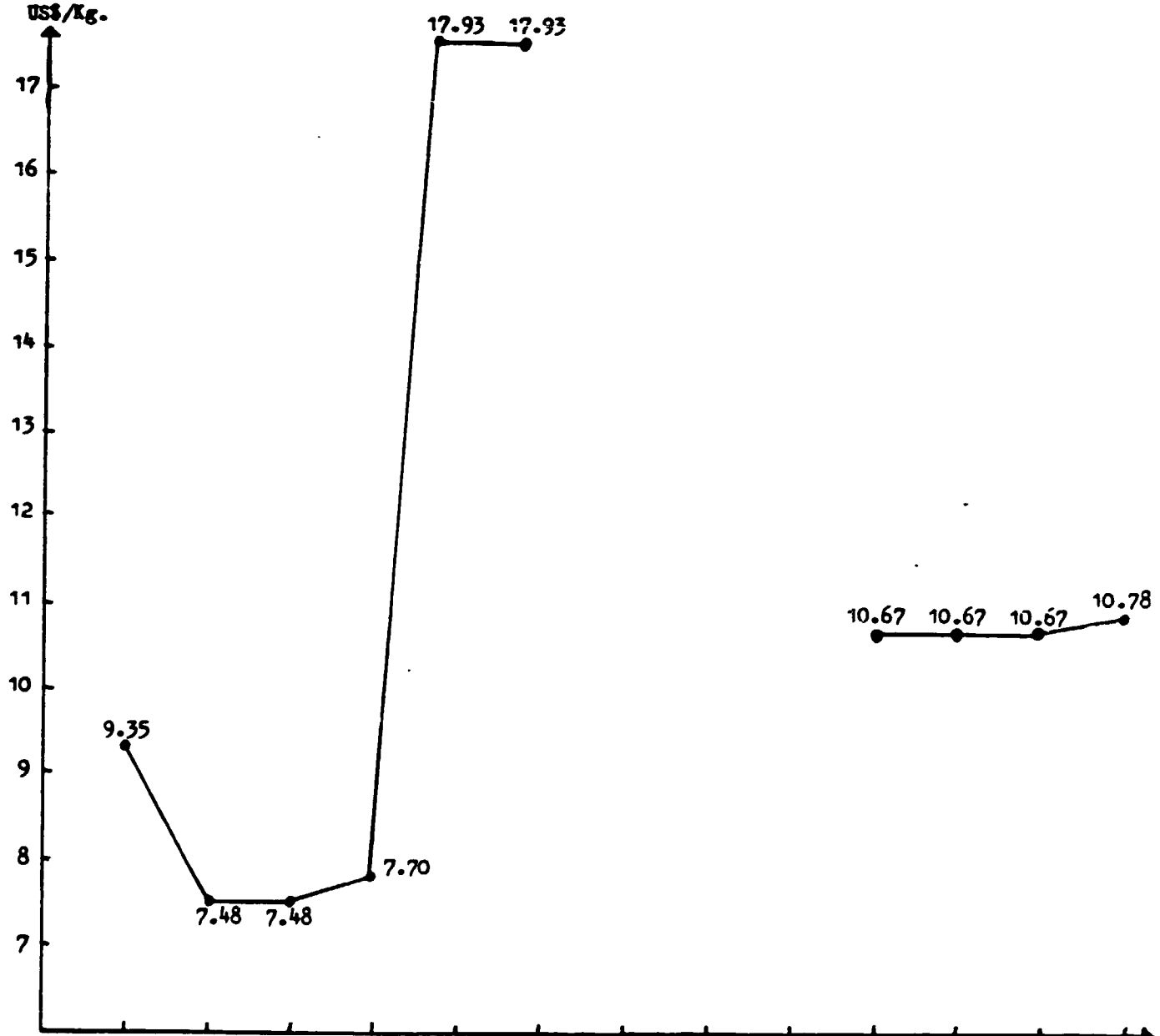


(1) The chemical marketing report issues for the period between June 1982 and June 1984 were not available in Nepal.

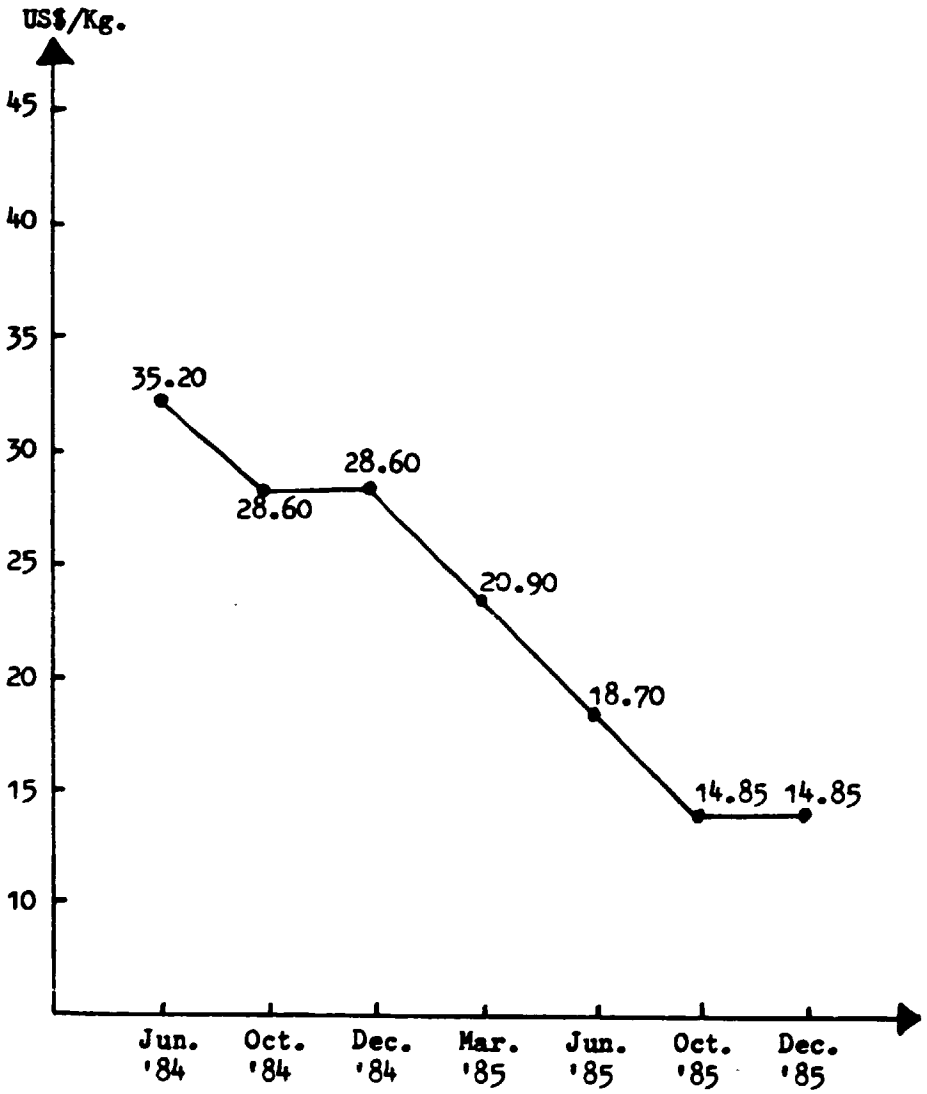
2. **Palmarosa Oil**



3. **Lemongrass Oil (Indian)**



4. **Menthol, nat, USP/Braselian large and regular chrystals**



5. Other products (prices quoted in Chemical Marketing Reporter of 17/3/86)

	US$/Kg.
Angelica root oil	700
Basil oil - Comores	198
Grand vert	99
Calamus oil	59 - 77
Cardamon oil	165 - 220
Citronella oil Ceylon	4.7
Java	4.84
Chinese	4.30
Coriander oil (USP)	48.6 - 61.6
Ephedrin hydrochloride (chryst)	83.6 - 88.0
Geranium oil Maroccan	52.8 - 60.5
Bourbon	72.6 - 83.6
Chinese	154 - 187
Egypt	116.6
Africa	165
Indian	154 - 187
Ginger Oleoresin	66
Juniper berry oil Italian	81.4
Lemongrass oil Indian	10.78
Guatemalan	5.0
Licocie root whole	0.9 - 1.1
Lycopodium powder	17.6
Menthol, nat USP Braselian	14.9 - 16.5
Palmarosa oil Indian	79.2

Pine oil 80% min.	103.4 - 116.6
Alc. content	
Pyrethrum flowers fine grade 0.9% pyrethru	4.2
Pyrethrum prepared 20% pyrethrin	82.5 - 83.1
Rauwolfia serpentina Root powder	48.4
Rhubarb root whole	1.0 - 1.3
Powder	1.3 - 1.5
Rose oil nat. Bulgarian	8470 - 8778
Turkish	4950 - 6600
Valerian root Belgian	1.4 - 1.9
Vetiver oil	35.2 - 37.4

+ Recent prices in India / + recent report.

+ Recent quantities produced in India.

B. Indian Prices

Prices were obtained through the good services of Mr. V. Sitaram, Executive Director of the Basic Chemicals, Pharmaceuticals and Cosmetics Export Promotion Council of India, and Marketing Consultant to this Project, and from price quotation from a herb trading house in Delhi.

	IC Rs.
Aconitum heterophyllum	12.10
Atropa belladonna leaves	6 - 23.20
Dioscorea Deltoidea roots	4.00
Lycopodium powder	28.00
Narodostachys jatamansi	32.20
Picrorhiza kurroa	36.20
Rheum emodi	16.20
Swertia chirata	20.80
Valeriana wallichhi (with rootlets)	10.90
Valeriana wallichhi (without rootlets)	20.80
Adhatoda vasaka	2.20
Mentha arvensis oil	100.00
Menthol Chrystals	170.00
Lemongrass oil	140.00
Citronella oil	120.00
Palmarosa oil	300.00

C. World Production of some essential oils[1]

Name	Producing Countries	Quantity produced (in tons.)	Total quantity (in tons)
Calamus oil	North Korea, India, Bulgaria, Poland, Yugoslavia, U.S.S.R.		10
Citronella oil	China,	1,200	2,300
	Indonesia	550	
	Argentina	150	
	Sri Lanka	120	
	India	120	
	Taiwan	50	
	Brasil	40	
	Guatemala, Colombia		

Name	Producing Countries	Quantity produced (in tons.)	Total quantity (in tons.)
Mentha arvensis oil	China	1,400	2,100
	Brasil	400	
	India	100	
	Paraguay	50	
	Taiwan	20	
	North Korea, Thailand, Japan.		
Davana oil	India	2	2
Ginger oil	China, India, U.S.A. Europe, Sri Lanka, Jamaica, South Africa.		55
Lemongrass oil	India	120	310
	China	120	
	Guatemala	40	
	Brasil	25	
	Sri Lanka, Haiti, U.S.S.R.		
Palmarosa oil	India	35	55
	Brasil	10	
	Paraguay	8	
	Madagassar, Comores, Gautemala, Indonesia.		

ANNEX - VIII.

Sales by HPPCL in the period 15/7/85 - 1/4/86

Product	Quantity Kg./litre	Sales Value (NC Rs.)	Destination	% of total sales.
Crude Herbs				
Picrorhiza kurroa	400 kg.	17,820	India	0.9%
Rheum emodi	110 Kg.	1,700	India, Nepal (10%)	0.1%
Jatamansi	1005 Kg.	39,333	India	2%
Lemongrass leaves	300 Kg.	3,285	Nepal	0.9%
Pyrethrum flower	8 kg.	384	Nepal	
Swertia chiretta	1000 kg.	26,350	India	1.4%
Azadirachta indica	60 kg.	2,421	France	0.1%
Acorus calamus	5 kg.	74	Nepal	-
Sugandh kokila powder	2850 kg.	11,400	India	0.6%
Sub-total		1,02,767		5.3%
Essential Oils				
Sugandh kokila oil	401 kg.	3,12,672	France	16.1%
Sugandh kokila concrete	11 kg.	3,555	France	0.2%
Palmarosa oil	525 Kg.	190.067	France	9.8%
Zanthoxylum oil	10 kg.	6.745	Belgium	0.3%
Lemongrass oil	15 kg.	318	Nepal	-
Citronella oil	55.5 kg.	7,930	Nepal	0.4%
Wintergreen oil	1 kg.	786	France	-
Mentha oil	6 kg.	1952	Nepal	0.1%
Menthol	5 kg.	2885	Nepal	0.1%
D.M.O.	2.5 kg.	563	Nepal	-
Sub-total		5,27,472		27.5%
Extracts				
Belladonna liquid extractor	100 litres	22.125	Nepal	1.2%
Vasaka extract	1.986 litres	116,540	Nepal	6%
Sub-total		1,38,665		7.2%

Product	Quantity Kg./litre	Sales Value (NC Rs.)	Destination	% if total sales.
Resinoids				
Rosin	74,574 kg.	970,053	India (90%) Nepal (10%)	50%
Turpentine oil	13,203 lit.	200,203	Nepal	11.2%
Sub-total		1,170,256		61.2%

Total Sales: 1,939,160 of which :

crude herbs	:	5.3%
essential oil and the like	:	27.2%
herbal extract	:	7.2%
resinoids	:	60.3%

Destination:

Nepal	:	453.434 Rs.	(23,5%)
India	:	969.481 Rs.	(50.0%)
Europe	:	516.245 Rs.	(26.5%)

DISCUSSION PAPER

Management Information and Corporate Planning

Introduction

The line of business the Herbs Production and Processing Company Limited (HPPCL) is engaged in is not an easy one indeed. The Company has to purchase or produce different raw materials from plant origin and transfer them into products for which the local market is limited, and exporting is thus often imperative. It is not an easy task to introduce new cash crops with farmers, certain raw materials are in short supply and maintaining good rapports with overseas buyers is often hampered by communication problems.

Nevertheless, difficulties can be overcome. A necessity in this regard is to have a smooth management information and corporate planning system, that will help the company to become a successful venture.

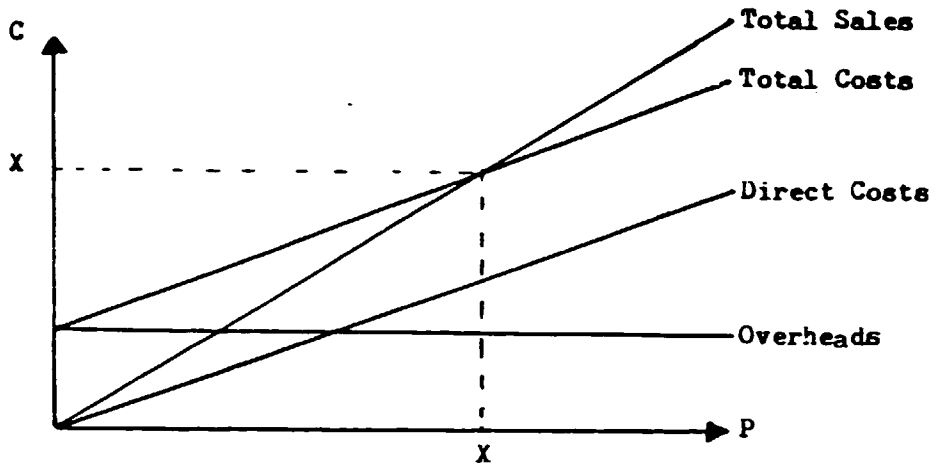
Reasons for management information and corporate planning

The HPPCL was set up a public company with a sizeable target in terms of sales. To this effect, high investments have been made in buildings, machineries and manpower.

It is therefore, imperative that production and sales are expanded is an efficient manner, in order to reach the break-even point as soos as possible.

This may be illustrated by the following graph:

Graph - Break-even point



C = Costs

S = Sales

P = Production

X = Break-even point

If production can achieved in a more efficient manner, direct costs will be reduced, and the break-even point can be achieved at a lower level of production and sales.

If part of the existing productions cannot be sold, it will take a higher level of production to reach the break-even point.

* In Nepal, as in most developing countries, capital (money) is expensive. Intrest rates are often as high as 17 - 18%. Therefore, it is very important to keep stocks as low as possible, of course taking into consideration the seasonal nature of the availability of some of the raw materials. Also production should tie in as closely as possible with customer's demands, in order not to waste expensive financial resources.

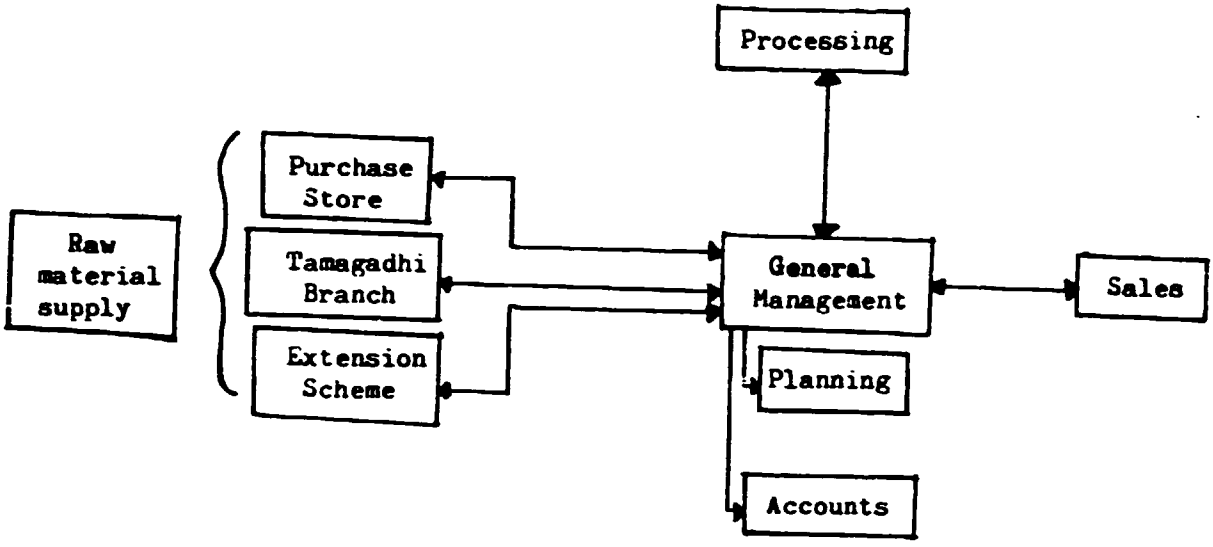
All this requires adequate planning

- Efficiency is only possible if we communicate between each other in an organised and regular way (reporting, budgeting .....), and staff take initiatives to introduce improved methods of operations.

- If planning is errorreous, it will be to the detriment of the company. Buyers will not be pleased if business deals cannot be fulfilled due to over-ambitious and unrealistic targets. It is better to be on the safe side when fixing the targets.

- Since market prices can hardly be influenced by the company, we have to be efficient in order to be able to pay collectors and growers of medicinal and aromatic plants a fair price for their produce. Since uplifting the living standard of these people is among the objectives of our public company, we have to work in an efficient manner.

Proposed Information and Planning Scheme (*)



At the centre of the decision making process is the general manager. To facilitate his task, the Planning Officer serves as a kind of secretariat, to assemble and process the information gathered.

Flow of Information

1. Sales - general management (GM)

   - sales during the period covered.
   - latest price information on relevant products in international and local markets.
   - new possibilities for sale in the domestic and international markets (should be provided immediately when it occurs).
   - customer's reaction to the price and quality of the products supplied by HPPCL.

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* This scheme does not treat the yearly planning and budgeting exercise, but is meant to provide a regular and stream lined flow of information throughout the Company.

The GM should provide the Sales Officer with a 3 monthly production plan, mentioning target dates for production.

Futhermore sales prices will be fixed by GM, and samples provided so that the Sales Officer can undertake market prospection.

2. Purchase and Store - GM

The GM should provide the purchase and store section (PS) with the company's raw material requirements every three months, except for raw materials that are hard to get (e.g. certain chemicals), and for which notice should be given 6 months in advance. In addition, a target date for the arrival of the raw materials at the store should be given.

Every , the store section should provide the GM with a detailed list of all products still in the store.

Every 3 months, the PS should provide the GM with an overview of available quantities and prices of required raw materials.

3. Tamagadhi Branch - GM

A yearly production programme should be agreed upon between GM and the Tamagadhi Branch. Based on this, a yearly budget will be prepared. The production programme should be further divided on a monthly basis.

Every month, the Tamagadhi Branch with supply GM with data on production achieved and funds spent, giving and explanation for deviations from the production programme and budget.

4. Extension Programme - GM

Same procedure as under (3) applies.

5. Processing Section - GM

A three monthly work programme should be agreed upon between the GM and the processing section (PS).

The PS will provide GM with it's requirements of raw materials, solvents, fuel, water and electricity and chemicals every three months.

Every week the PS will provide the GM with output figures and data of use of inputs.

6. Accounts Section (AS) - GM

Every month the AS will supply GM with.

- a statement of expenditures for that month.
- deviations from the yearly budget.
- every week, an overview of the financial position of the company (cash received and receivable, bills to be paid).

Role of the Planning Section

The planning section should perform the role of secretariat to the GM. It is the focal point for the stream of information throughout the company.

Some examples of this include:

- informing the sales section of the production targets proposed in the next three months.
- informing the purchase and store section about raw material requirements for the next three months.
- informing the processing section about the availability of raw materials, chemicals and solvents in the next three months.
- informing the accounts section what amount of money should be released to different sections periodically.

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

PROJECT IN THE KINGDOM OF NEPAL

JOB DESCRIPTION

DP/NEP/80/044/11-01/32.1.D

Post title	Economist/Cost Benefit Analyst
Duration	Six months with possibility of extension by another 3 months
Date required	December 1985
Duty station	Kathmandu
Purpose of project	To enhance His Majesty's Government (through the Herbs Production and Processing Company) to acquire processing technology for the production of plant-derived pharmaceuticals.
Duties	To enable His Majesty's Government (through the Herbs Production and Processing Company set up for plant derived pharmaceuticals and essential oils) develop management information system, cost benefit and marketing studies in plant derived pharmaceuticals and cultivation of aromatic and medicinal plants. The expert will be specifically required to:

1. Undertake Cost/benefit analysis and marketing studies.
2. Evaluate the market prospect of selected products.
3. Help developing management information system.
4. Study cost involvement in cultivation of crops in consideration of expected returns to private

farmers, evaluate the cost of production and overheads at partial and full production capacity.

5. Undertake cost calculations, evolve and introduce finished product and raw material price setting methods.

6. Train the management staff of the Company in the above mentioned activities.

7. Bring out clearly all the necessary data for the preparation of feasibility study for expanded activities of the Company and farms.

The expert will also be expected to prepare a final report, setting out the findings of his mission and his recommendations to the Government on further action which might be taken.

Qualification — Bachelor in Economics, with knowledge of Cost Accountacy relevant to medicinal and aromatic plants processing unit. The expert should have adequate experience in work of this nature.

Language — English

Background information — The country has a population of approximately 17 million with an annual growth rate of 2.6%. Over 90% of the populace live in rural areas and over 60% of them in the mountain zones. Most of the rural folk utilise plant-preparations for their therapeutic requirements and the traditional system of medicine is very similar and related to the Unani system prevalent in the Indian Sub-Continent. The wealth of medicinal plants can be consideted as one of the most important natural resources of the country. The country lies in the Central Sector of the great Himalayas and occupies one third of their total length. The diversity of physiography due to altitudinal and climatic variations has produced a great variety of plant species within the flora of this small country (area - 145,305 sq. km.). Much of this flora is used in medicine and the Royal Drugs Research Laboratory (RDRL) is responsible for the R+D efforts leading to the production of pharmaceuticals based on traditional remedies.

The RDRL has been assisted by UNIDO-UNDP for the past two years to enhance its capabilities as an R+D institution, and to provide technical assistance to the Herb Production and Processing Company. The latter, which will be the local executing agency for the present project, is also the recipient of FAO assistance in developing capabilities for the large-scale cultivation of medicinal plants.

A suitably integrated institutional framework already exists in the country for the systematic cultivation, research and development and processing of plant-derived products. The present projects are designed to develop this capability further in order to enhance the Government's health-care programme.