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18 April 1988
ENGLISH

PROCESSING OF MEDICINAL PLANTS CULTIVATED AND COLLECTED IN NEPAL

DP/NEP/80/044

NEPAL

Terminal Report*

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

Based on the work of Mr. Baldev C. Gulati
Adviser on processing of medicinal plants

Backstopping officer: R.O.B. Wijesekera,
Chemical Industries Branch

United Nations Industrial Development Organization
Vienna

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Introduction

Draft Terminal Report was prepared on 31 August 1987 for consideration at the Final TPR of the Project held on 7 December 1987. The present report is supplement to the Draft Terminal Report.

The Report summarises the progress especially with respect to Production Technology and Quality Checks for producing standard quality products. Manual for production processes has been handed over to Dr. A. Sheak, General Manager, Herbs Production and Processing Company Limited and National Project Director of NEP/80/044 vide letter of 23, January 1988.

Uptodate position regarding receipt and status of project equipment is also summarised here.

Development and Transfer of Technology

Work started in the Factory and Laboratory in January 1985 has resulted in successful transfer of technology and development of new products. Details of work done so far have been given in the Draft Terminal Report (31 August 1987). Technical personnels have been adequately trained in the various processes adopted for processing of aromatic and medicinal plant materials.

As a result of work done in the Project, 2 patents, one on oil of Sugnadha Kokila and second on Osmanthus Concrete has been granted by the HMG Nepal.

Transfer of technology and development of Processes achieved have been written in the form of a manual. Salient features of the process and important points for quality production of selected items only have been passed on to the HPPCL for reference and record.

It is relevant to mention that continuous and on job intensive training was provided to the technical personnel both in the factory and laboratory. HPPCL has the necessary capability now to produce a large number of standard quality products; sixteen with immediate marketability as per market evaluation.

Equipment Status

With the facility created in the form of workshop under the project proper care and timely repair of equipment has become possible. An Engineer appointed in HPPCL was trained for a short period by the Project Engineer. The Project Engineer also trained other personnels connected with the maintenance and repair work.

Bulk of the Project equipment has been installed and put to regular use. It is hoped that if due care is taken the equipment will continue to serve the purpose for which it was ordered.

Present position about receipt of equipment and its statusis enclosed at Annexure I.

Completion of Training/Study Tour Programme

Due to unavoidable reasons, following training/Study Tour Programmes could not be completed.

1. Processing Officer - One month training for Dioscorea Processing in West Bengal Department of Medicinal and Aromatic Plants at Mungpoo-(Darjeeling) could not be implemented due to disturbance in that area. This training is now suggested at the following:

Kurram Chemical Co. Ltd.
Attn: Mr. Mohammed Shamsul Haq Khan,
Managing Director,
Sihala Road,
P .. Box. 40
Rawalpindi (Pakistan)

Nomination of the Processing Officer, HPPCL to be sent to

Mr. Saadat Hussain Khan,
Chairman,
Federal Chemicals and Ceramic Corporation
15th Floor, PNSC Building
Manlvi Tamizuddin Khan Road
(KARACHI - Pakistan)

Preliminary contact with the above Companies elicited positive response.

2. Organisational and Management Training Programme for the National Project Director at Administrative Staff College, Hyderabad (India) scheduled for October 1987 had to be postponed for later date. The matter is pending with UNIDO, Vienna. This may be completed as soon as possible during 1988.

Achievement of Objectives, Outputs and Activities

Achievement of Developmental and Immediate Objectives, generation of Outputs and completion of activities were detailed in Draft Terminal Report (31 August 1987). All these Project Elements are now summarised in the form of a chart at Annexure II.

"PROCESSING OF MEDICINAL PLANTS"

DP/NEP/80/044

HMG

UNDP

Herbs Production and Processing Co. Ltd.
Kotesworo.
P. O. Box 2679, Kathmandu, Nepal
Tel. : 2-20342

United Nations Development Programme.
Pulchowk,
P. O. Box 107, Kathmandu, Nepal
Tel. : 5-21980-86
Cable . UNDEVPRO, KATHMANDU
Telex : 2206 UNDP NP
2306 UNDP NP

23 January 1988

Dear Dr. Sheak,

Please find enclosed details and important steps/points in processing various raw materials for quality products. As you are aware your technical staff is now well acquainted with the technology transferred and developed during the Project life. Nevertheless, I am putting these processes in writing for reference and record.

Also enclosed is a write-up on quality checks and specifications of various products.

With regards,

Yours sincerely,

Dr. Baldev Gulati
Chief Technical Adviser

Encl: i) Details of processing 18 plant raw materials pages 20.

ii) Quality checks and specifications on 14 products pages 6.

Dr. Asfaq Sheak
General Manager, HPPCL and National Project Director, Project DP/NEP/80/044.

Copy to - Dr. R.O.B. Wijesekera
Special Technical Adviser
Pharmaceutical Industries Unit
Chemical Industries Branch
Division of Industrial Operations
UNIDO, Vienna (Austria) - for information only.

Latest Position: Purchase and Receipt of Equipment — Annexure I.
Project NEP/80/044 - Kathmandu

S.No.	Item No.	Description of Equipment	Purchase Order Requirement	Received	Not yet Received	Remarks
1.	7(a)	VACUUM CONCENTRATOR				
		a) Vacuum concentrator capacity - 800 L; stainless steel construction with mild steel jacket size, 800x1500 mm.	1 No.	1 No.	-	Installed
		b) Mild steel stand	2 Nos.	2 Nos.	-	
		c) Column - Stainless steel construction for 800 L.	1 No.	1 No.	-	
		d) Refrigerant condensor capacity - 800 L - 5 Sq.m.	1 No.	1 No.	-	
		e) Distillation receiver for 800 cap.- 750 L, stainless steel construction size 800x1500 mm.	1 No.	1 No.	-	
2.	7(b)	VACUUM CONCENTRATOR				
		a) Vacuum concentrator capacity - 300 L; Stainless Steel construction with mild steel jacket size 525x1250 mm	1 No.	1 No.	-	Installed
		b) Mild steel stand	2 Nos.	2 Nos.	-	
		c) Column - Stainless steel construction for 300 L.	1 No.	1 No.	-	
		d) Refrigerant condensor capacity - 300 L - 3 Sq.m.	1 No.	1 No.	-	
		e) Distillation receiver for 300 L, capacity - 300 L, Stainless Steel size - 600 x 1100 mm	1 No.	1 No.	-	
3.	7	VACUUM PUMP				
		Model - WV-12- coupled to 7.5 HP motor	1 set	1 set	-	

Latest Position: Purchase and Receipt of Equipment
Project NEP/80/044 - Kathmandu

S.No.	Item No.	Description of Equipment	Purchase Order Requirement	Received	Not yet Received	Remarks
4.	9	PULVERISER				Installed.
		a) Capacity 100 kg. including with duct system etc.	1 set	1 set	-	
		b) Motor 15 HP.	1 No.	1 No.	-	30 HP Motor received.
5.	10	ROOT CUTTER				
		a) Knife blade type cap. 100 kg.	1 No.	1 No.	1 No.	
		b) 10 HP motor flam proof.	1 No.	1 No.	1 No.	
6.	11	JAW CRUSHER				
		a) Jaw crusher machine	1 No.	1 No.	-	Received 5.5 Kw motor instead of 10 HP.
		b) 10 HP motor flame proof	1 No.	1 No.	-	
7.	13	CENTRIFUGE BASKET TYPE	1 set.	1 set.	-	Installed.
		a) Basket 30"	1 No.	1 No.	-	
		b) Speed 1220 to 1440 spin	1 No.	1 No.	-	
		c) Electric motor 3 HP	1 No.	1 No.	-	
		d) Mouth dia. 16" (Fume tight top)	1 No.	1 No.	-	
		Note:- All contact part S.S. construction.				
8.	14	COUNTER CURRENT EXTRACTOR				Installed.
		a) Capacity 1000 L; stainless steel construction size, 100 mm x 1500mm	1 set.	1 set.	-	
		b) Solvent feeding tank, cap. 200 L., Stainless steel construction size, 500 mm x 1100 mm high.	3 Nos.	3 Nos.	-	
		c) With feeding pump 2.2 Kw.	1 No.	1 No.	-	

Latest Position: Purchase and Receipt of Equipment
Project NEP/80/044 - Kathmandu

S.No.	Item No.	Description of Equipment	Purchase Order Requirement	Received	Not yet Received	Remarks
9.	22	AIR CONDITIONER				
		Capacity - 2000 kg. (1 ton) window type.	1 No.	1 No.	-	Installed.
10.	29	STORAGE TANK FOR HCL				
		a) Capacity - 10,000 litres	1 No.	1 No.	-	Received without valves.
		b) FRP Stainless Steel Pump capacity - 30 L/Min. Head - 15 m coupled to 2 HP flame proof motor	1 set	1 set.	-	
11.	27	FRP GLASS LINED TANK				
		a) Capacity - 2000 L, size - 1200mm x 1987 mm with jacket for steam heating.	1 No.	1 No.	-	Received withoutsteam jacket as per specification not acceptable without jacket.
		b) Mild steel construction stand	1 set.	-	1 set.	
		c) 7.5 HP F/P motor	1 No.	1 No.	-	
		d) Gear box	1 No.	1 No.	-	
		e) Anchor type stirrer	1 No.	1 No.	-	
		f) Stop cock 4" (acid resistant)	1 No.	-	1 No.	
12.	28	FRP GLASS LINED TANK				
		a) Capacity - 2000 L, Size - 1200 mm x 1875 mm with mildsteel jacket for steam heating.				Received FRP tank without jacket and tilting arrangement. Not acceptable.
		b) Mild steel construction stand	1 set(2Nos.)	1 set.		
		c) 7.5 HP F/P motor	1 No.	-	1 No.	

Latest Position: Purchase and Receipt of Equipment
Project NEP/80/044 - Kathmandu

S.No.	Item No.	Description of Equipment	Purchase Order Requirement	Received	Not yet Received	Remarks
		d) Tilting arrangement	1 No.	-	1 No.	
		e) Gear box	1 No.	1 No.	-	
		f) Anchor type stirrer	1 No.	1 No.	-	
		g) Stop cock 4" (acid resistant)	1 No.	-	1 No.	
		h) Acid resistant pipe fitting	1 set.	-	1 set.	
13.	23.	WATER DISTILLATION PLANT (Pyrogen Free Distillation water).				
		a) Capacity - 100 L/hr.	1 No.	1 No.	-	Installed.
		b) Steam pressure gauge	1 No.	1 No.		
		c) Safty valve	1 No.	1 No.		
		d) Steam trap	1 No.	1 No.	-	
14.	1(a)	BOILER (STEAM GENERATOR)				
		with automatic control				Installed.
		a) Capacity - 1000 kg/hr. working pressure - 14 kg/cm^2 (100 psi)	1 set.	1 set.	-	
		b) Automatic pressure jet burner model - No - Way CL5 H1/Lo	1 No.	1 No.	-	
		c) Electric feed pump with F/P motor, mobrey dual control device	1 No.	1 No.	-	
		d) ON/OFF control	1 No.	1 No.	-	
		e) Low level water audible alarm (and burner output)	1 No.	1 No.	-	
		f) Burner output	1 No.	1 No.	-	
	1(b)	BASE EXCHANGE TUPE WATER SOFTENING PLANT	1 Unit.	1 Unit.	-	
		a) Chimney	1 No.	1 No.	-	
		b) Spare parts	1 Lot.	1 Lot	-	

Latest Position: Purchase and Receipt of Equipment
Project NEP/80/044 - Kathmandu

S.No.	Item No.	Description of Equipment	Purchase Order Requirement	Received	Not yet Received	Remarks
	1(c)	Steam pipe valves fitting	1 lot.	1 lot.	-	
15.	24.	TANK STAINLESS STEEL				
		a) Capacity - 400 L vertical type with steam jacket	1 No.	1 No.	-	Installed
		b) Level guage	1 No.			
		c) Stirrer with stand and motor	1 set	1 set	-	
16.	25.	TANK STAINLESS STEEL				Installed
		a) Capacity - 100 L, vertical type with bottom discharge	1 No.	1 No.	-	
		b) Stirrer arrangement with stand and motor.	1 No.	1 No.	-	
17.	30.	TANK STORAGE, STAINLESS STEEL(Construction).				All in use.
		Capacity				
		a) 50 litres	6 Nos.	6 No.	-	
		b) 100 litres	6 Nos.	6 Nos.	-	
		c) 200 litres	4 Nos.	4 Nos.	-	
		d) 500 litres	4 Nos.	4 Nos.	-	
		e) 1000 litres	4 Nos.	4 Nos.	-	
18.	31.	FILTER PRESS				
		a) Stainless Steel plate and frame type	1 No.	-	1 No.	Not yet received. No-response from Servotech.
		b) Plates	15 Pcs.	-	15 Pcs.	
		c) Frames - size - 36"x36"x15"	14 Pcs.	-	14 Pcs.	
		d) Crystal Pump, Capacity - 100 l/min. at 5 kg/cm^2 coupled to 7.5 HP motor.	1 set.	-	1 set.	

Latest Position: Purchase and Receipt of Equipment
Project NEP/80/044 - Kathmandu

S.No.	Item No.	Description of Equipment	Purchase Order Requirement	Received	Not yet Received	Remarks
19.	32.	WHEELED TUBS				
		FRP construction, capacity - 80 L.	2 Nos.	2 Nos.	-	
20.	33.	WEIGHING BALANCE				
		a) Plate farm type, capacity - 200 kg. Calibration - 100 gm.	1 No.	1 No.	-	In use.
		b) Dial type, capacity - 25 kg. calibration - 25 gm		(damaged)		Received in completely damaged condition. No replacement yet.
21.	34.	PUMP WITH MOTOR				
		a) Stainless Steel construction pump size - 1"x 1" (inlet and outlet) Head - 20 m.	4 Nos.	4 Nos.	-	
		b) 3 HP F/P motor	4 Nos.	4 Nos.	-	
		c) Acid Resistant Tubings	200 ft.	-	200 ft.	
		d) Screw clamp	20 pcs.	-	20 pcs.	
22.	37.	GENERATOR				
		a) Capacity - 100 Kva, 440 V, output.				Installed.
		b) Diesel engine driven (complete)	1 No.	1 No.	-	
		c) Distribution system	1 No.	1 No.	-	
		d) General Accessories and Chimney	1 set.	1 set.	-	
23.	18.	DEEP FREEZER				
		a) Capacity - 450 L, Horizontal type.	2 Nos.	2 Nos.	-	Installed.
		b) Voltage stablizer	2 Nos.			

Latest Position: Purchase and Receipt of Equipment
Project NEP/80/044 - Kathmandu

S.No.	Item No.	Description of Equipment	Purchase Order Requirement	Received	Not yet Received	Remarks
24.	20.	LIQUID/LIQUID EXTRACTOR				
		a) Capacity - 100 L/hr. Stainless Steel construction	1 set.	1 set	1 set.	Installed.
		b) Separator	1 No.	1 No.	1 No.	
		c) Turbine	1 No.	1 No.	1 No.	
		d) Explosion proof motor 2.2 KW.	1 No.	1 No.	1 No.	
		e) Frame	1 No.		1 No.	
25.	35(a)	HOIST				
		a) Capacity - 1 Ton, Hand operated type.	1 No.			
		b) Trolley	1 No.			
	35(b)	Hoist - capacity - 2 Ton Electrically operated.	1 set.			
		a) Lifting height - 7.5 m				
		b) Lifting spread - 8 m/min.				
		c) Trolley speed - 10 m/min complete with 1 motor with brake 1 set of control	1 set.			
26.	1.	JASMINE OIL EXTRACTOR	1 set.	1 set		Installed. (Ordered by Project)
27.		JEBIVAK HIGH VACUUM PUMPS MODEL V-15	2 set.	2 set	-	Installed. (Ordered by Project)
		a) Oilsealed b) Rotary vane type c) V-Belt driven d) Mounted on baseplate e) V-belt pulley f) Air ballast g) Belt guard h) Charg of oil				

Latest Position: Purchase and Receipt of Equipment
Project NEP/80/044 - Kathmandu

S.No.	Item No.	Description of Equipment	Purchase Order Requirement	Received	Not yet Received	Remarks
28.	2.	PERCOLATOR				Installed.
		a) capacity - 1000 L.	1 set.	1 set.	-	
29.	1.	STEAM DISTILLATION PLANT				Installed.
		2000 litres capacity	1 set.	1 set.	-	
30.		REACTIFICATION COLUMN	1 set.	1 set.	-	Installed.
		a) Glass equipment b) Backing flange, Teflon gasket c) Electrical Heating Mantle d) Tubular structure e) S.S. 304 lodrumn packing f) Electrical Heating tape with controller. g) 5 litre Cap. trap for vacuum system. h) Vacuum guage				
31.	36.	GLASS REACTION ASSEMBLY	1 set.	1 set.		
		a) Glass equipment b) Backing Flange, Teflon gasket. c) Tubular structure. d) Chunk and seal assembly. e) 9 HP 230 V AC/DC. Variable stirrer.				

Summary of Project Progress - DP/NEP/80/044 Annexure II.

1. Project Elements	2. Success Criteria	3. Verifiers	4. Progress achieved	5. Factors inimical to Progress A. Operational B. External
I. Development Objectives				
i. To reduce the import of medicines and hence the outflow of foreign currency by production and collection in Nepal of medicinal plants whichcan be cultivated and processed within the country and so substitute imported drugs.	Import substitution of pharmaceuticals	Extent to which import substitution has taken place.	Expected progress made. Import substitution has reduced imports by NC Rs. 230,000 by extracts of Vasaka and Belladonna alone (per annum). A further substitution of NC Rs. 400,000 p.a. expected by locally produced Menthol.	
ii. To increase the foreign currency earnings of Nepal by collecting, cultivating, processing and exporting of concentrates of both medicinal and aromatic plants.	Export of items to earn foreign exchange	Extent to which exports have gained foreign currency.	From 1984/85 to 1986/87 Increase of FE: NC Rs. 292,305 to NC Rs. 1.53 m (Europe) - NC Rs. 901,695 to NC Rs. 5.27 m (India).	
II. Immediate Objectives				
i. The establishment of processing facility in Kathmandu and of simple field processing equipment, with an objective to start primary processing of medicinal herbs for the first time in Nepal.	- Acquisition and operation of Pilot scal processing equipment. - Successful technology development and/or adaptation. - Generation of products, (plant extracts, essential oils, concretes etc...) to required specifications for handing to industry.	Technology packages now available for commercial production of selected products.	Objective successfully completed.	

1. Project Elements	2. Success Criteria	3. Verifiers	4. Progress achieved	5. Factors inimical to Progress A. Operational B. External
ii. Developing the Herbs Production and Processing Company Limited into an economically viable enterprise.	Manpower build-up to conduct all operations from regular acquisition of raw to processed products, functioning processing machinery and quality control.	Self generating ability of HPPCL and progress towards profitability.	Objective almost complete. Progress as expected. HPPCL has gained the confidence of clients and established credibility locally and in expert markets. HPPCL now a commercially viable Company.	
III. Outputs				
Output 1 A central facility in Kathmandu for processing of plant material for production of drugs, pharmaceuticals, and aromatic products on a pilot scale.	Acquisition, installation, start-up of pilot-scale equipment at HPPCL and the conduct of trial production runs.	Adequately functionning pilot plant assembly and number of trials conducted with satisfactory results.	Pilot equipment in position at site, installed, tested and functioning. Laboratory equipment installed and in use. Production trials on belladonna, vasaka XT, essential oils: Sugandha Kokila, Juniper, Calamus, Pine oil turpentine, Resin, Menthol, Diosgenin completed. Moss extract and absolute completed. Quality control methods established.	
Output 2 Installation of field processing equipment (post-harvest preparation: drying and pulverising in order to facilitate transportation to Kathmandu.	Acquisition, installation of field processing equipment for post-harvest preparation/distillation and satisfactory trial runs.	Number of distillations carried out and quantity and quality of essential oils produced.	Field distillation still installed as contribution of FAO project. This is being used to generate techno-economic parameters. Pine resin distillation unit and two further field stills under installation.	

1. Project Elements	2. Success Criteria	3. Verifiers	4. Progress achieved	5. Factors inimical to Progress A. Operational B. External
Output 3 A core of trained staff to operate and maintain the Central Processing facility and a national competence in the production of Pharmaceuticals and and allied products from plants.	Completion of training schedules and gainful employment of trained staff on ongoing production/technology development.	Number of trainees completing this training and being adequately employed.	4 trainees completed their training in production and Q.C. Further 4 trainees in Management/ Accounting, Planning/ Marketing completed. Experts provided on site training, in Production Methodology. Cost Analysis, Equipment Service and Maintainance and Workshop operations.	
Output 4 An experienced organisational capability within the Herbs Production and Processing Company Limited.	Satisfactory methodologies evolved from cultivation and acquisition of raw materials to processing and marketing of products.	Overall management practices introduced and incorporated in operations of HPPCL.	Based on contributions of experts good management practices introduced from cultivation, harvesting, production, to Q.C. schedules and Marketing guidelines established.	
Output 5 Feasibility studies on production of selected plant-derived from cultivation to marketing.	Feasibility reports on priority product items following completion of R & D.	Completion of reports.	Partially fulfilled; reports not completed.	
Output 6 Preparation of a feasibility study on expanded activities for the Herbs Production and Processing Company Limited.	Proposals for ongoing activities for HPPCL for 1987-92 based on R & D successfully completed.	Package of proposals available as a document.	Not yet delivered. Expected to be completed in due course.	

1. Project Elements					2. Success Criteria	3. Verifiers	4. Progress achieved	5. Factors inimical to Progress A. Operational B. External
IV. Activities Activities scheduled in project document	As originally scheduled start	 completion	Actual start	 completion				
a) Chalking out realistic programme of work.	10/84	10/84	10/84	11/84	Timely completion of activity.	Date of completion	Completed	
b) Evaluation existing equipment in HPCL and Department of Medicinal Plants under Project DP/IND/80/003	10/84	10/84	11/84	11/84	Timely completion of activity.	Date of completion	Completed	
c) Finalisation of specifications of new equipment, calling for tenders.	11/84	12/84	11/84	1/85	Timely completion of activity.	Date of completion	Completed	
d) Evaluation of tenders and award of contract for supply of equipment.	4/85	9/85	4/85	10/85	Securement of most appropriate equipment ensemble in keeping with costs.	Timely placement of order for most suitable equipment.	Completed albeit with understandable delay.	
e) Semi-commercial scale production trials on existing equipment HPCL.	1/85	3/85	1/85	12/85	Accomplishment of satisfactory trials.	Generation of products and process parameters.	Completed	
f) Evaluation of existing facilities in respect of routine analytical laboratory of HPCL	12/84	12/84	12/84	12/84	Evaluation results and follow up.	Generation of plan for acquisition of new equipment.	Completed	

1. Project Elements					2. Success Criteria	3. Verifiers	4. Progress achieved	5. Factors inimical to Progress A. Operational B. External
g) Preparation list of essential items of instruments, apparatus, chemicals and solvents.	1/85	1/85	1/85	1/85	Completion of list	Date of completion	Completed	
h) Initiation of analytical work with existing facilities.	1/85	3/85	1/85	2/85	Analytical methodology instituted.	Analytical results	Completed	
i) Reviewing Project	3/85 4/86 8/87	3/85 4/86 8/87	3/85 4/86 12/87	3/85 4/86 12/87	Conduct of review	Reports	Completed	
j) Study tour, National Project Director	6/85	6/85	9/85	10/85	Organisation and conduct of tour	Completion of tour and preparation of report	Completed	
k) Manufacture, supply period of equipment	6/85	6/85	12/85	9/87	Delivery of Equipment on site	Installed equipment	Completed with 6 m delay.	
l) Calling for quotations for laboratory instruments, apparatus, chemicals etc.	5/85	5/85	9/85	10/85	Timely completion of activity	Placement of orders	Completed	
m) Evaluation of quotations for laboratory instruments, apparatus etc. and placing orders.	7/85	8/85	11/85	1/86	Timely completion of of activity.	Placement of orders	Completed	
n) Establishing and equipping laboratory	10/85	11/85	8/86	12/86	Installation and start-up of equipment.	Fully equipped and functioning laboratory.	Completed with 1 year delay	Items had to be reviewed discussion delayed Dollar decline

1. Project Elements					2. Success Criteria	3. Verifiers	4. Progress achieved	5. Factors (risks) relevant to Progress	
								A. Operational	B. External
o) Routine analysis of essential oils and plant extracts resinoids.	6/85	9/86	8/85	11/87	Conduct of a number of analyses and generation of results	Analytical parameters of products, such as: sugandh kokila oil and concrete	Completed and ongoing, but some delays	Equipment delays and mechanism of coordination with RDRL.	Delay on equipment
p) Shipment, delivery, installation of equipment and production trials with the assistance of Engineer	10/85	12/85	1/86	9/87	Conduct of processing trials	Processed products	Products produced for Royal Drugs Ltd.- Extracts Adalhoda and Belladonna, Menthol: Total national demand estimated @ 1000 kg (value Rs. 400,000) can be met. Also dementhelin Tree moss resinoid and absolute on pilot scale, oil of calamus, jatammasi, Tagetes and Vimur and several other products.	Delivery and installation of equipped delayed.	Dollar decline and logistic problems.
q) Commencement final runs of equipment	1, 2/86	1, 2/86	7/87	10/87	Conduct of processing operations	Finalised products according to established quality/ standards	Almost all the products pilot trials completed	Delivery and installation of equipped delayed	Dollar decline and logistic problems
r) Establishment of machine-shop by Engineer and and training local personnel	12/85	3/86	8/86	7/87	Installed machineshop	Operational machine shop and trained personnel			

1. Project Elements					2. Success Criteria	3. Verifiers	4. Progress achieved	5. Factors inimical to Progress A. Operational B. External
s) Preparation of sample specifications for buyers and market response - Cost benefit analysis and marketing studies	11/85	5/86	1/86	10/87	Availability of compiled specifications on products and cost data.	List of export products according to standard specifications.	Achieved and ongoing	Delays due to setbacks on equipment acquisition.
t) Training local personnel in economic and market evaluation of selected products	12/85	5/86	4/86	9/87	Completion of training	Evaluation report on products	Completed.	
u) Development of management information system	3/86	5/86	2/96	3/86	Availability of system	Improved information flow and retrieval	Achieved	
v) Technical assistance by production technologist in ongoing work of production	5/85	10/86	3/85	11/87	Improved production methods.	Products of improved quality and/or more economic processes	Achieved	
w) On-the-job training of local personnel in production work.	12/85	10/86	3/95	1/87	Completion of training.	Trained manpower	Achieved	
x) Fellowship training, Senior Processing Officer	4/85	7/85	9/86	9/86	Completion of fellowship	Trained processing officer	Completed	
y) Preparation of feasibility study for expended activity	8/86	9/86	11/87	12/87	Study on feasibility	Report	Under preparation	

1. Project Elements					2. Success Criteria	3. Varifiers	4. Progress achieved	5. Factors inimical to Progress A. Operational B. External
a) Additional activities following project extension								
i) Training programme Processing Officer, Extracts and Resinoids								
ii) Training programme processing-cum-analytical chemist	9/86	10/86	9/86	10/86	Completion of training	Trained manpower gainfully utilised	Achieved	
iii) Training programme Medicinal and Pharmaceutical Chemicals.	1/87	2/87	1/87	2/87	Completion of training	Trained manpower gainfully utilised	Achieved	
iv) Training programme Assistant Officer Essential oils	12/86	2/87	12/86	2/87	Completion of training	Trained manpower gainfully utilised	Achieved	
v) Fellowship Sales Officer	4/86	5/86	4/86	5/86	Completion of training	Trained manpower gainfully utilised	Achieved	
vi) Training programme Organisational and Management, National Project Director	6/87	7/87			Not yet complete	Trained manpower to be gainfully utilised	-	Matter pending with UNIDO, Vienna (Austria)

1. Project Elements					2. Success Criteria	3. Varifiers	4. Progress achieved	5. Factors inimical to Progress A. Operational B. External
vii) Fellowship Planning Officer	9/87	10/87	7/87	9/87	Completion of training	Trained manpower gainfully utilised.	Achieved	
viii) Fellowship Accounts Officer	1/87	2/87	4/87	7/87	Completion of training	Trained manpower gainfully utilised	Achieved	
ix) Fellowship, Cost Accounts	1/87	4/87	7/87	9/87	Completion of training	Trained manpower gainfully utilised	Achieved	