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ASSISTANCE IN THE DEVELOPMENT OF THE TEXTILE INDUSTRY*

SI/NEP/77/802

NEPAL

Terminal report

Prepared for the Government of Nepal by the
United Nations Industrial Development Organisation,
executing agency for the United Nations Development Programme

Based on the work of H. J. Blydenstein,
textile engineer

United Nations Industrial Development Organisation
Vienna

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I. SUMMARY

- The expert was assigned to the Industrial Service Centre (I.S.C.) in Kathmandu. His activities were concentrated on a jointly-defined Long-Term Strategy Plan for the Textile Industry.

The creation of optimum labour employment within acceptable economic limits was the main guiding principle.

- The present and future market demand had already been very intelligently calculated by the I.S.C.
- Assuming that 70% of the market demand for woven fabrics of cotton and man-made fibres (MMF) can be met by domestic production, this production demand increases from 82 million meters in 1977/78 to 119 million meters in 1987/88.
  40% Of the production demand for cotton was allocated to the handloom sector, 20% to the small scale (decentralized) sector and 40% to the large-scale mills. The latter also should supply the steadily growing demand for MMF fabrics.
- The raw cotton inputs for this production was determined and the current raw cotton development project was evaluated. It should be actively supported by the Government.
- The handloom industry should extend its present production of 10 mill.meters to 33 mill.m. in 1987/88, for which 15.000 new handlooms should be installed, creating employment for 15.000 new weavers plus auxiliary labour.
  Considering the complexity of implementation it is recommended to establish a separate handloom division of the Department of Cottage and Village Industries (DCVI). A one-year Unido assistance is suggested, while expert advice on producers co-op societies is also desirable.
- The decentralized sector - in the realm of private enterprises - requires the addition of around 800 looms to meet the target for 87/88, thus creating employment for 2200 workers. To obtain the necessary finance, the sector will need the help of the Nepal Industrial Development Corporation.
- Large-scale mills. At present the establishment of large power-consuming spinning and weaving mills is not feasible due to shortage of public power capacity.
  To spin 90% of the required cotton yarn demand, around 55.000 additional spinning spindles should be installed in 1987/88 of which 25.000 spindles should be in operation in 1982/83.

A detailed feasibility study concluded that profit prospects are not optimistic. As soon as sufficient hydro-electric power is available at reasonable costs, the prospects improve.

- Weaving. A cotton weaving mill of 360 looms (later to be extended to 460 looms) is competitive and recommended, integrated with a cotton spinning mill of 15.000 spindles.
  Plans for MMF weaving can be delayed for a few years.

- Dyeing, printing and finishing. No time was available for this section; the services of a specialist are recommended.

- Organization. The establishment of a Government Textile Board is recommended. For its Secretariat a one-year fellowship for a Nepalese senior economist is recommended.

II. INTRODUCTION

1. Project Background

a. Co-operating agency

The Ministry of Industry and Commerce has assigned the expert to the Industrial Services Centre which is the original sponsor of the project.

b. Previous missions

An excellent and detailed report by the Unido expert Mr.John Buxton was presented in April 1968 covering many objectives of my present assignment, including an exhaustive feasibility study of a fully-integrated plant.

In the early seventies the feasibility study of the Buxton report was updated and brought to the implementation stage by the Unido expert Mr.J.Gregory. The mill now nearing completion in Hetauda is largely based on the Buxton/Gregory recommendations.

c. Request for further UNDP aid.

The Industrial Services Centre (I.S.C.) is assigned by the Ministry of Industry among others to investigate the potentials for industrial development in Nepal and to prepare long-term plans.

As the two previous Unido textile missions were not adequately geared to this purpose, further Unido assistance was requested.

d. Job Description

The Unido job description as handed to the expert states:

"In close cooperation with Government the expert is expected to assist the Government in formulating a long-term strategy and in that context ascertain the feasibility of a new plant with a maximum capacity of 50 million yards of cotton and synthetic a year" etc.

On my arrival the I.S.C. presented a detailed outline for a long-term strategy plan, based on the original application of H.M.G. for Unido assistance. It did not emphasize the one-plant conception of the Unido job description but instead suggested a far wider field of research.

Based on first investigations of the structure of the existing market, lack of industrial infra-structure, wage levels, etc., I could fully agree with the conception of the I.S.C. With my full cooperation the outlines and contents of the I.S.C. Long-Term Strategy Plan, together with the tasks for both the I.S.C. and the expert were determined.

This table of contents/outlines of the report reads as follows:

INDUSTRIAL SERVICES CENTRE

LONG TERM STRATEGY

FOR DEVELOPMENT OF TEXTILE INDUSTRY

IN NEPAL.

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The tasks of the expert deviate considerably from the original Unido job description. His report is based on the I.S.C. conception. It was recognized both by the I.S.C. and the expert that this programme could not be executed in the three months allotted by Unido and UNDP Kathmandu was informed accordingly. It is remarked that the I.S.C. had originally requested a four-months assistance.

2. Objectives of the Project.

The import of textiles is still 30 to 40% of Nepal's total import. In 1976/77 only around 12.5% of the textile consumption was produced domestically. Hence there is qua market size a considerable scope for a large expansion of domestic production.

Import substitution is of considerable importance to the country, because of the saving in foreign exchange expenditure generated by the domestic added-value and even more so for the creation of labour employment for its rapidly growing population and the future lack of arable land for agricultural employment.

In fact the creation of optimum labour employment within acceptable economic limits has been the main guiding principle of the expert's approach to his work.

The accepted version of the I.S.C. Long-Term Strategy Plan defines the detailed objectives and main activities for the expert. His report is based on it. The consequence is that his report can only be read and understood within the context of the I.S.C. study, of which it forms an integral part.

In accordance with the wishes of the I.S.C. the report sometimes goes into small details.

3. Notes

- To improve the readability for authorities not directly involved with the I.S.C. study the conclusions and recommendations (see III) are adapted accordingly.
- The knitting and woollen industries were not considered, nor the dyeing, printing and finishing sections of the cotton and man-made fibre industries (the latter due to lack of time).
- Import duties, sales taxes nor foreign exchange charges etc. have been taken into account, but are dealt with by the I. S.C.(Chapter 13).
- The following rates of foreign exchange were used:

  1 US$ = 12.5 Nepalese Rupees
  1 US$ = 8.9 Indian Rupees
  1 US$ = 2.35 Swiss Francs.

- All calculations for the planned industrial capacity are based on "average" fabric constructions selected from market observations, fabric analysis and experiences in other developing countries.

III. CONCLUSIONS AND RECOMMENDATIONS

a. Explanatory Notes.

The expert took charge of the following chapters of the I.S.C. study programme:

5 - Production Demand
6.- Inputs
7 - Domestic supply of cotton
8 - Handlooms
9 - Decentralized Sector/Small-scale mills
10 - Large-scale mills
11.- Locations
12 - Man-power planning
14 - Organization
15 - Government Policy
16 - Model plants, which are included in Chapter 10.

On arrival of the expert (Sept.5, 1977) the two officers of the I.S.C. in charge of the study had already prepared a very comprehensive and intelligent report on chapters 3 (Overview of the textile industry in Nepal) and 4 (Demand analysis up to 1991/92). These chapters could be accepted with only minor alterations.

The estimated market demand and per capita consumption for woven fabrics including woollen/others is:

	Market demand	Per capita consumption
1977/78	123 mill.meters	9.2 mters
1982/83	143 mill.meters	9.9 "
1987/88	178 mill.meters	10.6 "
1991/92	207 mill.meters	11.3 "

b. Chapter 5 - Production Demand.

1. It is proposed to aim at a national production of 70% of the envisaged market demand (Chapter 4) for woven fabrics of cotton and man-made fibres(MMF); the other 30% remains to be satisfied by imports.
2. No exports are envisaged.
3. Based on the fabric mix and because of the menacing large un- and underemployment in rural areas, low wages level, difficult infra-structure, scarcity of capital and electric power and its versatility, 40% of the production demand for cotton fabrics is allocated to handlooms, 20% to the decentralized sector (also called small-scale weaving mills) and 40% to the large-scale sector; the latter also taking the full production for MMF

fabrics (from blended and continuous filament yarns). 40% of the production demand to handlooms is - with the presently available know-how - about the maximum the market can take.

Definitions:

- A large-scale weaving mill has a rated capacity of at least 2½ million square meters per annum and a capital utilization of at least Rs 5 million.
- Any power driven unit below 2½ million square meters falls into the decentralized sector.

4. After deducting an estimated production level for the existing industry (approx. 20 mill.meters in 1977/78) the unsatisfied production demand for woven fabrics of cotton and MMF (to be met by new production) amounts to 62 million meters in 1977/78, 62 million meters in 1982/83 (no increase due to the production of the Hetauda mill now nearing completion) and 82 million meters in 1987/88.

The breakdown of the unsatisfied production over the three sectors is given below, while the first column shows the total production demand (including the expected production of existing facilities).

In million meters:

	Total Production Demand	Unsatisfied Production Demand				
		Total	Handlooms	Decentr.	Large-scale cotton	MMF
1977/78	82.-	62.4	15.67	11.79	19.52	15.42
1982/83	98.6	61.8	20.88	12.53	11.83	16.57
1987/88	118.6	81.8	23.27	13.72	14.22	30.65

5. It is assumed that up to 1983/84 the distribution is 75% cotton, 20% MMF and 5% woollen/others, (the latter has been excluded in the calculation), while beyond 1983/84 the percentage of MMF gradually increases until a share of 35% has been reached, after which the share of each remains constant at resp. 60%, 35% and 5%.

c. Chapter 6 - Inputs.

1. Raw Materials

Based on market observations, fabric analysis and experience in other developing countries "average" fabric constructions for all three sectors of the weaving industry were determined. In this way the necessary yarn inputs (to meet the total production demand) can be calculated.

The quantities are (in tonnes):

	Handlooms 100% cotton	Decentr.sect. 100% cotton	Large-Scale mills cotton	spun bl.MMF	Cont.fil.MMF
1982/83	3549	2180	4296	1354	1655
1987/88	3821	2346	4626	2272	2778
1991/92	3967	2436	4802	3312	4047

Based on realistic import prices of Nep.Rpees 23.000/ton for cotton yarn (average count Ne22), Rs.36.000 for spun blended yarns (Ne36) and Rs 25.000/ton for MMF continuous filament yarns, the total cash expenditure for yarns is shown in column 1. Column 2 shows the total cash expenditure for raw materials in case a domestic spinning capacity will be established capable of producing 90% of the demand for cotton yarn and 70% for spun blended yarns. The cost of yarns still to be imported are included. The calculation is based on a raw cotton price of 63.5 $cts/lb cif Hetauda (= Rs 17.5/kg), 54$cts/lb for polyester fibre and 65$cts/lb for Rayon fibre.

	Column 1	Column 2
1977/78	Rs 262 million	Rs 223 million
1982/83	Rs 320 million	Rs 270 million
1987/88	Rs 400 million	Rs 334 million
1991/92	Rs 474 million	Rs 396 million

The spindleage required for these 90 resp. 70% selfsufficiency is:

1977/78 - 63552 spindles
1982/83 - 76340 ") including the Hetauda mill of 14700
1987/88 - 89294 ") spindles now nearing completion.
1991/92 - 101024 ")

No domestic industry for producing MMF continuous filament yarn is recommended, nor for the polyester and rayon components in the blended yarns, as such industries would have a minimum economic size which is far above even the envisaged domestic demand in 1991/92. Moreover these industries are very capital-intensive and actual world capacity far exceeds world demand.

2. Power

It appears that shortage of electric power until 1982 will be a major deterrent for the establishment of spinning and large-scale weaving.

The 76340 spinning spindles envisaged for 1982/83 will put a maximum load on the public supply network of around 5200 kw while for 1991/92 close to 7000 kw will be required. For spinning mills located in the tropical areas the load will be around 8 - 10% higher due to the necessity of air-conditioning.

To meet the power demand for the decentralized and large-scale weaving sectors the following maximum loads are envisaged:

1982/83 - 6700 kw.
1987/88 - 8400 kw.
1991/92 - 10000 kw.

Diesel-electric power generators have not been taken into consideration in view of the present plans to increase hydro-electric capacity as quickly as possible. Moreover, the capital intensity of Diesel power and the fuel cost would increase power costs with at least 35%. The power costs in spinning, at the present price of Rs 0.40/kwh are near 40% of the annual out-of-pocket expenses (incl. wages and salaries).

No attention could be given to all inputs for dyeing, printing and finishing industry.

d. Chapter 7 - Domestic Supply of cotton.

Long discussions took place with Mr.Uhlenbroek, the leader of the Cotton Development Project (FAO), who we visited in the Nepalgunj area.

Based on my own cotton-growing experiences in Tanzania and Indonesia the following summarized conclusions and recommendations are given:

To supply the 1982/83 requirements of the spinning industry, around 25600 HA would have to be cultivated, at the world average yield of 400 kg lint cotton per HA. With luck and a lot of energy about 10.000 HA can perhaps be planted around 1990. Around 3000 HA are available in the present project for short-term development. Hence it must be concluded that Nepal must rely on imports for a long time.

Cotton is a very "sophisticated" and sensitive crop. It requires a number of activities from the farmer with which he is as yet completely unfamiliar.

If 5000 HA can be brought under cultivation, about 4500 farmers have to be trained by Extension Officers! But if a good farmer is successful and obtains a feasible good yield of 700 kg of lint cotton/HA, he receives a net income of 8000 Rs/HA in addition to returns from secondary crops. At a bad yield of 150 kg of lint cotton per HA his income would be negative.

A very effective way to kill all interest of the farmer would be to let him bear the risk of the sometimes enormous fluctuations in the world market. A Government Lint and Seed Marketing Board should take over this risk (in addition to other relevant activities) and establish a price-stabilization fund.

In view of:

- the good quality of the cotton actually grown
- the labour-intensity of the crop and its educational value for other crops
- the net savings in foreign exchange of Rs 10.800/ton,

it is strongly recommended to give maximum support to the present project. The Hetauda mill alone will require 2300 tons in 1980. An agro-economist should prepare a comprehensive analysis of cotton growing versus other crops.

e. Chapter 8 - Handlooms.

This sector received some emphasis because of its high labour content, rural under-and unemployment, low investments and the non-existence of power supply problems.
At present about 10.25 million meters are produced on approx. 9700 looms, of which 1750 are outside the Kathmandu Valley.
It is predominantly a cottage (family) industry in rural areas; the Department of Cottage and Village Industry (DCVI) estimates that only around 200 looms are employed on a non-cottage basis.
Due to the spare-time-occupation and seasonal character the average annual output per loom is below 50% of the feasible full one-shift production ("rated" capacity of 2209 meters/annum).
because of its particular suitability for the Nepalese situation, it is proposed to aim at a 40% share for the handloom sector of the total production demand for woven cotton fabrics. This amounts to approx. 33.5 million meters in 1987 or an increase of approx. 23.5 million meters on the 1977/78 production of 10 million meters.
It is expected that these 33.5 m.m. of handloom fabrics are about the maximum the market can take in 1987/88.
To attain this target, around 15000 new handlooms have to be installed up to 1987/88 (producing at 60% of the "rated" capacity) in addition to six - 100 loom units of the semi-automated handloom. (This S.A. handloom is an ingenious Nepalese light, feet-driven construction of the normal power loom.

Benefits. Approximate cost calculations were made for 3 fabric constructions. The two-loom family unit, acting as an independent entrepreneur, would make a net income of Rs 3670 per annum in 180 working days of 2 adults and 3 adolescents = 900 "mandays".
Comparisons were made between the above handloom unit and a large-scale non-automated mechanical weaving mill.
For the same output the capital investment in the mechanized mill is 4.36 times higher than for the handloom unit.

The capital costs of the former plus its electric power consumption favour the family unit handloom system at around Rs 0.44/meter or 28% of the added value.
The labour employment for the same production in the large mill is 29 mandays (skilled and semi-skilled).
Hence the ratio in labour employment is 31 : 1 in favour of the handloom unit. As the capital investment ratio is 4.36 : 1, the labour employment to capital investment ratio is 135 : 1.

It was investigated whether factory-wise production of the same 3 fabrics both on semi-automated and on ordinary handlooms would be a recommendable proposition. Whereas the handloom family unit can make a net annual income of Rs 3670, the loss for the S.A. handloom mill would be Rs 1527 and for the ordinary handloom mill Rs 4098. Though, at first glance, the conclusion would be that both factory-wise production systems are not attractive, it should be taken into account that an alert private entrepreneur with an excellent knowledge of the market and a feeling for its trends, still could make attractive profits in the S.A. handloom mill by specializing on fabrics with a high profit margin. However, the labour employment per 1000 meter is only 84 mandays compared with 269 for the family unit (adults + adolescents).
Nevertheless it is proposed to allocate a portion of the market demand to the Semi-automated handloom mills in the programme of Development.
Location. The DCVI envisages to concentrate 2/3 of the number of handlooms in the Kathmandu Valley. The effect would be that, though 16.700 weavers (excl.adolescents) in the Valley would obtain gainful employment, the excess of production over consumption in the Valley would amount to 20.9 million meters which have to be "exported" to other parts of the country.
It is strongly recommended to re-appraise this problem, taking into account regional population density and purchasing power, future regional labour un- and underemployment prospects, population mentality, training impediments, etc.
Furthermore it is suggested for areas outside the Valley to concentrate the 2-loom family units in clusters of at least 100 looms near existing marketing centers, as otherwise the essential common facilities for yarn preparation, dyeing and printing would remain underdeveloped and the adaptability to local market preferences reduced.

Summarizing these aspects it is strongly recommended to the DCVI to draft a "Master Plan of Location".

Training. The proposed 15.000 new handlooms require the training of 15.000 weavers. Though undoubtedly a large percentage of these new weavers will receive "on the spot" training, training facilities provided by the DCVI will become essential. It appears that 4 or more permanent training centres, strategically located, should be established, to which mobile training units should be attached. It is obvious that a "Master Plan of Training" has to be drafted by the DCVI.

Technology. The existence of the Handicraft Promotion Centre within the DCVI is of considerable importance for the envisaged expansion of the handloom industry. It can provide technical assistance both in the designing of fabrics and more in particular in improvements in weaving equipment and techniques to enlarge the sales potentials by creating more complicated fabrics. It should also study the much more advanced handloom industry in India and Bangladesh.
Expansion of the staff of the Handicraft Promotion Centre must be envisaged.

Marketing. Within the proposed large expansion of the handloom industry in the form of family units, run by farmer-entrepreneurs, the marketing aspect becomes of crucial importance. At present no organization of the family-units exist, though the Sales Emporia Company of the DCVI is of some use as an additional outlet for the home industry. However, considerable upgrading of these Emporia is needed anyhow.

The handloom industry is presently dominated by the "master weaver" who determines the fabric to be made by the family unit, supplies the yarn and pays a minimum compensation for the work of the family.

The envisaged expansion of the number of family units will cause marketing problems. It must be expected that a large part of the new family-entrepreneurs will lack the necessary skill to cover the marketing aspects of his function.

It is obvious that an organizational set-up is required as otherwise the family unit system will remain the victim of master weavers and the anticipated social benefits of the family system will be foregone. Co-operative societies could provide the kind of services the family-entrepreneurs need, both in marketing and purchase of inputs.

However, the experiences with co-ops in many other developing countries are notoriously bad because the master weaver usually

finds ways and means to exert a dominant influence in the co-ops. Expert knowledge of the pro's and con's of co-ops is required to recommend a satisfactory solution - if any - to this essential. UNIDO may be able to provide the necessary advice.

Financing. To infuse confidence in the possibility of increasing family income and loosening the tight economic grip of the master weaver, the following services are necessary:

a. Cheap medium-term credits of up to Rs500/loom to the enterprise for purchasing raw materials and to provide finance for stocks to prevent stop-loss sales in seasons of slack demand. These credits should be made available at a lower interest rate than normal prime-rates of commercial banks; however, with a lien on yarn and fabrics.

b. Cheap loans for investments, say for up to 8 years and within limits of Rs 1000 - 1500/loom.

With regard to a. and b. it is conceivable that HMG would initiate a differential-interest-rate credit system through the state-owned banks to help the weaker sections of the rural community. This seems a safer system that the establishment of district co-operative societies which are easier to be dominated by master weavers. The regional DCVI offices should assist the enterprise in the registration formalities, calculations of costs and profitability, administration, etc.
This credit system would enable the enterprise to pay cash for his raw materials, hence without financial ties to his supplier. Moreover he would pay a lower price.
To reach the target of 25.000 looms in 1987/88, investment credits for 15.000 looms x say Rs 1250 = Rs 18.75 million have to be provided in addition to working-capital credits for 25.000 x 500 = Rs 12.5 million.

Recommendations. Considering the above location-, training-, technological-, marketing- and financing aspects, it is recommended to establish a separate division of the DCVI, devoted solely to the development of the home weaving industry. It appears justified to integrate the Sales Emporia Company into this division.

A one-year Unido assistance is suggested.

f. Chapter 9 - Decentralized Sector.

Characteristics of the Decentralized Sector.

The Decentralized Sector has its own share in the supply of fabrics to the domestic market. It produces mostly coloured-woven textiles in short runs with a large variety in design and fabric-type; it stays close to consumer demand.
The large integrated mills cannot compete in this field with the decentralized sector.

On the other hand the decentralized mills should not try to compete with integrated mills by poorly imitating their production methods and set-up.

Competition from the very flexible handloom weaving sector espacially in the more isolated markets can be expected although - in general - the decentralized sector should be able to produce at a higher quality standard.

The production units in this secto are - almost by definition - privately owned and a "one-man show". The owner wants to be independent and call his own shots.

He must have a sound and practical managerial know-how, with emphasis on marketing.

The equipment does not have to be of modern design; however it must be in good shape. Provided the essentiality of good maintenance is understood and applied, the machines should last at least for 20 years and a depreciation rate of 5% is justified.

Compared with the large-scale mills the capital intensity is low and the labour-intensity still high, though much lower than in the handloom sector.

Mechanical spinning, because of the economy of scale, is not compatible with the definition of the decentralized sector. The Indian system of very small units (150 spindles) has been superficially investigated and it is felt, perhaps prematurely, that the obtainable yarn quality is unsufficient fot the decentralized sector.

Location. Technically speaking the ideal location is in the Industrial Estates with their facilities for water, power, warehouses machine shops, etc., in addition to the - more remote - chances for the establishment of specialized common facilities like yarn dyeing, sizing, etc. in more concentrated areas of textile enterprises.

The expression "more remote chances" is used because the entrepreneur in this section is a highly individualistic personality and usually not inclined to co-operate very much with his collegues.

The 7 existing Industrial Estates are also very suitable from a marketing point of view. So will be the future one in Surkhet.

Size. In both developed and developing countries the size of the enterprises varies from 10 - 80 looms with or without its own fabric finishing facilities. Though the specific conditions for favouring this sector very considerably between countries, experience shows that 50 to 60 loom units have the best chance of profitability. The commercial ability to exploit markets is the dominant factor for success. It is assumed that the same factors apply in Nepal. An average of 56 looms per enterprise is taken as the basis.

Decentralized Sector. After taking into account the envisaged production increase of the existing capacity, the unsatisfied production demand for the decentralized sector is:

1977/78 - 11.79 million meters
1982/83 - 12.53 " "
1987/88 - 13.72 " "
1991/92 - 14.36 " "

Rated capacity for the average fabric construction: 12760 meter/loom per annum in two shifts (4350 hours), while for 1987/88 and onwards it is assumed that partial working in 3 shifts increases the production.

The following table exhibits the required number of looms and enterprises to meet the target.

	Unsatisfied prod. demand in mill. linear meters	Prod/loom in linear meters	Required nr. of looms	Number of enterprises *)
1977/78	11.79	12760	924	17
1982/83	12.53	12760	982	18
1987/88	13.72	13600	1008	18
1991/92	14.36	14250	1008	18

*): At an average size of around 56 looms per enterprise.

The total investment per unit of 56 looms will be around Rs.2.7 million and the required working capital Rs 1.- million.

It is expected that the growth of the decentralized sector will be rather slow in the beginning with only 4 new units installed up to 1981/82, 9 in the period 1981/82 - 1987/88 and 5 beyond 1987/88.

Employees: 158 per unit or 2212 for the 14 units envisaged to be in production in 1987.

A detailed production cost calculation is included (in the Report), showing that the "average" fabric construction of 140 grams/m^2 in 40" finished width with 50% dyed yarn and 18% bleached yarn will cost around Rs 5.40/m. Comparisons with actual fabric prices in the market show that the mill can be competitive, though the profit margins were mostly not too attractive for a private antrepreneur. It is, however, emphasized that such "average" calculations have only a limited value.

The ability, initiative and drive of the owner (who selects the profitable qualities at the right moment) are the crucial matters.

Lack of finance will probably be a most serious handicap and the Nepal Industrial Development Corporation should play the dominant role in financing the growth of this sector.

The I.S.C. should screen proposed projects.

g. Chapter 10 - Large-scale Mills.

1. Spinning.

The present irregular and unreliable supply of cotton yarns from India affects the production level of both the handloom and decentralized sector. For the envisaged growth of the industry it is essential to establish a spinning industry to assure a basic supply to the weaving industry.

- Hand-driven Spinning (AMBAR-CHARKA system).

A small installation (in bad shape) of this Indian system was inspected near Kathmandu and a strand of yarn was tested at the Dutch Fibre Institute in Holland.

Results were poor, but they can certainly not be considered as representative for the system.

Further information and investigation by the I.S.C. (or DCVI) is recommended. It appears to be suited for remote areas where cotton is grown and electric power not available.

- Power-driven Spinning.

The following table shows the spindleage required to attain a 90% self-sufficiency for the handloom and decentralized sector (average yarn count Ne 21).

	Yarn Demand (cotton only)	Production/ spindle year	Nr. of spindles for 90% self-suff.
1977/78	4769 tonnes	0.15 tonnes	28614
1982/83	5729 "	0.15 "	34374
1987/88	6167 "	0.15 "	37000
1991/92	6403 "	0.15 "	38418

For the large-scale mills (cotton only, average count Ne 24):

	Yarn Demand	Prod. spindle year	Nr. spindles for 90% self-suff.	In operation (Hetauda)
1977/78	3577 tonnes	0.12825 t.	25102	nil
1982/83	4296 "	" "	30148	14688
1987/88	4626 "	" "	32464	14688
1991/92	4802 "	" "	33698	14683

In the same manner the spindleage for blended spun yarns is calculated (Ne 36, production/spindle year 80,2 kg and 70% self-sufficiency).

The summary reads as follows:

	COTTON YARNS		BLENDED SPUN YARNS	Total	GRAND TOTAL
	Handloom+ Decent.sec.	Large-scale Mills	Large-scale mills	Large-scale mills	
1977/8	28614	25102	9836	34938	63552
1982/3	34374	30148 *)	11818	41966	76340
1987/8	37000	32464	19830	52294	89294
1991/2	38418	33698	28908	62606	101024

*): Incl. the Hetauda Spinning Section.

It is clear that there is ample room for a few spinning mills. Deducting the 14688 spindles now being installed at Hetauda (supplying its own looms) 50.000 cotton spinning spindles are already required in 1982/83 (when sufficient electric power will be available). It is therefore recommended to initiate plans for a mill of at least 25.000 spindles.

The mill, which qua size is about optimal, should be build in the Kathmandu Valley to provide a basic yarn supply to all three weaving sectors already represented in the Valley.

Another step in the right direction would be a 50% extension (=7400 spindles) of the spinning section of the Hetauda Mill.

- Feasibility Study.

A very detailed feasibility study for a fairly flexible cotton spinning mill of 25200 spinning spindles and 3840 doubling spindles incl. winding equipment was prepared. Its annual production is 3000 tonnes of Ne 24 with a range from Ne 10 to Ne 40, to cope with the requirements of the three weaving sectors. Around 600 tonnes of Ne40 will be doubled to partially satisfy a basic demand for Ne 40/2 for the handloom industry.

The envisaged spinning equipment is of Swiss (Rieter) design. In value about 47% of the production machinery will be imported from Switzerland, while the remaining 53% can be purchased from India, based on licenses from well-known European textile machinery.

The total investment costs are:

Machinery, sundry plant and equipment	NRs.	70 million
Expatriate costs for erection		1 "
Buildings		26 "
Total	NRs.	97 "
4% for contingencies		4 "
	Rs.	101 "
10% for design, consultancy and supervision		11 "
Total	NRs.	112 million

Local assistance during erection is included.
Cost of land: P.M.

The necessary working capital is estimated at NRs 34 million. Hence total capital required: 146 million NRs.

It is emphasized that pre-operational expenses are not fully - and initial losses not at all - covered in the above calculations. According to experiences in other developing countries in a similar initial stage of industrialization, it is financially sound to have access to an additional 15 - 20% to cover these intangible costs and to avoid deadlocks.
Hence access to financial resources of about 170 million Rupees would be very desirable.
Power: The average load will be 1660 kw with peaks of 2000 kw; annual consumption 10.65 million kwh; power costs at Rs 0.40/kwh are Rs 4.26 million.
Personnel: Based on 100% Nepalese labour and staff 374 persons will be employed (for three shifts) with an annual salary bill of Rs 2.2 million (representing only 52% of the power costs!).
For the first 2 years the cost of essential overseas expatriate personnel (12 persons) are estimated at NRs 3 million, while for the next two years this personnel can be reduced to 6 persons at an annual cost of NRs 1.8 million.
Perhaps good shift supervisors and maintenance engineers can be obtained from India at reduced costs.
Including depreciation, but without interest on capital employed the cost price of Ne 24 will be Rs 5.6 per kg after departure of expatriates. 8% Interest on capital will increase the cost price with Rs 2.30 to a total of Rs 7.9.
The expatriate costs for the first two years will be another Rs 1.- per kg and for the second two years Rs 0.6/kg. The raw material costs in November 1977 are Rs 19/kg (incl. waste in spinning).
The resulting cost prices are (including interest):

	First 2 years	Second 2 years	Afterwards
Production costs	8.9 Rs/Kg	8.5 Rs/Kg	7.9 Rs/Kg
Cotton costs	19.- "	19.- "	19.- "
Total	27.9 Rs/Kg	27.5 Rs/Kg	26.9 Rs/Kg

Prices of imported yarn from India are about Rs 24, while Pakistan quotes at around Rs 26/kg (in a very depressed textile economy).
The outcome is that the expatriate costs and the interest on capital prevent profitability, while the power costs are also detrimental.

(It appears reasonable that the new and huge hydro-electric plants now under construction will reduce power costs with at least 35%.)
However, it is also clear that the raw material costs are all-important. The cottons used in the Indian and Pakistan yarns are of lower price and quality and the yarn from the Nepal mill would be of superior quality, resulting in good efficiency in weaving and better fabric appearance. The Indian and Pakistan raw cotton qualities are usually not available for export.
A further specialization (narrower range of yarn counts) would reduce the spinning and raw material costs.
The detailed feasibility study gives further information.

It is recommended that the I.S.C. should proceed with implementation plans for spinning mills in collaboration with a good consultant.

The latter should, preferably, be connected with a large overseas textile manufacturing group.

Location of Spinning Mills.
As close as possible to yarn consumers; however, the tropical area is less favourable to spinning due to the high power costs of air-conditioning.

2. W E A V I N G

The unsatisfied production demand is in million meters:

	Cotton	MMF
1982/83	11.83	16.57
1987/88	14.22	30.65
1991/92	15.50	46.57

Type and width of looms. Although narrow-width fabrics (up to 36" finished width) still dominate in the Nepalese market - because of backwardness of many Indian mills - it must be expected that in line with world trends wider fabrics will penetrate. These wider width are cheaper to produce in weaving, dyeing and finishing, and reduce cost in garment-making.
Any new installation should be able to produce fabrics with a finished width of 48", for which a loom width (reed space) of 56" is the absolute minimum. It is also recommended to install about 25% of the looms in 70" reed space, enabling the manufacture of 59" (150cm) finished fabrics.

For Nepalese conditions the simple non-automatic loom with warp-stop motions and a good let-off motion is recommended. They are build in

India at a cost of Nrs. 20.000 and run at 160 picks per minute. So does the Japanese Toyoda automatic loom, but it costs NRs 85.000, whereas a sophisticated Swiss or Belgian automatic loom runs at 220 p.p.m.; its costs, however, are NRs. 187.000.
A weaver can attend to 4 non-automatic looms (at 80% efficiency), whereas on automatic he can take 24 looms (at 90% efficiency). On this basis, Nepalese wages and including 5% depreciation and 4% interest, the production cost comparison is for one meter fabric: Indian loom 100%, Toyoda 200% and the European 300%.

In a well-run mill an automatic loom produces less weaving faults. However, considering that the present fabric imports from India must, objectively, be graded as second choice and often worse, the fabric appearance aspect is not of prime importance. A well-run non-automatic mill can easily beat the Indians in this respect.

Capacity to satisfy the production demand (cotton).
The annual production for a non-automatic loom in average width and on the average fabric construction (52 picks/") will be 25055 meters. To produce the unsatisfied production demand the following number of looms are required for cotton fabrics:

	Prod. Demand	Prod/loom	Number of looms
1982/83	11.83 million m.	25055 m.	472
1987/88	14.22 " "	25055 m.	568
1991/92	15.50 " "	25055 m.	618

This is quite an efficient and manageable size for one single mill in a developing country. However - though it was assumed in chapter 5 that 70% of the market demand should (and could technically and economically) be produced- it would imply that this one mill would have to produce a wide range of grey fabric qualities and yarn counts. This implication would put a high strain on management and efficiency. It is therefore proposed to apply a 25% reduction and hence the number of looms would become:

1982/3 : 360, with a total equipment investment/loom of Rs 87.200 = Rs. 31.4 mill.

1987/8 : 420, with a total equipment investment/loom of Rs 85.000 = Rs. 35.7 "

1991/2 : 460, with a total equipment investment/loom of Rs 82.600 = Rs. 38.- "

A very detailed feasibility study is presented in the Report for both the 1982/83 and 1991/92 situation. Its highlights are:

	1982/3	1991/2
Investment in fixed assets	Nrs.31.4 mill.	38.- mill.
(or: investment per loom	Nrs.87.200	82.600)
working capital	Nrs.10.6 mill.	13.3 mill.
Total capital required	Nrs.42 mill.	51.3 mill.
Total personnel	444	528

Production cost per meter including depreciation and interest:

140 cm loom	Nrs. 1.30/m	1.09/m
175 cm loom	Nrs. 1.41/m	1.19/m

Production cost per 100.000 picks:

140 cm loom	Nrs. 63.90	53.20
175 cm loom	Nrs. 68.90	58.10

These costs per 100.000 are (to a large extent) irrespective of the picks per inch in a fabric. It is the normal parameter used in weaving cost calculations. If the yarn count and quantity in weight and yarn costs are known in addition to the picks per inch, the costprice calculation of any fabric is a very simple matter.

Based on a yarn price of Rs 24/kg for our "average" fabric in 45" (115 cm) grey width and a yarn consumption of 136.8 gram/meter, the cost price is in 1982/83:

yarn costs/meter	Rs. 3.28
production costs	1.30
	Rs 4.58
+ retail costs 10%	.46

NRs. 5.04, which is fully in line with similar grey fabrics found in the Kathmandu market.

Comparison with Hongkong.

In October 1977 the price of perhaps the world's largest-selling grey cloth construction of 60/60 - 20/20 (60 ends and picks/" with Ne 20 in warp and weft) was quoted fob Hongkong at 37 $cts/m in 36" width = NRs. 4.63.

For production in Nepal, based on the National Trading Limited import price of Chinese yarn of Nrs. 22.37, the costprice would be (also for 36" grey width): NRs. 4.70 in 1982 and NRs. 4.45 in 1991.

Conclusion: It can be concluded that a weaving mill of the described size is economically justified and can be beneficial to the country, especially in the 1991/92 size.

MMF Weaving Mills.

The unsatisfied production demand for this sector is broken down as follows (in million meters):

	Total	Blends	Continuous Filament
1982/83	16.57	7.46	9.11
1987/88	30.65	13.79	16.86
1991/92	46.57	20.95	25.61

The required fabric appearance level of MMF fabrics is much higher than for simple cotton fabrics. Moreover - though MMF yarns give a good weaving performance - they are much more sensitive to stress and uncontrolled conditions. As a consequence a better-engineered loom is essential. That means automatic looms.

Though the width of fabrics in this sector also varies considerably, the average width is definitely wider than for cotton. Hence, for calculation purposes, a loom of 160 cm reed space was selected. At a speed of 180 p.p.m., an efficiency of at least 85% and 65 picks per inch, the annual production per loom will be 23.000 meters. Hence the number of looms is:

	blended	cont.film.	total
1982/83	324	396	720
1987/88	600	733	1333
1991/92	910	1113	2023

The warp preparation equipment and to a lesser extent the loom specification differs between blended and continuous filament fabrics. This implies that the physical production has to take place in separate sections, but it can very well be under one management.

The total investment per loom including pre- and post weaving equipment for loom-state MMF fabrics can be very roughly estimated at Rs 180.000/loom (based on the Swiss Rüti loom now build under license in India). A much more detailed market survey is necessary to determine the percentage production of yarn-dyed fabrics, which may considerably increase the average investment/loom.

Investment: up to 1982/83: 720 looms x Rs 180.000 = Rs 130 million
" " 1987/88: 1333 " " " = Rs 240 million
" " 1991/92: 2023 " " " = Rs 364 million

There is nothing mysterious in this rapid growth. It would even be bigger if foreign exchange would be freely available at the normal rate of exchange and duty levels equal to those on cotton fabrics. The present situation is rather peculiar because India has done its utmost to favour cotton fabrics and has artificially screwed up the price of MMF materials. If MMF were unbiased in India the jump to MMFwould be even higher as world market prices for the dominant polyester are presently much below ($cts 54 against $cts 62 for cotton), its manufacturing performance better and its waste lower.

Though MMF clothing is much more uncomfortable to wear in a hot humid climate, the consumers, even in propical climats show a marked preference for MMF (blended) fabrics because of a better appearance, easy-washing and better wearing performance. In Nepal the same tendency was noted, in spite of the artificially high price of MMF fabrics.

Any long-term policy neglecting these aspects is a dangerous one.

Integrated approach for spinning and weaving

Integration between spinning and weaving reduces costs of top management and general services. Unnecessary processing of yarn can be avoided and weaving performance will be better. The raw cotton quality can be better geared to weaving requirements. Hence the one large-scale cotton weaving mill proposed (average 420 looms) should be integrated with spinning. Its annual yarn consumption could be produced by about 12.000 spindles. However, a spinning section of 15.000 spindles is recommended for better economy.

Summary for the proposed spinning capacity for cotton.

- one mill of around 25.000 spindles serving the handloom and decentralized sector (in KTM Valley);
- one integrated spinning-weaving mill of around 15.000 spindles, of which 3000 spindles could serve the handlooms and decentralized sector (in KTM Valley);
- an extension of about 50% (=7000 spindles) of the Hetauda spinning section, serving also the handlooms and decentralized sector, but mainly the Biratnagar large-scale weaving mill. Thus in total around 47.000 new spindles should be installed. Together with the existing 14.700 Hetauda spindles, the total cotton spindleage would be around 62.000 spindles, which is close to the calculated requirements for cotton yarns.

For MMF blended yarns the same arguments pro integration can be raised. However, the strong demand for these yarns is expected beyond 1982/83. The required spindleage to cope with the 1982/83 demand is only 11818 and below economic size; moreover yarn must be supplied to several companies near Biratnagar. So integration up to 1982/83 is not feasible.

It is of little use to propose plans in this respect beyond 1982; the extensions of the MMF mills in Biratnagar should be closely watched.

3. Dyeing, Printing and Finishing sector (called finishing sector).
No time was available for this section, nor do I feel myself technically fully qualified for it. However a few remarks are made.
For small runs, as produced by the handloom and decentralized sectors the dyeing, printing and finishing can be done by simple means.
In concentrated areas of the small-scale weaving mills the establishment of one larger and more mechanized finishing plant can be appropriate. In Indonesia, where in several areas more than 20 million meters is produced, sometimes by over a hundred small-scale weavers, the Government has established a commission-finishing plant in each area.
For the large-scale sector (both in cotton and MMF) a large-scale finishing plant is essential for the required satisfactory fabric appearance at a competitive cost level. Its minimum size is between 18 and 25 million meters per annum.
For a proper appraisal of the sector it is recommended to request the services of a specialist, who could do the job in Nepal in around two months, followed by another month for report writing. Because of necessary data collection from suppliers the report can probably be finalized in around 4 - 5 months after arrival in Nepal.

4. Technology and foreign collaboration for the large-scale mills.
It is enevitable that foreign collaboration must be sought for implementation of the large-scale sector potentials.
Good consultants can do the job, but preference should be given to collaboration with large, well-known textile firms in the form of implementation fees and management contracts.
Due to the severe financial losses of the whole European textile industry their share participation - in itself very desirable - seems unlikely, unless in the form of used machinery. This could be a good proposition, provided independent consultants check the machines for suitability and technical condition.
Large textile firms in the Far East and more in particular Hongkong-based companies may be willing to collaborate.

h. Chapter 11 - Locations and Chapter 12 - Man Power Requirements.
These short chapters in the main report speak for themselves.
The total man power requirements (incl. the Hetauda mill) for the production demand in 1987/88 will be 22288.
An interesting picture of the labour intensity of the three weaving sections is summarized herewith:

Direct labour per million meters in 1987/88:

Handlooms : 696
Decentralized : 194
Large-scale cotton: 50
Large-scale MMF : 43

N.B. Chapter 13 - Economic Analysis is in the hands of the I.S.C.

i. Chapter 14 - Organization and chapter 15- Government Policy.

The characteristics of a textile industry in Nepal are:

- as long as no sizeable cotton crop is harvested, it is not a resource-based industry;
- as shown, the rate of return to capital and labour varies considerably;
- the comparative advantages of Nepal are cheap labour if used efficiently and in a later phase cheap hydro-electric power. They are the main factors of the domestic added value, which should be lower than if imported. In other words an investment project should be accepted if the domestic resources it uses per US$ of value added at world prices are below the real exchange rate. In such a case the social benefit in terms of foreign exchange saved is greater than the opportunity costs foregone. The value the Government wants to affix to the social benefit is a political question on which the questions of protection, incentive and facilities through import duties hinge and as such beyond the scope of this assignment.

If the Government decides to actively promote the textile industry, it is essential to establish an overall governmental body (Textile Board), directly responsible to the Minister of Industry.
Its function is to coordinate all aspects of promotion, development and financing of the industry. It should scrutinize the projects proposed by private investors and advise the Minister on the desiderata and conditions of implementation of such projects. In case of projects which the Government intends to establish or to participate in, the Board should advise on the appointment of the essential Textile Consultants for design, engineering and management of the project.
The manning of the Secretariat of the Board is crucial.
Its head should be a Nepalese Textile Economist, who has gained some know-how and insight in the important aspects of the industry. In all probability such qualifications cannot yet be found in Nepal and it is recommended to apply for a one-year Unido overseas fellowship

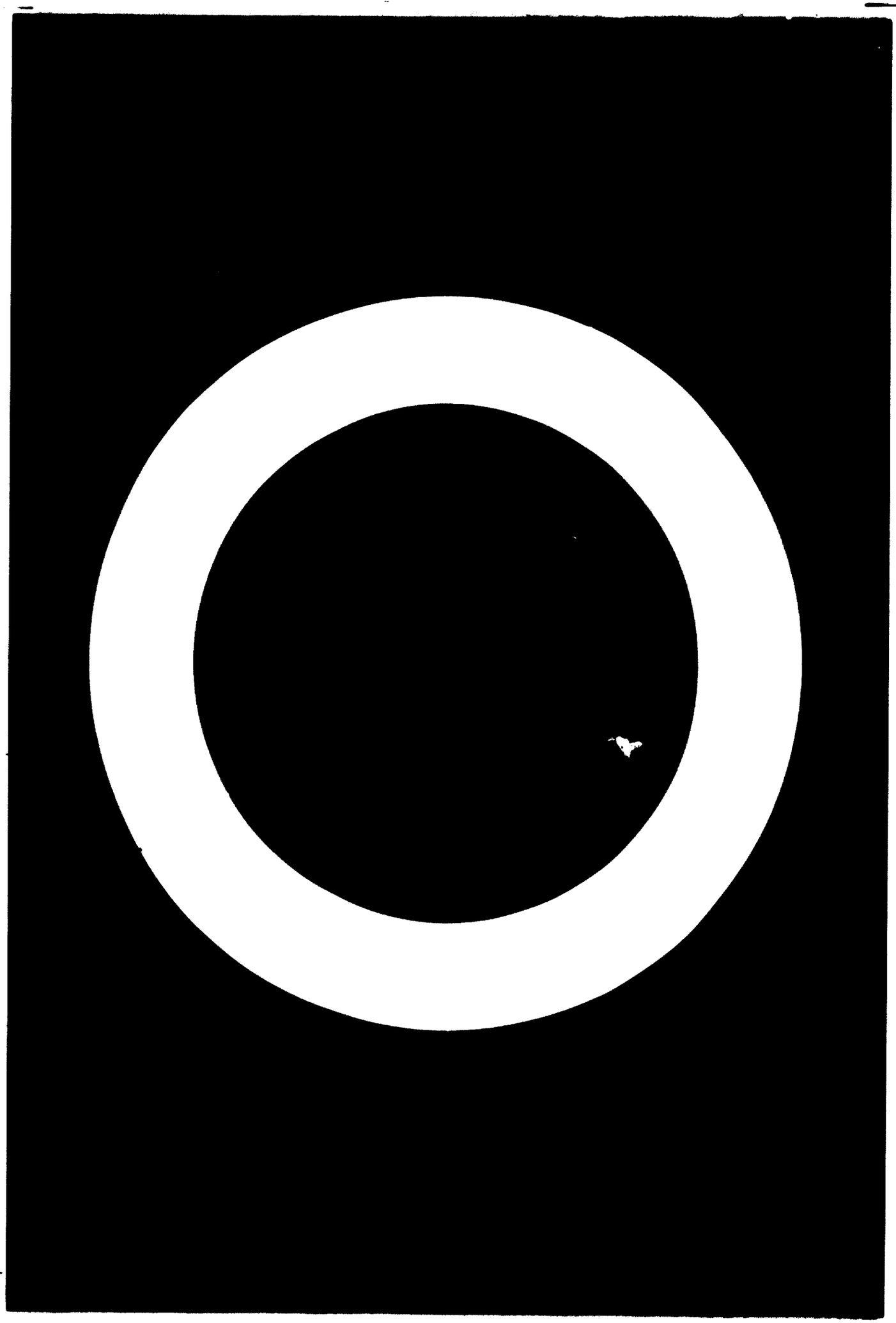
for a suitable candidate. The countries to be visited are India, Hongkong and England and short visits to machinery makers in West-Germany and Switzerland.

g. Chapter 16 - Investment Programme for a Model Plant.

Model plants are included in Chapter 10.

Counterparts.

During the full time in Nepal Mr.R.M.Shrestha, senior economist at the I.S.C. was attached to the expert, while Mr.Lal Shrestha, textile technologist at the DCVI assisted during a few weeks.



Annex I

DETAILED REPORT ON CHAPTER 5 OF I.S.C. STUDY - PRODUCTION DEMAND

A. Product Mix.

The domestic production of all sectors combined is estimated to be 16.77 million meters of apparel textiles in 1976/77 which is expected to meet about 12.68% of the consumption demand. The sectoral breakdown is as follows:

Handloom sector	10.25	million meters
Decentralized sector	0.82	" "
Mills	5.70	" "

The rest of the consumption demand is met by import supplies. The estimated supply and unfulfilled demand for the years till 1991/92 are given in the table 5.1. The textile mills under construction at Hetaura with rated capacity of 11 million meters per year is expected to supply 50% of the capacity in the first year of operation (1978/79), 75% in the second year and 100% in the third year.

TABLE 5-1.

Years	Handloom sector	Decentr. sector	Mills	Total Est. production	Unfulfilled Demand
1976/77	10.25	0.817	5.7	16.763	115.507
1977/78	10.25	1.17	8.26	19.68	117.49
1978/79	10.25	1.55	15.2	27	115.27
1979/80	10.25	1.94	18.9	31.09	116.47
1980/81	10.25	2.71	22.5	35.46	117.60
1981/82	10.25	3.04	23.5	36.79	121.97
1982/83	10.25	3.40	23.5	37.15	127.56
1987/88	10.25	3.40	23.5	37.15	161.04

No national plan of production should aim at a 100% self-sufficiency. The range of fabrics found in the markets all over the country is so diversified that production of this full range would imply huge investments and the major part of the equipment would run far below its break-even costs. Very high import duties or heavy Government subsidies combined with complete state-control of all textile imports would require to achieve 100% self-sufficiency.

Moreover, the very diversified technological and managerial know-how required would also be a prohibitive factor.

In industrialized countries even the largest companies do not try to cover the full market range. In the USA Burlington Mills - the largest textile company in the world,- has 84 mills (big ones and

small ones), each of them specialized on those selected specified sectors of the market which promise them the most favourable return on investment.

Large-scale mills - even when the selected technology takes into account the low labour cost in Nepal -are nevertheless capital. intensive and not labour intensive.
Large-scale mills differ in almost every aspect from small-scale industries and handlooms as illustrated below:

	Large	Small/handlooms
Management	Not in one hand, decisions take time	In one hand, decisions can be made quickly
Equipment	Not flexible, appropriate for long production-runs, advanced technology, airconditioned buildings	Flexible, simple non-automatic machinery, easy to maintain, cheap buildings, no air-conditioning
Change or discontinuation of production	Costly in time and money, incurring losses on capital	Decrease in income may result but not loss on capital
Production-runs	Large, uni-colour, no variety in design or cloth-types	Short, multi-coloured, large variety in design and cloth-types
Selling Price	Depending mainly on world-market prices	Depending on balance of local supply and demand
Profit	Depends on efficiency and high productivity, because of capital-intensity of production apparatus	Depends on initiative, inventiveness and ability to change production to local consumer demand.

From the above it can be concluded that each type of industry has its onw position in the textile market with its own possibilities and its own risks.
Under the specific conditions now prevailing in Nepal, such as large underemployment in rural areas, scarcity of capital, difficult infrastructure, the promotion of handlooms and small-scale industries is of particular importance.

Considering all factors it is assumed that 70% of the total market demand should be satisfied by domestic production and the remaining 30% by imports. If based on large-scale mills only, this percentage of 70% would have to be reduced to 60% or 65% (at the maximum) with a considerable decrease in total labour employment.

Within this context the production demand for cotton, man-made fibres and woollen/others is computed in table 5-2 on the basis of a 75% share for cotton, 20% for MMF and 5% for woollen/others.
Moreover the total market demand is reduced with 10% for knitted/hosiery fabrics which are outside the context of this Plan.
It is assumed that beyond 1983/4 the production demand for cotton remains constant until a share of 35% for MMF has been reached, after which the share for each category remains constant at resp. 60%, 35% and 5%.

Table 5-2 (after deduction of 10% for knitted/hosiery) in million meters.

Years	Market demand woven fabrics	30% import provision	Production Demand		
			Cotton	MMF	Woollen/others
1977/78	123.45	37.04	64.81	17.28	4.32
1978/79	128.04	38.41	67.22	17.93	4.48
1979/80	132.80	39.84	69.72	18.59	4.65
1980/81	137.75	41.33	72.32	19.28	4.82
1981/82	142.88	42.86	75.02	20.00	5.00
1982/83	148.24	44.47	77.83	20.75	5.19
1987/88	178.37	53.51	83.79	34.83	6.24
1991/92	207.17	62.15	87.01	50.75	7.25

To stay within the context of this report the market demand as given in the above table 5-2 should be reduced with 5% for woollen/others, resulting in 117.27 million meters for 1977/78 and for 1982/83 in 140.83 m.m.

Based on information obtained from importers, retailers and market observations the impression is that the market demand for 1977 and 1982 can be subdivided as follows:

Table 5-3.

1977/78		1982/83	
gray	- 25% = 29.32 mill.meters	20% = 28.17 m.m.	(100% cotton)
bleached	-10%= 11.73 " "	10% = 14.08 m.m.	(100% cotton)
yarn dyed	-15%= 17.59 " "	15% = 21.12 m.m.	(100% cotton)
printed	-20%= 23.45 " "	25% = 35.21 m.m.	(80% cotton)
dyed	-30%= 35.18 " "	30% = 42.25 m.m.,	(80% cotton)
TOTAL	117.27 mill.meters	140.83 m.m.	

Of the three established sectors, handlooms will concentrate on only cotton textiles, while the decentralized sector can absorb some MMF.

What percent of production demand should be allocated to handlooms, decentralized and mills production is a question that deserves serious consideration. Since weaving can be economically decentralized, and handlooms are a more labour intensive industry, a greater share shoudl go to handlooms and decentralized sectors within the limits of their ability to produce the fabric that the market demands.

Moreover the decentralized sector can meet the local requirement more effectively than the mills. However, because of limiting factors such as lack of processing facilities, and low operating efficiency, it can be argued that mill production should share a greater part of production demand. The allocation of total cotton textiles production demand to handlooms, decentralized sector and mills therefore requires a careful planning.

SECTORAL ALLOCATION

Definitions

1. Rated capacity for mechanized mills denotes the physical output that can be achieved per year for the installed unit of production in three shifts assuming that production is not constrained by outside

factors like shortage of inputs or market conditions.

2. A. A spinning mill must have at least 6000 power-driven spinning spindles.

   B. Large-scale weaving mills are defined by a rated capacity of at least 2½ million square meters per annum and a capital utilization of at least Rs 5 million, with the understanding that the mill is not dependent on outside production facilities for its major operations.

   In this context a large-scale weaving mill must have its own winding, warping, sizing, pirning and weaving equipment. It may or may not have its own bleaching, dyeing or printing capacity.

   C. A large-scale finishing mill must have a rated capacity of at least 5 million square meters for bleaching or dyeing or printing.

3. Any power-driven unit below the above capacities falls into the "decentralized Sector".

4. Handlooms. The rated capacity of a handloom is 2200 meters based on 290 days/annum and 7½ hours per day. Wherever handlooms are used as an additional source of income the actual production is much below this rated capacity (Chapter 8).

In view of the advantages for Nepal for handloom production, as outlined in Chapter 8. this sector has been allotted 40% of the production demand for woven cotton fabrics, while the decentralized sector (including mills with S.A. handlooms) absorbs a 20% share. The remaining 40% goes to the mechanized (mill)sector, which will also have to meet the entire production demand for MMF.

Additional capacity is required for producing the unsatisfied production demand, which was computed on the basis of the proposed production programme minus existing production and estimated future production of equipment already committed on the basis of tables ... and 5.1.

The outcome of this computation is depicted in table 5.3.

TABLE 5.4 (in million meters).

Proposed production programme and unsatisfied production demand.

Years	Handloom sector	Decentr. sector	Mills cotton	Mills MMF	Unsatisfied production demand Handloom	Decentr.	Mills cotton	Mills MMF
1977/78	25.92	12.96	25.92	17.28	15.67	11.79	19.52	15.42
1978/79	26.89	13.44	26.89	17.93	16.64	11.89	14.49	15.14
1979/80	27.89	13.94	27.89	18.59	17.64	12.00	12.24	15.34
1980/81	28.93	14.46	28.93	19.28	18.68	11.75	10.13	15.56
1981/82	30.00	15.00	30.00	20.00	19.75	11.96	10.70	15.82
1982/83	31.13	15.57	31.13	20.75	20.88	12.53	11.83	16.57
1987/88	33.52	16.76	33.52	34.83	23.27	13.72	14.22	30.65
1991/92	34.80	17.40	34.80	50.75	24.55	14.36	15.50	46.57

In 1977/78 the unsatisfied production demand amounts to 62 million meters of woven fabrics, decreasing to 56 million meters in 1980/81, mainly because the Hetaura mill should then be in full production. In 1987/88 the production demand has risen again to 82 million meters and in 1991/92 to 100 million meters.

Based on the above sectoral allocation the combined production of the handlooms and the decentralized sector is programmed at 46.70 million meters in 1982/83, which would take care of:

Table 5-5.

100% of the market demand for cotton yarn dyed fabrics	= 21.12 m.m.(table 5-3)
20% of the market demand for gray goods	= 5.63 m.m.
10% of the printed section (all in cotton)	= 3.53 m.m.
38% of the dyed section (all in cotton)	= 16.05 m.m.

This is close to, if not above, the maximum that the market can absorb in the specific qualities levels produced by these sectors.

However, it remains to be seen whether the handloom sector can increase its 1977/78 production of 10.25 m.m. to the targeted quantity of 31.13 m.m. in 1982/83. It would require the installation of 14466 looms in a 5 years period (Chapter 8, page 70 , in addition to an increase in the per loom production from 1056 to 1325 meters.

With regard to the decentralized sector (Chapter 9) a programme of implementation has been adopted which takes a slow start. In the period 1977/78 to 1982/83 the installation of only 336 new looms is envisaged, with a backlog of 646 looms. On that basis the total production of the decentralized sector will only be:

new looms	4.26 m.m.
77/78 looms around	3.-- m.m.
	7.26 m.m.

With a guesstimated production of 20.74 m.m. for the handloom sector th actual production could be at around 28 m.m. and it appears that the anxiety for over-production in certain fabric categories as expressed in the above table 5-5, is not justified.

A similar projection was made for 1987/88 when it can be assumed that the combined production of handlooms and D.S. will be around 45 m.m. However, the subdivision into the various fabric categories at that time is a question of pure guesstimating and it appears that serious worries for over-production for the two combined sectors is not justified.

The high share (40%) for handloom in the total production demand was deliberately chosen because of large labour employment in the rural areas, very low investment costs and the relatively favourable competitive position price-wise and (hopefully) quality-wise in the future.

Only time can show whether the assumptions and guesstimates were more or less correct. Nevertheless a close watch of developments is certainly essential. (Reference is made to Chapter 14).

Annex II

DETAILED REPORT ON CHAPTER 6 OF I.S.C. STUDY - INPUTS

A. and B. - Raw materials.

In Table 6-A-3 of the appendix the necessary inputs of yarn are given, whereas in Table 6-A-4 the same quantities of yarn are reduced into raw fibre, based on a national self-sufficiency for cotton yarns of 90% and 70 for blended spun yarns.

Assuming in first instance that no spinning industry will be established and also based on the actual average count Ne 22 for cotton yarns and Ne 36 for the blended yarns, the annual expenditure for the yarn quantities of Table 6-A-3 is:

Table 6-1.

	Cotton yarn at Rs.23.6 0/ton	Blended yarns at Rs.36.000/ton	Continuous at Rs.25.000/ton	Total
1977/8	8346ton=Rs.192mill.	1127ton=Rs.36 m.	1378ton=34.5m.	Rs.262.5 mill.
1982/3	10025ton=Rs.230 "	1354ton=Rs.49 m.	1655ton=41.3m.	Rs.320.3 "
1987/8	10795ton=Rs.248 "	2272ton=Rs.82 m.	2778ton=69.5m.	Rs.400.- "
1991/2	11029ton=Rs.254 "	3312ton=Rs.119m.	4047ton=101 m.	Rs.474.- "

In Table 6-2 it is assumed that a spinning industry is already established. Its raw material consumption is given in table 6-A-4 of the appendix under the assumption that this spinning industry supplies 90% of the demand for cotton yarns and 70% for blended spun yarns. The MMF Filament yarns continue to be imported, as the quantity is far too small ever to consider a domestic spinning plant in the face of a large over-capacity in the world.

To translate the quantities of Table 6-A-4 into money values is a most hazardous exercise, especially for cotton. The so-called Liverpool index (see chapter 7-Cotton Development Project) varied as follows:

Febr.1974 - 88.80 $cts/lb. June 1977 - 72.- $cts/lb

Febr.1975 - 46.30 " " Oct.4, " - 59.20 " "

July 1976 - 83.90 " " Jan.13,78 - 63.75 " "

In Chapter 7 it has been assumed with all possible reserves that there is a reasonable chance that the cif Betauda cotton price will not fall much below 63.5 $cts/lb = Rs.17.5/kg for any important length of time. The present very low price for polyester cif Betauda is around 54 cts/lb (ex Taiwan), while the rayon fibre price is actually around 65 cts/lb ex USA cif Betauda. The cotton used for blended yarn is Rs. 13.-.

On the above bases Table 6-2 reads:

	Cotton Cardedx Rs.17500/ton	Cotton for blends x Rs.15000/ton	Total Cotton	Rayon fibre Rs.17575/t.	Pol.Fibre Rs14350/t.	TOTAL
77/8	8336tons= Rs146mill.	240tons = Rs.4.3mill.	8578t= Rs150m.	90tons= 1.6mill.	526tons= 7.8mill.	159 mill.
82/3	10015t.= Rs175m.	288tons= Rs.5mill.	10303= Rs180m.	108t.= 1.93mill.	634tons= 9.41m.	191 mill.
87/8	10782t.= Rs189m.	483tons= Rs.8.7m.	11265t= Rs196m.	196tons= 3.5 mill.	1065t.= 15.5 m.	215 mill.
91/2	11013t.= Rs193m.	705tons= 12.7mill.	11723t= Rs206m.	286tons= 5.1 mill.	1552t.= 23 mill.	234 mill.

To get an idea about the savings in expenditure for raw materials through spinning, it is interesting to compare table 6-1 and 6-2. The latter must be adjusted for the yarns still to be imported (10% of table 6-1 for cotton yarns and 30% for blended yarns, 100% for Filament yarns). After these adjustments the comparison is given in Table 6-3.

	Table 6-1.	Table 6-2.
1977/78	262.5	159+19.2+10.8+34.5 = 223.5 million.
1982/83	320.3	191+23 +14.7+41.3 = 270 million.
1987/88	400.-	215 24.8+24.6+69.5 = 334 million.
1991/92	474.-	234+25.4+35.7+101 = 396 million.

The revenue for the sale of spinning waste is neglected, although about half of the 30% waste generated in spinning of the cotton component of polyester-cotton blended yarns, can be re-used for coarse carded yarns. For 1987/88 the raw material input for carded yarn would thus be reduced with around 57 tons x Rs.17500 = Rs.1 million.

C. Utilities.

C-1 = Power.

C-1-1-Spinning. In Table 10-5 of Chapter 10 the total number of spindles is:

1982/83 : 76340 with an average count of Ne 26

1987/88 : 89294 " " " " " Ne 25.7

1991/92 :101024 " " " " " Ne 26.5.

An average count of Ne 26 for the full period is assumed. The installed power capacity per 1000 spindles is (based on figures supplied by Rieter):

Spinning only	:	60 kw/1000 spindles
Air-cond(RTM V.)	:	9 kw (15%)
Lighting		3.6 kw (6%)
Miscellaneous	:	2.4 kw (4%)
		75 kw (100%) + 6% for doubling and winding.

Thus the installed capacity has to be:

1982/83 : 76.340 x 79.5 kw = 6070 kw.

1987/88 : 89.294 x 79.5 kw = 7100 kw.

1991/92 : 101.024 x 79.5 kw = 8031 kw.

The normal average load is around 70-72% of installed capacity, with incidental peaks of max 85% of capacity.

At a peak load of max. 85% of the installed capacity the expected maximum load on the public supply network will be:

Table 6-4.

1982/83 : 0.85 x 6070 = 5160 kw.
1987/88 : 0.85 x 7100 = 6035 kw.
1991/92 : 0.85 x 8031 = 6826 kw.

Annual power consumption 1982/83 : 28.-- mill. kwh.
Annual power consumption 1987/88 : 32.8 mill. kwh.
Annual power consumption 1991/92 : 37.1 mill. kwh.

The above figures are for the ATM Valley, for location in areas with climatic conditions like Hetauda, the installed capacity will be around 89.3 kw/1000 spindles or Ne 26 or 7.3% larger and the annual consumption perhaps 8% higher.

B-1-2. Weaving.

The total production demand for weaving according to table 5-4 (based on 70% self-sufficiency) and eliminating the handlooms - which do not need electricity) is in million meters:

	Decentr. Sector	Mills	
		Cotton	MMF
1982/83	15.57	31.13	20.75
1987/88	16.76	33.52	34.83
1991/92	17.40	34.80	50.75

The production per loom in meters/annum is:

Decentr. Sector

(Annex V, para. 9-B-2)
from 12760 to 14250 m.

Mills

Cotton, table 10-12, page 97: 25055 meter

MMF-chart.10, page 101: 23000 meter

Table 6-5 illustrates the total number of looms and the installed power to supply the production demand of table 5-4.

Table 6-5.

	Decentr. Sector			Mills					
				Cotton			MMF		
	looms	kw/loom	total kw.	looms	kw/loom	total kw.	looms	kw/l	total kw
1982/83	1220	2.-	2440 "	1242	2.55	3167 "	902	3.1	2796 "
1987/88	1232	2.-	2464 "	1338	2.55	3412 "	1514	3.1	4693 "
1991/92	1221	2.-	2442 "	1390	2.55	3545 "	2206	3.1	6839 "

At a peak load of 80% of the installed capacity the actual load on the public supply network for the mechanized weaving sector is (if the targeted production demand will be met :

1982/83 : 6722 kw
1987/88 : 8455 kw
1991/92 : 10260 kw.

The power consumption will be approximately:

1982/83	:	37.8 mill. kwh
1987/88	:	47.4 mill. kwh
1991/92	:	57.6 mill. kwh

SUMMARY

The total actual load on the public supply network for the combined spinning and (mechanized) weaving industry, established in the KTM Valley will be (re. table 6-4 and 6-5):

11832 kw with an annual consumption of 65.8 million kwh. 1982/83
14490 kw " " " " " 80.2 million kwh. 1987/88
17086 kw " " " " " 94.7 million kwh. 1991/92

It is reminded that for establishment in the Terai and, to a lesser extent also for the Hetauda region, the installed capacity must be higher because of the need for larger airconditioning installations.

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Appendix

A. Textile fibres and yarns.

The proposed production programme for woven fabrics as given in table 5 - 4 of Chapter 5, excl. woollen/others (in million linear meters) is in quantity:

		Handlooms	Decentr.	Mills	
	Total	Cotton	Cotton	cotton	MMF
1982/83	98.58	31.13	15.57	31.13	20.75
1987/88	118.63	33.52	16.76	33.52	34.83
1991/92	137.75	34.80	17.40	34.80	50.75

Based on market observations, fabric analysis and experiences in other developing countries "average" fabric construction for all 3 sectors of the weaving industry were determined, whilst the range of yarn counts for each sector is indicated. In this way the necessary quantities of yarn could be calculated.

"Average" fabric constructions, TABLE 6 - A - 1.

	(1) Handlooms 100% cot.	(2) Decentr. 100% cot.	Mills (3) cotton	Mills (4) MMF	
average width (finished)	76 cm	100 cm	106 cm	132 cm	
weight(gr./sq. m)incl.waste in weaving	150 gr	140 gr	130 gr	110 gr	
weight per lin. meter	114 gr	140 gr	138 gr	145 gr	
				Blended - cont.filam.x)	
average yarn count(Ne)	21.6	20	24	36	44
average picks per inch	45	48	52	65	65
share of spun(blended)yarns resp. filament yarns in MMF				45%	55%

TABLE 6 - A - 2. Corresponding weights.

1982/83(tonnes)	3549	2180	4296	1354	1655
1987/88	3821	2346	4626	2272	2778
1991/92	3967	2436	4802	3312	4047

x): continuous filament.

TABLE 6 - A - 3.

Total (in tonnes) of yarn.

	Cotton yarn (carded) (col.1, 2 and 3 of 6-A-1)	MMF Yarns (col.4 of 6-A-1)		Total yarns
		Blended	Continuous	
1982/83	10025 (77%)	1354 (10%)	1655 (13%)	13034 (100%)
1987/88	10793 (68%)	2272 (14%)	2778 (18%)	15843 (100%)
1991/92	11029 (60%)	3312 (18%)	4047 (22%)	18388 (100%)

The blended yarns (45% of MMF) are estimated to consist of:
for two thirds of the quantity in 65% polyester and 35% cotton;
for one third of the quantity in 65% polyester and 35% rayon.
Taking the above distribution of MMF blended yarns into account and considering that the following waste percentages are normal in cotton spinning:

for carded cotton yarns : 11% of the yarn weight
for combed cotton yarns : 30% of the yarn weight
for blended yarns : 30% of the cotton component in yarn weight
3% for the rayon component in yarn weight
3% of the polyester " " " "

and ASSUMING a 90% self-sufficiency in cotton yarns and 70% in blended yarns, the following table 6-A-4 shows the necessary raw materials inputs:

TABLE 6 - A - 4.

	Raw Cotton		Total	MMF		
	carded	blends	cotton	fibre rayon	fibre pol.	continuous
1982/83	10015	288	10303	108	634	1655
1987/88	10782	483	11265	196	1065	2778
1991/92	11018	705	11723	286	1552	4047

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Annex III

DETAILED REPORT ON CHAPTER 7 OF I.S C. STUDY - COTTON DEVELOPMENT PROJECT

Glossary.

SEED COTTON:	Cotton seed with the lint (Fibres) still attached to the seed, as picked from the cotton plant.
LINT COTTON:	The ginnery separates the seed and the lint (Fibres) the latter is called lint cotton.
GINNING OUT-TURN :	The quantitative ratio between seed and lint cotton, 35% is an average outturn, thus 100 kg of seed cotton produces 35 kg of lint cotton.

The cotton spinning industry in the world requires a very wide range of raw cotton qualities which are presently provided by the old cotton growing countries like the USA, India, Pakistan, Mexico, Egypt, Sudan, Syria, East Africa and a steadily growing number of developing countries.

The spinning mill determines what quality of cotton it wants for its end-uses and it implies that specific qualities are transported all over the world at high expense.

The Nepal market also shows a fairly wide range of fabrics, but based on the market observations in the Eastern, Central and Western areas in addition to the KTM Valley, it can be stated that 90% of the total quantity of cotton fabrics now consumed in Nepal can be spun from a fairly limited range of raw cotton qualities.

Technically speaking this range varies from strict low middling spotted grade 15/16" staple to strict middling $1\frac{1}{8}$ - $1\ \frac{5}{32}$" but again 75 to 80% of the demand within this range or around 70% of the total potential demand for cotton yarn can be satisfied by middling light spotted to strict middling grade and 1" to $1\frac{3}{32}$" staple; a Micronaire range from 3.8 to 4.2 and a Pressley fiber strength of 78 - 90.000 lbs/sq. inch.

Farmers fields around Nepalgunj were visited on November 3. Cotton ripe for picking in the field as well already picked were inspected. In addition samples from last year's crop were taken from the bales stored in Hetauda during October.

It can be stated that the quality of the cotton is very good; the staple length varied from 1" to 1$\frac{1}{8}$" with around 70% in the 1 $\frac{1}{32}$" and 1 $\frac{1}{16}$" range and the grades were middling light spotted to strict middling. The Micronaire and Pressley, being instrument readings, could not be assessed but based on my experience as a cotton classer for more than 25 years, it can be expected that both are in conformity with the above specification. Hence the cotton is eminently suited to the Nepal market requirements; it can even be said that it is too good for the very coarse fabric section.

Three major questions now arise:

1. Can sufficient quantity be produced within 10 years time?
2. At what price per kg?
3. What are the specific advantages for Nepal of cotton cultivation against other crops?

Ad 1.

In Chapter 5 (Production Demand) and Chapter 6 (Inputs) of this report a target for domestic production of 70% of the market demand for cotton and MMF fabrics has been set.

On this basis and also assuming that the yarn requirements for this target will be spun for 90% in Nepal, the requirements of raw cotton are (Table 6-2 of Chapter 6):

1982/83 : 10303 tonnes.
1987/88 : 11265 tonnes.

Based on a yield of 400 kg of lint cotton per HA (=356 lbs/acre, representing the world average yield for the 1976/77 season) 28162 HA would be required in 1987/83.

It is obvious that such an area is simply not available without upsetting the whole agricultural structure.

Based on present knowledge it appears realistic that 5000 HA can be brought into cotton production, unless other suitable areas can be found and developed in the Far-western district. With luck and a lot of energy perhaps 10.000 HA or around 35% of land requirements can be achieved around 1990. 3000 HA of suitable upland soil and not too widely dispersed are available at present for short-term development.

It must be emphasized that cotton is a very "sophisticated" and sensitive crop. It requires a number of activities from the farmer with which he is as yet completely unfamiliar. He must:

a. plant in rows at exactly the right time; if he is a fortnight late, his yield may be reduced with 30 - 50%;
b. weed at the exact time; if he begins weeding too late and does not continue weeding at regular intervals, his yield may go down again with 30 - 50%;
c. fertilize at the exact time the plants need it;
d. repeatedly spray with insecticides at the exact time and if untimely rains wash away the insecticides, he must do it again;
e. as soon as the picking begins he himself and his family and children must go in the fields several times during 6 weeks to 2 months; although he has a margin of several days, he should not delay picking too much;
f. after the last picking he must cut the stalks and burn them on the field to prevent insect infestation for next year's crop; he should not use it for fuel at home.

Traditionally and by sheer necessity the farmer's first thoughts are on providing food for his family. However, when he grows cotton he must plan, organize and divide his attention, a thing which is new to him. It is clear that without a lot of education, training and assistance by Extension Officers the chances are that he will fail to obtain a remunerative yield. It is also clear that such education or perhaps better expressed as "change of mental approach" cannot be achieved in one or two seasons for the majority of farmers. But if he is willing and able to follow the instructions of the Extension Officers, yields of 700 kg per HA become a reality.

At the rate of 700 kg/HA, about 3500 tonnes of lint cotton could be produced on 5000 HA, representing 25% of the potential demand in 1987/88; 3500 tonnes also represent about 150% of the Hetauda mill requirements at full production.

Assuming that each farmer, under guidance of the present project (3000 HA) plants 2 HA of cotton in addition to food crops and on the future additional 2000 HA around 2/3 of one HA per farmer will be used for cotton, a total of 4500 farmers have to be trained and assisted. The above figures show the magnitude of the problem. It must also be concluded that for a long time to come Nepal must import cotton if it wants to establish a spinning industry to satisfy the demand for cotton yarns.

ad 2. At what price per kg?

In evaluating the potentials of revenue for the farmer it is first of all necessary to consider the price the spinning mill can afford to pay for its cotton. It is my definite opinion - based on a long career in the spinning industry in Europe, as well as in Tanzania between 1960 and 1970, and having witnessed various price regulation experiments in East and West Africa and Indonesia - that, on longer term, the only sound basis is the world-market cotton price. Cotton yarn prices follow the same trend, mitigated or accentuated by business conditions. However, this world-market price shows considerable fluctuations. The best indicator is the so-called Liverpool index, which represents the average c.i.f. Liverpool price of the 5 cheapest quotations from all over the world for a specific quality (strict middling grade $1\frac{1}{16}$" staple). It is published weekly.

The monthly average varied from 88.80 $cts/lb in Febr.74 to 46.80 cts in Febr. 75; rose again to 88.90 cts in July 76 and fell back to 72 cts in June 77 (last monthly figure available to me). On Oct.4 it had fallen back to 59.20 $cts.

The c.i.f. Calcutta price will be somewhat higher. Though freight rates to Calcutta from suitable countries like Turkey, Iran, Iraq, Sudan and West Africa will not vary very much from those to Liverpool, the competition of South and Central American cottons will be excluded and its seems likely that the c.i.f. Calcutta price will be around 1 to 2 $cts higher than in Liverpool.

Freight costs from c.i.f. Calcutta including various costs to Hetauda is 1.4 $cts/lb (Rs 0.38/kg). Thus the Hetauda price for strict middling $1\frac{1}{16}$" will be around 3 $cts/lb higher than the Liverpool index.

However, the average quality for the envisaged production programme will be about middling $1\frac{1}{32}$" which usually quotes around 1.5 $cts lower than strict middling $1\frac{1}{16}$". Hence the price, based on world-market prices, that Hetauda has to pay will be around 1.5 $cts higher than the Liverpool index.

As a consequence the c.i.f. Hetauda price would have fluctuated from more than 90 $cts to 48 $cts since Febr. 75, while the prices since July 76 up to July 77 would have been between 90.4 and 73.5 $cts.

Future prices are completely unpredictable; it can only be gathered from fairly recent publications from the Int.Cotton Advisory Committee

in Washington DC (International Government-level) and the International Institute for Cotton (Manchester UK) that as soon as the Liverpool Index drops below the 62 cts (=63.5 $cts cif Hetauda) level at the critical decision time, there is a strong incentive for farmers in the USA, Brazil and other countries to switch over to competing crops.
So with all possible reserves there is a reasonable chance that the Hetauda price will not fall much below $63.5cts = Rs 17.5/kg for any important length of time.
Converted at a ginning outturn of 35%, the equivalent gross price to be paid to the farmer would be Rs 6125 for first-grade seed cotton. At the good, but achievable yield of 2000 kg/HA of such cotton (=700 kg of lint cotton) produced on 2 HA, the farmer would receive: Rs 24500 less

constant costs:	supply of seed, dressing etc.	Rs 100	
	fertilizer	Rs 2000	
	insecticides	Rs 3000	
		Rs 5100	Rs 5100
		Gross income:	Rs 19400
direct costs :	ginning costs at Rs1.5/kg	Rs 2100	
	transport to Hetauda ✱.	Rs 1400	
		Rs 3500	Rs 3500
		Net income:	Rs 15900

✱): based on medium-density bales.
For a yield of 400 kg lint cotton per HA (the world average) the farmer would receive a net income of Rs 7185 or only 45% of the income on the yield of 700 kg/HA.
At a yield of 150 kg of lint cotton, the farmer's income would be negative and all his efforts wasted.
By-products of the seed separated in the ginning process are also valuable. However, to produce these by-products large quantities of seed are required to justify the large investments in the necessary machinery. Furthermore the transport cost to offer these products on the world market would kill all net revenue. Thus for the time being these potentials are not taken into account, as there is no outlet in Nepal at this moment and India is fully self-sufficient in this respect.
Cotton is a six-months crop and if the farmer adheres to the strict rules mentioned earlier, he will be able to grow another crop on the same land which can give him an economic return, for instance Cicer S.P. or wheat.

A very effective way to kill all interest of the farmer in cotton growing would be to let him bear the risk of the price fluctuations in the world market. His own risks are already quite considerable (but largely depending on his mental and physical inputs). The farmer should know prior to planting time, what his revenue per kg will be.
The Governments of several developing countries have solved this dominant problem by establishing a "Lint and Seed Marketing Board", which pays cash for the seed cotton close to growing areas or at ginnery point, at the season's price fixed prior to planting. The Board supplies fertilizers and insecticides, and their inspectors assist the farmers in the close adherence to the necessary cultivational procedures. The Board pays for the ginning (or owns the gin) and sells the cotton at world market prices. (It can reduce its risks to a certain extent by hedging on the New York cotton futures market, which is however not recommendable for a small-size crop).
The Board can incur large losses or make large profits. The latter should be put aside in a price stabilization fund. In this way the price fluctuations for the farmer could be mitigated considerably. Another way could be to subsidize the farmer in times of low world market prices.

ad 3. What are the advantages for Nepal of cotton cultivation against other crops?

To place this question in its proper context it is remarked that cotton does not compete with paddy with regard to land use (but it does with regard to human labour).
The techniques required from the cotton farmer are also beneficial for other crops (planting in rows etc.). Hence he will gradually become a better farmer with a better standard of living.

*) Paddy is a wet crop, whereas cotton requires upland, on which paddy can only be grown with a very low yield. Furthermore cotton does not require perfect level land.

It is still rather early for a comprehensive economic analysis of cotton growing versus other crops. It requires the services of an experienced agro-economist.
One parameter is the foreign exchange saving. The 2300 tonnes of cotton to be consumed by the Hetauda mill, if produced in Nepal, already represent a saving of $ 3.137.200 (valued at a c.i.f. Calcutta price of 62 $cts/lb), less the imported inputs (at a yield of 400 kg/HA) of $ 1.150.000 = $ 1.987.200 per annum.

In another chapter of this report it is recommended to install additional spinning capacity which will absorb further large quantities. The present production of the handloom industry alone consumes 1.338 tonnes of yarn, equivalent to 1500 tonnes of lint cotton (annex IV).
Domestic cotton could avoid the complexity of purchasing abroad with the ensuing risk of delays in timely procuring the foreign exchange so often noticed in other developing countries.

The conclusion is that the cotton development project deserves continued and full support of H.M.G. Its success depends on accessable areas, the size of unit plots and the physical possibilities to assist the farmers; their willingness and ability to accept a continuous process of education which goes beyond the direct subject of cotton. It is not a mathematical problem which can be solved by pure logic.

To push at an early date for further extension beyond the presently envisaged 5000 HA will be extremely dangerous.
I have witnessed cases where high Government Officials for political reasons ordered large extensions - in spite of the warnings from experts - before the competent staff had been build up. It became a huge flop with a loss of millions of dollars and prevented for a generation future efforts to begin again.

Annex IV

DETAILED REPORT ON CHAPTER 8 OF I.S.C. STUDY - HANDLOOMS

Summary, Conclusions and Recommendations.

A. Role of the Handloom in the Textile Industry.

A-1. Present situation
A-2. Present production
A-3. Rated capacity per handloom
A-4. Potential demand for handloom fabrics
A-5. Benefits a. economic
b. socio-economic

B. Problems and Desiderata.

B-1. Yarn supply
B-2. Marketing
B-3. Factory-wise production
B-4. Semi-automated handloom mill
B-5. Ordinary handloom mill
B-6. Summary of B-3 to B-5

C. Programme of Development.

C-1. Targets (sectoral allocation)
C-2. Location
C-3. Number of looms per location
a. dyeing aspects
b. finishing
c. Man-made fibres
C-4. Handicraft Promotion Centre
C-5. Training
C-6. Organizational aspects

D. Marketing.

E. Financing.

F. Appendices.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

II Summary and Conclusions.

A. Role of Handlooms in the Nepalese Textile Industry.

1977 situation		KTM Valley	Outside	Country
1.	Estimated number of handlooms	7950	1750	9700
2.	" population	0.5 mill.	12.6 mill.	13.1 mill.
3.	" number of looms per 1000 population	15.9	0.14	0.74
4.	" production in 1977	8.4 m.m.	1.85 m.m.	10.25 m.m.
5.	" production per capita	16.8 m.	0.15 m.	0.78 m.
6.	" consumption per capita of country of woven textile			9.43 m.
7.	" potential share for handloom fabrics		approx.	2.85 m.

The conclusion is that the production of handloom fabrics in the KTM Valley far exceeds the local potential consumption. Hence both marketing and transport problems exist and furthermore the problem of underemployment in the rural areas outside the Valley is not attacked.

In view of the envisaged population increase of nearly 25% in the next 10 years, in addition to the lack of arable land to absorb this increase in the agricultural areas, the problem of rural up- and underemployment will become the more pressing.

In view of:

- the necessity to create gainful employment for the rural areas
- the versatility of the handloom, allowing quick adaption to local or regional consumer preferences
- low investment costs per handloom, no need for electricity, fuel oil nor airconditioning,

it is clear that the handloom can play a very important role in the supply of textiles. However, it must be remarked that the present handloom industry technically, qua marketing and qua skill is still rather undeveloped.

Moreover the "master weaver" dominates, thus limiting the role of the family weaving unit to physical labour at a miminum wage level largely determined by the master weaver.

B. Benefits (page 61, para A-5).

Approximate cost calculations were made for three fabric constructions.
The two-loom family unit, acting as an independent entrepreneur, would make a net income of Rs 3670 per annum in 180 working days of 2 adults and 3 adolescents = 900 "mandays".
Comparisons were made between the above handloom unit and a large-scale non-automated mechanical weaving mill.
For the same output the capital investment in the mechanized mill is 4.36 times higher than for the handloom unit.
The capital costs of the former plus its electric power consumption favour the family unit handloom system at around Rs 0.44/meters or 28% of the added value.
The labour employment for the same production in the large mill is 29 mandays (skilled and semi-skilled).
Hence the ratio on labour employment is 31 : 1 in favour of the handloom unit. As the capital investment ratio is 4.36 : 1, the labour employment to capital investment ratio is 135 : 1.

It was investigated whether factory-wise production of the same 3 fabrics both on semi-automated and on ordinary handlooms would be a recommendable proposition (par B-3, B-4 and B-5). Whereas the handloom family unit can make a net annual income of Rs 3670, the loss for the S.A. handloom mill would be Rs 1527 and for the ordinary handloom mill Rs 4098 (B-6 on page 68).
Though, at first glance, the conclusion would be that both factory wise production systems are not attractive, it should be taken into account that an alert private entrepreneur with an excellent knowledge of the market and a feeling for its trends, still could make attractive profits in the S.A. handloom mill by specializing on fabrics with a high profit margin. However, the labour employment per 1000 meter is only 84 mandays compared with 269 for the family unit (adults + children).
Nevertheless it was decided to allocate a portion of the market demand to the S.A. handloom mills in the programme of Development.

C. Programme of Development

The main issues governing this programme are:

1. The following estimate of the total market demand

	1982/83	1987/88
Woven cotton fabrics	111.13 m.m.	119.7 m.m.
30% for handlooms	33.35 "	35.91 "
less for S.A. handloom mills	1.32 "	2.64 "
Target for ordinary handlooms	32.02 "	33.27 "

Present (1977) production of handlooms is estimated at 10.25 m.m. o r 48% of the "rated capacity" (par A-3, page 59).

This low percentage is mainly due to insufficient and irregular supply of yarn and to other constraints. Provided these constraints can gradually be removed, a production of 60% of rated capacity is assumed for the family-unit system.

Conclusion: on these bases 14466 new looms have to be installed up to 1982/83 and 15410 up to 1987/88 to reach the demand target.

2. Location. The Dep. of Cottage and Village Industries (DCVI) envisages a distributional allocation policy of 2/3 of the total number of handlooms within the KTM Valley. The consequences of this policy are outlined in table C-2-1 on page 11. It is felt that this distribution puts too much emphasis on the KTM Valley and underrates rural underemployment and low income outside the Valley, beside creating a marketing problem.

It is preferable to promote not less than 25 two-loom family units in a small community as otherwise warp preparation facilities, yarn dyeing installations etc. will become expensive and underloaded. Such minimum production capacity will, however, already satisfy the handloom fabric demand of around 30.000 rural consumers, creating a marketing problem. The desirability of common facilities, and more in particular for larger concentrations of handlooms are discussed in par C-3, page 72. Although fabrics of man-made fibres and blends (MMF) are, presently technically outside the sphere of handlooms, it may be feasible to open up the feasibility of producing MMF fabrics on handlooms. Again size, concentration and markets are closely interrelated (C-3-c, page 73).

The conclusion of this paragraph is that location, production capacity and common facilities per location, inputs of MMF yarn are all closely related with local and regional markets.

However, the regionally important factors of population density, income level, labour un- and underemployment, infrastructural conditions, and present and future regional markets call for a "Master Plan for Location".

3. Training. Considering that outlets for the production of 15.000 new handlooms are feasible, the training of weavers becomes a major aspect (covered in par C-9, page 74).
   Conclusion: a "Master Plan of Training" is essential.

D. The Marketing aspect was touched upon in par A of this summary, while par D (page 75) of the Report covers the major aspects.
The present and the future role of Sales Emporia is discussed. Co-ops could play a very useful role for the family entrepreneur, both in marketing outputs and purchasing of inputs.
Conclusion: In view of the bad experiences with similar co-ops in other developing countries, specialized knowledge of the feasible structures of co-ops and their pro's and con's is required.

E. Financing (page 76)
To reach the target of 25.000 looms in the family-unit system in 1987/88, investment credits of around Rs 19 million in addition to Rs 12.5 million credits for working capital are required.
It is considered to be outside the scope of the assignment to estimate the cost of Government inputs with regard to training and technical assistance, promotion centre, etc.

II. Recommendations.

In view of the major objectives of this study:

- to increase the income of the low-income classes
- to reduce un- and underemployment, especially in the rural areas, facing an envisaged population increase of nearly 25% in the next 10 years and the emerging lack of arable land for agriculture
- to reduce the dependence on imports and to create domestic value added,

it is recommended to promote the development of the handloom industry in a family-unit system within the limits outlined in the Report; while 85 of the demand for handloom fabrics is reserved for the S.A. handloom sector (factory-wise).

The following actions are deemed to be necessary:

- to study the handloom industry in India, which is technically more advanced in the applications of dobbies and the Jacquard principle. Bangladesh with its age-old and enormous handloom industry is also far advanced;
- to study the Indonesian ASTM handloom which is more productive than the present ordinary handloom in Nepal (or India);
- to gain further experience with the S.A. handloom, also in the family-unit system in the KTM Valley;
- to collect information on the feasibility of applying yarns of man-made fibres in the handloom industry (C-3-c, page 73);
- to establish a separate division of the DCVI, devoted solely to the development of the home weaving enterprises; it appears justified to integrate the Sales Emporia Company into this division;
  This division to draft:
  - a master plan of location
  - a master plar of training
  - to study and advise upon the most suitable structure of a co-op society for the home units, in close consultation with specialized expertise.

It is remarked that at the time of writing this sectional report no complete figures were yet available to compare production costs of large-scale mechanized weaving with handloom. This is less serious than it appears, because each section of the textile industry has its own position in the textile markets with its own possibilities and risks. Reference is made to Chapter 5, page 2, of the main Long-Term Strategy Report.

The Government faces a formidable task in the implementation of these recommendations. It requires dedication, discipline and strict adherence to principles in the face of severe competition from the master weaver. It is my experience in many developing countries trying to find socially acceptable solutions for similar problems, that the Government usually loses the battle because it could not master the necessary initiative, drive and dedication and discipline. The profit motive of the private entrepreneurs proved to be the most effective stimulant for domination of the market. But the result is the accumulation of private wealth for a "happy few" at the expense of the rural population which continues to live at a below-subsistance level.
Such a situation should be avoided in Nepal.

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A. Role of the Handloom in the Textile Industry.

A-1. Present Situation and Potentials.

The Department of Cottage and Village Industries (DCVI) provided a detailed breakdown of the number and location of handlooms in the country.

Summary:

a. In the Kathmandu Valley: 7750. Population 500000. Looms/1000 population: 15.5

b. Non-Cottage Handlooms : 200.

c. Outside Valley : 1750. Population 12.5 mill. Looms/1000 : 0.14

9700. 13 million 0.75 loo 1000 pop

A-2. The present total production of these 9700 looms is estimated at 10.25 million meters per annum = 1056 m/loom/annum, which is around 7.5% of the total textile consumption of 137 m.m. in the country or 8.3% of the demand for woven fabrics.

A-3. Rated Capacity.

Examination - both in the shops and on the looms - of handloom fabrics showed a range of picks per inch between 25 and 60, and it is assumed that the average number of picks/" is around 45 for the handloom fabrics woven in the country.

If run in one 7½ hour shift during 290 days per annum (full-time job) with an effective speed of 30 picks per minute, the annual production would be:

$$\frac{30 \text{ PPM} \times 60 \times 7\tfrac{1}{2} \text{ hrs} \times 290 \text{ days} \times 0.914}{45 \times 36 \text{ (inches/yard)}} = 2209 \text{ m or } 7.61 \text{ m/day (rated capacity)},$$

provided no constraints due to lack of yarn, dye stuffs and absenteism etc. affect the production.

Consequently the actual production per loom of 1056 m. is below 50% of the rated capacity.

A-4. Potential demand for handloom fabrics.

In Chapter 4 it is estimated that the total textile demand for 1977/78 is estimated at 137.17 million meters or for a population of 13.1 mill = 10.5 meter per capita.

10% Has to be deducted for hosery/knitted fabrics.
Hence the annual demand for woven fabrics will be around 123.5 m.m. or 9.43 m/capita.
In view of the specific circumstances in Nepal:
- three climatic zones (tropical, subtropical and temperate)
- transportation constraints which favour a more regionally dispersed industry
- low purchasing power for over 90% of the population
- the versatility of the handloom, allowing quick adaption to local or regional consumer preferences (the differences qua marketing aspects between handloom/small scale industries on the one hand and the large scale mills on the other hand are outlined on page 34).

- low investments costs per handloom, no need for electricity, fuel oil nor air-conditioning,

it is clear that the handloom can play a very important role in supplying woven textiles for the population. However, it is remarked that the present handloom industry, technically, qua marketing and qua skill is still rather undeveloped.
Based on the above factors it is assumed that the cottage industry has the potentials - at long term - to supply 30% of the market demand for woven cotton fabrics. To avaoid very complicated calculations it has been assumed in other chapters of this Report that the handloom industry (excl. the S.A. handloom) will be allotted 40% of the production demand in lieu of 30% of the market demand for woven cotton fabrics. The long-term effect is negligible.
In India this percentage is slightly over 30%, in Bangladesh close to 65% and in Indonesia around 25%.
This subject will be discussed in par.C, however to give an idea of the magnitude, the following figures are given:
The 1977/78 market demand for cotton fabrics is estimated at 102.33 m.m. (table 1-2) less 10% for hosery/knitted fabrics is 92.59 m.m. 30% For handlooms represents 27.78 m.m. (2.12 m/capita) or 27% of the present production.
In 1982/83 the market demand for woven cotton fabrics is expected to grow to 111.77 m.m. and 30% represents 33.53 m.m. or 325% of the present handloom production.

A-5. Benefits.

a. Economic. Approximate cost calculations were made for three fabric constructions actually woven on handlooms and in a wide or growing demand in the markets:

- a coloured-woven fabric in 24/25" width for shirts and trousers. The gross annual income per two loom family unit is Rs 2800;
- a coarse saree in 36" width; gross income Rs 3800;
- 27" blue jeans (denim); gross income Rs 6800.

Details are provided in the appendix.

Assuming that 40% will be produced in the first quality, 40% in the second and 20% in the third, the annual production would be 3340 meter with a turnover of Rs 17832 and an average annual gross income of Rs 4000, excl. depreciation and financing costs. If the same 3340 meters were woven in a large scale mill in three shift operation, about 0.09 loom would be required. The investment per loom, including the pre- and post weaving equipment and building will be around $ 8500. Thus 0.09 loom represents an investment of $765 = Rs 9600, while the investment in handloom equipment excl. building would be Rs 2000 for 2 looms plus $\frac{1}{10}$ of one warper, creel, etc. (valued at Rs 2000) = Rs 2200. Hence for the same production the investment for power looms is 4.36 times higher than for handlooms. The difference in investment is Rs 7400 which, at a total depreciation + interest charge of 15%, represents Rs 1140 for 3340 meter= Rs 0.34 per meter in favour of the handloom. The electric power consumption for the power loom would increase the difference to around Rs 0.44/m.

The annual income for the two-loom family unit including depreciation and interest charges will be reduced from Rs 4000 to Rs 3670 excl. financing costs of working capital.

b. Socio-economic.

The 3340 meters produced annually on two looms will occupy 5 persons (2 skilled actually weaving and 3 semi-skilled and unskilled in the preparatory process) during 180 days = 900 mandays.

The same 3340 meters produced in a large well-organized non-automated power loom mill will require 0.1 manyear = 29 mandays (skilled and semi-skilled). Hence in this case the ratio is 900 : 29 = 31 : 1 with regard to labour employment per unit of production.

As the capital investment ratio for the same production is 4.36 : 1, the labour employment to capital investment ratio is 135 : 1.

It is emphasized that only 3 fabrics in the coarser section - which is the most suitable for handlooms in their present stage of development - have been investigated, hence the outcome presented has only a relative value.

B. Problems and Desiderata.

B-1. Yarn Supply.

In the past the irregular and insufficient supply of yarn was one of the major constraints for the development of the cottage industry. Only since the National Trading Ltd. (NTL) has started to import good and cheap yarns from China, the supply situation has improved. However, as long as no domestic spinning industry exists, there is no guarantee for an adequate and regular supply.

To supply the present production of handlooms (10.25 m.m.)- on the basis of the three fabric constructions of par A-5,-around 1338000 kgs of NE 18 (average) would be required, equivalent to 6700 spinning spindles. On the same assumption the number of spinning spindles required to satisfy the present potential demand for handloom fabrics would be 18090 spindles.

The capital investment for such a spinning mill would be, very roughly, US$ 4.5 million for the installed equipment, excl. building costs.

B-2. Marketing.

a. The KTM Valley with its 500000 inhabitants and 7750 looms probably produces around 8.2 m.m. of handloom fabrics or 16.4 m/capita. This is far above the potential national per capita consumption of 2.03 m for cotton handloom fabrics. 6 or 7 Million meters must be sold outside the KTM Valley and a marketing problem is created together with time and energy consuming transport without adding to the intrinsic value of the fabric.
The handloom weavers are not organized and both problems are presently solved by traders at the expense of the handloom weavers. The role of the Sales Emporia is still insignificant.

b. The handloom is eminently suitable for agricultural areas as a supplementary source of income to farmers.
It is economically preferable to install units of 50 to 100 looms in a small community (cluster of households, small villages) as otherwise warp preparation, yarn dyeing installations etc. will become expensive, heavily underloaded and space-consuming.

However the production of say 70 looms in 35 households, working 6 months/year (= around 150 days/year) will already amount to 70 x 8m/day x 150 days = 84.000 m. per annum, whilst the demand for handloom fabrics in this rural area may be around 2.5 - 3.5 meter per capita. Thus this little unit will already satisfy the demand of 24 to 34.000 rural consumers. A marketing problem is created and a location problem as well.

c. Marketing in relation to location.

It must be taken into account that the feasible consumption of cotton handloom fabrics is estimated at 30% of the total market demand of woven cotton fabrics = 27.78 mill. meters in 1977/78, which can be satisfied by 12575 handlooms producing at the "rated capicity". However, at the actual rate of 1056 m/loom, 26300 looms are required.

From the above observations it is evident that the planning of appropriate locations in relation to markets needs further careful investigation, requiring an intimate knowledge of the geographical population density, income and transport aspects, also considering that over 3000 Village Panchayats are in existence.

d. Special Marketing Situation

At present the function of deciding what fabric should be produced and how much of it is in the hands of the master weaver. He provides the yarn and distributes the fabric to wholesalers or retailers. He takes all risks and plays a very dominant, if not overruling role in the handloom industry. He also provides small cash loans, usually at an usurious rate of interest, to his weavers to celebrate a marriage, to pay for medical treatment or just to buy essentials. As such he has a tight grip on his weavers.

Thus he holds a key position in the cottage industry, which is both useful and exploitative. But the consequence is that the family-unit of handloom does not yet has the required marketing skill and market entries for independent operations, at least not outside its immediate vicinity.

B-3. Factory-wise Production on Handlooms (Handloom mill).

This form of production is still virtually unknown in the country. It would be in the realm of the agressive and capable small entrepreneur who sees profits in it, without being obliged or being unable to invest in the high cost of a mechanical weaving mill (total investment over Rs 100000/powerloom).

A unit of say 100 semi-automated handlooms would produce around 440000 meters/annum and could satisfy the demand for handloom fabrics of around 200000 consumers. Such size would allow for the installation of weaving-preparation machines (coning, yarn-dyeing, good creel and warper, good weft pirning) and calendering, simple piece dyeing, block or screen printing, etc.).

As a consequence the fabric quality and sales appeal would be better, while still maintaining the major advantage of small-scale operations (versatility and adaptability of designs to regional demand preferences).

In fact this kind of production system would probably penetrate to some extent in the field normally covered by the large-scale weaving unit.

However, such a 100-loom unit requires:

a. regular working hours during the full year (290 days);
b. a much wider marketing area compared with the village two-loom family units and as a consequence,
c. location close to the larger market centres;
d. investment costs in fixed assets of around Rs 1.5 million, excl. working capital, although still small compared with the large-scale mill;
e. alert and expert management (financial, marketing and technical).

It does not cope in a satisfactory way with the socio-economic problems of maximazing rural income and employment.

The calculation for a mill of 100 S.A. handlooms is given in B-4, while in B-5 the same calculation is made for a mill of 100 ordinary handlooms, both with mechanized equipment for the weaving-preparatory process.

The findings are summarized in B-6.

B-4. Semi-automated Handloom Mill.

The independent two-loom family unit, as outlined in par A-5 produces 3340 meters/annum and makes an annual net income of Rs 3670 on the three selected qualities.

The handloom mill of 100 semi-automated handlooms, as outlined in par B-3 with mechanized machines for weaving-preparation would have an annual production of 440000 meters, requiring:

		Investment.		Annual Costs.
Building	: 10000 sq.ft x 60=	Rs 600000	à 10% =	60000
Machinery	: 100 looms x 4000=	Rs 400000	à 15% =	60000
	preparation	Rs 360000	à 15% =	54000
	accessories and spares	Rs 40000	à 20% =	8000
	miscellaneous	Rs 100000	à 15% =	15000
	TOTAL	Rs 1500000		Rs197000
	electricity: 15000 kw x Rs 0.4			6000
Wages	: 100 weavers x Rs 4800			480000
	7 coners x " 4200			29400
	2 warpers x " 4800			9600
	3 winders x " 4200			12600
	4 drawing-in x " 4200			16800
	1 overseer preparation x " 7200			7200
	2 overseer weaving x " 7200			14400
	4 stores + adm. x " 6000			24000
	5 transporters guards x " 3600			18000
	Total annual costs			Rs.815000, for
	440000 m = Rs 1.85/m.			

It is assumed that the mill will make a 3% better price because of better sales appeal. The comparison with the two-loom family unit (par A-5) becomes:

	Family			Mill
Turnover	Rs 17832	Turnover		Rs 18367
less inputs	Rs 13832	yarns	13715	
	Rs 4000	prod.cost		
capital charges	" 330	3340m x 1.85	6179	
				Rs 19894
Net revenue	Rs 3670	Net loss		Rs 1527

The net loss for the handloom mill of Rs 1527 represents Rs 0.46/meter or 8.3% on turnover.
It is emphasized that the above calculation is approximate; it may very well be that actual productivity could turn out at a 10% higher level, which would reduce the loss to Rs 0.29/m.

The conclusion must be that the handloom mill, because of its higher capital costs, overheads and hired labour cannot - in general - compete price-wise with the family unit for whom weaving is an additional (but very welcome) source of income.
Nevertheless it is quite feasible that an alert entrepreneur with an excellent knowledge and feeling of the market could make attractive profits by specializing on fabrics with a high margin, such as for instance at this moment the blue denim. On wider fabrics his chances are also better; a 44" fabric is quite feasible on the S.A. handloom.
For this reason it appears justified to reserve 3 units (= 1320000 meters) in 1982/83 and 6 units (= 2640000 m) in 1987/88 for the semi-automated handloom mill in the development programme (Chapter C).
In evaluating this comparison it should be considered that the labour employment per 1000 meter is only 84 mandays, against 269 for the family unit (adults + children).

B-5. Ordinary Handloom Mill.

It was also calculated whether a handloom mill of 100 ordinary handlooms would be viable.
It is quite conceivable that - because of the envisaged population increase of nearly 25% in the next 10 years in addition to the lack of arable land to absorb this increase in the agricultural areas - rural unemployment will augment considerably. It seems likely that a percentage of these unemployed will be willing to work in a handloom factory during 290 days/annum.

Again based on the same three fabrics the annual production will be 265000 meter based on 32 effective picks per minute, against 30 PPM for the family unit because of better preparation.

	Investment	Annual costs
Building: 8500 sq.ft. x Rs 60	=Rs 510000	à 10% = 51000
Machines: 100 looms x Rs 1000	= " 100000	à 10% = 10000
Coner, warper, pirnwinder	" 250000	à 15% = 37500
Accessories and spares	" 25000	à 20% = 5000
Miscellaneous	" 40000	à 15% = 6000
Total	Rs 925000	Rs 109500
Repairs and maintenance		5000
Electricity 10000kw x Rs 0.4		4000
Wages: 100 weavers x Rs 4800		480000
5 coners x Rs 4200		21000
2 warpers x Rs 4800		9600
2 winders x Rs 4200		8400
4 drawing-in x Rs 4200		16800
1 overseer prep. x Rs 7200		7200
1 overseer weaving x Rs 6000		6000
3 stores+ adm. x Rs 5400		16200
3 guards+ transporters x Rs 3600		10800
	Total annual costs:	Rs 694500

Total costs Rs 694500 for 265000 m = Rs 2.62/m against Rs 1.85/m for the semi-automated handloom.

The ordinary handloom mill also has good preparation, however, of simpler design and with smaller loombeams than the semi-automated mill.

B-6. Summary of B-3 - B-5, incl. the two-loom family unit.

Comparison between the three cases (based on the production of the family unit):

	Family unit	Ordinary Handloom	S.A.Handloom
Turnover	Rs 17832	Rs 18367	Rs 18367
inputs/yarn	13832 -	13715 -	13715 -
	4000	4652	4652
capital charges	330 -	8750 - m	6179 -
Net revenue	Rs 3670 loss	4098 loss	Rs 1527
Manday/1000 m	269	132	84
Average revenue resp. wage/manday	4	16.40	16.50

m): Production costs 3340 x Rs 2.62 = 8750.

The difference in loss between the two mill system is due to the higher production of the semi-automated loom.

C. Programme of Development.

C-1. Targets (sectoral allocation).

As mentioned in par A-4 it is expected that in 1982/83 the market demand for woven cotton fabrics will grow to 11118 million meters. For 1987/88 this demand is estimated at 1197 million m. An allocation of 30% to the handloom sector means: *

	1982/83	1987/88
Market demand for woven cotton fabrics	11118 m.m.	1197 m.m.
30% for handlooms	3335 m.m.	3591 "
less S.A.handloom mills (par.B-4)	132 m.m.	2.64"
Potential production demand for ordinary handlooms	32.02 m.m.	33.27 m.m.

The present production of 9700 handlooms is estimated at 10.25 m.m. or 47.8% of "rated capacity" (par A-2 - A-3).

This low percentage is mainly due to insufficient and irregular supply of yarns, while constraints in marketing, technology and skill undoubtedly have had a further negative influence on production. Provided these constraints can be gradually removed a production of 60% of the rated capacity seems feasible (= 1325 m/loom/annum) in the family-unit system.

	1982/83	1987/88
Handlooms required	24166	25110
existing in 1977/78	9700	9700
New looms to be installed	14466	15410

C-2. Location.

The DCVI envisages a distributional allocation policy of 2/3 of the number of handlooms in the Kathmandu Valley.

The consequences of this policy are illustrated in the following table C-2-1:

*): To avoid very complicated calculations it has been assumed in other chapters of this Report that the handloom industry (excl. the S.A. handloom) will be allotted 40% of the production demand in lieu of 30% of the market demand for woven cotton fabrics. The long-term effect is negligible.

TABLE C-2-1.

	KTM Valley	Rest of Country	Total
1. Number of handlooms '87	16735	8375	25110
2. Number of handlooms '77	7950	1750	9700
3. To be installed in 10 years	8785	6625	15410
4. Production in 1977	8.400.000 m	1.850.000 m	10.250.000 m
5. Production in '87 at 60% of rated capacity	22.174.000 m	11.097.000 m	33.270.000 m
6. Estimated population in 1977	500.000	12.600.000	13.100.000
7. Estimated population in 1987	740.000 m)	15.622.000	16.362.000
8. Production per capita in 1977	16.8 m	0.15 m	0.78 m
9. Production per capita in 1987	30 m	0.71 m	2.03 m
10. Estimated consumption p.capita in 1987	1.8 m	2.04 m	2.03 m
11. Surplus resp.shortage of prod. p. capita	+ 28.2 m	- 1.33 m	
12. Employment of adult weavers (excl.adolescents) in 1987	16735	8375	25110

m): at a 4% annual increase.

At present the surplus production of the KTM Valley is "exported" to the neighbouring hill districts, but also in large quantities al all parts of the country.
It is felt that the distributional allocation as envisaged by the DCVI is putting too much emphasis on the KTM Valley.
It is suggested to re-appraise this problem taking into account regional population density and purchasing power, labour under- and unemployment, population mentality, infra-structural conditions and training impediments, etc.

Without such in-depth study any proposal for any regional targets is unfounded. Nevertheless it is recommended to put less emphasis on the growth of handlooms in the KTM Valley.

In paragraph B-2-b and B-2-c other aspects relating to location have already been mentioned to which should be added the physical constraints of training assistance spread out over too many villages.

C-3. Number of looms per location.

C-3-a. The strength of the handloom's position in the market depends to a large extent on the use of dyed yarns. To obtain regular and uniform shades, expert knowledge and a fairly large volume are required. Dyed yarns can be bought through the trade but from a marketing point of view it is preferable to have local or regional common facilities for yarn dyeing to meet local colour preferences of the consumer. Assuming that the fabric contains about 50% of coloured yarn (which may vary considerably), around 50 to 70 looms are required to sustain an economic dyeing unit of 3000 to 3500 kg/month.

Common facilities are also to be considered for warping, because both the investment and the field of expertise required from the individual two-loom family entrepreneur would be reduced, in addition to a considerable improvement in the quality of the warp and better productivity. As already indicated in par B-4 and B-5 one mechanized coner and one warper can feed around 300 ordinary handlooms (at 60% of rated capacity) and such installation is only recommended for large production areas. But simpler installations serveing around 100 looms are conceivable. Undoubtedly appropriate information can be obtained in India.
The disadvantage of these common facilities is the creation of key positions on which the weaver becomes dependent. In larger conglomerations, however, this would be of lesser importance as more dyeing and warping units would have to be installed.

C-3-b. Finishing.

The sales appeal of handloom fabrics in the more competitive markets could be considerably improved by calendering. It is a relatively expensive machine (though available cheaply on the second-hand market in Europe) which requires an electric power drive. Its production is high. A few, presently unused calenders were observed in the Kathmandu Valley (Patan Ind. Estate).
"Overprinting" (block) printing of handloom fabrics as a common facility (or by an independent entrepreneur) could become feasible in the larger handloom areas.

C-3-c. Man-Made Fibres.

According to my knowledge it is technically not feasible to dye blended yarns (polyester/cotton etc.) in the simple way required in underdeveloped areas. Furthermore, both yarn and fabrics need "heat setting", without which no acceptable fabric quality can be obtained and sold.

Hence pol/cotton fabrics are "out" for the moment in spite of rapidly growing demand, even in more remote areas.

However, in the larger concentrations of handlooms yarn dyeing and heat setting units could be installed whenever the necessity arises. Its investment costs will be high. Further information can be obtained from the large fibre and dyestuff producers like Hoechst, I.C.I. and Bayer.

C-4. The Handicraft Promotion Centre.

The Handicraft Promotion Centre in cooperation with the training section of the DCVI can assist the industry by providing technical assistance both in the designing of fabrics and in improvements in weaving equipment and techniques.

In India simple dobbies and jacquards are applied on handlloms, enlarging the fabric sales potentials.

Moreover it is recommended to pay attention to the Indonesian Handloom developed by the Institut Teknologi Tekstil, Jalan Jendral A Yani, Bandung, West Java, Indonesia.

It is an improvement on the normal handloom, by which the shuttle is automatically propelled by the movement on the slay. Thus only one hand is required, while the other hand rests and is also used for small adjustments. Production is around 10-15% higher with less fatigue and fabric regularity slightly better. The Indonesian handloom industry has rapidly adopted this new loom.

C-5. Training.

It is fortunate that a growing interest of the population in handloom weaving activities exists. Considering that there is room for over 25000 handlooms in the country, whereas only around 10000 looms are now installed, there is a considerable demand for training courses. Admittedly a large number of future weavers can receive their training "on the job".

However, to expedite the growth of the industry and to improve the skills of the weaver, properly organized training courses led by specialists remain essential.

The present mobile training units of the DCVI, in combination with "showrooms" in selected centres, where weavers can be taught and upgraded, seem the appropriate media to obtain results within a reasonable time.

Assuming that 50% of the new weavers (=7500) receive "on the job" training, another 7500 weavers will rely on the training facilities provided by DCVI. A rather large "drop-out" compensation multiplier must be taken into account.

Without further investigations and discussions with the DCVI it is difficult to assess the number of weavers that can be given "on the spot" training annually by mobile units and also the number of "showroom" training centres required to attain the target of 15000 additional looms within a 10-years time period.

The permanent training centres can provide facilities for both training and upgrading for not only weaving, but also for weaving preparation (warping, drawing-in and pirning).

Moreover they could play an important role as demonstration centres for new designs, fabric constructions, etc. and as such strengthen the marketing position of handlooms.

Considering the above facts and in view of the desirability to concentrate the industry around market centres, it appears that 4 or more permanent centres should be the central training point to which the mobile units should be attached.

It is obvious that a "Masterplan" of training has to be drafted; it is however beyond the scope of this assignment.

C-6. Organizational Aspects of C-4/C-5.

a. From the above it is clear there is the necessity of close coordination between the H.P.C. (par C-4) and the training and upgrading requirements (par C-5). Both activities have rather a "technical" character.

However, for their proper functioning they require a close contact with the evolution in the market, which can be provided by the 11 Sales Emporia now in existence in the country.

b. In the next paragraph D (Marketing) the role of the Sales Emporia is outlined and the importance of feed-back of all market aspects is emphasized.

c. The socio-political objective of maximization of rural income is realistic and the active promotion of the home/family weaving enterprise can play an important role in the realization of this objective.

In view of these 3 aspects it is recommended that a separate division of the DCVI be established, devoted solely to the development of the home/family weaving enterprises.
Considering the dominating importance of handloom products for the Sales Emporia it seems justified to integrate the Sales Emporia Company into this division of DCVI.

D. Marketing.

In par B-2 of this sectional report several relevant aspects were already discussed. They are summarized:

a. a rather too dominant position of the KTM Valley;

b. conflict between minimum number of looms and the market demand in more remote areas;

c. non-organization of the family units and the overruling position of the "master weaver".

It must be expected that rather a large part of the family farmer entrepreneur will lack the necessary skill to cover the marketing aspects of his function.
It is obvious that an organizational set-up is required as otherwise the family unit system will remain the victim of the master weaver.
The Sales Emporia could play a very useful role as an additional sales outlet for home industry over a wider area than the local shops. Moreover, they could and should feed-back information on changing trends in fabric designs and other marketing aspects.
However, exclusive sales rights for the Sales Emporia should not be permitted and free competition should be maintained.
The leader of each Emporium should definitevely have commercial instincts and drive. The few Emporia visited were poorly stocked and not inviting to the buyer.

Co-operative societies could provide the kind of services the family entrepreneur needs both in marketing and purchase of inputs. However, the experiences in other developing countries are notoriously bad because the master weaver usually finds ways and means to exert a dominant influence in the co-ops.
Expert knowledge of the pro's and con's of the co-ops is required to recommend a satisfactory solution - if any - to this essential problem.

E. Financing.

To infuse confidence in the possibility of increasing family income and loosening the tight economic grip of the master weaver, the following services are necessary:

a. Cheap medium-term credits of up to Rs 500/loom to the enterprise for purchasing raw materials and to provide finance for stocks to prevent stop-loss sales in seasons of slack demand. These credits should be made available at a lower interest rate than normal prime-rates of commercial banks; however, with a lien on yarn and fabrics.

b. Cheap loans for investments, say for up to 8 years and within limits of Rs 1000 - 1500/loom.

With regard to a. and b. it is conceivable that HMG would initiate a differential-interest-rate credit system through the state-owned banks to help the weaker sections of the rural community. This seems a safer system than the establishment of district co-operative societies which are easier to be dominated by master weavers. The regional DCVI offices should assist the enterprises in the registration formalities, calculations of costs and profitability, administration, etc.
This credit system would enable the enterprise to pay cash for his raw materials, hence without financial ties to his supplier. Moreover he would pay a lower price.
To reach the target of 25000 looms in 1987/88, investment credits for 15000 looms x say Rs 1250 = Rs 18.75 million have to be provided in addition to working-capital credits for 25000 x 500 = Rs 12.5 million.

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Appendix

Par. A-5 of Chapter 8.

Multi-coloured checkered fabric in 24/25" width.

Original yarn consumption 126 gram/linear meter.

Composition: yarn consumption warp 60 gram/linear meter of Ne 20/2.
yarn consumption weft 66 gram/linear meter of Ne 10.

Warp: 50% bleached (=30gr/m) and 50% dyed (=30gr/m).

Weft: 67% bleached (=44gr/m) and 33% dyed (22gr/m).

Total bleached	: 74 gr x 2.2 Rs/kg	= 0.163 Rs/m.
Total dyed	: 52 gr x 6.6 Rs/kg	= 0.343 "
20/2 warp yarn	: 60 gr x Rs 29.7/kg	= 1.782 "
10's weft yarn	: 66 gr x Rs 20.9/kg	= 1.377 "
	Total expenditure	= 3.667 = 3.7 Rs/m.

The weaver gets a sales price of 4.6 Rs/m.
Hence gross profit: 0.9 Rs/m.
Production/day with 42 picks/inch and an effective speed of 30 picks/minute =

$$\frac{30 \times 60 \times 8 \times 0.914}{42 \times 36} = 8.70 \text{ m/day of 8 hours.}$$

Daily gross income: 8.7 x 0.9 Rs = 7.8 Rs/day/loom.

Yarn prices based on Kirtipur market prices:

	Kirtipur/Indian	KPL/Chinese
Ne 20/2	13.5Rs/lb = 29.7 Rs/kg.	10.45/lb = 23 Rs/kg.
Ne 10's	9.5 Rs/lb = 20.9 Rs/kg.	7.15/lb = 15.73 Rs/kg.
Ne 40/2	15.1Rs/lb = 33.2 Rs/kg.	14.9 /lb = 32.78 Rs/kg.

Coarse 36" Saree. Weight/m^2 : 100 grams.

Composition : yarn consumption warp 50.5 gr/linear meter of Ne 40/2.
yarn consumption weft 45.5 gr/linear meter of Ne 20's.

Dyeing costs: Warp 50.5 gr x 6.6 Rs/kg	= 0.333 Rs/m
Dyeing costs: Weft 45.5 gr x 6.6 Rs/kg	= 0.300 Rs/m.
Grey yarn costs. Warp 50.5 gr x 33 Rs/kg	= 1.667 Rs/m.
Grey yarn costs: Weft 45.5 gr x 22.5 Rs/kg	= 1.024 Rs/m.
	3.324 Rs/m.

Sales price for the weaver: 4.4 Rs/m.

Gross revenue: 1.05 Rs/m.

Production/day of 8 hours with 36 picks/" and 30 effective picks/min = 10.15 m.

Gross revenue/day/loom = 10.6 Rs.

If the warp preparation including drawing-in is done elsewhere, the gross revenue decreases with approx. 0.2 Rs/m = 2Rs/day.

If the fabric construction is reversed the grey yarn costs/m would be reduced with about 6 paisa/m, while the sales price would not alter. The gross revenue/m would increase to 1.1 Rs/m, however due to a 10% higher number of picks/" the production per day would decrease to 9.15 m and the gross revenue to around 10.-Rs/day/loom.

27" Blue Jeans (Denim).

Construction: warp 72 ends/inch Ne 20/2 (blue);
weft 42 picks/inch Ne 10 (grey).

Warp weight	124 grams/linear meter		
Weft weight	72 grams/linear meter		
	196 grams/linear meter	=	234 gr/m^2

Yarn consumption:	Warp 124 gr + 7% waste	133 gr.
	Weft 72 gr + 5% waste	76 gr.

Costs of raw materials:

Warp yarn	133 gr x 29.7 Rs/kg	Rs. 3.95/m
Dyeing	133 gr x 7 Rs/kg	Rs. 0.93/m
Weft	76 gr x 22 Rs/kg	Rs 1.67/m
	a. total expenditure	Rs 6.55/m
If warp preparation by outsiders		Rs 0.22/m
	b. total expenditure	Rs 6.77/m=Rs.6.8.

The retail price of imported denim is 27" width is Rs 13/m.

Denims are rapidly becoming popular and profit margins are high.

It is assumed that the weaver could get around 10 Rs/m, which leaves him a gross revenue of 3.2 Rs/m. However in the summary on page 69, a sales price of Rs 9.- has been assumed.

Production in 8 hours/day : 8.7 meters.

Gross revenue/day 8.7 x 3.2 = 27.8 Rs.

Yarn prices are based on Kirtipur market prices.

Annex V

DETAILED REPORT ON CHAPTER 9 OF I.S.C. STUDY - DECENTRALIZED SECTOR

A. Characteristics of the Decentralized Sector.

The Decentralized Sector has its own share in the supply of fabrics to the domestic market. It produces mostly coloured-woven textiles in short runs with a large variety in design and fabric-type; it stays close to consumer demand.

The large integrated mills cannot compete in this field with the decentralized sector.

On the other hand the decentralized mills should not try to compete with integrated mills by poorly imitating their production methods and set-up.

Competition from the very flexible handloom weaving sector especially in the more isolated markets can be expected although - in general - the decentralized sector should be able to produce at a higher quality standard.

The production units in this sector are, - almost by definition - privately owned and a "one-man show". The owner wants to be independent and call his own shots.

He must have a sound and practical managerial know-how, with emphasis on marketing.

The equipment does not have to be of modern design; however it must be in good shape. Provided the essentiality of good maintenance is understood and applied, the machines should last at least for 20 years and a depreciation rate of 5% is justified.

Compared with the large-scale mills the capital intensity is low and the labour-intensity still high, though much lower than in the handloom sector.

Mechanical spinning, because of the economy of scale, is not compatible with the definition of the decentralized sector. The Indian system of very small units (150 spindles) has not been superficially investigated and it is felt, perhaps prematurely, that the obtainable yarn quality is insufficient for the decentralized sector.

Location. Technically speaking the ideal location is in the Industrial Estates with their facilities for water, power, warehouses machine shops etc., in addition to the - more remote - chances for the establishment of specialized common facilities like yarn dyeing, sizing, etc. in more concentrated areas of textile enterprises.

The expression "more remote chances" is used because the entrepreneur in this section is a highly individualistic personality and usually not inclined to co-operate very much with his colleagues.
The 7 existing industrial Estates are also very suitable from a marketing point of view. So will be the future one in Surkhet.
Size. In both developed and developing countries the size of the enterprises varies from 10 to 80 looms with or without its own fabric finishing facilities. Though the specific conditions for favouring this sector vary considerably between countries, experience shows that 50 to 60 looms units have the best chance of profitability. The commercial ability to exploit markets is the dominant factor for success. It is assumed that the same factors apply in Nepal. An average of 56 looms per enterprise is taken as the basis.

B. Programme of Development.

After taking into account the envisaged production increase of the existing capacity, the unsatisfied production demand for the decentralized sector is:

Table 9-1. 1977/78 - 11.79 million meters (see Table 5-3)
1982/83 - 12.53 " "
1987/88 - 13.72 " "
1991/92 - 14.06 " "

B-1. Standard Capacity.

As the looms are not as sophisticated as in the large-scale sector and, moreover, are predominantly 4-shuttle looms equipped with dobbies or even jacquards, the average loom speed will be around 132 picks per minute for a 54" loom. Loom efficiency, due to frequent changes in warps and designs, will be around 70%. With the assumed (average) 48 picks per inch the production per day per shift is 22 meters.

B-2. Envisaged Production.

It is further assumed that the average unit will run in 2 shifts because it will be probably very difficult to find competent technical and supervisory staff to man the third shift, at least during the first five years.
Hence the total production per loom per year of 270 days will be 12760 linear meters in 40" finished width = nearly 13000 sq.m.; whereas for 1987/88 and onwards it has been assumed that partial working in 3 shifts increases the production.

Table 9-2 shows the required number of looms.

Table 9-2.	Unsatisfied produc. demand in mill.linear meters	Prod/Loom in linear meters	Required nr. of looms	Number of enterprises *
1977/78	11.79	12760	924	17
1982/83	12.53		982	18
1987/88	13.72	13600	1008	18
1991/92	14.36	14250	1008	18

*: At an average size of around 56 looms/enterprise.

Table 9-3.	(2)	(3)	(4)	(5)	(6)
Year (1)	Annual demand for decentr.sector in tonnes *	Yarn required to cope with the unsatisfied demand	(3) in mill. meters	Nr.of new enterpr.	Yarn demand p.new enterpr.
1977/78	1814	91%of(2)=1650 t.	11.79	17	97. t.
1982/83	2160	81%of(2)=1754 t.	12.53	18	97.4 t.
1987/88	2346	82%of(2)=1920 t.	13.72	18	106.7 t.
1991/92	2436	82.5% " =2010 t.	14.36	18	111.7 t.

9-3. Necessary Equipment for the standard mill of 56 looms.

Machines:	Hank-to cone winders: 140 spindles x $100=$14000	* Rs	175.000
	Warper, creel and beams	Rs	140.000
	Sizing machine and size cooker and small electric boiler	Rs	360.000
	Non-automatic pirn winder (40 spindles)	Rs	140.000
	Yarn dyeing (by hand on hanks)	Rs	35.000
	Weaving: simple non-automatic looms, however with weft feelers and warp stop motion:		
24	single shuttle dobby looms in 54" width	Rs	336.000
28	4-shuttle looms with dobby " " "	Rs	560.000
4	4-shuttle looms " simple jacquard in 54" w.	Rs	100.000
1	inspection table/plaiter	Rs	20.000
		Rs	1.846.000

		Rs 1.846.000
	Spare parts(5%)and accessories(12%) of investment	314.000
Buildings:	Production departments 1050 m^2 x Rs 70	73.000
	Offices and store rooms etc. 200 m^2 x Rs 60	12.000
Power and Light.	Installations, sundry plant and equipment	275.000
	4% contingency	96.000
	Total investment:	Rs 2.7 million

It is assumed that warp tying and reaching-in is done by hand.

B-4. Working Capital Rs 1 million.

B-5. Manufacturing Costs.

Personnel				
Direct :	71 empl.	skilled x Rs 4800/year	Rs	340.800
	53 "	semi-skilled x Rs 3600/year		190.800
	12 "	unskilled x Rs 2400		28.800
	136		Rs	560.400
Contingency: 8% for absenteism, illness, etc.				44.800
		Total	Rs	615.200
Indirect:	11 empl. (supervisors, maintenance, clerks)			72.000
		Total personnel costs	Rs	687.200
Power and Lighting	610.000 kwh/annum x Rs 0.40			244.000
Water	7500 m^3 x Rs 1.7/m^3			12.750
Sizing and dyeing materials				223.000
Other consumables and spare parts: 3% of mach. investment of Rs 1.846 million				55.400
Insurance	1% of fixed assets and movables (Rs 3.6 mill)			36.000
Maintenance	of building and elect. equipment 2%/annum of Rs 300.000			9.000
	Total manufacturing costs:		Rs	1.268.150
Depreciation	5% p.a. on machines of Rs 1.846 mill.Rs.			92.300
	3% p.a. on buildings of Rs 85.000=			2.550
	8% p.a. on sundry equipment and electr. installation			22.000
			Rs	116.850

Interest	5% per annum on total fixed assets of Rs 2.6 mill.	Rs 130.000
	10% interest on working capital of Rs 1 million	100.000
		Rs 230.000

Total depreciation and Interest Rs. 346.850.

Total production costs:	manufacturing	Rs. 1.268.150
	depreciation + interest	Rs. 346.850
		Rs. 1.615.000

Output in 1982/83 for 56 looms = 56 x 12760 m = 714560 meters(table 9-3).

Manufacturing costs per meter: 2.26 Rs/m = Rs. 119.5/100.000 picks (see also annex VI, page 99).

Yarn costs: 97.4 tonnes Ne 20 x Rs 22.44kg = Rs 2.185.656 = Rs 3.14/m.

Total production costs 5.40 Rs/m ex factory for the hypothetical standard quality in 40" finished width and 140 grams/m^2 (of which 70 grams are yarn dyed and 25 grams are bleached).

The profitability prospects based on a few calculations, were mostly not too attractive. However, it is repeated and emphasized that such calculations have only a limited value. The ability, initiative and drive of the private entrepreneur (who selects the right qualities at the right moment) is the crucial matter.

The total investment to reach the preliminary target of 982 new looms in 1983 in 18 enterprises would involve an investment of 18 x Rs.2.7 million = Rs.48.6, sat 50 million Rs. + 18 million working capital = Rs 68 million.

However, to find the entrepreneur and train the necessary personnel will probably be even more difficult.

Hence it seems realistic to accept a slower programme of implementation.

Table 9-4.

	Unsatisfied Prod.Progr. (mill.m.)	Additional number of looms req.	Installation progr.(number of looms)	Balance to be installed (number of looms)
1977/78	11.79	924	0	924
1978/79	11.89	8	56	876
1979/80	12.00	8	56	828
1980/81	11.75	-	56	772
1981/82	11.96	-	56	716
1982/83	12.53	42	112	646
1987/88	13.72	26	392	280
1991/92	14.36	-	280	0

Assumptions: 290 working days/annum, 2 shifts per day and from 1987/88 onwards partially in 3 shifts. Production per loom per shift: 22 meters.
Further scope. Though the main field of activities will be in the coloured-woven fabrics category (hand yarn dyeing being a satisfactory, simple and competitive operation) it can be of advantage to a few enterprises to widen their marketing scope by adding facilities for piece-dyeing and/or hand screen-printing.
In all honesty I have never been confronted with small-scale operations in these fields. However, I noted in West Africa that the large dyestuff manufacturers like Hoechst, Bayer, B.A.S.F. and I.C.I. are thoroughly familiar with it and I'll be glad to approach them if you feel it to be necessary. My personal opinion is that this would be too far-fetched at this moment.
In Indonesia (and perhaps in India?) - where small-scale weaving enterprises are largely concentrated in only a few areas - these problems were solved by "Common Facilities", each operating a fairly large scale of production (around 5 million meters per annum). These C.F.'s were mostly established by Co-ops under pressure of and partly financed by the Provincial Government or by the Central Government itself.

C. Marketing.

It was repeated several times in this chapter that the decentralized sector is considered to be in the sphere of the independent private entrepreneur with the profit motive as the strongest incentive. Backed by his knowledge of input prices, the quantitative and qualitative potentials and cost prices of his production, he keeps in constant touch with the market and "smells" its trends. On that basis he selects the most profitable fabrics he can produce. He sells through wholesalers and in the near markets direct to retailers. Hospitals and other textile consuming institutions who often have special fabric requirements can be his customers. The promotion of his trade-marks is important.

D. Financing.

The most important handicap will be to raise the finance for his capital investments of around 2½ - 3 million Rs, in addition to the necessary working capital of around Rs 1 million for the "standard" unit.
It is obvious that the Nepal Industrial Development Corporation should play the dominant role in financing the capital investment (say up to 75%) and the working capital (up to 50%).
It appears also that the I.S.C. is the most appropriate institution to screen proposed projects.

Annex VI

DETAILED REPORT ON CHAPTER 10 OF I.S.C. STUDY - LARGE-SCALE MILLS

10-A. - Spinning Section.

a. During the last few days of my stay in Nepal I was confronted with the Indian hand-driven spinning system (Ambar Charka), completely unknown to me. Unfortunately the few spindles installed near Kathmandu were in bad shape and did not allow a proper evaluation of the system. A strand of yarn was taken to the Dutch Fibre Institute TNO in Delft Holland for testing. Results are not yet available, but can certainly not be considered as a judgement of its potential technological performance.
The system certainly merits further consideration. Information can undoubted be obtained in India.
It appears to be particularly suited for remote rural areas where cotton can be grown and electric power is not available.
However, it is the expert's opinion that the yarn quality which can be obtained in this system may be too low for large-scale application with the possible exception of weft yarns for handlooms. For these reasons the system has not been included in this report. It is repeated that a further study in India is certainly worthwhile in view of relatively low investment costs and very high labour intensity.

b. The regular supply of cotton yarns to the handloom and decentralized sectors is of crucial importance for their existence and growth.
In annex II, section A (raw materials) the annual requirements of cotton yarns (incl. weaving waste) were calculated in table 6A1 and summarized hereunder (in tonnes):

TABLE 10 - 1.

YEAR	HANDLOOMS	Decentr.S.	SUB-TOTAL	LARGE-SCALE	TOTAL
	Yarn count Ne21.6	Count Ne20	Yarn count	yarn count Ne24	
1977/78	2955	1814	4769(Ne21)	3577	8346
1982/83	3549	2180	5729(Ne21)	4296	10025
1987/88	3821	2346	6167(Ne21)	4626	10793
1991/92	3967	2436	6403(Ne21)	4802	11202

The spindleage required to cope with the combined yarn demand for the handloom and decentralized sector is calculated on a conservative spindle speed of 11.700 RPM, an efficiency of 88% and a twist multiplier of 4.1. On this basis the production per spindle hour is 23.36 grams for Ne21, or, annually (in 235 days off 22.5 hours) 150 kg per spindle.

Hence the following number of spindles are required for 90% self-sufficiency of cotton yarns:

TABLE 10 - 2.

1977/78:	28614	spindles
1982/83:	34374	"
1987/88:	37000	"
1991/92:	38418	"

The aim at 100% self-efficiency would be irrealistic as there always exists a consumptionof speciality yarns in smaller quantities, which cannot be spun efficiently and competitively.

A spinning mill for an average yarn count of 21.- (with a range of Ne 14 - 40) can already be of economic size with 15.000 spindles. Hence the phased establishment of two mills of 17.000 to 19.000 spindles can be considered.

c. Cotton yarn supply to the large-scale mills with a calculated average count of Ne 24.

The spindle speed for cotton yarns is 12.000 RPM with an efficiency of 89% and a twist multiplier of 4.1. On this basis the production per spindle hour is 20 grams or per year of 285 days x 22.5 hours: 128.25 kg.

TABLE - 3 shows the spindleage required; (reference is made totable 6-B-2.

YEAR	COTTON YARN DEMAND (tonnes)	PROD. PER SPINDL. YEAR in 24	SPINDLEAGE REQ. FOR 100% SELF-SUF.	SPINDLEAGE REQ. FOR 90% SELF-SUFFICIENCY
1977/73	3577	128.25 kg	27890	25102
1982/83	4296	"	33497	30148
1987/88	4626	"	36070	32464
1991/92	4802	"	37442	33698

d. Supply of blended spun yarns to the large-scale mills.

In Chapter 6, table 6 - 2 the quantity of blended spun yarns was calculated. The average count is Ne 36. Spindle speed 12.000, efficiency 90%, twist multiplier 3.6, Production per spindle hour 12.51 grams = 80.2 kg/spindle year.

Table 10 - 4 shows the spindleage required.

TABLE 10 - 4.

YEAR	MMF SPUN YARNS DEMAND	PROD. PER SPINDLE YEAR in Ne 36.	SPINDLEAGE REQ. FOR 100% SELF-SUFFICIENCY	SPINDLEAGE REQ. FOR 70% SELF-SUFFICIENCY
1977/78	1127 tonnes	80.2 kg	14052	9836
1982/83	1354	"	16882	11818
1987/88	2272	"	28329	19830
1991/92	3312	"	41296	28908

In this case the realistic percentage of self-sufficiency was fixed at 70%, due to the larger variation in fibres (cotton, polyester and rayon) and the larger variation in MMF characteristics needed for specific fabric characteristics.

e. Observation.

In Chapter 5 (production demand) it is remarked that knitted /hosiery fabrics are not included in this report and consequently no spindleage for the 100% cotton, blended and continuous MMF is included.
Purely as a guideline it is mentioned that the 100% cotton and blended spun yarns used in modern knitted underwear normally have an average count of Ne 36. The yearly production per spindle of such yarns varies from 80 to 85 kg.

SUMMARY of spindleage required, based on the assumed realistic percentage of self-sufficiency.

TABLE 10 - 5.

YEAR	COTTON YARNS		BLENDED SPUN YARNS	TOTAL	GRAND TOTAL
	Handloom + decentr.sec.	Large-scale mills	Large-scale mills	Large-scale mills	
1977/78	28614	25102	9836	34938	63552
1982/83	34374	30148*	11818	41966	76340*
1987/88	37000	32464	19830	52294	89294
1991/92	38418	33698	28908	62606	101024

f. Location of spinning mills.

Raw cotton in the form of standard or high-density pressed bales takes little volume and can stand a lot of rough treatment in transport without damaging the spinning properties. However, around 10 to 12% waste loss in spinning is also being transported.
Spun yarns delivered on cones or bobbins by the spinning mill require a large volume and are much more liable to damage on long hauls.

* Including the Hetauda spinning section.

Yarns on hanks as presently imported are much more transport-resistent but require one unnecessary process for gray and piece-dyed fabrics. The weaving performance of yarns on hanks is normally inferior to yarns delivered on bobbins or cones.
Hence it is the modern view that the spinning mills should be as close as possible to the yarn consumers, which also implies that, as long as no yarn demand exists in cotton growing areas, there is not much purpose in building a mill in such areas.

It is clear from table 10 - 5 that there is ample room for a few spinning mills; deducting the 14685 spindles now being installed at Hetauda, around 62000 spindles would be required already in 1982/83. It is the expert's definite opinion that the Hetauda spindles cannot supply sales yarns to outsiders, as the Hetauda looms, at reasonable efficiency, will fully absorb the spinning production. In view of the preponderance of handlooms in the KTM Valley and the Balayu mill, in addition to several smaller mills in the Patan Industrial Estate, it appears logical to establish one mill in the KTM Valley, which should have first priority.
The range of yarn counts should be between Ne 10 and Ne 40, but before deciding definitely on this subject, an exhaustive contact should be established with future customers.
In appendix 10-A-1 a proposal of a 25200 spindle mill for 100% cotton yarns is presented. The sole criteria have been an economic size, competitive with imports, a superior yarn quality and an intermediate technology adapted to Nepalese conditions.
The mill should start production early in 1982 or earlier.
The annual production would be 3000 tons of average Ne 24 and as such provide a basic supply to all three sectors already represented in the KTM Valley.

The second step should be the consideration of a 50% extension of the spinning section of the Hetauda mill to be supplied by the original Chinese makers.

The proposed mill in the KTM Valley has the following characteristics:
Average count of Ne 24, with a range from Ne 10 to Ne 40. The output per spindle hour is 18.53 grams or in 285 days of 22.5 hours (6412 hours) = 119 kg/spindle year.
Due to the necessary flexibility to satisfy a basic demand for all three weaving sectors the production/spindle is slightly lower than for the specialized mill mentioned under par. 10 - A - c, of 20 grams.

The equipment consists of 50 ring spinning machines of 504 spindles = 25200 spindles, with the necessary preparatory equipment. Total annual production is 3000 tonnes of 100% cotton yarn, of which 20% = 600 tonnes will be doubled to partially satisfy a basic demand for Ne 40/2 for the handloom industry.
50% (=231 kg/hour) of the output will be supplied on cones and 50% on hanks (= 3000 tons/year less 1% winding waste).
The total investment costs in fixed assets are (in Indian Rupees):

TABLE 10 - 6.

Machinery	:	Rs. 50 million
Buildings	:	Rs. 18.5 "
Expatriate cost for erection	:	Rs. 0.675
contingencies and consultancy	:	Rs. 10.825
Total		Ind.Rs. 80 million =
		Nep. Rs. 112 million.

The assumed (and now very variable) rates of exchange for the various countries of origin are given in the appendix prior to par. 1.

Working capital
(see app. par.m.) Nep. Rs. 34 million.

Total capital required: N.Rs. 146 million.
It is emphasized that pre-operational expenses are not fully - and initial losses not at all - covered in the above calculation. According to my experiences - and those of large consultancy firms in developing countries in a similar stage of industrialization - it is financially sound to have access to an additional 15 - 20% to cover these rather intangible costs and to avoid financial deadlocks. Hence access to total financial resources of about 170 - 175 million Rupees would be very desirable, if not essential.

Power.
The installed capacity of motors and lighting is 2370 kw, the average load will be around 1660 kw with incidental peaks of around 2000 kw, annual power consumption 10.65 million kwh.
The air-cond. installation is an important power consumer, depending on climatic conditions at location. Cotton spinning is power-intensive and considerable heat is generated. Moreover the humidity both in the preparatory stage and in spinning should not exceed 50 - 55%.

Both conditions imply that the air-cond. installation in a hot humid climate, like the Terai, will be much more expensive and in extreme climatic conditions the installed power for air-conditioning can go up to 40% of the total.
In this plan for the KTM Valley the percentage taken is around 15, based on an approximation, taking climatic conditions into account. It is emphasized that the proper calculation of an a.c. installation is a very specialized job, requiring close cooperation with the architect and the machine suppliers.

Availability of electric power. The 2000 kw required may not yet be available in the KTM Valley. Installation of a Diesel-electric power plant would increase the total investment with around Rs.22 million and the price per kwh would be around 35% higher, adding about Rs 0.50 to the costprice of the yarn. Reference is made to the app., par. 2.

Personnel. A detailed breakdown of personnel is given in table 10 - A - 1 of the appendix. Based on 100% Nepalese labour and staff, the total personnel will be 374 persons with an annual wage/salary bill of Rs. 2.16 million. Total wage costs roughly Rs.0.72/kg.
However, the expatriate personnel necessary during the first four years is not included.
For the first 2 years the essential expatriate personnel, over and above the Nepalese staff will be:

One general manager at US$ 33.000/year	= N.Rs.	412.500
one chief engineer at $ 27.000/year	= "	337.500
one assistant mill manager at $ 22.000/year *)	= "	275.000
four shift supervisors at $18.000/year	= "	900.000
one quality control engineer at $22.000/year	= "	275.000
four maintenance engineers at $18.000/year	= "	900.000
	N.Rs.3.000.000 **)	

*): the assistant mill manager should be responsible for labour training.
**): including housing allowances, leave costs, etc., no income tax should be levied.

For the next two years the expatriate staff can be reduced to:

1 general manager	N.Rs.	412.500
1 assistant mill manager		275.000
2 shift supervisors		450.000
2 maintenance engineers		450.000
	N.Rs.1.787.500	

Perhaps good shift supervisors and maintenance engineers can be obtained from India, but they should have excellent credentials.

Cost of Production (without expatriate personnel) for 3000 tons/year.
No division of fixed and variable costs for personnel has been introduced.

1. Wages and salaries domestic-personnel:	Rs. 2.159.000(12%)
2. Power 10,644 million kwh x Rs 0.40	4.257.600(24%)
3. Water for air-cond. 30.000 m^3 x Rs 2.-	60.000(0.3%)
4. Maintenance costs production equipment (materials)	1.117.200(6.3%)
5. Consumption of consumables at Rs 0.12/kg	360.000
6. Maintenance costs of building, sundry plant and equipm.	780.000(44.4%)
7. Fire insurance 0.7% of fixed assets(N.rs.112 mill.)	784.000(4.4%)
Total of annual production expenses	Rs. 9.517.600(53.6%)
8. Depreciation:	
a. produ.equipm: 8% of Ind.Rs.44 mill.	= N.Rs. 4.928.000
b. sundry plant and equipm.12.5% of Ind.Rs. 6 mill.	= N.Rs. 1.050.000
c. buildings;3.3% of Ind.Rs.15.5 mill.	= N.Rs. 855.000
d. miscellaneous (design, consultancy, etc. 10% of Ind.Rs. 10 mill.	= N.Rs. 1.400.000
Total depreciation	Rs. 8.233.000(46.4%)
Total annual production costs	N.Rs. 17.750.600(100%)=

Rs. 5.92 per kg (without expatriate costs nor interest on capital employed. The Rs.5.92/kg thus represents the production costs/kg when all expatriate staff has departed; probably after 4 years.

If the doubling section with its corresponding winding capacity were eliminated the investment in fixed assets would be reduced with around Rs 5 million and the working capital with around Rs. 1 million.
Wages and power and consumables would be reduced with around Rs. 380.000. The net total production costs would be reduced with ar Rs. 810.000 or 0.2 Rs/kg, while the doubling costs for 40/2 would be around 1.30Rs/kg (excl. interest and expatriate costs).
Excl. the doubling section the production costs would be 5.64Rs/kg for average count of Ne 24, to be valid for the period when all expatriates have departed.
No time was available to calculate the spinning costs for each yarn count
Assuming that in the second two-years period full production has been attained, the remaining expatriate costs of Rs 1.738 million will add Rs 0.60 per kg to the production costs, which will then be Rs. 6.24
No time was available to estimate the production costs/kg for the first two years. In that period full production will not be achieved and the full expatriate costs of Rs 3.1 million have also to be borne

Not included are also the costs of financial bookkeeping, auditing, travelling, telephones and cables, directors fees, etc.

If a 4% interest rate is charged on the non-depreciated assets of 107 million (112 less 5 for doubling) + 8% on the working capital of 33 million, the cost prices increase with Rs 6.92 million or Rs 2.31/kg.

The summary is: TABLE 10 - 7.

a. Incl. doubling, without interest, after departure expatriates : Rs. 5.91

b. Excl. doubling, without interest, after departure expatriates : Rs. 5.64

c. Excl. doubling, with interest , after departure expatriates : Rs. 7.95

d. Excl. doubling, with interest , second two-years period : Rs. 8.55

e. Excl. doubling, without interest, second two-years period : Rs. 6.24

The raw material component in the total cost price of yarn is calculated as follows:

For 1 kg of yarn around 1.12 kg of raw cotton is consumed. The waste has a low commercial value and its revenue is neglected. Based on raw cotton prices of November 1977, which - incidentally - are remarkably close to the minimum price needed for the Nepalgunj cotton growing project (chapter 7), the following annual expenditure must be made:

20% of 3 mill.kg= 0.6 mill. x 1.12= 0.672 mill.kg x 5cts 63.5/lb x 2.2 = $ 938.748

80% of 3 mill.kg= 2.4 mill. x 1.12= 2.688 mill. kgx 5cts 62/lb x 2.2 = $3.666.432

$4.605.180 =

Rs 57.564.750 or Rs 19.19 per kg of yarn.

The resulting cost price of yarn for an average count of Ne 24 is given in TABLE 10 - 8.

a. Excl. Doubling, without interest, after departure expatriates : Rs. 24.83/kg

b. Excl. Doubling, with interest , after departure expatriates : Rs. 27.14/kg

c. Excl. Doubling, with interest, second two-years period : Rs. 27.74/kg

d. Excl. Doubling, without interest, second two-years period : Rs. 25.43/kg

During September and October 1977 the following prices of imported yarns were noted in the KTM Valley (made up on hanks, in bundles):

TABLE 10 - 9.

	N.T.L. (Chinese origin)	Indian	Pakistan
Ne 20	10.17/lb= 22.37/kg	10/3/lb= 22.66/kg	11/lb= 24.2/kg
Ne 30	11.50/lb= 25.3 /kg		
Ne 2/20	10.45/lb= 22.99/kg	13.5/lb= 29.7/kg	
Ne 2/40	14.91/lb= 32.80/kg	15.1/lb= 33.22/kg	

Lacking exact information it is estimated that the Indian sales price for Ne 24 would be around NRs. 24/kg.

At first glance the outcome is not very optimistic. Why?

It is clear that the price o f raw cotton is by far the most dominant factor in the total cost price. For case c. of table 10 - 8 with a cost price of 27.74 the raw cotton component amounts to 69%. It is not exactly known at what prices the Indian spinners obtain their domestic cotton, but quotations from the East India Cotton Association in Bombay may shed some light.

Without having graded such cottons it appears from these quotations that suitable cottons for Ne 24 are quoted at around 14.80 Rps/kg= N.Rs 20.7, thus above our assumed cotton input costs, whereas from Ne 20 the Indian cotton price is around 13.80= N.Rs. 18.32 (or around our assumed price) and for Ne 40 at 15.60= N.Rs. 21.84.

As already said no time was available to make the detailed calculations for the various yarn counts from Ne 10 to Ne 40. However, some rough estimates are now desirable.

At Ne 20 the production of the mill would be around 3655 tons per annum. On the basis of the same total annual production costs (not quite correct, because total irvestment costs and direct personnel costs would be slightly higher) of NRs 17.67 million the costs per kg would be Rs 4.79 less Rs 0.27= N.Rs 4.52/kg against Rs 5.64 for Ne 24, hence roughly Rs 1.1 less.

For Ne 40 the production would be 9.5 gram per spindle hour or 1535 tons per annum. Total yearly production costs would be around N.Rs 16.5 - 17 millions= Rs 11/kg less 0.27= Rs. 10.73 or roughlymx Rs. 5.1/kg more.

On these bases, combined with realistic raw cotton costs of 6.1 Sets/lb for Ne 20, 62 cts for Ne 24 and 63.5 cts for Ne 40, the production costs would be for case b of table 10 - 8:

TABLE 10 - 10.

	Ne 20	Ne 24	Ne 40	Ne 40/2
production costs	4.60	5.64	10.75	12.-
raw cotton costs	18.80	19.10	19.6	19.6
Total c.Rs/kg	23.40	24.74	30.35	31.6
and for the more realistic case c of table 10 - 8:				
expatriate costs	+ 0.49	+0.60	+ 1.16	+ 1.16
	25.89	25.34	31.51	32.76,

which are now much more in line with the Indian and Pakistan yarn prices and for 40/2 at par with the NTL price of Chinese origin. However, it should be kept in mind that we are now basing the Pegaleso production costs on more specialized mills with less flexibility and certainly not for a range from Ne 10 to Ne 40.
It is also remarked that these kind of calculations have only a relative value, being based on cotton prices of a certain moment. Reference is made to chapter 7 (Cotton Development Project) in which the enormous cotton price fluctuations of the last few years are shown. The present variations in the foreign exchange rates add another disturbing factor, both for cotton and machinery prices.
Bearing in mind that the proposed flexible mill of 25200 spindles as described above probably is not optimal with regard to both efficiency and competitive position, it was considered to propose the establishment of one mill of 30656 spindles to cover the basic needs of the handlooms and decentralized sector, consisting of two specialized sectors:

- one for an average count of Ne 20 with a range of Ne 10 - Ne 24 and an average production/spindle of 163.5/kg/annum; a balanced unit should have 14400 spindles = 2354 tonnes/annum;
- one for an average count of Ne 36, with a range from Ne 24 to Ne 40, with 16256 spindles and a yearly production of 1246 tonnes.

The combined production of the 2 sectors would be 3600 tonnes/annum. This mill would be of optimum efficiency, however, its investment cost would be higher and less direct personnel would be employed, the expatriate and supervisory staff would remain about the same. It is likely that only Swiss or German machinery will be adequate. No time was available to further study and calculate the consequences of such optimum mill, but further investigation seems justified.
The spinning capacity needed for the large-scale weaving mills- for which integration of spinning and weaving is often very appropriate- will be discussed ib a later phase.

10 - B. WEAVING SECTION.

a. The following resumé from table 5 -4 of chapter 5 shows the unsatisfied demand for woven fabrics allocated to the large-scale weaving mills (in millio meters):

	Cotton	MMF
1977/78	19.52	15.42
1982/83	11.83	16.57
1987/88	14.22	30.65
1991/92	15.50	46.57

b. In annex chapter 6, page 1 an average weight of 138 gr/linear meter, a width of 106 cm and 52 picks per inch are assumed for cotton fabrics.

For the selection of the appropriate type and width of looms, the following aspects have to be considered.

It is quite certain that in line with world developments the average fabric width in Nepal will increase in the future. The trend in the USA is to 44 - 48" fabrics, whereas in Europe, with the large acceptation of the very sophisticated very wide Sulzer weaving machines in the industry the trend is to 58 - 63" (150-160 cm) finished width. (The Sulzer loom can take 2 fabrics of 63" width side by side). The main advantage of these wide width fabrics in high-wage countries is in reducing the weaving, dyeing and finishing costs in addition to cheaper garment-making.

Garment-making will, in all probability, not play a role in Nepal in the next ten years and hence does not affect the decision on loom width.

Much more decisive is the type of loom (automatic or not).

Non-automatics are build in India, a 64" loom with all accessories costs only aroun N.Rs. 20.000, whereas a sophisticated automatic loom from Belgium or Switzerland is priced at arcund USD 15.000= N.Rs. 187.500; while the Japanese Toyoda automatic loom, running at 160 PPM costs around N.Rs. 85.000 cif.

TABLE 10 - 11 gives a simplified calculation for the above looms.

		INDIAN	EUROPEAN	JAPAN
	1. Speed in 64" reed space	160 PPM	220 PPM	160 PPM
	2. Efficiency	80%	91%	90%
m)	3. Prod./year of 6412 hrs.	24054 m.	37934 m.	27060 m.
	4. Looms/weaver	4	24	24
	5. Prod./weaver/year	96216	902016	649440
	6. Wage/weaver/year	N.Rs.6600	6600	6600
	7. Wage cost/meter	N.Rs. 0.0686	0.0073.	0.0102
	8. Price loom incl. accessories cif Calcutta	N.Rs. 20.000	187.500	85.000

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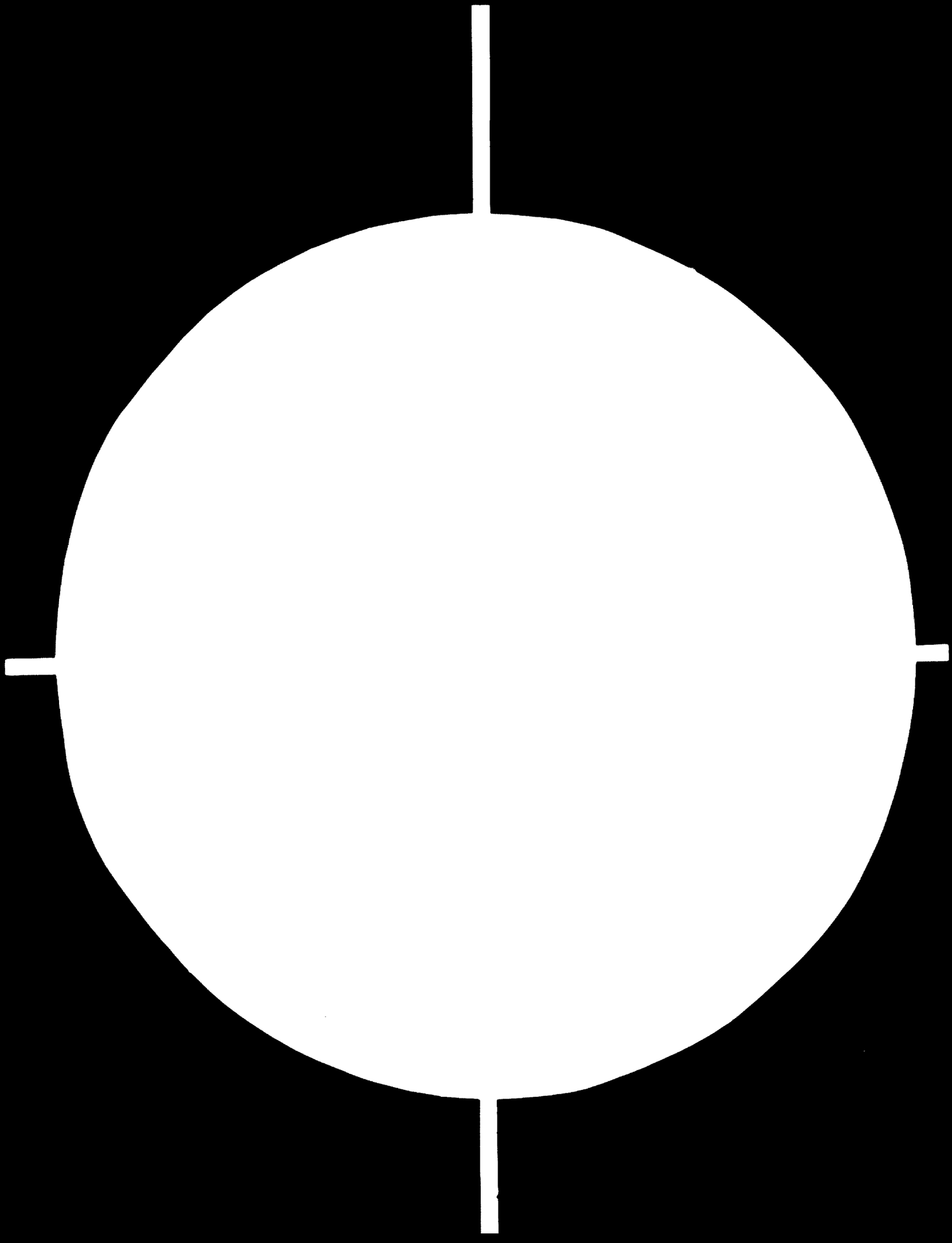

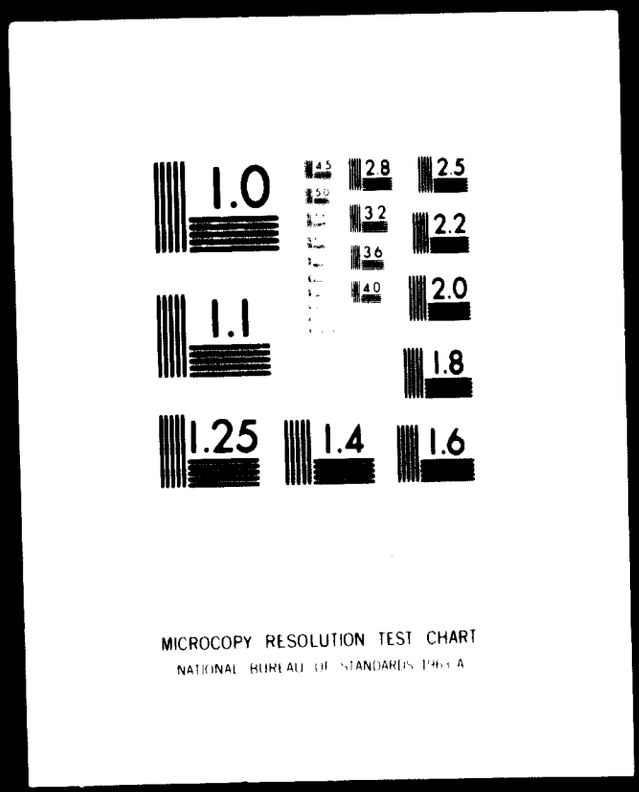

		INDIAN	EUROPEAN	JAPAN
MM) 9. yearly depreciation(5%) and interest (4%)	N.Rs.	1800	16875	7650
10. (9) in N.Rs/meter		0.0748	0.4490	0.2627
11. (9) and (10) per 100 m.	"	14.34	45.63	29.29

M) : Based on a fabric width 52 picks/".

MM) : The depreciation of 5% per annum for automatic looms is very low; at the normal 8% the difference in favor of the non-automatic loom becomes even higher.

This table clearly shows that for Nepalese conditions the non-automatic loom is economically preferable, in addition to the fact that labour employment is much higher.

For the sake of interest it is mentioned that in the Netherlands with wage costs of N.Rs 180.000 per man-year, the wage cost per 100 m would be Rs. 187 on the non-automatic and Rs. 19.96 on the Eur. automatic loom, thus completely reversing the picture.

It is emphasized that the table only researches the two main cost factors. Power and costs of spares for automatics are higher and expatriates would be required for a much longer time.

The Swiss Rüti automatic loom is now built in India by Lakshmi; prices are not yet known but even at 50% of the Swiss price the conclusion of table 10 - 11 would not alter.

It is a proven fact that in a well-run organization an automatic loom produces a more regular fabric with less weaving faults. However, considering that the present Indian imports must be, objectively, graded as second choice, these fabric appearance facts do not play any role for cotton fabrics.

As regards the loom width it is proposed to install 3/4 of the required weaving capacity in 140 cm width and 1/4 in 175 cm width, enabling the production of finished fabrics in max. 120 cm resp. 150 cm width, thus providing a certain flexibility in the production programme. Consequently, the finishing plant should be based on a maximum of 150 cm finished width.

To cope with the unsatisfied production demand as mentioned under 10 - E - a, the following loom specifications are relevant.

A 140 cm non-automatic loom will run at a speed of 170 PPM and its effective yearly production for the assumed average quality (52 picks/") will be: $\frac{170 \times 0.3 \times 60 \times 6412 \times 0.0144}{52 \times 36}$ = 29560 meter,

while for the 170 cm loom (at 160 PPM) and 75% efficiency the yearly production will be 23452 meter.

The average production for the two width will be 3/4 x 25560 + 1/4 x 23452 = 25055 meter.
Table 10 - 12 shows the number of looms required.

TABLE 10 - 12.

(Cotton looms only). Single shuttle looms.

	Production demand	Production/loom	Number of looms
1982/83	11.83 million m.	25055	472
1987/88	14.22 million m.	"	568
1991/92	15.50 million m.	"	618

This is quite an efficient and manageable size for one single mill in a developing country. However - though it was assumed in chapter 5 that 70% of the market demand should (and could, technically and economically) be produced - it would imply that this one mill would have to produce a wide range of grey fabric qualities with many yarn counts.
These implications would put a high strain on the technical know-how, management and efficiency.
Hence common sense commands a reduction in size, which is proposed at 25%. Hence the number of looms would be:

TABLE 10 - 13.

1982/83	360
1987/88	420
1991/92	460

d. Detailed calculations were made on the investment and production costs of the 1982 mill of 360 single-shuttle looms and the 1991 mill of 460 looms. Reference is made to app. 10 - B (Weaving).
The outcome is given below.

APPL 10 - 14:

A. Investment costs (fixed assets)

	1982/83	1991/92
1. Production equipment	NRs. 13.938.000	NRs. 17.033.000
2. Sundry plant and equipment	2.960.000	3.380.000
3. Building, site clearing and fencing	9.433.000	11.477.000
4. Erection costs	1.183.000	1.339.000
	NRs. 27.534.000	33.229.000
5. 4% contingencies	1.101.000	1.332.000
6. 10% for design, consultancy and supervision	2.754.000	3.329.000
Total investment in fixed assets:	NRs. 31.389.000	NRs. 37.950.000 =
per loom	NRs. 87.200	NRs. 82.500.

B. Working Capital. (app. 10 - B - 1).

NRs. 10.5 million. NRs. 15.3 million.

C. Annual production costs.

1. Wages production and general service personnel for 413 men in '82 and 507 in '91.	NRs.	2.767.800	NRs.	3.403.800
2. 10% reserve		277.000		340.400
3. Supervisionary personnel 7 in both years		84.000		84.000
4. Management domestic, 14 persons		166.800		166.800
5. Expatriates (partly Indian) 10 men		1.535.000		none
Total: 444 in '82, 523 in '91:	NRs.	4.830.600 (48.0%)	NRs.	3.995.000 (33.4%)
6. Power installed 953 resp. 1162 kw; 1982 annual cons. 4.014.300 kwh x Rs.0.40	NRs.	1.605.720 (16.0%)		
1991 annual cons. 5.071.400 x Rs.0.40			NRs.	2.028.560 (19.7%)
7. Water 1300m³ (softened and purified), resp. 1650m³ at Rs.2/m³.		2.600		3.300
8. Sizing materials		384.000 (3.8%)		484.800 (4.7%)
9. Spare parts and consumables Rs.0.25/loom hour resp. 1693/ loom year		577.000 (5.8%)		737.000 (7.2%)
4% on value of sundry plant and equipment		113.200 (1.2%)		135.200 (1.3%)

	1982/83	1991/92
10. Building maintenance(paid to outsiders)2% on value	189.700(1.9%)	229.500(2.2%)
11. Fire insurance. 0.7% of fixed assets and inventory loss foundations	270.000(2.7%)	308.000(3.%)
Total rpoduction out of pocket expenses NRs.	7.977.820(80.8%)	7.920.960(77.2%)
12. Deprociation		
a. 6% of value prod.equip. of resp.Rs13.9 and 17.1 million	834.000	1.026.000
b. 10% of sundry plant and equipment	298.000	338.000
c. 3.3% of buildings,etc.	312.300	378.700
d. 10% of erection costs	118.300	139.900
e. 10% of contingencies, design,consultancy	338.500	466.100
Total of annual depreciation costs	1.900.000(19.2%)	2.349.000(22.8%)
13. Total of annual production costs without interest charges NRs.	9.878.000(100%)	10.270.000(100%)

If a 4% interest charge is levied on the non-depreciated fixed assets of NRs. 31.4 resp. 38.- million and 8% on the working capital of Nrs. 10.6 resp. 13.3 million, the total production costs will increase with 2.104 resp. 2.58 million NRs.

Hence total production cost incl. interest:

1982/83: 11.982 mill.Rs. for 9 mill. meters = 1.33 Rs per meter.

1991/92: 12.85 mill.Rs. for11.5 mill. " = 1.12 Rs per meter.

It is reminded that 75% of the number of looms are able to weave fabrics with a finished width of 120 cm and 25% with a finished width of 150 cm. The production costs per meter for the two loom widths:

	1982183	1991/92
140 cm loom	Rs 1.30/m	Rs. 1.09/m
175 cm loom	Rs 1.41	Rs. 1.19/m

for the standard fabric with 52 picks per inch.

As the production per loom is dominantly determined by the number of picks per length of fabric the normal parameter used in weaving cost claculation for fabrics is the cost per 100.000 picks. If the yarn count, quantity in weight and cost of yarns are known in addition to the picks per inch, the cost calculation of any grey fabric is a very simple matter.

In our case the costs per 100.000 picks are:

	1982/83	1991/92
140 cm looms	Rs. 63.5	Rs. 53.2
175 cm looms	Rs. 68.9	Rs. 58.1

How does our costprice compare with actual grey cloth fabrics found in the market?

Our yarn weight consumed per mete including waste is 136.3 grem. Yarn price for Ne 24 is Rs 24/kg.

Yarn cost/m	Rs. 3.28
Production cost 1982	Rs. 1.30
Cost price	Rs. 4.58 for 115 cm grey width
+ 10% in retail	46
	Rs. 5.04 which is fully in line with similar grey

fabrics found in the KTM market.

Comparison with Hongkong.

In October 1977 the price of perhaps the worlds largest-selling grey cloth construction of 60/60 - 20/20 (60 ends and picks/" with Ne 20 in warp and weft) was quoted fob Hongkong at 37 cts/m in 36" width= Rs. 4.63.

For production in Nepal, based on the KTM import price of Chinese yarn of Rs 22.37, the costprice would be (also for 36" grey width): yarn weight/m = 143 gr x Rs 22.37 = Rs. 3.20. Picks/m: 2364, production cost/m Rs 1.50; total Rs 4.70 in 1982 and Rs 4.45 in 1991 for a fabric which, due to its narrow width is slightly more expensive per m^2 to produce than our standard fabric.

Conclusion: it can be concluded that a weaving mill of the described size is economically justified and can be beneficial to the country, especially in the 1991/92 size.

e. MMF Mills Unfortunately no time was available to calculate the MMF mill. However a few observations are made.

On page 11 the unsatisfied production demand is assessed, while in the app.to chapter 6 a distribution of 55% to 100% MMF and 45% to blended (spun) yarns is assumed. On these bases the unsatisfied production demand is:

	Total	Blends	100 % MMF
1982/83	16.57 m.m.	7.46 m.m.	9.11 m.m.
1987/88	30.65 m.m.	13.79 m.m.	16.86 m.m.
1991/92	46.57 m.m.	20.95 m.m.	25.61 m.m.

It is first of all remarked that the required febric appearance level of MMF fabrics is much higher than for simple cotton fabrics. Moreover although MMF yarns give a good weaving performance they are

much more sensitive to stress and as a consequence a better engineered loom is essential. In actual practice that means automatic looms.

Considering that:

1. the width is larger
2. the picks per inch are higher

) ref. app. chapter 6

the number of looms to satisfy the production demand is calculated as follows:

the width of finished fabric is 132 cm, which requires a loom with a reed space of 160 cm. Such looms have a speed of 180 ppm and an efficiency of at leadt 85%. At the average of 65 picks/inch the annual production in 6412 hours is 23000 meters. Hence required:

TABLE 10 - 15	Blended	100 MMF	Total
1982/83	324 looms	396 looms	720 looms
1987/88	600 looms	733 looms	1333 looms
1991/92	910 looms	1113 looms	2023 looms

It is clear that the establishment of MMF weaving mills deserves close attention of the I.S.C. the 2 sections should be physically separated.

10 - F - f. Investment in the weaving sector (large-scale mills).

The total investment to supply the unsatisfied production demand of the MMF section can be roughly estimated at:

up to 1982/83: 720 looms x Rs.180.000 = Rs. 129.6 million
up to 1987/88: 1333 looms x NRs.180.000 = Rs. 240.- million
up to 1991/92: 2023 looms x NRs.180.000 = Rs. 364.- million

With regard to the cotton sector of the large-scale mills it is reminded (table 10-12 and 10-13) that the number of looms which should be installed is the actual number calculated in par 10 - d.

Investment:

up to 1982/83 : 360 looms x Rs 87.000 = Rs. 31.4 million
1987/88: 420 looms x Rs 85.000 = Rs. 35.7 million
1991/92: 460 looms x Rs 82.500 = Rs. 38.- million

10 - G. Finishing section.

No time was available for this section, nor could the very detailed market research - followed by technological analyses - , necessary to determine the size and type of equipment, be properly initiated. If the necessity arises for such investigation, it is suggested to request the services of a dyeing and finishing specialist, who could do the job in around 2 months in Nepal, followed by another month to prepare the report. However, it must be expected that much time will be lost in correspondence with suppliers and hence the report can probably be finalized in around 4 - 5 months from the date of arrival in KTM.

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Appendix

10 - A - 1 - SPINNING PLANT

A cotton spinning plant of 25200 spindles is envisaged with an average count of Ne 24 and a range of Ne 10 to Ne 40.
The flexibility to cope with all yarn counts demanded by all three sectors of the weaving industry without losing a fundamental efficiency is incorporated in the design.
The average production(output) per spindle hour is 18.53 gram or 467 kg/hour for 25200 spindles = 2.995 million kg/annum of 6412 production hours.
It is remarked that the production per spindle hour of 18.53 grams for Ne 24 is lower than the one of 20 grams assumed in par 10-A-c, because it is expected that the mill will have to spin a rather large gamma of yarn counts in the first few years. This necessary versatility affects the efficiency to some extent.

The main machinery is based on two suppliers, the LAKSHMI Machine Works Ltd. in Coimbatore, India, and RIETER Machine Works of Winterthur Switzerland. The former is the licensee of the latter.
In my world-wide experience the Swiss machinery is the best in the world and now installed in large volume in developing countries by those entrepreneurs who also have considerable experience with Japanese and other (cheaper) machinery.
The inclusion of the Lakshmi machines which are built on the Rieter designs, reduces the total investment cost to an acceptable level.
Prices are based on a Rieter offer of August 1977 and a Lakshmi offer of October 26, 1977.

Rate of Exchange.

1 U.S.$	=	8.9 Indian Rupees
1 U.S.$	=	2.35 Swiss Francs
1 U.S.$	=	12.5 Nep.Rupees
1 Ind. Rupee	=	1.40 Nep.Rupees
1 Swiss Franc	=	3.80 Ind. Rupees
1 Swiss Franc	=	5.32 Nep. Rupees

1. Equipment

a. 50 Lakshmi Ring Spinning Frames of 504 spindles 70 mm gauge 45 mm ring and 230 mm tubes. Drafting system R2R3G:

Price/machine f.o.b. Coimbatore Ind.Rs.280.000 =Ind.Rs. 14.000.000

b. 8 Lakshmi Flyers type G.S. of 108 spindles 12" x 6½":

Price/machine fob Coimbatore Ind.Rs.296.000 =Ind.Rs. 2.368.000

c. 2 x 5 Rieter Drawframes type DO/2:

Price/machine cif Calcutta Sw.Frs. 53610 =Ind.Rs. 2.037.200

d. 20 Rieter High Prod. Cards type C1/3RL:

Price/machine cif Calcutta Sw.Frs. 117260 =Ind.Rs. 8.912.000
AEROFEED System Ind.Rs. 772.200

Ind.Rs. 6.870.600

e. Rieter Blowroom machinery

Grand total of Spinning Machinery	Ind.Rs. 34.960.000
Spare parts 3%	1.050.000
Accessories 7%	2.448.000
	Ind.Rs. 38.458.000
3% transport Coimbatore-Calcutta-KTM	1.154.000
	Ind.Rs. 39.612.000
1% contingencies	388.000
	Ind.Rs. 40.000.000

f. WINDING MACHINERY

Cone-winding.

It is assumed that 20% of the production of the spinning mill (=20% of 467 kg/hour = 93 kg/hour) must be doubled to supply the handloom industry with its Ne 40/2 warp yarn. The input for doubling machines must be on cones. Furthermore it is assumed that 50% of the total sales of the spinning mill will be delivered on cones.

Actual input of yarn for coning:

93 kg/hour of Ne 40 for doubling = 92 kg output

235kg/hour of Ne 24 (average count) =233 kg output.

Production per cone winding spindle on Ne 40 at 900 yds/min and 65% efficiency is 475 gr/hour. Thus 200 spindles are required. For Ne 24 at 900 yds/min and 60% efficiency the production per spindle hour is 730 grams. Thus 322 spindles are needed.

Total cone spindleage: 200 + 322 = 522 spindles = 5 machines of 120 spindles, providing the necessary reserve and safety margin.

KMM of Bombay offers on behalf of one of its associates the P.S.-Mettler (India) coner which is build on the basis of the famous Swiss Mettler machine with electronic slubcatchers.

Price/machine of 120 spindles	Ind.Rs. 235.300	= Ind.Rs. 1.176.500
5% spare parts		58.825
5% for wooden cones, knotters, boxes etc.		58.825
		Ind.Rs. 1.294.150
Delivered at mill site 4%		51.766
		Ind.Rs. 1.346.000
		= Ind.Rs. 1.350.000

Hank Winding.

At 450 yds/min and 70% efficiency a hank-winding spindle produces on Ne 24 around 420 grams/hour. For the required production of 142 kg around 340 spindles are needed. However, it is also assumed that 91 kg of doubled yarn (Ne 40/2) must also be rewoundeon hanks for sale to the handloom industry. At 475gr/sp/hr 192 spindles are needed.
Total 532 spindles = 5 machines of 120 spindles.
These machines are built in India; prices, however, are unknown to me. It is a much simpler machine than the cone winder, without electonic slubcatchers and precision engineering. It is estimated that the price f.o.b. India will not be more than Rs 125.000 incl. reels and spare parts for a 120 spindle machine:

Investment for 5 machines	Ind.Rs. 625.000
delivered at mill site 4%	25.000
	Ind.Rs. 650.000

6. DOUBLING (Twisting).

To produce Ne 40/2 and to a lesser extent Ne 30/2 and Ne 20/2 doubling frames are required. Based on Ne 40/2 exclusively the production per spindle at 11.000 Rpm and 83% efficiency with a twist multiplier of 4.0 is 24.2 grams/hour. Required 92 kg/hour = 3802 spindles. Actual output 91 kg.
The price of a Lakshmi conventional doubler of 480 spindles 75 mm gauge 50 mm ring is estimated at Rs.204.000 fob India.

Investment for 8 machines = 3840 spindles		= Ind.Rs. 1.632.000
3% spare parts		48.960
2% for bobbins and boxes		32.640
		Ind.Rs. 1.713,600
3% transport to mill site		51.108
Total investment		Ind.Rs. 1.765.000

Another way to achieve the same end is the two-for-one twisting system as build in Europe and Japan. It has its advantages for very high-grade fabrics, but its investment costs are at least 3 times higher for the same production and its installation is not justified for Nepalese conditions.

Summary of machinery investment costs.

(a - e)	Spinning machinery	Ind.Rs. 40.000.000
(f)	Winding machinery	Ind.Rs. 2.000.000
(g)	Doubling(twisting)	Ind.Rs. 1.765.000
	Total	Ind.Rs. 43.765.000

h. Sundry plant and equipment.

Air-conditioning based on a LUWA (Swiss) installation. Central stations system. 6 units x sw.frs. 160.000=Sw.Frs. 960.000= Ind.Rs.3.648.000 fob Europe + 9% for delivery at mill site = Ind.Rs. 3.976.000.

In all likelihood a similar satisfactory installation can be bought in India at half the price: Ind.Rs. 2.000.000

Workshops (electrical and mechanical)	:	Ind.Rs. 450.000
Simple laboratory	:	Ind.Rs. 220.000
Transformers, lighting and electrical installation	:	Ind.Rs. 2.200.000
Water, compressed air system, fire fighting, fork trucks, internal transport equipment and sundries	:	Ind.Rs. 850.000
Total costs at mill site	:	Ind.Rs. 49.485.000
1% contingencies	:	Ind.Rs. 515.000
		Ind.Rs. 50 million

i. Erection costs for expatriates.

European machinery: 12 man-months x Rs.45.000	=	Ind.Rs. 540.000
Indian machinery: 18 man-months x Rs. 7.500	=	Ind.Rs. 135.000
		Ind.Rs. 675.000

j. Building costs.

1. Production departments incl. provisions for air-cond: Spinning section 6930 m^2.
Winding/doubling sec. 1780 m^2
Total 8710 m^2 = 93754 square feet x Ind.Rs. 150/sq.ft = Ind.Rs. 14.063.000

The above cost per sq.foot of 150 Ind.Rs. is much higher than the 100 Nep.Rs. given to me in Nepal for reinforced concrete constructions. However, the Nepalese price in comparison with other developing countries is definitely too low for the necessary solid construction, dust-resistant flooring, good heat insulation, complicated build-in overhead air-cond. ducts with return-air channels in the floors, etc. The figures for the Hetauda spinning section, which is of similar construction, should provide a foothold.

2. Non-production buildings like wardrobes, toilets, laboratories, workshop, overseers and manager office, First Aid clinic, building for the a.c. installation etc. normally take 35% of the footage for production rooms = 32800 sq.ft.x Ind.Rs. 80 = Ind.Rs. 2.624.000

3. Raw materials, yarn and waste godowns 25.000 sq.ft. x Ind.Rs. 50 = Ind.Rs. 1.250.000

4. Site clearing, roadworks and fences Ind.Rs. 500.000

Total building costs Ind.Rs.18.437.000=
Ind.Rs.18.5 million.

k. LAND. 30.000 square meters P.M.

l. Summary of total investment costs in fixed assets.

(h) machinery, sundry plant and equipment	Ind.Rs. 50 mill.
(i) expatriate cost for erection	Ind.Rs. 0.675 mill.
(j) buildings	Ind.Rs. 18.5 mill.
Total	Ind.Rs. 69.175 mill.
4% Contingencies	2.767 mill.
Grand total Ind.Rs.	71.942 mill.
10% for design, consultancy and supervision	7.194 mill.
roughly Ind.Rs. 80 million =	Ind.Rs. 79.136 or Nep.Rs. 112 million.

Included are: local assistance during exction
180 man-months at Rs.500=Rs.90.000 +
local contingencies = Ind.Rs. 200.000.

m. Working Capital.

1. Direct Materials.

Approx. 4 months of cotton stock. Raw cotton requirement 1.12 kg per kg of yarn. Monthly yarn output 250 ton.
Total requirement 4 x 250 x 1.12 = 1120 tons;
Assumed price at mill site 63.5 $cts/lb for 80% (middl. 1 1/32") and 65$cts/lb for 20% (str.m. 1 1/16").

Total Financial requirements:US$ 1.572.000x 12.5 Nep.Rs.= N.Rs. 19.65 mill

Transport: N.Rs.19.65 mill.

2. Stocks in processing
   ½ Month production = 125 ton x N.Rs.20.000 = N.Rs. 2.500.000
3. Finished product stock.
   ½ month production = 125 ton x N.Rs. 22.500 = N.Rs. 2.812.000
4. Wages and salaries (2 months). N.Rs. 360.000
5. Power Bills, etc. N.Rs. 1.740.000

TOTAL N.Rs.27.06 mill.
+ 25% cash reserve 6.94 "
Minimum working capital requirement N.Rs. 34 million.

P.S. Stocks of spares and consumables are included under fixed assets. For other items a balance between debtors and creditors is assumed.

n. In fixed assets: N.Rs. 112 million
Working capital: N.Rs. 34 million
N.Rs. 146 million
15% reserve 22 million
N.Rs. 168 million, say 170 million.

It is emphasized that pre-operational expenses are not fully - and initial losses not at all - covered in the above calculation. According to my experiences in other developing countries in a similar stage of industrialization it is financially sound to have access to an additional 15 - 20% to cover these rather intangible costs and to avoid deadlocks.

2. POWER

The installed power is:

Spinning section	1656.8 k.w.
cone and hank winding	57.5 "
doubling: 8 x 17 kw	136 "
lighting: 13 watts x 11760 sq.m.	152.9 "
	2003.2 k.w.
air-cond.: 15% of installed power	300.5 "
compressed air and miscellaneous	66.3 "
	2370.0 " ,

with an average load of 1660 kw and an annual consumption of 10.644.000 kwh. Peak load will be around 2000 k.w.

It is emphasized that the air-cond. installation is based on climatic conditions in the KTM Valley. In the Terai the installation will consume considerably more power. For such location a detailed project calculation by expert firms like LUWA (Switzerland), LTG (West Germany) or Carrier (USA) is required.

Cost per kwh: Rs 0.40, hence the annual electricity bill will be around N.Rs. 4.257.600.

If regular public supply of electricity cannot be guaranteed it will become necessary to instal a Diesel-Electric plant with 3 - 1000 kw units (one for reserve).
The very approximate cost erected at site ready for operation will be around $600/kw= $ 1.800.000 = N.Rs. 22.5 million. The fuel consumption will be 224 grams per kwh= 2384 tonnes/annum of Diesel oil B.S.2869, 1967 classification bl-2, 10.200 cal/kg.
Based on June 1977 figures supplied by VMF Stork of the Netherlands, the total exploitation costs (cash flow) will be around Rs.0.22/kwh, incl fuel and lubricants, spare parts, maintenance and service personnel (at Dutch levels).
15% Depreciation and interest on the invested capital of Rs.22.5 mill. will add another Rs 0.32 per kwh. Hence the costprice/kwh will be around Rs.0.54 or 35% above the price of public supply.
For the spinning mill the yearly extra costs for own power generation will be Rs.1.490.000 compared with public supply - apart from the necessity to invest an extra Rs.22.5 mill. - adding Rs.$ 0.5 per kg of yarn output.
It is evident that from a purely costs and investment point of view the mill should not become operational before sufficient and stable public supply of electricity becomes available.

This gloomy picture changes slightly whenever a fully integrated mill with bleaching and dyeing facilities will be established. The latter require a lot of steam, which can partly be generated by an exhaust boiler on the Diesel engines. In this way the spinning mill can generate about 0.62 tonnes of saturated steam of 12 ato 665 calories per hour for say yarn sizing (slashing) or yarn dyeing.

3. Personnel and Personnel Costs.

a. Spinning Section.

Semi-skilled (for three-shift operation), direct personnel, machine operators:

Ring frames 50 machines =	25 op/shift	=	75 operators
Doffing	8/shift		24 "
Flyers	4/shift		12 "
Draw frames	3/shift		12 "
Cards	2/shift		6 "
Blowroom	2/shift		6 "
			135 operators
	10% reserve pers.		14 "
Total for spinning section, semi-skilled			149 operators

Skilled:

Maintenance 3 x 3 + 3	12
Laboratory and quality control	4
Electricians and mech. workshop	5
Total skilled + 5% reserve	22

Unskilled.

Warehousemen (2), sweepers (6), oilers (2), guards (3) and miscellaneous (3)	16
Total unskilled	16
reserve	2
	18

Summary Spinning Section:

Semi-skilled	: 149 x Rs 450/months	N.Rs. 804.600/annum
Skilled	: 22 x Rs 600/month	158.400 "
Unskilled	: 18 x Rs 350/month	75.600 "
	189 operators	N.Rs.1.038.600 "

Supervision

1 supervisor per shift ring room to
1 supervisor per shift preparation(blow room and incl flyers)

Total 6 supervisors x Rs 1000/month	N.Rs.	72.000/A
1 quality control engineer at Rs 1200/M		14.400/A
1 assistant spinning manager at Rs 1500/M		18.000/A
Total 8 men	N.Rs.	104.400/A.

EXCLUDING expatriate personnel for the first 2 two-years periods.

b. Winding Section.

Semi-skilled direct labour at Rs 400/M.

1. Conewinding.

Ne-24. Prod./spindle: 730 grams/hour or 9.125 bobbins (weight per bobbin 80 grams). One operator can handle around 200 bobbins/hour and hence tend 200 : 9.125 = 22 spindles. The production/operator is 200 x 80 grams = 16 kg. Required production: 235 kg/hour = 15 operators/shift.

Ne-30-40. Production/spindle on Ne 40 = 475 grams = 5.94 bobbins. At 200 bobbins/operator/hour the production/operator can tend 200 : 5.94 = 34 spindles, producing 16 kg. Required production/hour 93 kg : 16 = 6 winders/shift. Total for conewinding: 3 x (15 + 6) = 63 winders + 10% reserve = 70 winders x Rs 400/M = Rs. 336.000/A.

2. Hankwinding.

Production programme: 142 kg of Ne 24/hour
91 kg of Ne 40/2/hour.

Ne 24. Prod/spindle = 420 grams/hour = 5.25 bobbins/hour. One operator can handle about 160 bobbins/hour and hence tend 160 : 5.25 = 30 - 31 spindles, producing 12.8 kg. Required 142 kg : 12.8 = 11 winders/shift.

Ne 40/2. Production per spindle 475 grams = 4.75 bobbins (bobbin weight 100 gram). At 160 bobbins/hour/operator (= 16 kg/h), one operator can tend 160 : 4.75 = 34 spindles. 5.7 operators/shift are required.

Total for hankwinding 16.7 x 3 = 50 winders are needed + 10% reserve = 55 winders = 55 x Rs 400/m = Rs. 264.000/annum.

Total for winding:

direct labour 125 winders x Rs 400/m =	N.Rs. 600.000/a
3 transporters/handlers/shift x Rs 350/m=	37.800/a
	N.Rs. 637.800/a
one maintenance man for three shifts at Rs 600/m	7.200/a
Total	N.Rs. 645.000/a.

Supervision: one supervisor/shift for winding and doubling = 3 x Rs 1000/m = Rs 36.000/a, of which 2/3 = Rs 24.000 is charged to winding.

Total personnel costs for winding: N.Rs. 669.000/annum.

c. DOUBLING

4 Operators/shift can easily do the necessary, while supervision is shared for 1/3 with winding.

Total wage costs 3 x 4 = 12 operators x Rs 450/m	N.Rs. 64.800/a
10% reserve	6.480/a
share in supervision	12.000/a
	N.Rs. 83.280/a.

General overheads for the mill.

one mill manager at Rs 2500/m	N.Rs. 30.000
one chief engineer Rs 1800/m	21.600
one personnel manager 1800/m	21.600
3 general maintenance mechanics at Rs 800/m	28.800
1 air-cond. mechanic at Rs 800/m	9.600
2 drivers at Rs 500/m	12.000
3 personnel management assistants at Rs 800/m	28.800
3 trainers at Rs 800/m	28.800
3 storekeepers at Rs 700/m	25.200
8 clerks and administrative personnel at Rs 600/m	57.600
26	N.Rs. 264.000/a

TABLE 10 - A - 1.

Summary of personnel force and their annual costs, excluding expatriate staff for the first 2 two-years periods:

SEMI-SKILLED			UNSKILLED		SKILLED	
Spinning:	149 operators	= Rs 804.600	18	= Rs 75.600	22	= Rs 158.400
Winding :	125 "	= Rs 600.000	9	= Rs 37.800	1	= Rs 7.200
Doubling:	13 "	= Rs 71.280	-	-	-	-
	287	Rs 1.475.880	27	113.400	23	Rs 165.600

Supervision:

Spinning: Rs 104.400 for 8

Winding/
Doubling: Rs 36.000 for 3

Rs 140.400 for 11 men.

General Overheads:

26 = Rs 264.000.

T O T A L: 374 employees and staff at an annual cost of N.Rs. 2.159.280.

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10 - B. Weaving.

In Table 10 - 13 of Chapter 10 it is shown that for 1982/83 360 looms are envisaged, producing around 9 million meter, while in 1991/92 the total production would be around 11.5 million m. The assumed average fabric has the following construction:

finished width : 106 cm, loom-state (grey) 115 cm = 45.3";

contraction : warp 7%, weft 8%;

width in reed : 124.3 cm = 48.9";

Warp Ne 24 : 56 ends/" in grey cloth = 60.8" finished cloth;

Weft Ne 24 : 52 picks/";

Number of ends in warp : 56 x 45.3" = 2536 ends + 32 for selfedges = 2568 ends;

Warp weight per linear meter : $\frac{2568 \times 1.07 \times 454 \times 1.0936}{24 \times 840}$ = 67.7 gr.

Weft weight per linear m. : $\frac{52 \times 48.9 \times 454 \times 1.0936}{24 \times 840}$ = 62.6 gr

130.3 gr. + 5% waste = 136.8 gram.

	1982/83	1991/92
Warp yarn consumption :	9 mill.m.x 71.08gr. = 640 ton	11.5 m.m. = 817 ton
Weft yarn cons:	9 mill.m.x 55.73gr = 592 ton	11.5 m.m. = 756 ton
Total	1232 ton	1573 ton

a. Coning/Warping. In first instance it is assumed that the warp yarn will be bought on cones and only one small coner is required to re-wind remnants of max. 10% of the warp consumption = 80 ton in 6412 hours/annum = 12.5 kg/hour or 37.5 kg/hour in single shift.

Production/spindle on Ne 24 for a simple machine without slub-catchers is around 600 gr/hour. Hence a machine of 60 spindles will be ample. Estimated costs at mill site L.Rs. 100.000.

Warping. For 11.5 mill.meter, needed in 1991 the calculation for the required warping quality is as follows:

for one weaving beam of 2568 ends 5 warping beams each of 514 ends are needed. Total warping lengths 11.5 m.m. x 5 x 1.10 (maximum contraction in weaving) = 63.2 million meters.

Warping speed 450 m/min, at a normal efficiency of 45%, the effective production is 200 m/min., which equals in 6412 hours/annum: 6412 x 60 x 200 = 77 million meters.

Hence one machine will be loaded for 64% in 1982 and 82% in 1991.

This is quite an acceptable proposition.

The price of one warper in 160 cm width and a 600 ends creel of Indian origin delivered at mill site is estimated at	M.Rs. 460.000
30 warping beams at M.Rs. 8000	240.000
24 creel trucks at M.Rs. 5400	130.000
spare parts	25.000
	M.Rs. 855.000
3% contingencies	25.000
Total investment	M.Rs. 880.000

b. Sizing: A 5-cylinder machine running on the assumed quality of 2568 ends Ne 24 will have an effective minimum production of 220 kg/hour. For the 817 tons required in 1991 the machine must run 3714 hours. Hence there is ample reserve capacity.

The cost of a 5-cylinder machine of Indian origin offered by MTM on a German (Zell) license with a maximum width for weavers beams of 72" between flanges = M.Rs. 880.000

size mixing cooking and storage kettles	280.000
storage racks for 150 loom beams	120.000
2 beam trucks	48.000
floor scale	60.000
	M.Rs.1.388.000
3% contingencies	72.000
	M.Rs.1.460.000
Installation costs(indian) 3 man-months	22.500
Total	M.Rs.1.482.500 or M.Rs. 1.49 million

The number of beams that must be changed on the looms, based on 1800 m/beam (incl. weaving contraction) will be 11.5 million: 1800 = 6388 in 1991 and 5000 in 1992 or -1/hour in 1991.

It is normal that one in every four beams must be drawn-in, while 3 in every four are tyed together with a warp-tying machine.

The drawing-in machine has an effective capacity of 500 ends/hour, each beam of 2568 ends therefore takes 5.14 hours; 0.25 beams must be produced per hour hence 1.30 machines = 2 machines must be installed, thus creating an adequate reserve for new warp constructions (which must always be drawn-in).

The warp-tying capacity must be 3/4 beam/hour in 1991 of 3/4 x 2568 ends= 1926 ends/hour.

The machine has an effective production of 3600 ends/hour, thus one machine must be installed.

Investment (based on Japanese machines):

2 drawing-in (also called reaching-in) machines delivered at mill site 2 x $ 3400	= N.Rs. 85.000
1 warp-tying machine $ 15500	195.000
spare part 7% of $ 22.300	19.500
	N.Rs. 299.500=
	L.Rs. 300.000
3 single beam trucks	24.000
Total	N.Rs. 324.000

d. Weft Winding. Weft yarn consumption in 1982: 592 tons/annum = 92.52 kg per hour in 1982/83. The very reliable Swiss Pirn winder (Schärer) has an effective production per spindle hour of 0.38 kg on Ne 24 (input on cones). Hence 104 spindles are required = 9 machines of 12 spindles.

Price delivered at mill site 9 x Sw.Frs.42.000 fob	Frs. 378.000
3% spare parts	11.340
Total fob	389.340
11% ocean freight, insurance and inland transport	42.327
	Sw. Frs. 432.167 =
	N.Rs. 2.300.000

The Japanese Murata machine has an effective production per spindle of 0.41 kg/hour- Hence 225 spindles are required = 14 machines of 16 spindles. Price delivered at mill site 14 x $ 14.400= $172.800 cif Calcutta

~~CIF Calcutta~~ + 5% spare parts	$181.440
delivered at mill + 4%	$188.700 x 12.5=
	N.Rs. 2.360.000

Based on my experience in the Far East and Europe the Swiss machine is much better engineered and gives much less trouble in maintenance. Thus the Swiss machine is preferred. The machine will require no erection costs (shipped in one case).

SELMET in India (MH) also quotes for Pirn Winders without giving adequate details. Presumably it is a copy of the Murata machine. Based on such premise the investment costs would be N.Rs. 1.150.000 or half the price of the investment in Swiss machines. Further investigation is desirable.

No Pirn stripping machine has been envisaged, because of low labour costs for unskilled young labour which can do this job.

Further requirements: 120 wooden weft boxes x N.Rs 300 =	N.Rs. 36000
1 hand pallet truck	7000
3 weft transport trucks	29000
	L.. s. 72.000

Total investment (Swiss machines) in 1982: NRS.2.372.000= NRS 2.400.000.
In 1991 the annual weft consumption has increased to 756 tons for which 154 spindles = 12 machines of 12 spindles are required.
Total extra investment, incl. accessories: NRS.300.000.

e. Weaving. As mentioned in Table 10 - 13 the installation of 560 looms in 1982/83, increasing to 460 in 1991/92 is proposed.

Investment costs:	1982	1991
270 looms in 140cm width x NRs 19.000, incl. accessories	5.130.000	
90 looms in 175cm width x NRs 21.000, "	1.890.000	
345 looms in 175cm width x NRs 19.000, "		6.555.000
115 looms in 175cm width x NRs 21.000, "		2.415.000
extra beams, cloth rollers, pirns, healds, harness frames, reeds, etc. at 9%	630.000	807.000
spare parts at 5%	350.000	459.000
Total investment	N.Rs.7.950.000	10.227.000= 10.250.000

f. Cloth inspection. A cloth cropping and shearing machine is not envisaged. A cloth inspection; measuring and folding table can produce around 1000 m/hour, depending on weaving faults.
For 9 million meters in 1982, 9000 machine hours = 2 machines in two shifts are needed whereas for the 11.5 m.m. in 1992 the same 2 machines in 3 shifts are adequate.

Investment costs, based on Indian machines:	1982		1991
1 machine in 150 cm width	NRs. 51.000		
1 machine in 180 cm width	56.000		
2 industrial sewing machines	12.000		
input pallets and 2 handfork trucks	75.000	+	25.000
output pallets + 2 handfork trucks	100.000	+	20.000
	NRs. 292.000	+	45.000 =
			Rs. 337.000.

The inspected fabric will be folded and then stored on pallets, each with 20 pieces of 60 meters.

g. Sundry plant and equipment. An air-conditioning plant for a mill in the KTM Valley will not be necessary, because cotton weaving needs an ambient temperature of 25 - 30° C and a humidity of 75 - 80%.
In the cool dry season additional humidification will be required, whereas the heat generated by the looms will probably be sufficient to maintain the right temperature provided the building is reasonably insulated.
In the hot wet season adequate ventilation must be provided to maintain reasonably comfortable working temperature of max 36° C.

The cost of this ventilation and humidification equipment is estimated at NRs. 700.000, whereas for the Terai an installation of at least NRs. 1.8 million will be required (excl. the extra building costs).

Workshops (electrical and mechanical)	NRs. 320.000
Simple yarn and fabric testing equipment	160.000
Transformers, lighting and electrical installation, water supply, compressed air (for cleaning), fire fighting and sundries	1.800.000
	NRs.2.280.000

Total costs for KTM Valley: NRs.2.280.000 + 700.000= NRs.2.98 mill.= 3 million.

for Terai : NRs.2.280.000 + 1.8 mill= NRs 4.1 mill.

It is remarked that an more exhaustive estimate of the ventilation/ humidification installation can only be made by specialized firms (see spinning section) in collaboration with the architect. It is assumed that the 1991/92 plant will require an extra investment of NRs. 400.000 ?

h. Expatriates cost of erection 1992/93.

		Extra for 1991.
Indian Text.tech. 44 man-months x NRs.10.500/m	: Rs. 462.000	10 man-months= Rs. 105.000
Japanese(drawing in and tying in) incl. instruction 2 man-months x Rs.50.000	: Rs. 100.000	
Sundry plant and equipment:		
ventilat.&humidif. 6 m.m.		
electr. installat. 24 m.m.		
workshop, lighting and compressed air 12 m.m.		
42 m.m.x Rs.10.500	Rs. 441.000	Rs. 84.000
Total expatr.costs	Rs.1.003.000	+ Rs 189.000
Local assistance 360 m.m. x Rs 500	180.000	54 m.m.x Rs.500= 27.000
Total erection	Rs.1.183.000	+ Rs. 216.000

i. Building (windowless with forced ventilation and humidification for item 1. to item 6.)

	1982/83	1991/92
1. Weaving 270 looms(140cm)x 11m^2	2970 m^2	345 looms= 3795 m^2
90 looms(175cm)x 12½m^2	1125 "	115 " = 1438 "
2. Warping 24 x 12 m^2	288 "	288 "
3. Weft winding (Schärer mach.)	180 "	240 "
4. Drawing-in and Tying	100 "	100 "
5. Coning	30 "	30 "
TOTAL	4713 "	5891 "
At NRS.150/sq.ft=RS.1615/m^2	: NRs.7.610.000	NRs. 9.514.000
6. Sizing(high bldg.with natural ventilation) 360m^{2}x [Rs. 100/sq.ft	: NRs. 387.500	NRs. 337.500
7. Cloth inspection and storage, yarn storage(good floors) 570m^{2}x Rs.75/sq.ft	: NRs. 460.000	NRs. 549.000(680m^2)
8. Workshop, offices, stores for spare parts and accessories, locker-and restrooms,corridors 550m^2= 6245 sq.ft x Rs 60	: NRs. 375.000	NRs. 426.500(660m^2)
9. Site cleaning, roadworks and fences	: NRs. 600.000	NRs. 600.000
Total 6223m^2 at a cost of	NRs.9.432.500	NRs.11.477.000(7591m^2)
or 17.3m^2/loom		or 16.5m^2/loom.

It is estimated that for location in the Terai the total building costs would be Rs.600.000 resp. 700.000 higher due to changes in the building construction and the addition of underfloor channels for air-cond. installation.

j. Size-cooking, and sizing require a heating medium. Normally it is done by steam from a boiler. In view of the very expensive fuel oil for this boiler it is proposed to install an electric boiler or, more revolutionary to install electric heating devices in the size cooker, storage tanks, size box and dying cylinders. I have taken up this matter with Gebrüder Sucker P.O.Box 275, Mönchengladbach, Federal Republic of Germany.
In the absence of their information it is assumed that the necessary equipment will require an expenditure of Rs. 500.000.

k. Summary of investments in fixed assets.

Production Equipment.		1982/83	1991/92.
1. Coning	NRs.	100.000	100.000
2. Warping		880.000	880.000
3. Sizing		1.490.000	1.490.000
4. Drawing-in and tying		324.000	324.000
5. Weft winding		2.372.000	3.172.000
6. Weaving		7.980.000	10.230.000
7. Cloth inspection and making-up		292.000	337.000
8. Heating medium for sizing		500.000	500.000
Total for production equipment	NRs.	13.936.000	17.033.000
9. Sundry plant and equipment		2.080.000	3.380.000
10. Building, site cleaning, fencing		9.435.000	11.477.000
11. Costs for erection		1.163.000	1.399.000
	NRs.	27.534.000	33.289.000
4% for contingencies		1.101.000	1.332.000
10% for design, consultancy and supervision		2.754.000	3.329.000
TOTAL investment	NRs.	31.389.000	37.950.000
Per loom	NRs.	87.192	82.500

1. Working Capital.	1982/83	1991/92
One month of yarn stocks	103 tons	131 tons
Assumed yarn price	NRs. 24/kg	24/kg
Money value	NRs. 2.472.000	3.144.000
Stocks in course of processing (one month)	100 tons	125 tons
Value at Rs.28/kg	NRs. 2.800.000	3.500.000
Grey cloth(one month production at Rs.32/kg	100 tons NRs. 3.200.000	125 tons 4.000.000
Factory supplies	400.000	500.000
	NRs. 8.472.000	10.644.000
25% contingencies	2.118.000	2.661.000
TOTAL working capital	NRs. 10.6 million.	13.3 million.

It is assumed that debtors and creditors are in balance with each other.

m. Installed Power

	1982	1991	Annual Consumption 1982	Annual Consumption 1991
Coning	6 kw	6 kw	8.500 kwh	11.000 kwh
Warping	20 kw	20 kw	29.600 "	37.900 "
Sizing/cooking	29 kw	20 kw	46.600 "	59.500 "
Drawing-in/tying			negligible	negligible
Weaving	565 kw	718 kw	2.308.000 "	2.950.000
Cloth inspection	3 kw	3 kw	10.800	13.800
Lighting	88 kw	106 kw	565.000 "	680.000 "
Ventilat./hum.	70 kw	88 kw	360.000	451.400
Air-compressors, etc.	45 kw	56 kw	230.800	301.800
Elec.heating for sizing	100 kw	100 kw	262.000	335.000
Miscellaneous	36 kw	45 kw	193.000	291.000
Installed:	953 kw	1162 kw	Cons.: 4.014.300 kwh	5.071.400 kwh
			At Rs.0.40/kwh= Rs.1.605.720	Rs.2.028.560.

n. Personnel (Domestic) 1982/83.

1. Direct personnel.	Unskilled	Semi-skilled	Skilled	
Yarn store	1			
Coning		1		
Warping	2	6		
Sizing	2	4	2	
Drawing-in		6		
Tying	3		3	
Weft winding		9		
Pirn stripping	4			
Weavers			270	
Bobbin carriers	6			
Empty pirn carriers	3			
Cloth rolls carriers	6			
Beam gaiters			3	
Cleaners/Sweepers	9			
Overlookers/fixers			12	
Oilers/greasers		9		
Maint.weaving prepar.			12	
Cloth inspection	2	4		
Cloth storage	3			
Clerks + storekeepers			9	
Guards		6		
	41	45	311	Total: 397
2. Whereas for 1991:	51	51	389	491

3. General services 1982.

General maintenance			5
Electricians			3
Fire fitter etc.			2
Administr.clerks			4
Laboratory		1	1
Drivers			2
	1982/83:	1	15
	1991/92	No change,	

4. Summary and annual costs 1 to 3.

	Unskilled	Semi-skilled	Skilled
1982:	41 x Rs 350/m=Rs.172.200	46 x Rs 450=Rs.248.400.	326 x Rs 600= Rs.2.347.200.

Total: 413 men at an annual cost of NRs. 2.767.800.

1991	51 x Rs 350/m=Rs.214.200	52 x Rs 450=Rs.280.800.	404 x Rs 600= Rs.2.908.800.

Total: 507 men at an annual cost of NRs. 3.403.800.

5. Supervision (both for 1982 and 1991).

1 supervisor per shift weaving-preparation	= 3	
1 supervisor per shift weaving	= 3	
1 supervisor for clothroom and storage	= 1	
Total		7 x Rs.1000/m= Rs. 84.000/a.

6. Management. (both for 1982 and 1991).

1 mill manager at Rs 2500/m	Rs. 30.000/a
1 assistant mill manager at Rs 1800/m	21.600
1 personnel manager Rs 1800/m	21.600
3 personnel management assistants Rs 800/m	28.800
1 quality control officer at Rs.1000/m	12.000
3 trainers at Rs 800/m	28.800
4 secretaries/typists at Rs 500/m	24.000
Total: 14 persons	Rs.166.800/a.

7. Total personnel and annual cost (without expatriates:

1982: 434 persons at an annual cost of Rs. 3.018.600

1991: 528 " " " Rs. 3.654.600.

8. Expatriates. (1982/83) over and above the Nepalese staff.

1 General manager at US$ 30.000/year	Rs. 375.000
1 chief engineer at US$ 24.000 /year	300.000
1 assistant mill manager at US$ 20.000/year	250.000
1 supervisor weaving-preparation at US$ 18000,	225.000
3 shift supervisors weaving at US$ 15.000	675.000
3 maintenance engineers at US$ 18.000	675.000
10 men at an annual cost of	Rs.2.500.000.

1992/93: No expatriate personnel should be required.

9. Summary of total personnel costs:

1982 : NRs. 5.518.600

1991 : NRs. 3.654.600.

It is quite conceivable that a major part of the expatriate staff for 1982 can be recruited from India. In that case the total personnel costs for 1982 may be reduced to arcund NRs. 4.55 million.

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DETAILED REPORT ON CHAPTER 11 OF I.S.C. STUDY - LOCATION

It is a proven (but socially regrettable) fact that in all developing countries any private entrepreneur will try to establish his textile factory close to the main cities. His sound way of reasoning is that the vicinity of a larger town has the following advantages:

a. He is usually close to higher-placed government officials, whose cooperation he will need in many respects;
b. the bottlenecks in the supply of water and electricity, telephone, road systems are less;
c. if he produces consumer goods he is close to the main markets and can keep his finger on the pulse with regard to changes in consumer preferences, so important for his future profits;
d. there is usually already a nuclues of industrial mentality and labour is better educated. Educational facilities, so essential for promotion of labour to supervisory and lower management staff are usually lacking in rural areas;
e. there is usually already some embryonic industrial infrastructure like small machine and repair shops, whereas in rural areas he himself has to take care of these essentialities, unless such facilities can be provided in industrial estates like Hetauda;
f. perhaps even more important is the willingness of expatriates to live outside the KTM Valley, where educational and recreational facilities may be below their satisfaction. This particularly applies to overseas expatriates - of whom only a minority will be willing to live in Biratnagar, Birgunj, Nepalgunj or Butwal/Bairawa; it applies less to Indian expatriates.

On the bases of these arguments it is recommended to establish the large-scale weaving mills and more in particular the TF weaving mills in the KTM Valley, whilst the decentralized sector should be encouraged in the 7 industrial estates (+ the forthcoming one in Surket). See also chapter 9.

The location of handlooms is discussed at length in chapter 8.

In order to maximize rural income it is recommended to develop the handlooms in rural areas; however, as much as possible concentrated around market centres. The relevant aspects of location are dealt with in par. B-2-b, B-2-c, C-2-1 and C-3.

It is felt that the Department of Cottage and Village Industries (DCVI) puts too much emphasis on the development of the handlooms in the KTM Valley.

In view of many aspects which still have to be researched by the LCVI, it is too early to give more definite recommendations.

Location of spinning mills.

In view of the preponderance of handlooms in the KTM Valley and the urgent necessity to guarantee their yarn supply, the presence of the Balaju mill and several small-scale mills in the industrial estates, it is recommended to establish the first cotton mill of 25 - 30.000 spindles in the KTM Valley.

The integrated cotton mill with around 15.000 spindles and 420 looms should preferably also be located in the KTM Valley, but any point on the cross-roads of the East-West Highway and the main arteries with India is not excluded, provided there is sufficient water the whole year through.

A further spinning mill for cotton and blended yarns is envisaged in a later phase (beyond 1982/83). Its location depends to a certain extent on the further penetration of blended yarns by the Biratnagar industry.

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Annex VIII

DETAILED REPORT ON CHAPTER 12 OF I.S.C. STUDY - MANPOWER PLANNING

A. Labour requirement.

1. Handlooms. In par C-1 of chapter 8 it is calculated that 15410 additional ordinary handlooms should be installed in 1987/88 or an average of 1500 looms in 10 years. Based on the two-loom family unit (consisting of two adult weavers and 3 adolescent helpers) the labour recruitement during 10 years must be around 1500 weavers per annum.

In addition it is envisaged to install 3 units of 100 semi-automated handlooms in 1982/83 and another three for 1987/88. Their labour requirement is 128 persons per unit.

Summary of the labour requirement for the handloom sector:

	up to 1987/88
Ordinary	15410
S.A. units	768
Total	16193.

2. Decentralized sector To meet the targeted new production of 13.72 million meters in 1987/88, 18 additional units (of an average size of around 56 looms/unit) must be installed.The labour employment is 148 direct labour and 11 indirect labour (supervisor, maintenance and clerks) per unit.

Total recruitement:

Direct labour	:	18	x	148	= 2664
Indirect "	:	18	x	11	= 198
Management	:	18	x	2	= 36
			Total		2898.

3. Large-scale mills.

Cotton weaving. Based on the deliberations as outlined in chapter 10, tables 10-12 and 13 about 420 cotton looms would be justified in 1987/88.

Based on table 10-13 the requirement of direct labour and general services is 1.25 man/loom.

Hence to be recruited for 1987/88	:	525
supervisory personnel	:	7
management	:	14
Total		546.

MMF Mills. In table 10-15 the targeted number of new looms is 1333 for 1987/88. The direct labour and general service personnel for these wider, automated looms can be estimated at 1.- person per loom.

Thus required in 1987/88 :	1333
(for 3 mills) supervisory personnel:	27
(for 3 mills) management, trainers, clerks	57
Total	1417

Spinning (incl. winding). In table 10-5 it is calculated that a total of 90.000 spindles (including the Hetauda spinning section) is required in 1987/88 to supply the weaving industry. This spindleage should be established in 4 mills. The labour employment (incl. Hetauda) can be estimated as follows:

Direct personnel, incl. winding and general services:

12.5/1000 spindles=	12.5 x 90 =	1125
Supervisory personnel	4 x 10 =	40
Management, training, clerks etc.		64
	Total	1229

TABLE 12-1 - Summary for 1987/88

	Direct pers.	Supervision	Managem.	Total
Handlooms	16198	-	-	16198
Decentr.sector	2664	198	36	2898
Large-scale cotton weaving	525	7	14	546
Large-scale MMF weaving	1333	27	57	1417
Spinning	1125	40	64	1229
	21845	272	171	22288

TABLE 12-2.

It is interesting to note the labour intensity for weaving:

Handlooms:	Target 87/88:	23.27 m.m..	Direct labour/mill.m.:	696
Decentr.	" "	13.72 m.m.	" " "	194
Large-scale cotton	" "	10.5 m.m.	" " "	50
Large-scale MMF	" "	30.65 m.m.	" " "	43

B. Technical expertise.

For the ordinary handloom sector no special new expertise will be required provided the recommendation of the establishment of a separate division (within the DCVI) for the development of the home weaving interprises is implemented (page 18-20, chapter 9). If required this division can assist also in the establishment of S.A. handloom factories, as they already have gathered some experience with this type of loom.

The Decentralized Sector requires 18 additional units, which are - almost by definition - in the realm of private enterprise. It can be expected that the entrepreneurs will find their own way to acquire the technical expertose (probably from India).

The one new cotton mill in the large-scale sector will need 10 foreign experts as outlined in item 8, appendix 10-B.

For the three weaving mills envisaged in the MMF weaving sector (blends + continuous filament) around 12 expatriates will be required. The technical know-how required (a lot of technical "tricks" and a higher level of technology) is totally absent and cannot be readily found in India because of its rather undeveloped state with regard to MMF and more in particular in the non-cellulosic sector, which is the growth sector.

Spinning. For the three new mills (now excluding Hetauda) an expatriate staff of 12 per mill is considered to be essential. Total 36. Reference is made to page 90 (chapter 10).

C. Training needs.

For the handloom sector reference is made to section C-5, page 73 and 74 (chapter 8) in which the training aspects are discussed in extenso. A "Masterplan" of training has to be drafted by the DCVI which - in view of the many-sided aspects - is outside the scope of this assignment..

For the S.A. handlooms the DCVI should render assistance by providing properly trained trainees.

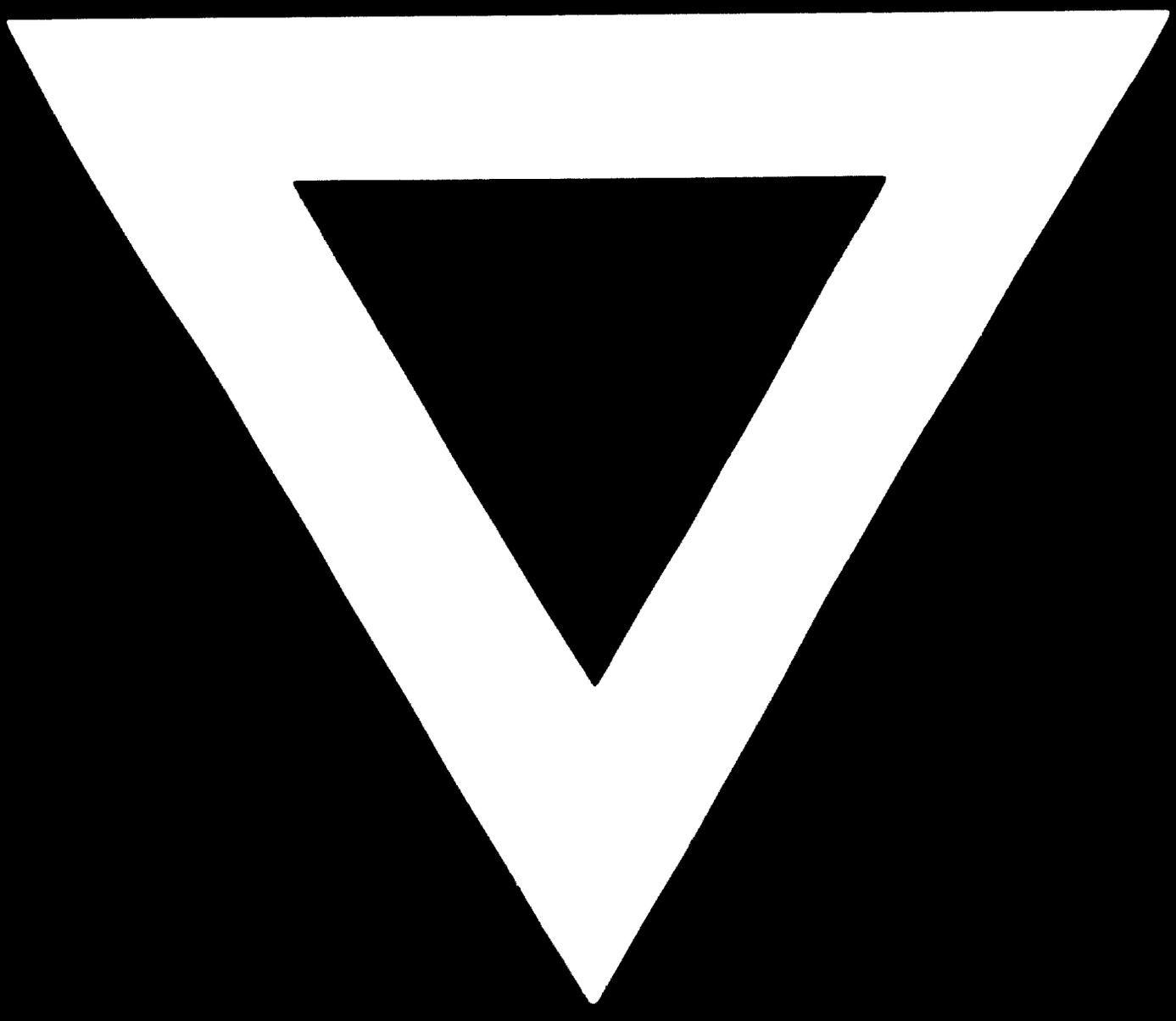
For all other sectors of the industry the labour training should start as soon as the machines are in an advanced stage of erection. As far as possible a few machines should enjoy preference in erection to enable pilot production for labour training.

In the large-scale weaving mills about 24 looms should be brought into production as soon as possible for training purposes. In the large-scale MMF weaving sector with its mills of over 400 looms, it pays to maintain a permanent training sector of 12 - 24 looms in a separate room to assure continuous and proper training for replacement weavers.

However, the most important factor is the proper education of the trainers. Their sole function is to learn the trainees to avoid faulty, unnecessary and maladroit manipulations. This implies that the trainers should have an idea about the merits of time and motion study.

The usual procedure in developing countries is to send a few selected persons to training courses in developed countries; they, on their return, train future other trainers.

C-721



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