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ASSISTANCE TO THE FURNITURE INDUSTRY

SI/DRK/86/880

THE DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA

Terminal report *

Prepared for the Government of
the Democratic People's Republic of Korea
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Radmilo Malis, furniture production technician

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United Nations Industrial Development Organization
Vienna

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A B S T R A C T

This Terminal Report covers the expert's mission in the Democratic People's Republic of Korea, as foreseen in the Project Document for SIS project SI/DRK/86/880 and entitled "Assistance to the Furniture Industry". This mission was carried out by Radmilo Malis, Furniture Production Technician, from 14 January to 13 May 1987.

The expert was requested to make a survey of the furniture production in the country, to give ad-hoc advice to the factories visited, to prepare a plan of action for the future development of the sector and to propose a project document for a new IPF funded project. The Government authorities limited the expert's mission to the sector of wood processing industry belonging to the General Bureau for Building Materials in the City of Pyongyang. Consequently all findings and conclusions are based on the survey done in the four wood processing enterprises visited by the expert. More detailed analysis has been done for the Pyongyang Wood Complex, where the project was located. This is fully in accordance with the Government's orientation to direct the future UNDP/UNIDO assistance to the furniture factory of this Complex.

A project document has been prepared proposing assistance in the establishment of a furniture pilot plant.

During this mission the expert was rendering day-to-day assistance to the factory foreseen to be the furniture pilot plant. Ad-hoc advice was given in solving current problems, complemented by written instructions and short practical training in the production processes.

Certain recommendations for the future development of the sector are given in this report. The main recommendations are directed towards improvement of the primary wood processing, a switch from plywood to particle board production, specialization in future production and establishment of a national development centre for the wood processing industry.

At the end of the mission a three week study tour for three participants was conducted in Yugoslavia.

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- A full stop (.) is used to indicate decimals.
- A comma (,) is used to distinguish thousands of millions.
- Reference to dollars (\$) is to the United States Dollars, unless otherwise stated.
- The monetary unit of the Democratic People's Republic of Korea is the Won. During the period covered by this report the official exchange rate was 2.15 Wons to the US\$.
- The Fifth Department of the Ministry of Foreign Trade is the Government's Central Co-ordinating Agency for the Operational Activities of Multilateral Co-operation.
- The General Bureau for Building Materials in Pyongyang is considered as the Government's Implementing Agency.
- The Pyongyang Wood Complex in Pyongyang is considered by the Government as the project site.

T A B L E O F C O N T E N T S

	<u>P a g e</u>
INTRODUCTION	1
a. Objectives and logic of the project	2
b. Selected recommendations	3
I. ACTIVITIES AND FINDINGS	4
1. Technical survey of the existing furniture industry in the country	4
1.1 Raw material for the wood processing industry	5
1.2 Saw mill production	7
1.3 Plywood production	8
1.4 Veneer production	9
1.5 Particle board production	9
1.6 Fiberboard production	9
1.7 Joinery production	10
1.8 Furniture production	10
1.8.1 Furniture products	10
1.8.2 Materials for furniture production	11
1.8.3 Equipment	11
1.8.4 Technology	12
1.8.5 Productivity	12
1.8.6 Quality of products	13
1.8.7 Organization of production	13
1.8.8 Maintenance of equipment	14
1.8.9 Production management	14
1.8.10 Economy of production	14
2. Ad-hoc advice to the existing production	14
3. Study tour for technician from the DPRK	15
4. Plan of action for the future development of the sector	15
5. Project document for a new IPF funded project	15
6. Selection of candidates for the Workshop in Ljubljana	16
II ACHIEVEMENT OF IMMEDIATE OBJECTIVES	16
III UTILIZATION OF PROJECT RESULTS	17
IV CONCLUSIONS AND RECOMMENDATIONS	17
1. Technical survey of the existing furniture industry	17
1.1 Raw material for the wood processing industry	17
1.2 Saw mill production	18
1.3 Plywood production	18
1.4 Veneer production	19
1.5 Particle board production	19
1.6 Fiberboard production	19
1.7 Joinery production	19

1.8	Furniture production	20
1.8.1	Furniture products	20
1.8.2	Materials for the furniture production	20
1.8.3	Equipment	21
1.8.4	Technology	21
1.8.5	Productivity	21
1.8.6	Quality of products	21
1.8.7	Production organization	22
1.8.8	Maintenance of equipment	22
1.8.9	Production management	22
1.8.10	Economy of production	22
2.	Ad-hoc advice	22
3.	Study tour	23
4.	Plan of action for the future development of the sector	23
5.	Project document for a new IPF funded project	23
6.	Selection of candidates for the Workshop	23
	A c k n o w l e d g e m e n t s	23

TABLES

Table I	Basic data of the factories visited	5
Table II	Capacity of 12 wood processing enterprises under the Ministry of Forestry	7
Table III	Forested area, stock of wood, annual cut and production of logs	8

FIGURES

Figure 1	Organizational chart of the Prongyang Wood Complex	16
Figure 2	Organizational chart of the furniture factory	17
Figure 3	Hypothetical model for wood utilization	22

ANNEXES

ANNEX I	Job Description	29
ANNEX II	Work Plan	31
ANNEX III	Names and titles of people met by the expert	32
ANNEX IV	Names and titles of the Study Tour participants	33
ANNEX V	Report on the Study Tour	34
ANNEX VI	Project proposal	46
ANNEX VII	Woodworking machines necessary for a Pilot Furniture Plant.	67

I N T R O D U C T I O N

This terminal report covers technical assistance provided to the Government of the Democratic People's Republic of Korea from 14 January to 13 May 1987. The project document for this preparatory mission was agreed and signed in August 1985 by the three parties involved in its realization, the Government of the Democratic People's Republic of Korea (DPRK), the United Nations Development Programme (UNDP), and the United Nations Industrial Development Organization (UNIDO) as the executing agency.

Some basic data of the project are:

-Country:	DPR Korea
-Title:	Assistance to the Furniture Industry
-Number:	3I/DRK/86/880
-Duration:	4 months
-Period of execution:	14 January to 13 May 1987
-Government inputs:	In kind
-UNDP/UNIDO inputs:	US\$ 45,000
-Government co-ordinating agency:	Fifth Department of the Ministry of Foreign Trade
-Government's implementing agency:	The General Bureau for Building Materials in Pyongyang.

The Government's inputs (in kind) for the project were for local transportation, interpreter, one technician as a guide, an office with appropriate furniture and a typewriter. The government did not assure secretarial assistance as foreseen.

This project follows the Government's policy to promote industrialization based on resources available in the country and to develop an export-oriented production. With some million hectares or about 3/4 of the country's land surface considered as forested area, and an estimated growing stock of about 620 million m³ of wood, the country has a potential to develop rather successfully the wood processing industry.

The Government is giving high priority to the improvement of the living standards of the population. This includes improving the quality of furniture produced in the country. But in the past this sector of the economy has not been favoured, and now it is lagging behind the country's general level of development. This is particularly evident from the very old equipment in use.

To assist the country in its industrial goals in the wood processing industry, the Government requested UNIDO's assistance in improving the production and the quality of furniture through the introduction of updated technology, transfer of technical skills and knowledge, and the provision of additional training opportunities, equipment and tools.

This SIS project (SI/DRK/86/880) has been agreed between the Government, UNDP and UNIDO as an initial assistance to assess the need for and to compile data enabling the formulation of a full project document for a larger scale IPF project, oriented towards further improvement of the furniture production for local consumption and for export. In order to carry out this task and to come up with a qualitative technical survey of the state of the furniture production in the country, the expert was requested to visit a representative sample of the furniture factories in the country and to collect necessary information to support his conclusions and recommendations.

The number of factories to be visited by the expert as well as information about the furniture industry in the country has been limited. This made the obtention of a well documented survey and irrefutable conclusions and recommendations difficult. However, comparing data collected with some data reported by FAO experts after their recent missions in the country, it can be concluded that the situation in the majority of the furniture industry in the country is very similar to that in the factories visited.

The project document for a new IPF project has been prepared, proposing the establishment of a pilot furniture plant in an existing furniture factory. As a part of his mission the expert was requested to provide ad-hoc (trouble shooting) assistance to the factories visited, and to advise wood technicians how to solve some essential problems facing their production. Because the project was located within the Pyongyang Wood Complex, this ad-hoc assistance was given mainly to the furniture factory of this Complex. It is the factory intended to be the pilot plant for the future project. The quality of products has been emphasized as the most critical problem, so the assistance was directed towards their improvement.

The study tour, foreseen as an output of this project, was organized and conducted for three participants. This three week study tour is covered in the separate Study Tour Report. (Annex VI).

The expert was also involved in the selection and preparation of participants to the Workshop on Production Management in Public Sector Mechanical Wood Processing Industries, which took place in Ljubljana, Yugoslavia from 11 to 29 May 1987.

a. Objectives and logic of the project

Considering some crucial facts related to the production of furniture in the country, the following was concluded:

-The level of technology, productivity and quality of the wooden furniture industry in the country is below expectation.

-In its development plans the Government is placing emphasis on providing furniture for the population to complete its ambitious housing programme.

-The country is reasonably well endowed in forests, currently felling some 6.5 million m³ of wood per year.

Based on the conclusions it was agreed that the development objective of the project is, as foreseen in the Project Document:

"To improve the standard of living of the population through the provision of consumer durables (furniture) of good quality at reduced prices".

The immediate objectives of the project are formulated as follows:

"To provide ad-hoc assistance to the country's furniture industry and assist in the preparation of a longer range plan of action".

The outputs and activities of the project are in keeping with achievement of the immediate objectives. The Job Description and Work Plan of this project are contained in this report as Annex I and II; the list of persons met is given in Annex III and the names of the participants in the Study Tour in Annex IV. Annex V is the project document for the proposed project.

b. Selected recommendations

1. The first step toward improvement of the wood processing industry in the country should be the improvement of the primary wood processing sector (production of sawn wood, veneer and various wood based panels).
2. The wood raw material, available in the country for the wood processing industry, could be utilized much better if the country would reduce its production of plywood and increase the production of particle board.
3. The successful development of the furniture production can be possible only if the future development of this production leads towards specialization for certain kinds of products, adopting a more effective and less expensive specialized technologies.
4. The establishment of a national developing centre for the wood processing industry is a fundamental prerequisite for a more successful and harmonious development of this sector.
5. Concerning the allocation of foreign exchange and foreign aid, in particular UNDP/UNIDO assistance, the Government should give a higher priority to this sector, developing it to become an exporter and an earner of foreign currency.

I. ACTIVITIES AND FINDINGS

The activities and findings will be described following the project outputs:

1. A qualitative technical survey of the art of the furniture industry in DPRK.
2. Ad-hoc advice to the existing plants and possible solutions to their problems.
3. Study Tour for technicians from DPRK to familiarize them with modern serial production techniques.
4. A plan of action for the future development of the sector.
5. A full project document for the future UNDP/UNIDO assistance to the furniture industry of the country.
6. Selection and preparation of candidates for the Workshop (casual task).

1. Technical survey of the existing furniture industry in the country

As mentioned earlier in this report, the expert was allowed to visit only four furniture factories and to get an overall insight in the state of production. Three of these factories are located in the city of Pyongyang and belong to the General Bureau for Building Materials of this city. The fourth is located in the city of Hamhung and belongs to the General Bureau for Building Materials in the Province of South Hamgyong. Each of these factories is part of a wood processing complex, usually composed of a sawmill, a plywood and veneer factory, a particle board factory and a universal furniture factory. Production of joinery is sometimes done in a separate factory.

There were no limitations regarding detailed inspections of production, but all information provided by managerial staff was verbal and related to the nominal capacities and not to the real achievements.

Some elementary data about the wood processing enterprises are contained in Table 1.

In order to get a complete insight into the country's furniture production the expert submitted to the Government's implementing Agency a simple questionnaire to be filled up. The questionnaire was composed of very simple questions about the major facts concerning the furniture production in the country. Unfortunately the completed questionnaire was never returned. In such a situation, two reports prepared by FAO experts were very helpful. One was prepared by W.K. Chalmers who visited the DPRK in 1983 to obtain information about the then current state of the country's Wood Processing Industry, with particular reference to the plywood and particle board sector.

BASIC DATA OF THE FACTORIES VISITED

TABLE 1

CAPACITIES	Units of products		Pyongyang Wood Complex	Pyongyang Furniture Factory	Pyongyang Furniture Combined Factory	Hamhung Wood Processing Factory
	Saw mill	Logs m ³	Nominal capacity per year	100,000	3,000	75,000
Sawn wood m ³		70,000		2,000	33,000	3,000
Plywood factory	Plywood m ²	600,000		-	1,000,000	300,000
	Veneer m ²	500,000		-	1,200,000	-
Particle board factory	Particle b.m ³	5,000		-	5,000	-
Joinery factory	Doors/Windows m ²	150,000		-	-	-
Furniture factory	Various furn.pcs.	50,000		20,000	200,000	100,000
Year of establishment				1956	1971	1980
Total number of employees			1,180	330	1,000	1,100
Number of engineers			15	7	78	150
Number of administrative officers			80	11	50	N/A
Number of quality controllers			19	3	18	N/A
Value of production (Wons per year)			8,800,000	1,000,000	10,000,000	N/A

The other was the report of Y.S. Rao, FAO Regional Forestry Economist, who visited the country at the end of 1985, with an aim to review the wood based industry sector of DPRK and to assist the country in the identification and formulation of a project for international aid. Since 12 factories, visited by the two mentioned experts, produce more than half of the country's output in this sector, some basic data about their capacities are included in this report. (Table 2). This is done for the sake of a better understanding for further consideration.

The description of production facilities given in these reports fully corresponds to the situation found in the four enterprises visited by the expert. Since capacities visited by both FAO and UNIDO experts comprise the bulk of total production, a conclusion can be drawn up that the majority of the wood processing industry is at about the same level of technology and quality of products.

One surprising fact is that the wood processing industry in the country is divided into different enterprises which do not co-operate closely among themselves. As a result all these enterprises like to develop self-sustaining production of various products. This results in a lower utilization of installed capacity, and, by and large, lower efficiency. Quality of wood and appropriate primary processing are fundamental prerequisites for the production of wooden furniture. Therefore, this assessment will cover elementary questions about:

- raw material for the wood processing industry
- sawmill production
- plywood production
- veneer production
- particle board production
- fiberboard production
- joinery production, and
- furniture production

The furniture production will be considered in detail with reference to:

- products
- non-wood materials
- equipment
- technology
- productivity
- quality
- organization
- maintenance
- management, and
- economy of production

1.1 Raw material for the wood processing industry

Based on the data obtained from Mr. Rao's report as the only available source of such information, Table 3 has been compiled showing: forested areas, growing stock of wood, density of the forests, average annual wood cut, intensity of cutting, quantity of logs and ratio between quantity of logs and the total annual cut.

THE CAPABILITIES OF 12 WOOD PROCESSING ENTERPRISES UNDER THE MINISTRY OF FORESTRY

TABLE 2

N.o.	WOOD PROCESSING CAPACITIES	Constructed in year	Origine and state of equip-ment	Saw mill capacity		Plywood m ²	Veneer m ³	Particlc boards t.	Fiber boards t.	Joinery products m ²	Various furniture (pieces)	Number of employees	
				m ³ of logs	m ³ of sawn timber							Total	Qualified tech. peop
1	Ungson Mill	1960	Modern	140,000	100,000	-	-	-	-	-	-	140	40
2	Tumongang Mill	1954	Korean, old	150,000	90,000	-	-	-	-	-	-	220	26
3	Musan Mill	1954	Soviet, old	90,000	55,000	-	-	4,000	-	40,000	20,000	750	40
4	Kilju Mills	1958	Soviet, old	50,000	30,000	3.5 million	-	4,000	10,000	100,000	30,000	1200	120
5	Wiwyan Mill	1958	Korean/Sov.	100,000	70,000	80,000	-	5,000	-	80,000	30,000	800	50
6	Yuppyong Mill	1955	Jap. Sov. CSR	70,000	40,000	-	300	-	-	-	-	120	11
7	Yonan Mill	1944	Jap. Sov. CSR	70,000	40,000	-	-	3,000	-	-	-	120	11
8	Hamhung Mill No.1	1954	Japan/DDR	80,000	50,000	-	-	-	-	-	20,000	600	30
9	Hamhung Mill No.2	-	DDR	-	-	-	-	-	-	-	180,000	890	45
10	Chonchon Mill	1954	Korean/Jap.	80,000	50,000	300 thous	-	6,000	600	80,000	20,000	N/A	N/A
11	Umbong Mill	1969	Korean(1984)	155000	100000	-	-	-	-	-	-	340	28
12	Tokchon Mill	1950	Korean	50,000	30,000	-	-	3,000	-	30,000	10,000	240	18

FORESTED AREA, STOCK OF WOOD, ANNUAL CUT AND PRODUCTION OF LOGS

TABLE 3

Province	Forested area 1000 ha	Growing stock million m ³	Density of forest m ³ /ha	Average annual cut 1000 m ³	Intensity of cutting % of growing stock	Logs supplied 1000 m ³	Ratio logs/total cut %
Changang	1,808	207	114	1,465	0.7	360	24.6
Ryanggang	1,980	250	126	1,795	0.7	350	19.5
N.Hangyong	1,300	35	27	1,092	3.1	210	19.2
S.Hangyong	1,143	36	31	885	2.5	260	29.4
N.Pyongan	880	34	39	520	1.5	250	48.1
S.Pyongan	1,204	29	24	421	1.5	200	47.5
Wangwon	680	28	41	322	1.2	180	55.9
T O T A L	9,000	619	69	6,500	1.1	1,810	27.8

Except for two provinces, Changang and Ryanggang, in the northern part of the country, where the average density of forests is close to 120 m³/ha, the growing stock per hectare in the other provinces is very low, amounting to between 30 and 40 m³/ha. Actually about 74% of all growing stock is located in these two provinces. On the contrary, the lowest rate of cutting is here (0.7% of the stock), as well as the lowest percentage of logs (20 to 25% of the wood cut).

Obviously, the DPR of Korea has a big potential in forestry, but at present the yield of wood is rather low. Namely, in the past, during occupation and wars, the forests were badly devastated and after liberation the Government made huge investments in afforestation. One of the best ways to help the regeneration of forests is a proper utilization of wood. This must be taken into account when planning what kind of wood processing industry to develop.

The major wood species are: Betula spp. (White Birch), Larix spp. (Korean Larch), Picea spp. (Picea excelsa and Picea Koreansis), Pinus spp. (Pinus Koreansis), Populus spp. (various spp.) and limited quantities of Oak and various other species.

The diameters of logs processed in sawmills and plywood factories are between 15 and 30 cm. with an average of 25 cm. for sawlogs, and not more than 30 cm. for veneer logs. The quality of wood is rather low because of juvenile wood and too many knots. Due to the lack of selection some big diameter logs are sawn in sawmills, while bad ones, with small diameter are processed for the production of plywood. The prices of logs are 30 to 40 Wons per m³.

To get some more accurate and comprehensive assessment one must have an opportunity to see the forest and to have access to more pertinent information.

1.2 Sawmill production

One of the sawmills visited is reasonably well equipped, while the other three are in a rather bad shape due to the very old and worn-out equipment. A similar situation exists in the whole country. There are several big sawmills, well designed and equipped, with modern machines and conveyors, while the majority of the sawmills are still using various old machines and manual transport.

The modern sawmills have machines produced in the Soviet Union, in Romania or locally produced. The old sawmill machines (frame saws, band saws and circular saws) are mostly of Japanese origin, but those made in the Soviet Union, Czechoslovakia and Romania are also operating.

Bearing in mind the very small diameter of logs, a remark could be made on the unnecessary use of very big primary machines. For example, all frame saws have daylight openings 700 mm or more, but 500 mm. could suffice. The same applies to the band saws which have diameters of wheels 1500 to 1600 mm, instead of 1200 to 1400 mm. Actually, for this kind of logs (small diameters and mostly conifers) band saws are not recommended at all. The smaller machines would be more economical through less investment, better utilization of wood (thinner tools) and savings in energy.

The logs arrive at the sawmills very poorly prepared, the bark is still on and branches are not cut off near the log.

The critical aspect of all the sawmills is inadequate sawdoctoring. The existing sawdoctoring machines are almost unusable. Sharpening the teeth is often done on a simple grinding wheel with the operator holding the saw blade in his hand and presenting each gullet against the grinding wheel. No satisfactory sharpening machines were seen during the mission. As a consequence of inadequate sharpening the quality of sawing is rather poor and sometimes inaccurate.

Generally speaking the rudimentary sawmill technology is known to the technicians, and changes and improvements to the existing situation depend on allocation of funds.

1.3 Plywood production

The production of plywood is probably the most disputable question in all the wood processing industry in the country. The logs to be peeled are of very small diameter, between 20 and 40 cm, and of very poor quality. Inadequate technology, with very old bulky machines, cause a big waste of wood and an output of plywood which is below any quality standard. The yield from the logs is 34%. These factories have very big capacities, two to three peeling lathes each, but are incomplete. Such production operations as jointing of veneer and sanding are not in use at all. Neither logs nor veneer are selected to obtain a better quality, at least for the face of panels.

Two of the three factories visited are in a run-down condition and they are not worthy of any consideration. The third one, recently built (1980) within the Pyongyang Furniture Combined Factory is a rather modern factory mostly equipped with Romanian machines and with two very good lathes made in Czechoslovakia. But this modern factory suffers also because of inadequate logs for peeling. It processes about 12,000 m³ of logs per year, but its capacity is twice as big. The major wood species used are Birch and Poplar. The logs are cut to length for peeling and then preheated in basins with hot water. By the time of peeling the logs have been allowed to cool, thus eliminating all the effects of heating. Consequently, the surface of the veneer is very rough. They could peel to a core diameter of 70 mm.

The two peeling lathes are working in pairs with wet clippers. One line has a continuous flow of veneer and the other one reels the veneer and takes it to the clipper. The clipping of veneer is only done to size, without removing any defect, and afterwards without selecting the better veneer for the faces. This has a very bad consequence in the production of furniture.

The veneer is properly dried in two modern driers with wire mesh conveyors. In spite of two new dry veneer clippers (bundle clippers) the veneer is not prepared for jointing nor is it jointed. Recently two new veneer jointing machines were obtained but they are not yet installed. Also there are two new machines for removing defects and inserting sound veneer patches but they also are not used.

The plywood is composed of single pieces of veneer just put one next to the other, which results in many gaps between the pieces of veneer. The press is in good condition, with manual loading and unloading. Sanding is foreseen to be done in furniture factories and there are no sanding machines in the plywood factory.

The largest plywood factory in the country is the Kilju Plymill, producing 3,500,000 m² or 16,000 m³ of panels per year. It was constructed in 1957, equipped with Soviet made machines and two lathes made by Raute, Finland. The quality of the products is also low due to the absence of jointing machines and a lack of selection of logs and veneer.

1.4 Veneer production

Local production of decorative veneer is insignificant. This is because of a very limited quantity of quality logs for slicing. The slicers are very old, mostly of Japanese origin, operating at 30 cuts per minute. Usually each plywood factory has one such slicer. They produce very thin oak and pine veneer - 0.25 to 0.5 mm. Veneer is used without drying and is usually intended for the furniture produced within the same wood processing complex.

1.5 Particle board production

Eight particle board factories were identified in the country; each with a nominal capacity of 5,000 m³ per year, giving altogether 40,000 m³ of boards. Some of these factories are built to produce one layer, others to make three layer boards, but in both cases they make one layer boards, they use the same type of chips for all layers, so the final result is the same as in the production of one layer boards.

The equipment and technology are mostly designed and made domestically, and in some cases imported from the USSR or Romania. These factories are built to utilize chips and saw dust produced by the other wood processing factories. The absence of appropriate chippers, flakers, refiners and separators, and the use of chips and dust as produced on the secondary wood processing machines results in extremely low quality boards. This is partially compensated by adding an excessive quantity of glue, from 130 to 240 kg/m³.

The sizes of the boards produced are usually 2,200 by 900 mm, and thicknesses are in the range from 8 to 20 mm. About 50 mm is trimmed from each edge, so that the waste is 14 %. The boards are delivered to furniture factories unsanded.

The nominal capacities, which are usually 5,000 m³ per year, are not utilized fully because the factories are technically archaic, and they work only when enough chips and the dust have accumulated.

1.6 Fiberboards production

There is only one medium sized fiberboard factory (in the Kilju Mills), producing 10,000 tons of fiberboards per year. The equipment of the factory was made in the Soviet Union. Other information about this production was not available.

Another small mill, with a capacity of only 600 tons per year, working with locally made machines could be ignored in this survey.

1.7 Joinery production

There are two kinds of joinery production: one in the specialized factories, and the other in the furniture factories. All these factories manufacture standardized doors and windows. Their capacities are between 30,000 and 150,000 m² of products per year. The equipment is either locally made or imported from the Soviet Union.

The accuracy of processing is not satisfactory and preassembling adjustments are considerable. Productivity, about 3 hours per m², as well as quality of products are very low.

1.8 Furniture production

According to the data included in this report there are 16 large furniture factories in the country having a total nominal capacity of 680,000 units of various types of furniture per year. It is estimated that the rest of the furniture production in the country is far below this quantity. Comparing this production with the population of about 20 million inhabitants, a conclusion could be drawn that an increase in the furniture production is unavoidable. On the other hand there are many factors avoiding development of the furniture manufacturing sector. Some of these factors derive from the quality of raw material and from inadequate primary wood processing. The others are typical to the furniture manufacturing and will be considered hereunder.

1.8.1 Furniture production

Visiting different furniture factories one can see different equipment, different sizes of plants, different levels of technology; but items produced in all these factories are always the same: the same kind of furniture, the same style and design. There is no specialization for certain type of products, so most of the factories produce the same programme. These products are: several types of chairs and tables, office desks, shelves, cupboards, wardrobes, dressers, beds, school furniture, theatre chairs, coffee tables and sofas with armchairs. This mixture of different products, different materials and technologies is typical for the PDRK furniture production. When arguing for specialized production with the local technicians they agreed that some advantages may exist, but they liked to keep a universal production.

Design of the products is very simple, adapted to the technological possibilities, and this could be significantly improved. Interchangeable components are not employed in the construction of products, and the construction in general could be much better. The products look poor because of low quality materials and unsatisfactory workmanship.

1.8.2 Materials for furniture production

Besides wooden materials, which have already been described in this report, such materials as glue, lacquers, hardware, fabrics and fillings are of the utmost importance for a successful furniture production. A limited assortment of glues (urea formaldehyde and PVC), and lacquers (nitrocellulosic) are produced locally, as well as simple hardware and fabrics. Production depends on imports for special glues, finishing materials, better hardware, good fabrics and fillings.

There is an attempt to develop their own plastic foil as a substitute for veneer, but so far the quality is unsatisfactory. Bearing in mind the limited veneer production in the country a successful development of plastic foil would be of great help.

The assortment of screws is very limited and such items as staples and pneumatic nails have not yet been used in the furniture production here.

1.8.3 Equipment

As stated earlier, the majority of the equipment used in the existing furniture production in the country is very old, both physically and technologically. Sawing departments for the production of square parts, and machine shops for moulding, profiling and complete machining are equipped with classical woodworking machines with the lowest level of mechanization. Assembling and finishing departments are equipped with a limited number of simple machines and fixtures. But since assembling requires many corrections, hand tools are used to a vast extent.

Dry kilns are usually built out of bricks as small chambers for only one pile of wood and without any control or automatic regulation. The most simple rail transportation is used for lumber.

The cross-cutting and ripping machines are heavy and productive but with a very low accuracy. The same statement could apply for the planers and thicknessers. The narrow band saws, moulders and routers are totally worn out. The tenoners and mortisers are available only for open tenon-mortise joints. Cutting to the final lengths and sizing of boards is improvised on old circular saws. There are no machines for the preparation and jointing of veneer. The glue spreading machines are for one side glueing only. The veneer presses are antique. Edge banding with veneer does not exist. Simple sanding machines exist but due to the inadequate quality of the sanding paper used, results are unsatisfactory. Assembling presses are available, but they are not used properly. Spray booths are available but more finishing is done by brushing than by spraying.

These statements do not apply to the recently built Pyongyang Combined Furniture Factory, which has almost new machines imported from Romania, and many of them have not yet been used. This factory has an enormous selection of various woodworking machines, including a mechanized finishing flow line. Unfortunately they are utilized less than 50 %.

The woodworking tools are as critical as the machines. The selection of tools is very limited and tools with wrong parameters are often used. The maintenance of tools is very poor due to the absence of proper sharpening machines.

The only machines which exist in the upholstering departments are sewing machines for upholstering fabrics.

1.8.4 Technology

The production is mainly at the mechanized craft level, using woodworking machines as tools. Factory layouts are not conducive to a rational serial production. Production batches are small and not enough attention is paid to the optimization of production. Internal transport was not designed properly and its cost is neglected. Dust exhaust systems exist but they are often out of use because of wrong connections to the machines. Jigs or any kind of fixtures added to the machines in order to improve productivity, accuracy and safety are not used. Protection of operators on the woodworking machines is at a critical level, because guards and protective devices are not used properly or are not used at all. Compressors usually exist but factories do not have any kind of pneumatic hand tools. Very little attention is paid to the micro-organization of work stations, and workers usually do many unnecessary movements. Assembling and finishing operations are done mostly on the floor and people work squatting.

Quality control is rather formal, so parts with defects go from one operation to another, coming to the assembling area. Production documentation is insufficient, lacking quality requirements, operational instructions and technological parameters.

Generally speaking, these technological processes are designed for labour intensive manufacturing.

1.8.5 Productivity

In order to figure out a level of productivity the only available information about production are the nominal capacities of the factories visited.

It appears that factories need approximately 15 to 20 working hours to produce one piece of a simple furniture product. It is about a 5 to 10 times lower productivity than in most of developed or even some developing countries. Bearing in mind that finished products look poor, without proper sanding and finishing, it looks even worse.

On the other hand, working discipline is very good and work pace is satisfactory. The main causes of low productivity are: low quality and lack of selection of timber, inappropriate design of products, old equipment and inadequate production organization.

1.8.6 Quality of products

The quality of products is strongly emphasized by the Government authorities. The factories responded organizing quality control units staffed with engineers and other skilled people. In addition to this there is an inspection of quality of finished products done by the Government's body. But in spite of all this, the quality of products is at a critical level. There is a total lack of a systematic approach to the problem of quality. The quality is considered as a matter of discipline and focused on the responsibility of workers, neglecting numerous other factors on which the workers do not have any influence.

Inadequate design, incomplete production, documentation, wrong material, poor preparation of tools, low accuracy of machines and many other shortcomings are very complex questions in the production. Unless they are systematically looked into, the quality will not change significantly. The lack in tradition in both production and consumption of furniture, requires that more attention be paid to this problem.

1.8.7 Production organization

The present production organization in the factories is rather rigid, following a vertical line of subordination.

Organizational charts for the Pyongyang Wood Complex and the Furniture Factory of the same Complex, excluding political organizations, are given on Figures 1 and 2 respectively.

The sales department has a marginal role, while the planning department has the central position in the functioning of this organization. Product development and work preparation are tasks of the technical department. The production department, consisting of one man for each factory, is conveying job orders to the factories and receiving reports about production.

The typical factory organization rests on working teams, usually covering one department each. The teams are supervised by team leaders who are responsible to a Director and a Deputy Director. The size and work areas of teams differ from one factory to another.

In spite of many departments the number of people working in offices is below 10% of the total, which is rather low.

The teams are stimulated to produce more and at a higher quality. The results are measured partially for each team. The consequences are that the quality and a final result of the factory as a whole is neglected.

This is a classical, ineffective organization which is not fully acceptable in a modern industrial unit.

Figure 1

THE ORGANIZATIONAL CHART OF THE PYONGYANG WOOD PROCESSING COMPLEX

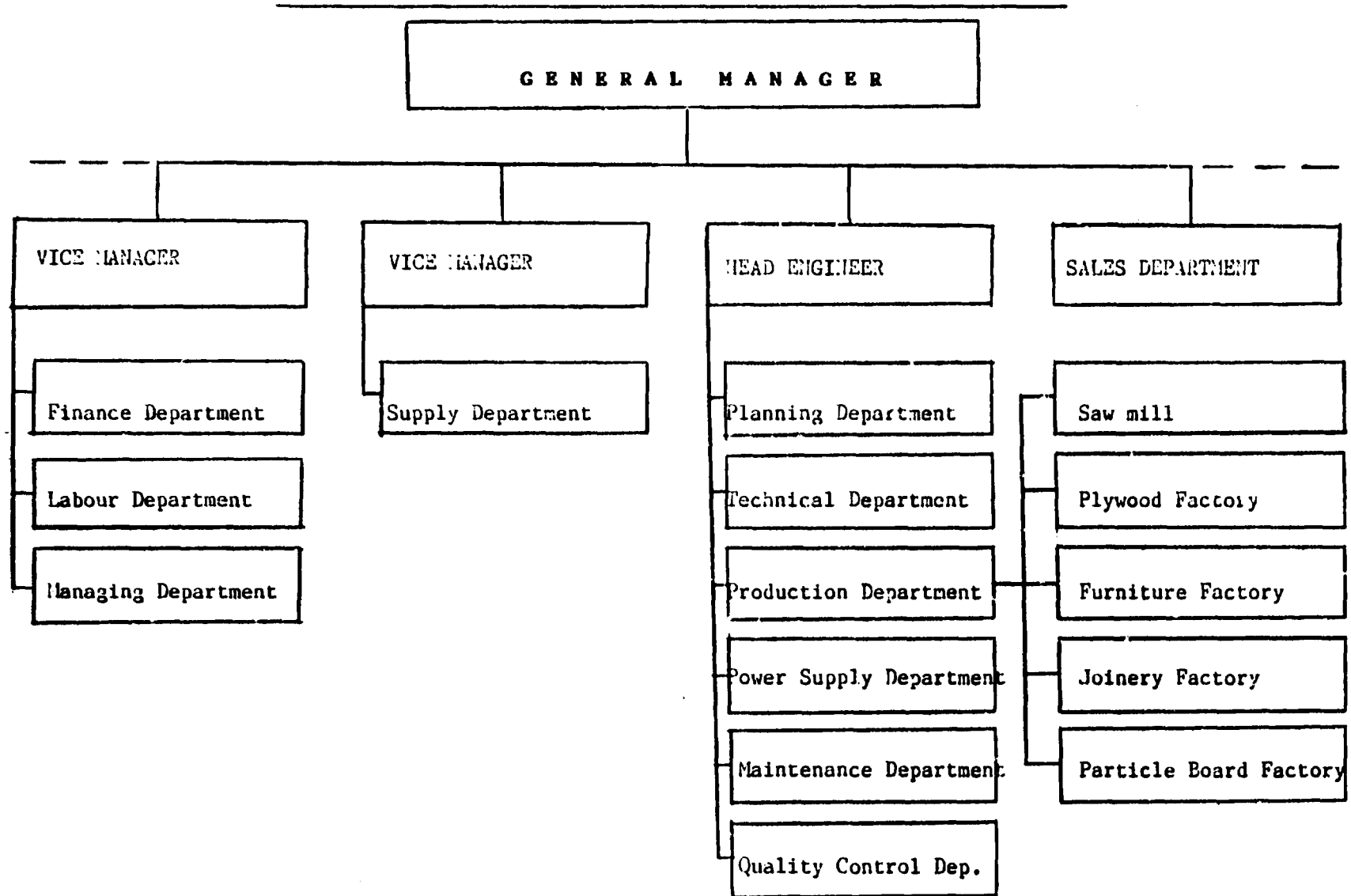
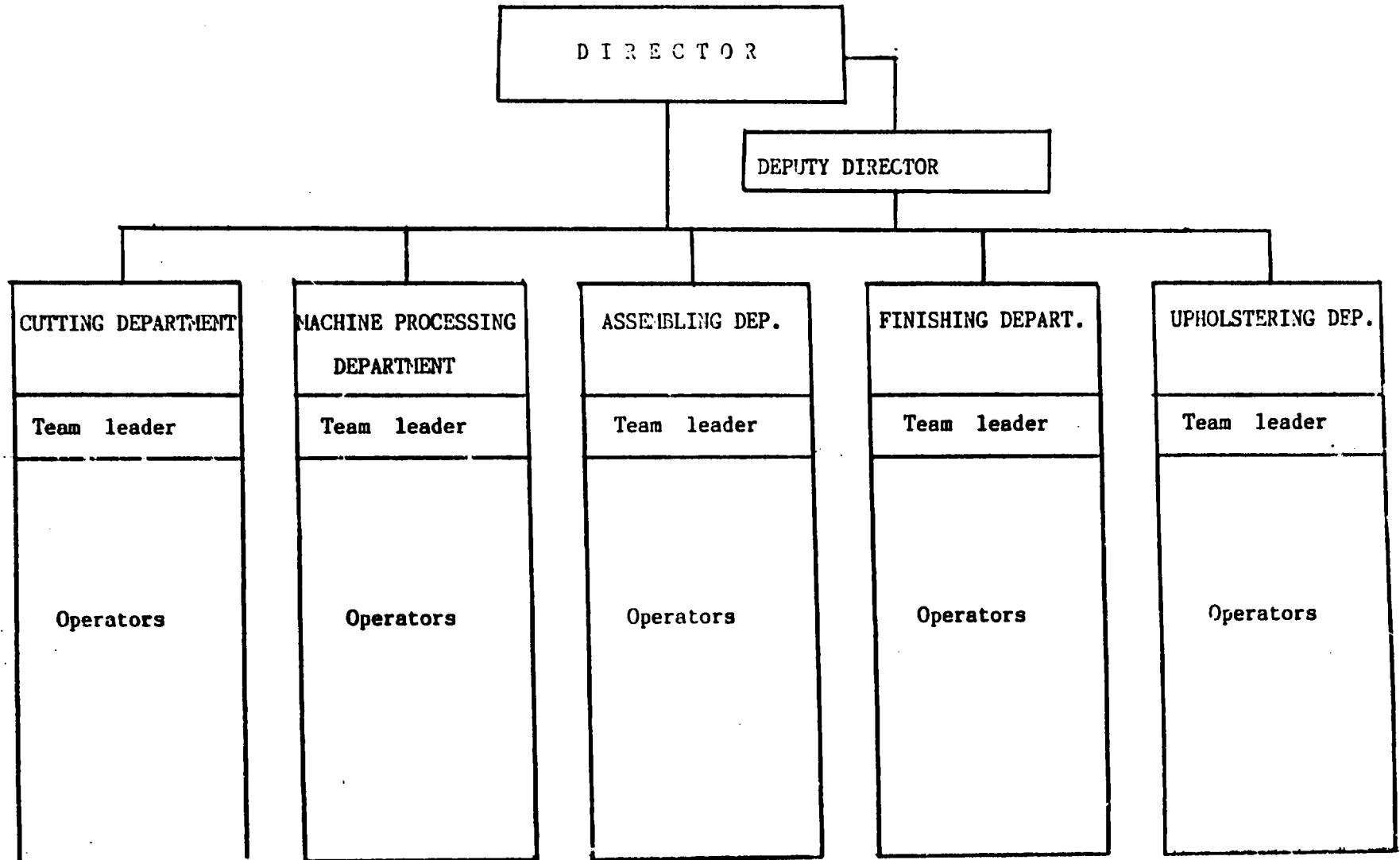


Figure 2: THE ORGANIZATIONAL CHART OF THE FURNITURE FACTORY



1.8.8 Maintenance of equipment

Bearing in mind the critical condition of equipment, the maintenance departments deserve full support. With really big efforts they keep machines running. All good procedures of a preventive maintenance are practiced, including keeping of appropriate machine cards and lists of spare parts. Periodical check-ups of machines as well as preparation of general overhauls are in accordance with the maintenance plan.

Greasing and oiling, as well as maintenance of tools is the responsibility of the machine operators. The maintenance of tools is one of the most critical points in the production as a whole.

1.8.9 Production management

The main task of the management is to follow up the plan of production, and to maintain communication between the Government bodies and the production organization. It was not possible to examine everyday management practice.

1.8.10 Economy of Production

The economies of production is based on the direct cost accounting system and adding a percentage fixed in the plan. The situation with the fixed costs is rather vague, and, due to the possible deviations in the achievement of the plan, it could cause unpleasant surprises.

There is not any kind of economical optimization of production and/or business operations. The prices of products are approved and controlled by the Government bodies.

2. Ad-hoc advice given to the existing production

During his visits and observations of four furniture factories the expert did not have an opportunity to advise technicians, though there were many things which could be corrected easily. First, the interpretation was very poor, and second, the time was always limited. Some advice given in the factories has been warmly accepted.

This activity was performed mainly in the furniture factory of the Pycngyang Wood Complex. The authorities of the Fifth Department as well as of the General Bureau for Building Materials requested assistance in the improvement of quality and products. For that purpose two reminders have been written and translated into Korean, both concerning the utilization of wood and the improvement of quality. The technicians and machine operators have been trained how to select and properly cut lumber in the cutting department. Lectures were conducted for the managerial staff and the controllers of quality on how to organize a system of integral quality control. An attempt to improve the preparation of tools was futile because of a total absence of the necessary equipment.

Many hours (at least three days each week) were spent discussing with the chief of the Technical Department, with chiefs of the Quality Control, Maintenance, Planning Department and so on. There were always two way discussions. They informed the expert about their methods of work and the possible different improvements and solutions were discussed.

With regard to the future development of the Furniture Factory, and its transformation into a pilot plant, equipment for new technology was discussed, as well as global technological layout of the factory.

All people showed a great desire to learn and they accepted all ideas, but it is not going to be easy to change the existing methods. To change the existing technology and organization will require longer and more thorough assistance as well as more profound training.

3. Study Tour for technicians from DPRK

Following the Project Document's output (c), a study tour was organized for three participants. For that purpose a study tour programme was prepared and proposed to UNIDO. This programme for a three week study tour to Yugoslavia included visits to 14 furniture factories and 16 other plants for the primary and secondary wood processing. The study tour took place from 19 April to 10 May 1987. The report of this study tour will be prepared by the participants and submitted to the parties involved in this project. The expert's report on this study tour is given in Annex V.

4. Plan of action for the future development of the sector

This task of the project had to be reduced because of limited opportunities to visit a representative number of factories and to make a qualitative technical survey. It seems that this output was not clarified enough at the moment of reaching an agreement on the Project Document. It is not clear whether or not the Government wanted to obtain a plan of action for the future development of the sector.

However, in Part IV of this report (Conclusions and Recommendations) all recommendations are directed towards the future development of the sector. For a more detailed plan it would be necessary to make a more detailed and subtle analysis and to have more arguments to support proposals.

5. A full project document for a new IPF project

Based on the findings described in this report and in the opinion of the Government and other authorities concerned, a proposal for a larger scale IPF project has been drawn up in the form of a Project Document and submitted to the Government, UNDP and UNIDO for further consideration. It is given in Annex VI.

Taking into account all circumstances and available facts about existing furniture production in the country, UNDP/UNIDO assistance for the establishment of a pilot furniture plant has been proposed. Other possibilities (for example a training centre) were also analyzed, and the result was that the furniture pilot plant will produce the most valuable benefits to the country and it has a top priority at present.

The project's objectives, outputs and activities have been balanced within the limited funds of US\$ 300,000 earmarked for this purpose by common prior agreement between the Government and UNDP.

6. Selection of candidates for the Workshop in Ljubljana

In addition to the activities foreseen in the Project Document the expert has been involved in the selection and preparation of candidates for the Workshop on Production Management in Public Sector Wood Processing Industries. Two candidates selected by the Government have been tested by the expert and Nomination Forms have been completed and sent to UNIDO for final selection. (One of these actually attended the Workshop).

II. ACHIEVEMENT OF THE IMMEDIATE OBJECTIVES

With respect to the circumstances under which the execution of the project was going on, achievement of the immediate objectives were at a satisfactory level. These achievements are summarized in this Chapter.

- 1 Day-to-day assistance to the factories has been provided during three months for approximately three days per week. The main aim of this assistance was the introduction of modern industrial methods in production processes. Following the request of the Government only one factory benefitted from the expert's advice.
- 2 A full project document for a larger scale IPF project has been prepared, proposing assistance in the establishment of a furniture pilot plant.
- 3 A three week study tour for three Koreans was organized and conducted in Yugoslavia. During this tour the participants visited 30 different factories for primary and secondary wood processing.
- 4 This Terminal Report was prepared with a limited survey of the state of the furniture producing industry in the country and recommendations for the future development of this sector. Due to restrictions on the obtention of appropriate information and on visits to a representative number of factories, this survey and recommendations have been supported with only those arguments which were accessible. However, assessments about the state of the furniture production in the country are reliable enough to be taken as an orientation for both the future development of this sector and the future assistance to this industry.

The project work plan was fully completed.

III UTILIZATION OF PROJECT RESULTS

The utilization of this project's results is expected through the future assistance. However, the knowledge gained from ad-hoc advice and the study tour will be helpful to both management and wood technicians in solving various production problems.

The future utilization of the project's results depends on the readiness of the factories and other authorities concerned to follow up on the recommendations given in this report.

IV CONCLUSIONS AND RECOMMENDATIONS

A general conclusion is that this assistance has shed some more light on the state of the furniture industry in the country. The recommendations given in this report are directed towards the future development of the sector.

Both conclusions and recommendations will follow the same order as the activities and findings described above.

1. The technical survey of the existing furniture industry in the country.

Furniture production is the final stage of the wood processing industry. It is successful only if the primary wood processing capacities assure adequate semi-manufactured products. Development of facilities for the primary wood processing should take into consideration both the nature of wood available as raw material and the purpose of a production line. To meet these requirements the wood processing industry in the country needs some structural changes. It would be very rational if these changes were to go together with the modernization of this industry, which is unavoidable.

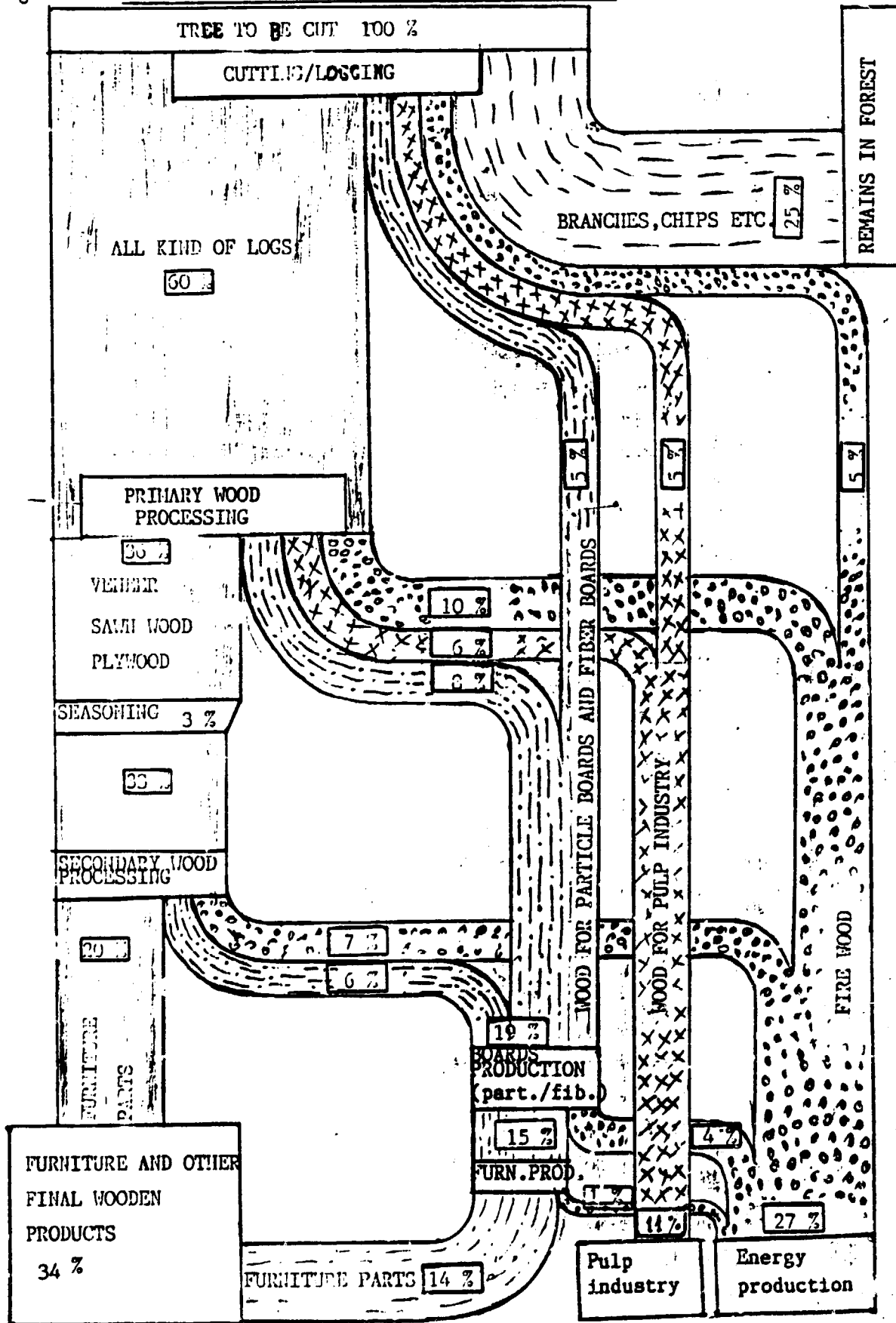
The allocation of funds for the further development of the sector is probably the most decisive factor, and it is the only possible way for the revitalization of the wood processing industry in DPRK.

Conclusions and recommendations with regard to the other important factors will be considered hereunder.

1.1 Raw material for the wood processing timber

According to the data available the utilization of wood resources in the country could be significantly improved. For that purpose it is necessary to have a balance of wood, taking into account the total annual cut and all kinds of consumption. Such a hypothetical model is shown in Figure 3.

Figure 3: A HYPOTHETICAL MODEL OF UTILIZATION OF WOOD



In the case of the PDR of Korea sawlogs and veneer logs represent only 28% of the total wood cut. It means that wood could be utilized better only if it is used for the chemical processing (pulp industry), or for the manufacturing of products composed of chips or fibers (particle-boards and fiberboards). Conifers, Birch and Poplars are very suitable species for such production and they make the bulk of wood available.

On the other hand the DPRK has rather limited resources for the classical wood processing based on the solid wood material.

Recommendation: In order to increase the utilization of wood and to get more suitable and valuable semi-manufactured products for the furniture industry, the country should favor the development of capacities based on small diameter and low quality wood.

1.2 Saw mill production

Development of the new saw mill industry in the DPRK should respect the specific conditions in the country. The selection of machines and technological solutions should correspond to the composition of wood species and to sizes of logs. For small diameter and low quality logs band saws have lower productivity, lower accuracy and lower utilization of wood than frame saws.

Recommendation: Frame saws with a daylight opening up to 500 mm. and light mechanized circular saws would be the most suitable saw mill machines for DPRK. Similarly, the conveyors for the internal transport are also over dimensioned.

1.3 Plywood production

A big part of the present Korean wood processing industry was established 20 to 30 years ago. At that time plywood was an irreplaceable product with growing trends in both production and consumption. Nowadays the situation of plywood looks quite different. Even those countries which have good raw material and modern factories are cutting down the production of plywood. In the case of the DPRK, raw material for the production of plywood is very limited, and it is one reason more to limit this industry to the quantity of appropriate wood available.

Recommendation: In the future development of the wood processing industry, the production of plywood should be limited to the quantity of logs suitable for plywood production. It should be concentrated in big factories. Plywood of low quality has very negative impact on the quality of furniture produced from it.

1.4 Veneer production

Veneer is an irreplaceable material for the production of case goods furniture of a good quality. The country has limited production facilities which are at present in small capacities with old machines.

Recommendation:

One modern specialized veneer factory which would buy veneer logs from all over the country would be a better solution than more small capacities. A new technology and modern machines could improve this production significantly. Import of logs of precious wood species could be taken into consideration.

1.5 Particle board production

At present the eight existing particle board factories in the country produce a quantity of boards which is considered on a world scale as the minimum for only one economical capacity. The present production is based on saw dust and chips produced on the woodworking machines, without any further preparation. Therefore the quality of products is unsatisfactory.

Recommendation: Due to the fact that a very small part of the wood is used in the mechanical wood processing industry, the future development of this industry should pay special attention to the increase of the particle board production. This development should be based on economical capacities with a minimal output of 40,000 m³ boards per year. Such factories could use to a large extent chips and other waste wood from other wood processing factories; but without specially produced chips for the outer layers it is not possible to make particle boards of high quality. Good quality particle boards are exportable products.

1.6 Fiberboard production

Fiberboards are a good substitute for plywood and for many parts of furniture. Laminated fiberboards have a very wide range of uses. Fiberboards are also exportable products.

Recommendation: An increase in the production of fiberboards as well as laminated fiberboards would ensure good materials for the furniture production, and for many other purposes. Taking into account the country's wood resources production of medium density fiberboards (MDF) could be taken into consideration for a long range plan.

1.7 Joinery production

Development of the joinery production in the world is directed towards finishing these products in factories. This is more rational than finishing them on the building sites.

Recommendation: Joinery factories manufacture standardized products and, in the case of specialization, a very rational technology could be used and achieve high productivity and quality.

1.8 Furniture production

There is no successful furniture production without a certain level of specialization. It is, together with good design of products, an elementary prerequisite for productivity, quality and consequently for export. The modern industrial technology used nowadays in the well organized production of furniture is based on specialized production, using standardized interchangeable parts.

Recommendation: As the first step towards improvement of production, factories should specialize in one of three major groups of furniture: solid wood, case goods or upholstered furniture. Further processing should lead towards more narrow specialization for certain groups of products as: school furniture, kitchen furniture, bedroom furniture and so on.

1.8.1 Furniture products

The existing furniture producing factories do not try to develop original product lines. Most of the factories have the same items in their production. These items are very simple and belong to the cheapest furniture, which could not be acceptable for export. In hotels and other public places there is a lot of very good furniture. In the Ethnographic Museum in Pyongyang many attractive pieces of furniture testify that this production could be backed up by some traditional styles.

Recommendation: The design of furniture is a highly professional work. Designers must be familiar with aesthetic and ergonomic principles, characteristics of wood and other materials, construction of furniture and production technology. Education of industrial designers is very important. Some traditional furniture items, such as coffee tables, if adapted for industrial production could be very attractive for export.

1.8.2 Materials for the furniture production

There are good domestically produced materials (glues, lacquers, fabrics, hardware, etc.) for the production of furniture, but the range is rather limited.

Recommendation: Further development of materials and improvement of their quality is of utmost importance for the improvement of the quality of furniture. This could be done in close co-operation with other industries (chemical, textile, metal, and so on).

1.8.3 Equipment

Worn out and technologically outdated equipment cannot assure high productivity and satisfactory quality in the production of furniture. Also, it is impossible to achieve the quality required for export without proper tools and equipment for their maintenance.

Recommendation: It is urgent to scrutinize how to replace old equipment and gradually bring the production of furniture in the country to a satisfactory level. A pilot factory equipped with modern machines would be the right way to encourage the process of modernization.

1.8.4 Technology

Modern equipment will give its full output only if it is used in accordance with modern technological concepts. The modern technology comprises not only equipment but many other elements of production and relationship between them.

Recommendation: Special attention should be paid to the design of modern technology, including: equipment, internal transport, micro-organization of work stations and safety measures. All production activities and procedures should be taken into consideration when designing a factory's technological layout. It is highly advisable to create an institution which is specialized in designing furniture production technology facilities.

1.8.5 Productivity

Low productivity in any production results in the stagnation of development.

Recommendation: By studying and improving all conditions in the production of furniture, special attention should be paid to the increase of productivity. There are big reserves which could be utilized, resulting in an overall higher production of factories. Introduction of new, more effective, methods of manufacturing should be a permanent task. Changes should become a basic attitude in production.

1.8.6 Quality of products

The importance of the quality of products is widely recognized by all authorities concerned. At present the approach to the improvement of quality is rather narrow.

Recommendation: In order to improve the quality of furniture products it is necessary to design a system of integral quality control, comprising all factors on which quality depends. These factors are: design and construction of products, working documentation, materials, machines, tools, skills of operators and quality control organization.

1.8.7 Production organization

The efficiency of a production depends mostly on its organization. Every improvement in technology requires certain improvement in organization.

Recommendation: It would be necessary to analyze the present organization of production in greater depth and to propose its possible adaptation to the new technological requirements. Many routine tasks could be standardized and many procedures could be simplified.

1.8.8 Maintenance of equipment

The maintenance system in the factory is rather good, but some standards of maintenance are still low.

Recommendation: Reliability and accuracy of woodworking machines should be considered as a test of quality of maintenance. Control of accuracy of machines should become a routine in the factories.

1.8.9 Production management

The management of production is the part of the unitary management system accepted in the country, and in principle cannot be changed.

Recommendation: It would be useful to take into consideration some good management methods, recognized in the world as efficient, if they are not opposed to the system accepted in the country. The management system should be backed up by a modern information system.

1.8.10 Economy of production

The economy of production in factories is part of the central planning system in the country. Direct expenses are under control while fixed costs are too generalized. This covers up the importance of utilization of installed capacities.

Recommendation: Fixed expenses should be taken into consideration more seriously, to get information on the real cost of production and to establish realistic prices of products.

2. Ad-hoc advice

Day-to-day assistance to the factories was limited due to the poor interpretation and limited communication.

Recommendation: In future UNDP/UNIDO assistance, experts should have better interpretation and more opportunities to communicate with people. Advice is useful if it is immediately applied in production.

3. Study Tour

A study tour is a good opportunity to gain new knowledge and experience in a short time.

Recommendation: Candidates for a study tour should be selected among people working in production and in technical departments, who will benefit more than those who are not technicians.

4. A plan of action for the future development of the sector

Due to the circumstances described earlier in this report it was not possible to prepare a complete of action plan for the future development of the sector. Some arguments collected during this mission show that the country urgently needs such a plan.

Recommendation: Some ideas given in this report could be helpful for the preparation of a development plan for the wood processing industry in DPRK.

5. A full project document for an IPF funded project

The outputs and activities given in the proposed project document for a new project (see Annex V) have been finalized bearing in mind the limitations placed by the US\$ 300,000 allocated for this sector in the agreement between the Government and UNDP.

Recommendation: The Government should endeavour to allocate more international aid to furniture production, and to the wood processing industry as a whole.

6. Selection of candidates for the Workshop in Ljubljana

Two candidates for the Workshop on Production Management in Mechanical Wood Processing Industries have been selected among the study tour participants. The key problem was knowledge the English language.

Recommendation: Better and timely preparation of candidates for all kinds of fellowships is very important. The candidates should meet both requirements: knowledge of a language and to be from among the technical people in production.

A C K N O W L E D G E M E N T S

During his mission a remarkable support and very helpful assistance was given to the expert by the UNDP staff in Pyongyang. Also he experienced an outstanding hospitality shown by the officials from the Fifth Department of the Ministry of Foreign Trade, by the management of the General Bureau for Building Materials and by the people working in the Pyongyang Wood Complex.

August 1986



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

PROJECT FOR THE GOVERNMENT OF
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREAAssistance to the Furniture Industry

JOB DESCRIPTION

SI/DKR/86/880/11-01/J13101

- Post title** Furniture Production Expert
- Duration** 4 months
- Date required** As soon as possible
- Duty station** Pyongyang with possibilities of travel in the country
- Purpose of project** To provide ad-hoc assistance to the country's furniture industry and assist in the preparation of a long range plan of action.
- Duties** The expert will be attached to the Fifth Department of the Ministry of Industry and, in close cooperation with the counterpart staff he will make a diagnostic survey of the furniture industry and provide ad-hoc advice to the management of the factories visited. In particular he is expected to:
1. Study statistical and other data available on the sector to obtain an idea of its current and potential role in the economy and the problems it faces.
 2. In consultation with and with the assistance of the counterpart staff visit selected furniture factories representative of the industry and conduct a diagnostic survey to assess their techno-managerial capabilities in terms of production equipment, utility and service installations, production planning and control practices, quality and process control procedures, machine and tool maintenance, range of products manufactured, supply situation and availability of manpower and their training needs as well as locally produced equipment.

Applications and communications regarding this Job Description should be sent to:
Project Personnel Recruitment Section, Industrial Operations Division
UNIDO, VIENNA INTERNATIONAL CENTRE, P.O. Box 300, Vienna, Austria

3. To the extent possible, give ad-hoc advice and provide on-the-job training to the factories visited in solving the problems identified.
4. Identify, in the light of the above, positive and negative aspects of the industry, determine its needs and draw up plans of action for the improvement of the existing industry and for the creation of new industries using the country's domestic resources.

Qualifications: Wood technologist or engineer with considerable experience in medium scale furniture manufacturing at both the shop floor and managerial level. Familiarity with conditions prevailing in developing countries desirable.

Language: English

Background
Information:

The wooden furniture industry in the People's Republic of Korea (PRK) is below the expectations of the general public both aesthetically and qualitatively. The technology used is rudimentary and productivity is low.

In its development plans the Government is placing emphasis on providing furniture for the population to complement its ambitious housing programmes. Emphasis is to be placed on serial production of household furniture using modern knock-down technology for ease of transport. (So far, furniture has been made using craft or "mechanized craft" production methods).

The country is reasonably well endowed in forests, felling some 6 million m³ of wood a year. Most of this volume, however, is used as firewood, sawlogs and veneer logs representing only 10% of the volume felled. It complements this with limited imports. Most of these logs are converted into sawnwood (production of the order of 280,000 m³). No data is available on production and trade in wood based panels, but there are indications that both plywood and particle board are produced locally.

WORKING PLAN (GANTT CHART)

ORD. NUMB.	PROJECT ACTIVITIES	FOUR MONTHS PERIOD				
		15-31 JANUARY	FEBRUARY	MARCH	APRIL	1-15 MAY
1	BRIEFING IN VIENNA	N				
2	STUDY TOUR PROGRAMME AND CANDIDATES FOR THE SEMINAR	NNNNNNNN				
3	VISITING FACTORIES TO SURVEY THE PRESENT LEVEL OF TECHNOLOGY	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN				
4	PROPOSAL OF A NEW PROJECT DOCUMENT			NNNNNNNNNNNNNNNNNNNN		
5	DAY-TO-DAY ASSISTANCE TO FACTORIES	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN	NNNNNNNNNNNNNNNNNNNN	NNNNNNNNNNNNNNNN	
6	TERMINAL REPORT				NNNNNNNNNNNNNNNN	
7	ACCOMPANING STUDY TOUR					NNNNNNNNNNNNNN
8	STUDY TOUR REPORT					NNN
9	DEBRIEFING IN LJUBLJANA					N

NAMES AND TITLES OF THE PEOPLE MET

Mr. Han Tae Hyok - Deputy General Director of the Fifth Department.
Mr. Jong Yang Yung - Division Director of the Fifth Department.
Mr. Ko Ju Chol - Senior Officer of the Fifth Department.
Mr. Li Song Ho - Senior Officer of the Fifth Department.
Mr. Jang Gwang Ho - Senior Officer of the Fifth Department.
Mr. Li Sang Ung - Senior Officer of the Fifth Department.
Mr. Jo Dal Son - General Director of the General Bureau for
Building Materials (GBBM).
Mr. Li Song Haik -Chief of the Technical Department of GBBM.
Mrs. Jo Li Sun -Officer of the Technical Department of GBBM.
Mr. Li Tong Chun -General Manager of the Pyongyang Wood Complex (PWC).
Mr. Ryu Chun Gyu -Chief of the Technical Department of the PWC.
Mr. Li Sang Hwa -Manager of the Pyongyang Furniture Factory.
Mr. Kim Hyon Sam -Technical Manager of the Pyongyang Furniture Factory.
Mr. Sin Jong Han -Manager of the Pyongyang Combined Furniture
Factory.
Mr. Han Yong Gwon -Interpreter (Student of English language).
Mr. Cho Jin Su -Chief of the Quality Control Department (PWC)
Mr. Lyang Won U -Chief of the Maintenance Department (PWC).
Mr. Li Gong Su -Chief of the Planning Department (PWC).
Mr. Cho Jin Suk -Guide in the Project (Deputy Director of the
Furniture Factory (PWC)
Mr. Ho Jong Chol -Driver (Belongs to the Fifth Department).

PROJECT SI/DRK/86/880

A N N E X IV

STUDY TOUR PARTICIPANTS

1. Mr. Li Song Hak - Chief of the Technical Department of the General Bureau for Building Materials,
2. Mr. Ryu Chun Gyu - Chief of the Technical Department of the Pyongyang Wood Complex.
3. Mr. Jang Gwang Ho - Senior Officer of the Fifth Department, Ministry of Foreign Trade.

STUDY TOUR REPORT

BASIC DATA- SI/DRK/86/880

COUNTRY: The Democratic People's Republic of Korea.

PROJECT TITLE: Assistance to the Furniture Industry.

OUTPUT (c): Two technicians from the DPR of Korea familiarized with modern serial furniture production techniques.

ACTUAL NUMBER OF PARTICIPANTS: Three (3)

NAMES AND TITLES:

1. Mr. Li Song Hak
Chief of the Technical Department,
General Bureau for Building Materials in P'yongyang.
2. Mr. Ryu Chun Gyu
Chief of the Technical Department,
P'yongyang Wood Complex.
3. Mr. Jang Gwang Ho
Officer of the Fifth Department,
Ministry of Foreign Trade.

COUNTRIES AND COMPANIES VISITED: Yugoslavia,
factories within Sear Sipad.

DURATION: Three weeks.

PERIOD: From 19 April to 9 May 1987.

FUNDS ALLOTTED: US\$ 14,000

PARTICIPANTS ACCOMPANIED BY: Radmila Malis, Furniture Production Expert.

REPORT PREPARED BY: Radmila Malis.

I. INTRODUCTION

This study tour has been organized for the Democratic People's Republic of Korea as a part of the SIS project number SI/DRK/86/060 entitled "Assistance to the Furniture Industry". US\$ 14,000 have been allotted under BL 32 to cover a study tour for two participants. The Government insisted on sending three professionals on the study tour. Its request was accepted, and could be financed since one of the three participants participated in the Workshop on Production Management in Public Sector Mechanical Wood Processing Industries in Ljubljana, and his air ticket could be covered by the Workshop's budget.

Certain factories within the Sipad Wood Complex in Yugoslavia have been selected for the study tour. The detailed study tour programme, prepared by the expert on the project, has been accepted by UNIDO and Sipad. (See III below). Sipad's support to the study tour was very welcomed. It arranged all the necessary information and enabled the visits to factories in accordance with the programme and the schedule.

II. ITINERARY

Departure from P. ongyang	: 15 April 1987	15.30 Hrs.
Arrival in Moscow	: 15 April 1987	20.00 Hrs.
Departure from Moscow	: 16 April 1987	08.30 Hrs.
Arrival in Belgrade	: 16 April 1987	09.15 Hrs.
Departure from Belgrade (by train)	: 19 April 1987	15.10 Hrs.
Arrival in Sarajevo	: 19 April 1987	21.00 Hrs.
Departure from Sarajevo (by train)	: 7 May 1987	15.15 Hrs.
Arrival in Belgrade	: 7 May 1987	21.00 Hrs.
Departure from Belgrade 1/	: 9 May 1987	08.30 Hrs.
Arrival in Moscow 1/	: 9 May 1987	12.00 Hrs.
Departure from Moscow 1/	: 12 May 1987	
Arrival in Pyongyang 1/	: 13 May 1987	

NOTE: Since all planes after 15 April were reserved for the country's guests, participating in the celebrations of Kim Il Sung's birthday, the departure from Pyongyang had to be brought forward. The longer stop-over in Moscow was due to the Korean participants' insistence to return to Pyongyang on their national airline.

1/ Applies only to Messrs. Jang Gwang Mo and Li Song Mak. Mr. Ryn Chun Gyn travelled to Ljubljana and participated in the Workshop. He returned to Pyongyang via Moscow, on 30 May 1987.

III. FACTORIES VISITED

The furniture production in the DPR of Korea is limited by the low level of development of the primary wood processing sector. In order to show the complete structure of the wood processing industry, the study tour programme comprised a number of production facilities covering both primary and secondary wood processing industries.

During the study tour more than 30 factories and institutions were visited as follows:

-saw mills	5
-veneer factory	1
-plywood factory	1
-blockboard factories	2
-particle board factories	3
-factory producing surface improved particle boards	1
-fibreboard factory	1
-plastic laminate factory	1
-foam factory	1
-case goods furniture factories	4
-solid wood furniture factories	10
-upholstered furniture factory	1
-kitchen furniture factory	1
-office furniture factory	1
-metal furniture factory	1
-joinery factories	3
-research laboratories	5
-quality testing centre	1

The visits were organized following the itinerary and schedule proposed in the study tour programme. The following table shows dates, cities and names of Sipad's working organization (WO) and factories visited.

DATE	CITY	WORKING ORGANIZATION	VISITED FACTORIES
20 April	Banja Luka	WO SIPAD-VRBAS	-saw mill -solid wood furn.fact. -case furniture factory
21 April	Bosanska Gradiska	WO SIPAD-RADNIK	-upholstery furn.fact. -foam factory
22 April	Sanski Most	WO SIPAD-SANA	-saw mill -particle board factory -blockboard factory -solid wood furn.fact. -case furniture factory
23 April	Bosanska Krupa	WO SIPAD-UKA	-particle board factory -improved particle boards -2 solid wood furniture factories
24 April	Bihac	WO SIPAD-UNA	-case furniture factory -office furniture fact. -solid wood furn.fact. -metal furn.factory

<u>DATE</u>	<u>CITY</u>	<u>WORKING ORGANIZATION</u>	<u>VISITED FACTORIES</u>
25 and 26 April	Sihac - Plitvice		Free weekend
27 April	Bosanska Petrovac	WO SIPAD-OSTRELJ	-saw mill -joinery factory
28 April	Klujc	WO SIPAD-KLUJC	-blockboard factory -veneer factory -plywood factory
29 April	Donji Vakuf	WO SIPAD-JANJ	-saw mill
	Bugonjo	WO DIPAD-JANJ	-joinery factory -solid wood furn. fact.
30 April	Gornji Vakuf	WO SIPAD-JANJ	-solid wood furn. fact.
1, 2 and 3 May	Sarajevo	Holiday and weekend	
4 May	Sokoolac	WO SIPAD-ROMANIJA	-saw mill -kitchen factory
	Rogatica	WO SIPAD-ROMANIJA	-joinery factory -solid wood furn. fact.
5 May	Foca	WO SIPAD-MAGLIC	-fibreboard factory -laminated factory -particle board factory -solid wood furn. fact.
6 May	Sarajevo	WO SIPAD-IRC	-research laboratories (wood preservation, wood drying, wooden panels, furniture fini- shing and mechanical characteristics -testing the furni- ture's quality
7 May	Sarajevo	WO SIPAD-IRC	-conclusions and draf- ting of the study tour report.

IV REVIEW OF OBSERVATIONS

The purpose of this review is to point out those facts that could be useful for the improvement of the wood processing industry in the DPR of Korea. The factories are listed in the order in which they were visited.

SIPAD-VRBAS, BANJA LUKA

Saw mill. This saw mill, with a capacity of 50,000 m³ of logs per year, is specialized in sawing beech wood, producing sawn wood mainly for the furniture factories within SIPAD-VRBAS. The logs having a diameter over 35 cm. are sawn on two pairs of bandsaws and those with a diameter up to 35 cm. on the frame saw with an opening of 500 mm. Part of the sawnwood produced for export is sawn to the final size in the saw mill, while the rest of the sawn wood is only separated from the waste wood and is further sawn in the special cutting department after predrying to a moisture content of about 20%.

In the cutting department planks are cut to the gross sizes of the furniture parts and delivered to the furniture factories. The predrying dry kilns are substitutes for air seasoning, lowering seasoning time from approximately 4 months to an average of 25 days. The cutting department is equipped with cross-cutting and ripping circular saws and narrow bandsaws, all made in Yugoslavia and one 6 spindle planer-moulder made in West Germany.

The internal transport is mechanized: three portal cranes (one in the log yard and two in the sawnwood yard), rolling and chain conveyors in the saw mill and rolling and belt conveyors in the cutting department.

The sharpening shop is well equipped with modern sharpening, teeth pressing and setting machines made by Vollmer, Federal Republic of Germany. As a result of good tool and machine maintenance, the quality and accuracy of sawing is maintained at a high level.

Most of the machines seen in this saw mill, especially the 500 mm frame saw, as well as machines in the sharpening shop and in the cutting department, are well suited to the Korean conditions.

Solid wood furniture factory. This is a very big furniture factory producing more than 500,000 units of different types of furniture made of solid wood. Both mechanical and bending and high frequency presses are used for bending. Wooden parts are dried in both metal dry kilns and vacuum driers. The drying process is fully controlled and regulated automatically by a computer. The machining is organized in three major technological lines: the production of chair seats, the production of profiled and rectilinear parts and the production of turned parts.

After precise machining and very careful sanding the parts are prepared for finishing. The finishing line is equipped with dipping devices, spray booths, airless spray guns and drying channels. The factory has a small laboratory for the preparation and quality control of finishing materials.

Since the majority of production is oriented for export, the furniture is constructed to be delivered knock-down, and assembled in the importing countries.

Good maintenance of equipment and good sharpening of the tools play a decisive role in the achievement of productivity and quality.

The selection of wood, the quality of processing, especially sanding and the selection of the equipment seen in this factory could be taken as an orientation and guide on how to improve the furniture production in the DPR of Korea.

Case Furniture Factory. This factory produces wall units and other case goods that use particle board as the main raw material. Panels are veneered or laminated and the standardized furniture parts are made on a line with connected machines for sizing, edge banding and dowel drilling. Veneered parts are sanded and surface finished. Packing of knock-down furniture is the last operation in the factory.

Solid wood parts are made by the solid wood furniture factory. This factory also makes panels needed to complete products of the solid wood furniture factory.

This factory, complete as it is, could be used as a model for developing production of the case goods furniture in the DPR of Korea.

SIPAD-RANDIK, BOSANSKA GRADISKA

Case goods furniture factory. This factory is very similar to that one seen in Banja Luka. It has a small line for solid wood processing, making components for case furniture. The major products are wall units and bedrooms. This is a very flexible factory with a rather wide range of different products, very interesting for Korean conditions.

Upholstery furniture factory. This is the biggest upholstery furniture factory in Sipad and one of the biggest in Yugoslavia. The factory has two production lines: one for the production of mattresses and the other for sofas, armchairs and sofa-sleepers.

Frame parts are made in other Sipad factories and assembled in a department of this factory. The metal mechanisms are bought from the metal working industry. Foam is produced in the same company. Fabrics and other filling materials are bought on the market. Springs for the mattresses are made in the same factory, using steel wire 1.8 to 2.2 mm. in diameter depending of the end use of the springs.

Cutting of materials, sewing of fabrics and assembling of products are the major operations in the production. The skill of workers is most important for the quality of upholstered furniture.

The production of upholstered furniture depends more on the supply of different materials than on equipment, which is simple and inexpensive. Except for the size of the factory, which is too big, all other technological details can be used in order to develop a similar production in the DPR of Korea.

Foam factory. This is the only Sipad factory producing foam for the production of upholstered furniture. Polyurethane foam is made of two components (polyol and isocyanate) and polymerizes under the influence of heat. The fully automatic equipment is programmable for different densities and hardness of foam, depending on the envisaged end use. The cutting department is equipped to cut blocks of foam into different sizes of sheets, profiles and rolls. Some of these machines have sensors reading drawings and cutting according to the drawing. Since the production of modern upholstered furniture uses foam as the main filling material, production of foam is a pre-requisite for a successful production. This technology is of great interest for the furniture production in the DPR of Korea, because they currently import foam.

SIPAD-SANA, SANSKI MOST

Saw mill. This is a big saw mill sawing 70,000 m³ of logs (beech wood and conifers). It has debarking equipment, two band saws and one frame saw line. Saw dust is used for the production of energy, while waste wood is used for the production of particle boards. Big sized planks are selected for export and the rest of sawn wood are used for the production of furniture, parquet and blockboards. The sawdoctoring shop is very well equipped and the quality of sawing is excellent, as is the yield obtained from the log input. The internal transport is similar to that seen in Banja Luka.

Particleboard factory. The annual production of this factory is 55,000 m³ of three layer particle boards. Raw material is round wood from 5 to 25 cm. in diameter and waste wood from the saw mill. The factory has three flakers; it usually uses two and one is kept in reserve. A Pallman chipper is used for chips made out of waste wood. Particles for the outer and inner layers are selected by an air separator located after the dryers. After adding glue, chips are sent to the mat forming machines. The next operations are prepressing and pressing, followed by cooling, trimming and sanding. The weight of the boards is controlled by an automatic scale before pressing. The equipment of the factory is made in Italy and the Federal Republic of Germany.

Bearing in mind the nature of wood in the DPR of Korea, the production of particle boards has a decisive importance for the successful furniture production. The Koreans have seen the difference between this technology and that used in DPRK.

Blockboard factory. This is a small factory manufacturing 3,000 m³ of panels per year. The quality of boards is extraordinarily high and the total production is exported. The core is made from glued laths of conifers. All knots are cut out before glueing. 3mm thick veneer is produced on the peeling lathe and the best sheets are selected for blockboards on the wet clippers, while the rest is used for the production of fruit cases.

The veneer sheets are edged, jointed and glued onto the core in the press. After trimming and sanding the boards are checked and selected, marked and packed for transport overseas.

The blockboards are excellent material for furniture production and, in the conditions of DPRK, the present plywood production could be easily switched to the blockboard production, using available low grade soft wood to make the cores.

Solid wood furniture factory. This factory is specialized in producing cupboards for the USA market. They make about 1,200 units per month. All cupboards are in the Early American style. They are produced as a knock-down product, and assembled in Sipad's assembly and distribution centres in the USA. Due to the strong competition and very high quality standards in the USA, the quality of the products is of utmost importance. Special attention is paid to the sanding and finishing of surfaces.

This factory is a very good example of a well organized and prepared production using simple woodworking machines to produce rather complex and high quality products.

Case goods furniture factory. Equipment and technology are similar to those seen in Banja Luka and Bosanska Gradiska. The products are very simple bedrooms, wall units and bookcases. Particle boards are veneered with so called "fine line" veneer, and finished products are decorated with profiled decorative applications made of solid wood. This is an example of production of inexpensive products, and could be of interest to Korea.

SIPAD-UNA, BOSANSKA KRUPA

Particle board factory. This factory uses the "Bison" technology to make particle boards of the best quality. The capacity is 45,000 m³ of boards per year. These three layer boards are made of round wood and waste wood from the saw mill. This is another proof that only big particle board factories can be economic.

Surface improved particle boards. A fully automatic line is used for lamination of particle boards with resin or plastic foils. The technology is very simple but requires high quality particle boards and adequate decorative materials.

Due to the lack of good quality decorative veneer in the DPRK this technology could be the right solution for the furniture production.

Solid wood furniture factories (two factories). These factories have a long tradition. They are universal furniture factories, producing a rather wide range of different products of high quality for both the export and the domestic markets. The improvement of this technology is gradual, and the factories are equipped with a range of old and new machines. Such a method of improvement of technology could be advisable under the Korean conditions.

Case goods furniture factory. Using improved particle boards with laminates, this factory produces bedroom furniture which looks very attractive. The technology is very simple and productivity is very high. This technology could be recommended for the case goods furniture production in the DPR of Korea.

SIPAD-UNA_BIHAC

Office furniture factory. This is the only metal furniture factory in Sipad. It produces metal components for other furniture factories, but it also has its own programme of metal furniture in combination with wood, glass and plastic intended for gardens, restaurants, offices, schools and sometimes as household furniture. The surface finishing of metal is the most important operation in the production. The study tour participants have paid special attention to this production.

Solid wood furniture factory. Actually this is a chair factory using beech wood to produce medium quality chairs for the export and the domestic markets.

SIPAD-OSTRELJ_BOSANSKI_PETROVAC

Joinery factory. This factory is specialized in the production of doors. They use softwood frames, plywood and paper honey-comb fillings to make flush doors. Cheap doors are made of fibreboards coated with coloured paints and expensive doors are veneered and finished with transparent lacquers. This factory uses very successfully finger joints for using short pieces of wood. This done on an automatic finger jointing line. Such a line would be very useful in the DPR of Korea.

SIPAD-KLJUC_KLJUC

Blockboard factory. This factory produces cores of boards using Toweragge machines, and they get veneer from the plywood factory. The capacity is 12,000 m³ of panels per year, but they currently produce 75% of this quantity because of low demand on the market. This technology could be acceptable for Koreans because of low investments and very good quality panels for the furniture production.

Veneer and plywood factory. Comparing the plywood production in this factory with the production in the DPR of Korea many differences are observed. These are: selection of logs, steaming of logs, peeling and selecting veneers, jointing of veneer, sanding of plywood and so on. They also produce water resistant plywood used for shuttering, for production of railway wagons, etc.

Besides the equipment, which is quite different from that used in Korea, the study tour participants have been able to see that plywood production requires much better raw material than that used in DPRK.

SIPAD-JANJ_DONJI_VAKUF

Saw mill. This saw mill has an annual capacity of 100,000 m³ of logs. It only saws conifers. The saw mill is equipped with two pairs of framesaws (Linck, Federal Republic of Germany) and one framesaw with an opening of 500 mm. for sawing small diameter logs. This saw mill supplies one big joinery factory and two solid wood furniture factories with rough cut parts. Therefore, all lumber is seasoned in dry kilns to a moisture content of 8% and then cut in the cutting department. Having only one cutting department for three factories permits a big saving in investment and ensures a better utilization of wood. This experience is very useful for the Koreans.

Joinery factory. This factory makes both, doors and windows of very high quality, painted and completely glazed. They have a separate group of assemblers on the construction site to install doors and windows. Special requirements for joinery is the conservation of energy; and windows must meet the high insulating factors. So called "Isomax" windows are double glazed with a vacuum in between the two panes. It is very important to mention that the saw mill produces sawn wood in the sizes which correspond to the sizes of the joinery components. Technology, organization and quality of the production in this factory can be taken as standards for how a good factory should be.

SIPAD-JANJ__BUGOJNO

Solid wood furniture factory. This factory manufactures furniture made of solid pine and spruce. The production line is composed of different chairs, tables, beds and cupboards. About 50% of the production is for export. The factory gets parts already cut to the gross sizes of the furniture parts. In order to utilize low quality wood the factory also has a line for the production of the packing cases for special products.

This factory is interesting for the Koreans because it makes furniture out of a raw material similar to that available in Korea.

SIPAD-JANJ__GORNJI_VAKUF

Solid wood furniture factory. The technology and production line is very similar to that seen in Bugojno, but this factory is considered to be one of the best in Sipad. This attribute is gained through very high productivity and an extraordinary quality. Actually the only difference is in better management and organization of production. The raw material used is pine, spruce and fir. Beech is also used for some products.

In the same place we have seen production of wooden fancy goods (trays, bowls, decorative products etc). It was very useful for the Koreans to see this middle size factory producing almost 100% of its products for export without any problem to attain the necessary quality.

SIPAD-ROMANIJA__SOKOLAC

Saw mill. This saw mill, which only saws conifer logs, has a capacity of 100,000 m³ of logs per year. It is the best equipped saw mill seen during this study tour. Trimming, grading and measurement of sawn wood is done automatically, as well is the sticking for seasoning.

The short visit to this saw mill was organized in order to initiate some thoughts for the further perspective of the saw mill production in the DPR of Korea.

Kitchen furniture factory. This factory has started operation two years ago, but now it is already very successful in the production of several types of very attractive kitchens made of solid wood (fronts) and laminated particle board (cases goods). Its modern machines including a softforming line, enable it to manufacture kitchen furniture of a very high quality. Sinks and other metal and plastic components are bought from specialized producers.

This was another opportunity for Koreans to see the advantages of production in a specialized factory.

Joinery factory. This is a usual joinery factory with standard machines and products. It is worthwhile to mention that the wood cutting department is common to both factories (kitchen and joinery) to ensure a better utilization of lumber.

SIPAD-ROMANIJA__ROGATICA

Solid wood furniture factory. This is yet another very well organized factory producing solid wood furniture made of coniferous wood. Bedrooms, wardrobes, cabinets and other related products are made mostly in natural colour and finished with nitrocellulose lacquers. About 50% of the production is for export.

SIPAD-MAGLIC__FOCA

Fibreboard factory. This factory produces 25,000 tons per year on its two lines for hard fibreboards and one line for insulating fibreboards. The raw material is waste wood from other wood processing factories and the lowest grade round wood. The process is completely automated and controlled by a small number of workers. More than half of the production is exported.

The fibreboards are a good substitute for plywood in furniture production. They are made out of cheap material and could be well recommended for the DPR of Korea.

Laminate factory. This factory produces different laminates based on melamine resin and decorative papers. A part of the production is used for the lamination of fibreboards and particle boards, and the rest of the production is sold to the other manufacturers of final products.

Due to the lack of good decorative veneer in the DPRK the production of laminates would be very rational for the Korean furniture production.

Particle board factory. These are thin (3 to 8 mm.) particle boards produced using a technology known as the MENDE system. It could be an alternative for fibreboards production.

Solid wood furniture. The only important feature of this factory is that it makes furniture of coniferous species, similar to those used in the DPR of Korea.

SIPAD-IRC SARAJEVO

Research laboratories. The Korean participants visited laboratories for: wood preservation, wood drying, production of wood based panels, furniture finishing and the research of mechanical characteristics of wood and wooden products. They have seen all available equipment in these laboratories and its use in various experiments and research work.

Part of these laboratories have been equipped by UNIDO as part of a former project of assistance to SIPAD. It is without any doubt that similar laboratories are necessary for a more rapid progress of the Korean wood processing industry.

Quality testing centre. This centre is used for testing the quality characteristics of different final products (furniture, joinery, etc.) in order to check whether they fit to the standards and to issue necessary certificates attesting the products' quality. Such a centre is indispensable for the improvement of quality and is recommended for the development of the production of furniture in the DPRK.

V CONCLUSION

This study tour was very well organized and its programme was fully implemented. The participants have learned many new facts about furniture production and the wood processing industry in general. After this study tour they will be able to make a significant contribution in planning further development of this industry in their country.

VI RECOMMENDATIONS

Study tours are the most suitable and efficient way to accelerate the transfer of technology, to gain a new knowledge about industrial development and to become convinced of the efficiency of modern equipment. Therefore it is recommended to organize such a study tour to countries with advanced industries and, if possible, to combine them with visits to specialized fairs of wood working machines. Participants must be selected among engineers able to understand modern techniques and to able to communicate easily in a common language.

UNITED NATIONS DEVELOPMENT PROGRAMME

Project of the Government of
The Democratic People's Republic of Korea

PROJECT DOCUMENT

Title: Assistance in the Establishment of
a Pilot Furniture Plant

Number : _____ **Duration:** 24 Months

Primary function: Pilot Project

Secondary function: Training

Sector: (Govt class) Industry (UNDP class and code) Industry 05

Sub-sector:(Govt class) Industrial (UNDP class and code) Industrial
Production Production 0520

Government Implementing Agency: The General Bureau for Building Materials
Pyongyang City, Pyongyang

Executing Agency: United Nations Industrial Development
Organization (UNIDO)

Estimated Starting Date: September, 1987

Government Inputs: 800,000 Wons (in kind)

UNDP Inputs: US\$ 300,000

Signed: _____ **Date** _____

on behalf of the Government

_____ **Date** _____

on behalf of the Executing Agency

_____ **Date** _____

on behalf of the United Nations
Development Programme

PART I LEGAL CONTEXT

This Project Document shall be the instrument referred to as such in Article I, paragraph 1, of the Assistance Agreement between the Government of the Democratic People's Republic of Korea and the United Nations Development Programme, signed by the Parties on 8 November 1979.

The Government Implementing Agency shall, for the purposes of the Standard Basic Agreement, refer to the Government Co-operating Agency described in that Agreement.

PART II THE PROJECT

A. Development Objectives

An overall development objective of this project is to improve the existing furniture industry in the country, in order to gainfully utilize available wood resources, increase efficiency in production, and to produce furniture of satisfactory quality for both local consumption and export.

B. Immediate Project Objectives

The project is aimed at achieving the following objectives in order to facilitate the creation of an exemplary furniture production unit for the manufacture of items of satisfactory quality.

- a/ Establishment of a modern equipped pilot furniture plant, organized for industrial production, in the existing furniture factory in the Pyongyang Wood Complex.

- b/ The training of wood technicians and machine operators in the efficient operation of all the machinery and maintenance of tools, so as to manufacture furniture of medium quality.

- c/ The design and implementation of an initial product line based on standardized interchangeable furniture parts.
- d/ The training of managerial staff in overall management techniques including introduction to the marketing of furniture products.

C. Special Considerations

This project is in line with the development plans of the Government and places emphasis on its objective of improving standards of living by providing furniture for the population to enable the full realization of the Government's ambitious housing programme.

The production of furniture is to be based predominantly on wood as a raw material with which the country is well endowed, and which is renewed through regular reforestation.

The pilot furniture plant, once having become fully equipped and operational, will represent a source of experience which will be replicable in other furniture factories throughout the country. The achievement of the objectives of this project will, consequently, help to improve the productivity and quality of production of the national furniture industry, and in the long term enable the country to increase its export potential.

D. Background and Justification

DPR Korea is a predominantly mountainous country with some 9 million hectares, or 74 % of its land, designated as forested areas. The total growing stock of wood is estimated to be about 620 million m³, allowing an average annual cut of approximately 6.5 million m³. The primary wood processing industry is supplied with some 1.8 million m³ of logs.

domestically produced, and with a limited quantity of logs imported from the Soviet Union. The furniture production in the country has been developed mainly within wood processing complexes which produce also sawn wood, joinery, and various wood based panels.

The level of development of the wood processing industry, and of furniture manufacturing in particular, is lagging behind the general level of development in the country. Productivity and product quality are at a very low level in the factories where machines are old. Furthermore, although a large number of professionals are educated at the university level and at various other specialized schools they could benefit further by being exposed to new technologies in the field of furniture production. The lack of know-how and modern equipment are major impediments to the development of this industry.

On the other hand, the Government is giving high priority to the improvement of the living standards of its peoples. The achievement of this goal includes as well the increase in production and improvement of the quality of furniture produced in the country. To assist the country in the achievement of its goals in the area of furniture production, the Government requested UNDP/UNIDO assistance in improving the production processes and quality of furniture produced, through the introduction of appropriate new technology, transfer of technical skills and knowledge, and the provision of additional training opportunities within the country in a demonstration unit equipped with modern machines, measuring instruments and tools.

Initial UNDP/UNIDO assistance in the form of an SIS project was agreed to in June 1986. It resulted in the engagement of a consultant to undertake a survey of the present status of the furniture industry in the country and to prepare as well a draft for an IPF project oriented towards further improvement of furniture production for local consumption and for export.

In the course of this exercise several possibilities for drawing up the IPF project were considered, of which two have been examined in depth.

First - the establishment of a design, prototype making and training centre, and second - the establishment of a small scale furniture pilot plant. Following the analysis of data relating to the industry, collected during the consultant's visit to four wood processing enterprises, and matching them with the Government's expectations, the Government and the UNDP authorities have accepted the expert's view that at the present stage of development of the country's furniture industry, the establishment of a small scale furniture pilot plant would suit the particular needs of the industry. Such a plant is expected to be more beneficial to the country and should be given the highest priority. The assistance given to a furniture pilot plant will result in the acquisition of experience which could be spread throughout the country, and help to influence the adoption of similar solutions in other factories elsewhere.

The furniture factory within the Pyongyang Wood Complex has been selected for transformation into the pilot furniture plant. Such an approach has been chosen because of the possibility of using reconditioned machines since new ones are not readily available for all operations due to limited financial resources. The factory, which is located in Pyongyang, also possesses as part of its Complex, a sawmill of nominal annual capacity 100,000 m³ of sawn logs, a ply-wood factory of nominal capacity 600,000m² of plywood and 500,000 m² of veneer, a particle board factory of annual capacity 5,000 m³ of boards, joinery factory of a nominal capacity 100,000m² of doors and windows, a furniture factory of annual capacity 100,000 peices of various furniture, and one new building intended to be a new furniture factory. The Complex employs 1100 people and has a total annual value of production of approximately 8 million Wons.

The Pyongyang Wood Complex which belongs to the General Bureau for Building Materials is situated in the City of Pyongyang. The Bureau is an independent Government sector enterprise controlling about 20% of the wood processing industry in the country, while the rest of this industry belongs to the Ministry of Forestry. The State Planning Commission is responsible for the distribution of the wood requirements to meet the processing capacities of the various enterprises under the General Bureau and Ministry of Forestry, and allocates wood in

accordance with the Government's goals and plans for each enterprise.

Establishment of the pilot furniture plant will be justified through the many benefits that would accrue to the General Bureau for Building Materials, as well as to the whole furniture industry in the country. The pilot furniture factory is expected to make a breakthrough existing levels of productivity and quality. It will demonstrate in the most convincing way the importance of an appropriate organization to improvement of the industry, and provide the country's professionals with an opportunity to get acquainted with new equipment and technology in this field.

The training programme, which is a critical part of this project, will contribute to the successful acceptance and use of new methods, procedures and criteria. The pilot factory is expected to produce double the quantity of a similar sized unit in existence in the country today, with a quality higher than any manufactured under present levels of production.

E. Outputs

The project outputs listed below are in sequence of accomplishment. They do not, however, represent the order of priorities of the outputs.

1. A modern, flexible pilot furniture plant established in the existing furniture factory, equipped partially with modern wood working machines and with existing reconditioned equipment, to produce solid wood furniture of medium quality, with a limited possibility of board processing and veneering, to help to double the quantity of production obtained at the beginning of the project.
2. The design and production of two new items of furniture and the training of two factory designers in product development techniques and procedures.
3. Establishment of a system of internal standards for products, based on interchangeable parts and components, and the training of two

technicians to maintain and further develop product standards.

4. Establishment of a system of integral quality control, with ten technicians trained as controllers.
5. Two fellows with an better knowledge obtained abroad of the requirements for the successful production and export of furniture.
6. The efficient use of the available manufacturing equipment, with 20 wood machinists, 10 assemblers and 4 team leaders trained to manufacture furniture of medium quality acceptable for export.
7. The provision of adequate tool maintenance facilities, with 1 supervisor and 4 machinists trained in this subject.
8. Two wood technicians trained to design and make required production fixtures aimed at attaining accurate machining of component parts.
9. Improved working conditions, safety and work protection measures.
10. Design of overall factory organization, with improved work preparation, cost accounting and management procedures, with managerial staff trained in (a) improved factory management based on modern industrial production methods and in (b) the basic elements of marketing.

F. Activities

To accomplish the above mentioned outputs the following activities should be undertaken:

For Output 1:

- 1.1 Define production programme for the pilot furniture plant.
- 1.2 Select new equipment to be purchased and old to be reconditioned.
- 1.3 Assist in designing new technology.
- 1.4 Test reconditioned machines.
- 1.5 Purchase of new equipment.
- 1.6 Instal and commission equipment according to the new technological design.

For Output 2:

- 2.1 Design two new products with standardised interchangeable parts and components.
- 2.2 Prepare production documentation and prototypes, and bring the new products into production.
- 2.3 Train two factory designers in product development techniques.

For Output 3:

- 3.1 Make a survey of existing standards of products and components.
- 3.2 Establish a new system of internal standards for products, component parts and materials.
- 3.3 Implement the new standards.
- 3.4 Train two technicians in maintaining and further developing of standards.

For Output 4:

- 4.1 Make a survey of the existing quality control system.
- 4.2 Design a new system of integral quality control.
- 4.3 Develop a training programme for controllers.
- 4.4 Train 10 controllers in the procedures and techniques of quality control.

For Output 5:

- 5.1 Select a country for the study tour.
- 5.2 Select two participants for study tour.
- 5.3 Conduct the study tour.
- 5.4 Report on the study tour.

For Output 6:

- 6.1 Prepare a training programme for furniture manufacturing.
- 6.2 Prepare training manuals for the major production operations.
- 6.3 Train twenty machine operators, 10 assemblers and 4 team leaders to manufacture furniture of acceptable quality.

For Output 7:

- 7.1 Develop a training programme and prepare instruction manuals for maintenance of furniture production tools.
- 7.2 Train two technicians and four machinists in sharpening and repairing tools.

For Output 8:

- 8.1 Train two wood technicians to design, produce and maintain jigs and other furniture production fixtures.

For Output 9:

- 9.1 Train team leaders and machine operators in the correct use of protective devices of 10 wood working machines.

For Output 10:

- 10.1 Make a survey of the present production organization, work preparation, cost accounting and management methods.
- 10.2 Design improved interrelated systems of production organization, work preparation, cost accounting and management systems.
- 10.3 Train factory management staff in modern industrial production methods.
- 10.4 Acquaint the managerial staff with the basic elements of export marketing.

G. Inputs

To carry out project activities the Government and the UNDP/UNIDO need to ensure the provision of the following essential inputs.

1. Government Inputs:

- A technician from the selected factory as a full time counterpart and National Project Director.
- Office space with necessary furniture and appropriate heating and cleaning facilities.
- Secretarial assistance for typing in English and Korean, as well as for administrative services.
- Interpretation and translation services of good quality.
- Local transport.
- Wages to the national staff assigned to the project.
- Wages to the trainees during the time of training.
- Cost of reconditioning of the old machines to be used in the pilot factory.
- Cost of transport for imported equipment from the harbour and import duties, if any.
- Cost of installation and replacement of equipment.
- Cost of production of new jigs and other fixtures.
- Cost of palets for the internal transportation.
- Cost of raw materials and components for production.
- Cost of any necessary addition to and modification of the existing facilities as required for the proper operation of the project.
- Supply of spare parts for equipment not eligible for purchase under the UNDP project.

2. UNDP/UNIDC Inputs :

- A furniture production expert as Chief Technical Adviser (CTA) of the project with responsibility for ensuring the implementation of the majority of the activities of the project for a period of 12 months, split into 3 missions of 4 month duration each (at the beginning, middle and end of project).

- A short term consultant - expert in furniture design - for three months at the beginning of the project.
- A short term consultant - expert in the maintenance of tools used in furniture production for three months in the middle of the project period.
- Two fellowships for a three weeks Study Tour.
- Expendable equipment of approximately YS\$ 17,500.
- Non-expendable equipment of approximately US\$ 125,000 (From among the equipment listed in Appendix V -see also Item 1 under prerequisites).
- Backstopping support.
- Miscellaneous expenses.

H. Work Plan

The preliminary Work Plan covering all project activities is presented in the Table below:

No. Act.	Activity Description	Location	Timing	
1. -	Approval of project	UNDP/UNIDO HQ	Month	0*
2. -	Initiation of recruitment	UNIDO HQ	Month	1
3. -	Submission of candidates for expert posts	UNIDO HQ	Month	3
4. -	EOD of CTA	Pyongyang	"	4
5. -	EOD of expert for design work	Pyongyang	"	5
6. 1.1	Define production programme	CTA/Counterpart	"	5
7. 1.2	Select equipment	CTA/Counterpart	"	6
8. 1.3	Design of new technology	CTA/Counterpart	"	7
9. 3.1	Survey of existing standards of products	CTA/Counterpart	"	7
10. 5.1	Selection of country for Study Tour	UNIDO/Govt.	"	7
11. 3.2	Establish new internal standards	Project Staff	"	8
12. 5.2	Selection of Study Tour participants	UNIDO/Govt.	"	8
13. 2.1	Design new furniture products	Design Expert	"	8
14. 2.3	Train 2 Factory Designers	Design Expert	"	8
15. 5.3	Conduct Study Tour	UNIDO	"	10
16. 1.4	Test reconditioned machines	Project Staff	"	15
17. 1.5	Purchase of new machines	CTA/UNIDO	"	15
18. 4.1	Survey of existing quality control measures	CTA	"	15
19. 4.2	Design new system of integral quality control	CTA	"	16
20. 4.3	Develop training programme for Controllers.	CTA	"	16
21. 7.1	Develop training programme for maintenance of tools	Tool Maintenance Expert	"	16
22. 1.6	Install and commission equipment	Factory/Proj. Staff	"	18

No. Act.	Activity Description	Location	Timing
23. 3.3	Implement the new standards	Fact./Proj.Staff	Months 18
24.4.4	Train 10 controllers	CTA	" 18
25. 7.2	Train 2 technicians and 4 Machinists for tool sharpening	Tool maintenance Expert	" 18
26. 2.2	Prepare production documentation for new products and bring them into production	Fact./ Proj. Staff	" 18
27. 10.1	Survey of the present organization, cost accounting etc.	CTA	" 25
28. 6.2	Prepare training manual for production operations	CTA	" 26
29. 6.3	Train 20 Machinists,10 Assemblers and 4 Team Leaders	CTA	" 26
30. 8.1	Train 2 Technicians to design and produce jigs and fixtures	CTA	" 27
31. 9.1	Train Team Leaders and Machinists in the correct use of protective devices	CTA	" 27
32. 10.2	Design improved systems of production organization	CTA	" 27
33. 10.3	Train management staff in modern industrial organization methods	CTA	" 28
34. 10.4	Acquaint managerial staff in export marketing techniques	CTA	" 28
35. -	Technical Reports	All Experts	End of each Mission
36. -	Progress Reports	CTA	End of each Year of Project.
37. -	Terminal Report	CTA	End of Project.

Duration of each activity of this Work Plan is shown on the Bar Chart in Annex 1.

A detailed Work Plan for the implementation of the project will be prepared by the CTA in consultation with the Government Implementing Agency. This will be done at the start of the project and be revised periodically as necessary. The agreed upon Work Plan will be attached to the Project Document as Annex 1, and will be considered as an integral part of that document.

*/ Estimated Month "0" - August 1987.

I. Preparation of the Framework for the Effective Participation of National and International Staff in the Project.

The activities necessary to produce the outputs indicated above in order to achieve the project's immediate objectives will be carried out jointly by the national and international staff assigned to the project. The respective roles of the national and international staff will be agreed between the CTA and the National Project Director by mutual discussion and agreement at the beginning of the project, and set out in a document to ensure the effective participation of the national and international staff in the project. This document will be attached to the project document as an Annex and will be reviewed and revised from time to time. The respective roles of the national and international staff shall be in accordance with the established concept and specific purposes of technical cooperation.

J. Development Support Communication

In order to produce Outputs 3 and 4, related to the standards and quality of products, it is necessary to establish communication with the Governmental Organizations in charge of standardization and quality control of products.

For the creation of internal standards in the pilot furniture plant, which should fit in with the national standards and quality criteria, the project staff will need specific information related to national standards and quality criteria. The relevant Government Organizations shall be responsible for providing such information to project staff represented by the counterpart. This information shall also be made available to the international staff assigned to the project.

K. Institutional Framework

The Government Implementing Agency for this project would be the General Bureau for Building Materials in the City of Pyongyang (GBBM). GBBM is an independent Government body under the Pyongyang Municipal Administrative and Economic Guidance Committee. The main task of the GBBM is to produce and distribute all kinds of furniture products and other building materials within the City. About 20% of the wood processing industry is under the control of the GBBM. The Government has specially emphasized the improvement of production in this part of the wood processing industry.

There are three wood processing enterprises belonging to the GBBM in the City of Pyongyang, which could directly or indirectly benefit from the outputs of the project, which is one of the reasons why the Government authorities selected GBBM as the Implementing Agency for this project. The site for the project will be located in the Pyongyang Wood Complex, in the City of Pyongyang.

All Government inputs will be assured or provided by the Implementing Agency.

For the purpose of the proposed project the Government of the PDRK would, under its existing management system of production, ensure the smooth implementation of the project through the National Project Director. The National Project Director would work in close co-operation with the international staff in order to achieve the same objective.

L.-----Prior Obligations and Pre-requisites

Prior obligations: None

Pre-requisites: The Government will:

1. Undertake the complete reconditioning of all existing machines to be installed in the pilot plant. (UNDP/UNIDO will finalize the list of equipment it will provide only upon completion of this task).
2. Provide all alterations to the buildings required as pre-requisites for the installation of the new machines.
3. Ensure the provision of all power and dust exhaust installations for new equipment and for moving of old machines.
4. Ensure the timely selection, preparation and release of the national staff for the project and trainees under the Fellowships provisions of the project.
5. Ensure the provision of all information to the members of the international staff assigned to the project necessary for the implementation of the project.
6. Take the necessary action to improve the primary wood processing industry in order to get intermediate products (e.g. sawn wood, particle boards, veneer and plywood) in adequate quality and sufficient quantity for the furniture pilot plant.

The project Document will be signed by the Resident Representative on behalf of UNDP, and UNDP assistance to the project will be provided subject to UNDP being satisfied that the pre-requisites listed above have been fulfilled, or are likely to be fulfilled. When anticipated fulfillment of one or more pre-requisites fails to materialize, UNDP may, at its discretion, either suspend or terminate its assistance.

M.-----Future UNDP Assistance

Possible needs for additional UNDP assistance will be considered depending on the satisfactory achievement of the outputs as described in Part II E, and as decided by the Tripartite Review Meeting prior to the termination of the project.

At present, the most useful development that could take place in this field would be the provision of assistance for the establishment of a national research and development centre for the wood processing industry. Such a centre would be equipped and staffed to undertake work directed towards the future development of the sector, the transfer of new technology, and the permanent training of professionals to meet the future needs of the furniture production industry.

PART III. SCHEDULE OF MONITORING, EVALUATION AND REPORTS

A.-----Tripartite Review Meetings, Technical Reviews

The project will be subject to periodic review in accordance with the policies and procedures established by UNDP and UNIDO for monitoring project programme implementation.

The Tripartite Review Meetings should take place at the end of each year of project execution, and two missions will be undertaken by

a UNIDO Headquarters staff member to monitor the progress of the project.

B. Evaluation

The project will be subject to evaluation, in accordance with the policies and procedures established for this purpose by UNDP and UNIDO. The organization, terms of reference and timing of the evaluation will be decided by consultation between the Government, UNDP and UNIDO.

C. Reports

-Progress reports:

These will be submitted two months prior to the Tripartite Review Meetings.

-Technical reports:

All international staff are required to submit their technical reports at the end of their assignments and, when necessary, on an ad-hoc basis.

-Fellowship reports:

These will be prepared for UNIDO by participants and submitted immediately after the study tour is finished.

-Terminal Report:

The Terminal Report will be prepared by the Chief Technical Adviser for UNIDO's review one month prior to the completion of his assignment. It will be submitted formally by UNIDO upon completion of the project.

PART IV. BUDGETS

The UNDP and Government budgets are attached to the Project Document as annexes II and III respectively.

No.	Activ	Activity description	1987				1988												1989												
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
			A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	-	Approval of the project	█																												
2	-	Initiation of recruitment		█																											
3	-	Submission of candidates			█	█	█																								
4	-	Engagement of CTA						█	█	█	█							█	█	█							█	█	█		
5.1	-	Engagement of Design Expert						█	█	█																					
5.2	-	Engagement of Tool Expert																	█	█	█										
5	1.1	Define production programme						█																							
7	1.2	Select equipment							█																						
8	1.3	Design of new technology							█	█	█																				
9	3.1	Survey of existing standards							█	█	█																				
10	5.1	Select country for study tour							█	█	█																				
11	3.2	Establish internal standards								█	█	█																			
12	5.2	Select study tour participants								█	█	█																			
13	2.1	Design new furniture products								█	█	█																			
14	2.3	Train 2 factory designers								█	█	█																			
15	5.3	Conduct the study tour										█																			
16	1.4	Test reconditioned machines																	█												
17	1.5	Purchase of new machines																													
18	4.1	Survey of exist. quality control																		█											
19	4.2	Design new quality contr. system																			█	█	█								
20	4.3	Dev. training progr. for controllers																				█	█	█							
21	7.1	Dev. training prog. for tool maint.																				█	█	█							
22	1.6	Instal and commission equipment																					█	█	█						

(Continue)

WORK PLAN GNATT CHART (Continue)

PROJECT: _____

No.	Activ.	Activity description	1987				1988												1989												
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
			A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
23	3.3	Implement the new standards																													
24	4.4	Train 10 controllers																													
25	7.2	Train 2 tech.and 4 tool machinist																													
26	2.2	Prepare docum. for new products																													
27	10.1	Survey of present organization																													
28	6.2	Prepare manual for prod.operation																													
29	6.3	Train 20 mach.10 assemb.2 team 1.																													
30	8.1	Train 2 techs.to design jigs																													
31	9.1	Train team leaders on safety																													
32	10.2	Design improved system of organiz.																													
33	10.3	Train management on organization																													
34	10.4	Acquaint management with marketing																													
35	-	Technical reports																													
36	-	Progress reports																													
37	-	Terminal report																													

PROJECT BUDGET COVERING UNDP CONTRIBUTION
(In US dollars)

APPENDIX II

COUNTRY: Democratic People's Republic of Korea
 PROJECT TITLE: Assistance in the Establishment of Pilot Furniture Plant
 PROJECT NUMBER: _____

BUDGET LINE	I N P U T S	TOTAL		1938		1939	
		N/M	US \$	N/M	US \$	N/M	US \$
11-01	Chief Technical Adviser	12	92,000	6	46,000	6	46,000
11-02	Furniture Design Expert	3	18,000	3	18,000	-	-
11-03	Tool Maintenance Expert	3	18,000	1	6,000	2	12,000
11-99	International experts total:	18	128,000	10	70,000	8	58,000
16-00	Headquarters backstopping mission (twice - one week)		7,500		3,500		4,000
32-00	Study tour (two person - three weeks)		14,000		14,000		-
41-00	Expendable equipment		17,500		12,000		5,500
42-00	Nonexpendable equipment		125,000		125,000		-
49-99	Equipment total:		142,500		137,000		5,500
51-00	Sundries		8,000		4,000		4,000
99-99	PROJECT TOTAL:	18	300,000	10	228,500	8	71,500

PROJECT BUDGET COVERING UNDP CONTRIBUTIONS
(In US dollars)

APPENDIX III

COUNTRY: Democratic People's Republic of Korea
PROJECT TITLE: Assistance in the Establishment of a Pilot Furniture Plant
PROJECT NUMBER: _____

I N P U T S F O R:	T O T A L		1 9 8 6		1 9 8 9	
	M/M	W o n s	M/M	W o n s	M/M	W o n s
LOCAL PERSONNEL: - National Project Director	24		12		12	
- Secretary	24		12		12	
- Interpreter	12		6		6	
- Driver	12		6		6	
Total personnel	72	27,000	36	12,000	36	15,000
TRAINING: - Salaries for trainees		88,000		38,000		50,000
BUILDINGS: - Repairing and adaptations		348,000		348,000		-
EQUIPMENT: - New equipment		140,000		-		140,000
- Repairing existing equipment		30,000		10,000		20,000
- Transport from harbour		16,000		7,000		9,000
- Spare parts		18,000		-		18,000
- Tools		6,000		6,000		-
Total equipment		210,000		163,000		47,000
OFFICE EQUIPMENT: - Furniture, typewriter etc.		7,000		6,000		1,000
PRODUCTION MATERIALS: - Raw material and auxiliary materials		120,000		50,000		70,000
GRAND TOTAL:	72	800,000	36	477,000	36	323,000

COUNTRY: Democratic People's Republic of Korea
PROJECT TITLE: Assistance in the Establishment of a Pilot
Furniture Plant

PROJECT NUMBER: _____

JOB DESCRIPTIONS

1. Post title: Chief Technical Adviser

Duration: 12 months split in three mission, four months each.

Date required: January 1987, November 1988, September 1989.

Duty station: Pyongyang, DPR Korea.

Qualification: Wood technologist or engineer.

Experience: Considerable experience in furniture production and in the management of a medium sized furniture plant.

Language: English or Russian.

Responsibility: Co-ordination of the work of the internationally recruited staff assigned to the project (expert for furniture design and for tool maintenance), and reporting on project activities.

- Duties:
- To assist in designing of a new technology for the pilot furniture plant,
 - To assist in installation and commissioning of the equipment purchased by the project,
 - To develop and produce standards of products for the pilot furniture plant,
 - To introduce basic quality control procedures for work in process,
 - To introduce machining methods suitable for serial production with interchangeable parts,
 - To train team leaders, wood technicians and machinists in the full and efficient use of production equipment available under actual production condition, and training assemblers,
 - To develop required production fixtures,
 - To design and introduce improved industrial organization, work preparation and cost accounting methods,
 - To train the management in improved organization methods and basic export marketing techniques,
 - To prepare technical reports, progress reports and the terminal report of the project.

2. Post title: Furniture Design Expert
Duration: 3 months.
Date required: February, 1988.
Duty station: Pyongyang, DPR of Korea.
Qualification: An industrial designer or architect specialized in designing of furniture products.
Experience: Considerable experience and a proof of successful performance.
Language: English or Russian.
Duties:

- To analyse the present products, available materials and technological possibilities of the pilot furniture plant,
- To design 2 furniture products using standardized interchangeable components,
- To improve construction details of the furniture products and prepare basic construction documentation with technical descriptions, identification of materials and determination of quality criteria,
- To train 2 factory designers in the procedures and techniques concerning development of the furniture products.
- To prepare technical reports, as necessary,
- To participate in the programme set by the Chief Technical Adviser concerning introduction of the new designed products into production.

3. Post title: Tool Maintenance Expert
Duration: 3 months.
Date required: December, 1988.
Duty station: Pyongyang, DPR of Korea.
Qualification: Wood technologist or engineer.
Experience: Specialized in the maintenance of tools in the furniture production with good practical experience in sharpening of various tools in secondary wood processing field.
Language: English or Russian.
Duties:

- To assist in installation and commissioning of the tool sharpening machines,

- To prepare instruction manuals for maintenance of various tools in furniture production,
- To train the machinists in efficient sharpening of tools,
- To train wood technicians in proper maintenance and managing of tools,
- To introduce the proper parameters of elements of tools and controlling methods,
- To prepare a technical report,
- To participate in the programme set by the Chief Technical Adviser concerning the proper preparation and use of tools, as well as the achievement of the required quality of processing.

WOODWORKING MACHINES NECESSARY FOR A PILOT FURNITURE PLANT
(Listed in order of priority)

Order of Priority	Type of machine and its characteristics	Indicative Price in US\$
1.	Universal saw blade sharpening machine	22,500
2.	Universal sharpening machine for cutters of moulders and different tools.	24,800
3.	Teeth setting and sharpening machine for narrow band saw blades.	6,200
4.	Semiautomatic lathe (turning) with 3 movable supports for profiled cutters. Maximum length of turning 900 mm.	43,150
5.	Double circular saw for cutting to final length and for sizing panels, with adjustable distance and adjustable angle of sawing.	12,400
6.	Veneer clipper (bundle clipper) for sizing of decorative veneer. Maximum length 2,500 mm.	34,600
7.	Veneer zig zag jointer.	12,400
8.	Hot veneering press, 6 daylight, 2,500 X 1,500 mm. Total pressure 150 tons.	28,680
9.	Mortiser for oval mortises.	8,450
10.	Tenoner for oval tenons.	14,750
11.	High speed router	6,030
12.	Moulder	4,825
13.	Mechanical roller-feeder for moulder	1,530
14.	6 spindle planer-moulder, maximum section 160 X 80 mm.	65,000
15.	Single side edge banding machine for veneer, laminate and solid wood laths.	14,760

Order of Priority	Type of machine and its characteristics	Indicative Price in US\$
16.	Wide belt sanding machine for solid wood and veneered panels. Maximum width 900 mm.	26,900
17.	Semiautomatic horizontal narrow belt sanding machine.	6,300
18.	Belt sanding machine for sanding edges.	3,100
19.	Single blade circular saw (ripsaw) with mechanical chain conveyor feeding.	16,800
20.	Narrow band saw with tilting working table. D. = 800 mm.	2,500
21.	Planer-jointer, width about 400 mm.	2,900
22.	Thicknesser, width about 400 mm.	2,400
23.	Dowels making machine with cutter head for 8 mm dowels.	7,360
24.	Dowel drilling machine, with one horizontal and one vertical drilling head.	7,030
25.	Airless spray gun with pump.	4,400
26.	Pneumatic stapler for upholstery	180
27.	Pneumatic screwdriver	465
28.	Pneumatic drill	580
29.	Pneumatic nail gun	500
	Total :	----- 381,494 =====