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DEVELOPMENT OF SECONDARY WOOD PROCESSING INDUSTRIES

DP/TUR/76/015

TURKEY .

Terminal report

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

Based on the work of Heinz Eldag, consultant  
in secondary woodworking industry

United Nations Industrial Development Organization  
Vienna

id.77-6507

### Explanatory notes

A comma (,) is used to distinguish thousands and millions.

A full stop (.) is used to indicate decimals.

References to dollars are to United States dollars, unless otherwise stated.

The monetary unit in Turkey is the Lira (LT). In March 1977 its value in relation to the United States dollar was \$1 = 17.50.

The following abbreviations are used in this report:

OGM      General Directorate of Forestry (Turkey)  
ORUS     Directorate of Forest Products Industries

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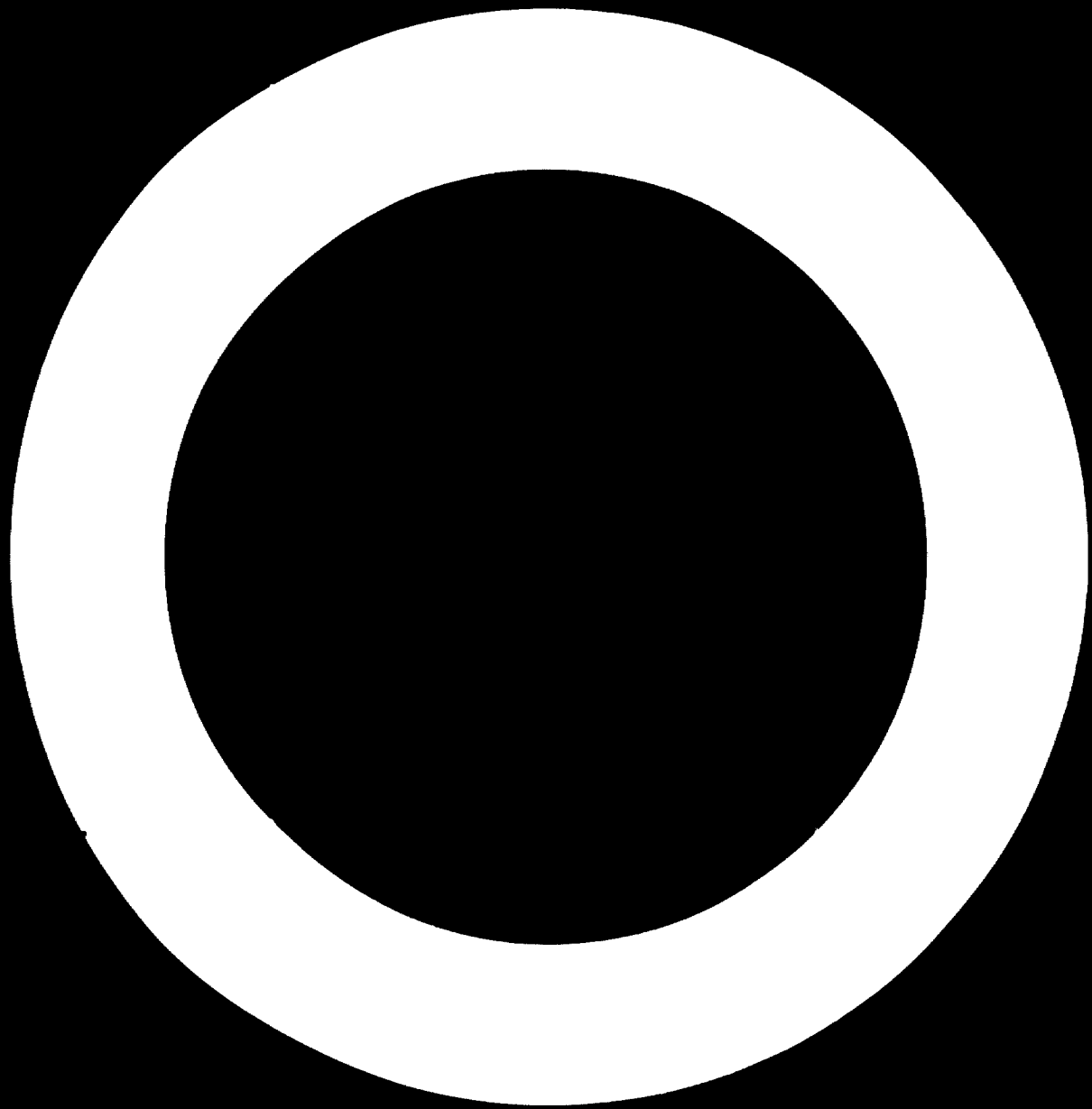
ABSTRACT

The project entitled "Development of Secondary Wood Processing Industries" (DP/TUR/76/015) originated in the request made by the Government of Turkey in April 1977 for assistance by the United Nations Development Programme (UNDP) in reviewing the development potential of Turkey's wood industry, in identifying priorities and in formulating selected projects. The request was approved by UNDP in October 1976, and the six-week mission took place in March and April 1977, with the United Nations Industrial Development Organization (UNIDO) designated as executing agency and the Forest Research Institute as the government co-operating agency.

The following conclusions of the report are noteworthy:

1. Turkey, thanks to its geographical location and the fact that 20% of its land area is covered by usable forests, could achieve a dominant place among the countries of Western Asia and the Southern Mediterranean in the supply of forest resources and the production of industrial wood.
2. UNIDO assistance to the secondary wood processing industry will be needed for project evaluation, the promotion of training centres, the expansion of the forest products and wood processing research institute, industry development and technology transfer seminars.

One of the report's chief recommendations is that research on, and the manufacture of, woodworking machinery and tools in Turkey should be promoted.



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## INTRODUCTION

Turkey's national five-year plan stresses the importance of the utilization of forest products and the development of forest co-operatives in order to meet domestic and foreign demand, to provide additional foreign exchange earnings, to create employment opportunities in the country's forest areas, and to improve living standards. In striving to achieve these goals, Turkey has the advantage of a very large forest reserve (nearly 20% of the country consists of forest areas) and a substantial forest village population. Turkey has therefore decided to make fuller use of its forest resources and, to this end, wishes to develop a secondary wood-processing industry, both mechanical and chemical. This would in turn promote the further development of a primary wood-processing industry. To this end, the Ministry of Forestry requested in April 1976 United Nations Development Programme (UNDP) assistance to review and assess the potential of Turkey's wood processing industry, and to advise on suitable programmes of assistance for follow-up action. The request was approved by UNDP in October 1976, with the United Nations Industrial Development Organization (UNIDO) designated as executing agency and the Forest Research Institute, a body operating under the auspices of the Ministry of Forestry, as the government implementing agency. The project budget was \$6,356. Two consultants were foreseen, one in mechanical wood processing (secondary wood products), and the other in chemical wood processing.

The experts had the following specific tasks to perform:

- (a) To review the development potential of the wood industry;
- (b) To identify priorities among the projects suggested and others in the mechanical secondary wood-processing industries sector;
- (c) To formulate suitable designs for selected projects, including field trials and the training of counterparts where necessary;
- (d) To identify all measures to be taken by the industry, the Government, research institutions and international organizations to ensure the speedy implementation of the programme proposed.

The six-month project entitled "Development of Secondary Wood Processing Industries" (DP/TUR/76/015) was carried out in March and April 1977 by a team of two experts. During their mission both experts travelled throughout Turkey to obtain first-hand information concerning the different woodworking production facilities. In addition to this report, drawn up by one of the experts, a separate technical report, dealing exclusively with the development of the chemical wood-processing industries, has been prepared by UNIDO on the basis of the work of the other member of the team.



It should be noted that the statistics contained in the various Turkish reports listed in the bibliography are often inconsistent, owing to the use of different source material. To achieve consistency in this report, the statistics presented were all selected from one source (with the exception of table 7), namely the "Expert Report on Forest Products Industry, Five-years Four-point Programme" (see bibliography).

I. WOOD INDUSTRIES

A. Forest resources and the wood processing industries

The secondary wood-processing industries of Turkey could play an important role in developing the commercial utilization of the country's forest resources. One reason for this is that 20 per cent of Turkey's land area is covered by usable forests. An assessment of standing volume and increment made by the General Directorate of Forestry (OGM) is shown in table 1.

Table 1. Forest resources

Condition	Hectares	Forest area (%)	Total area (%)	Standing volume (m <sup>3</sup> )	Increment (m <sup>3</sup> )	Site index (m <sup>3</sup> )
High forest						16,795,283
Normal	6,165,203	30.57	7.91	754,675,135	20,703,581	
Degraded	<u>4,770,962</u>	<u>23.65</u>	<u>6.12</u>	53,487,141	1,371,577	
	10,936,165	54.22	14.03			
Coppice						7,603,056
Normal	2,068,188	10.25	2.65	102,992,724	5,458,906	
Degraded	<u>7,165,843</u>	<u>35.53</u>	<u>9.19</u>	48,310,257	1,891,930	
	9,234,031	45.78	11.84			
Total	20,170,196	100.00	25.87			

Source: Forest Research Institute.

Forestry represents an important branch of Turkey's economy, particularly the regions marked in figure I.

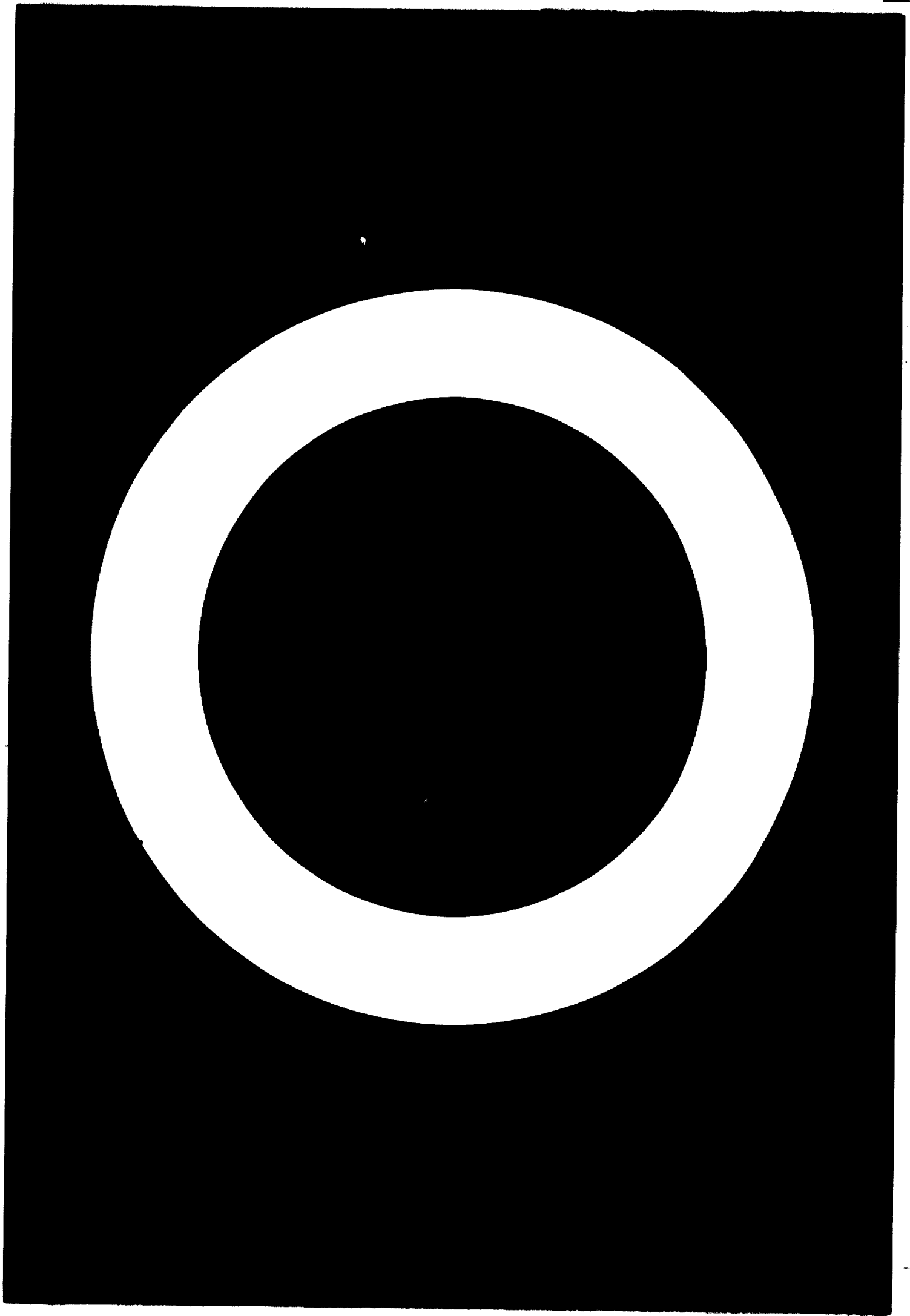
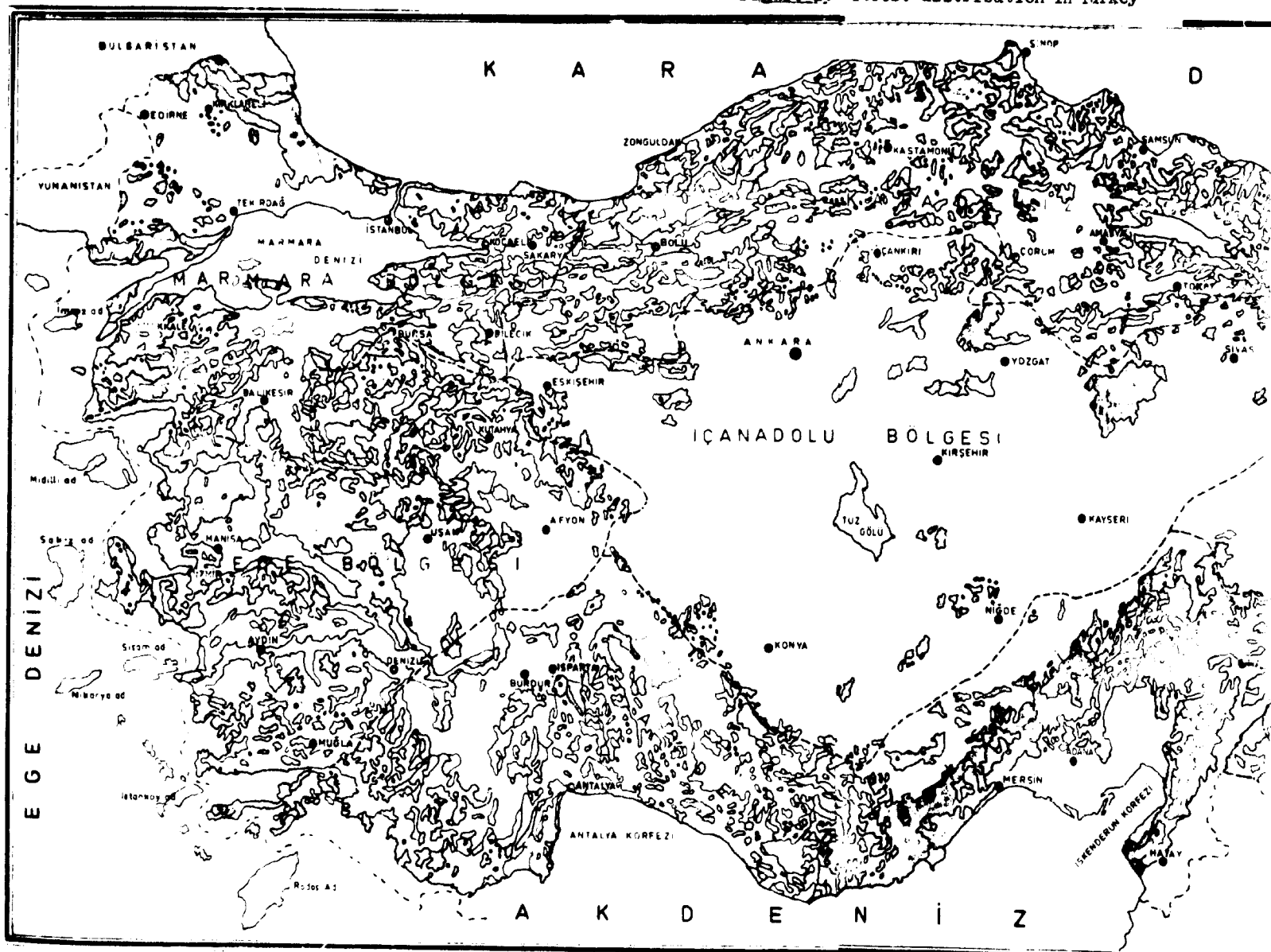


Figure I. Forest distribution in Turkey



**Marmara Region:** The commonest hardwoods are: oak, beech, followed by chestnut, hornbeam and sycamore. Conifers are mostly pine, plus some fir and juniper. Hardwoods predominate.

**Black Sea Region:** Conifers found in eastern areas: spruce, fir pine.  
 Hardwoods: beech, oak, hornbeam, alder.  
 Soft and hardwoods are found in about the same proportions. In western areas hardwoods predominate: beech, oak, hornbeam, chestnut, lime, ash.  
 The most common conifers are pine and fir.

**Central Anatolia:**

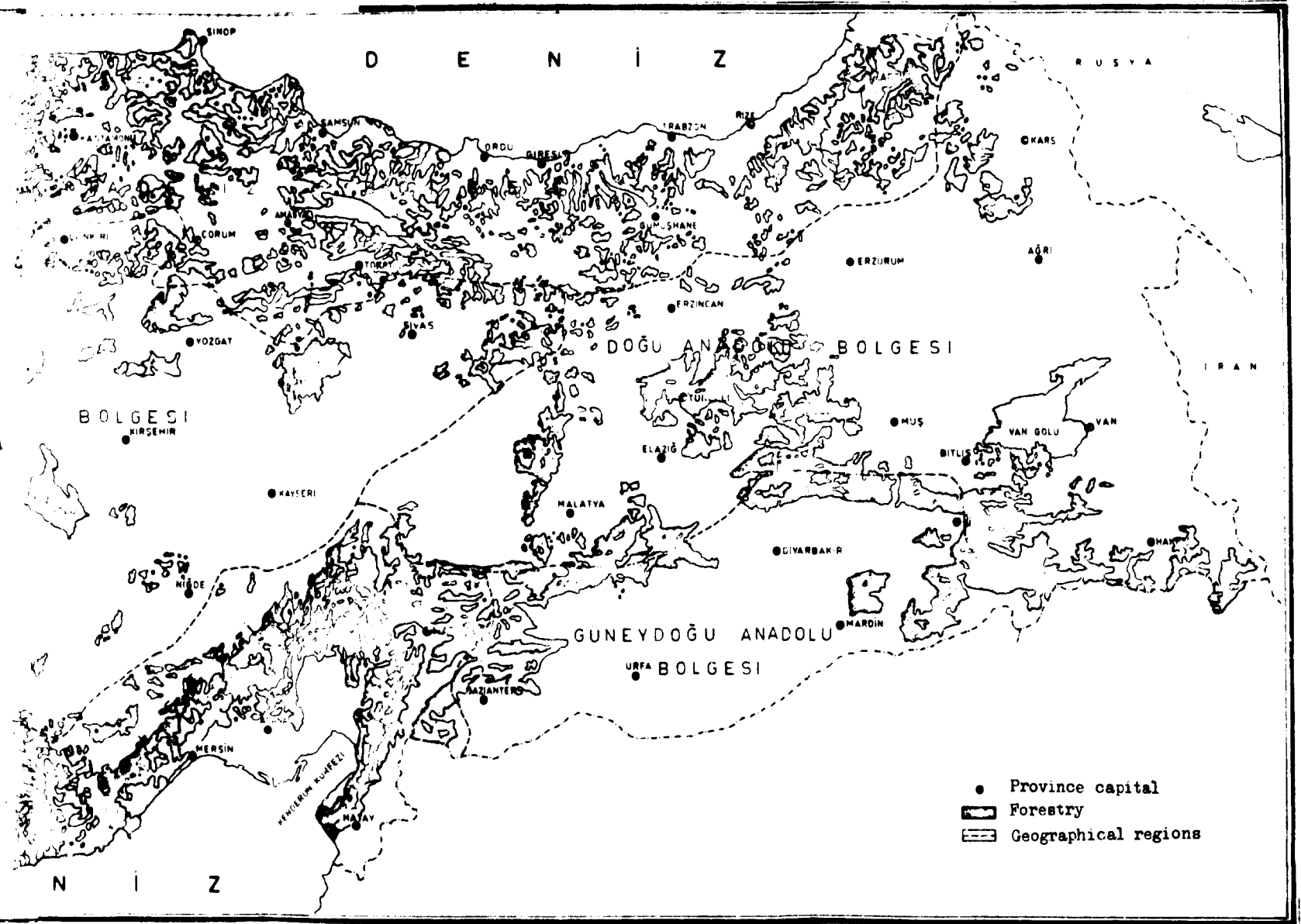
**East Anatolia:**

**Aegean Region:** The dominant species is pine. The most common hardwoods are oak species followed by beech and chestnut.

**Mediterranean Region:**



Forest distribution in Turkey



● Province capital  
 [Shaded Area] Forestry  
 [Dashed Line] Geographical regions

nut, hornbeam and  
 ash. Hardwoods

Liquidambar orientalis is of great importance in this area and its yield of storax is unique to this country.

Conifers predominate. Denuded forest areas near sea level are overrun with maquis flora.

In western areas  
 ash.

Central Anatolia:

Hardwoods: oak. Conifers: Pine and juniper. Hardwoods predominate.

East Anatolia:

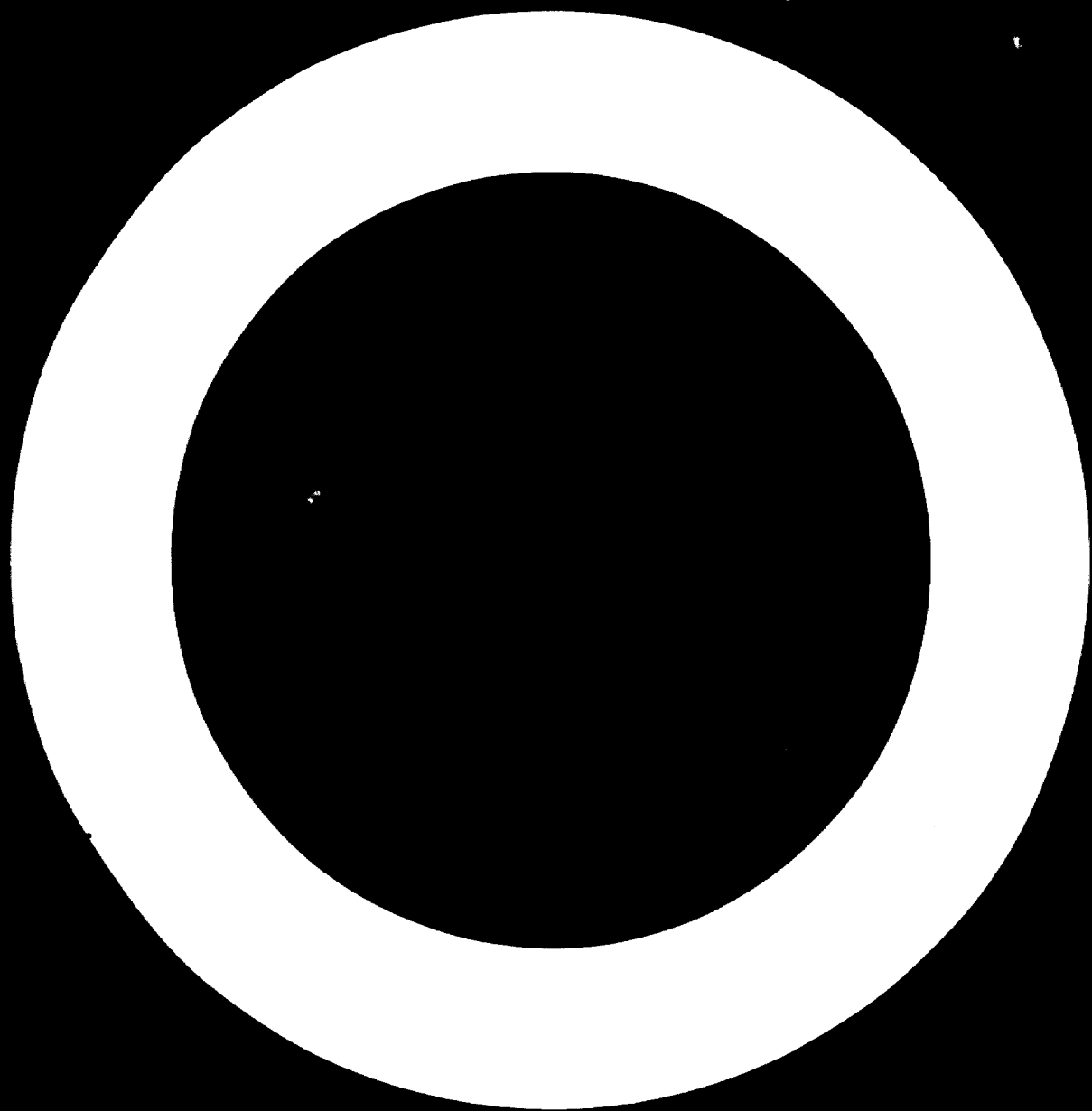
Hardwoods predominate and oak species are widespread, some poplar and birch. The dominant conifer is soots pine with some juniper.

oak species

Mediterranean Region:

Conifers: mostly pine, followed by cedar, fir and juniper  
 Hardwoods: mostly oak species, some poplar, beech, Ostrya carpinifolia and alder. Conifers greatly outnumber hardwoods. Maquis flora covers now more than 15 per cent of the forest area of this region.





The forests of Turkey contain 54.4% of softwoods and 45.6% of hardwoods in the proportions given in table 2 below:

Table 2. Population of forest trees in Turkey

Tree type (genus and species)	Percentage
<b>A. Conifers</b>	
Pine: <u>Pinus silvestris</u> , <u>P.nigra</u> , <u>P.brutia</u>	38.5
Fir: <u>Abies nordmanniana</u> , <u>A.bornmülleriana</u> , <u>A.eguitrojani</u> , <u>A.cilicica</u>	6.8
Spruce: <u>Picea orientalis</u>	2.0
Cedar of Lebanon: <u>Cedrus libani</u>	3.5
Juniper: various species	3.5
Other conifers	<u>0.1</u>
	54.4
<b>B. Broad leaves</b>	
Oak: <u>Quercus pedunculata</u> , <u>Q.sessiliflora</u> , <u>Q.cerris</u> , <u>Q.pubescens</u> , <u>Q.ilex</u> , <u>Q.infeectoria</u> , <u>Q.coccifera</u> , <u>Q.agilops</u>	25.9
Beech: <u>Fagus orientalis</u>	8.5
Hornbeam: <u>Cornus betulus</u>	2.7
Chestnut: <u>Castanea vesca</u>	1.4
Alder: <u>Alnus glutinosa</u>	0.9
Poplar: <u>Populus nigra</u> , <u>P.tremula</u>	0.8
Lime	0.5
Ash	0.4
Other hardwoods and shrubs	<u>4.5</u>
	45.6

Turkey spreads over an area of 77,945,200 ha and has a total of 20,170,196 ha of forests, which are administered by 24 regional administrative head offices. Of this total 10,936,165 ha may be classified as commercial forest. By the end of the year 2000, 1,750,000 ha is planned to be converted to productive forest in plantations. At present, an area of 373,920 ha is covered by plantations, an estimated 33,255 ha of which were planted in 1976.

In 1976 Turkey's population was estimated at 41,170,452, giving a per capita annual wood consumption of 0.2 m<sup>3</sup>.

With regard to exports (excluding pulp and paper), the volumes achieved were 2,500 m<sup>3</sup> for sawn timber and 60,000 m<sup>3</sup> for parquet and boxboard. The value of exported processed forest products was \$4,235,000. The export target for 1977 is \$10,000,000. Forest product imports (excluding pulp and paper) increased to \$2,363,000 in 1976, from \$1,900,000 in 1975.

Tables 1 to 5 show that Turkey could achieve, thanks to its geographical location, a dominant place in the supply of forest resources and production of industrial wood. In Turkey, forests cover an area of 9.7 mil ha, followed by Bulgaria with 9.6 mil ha, Yugoslavia 8.7 mil ha, Romania 6.4 mil ha, Morocco 4.8 mil ha, Greece 2.6 mil ha, Iraq 1.5 mil ha, Tunis 0.8 mil ha, Libya 0.5 mil ha and Israel 0.1 mil ha. Neighbouring countries with forest resources exceeding Turkey's forest land are the Union of Soviet Socialist Republic (USSR) with 910 mil ha and Iran with 12 mil ha. This statistical comparison shows the leading role of Turkish forestry among the countries of Western Asia and the Southern Mediterranean.

Table 3. Industrial wood production in 1976

Item	Volume (m <sup>3</sup> )	Number of mills involved
Industrial roundwood harvested	8,100,000	
Sawn timber	3,202,500	6,100
Plywood	40,000	14
Particle board	317,000	10
Hardboard	68,000	4
Parquet and box board	565,000	

Source: World Wood and Turkey and Economy Survey 77.



Table 4. Regional distribution of forests in 1976

Forest region	Standing volume (m <sup>3</sup> ) of wood in 1976		
	Softwood	Hardwood	Total
Adana	31,542,235	2,145,103	33,687,338
Adapazari	1,744,617	16,619,606	18,364,223
Amasya	28,720,352	20,062,430	48,782,782
Ankara	24,758,915	478,896	25,237,811
Antalya	57,149,055	1,344,387	58,493,442
Artvin	24,307,066	10,660,804	34,967,870
Balikesir	27,553,497	4,370,226	31,923,723
Bolu	48,926,784	23,551,219	72,478,003
Bursa	16,181,608	13,333,914	29,515,522
Canakkale	17,146,241	5,431,066	22,577,307
Denizli	21,892,876	73,586	21,966,462
Elazig	141,100	1,175,203	1,316,303
Erzurum	20,178,228	34,053	20,212,281
Eskisehir	28,951,436	1,561,234	30,512,670
Giresum	13,109,183	18,368,714	31,477,897
Isparta	19,847,881	551,458	20,399,339
Istanbul	117,760	16,929,646	17,047,406
Izmir	20,795,256	554,094	21,349,350
K. Maras	14,737,295	1,126,867	15,864,162
Kastamonu	62,201,353	27,939,921	90,141,274
Mersin	33,396,794	927,196	34,323,990
Mugla	39,819,072	659,212	40,478,284
Trabzon	19,283,177	9,656,324	28,939,501
Zonguldak	20,392,785	42,467,987	62,860,772
Total	592,894,566	220,023,146	812,917,712

Table 5. Harvested wood volume in 1976  
Volume cut (m<sup>3</sup>) in 1976

Forest region	Softwood	Hardwood	Total
Adana	744,819	59,407	804,226
Adapazari	28,731	321,076	349,807
Anasya	479,357	585,574	1,064,931
Ankara	425,692	3,968	429,660
Antalya	1,211,105	34,873	1,245,978
Artvin	494,987	208,955	703,942
Balikesir	553,231	84,730	637,961
Bolu	1,090,317	556,857	1,647,174
Bursa	304,609	270,187	574,796
Canakkale	336,291	81,909	418,200
Denizli	477,918	225	478,143
Elazig	549	15,222	15,771
Erzurum	376,207	257	376,464
Eskisehir	563,552	32,858	596,410
Giresum	278,865	357,284	636,149
Isparta	289,998	5,444	295,442
Istanbul	1,013	380,079	381,092
Izmir	550,063	4,825	554,888
K. Maras	243,286	24,257	267,543
Kastamonu	1,243,848	602,903	1,846,751
Mersin	669,849	30,210	700,059
Mugla	902,026	5,742	907,768
Trabzon	429,280	171,335	600,615
Zonguldak	399,026	863,708	1,262,734
<b>Total</b>	<b>12,094,619</b>	<b>4,701,885</b>	<b>16,796,504</b>

B. Primary wood processing industries

Sawmills

In many reports recently issued the number of sawmills is listed as being more than 6,000 privately owned and 16 state-owned plants. The total log conversion capacity is estimated at 8.7 million m<sup>3</sup>, with an estimated output of only 2.5 mil m<sup>3</sup>. The average sawn wood capacity of the private mills is

1,000 m<sup>3</sup> per annum, while the state-owned mills have an average capacity of 35,750 m<sup>3</sup>. Their actual capacity ranges between 12,000 and 100,000 m<sup>3</sup>. Eighty per cent of the sawn softwood is used in the construction industry, and 90 per cent of hardwoods is used in furniture, vehicle body and flooring production.

It appears from the above figures that many mills operate with no more than a heavy-duty table band saw with the table demounted and a temporary bolter carriage, travelling on floor-mounted rails or table slide rails, fed manually to break down short logs. Machining operations of this kind can never be efficient. This explains the low rate of conversion capacity. The annual capacity of sawmills is listed in table 6, for ORUS sawmills and in table 7, for sawmills in the public and the private sector.

The distribution of sawmills within the eight regions according to capacities ranging in steps of 5,000 m<sup>3</sup> is shown in table 8.

Table 6. Annual capacity of ORUS sawmills

Location	Number of shifts	Log input capacity (m <sup>3</sup> )
Ayancik	1	100,000
Bolu	2	100,000
Bafra	1	15,000
Ulupinar (Bartın)	1	12,000
Eskipazar	1	15,000
Dursunbey	1	15,000
Duzce	1	30,000
Pazarköy (Isparta)	1	12,000
Dorcka	1	15,000
Devrek	1	30,000
Yonice	1	30,000
Cide	1	30,000
Ardesen	1	30,000
Akkus	1	30,000
Demirköy	1	30,000
Bartın	1	30,000
Total		524,000

Source: Orman Bakanligi 1976 Yili Calismalari and Forest Research Institute.

Table 7. Comparison of public and private sawmills according to number and capacity

Location	Number of mills		Log input capacity (1,000 m <sup>3</sup> )		
	Private sector	Public sector	Private sector	Public sector	Total
Adana	382	-	727	-	727
Ankara	300	-	726	-	726
Elazig	440	-	659	-	659
Istanbul	479	1	639	30	669
Bolu	201	3	631	174	805
Mersin	290	-	438	-	438
Amasya	414	1	435	30	465
Izmir	370	-	403	-	403
Adapazari	217	-	393	-	393
Antalya	356	-	376	-	376
Bursa	545	-	370	-	370
Eskisehir	190	-	356	-	356
Balikesir	187	1	329	50	379
Mugla	298	-	325	-	325
Trabzon	291	1	320	30	350
Zonguldak	102	2	300	60	360
Denizli	236	-	257	-	257
Isparta	204	1	238	15	253
Kastamonu	101	4	236	175	411
Canakkale	194	-	186	-	186
Giresun	103	1	173	30	203
Erzurum	138	-	150	-	150
Artvin	44	1	78	25	103
Total	6,082	16	8,745	619	9,364

Source: Sandwell report.

Table 8. Annual log breakdown for different sawmill capacities

	Up to 5,000 m <sup>3</sup>		5,000 m <sup>3</sup> up to 15,000 m <sup>3</sup>		15,000 m <sup>3</sup> up to 25,000 m <sup>3</sup>		more than 25,000 m <sup>3</sup>		TOTAL						
	No. of mills	Capac. 1,000 m <sup>3</sup>	No. of mills	Capac. 1,000 m <sup>3</sup>	No. of mills	Capac. 1,000 m <sup>3</sup>	No. of mills	Capac. 1,000 m <sup>3</sup>	No. of mills	Capac. 1,000 m <sup>3</sup>					
1. Marmara	812	1,203	69	355	21	6	110	5	1	95	5	874	1,763	100	2,017
2. West Black Sea	272	337	27	536	44	4	65	5	8	296	24	295	1,234	100	4,183
3. East Black Sea	386	506	73	100	14	2	30	4	2	60	9	407	696	100	1,710
4. West Anatolia	355	433	73	92	17	2	33	10	-	-	-	369	558	100	1,512
5. Central Anatolia	533	1,121	83	181	13	3	41	4	-	-	-	567	1,343	100	2,369
6. East Anatolia	208	403	97	15	3	-	-	-	-	-	-	210	418	100	1,990
7. West Mediterranean	215	180	64	57	20	1	16	6	1	32	10	224	285	100	1,272
8. East Mediterranean	151	229	65	108	31	1	15	4	-	-	-	166	352	100	2,120
Total	2,932	4,412	62	1,444	22	19	310	5	12	483	11	3,112	6,649	100	2,230

Source: DFT, Orman Ürünleri Arastirmasi (corrected additions).

Flywood industry (including blockboard)

The total capacity of plywood production exceeds 85,000 m<sup>3</sup> per annum. Most of the factories are manufacturing panels according to international standard sizes, their capacities varying between 3,000 and 9,000 m<sup>3</sup> per annum, including from 500 m<sup>3</sup> to 1,000 m<sup>3</sup> of ply mould and small-sized ply panels.

Ninety percent of the log consumption is beechwood, but elm, alder, poplar and oak species are also used. Two of the blockboard plants are integrated with plywood factories and one with a particle board plant.

The regional distribution of the plants is shown in table 9.

Table 9. Installed capacity in 1977 and forecast development up to 1982

Regions	Sawmills	Installed capacity in 1977			
		Plywood (1,000 m <sup>3</sup> )	Box (1,000 m <sup>3</sup> )	Fibreboard (1,000 m <sup>3</sup> )	Particle board (1,000 m <sup>3</sup> )
Marmara	1,075	140	364	45	177
West Black Sea	1,045	45	14	45	193
East Black Sea	621	49	14	78	44
West Anatolia	421	-	92	27	-
Central Anatolia	842	18	50	-	69
East Anatolia	281	-	7	-	-
West Mediterranean	281	-	92	-	101
East Mediterranean	514	20	78	-	75
Subtotal	5,080	272	711	195	659
<u>Forecast development up to 1982</u>					
Marmara	200	-	72	-	-
West Black Sea	1,295	40	3	-	-
East Black Sea	224	40	3	52	47
West Anatolia	343	-	19	-	30
Central Anatolia	-	-	10	-	-
East Anatolia	-	-	1	-	-
West Mediterranean	474	-	18	-	-
East Mediterranean	-	-	1	-	22
Subtotal	2,536	80	127	52	99
Total	7,616	350	838	247	758

Particle board industry

The production of particle board has increased rapidly since 1976, as reflected in table 10 below.

Table 10. Particle-board production and growth rate

Year	Production (m <sup>3</sup> )	Annual growth rate (%)
1965	5,000	
1966	8,000	60
1967	24,000	200
1968	46,000	92
1969	51,000	11
1970	58,000	14
1971	61,000	5
1972	108,000	77
1973	130,000	20
1974	160,000	23
1975	240,000	50
1976	317,000	32
1977	450,000 <sup>a/</sup>	42

<sup>a/</sup> This figure would exceed the production target.

As shown in table 11 eight particle-board factories belong to the private sector and two belong to the group operating under the auspices of the Directorate of Forest Products Industries (ORUS).

Table 11. Location and capacity of existing particle-board factories in 1976

Company	Location	Capacity (m <sup>3</sup> /a)
Public sector		
Ministry of Forestry	Ayancik	24,000
Ministry of Forestry	Bolu	10,000
Private sector		
Sunta	Kartal-Istanbul	75,000
Tever	Gebze-Istanbul	28,000
Modta	Halkali-Istanbul	24,000
Düzsan	Düzoe	43,000
Istas	Inegöl	30,000
Orma	Isparta	25,000
Yongapan	Kastamonu	23,000
Enerel	Gebze-Istanbul	12,000
Total		294,000

Table 12. Consumption forecasts for wood-based panels during the period 1978-1987

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<u>Production forecast</u>										
Flywood (1,000 m <sup>3</sup> )	48.2	60.7	73.8	87.7	102	118	134	150	168	186
Blockboard (1,000 m <sup>3</sup> )	4.8	6.1	7.4	8.7	10.3	11.8	13.4	15	16.8	18.6
Particle board (1,000 m <sup>3</sup> )	256	318	382	450	522	597	675	757	842	932
Fibre board (1,000 m <sup>3</sup> )	43.8	50.7	58.4	66	75	83.8	95.6	102	112	122
Lamin board (million m <sup>2</sup> )	3.0	3.6	4.1	4.7	5.3	5.9	6.6	7.3	8.0	8.7
Veneer (million m <sup>2</sup> )	14.8	16.2	17.6	19.1	20.8	22.4	24.2	26	27.9	29.9
<u>Population forecast (million)</u>										
	43.4	44.5	45.6	46.8	48.1	49.3	50.6	51.9	53.2	54.6
<u>Per capita consumption</u>										
Flywood (m <sup>3</sup> )	1.11	1.365	1.62	1.875	2.13	2.38	2.64	2.895	3.15	3.41
Blockboard (m <sup>3</sup> )	0.111	0.136	0.162	0.187	0.213	0.238	0.264	0.289	0.315	0.341
Particle board (kg)	3.84	4.64	5.45	6.26	7.06	7.87	8.68	9.48	10.29	11.10
Fibre board (kg)	1.01	1.14	1.28	1.42	1.56	1.70	1.83	1.97	2.10	2.24
Lamin board (m <sup>2</sup> )	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16
Veneer (m <sup>2</sup> )	0.34	0.363	0.386	0.409	0.432	0.455	0.478	0.501	0.524	0.547



Board sizes and thicknesses are according to the demand of the furniture industry. The furniture market is supplied with laminated particle boards by private manufacturers who have already established the necessary production facilities.

#### Fibreboard industry

Most of the factories operate by using the wet process. With an annual production of 68,000 tons in 1976, the forecast rate (table 12) has been attained. There is one laminating plant, so that certain market requirements can be satisfied. Table 13 contains data on the fibreboard factories existing in 1975.

Table 13. Fibreboard factories in 1975

Location	Company	Capacity (m <sup>3</sup> )
Istanbul	Elka	15,000
Izmir	Selçloit	10,000
Bolu	Sümerlit	15,000
Artvin	ORUS	28,000

#### Veneer industry

The veneer industry has not yet been developed to meet the full demand of the industry. The production for 1976 is estimated at 8,200,000 m<sup>2</sup>.

Thermosetting laminates are in many cases the preferred furniture overlays. An appropriate demand for veneer will arise with the development of the furniture industry.

### C. Secondary wood processing industries

#### Furniture production

Furniture manufacturing in Turkey is mostly a small-scale production. The whole capacity of this branch is represented by 4,661 companies. Many cabinet-making firms are one man operations. Only 106 companies employ more than 10 persons.

Between 1963 and 1968 there was a 20% increase in the number of furniture plants with an average of 30 employees. At that time no enterprise was within the public sector. In 1972, 12 companies were listed in the public and 105 in the private sector.

The demand for furniture products, especially quality products, is still higher than production. Table 14 reflects the market situation in 1974.

Table 14. Furniture production and prices in 1974

Item	Number	LT per set
Dining-room sets	100,000	1,000
Bedroom sets	66,463	950
Living-room sets	113,843	600
Armchairs	252,033	500
Cabinets	31,596	200

Furniture production doubled between 1972 and 1976, and production capacity in 1977 will probably be more than 1,000,000 furniture sets. The calculated rate of interest of 7.7 per cent forecast for 1982 will raise the total number of sets produced to 1.5 million. New investment projects in the furniture industry are shown in table 15.

The average level of skill is still at the handicrafts stage. Assistance in the transformation of a skilled cabinet-making business into an industry is necessary and has been requested by ORUS. The many craftsmen in forest villages, including cottage craftsmen, also need assistance in applied craftsmanship, in order to improve the efficiency and quality of their production without losing the characteristics typical of Turkish handicraft products.

The case-goods furniture industry consumed 60 per cent of the locally-produced panel products. Blockboard is in some cases preferred to particle board. Some of the latter panels need crossbanding before veneering. Hardwood species like beech, walnut, oak, are preferred for the production of chairs and chair frames. In addition to steel-tube furniture, chair manufacturing is growing steadily. The technology of steam bending is used together with the standard production of sawn and shaped chair parts.

#### Door and window production

Joinery products are preferably based on coniferous sawn wood. Workshops are mostly small-scale facilities. The official statistics do not separate joinery products within the category of goods classified under the heading "manufacture of wood and cork." Seven per cent of all establishments listed represent 94 joinery products firms. Minor changes were noted between 1973 and 1968. In 1970, 1,615 firms produced primarily 2,047,000 m<sup>2</sup> of doors and

windows. It is forecast that the joinery industry will increase within ten years by approximately 50 per cent to a utilization capacity of 383,000 m<sup>3</sup> of **sawn wood**.

Flush-door production is primarily based on hollow-core particle board. Various possibilities of applying semi-hollow cores based on paper honeycombs or wooden slats according to European or United States standards have not yet been introduced. Standards for flush doors need not hinder any development in construction technology as long as stability of the finished product is guaranteed.

Windows should be similar to European design because of similar climatic conditions, but designs which are adapted to low cost housing should be produced.

Production in small workshops does not yet allow the use of finger-jointed stiles and rails because of lack of standards and special tools to prevent a high amount of wood waste.

#### Prefab housing production

Most of the wooden houses reported in the census statistics are for residential use (357,279 units) in addition to 44,683 commercial, 846 governmental, 1,165 religious, 45 medical and 418 educational and cultural buildings. Prefab-housing factories are not working with modern production techniques. Three factories manufactured 5,200 units in 1970.

This industry contributed to reconstructing the disaster areas during the second development period. Wooden houses have proven to be flexible enough to withstand earthquakes. Some prefab houses have been introduced in vacation areas.

#### Parquet production

From 1968 to 1974 the number of establishments producing wood flooring (parquetry) increased from 12 to 23 (doubling their capacity by 100 per cent within 6 years). The production rate increased from 319,456 m<sup>2</sup> to 673,030 m<sup>2</sup> over the same period.

Most parquet is manufactured as matched floorings, but mosaic parquet is also produced. Productivity among comparable machining and grading lines varies considerably. Kiln-drying equipment is available but inadequate for parquet flooring. Prefab parquet production has not yet been introduced.

Table 15. New investment projects <sup>a/</sup>

Factory	Production		Employment	Total investment (LT)	Fixed investment (LT)	Foreign currency requirement (\$)
	Type of product	Amount produced per year				
ALPTAS AS	Chipboard	45,000 m <sup>3</sup>	80	158,153,000	148,183,000	3,500,000
Zeki Han ve Ort	Chipboard	50,000 m <sup>3</sup>	80	183,649,000	173,649,000	4,684,000
Cahit Turker ve Ort	Kitchen sets	3,000	65	36,550,000	31,550,000	515,000
	Library furniture items	3,000				
	Flushdoors	4,000				
Huseyin Turkoglu	Chipboard (19 mm)	45,000 m <sup>3</sup>	80	141,300,000	131,300,000	3,284,000
Tepe Agac Ltd.	Dining room sets	3,300	60	20,800,000	16,800,000	428,571
	Bedroom sets	3,300				
	Office furniture	2,500				
Tekirdag Agac San AS	Chairs	13,000	50	30,575,000	26,575,000	510,000
	Livingroom sets	3,000				
	Garden furniture items	1,100				
Ortaca Tekstil AS	Chipboard	60,000 m <sup>3</sup>	80	148,100,000	138,000,000	3,831,000
ORUN AS	Chipboard	49,000 m <sup>3</sup>	90	149,600,000		3,800,000
	Veneer	1,500,000 m <sup>2</sup>				

Source: Report EBA/19.8.1977, p. 3 and 4.

<sup>a/</sup> Data include figures for licences granted by the Ministry of Industry and Technology.

### Other wood products

The production of truck container bodies has increased constantly, and 9,000 m<sup>3</sup> of sawn wood are consumed annually.

About 30 establishments with a capacity of 360,000 shuttles, 1,500,000 bobbins, 160,000 reels and 450,000 striking arms manufacture various wooden accessories for the textile industry.

About 136 establishments manufacture 1,400,000 pairs of shoe lasts, and 750 establishments manufacture wooden products using about 140,000 m<sup>3</sup> wood (shoe heels, sandals etc.).

The wood-boxes manufacturing industry, with more than 900 establishments, has a capacity of 457,100 m<sup>3</sup> of sawn wood. Most of the small box-making plants have a high waste factor. A well-established factory manufacturing wire-bound boxes in Antalya has the largest capacity, amounting to 1,200,000 boxes annually.

### D. Village industry and wood processing infrastructure

#### Village woodworking

In the Forest Service, legal privileges are recognized in favour of native forest villagers who use whatever time they can spare from their agricultural activities to work in the forests. Difficulties arise during the summer season when villagers preferably harvest their own agricultural products. To avoid dispute between hired workers and villagers during the harvest season, existing forestry management plans should be reorganized. Investigations show that, if only one member of each family was employed, 20 per cent of all families would be catered for, which is an important contribution to their welfare compared with what is done by other public bodies.

Besides working for the forest service, many villagers spend time in handicraft woodworking, which is still done with only the simplest tools. This handicraft has to be assisted through the introduction of modern manually-operated tools and power-driven small tools.

#### Woodworking machinery

The existing woodworking machinery industry in Turkey produces basic equipment such as band saws, circular saws, planers, moulders and combined machinery. The machines are not of high standard, as workshops do not yet require machinery with a high precision level. Woodworkers now starting production on an industrial basis prefer the more developed machinery used in Europe. Thus, they will again have the problem of tooling for this equipment.

Tooling, technology and training

Most of the imported European machinery can be efficiently operated only with the appropriate toolings, because of speed variations on basic machinery avoiding cutterheads with manually adjusted knives. These machines have speed ranges varying from 3,000 to 9,000 rpm. Shaping tools with manually adjusted profile cutters are not allowed to run at higher speeds than 3,000 rpm according to European safety regulations. With cutterheads for high-speed shaping it is therefore necessary to have the appropriate tools and maintenance facilities.

Most of the primary and secondary wood-processing industries have tool maintenance equipment, although the latter does not fully meet current tool maintenance needs.

With regard to machining technology and research, all available information is of European or United States origin. Applied research has not yet been done in universities or colleges.

The only training in woodworking is being done in the Tepe Furniture Factory in Ankara and the Furniture Enterprise of the Ministry of National Education. By European standards, real basic training for woodworking has not yet been organized. Consequently, "skilled workers" in the real sense, with the basic practical training and education, are not available. The skill of the woodworker is based wholly on on-the-job training.

## II. WOOD PROCESSING DEVELOPMENT PROGRAMMES

### A. Primary and secondary wood processing industries

The future development of the primary wood industry will be influenced considerably by the progress of the secondary wood-processing industry. It is necessary to establish standards and grading rules for the measurement and inspection of glued and solid hardwood, dimension parts for furniture, hardwood interior trim and mouldings, and hardwood stair treads and risers. According to the grading rules, sawmills have to deliver air-dried or kiln-dried lumber, or edged or unedged lumber.

The sawmills have not only to increase the quantity but also the quality of their lumber production. The panel manufacturing industry has to improve its products and deliver either accurately-calibrated particle board ready for veneering and cut to size, or boards already laminated and cut to size to support the easy handling of panels and to facilitate production in furniture manufacturing.

As long as the panel industry, especially the particle-board industry, does not fulfill the requirements of modern furniture production, the quality of the latter cannot be upgraded. Therefore, quality rules in addition to panel standards have to be available and applied to serve both the needs of the particle-board industry in its competition with foreign articles for possible export markets and to support high quality in furniture production.

The development of a strong competitive secondary wood-processing industry is based not only on the quality of basic wood products, namely sawn wood, panels and ancillary materials, but also on a well-established and co-ordinated infrastructure industry to avoid the need to import new products.

The development programme of the secondary wood-processing industry in Turkey is based on information about industrial planning policies, considering the production balance within the eight regions (Marmara, Western Black Sea, Eastern Black Sea, Aegean, Central Anatolia, Eastern Anatolia, Western Mediterranean, Eastern Mediterranean) with a well-established interregional product flow (table 16) all over Turkey, the best transport facilities by rail, road or ship, population growth in different districts and provinces, the possible influence of labour redeployment, and the location of forest resources.

Table 16. Interregional product flow for 1982

Region and quantity	Marmara	Western Black Sea	Eastern Black Sea	Central Anatolia	Eastern Anatolia	Western Mediteranean	Eastern Mediteranean	Available surplus	Total
1 Marmara Istanbul	1,753 R 1,014 T 192 P					204 T			1,753 R 1,218 T 192 P
2 Western Black Sea Zonguldak	1,430 R 562 T 81 P	1,014 R 273 T 43 P		604 R 190 T 74 P				26 P	3,048 R 1,025 T 224 P
3 Eastern Black Sea Giresun	882 R 179 T		1,198 R 483 T 74 P		100 R 29 T			293 R 42 P	2,473 R 691 T 155 P
4 Western Anatolia (Aegean) Izmir				1,505 R 544 T 47 P					1,505 R 544 T 47 P
5 Central Anatolia Ankara					1,057 R 816 T 8 P				1,057 R 816 T 8 P
6 Eastern Anatolia					168 R 215 T				168 R 215 T
7 Western Mediterranean Antalya					98 R 69 P	1,105 R 315 T 49 P	53 R 63 T		1,256 R 378 T 153 P
8 Eastern Mediterranean Mersin					241 R 38 P		1,061 R 521 T 95 P	1 P	1,302 R 521 T 134 P
9 Surplus						2 T	26 T		28 T
Total	4,065 R 1,755 T 273 P	1,014 R 273 T 43 P	1,198 R 483 T 74 P	1,661 R 1,006 T 156 P	509 R 246 T 38 P	1,105 R 315 T 49 P	1,061 R 610 T 95 P	346 R 69 P	12,562 R 5,436 T 913 P

Key: R = Raw material (logs, industrial wood and industrial wastes); T = Timber products (timber parquet, wooden boxes); P = Panel products (chipboard, plywood, blockboard, fibreboard, veneer).



The distribution of the ORUS secondary wood industry is shown in table I7 and the project assistance needed to complement the development of the secondary wood processing industry is listed in table 18.

B. Selection and location of the wood processing industries

Major concentrations of large and small sawmills and wood panel industries are found in the Marmara, Black Sea, Aegean and West Mediterranean regions (see figure II). The location of the ORUS primary wood-processing factories is of importance for planning the distribution of the secondary wood-processing industries (see figure III). The planned ORUS secondary wood processing industries listed in table 17 are shown in figure IV.

New furniture factories are planned in both the public and private sectors. The public sector plans to annex to the Bolu Wood Industries Complex, a furniture factory with a capacity of 92,000 units broken down as follows:

<u>Bedrooms</u>	<u>Dining-rooms</u>
8,000 beds	6,000 tables
8,000 cupboards	6,000 sideboards
16,000 sideboards	40,000 chairs
8,000 stools	

School furniture will be produced in Duzce. The plant will have a capacity of 102,000 units (approximately the requirements of 2,000 class-rooms), including 50,000 double desks, 50,000 double benches or 100,000 pupils' chairs and 2,000 cupboards.

In view of the demand for wood products in the tourist areas of Mugla and Antalya, the establishment of furniture factories in the areas of Karaman and Denizli should be considered. There are plans to build hotels with capacities of 195,000 beds (70,000 and 125,000 beds respectively) in the areas of Mulga and Antalya. Hotel room furnishings for this purpose will involve a demand for wooden products of approximately \$400,000.

Private furniture factories are planned in Trabzon and Istanbul with the following annual capacities:

<u>Trabzon plant</u>	<u>Istanbul plant</u>
2,500 bedroom sets	15,000 bedroom sets and
1,500 dining-room sets	modular wall units
1,500 living-room sets	
1,000 double door wardrobes	
1,000 book shelves	

Figure II. Location of primary wood processing mills in the public and private sector

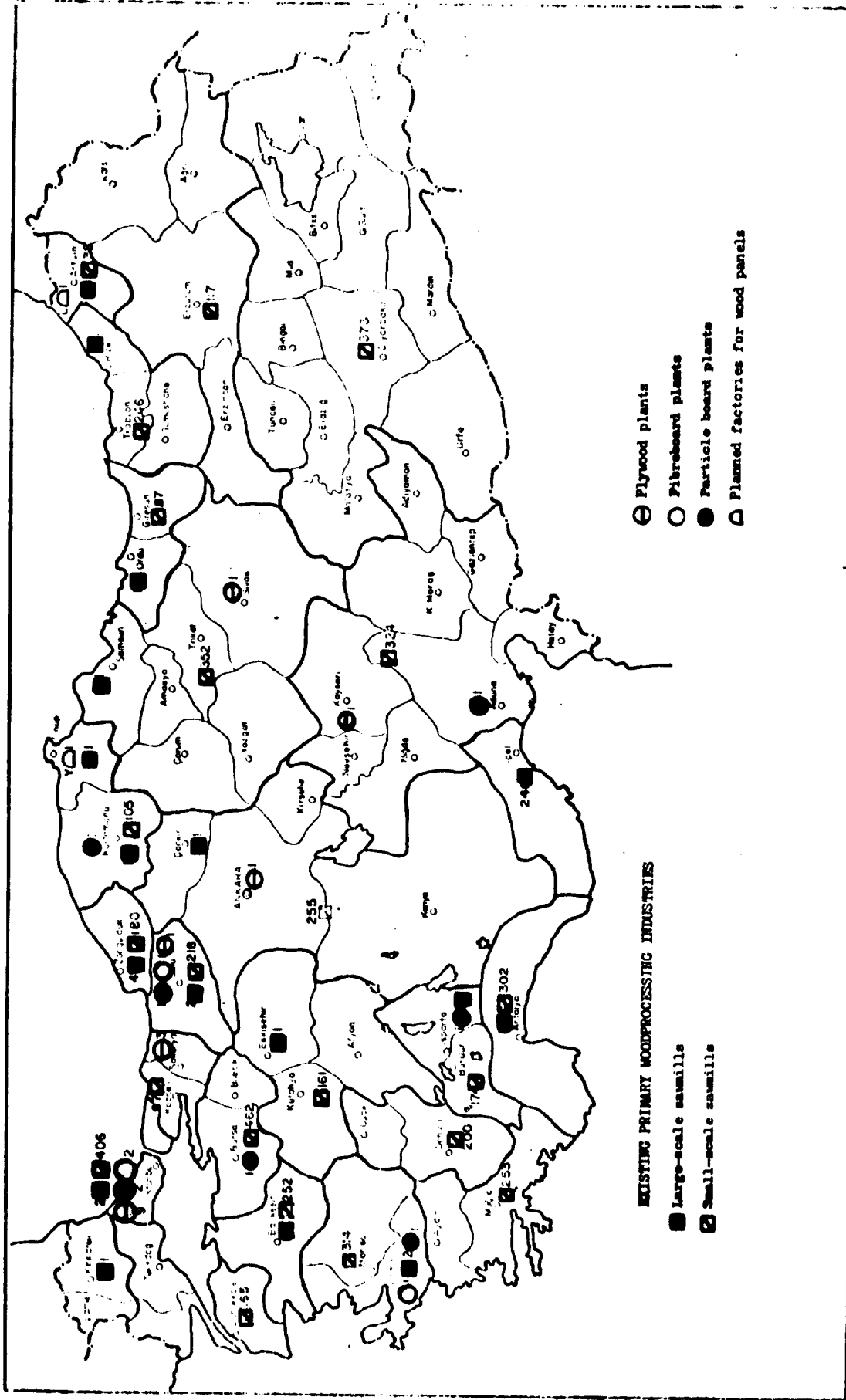


Figure III. Location of ORUS - primary wood processing mills

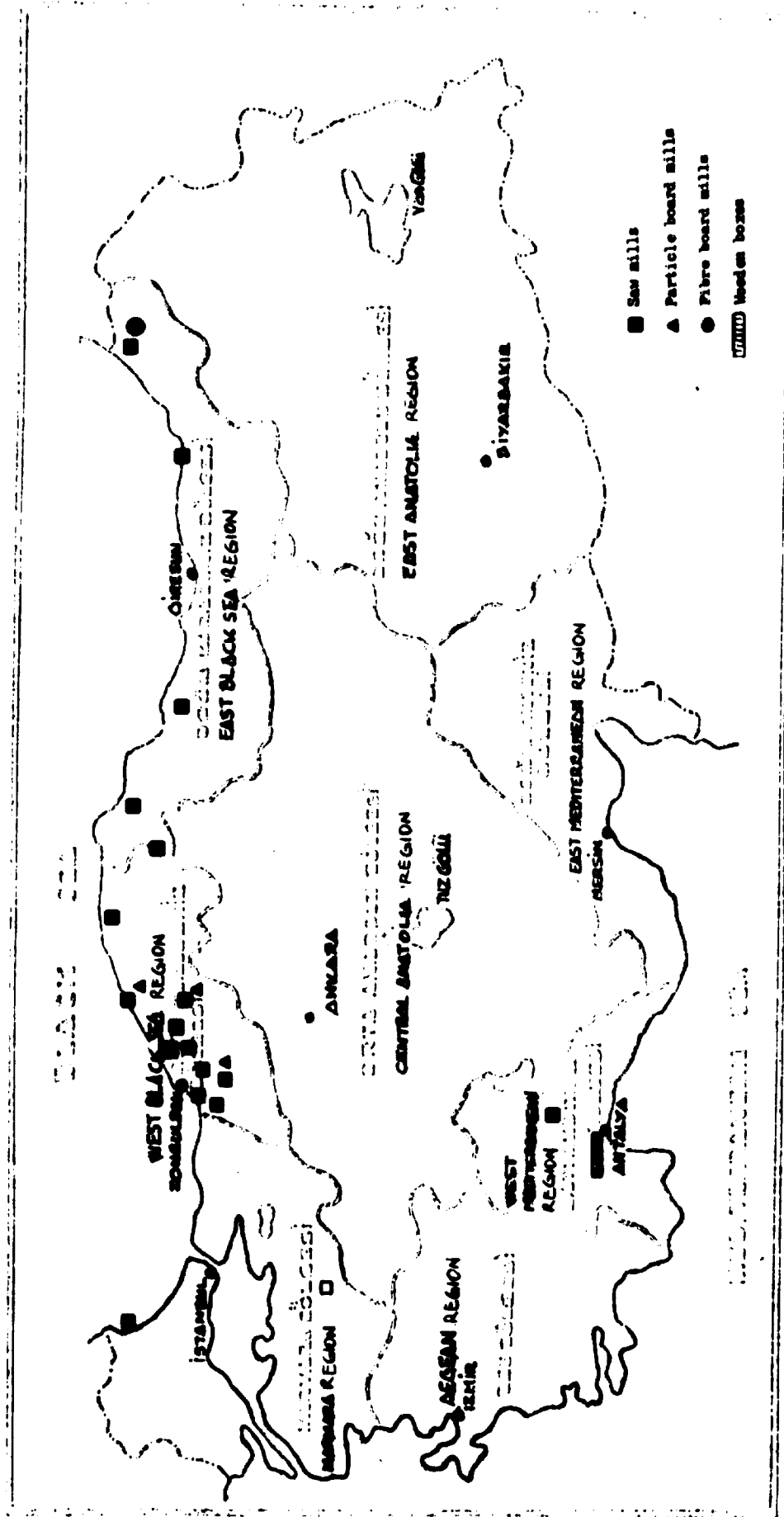


Figure IV. Planned ORUS - secondary wood processing mills

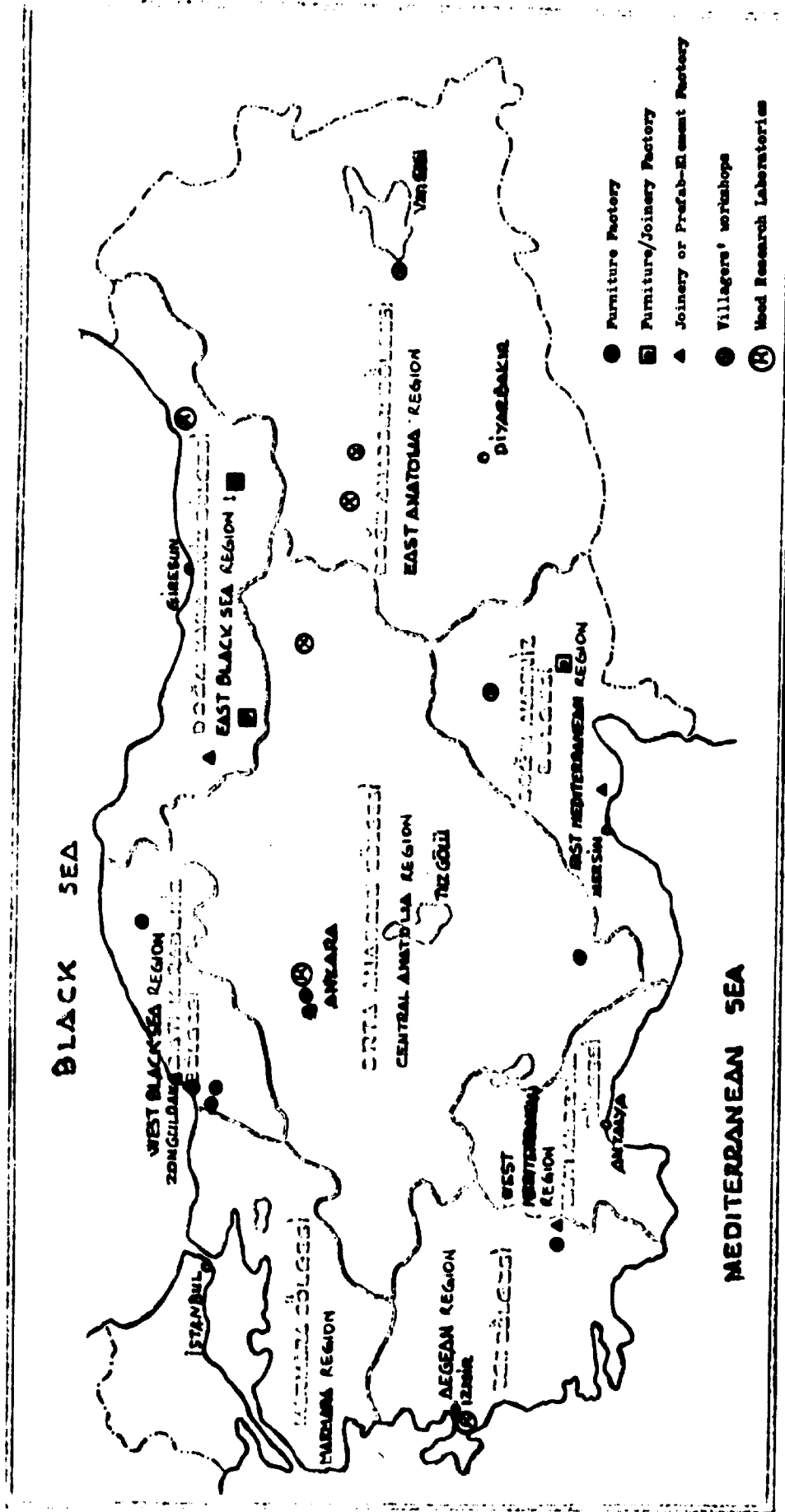


Table 17. Projects for the development of secondary wood products  
five-year plan for the period 1978

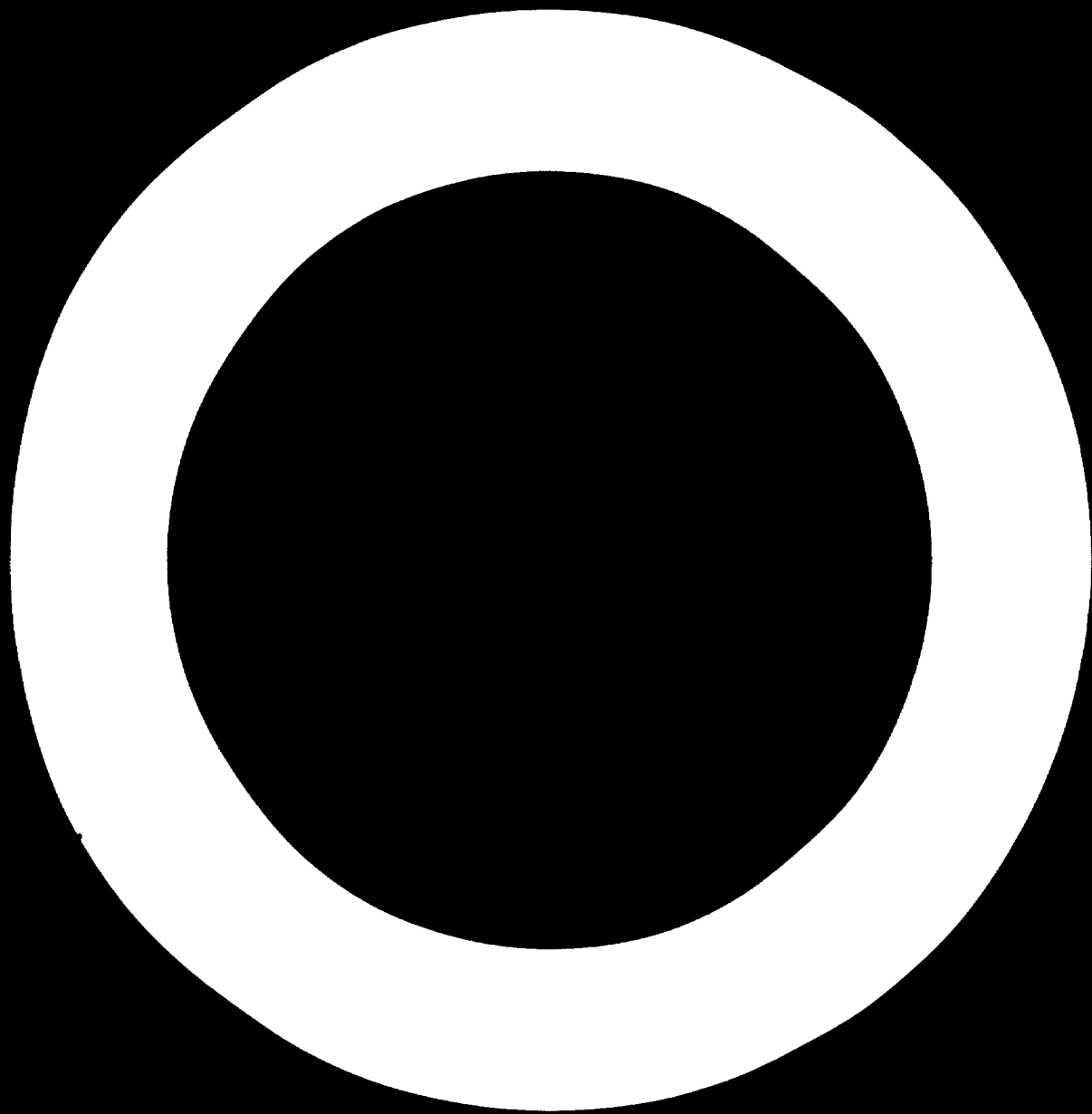
ITEM	PRODUCTION FACILITIES	LOCATION	\$ INVESTM. PROD. Mach. and Deliv.Trucks	1. YEAR		2. YEAR
1	Case Good Furniture Factory (preferably KD Furniture Production)	Bolu	1,200.000		1,200.000	
2	School Furniture Factory (excl. case goods)	Düzce	1,000.000			1,000.000
3	Chair Factory (including hotel chairs and office chairs)	Kastamonu	1,000.000			
4	Hotel Furniture Factory (case goods also built-in units)	Karaman	1,200.000			
5	Office Furniture Factory (case goods including office chairs)	Denizli	1,200.000			
6	Kitchen Cabinet Factory (case goods only)	Ankara	1,200.000			
7	Furniture-Joinery Factory (mixed products)	K. Maras	800.000			
8	Furniture-Joinery Factory (mixed products)	Tokat	800.000			
9	Furniture-Joinery Factory (mixed products)	Gümüşhane	800.000			
10	Prefab Door and Window Factory (flushdoors, glazed doors, windows)	Isparta	1,200.000			
11	Infants and Juvenile Furniture Factory (including wooden toys)	Zonguldak	800.000			
12	Prefab-Building-Element Factory (wooden houses, trusses, bridges)	Adana	1,500.000			
13	Prefab-Parquetry and Wall Panelling Factory (stripflooring, mosaic parquet, tongue and groove boards)	Amasya	1,000.000			
14	Villagers' Workshops	Tucelli	25.000	25.000		
		Bingöl	25.000		25.000	
		Bitlis	25.000			25.000
		Akdagmaden	25.000			
		Göksun	25.000			
15	Villagers' Sawmills (mobile sawmills)		45.000	45.000		
			45.000			45.000
			45.000			
			<u>13,960.000</u>			
16	Woodindustries Tool Factory (sawblades, shaping tools, bits)	Ankara	1,500.000			
17	ORUS Service Station (machine maintenance, machine repair, sparepart storage)	Ankara	1,700.000			700.000
<b>TOTAL</b>			<u>17,160.000</u>			



ects for the development of secondary wood processing industries -  
 five-year plan for the period 1978-1982

\$ INVESTM. PROD. Mach. and Deliv.Trucks	1. YEAR		2. YEAR		3. YEAR		4. YEAR		5. YEAR	
1,200.000		1,200.000								
1,000.000			1,000.000							
1,000.000				1,000.000						
1,200.000				1,200.000						
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1,200.000								1,200.000		
800.000									800.000	
1,500.000										1,500.000
1,000.000										1,000.000
25.000	25.000									
25.000		25.000								
25.000			25.000							
25.000				25.000						
25.000					25.000					
45.000	45.000									
45.000			45.000							
45.000				45.000						
<u>13,960.000</u>										
1,500.000										
1,700.000			700.000		500.000			500.000		
<u>17,160.000</u>										





One factory is planned with the assistance of a Turkish professor in wood processing, the other is being planned by a German wood consulting firm. A new private furniture factory has been established in Denizli. Production is not yet proceeding smoothly, but the quality of the furniture displayed is high.

Through the many contacts with machinery dealers and importers it is obvious that many more private woodworking plants will be established in the near future. Thus it is important for the ORUS group to have clear factory planning covering a range of furniture (bedroom, dining-room, and living-room furniture, kitchen cabinets, chairs and upholstered seating furniture, children's furniture, hotel-room, office and school furniture, modular and built-in furniture) and joinery products (flush and panelled doors, windows, stairs, wall panelling, interior trim, parquet, prefab roof trusses, bridges, wall elements, complete houses) nearly complete according to customers' requirements. Table 17 includes the five-year development plan for the secondary wood-processing industry. The case-goods furniture factory planned for Bolu is based on a feasibility study. The production is based mainly on knock-down (KD) furniture, including small assembled cabinets. It will be integrated in the Bolu sawmill and particle-board plant, which will also incorporate a veneer production line.

Case-goods furniture production

Total investment (government) excluding building: \$1,200,000

Proposed time of machinery installation: July-December 1978

Proposed production start-up: January 1979

Proposed UNDP/UNIDO technical assistance:

<u>Type of assistance</u>	<u>Duration</u>	<u>Date</u>	<u>Cost</u>
Furniture design expert	2 m/m	October-November 1978	9,600
Furniture production expert	3 m/m	November 1978-January 1979	14,400
Total assistance			<u>24,000</u>

Government inputs: 4 counterparts

The school-furniture production planned for Duzce is also based on a feasibility study. Here the specialization is given and the manufacture of pupils' benches, chairs and desks can benefit by the many similar production experiences in Europe.

Cupboard production for the schools was to be a part of the Bolu factory because of the specialized equipment that will be available in any case.



School furniture production

Total investment (government) excluding building: \$1,000,000

Proposed time of machinery installation: January 1979

Proposed production start-up: July 1979

Proposed ORUS technical assistance:

<u>Type of assistance</u>	<u>Duration</u>	<u>Date</u>	<u>Cost</u>
Kiln-drying expert	3 m/m	May-June 1979	Covered in co-ordination with ORUS training centre
Tool maintenance expert	3 m/m	June-August 1979	\$14,400 (covered in co-ordination with ORUS training centre)
Furniture design expert	3 m/m	June-August 1979	Covered in co-ordination with hotel furniture production
Furniture production expert	3 m/m	June-August 1979	Covered in co-ordination with hotel furniture production

As a further step in establishing furniture factories a chair manufacturing plant has to be installed in Kastamonu. This specialized chair plant has to base its production on dining-room chairs for homes and hotels, office chairs, conference-room chairs, stools and upholstered chairs as well as settees and sofa-beds. The range of seating furniture and designs have to be well selected to maintain specialized production.

Chair and seating furniture production

Total investment (government) excluding building: \$1,000,000

Proposed time of machinery installation: July-December 1979

Proposed production start-up: January 1980

Proposed UNDP/UNIDO technical assistance:

<u>Type of assistance</u>	<u>Duration</u>	<u>Date</u>	<u>Cost</u>
Kiln-drying expert	3 m/m	November-January 1980	Covered in co-ordination with ORUS training centre
Tool maintenance expert	3 m/m	December-February 1980	\$14,400 (covered in co-ordination with ORUS training centre)
Furniture production expert	3 m/m	January-March 1980	\$14,400
Furniture design expert	3 m/m	January-March 1980	\$14,400
Total assistance:			\$28,800

Government inputs: 4 counterparts

Proposed ORUS inputs: Quality expert

Bearing in mind that the Mulga and Antalya areas are the tourist development areas, Denizli is the site selected for hotel-room furniture production. The plant has to be designed for the production of KD and built-in furniture. Whenever the demand for similar designs is required, the range of production can be changed. This range could also include the manufacture of modular conference tables.

Hotel furniture production

Total investment (government) excluding building: \$1,200,000

Proposed time of machinery installation: July-December 1979

Proposed production start-up: January 1980

The counterpart trained in Bolu has to manage the production

Proposed UNDP/UNIDO assistance:

<u>Type of assistance</u>	<u>Duration</u>	<u>Date</u>	<u>Cost</u>
Kiln-drying expert	3 m/m	November 1979- January 1980	} Covered in co-ordination with ORUS training centre
Tool maintenance expert	3 m/m	December 1979- February 1980	
Furniture production expert	3 m/m	December 1979- February 1980	
Furniture design expert	2 m/m	January- February 1980	\$9,600
Total assistance			\$9,600

Proposed ORUS inputs: Standardization expert, quality control expert

Government inputs: 3 counterparts

Because of the construction boom in Ankara, a kitchen-cabinet factory has to be developed, starting with plastic laminating of the particle board. Modern kitchens have to include all electrical equipment and built-in accessories which will come from other places in the western regions of Turkey. This factory has to include a line of hotel and restaurant kitchen facilities so that a complete range of kitchen furniture can be offered.

Kitchen cabinet production

Total investment (government) excluding building: \$1,200,000

Proposed time of machinery installation: January-July 1980

Proposed production start-up: July 1980

Proposed ORUS inputs:

<u>Input</u>	<u>Duration</u>	<u>Date</u>	<u>Cost</u>
Furniture production expert	3 m/m	July-August 1980	Covered in co-ordination with ORUS training centre
Standardization expert	2 m/m	June-July 1980	
Quality control expert	2 m/m	July-August 1980	
Tool maintenance expert	2 m/m	July-August 1980	

Similar to case-goods and hotel-room furniture is the office furniture production based on particle board and hardboard. The production of built-in file chests and file boxes is based on beechwood. Office furniture designs should be based on wooden materials. Denizli is the selected site for this factory, with a strong market in the Marmara and Aegean regions. Production should be expanded at a later date for steel-tube office furniture. A certain part of the whole capacity should be reserved for the school furniture programme, including library book shelves and display boards.

Office furniture production

Total investment (government) excluding building: \$1,200,000

Proposed time of machinery installation: January-July 1980

Proposed production start-up: July 1980

Proposed ORUS inputs:

<u>Input</u>	<u>Duration</u>	<u>Date</u>	<u>Cost</u>
Furniture production expert	3 m/m	June-August 1980	Covered in co-ordination with ORUS training centre
Standardization expert	2 m/m	June-July 1980	
Quality control expert	2 m/m	July-August 1980	
Tool maintenance expert	2 m/m	July-August 1980	

Three identical medium-sized wood-processing plants should be established in K. Maras, Gümüşhane and Tokat. The machinery has to be selected to handle both joinery and cabinet making. Whenever necessary, plants should specialize in machining joinery products or furniture products only. These plants will include training places for wood craftsmen to learn woodworking skills for all ORUS plants.

The production line should include the products listed below:

- Joinery: flush doors, windows, stair treads
- Interior trim: wall panelling, mouldings
- Cabinet making: carcass furniture, KD chairs

Furniture and joinery production

Total investment (government) excluding building: \$2,400,000

Plants:

(a) K. Maras	800,000
(b) Tokat	800,000
(c) Gümüşhane	<u>800,000</u>
Total	2,400,000

Proposed time of machinery installation: (a) October-December 1980  
 (b) January-March 1981  
 (c) April-June 1981

Proposed production start-up: (a) January 1981  
 (b) April 1981  
 (c) July 1981

Proposed ORUS inputs:

<u>Input</u>	<u>Duration</u>	<u>Date</u>
Production expert	3 m/m	December 1980-February 1981
Kiln-drying expert	3 m/m	March-May 1981
Tool maintenance expert	3 m/m	June-August 1981

Complete doors and windows should be produced in a specialized factory at Isparta in view of the planned hotel development in the tourist areas of Mugla and Antalya. Flush doors have to be designed for prefabrication and should include a range of glazed flush doors.

Prefab door and window production

Total investment (government) excluding building: \$1,200,000

Proposed time of machinery installation: July-December 1981

Proposed production start-up: January 1982

Proposed UNDP/UNIDO/ORUS inputs:

<u>Input</u>	<u>Duration</u>	<u>Date</u>	<u>Cost</u>
Prefab component expert (UNDP)	2 m/m	January-February 1982	\$9,600
Production expert (ORUS)	3 m/m	December 1981- February 1982	
Kiln-drying expert (ORUS)	2 m/m	November-December 1981	
Tool maintenance expert (ORUS)	2 m/m	January-February 1982	
Standardization expert (ORUS)	2 m/m	January-February 1982	

A small but efficient specialized production of infant and juvenile furniture is needed to complement this programme. It could be established in Zonguldak. This production requires especially hardwood, some softwood, plywood and hardboard. The manufacturing range should include kindergarden furniture and education accessories as well as mass-produced wooden toys.

Infants and juvenile furniture production

Total investment (government) excluding building: \$800,000

Proposed time of machinery installation: January-March 1982

Proposed production start-up: April 1982

Proposed ORUS inputs:

<u>Input</u>	<u>Duration</u>	<u>Date</u>
Production expert	3 m/m	March-May 1982
Kiln-drying expert	2 m/m	March-April 1982
Tool maintenance expert	2 m/m	April-May 1982

Adana is the selected site for the production of prefab houses and elements.

The prefab house range has to include houses for one or two families, vacation bungalows for tourist centres, houses for disaster areas, farm houses, agricultural buildings (barns etc.).

Prefab components such as roof trusses, prefab bridge elements, wall claddings and ceiling tiles have to be included in the production line.

Prefab wooden building: element production

Total investment (government) excluding building: \$1,500,000

Proposed time of machinery installation: June-July 1982

Proposed production start-up: August 1982

Proposed ORUS inputs:

<u>Input</u>	<u>Duration</u>	<u>Date</u>
Production expert	3 m/m	June-August 1982
Kiln-drying expert	2 m/m	June-July 1982
Tool maintenance expert	2 m/m	August-September 1982
Standardization expert	3 m/m	August-October 1982

Prefab parquet and matchboard production has to be established in Amasya. Low-grade softwood will be used as substrate material, while oak, ash, and beech is used for the top layer. There are many new technologies known for prefab floorings and ply parquet with two, three or four layers can be applied.

Prefab parquet and wall-panelling production

Total investment (government) excluding building: \$1,000,000

Proposed time for machinery installation: August-November 1982

Proposed production start-up: December 1982

Proposed ORUS inputs:

<u>Input</u>	<u>Duration</u>	<u>Date</u>
Production expert	3 m/m	November 1982-January 1983
Kiln-drying expert	2 m/m	September-October 1982
Tool maintenance expert	2 m/m	November-December 1982
Quality control expert	2 m/m	December 1982-January 1983

C. Integrated rural woodworking and forest villagers

There are 19,000,000 people living within the forest areas and 5,300,000 within 10 km of the forests. National projections forecast a 43 per cent reduction in the forest village population over the next 20 years. Potentially 1,600,000 people could be employed in forest-related jobs. Mechanized methods deemed suitable for most aspects of forest work are recommended, and an appropriate introduction scheme has been developed for this purpose.

A systematic training programme has to be started under the supervision of the Regional Directorate of OGM and directed by a "Villagers Woodwork Programme" of ORUS for the eventual introduction of low-cost woodworking equipment. In selecting low-grade logs for higher yield than fuel wood they have to learn how to use this raw material for manufacturing products such as fence posts, wheelwrights' products, agricultural tool handles, broom sticks, tool handles and similar turned products, cottage products for tourism centres etc.

Wooden souvenir articles have for long been made in the districts of Kastamonu and Zonguldak, in the Sinop provincial centre and Antalya. As the handicraft workshops are not organized, the market prices for their products are high but the standards low. To speed up progress it is necessary to raise the quality of the products and co-ordinate cottage woodcrafts. This programme has to be co-ordinated with the institutional development suggested within the integrated rural development plan.

Forest villagers will be trained in timber harvesting under the instructions of OGM.

ORUS includes three pilot mobile sawmills with the following aims:

- (a) Increasing the productivity of stationary mills through pre-cutting of logs in the forest into balks for resawing at the mill site, producing also boards for sale to villagers and slabs for fuel wood;
- (b) Training of villagers in sawmilling, especially in primary log break-down and grading of lumber;
- (c) Reducing the cost of log and lumber transport in high forest regions.

The location could be in high forest regions, on landing sites to assist stationary mill capacity, or in Eastern regions, for example Eastern Anatolia, to make use of some low-grade oak species.

Pilot mobile sawmills

Total investment (government): \$135,000

3 bandmills (location not yet decided) (a) \$45,000  
(b) \$45,000  
(c) \$45,000

Proposed time of operation start-up: (a) March 1978  
(b) February 1979  
(c) September 1979

Proposed ORUS inputs:

	<u>Duration</u>
Sawmill expert	3 m/m
Lumber-grading expert	3 m/m
Tool maintenance expert	3 m/m

Vocational education programme: universal workshops

In the rural areas of Tuzeli, Bingöl, Bitlis, Akdagmaden and Göksum small-scale workshops should be installed. Woodworking equipment has to include light-duty stationary saws, portable saws, shapers, routers, belt and disk sanders, power drills, boring jigs and templates and tool sharpeners. Most of these machines can also be used in stationary operations. The workshops have to be assisted by the forest stations and will be used for training young and adult workers to build up skills in woodworking and to provide wooden products needed by the rural areas in small series at low cost.

Universal workshops (vocational training)

Total investment (government) excluding building: \$125,000

Location: (a) Tuzeli \$25,000  
(b) Bingöl \$25,000  
(c) Bitlis \$25,000  
(d) Akdagmaden \$25,000  
(e) Göksum \$25,000

Proposed ORUS-OGM inputs:

	<u>Duration</u>
Woodworking training expert	10 m/m (monthly rotation)
Tool maintenance expert	5 m/m (monthly totation)

Cottage woodwork

With the establishment of universal workshops the cottage woodworking industry has to be organized to upgrade the quality of souvenir products based on original Turkish handicraft work. Assistance should be provided to the training centre for product development, marketing and quality control.

D. Wood-related industries

A well-organized development of the secondary wood-processing industry should also include related products which are not yet, or which are insufficiently manufactured in the country. The adequate development of the local industry to produce woodworking machinery and tools is most important.

Woodworking machinery

Standard woodworking equipment such as band-saws, circular saw benches, planers, moulders, routers, belt sanders etc. are still largely imported. Because of the sophisticated machining technology applied to woodwork, standard machinery has appropriate speed rates which require special toolings, namely cutters of high-speed steel, either solid or carbide-tipped, which also require special tool-maintenance machinery.

Recommendations for manufacturing woodworking machinery locally to avoid imports have already been made in earlier reports. It has also been mentioned that the woodworkers mistrust locally-made machinery and that there is no organization interested in machine research. It is necessary to support the scientific and technical research work to keep up with the rapid development of wood-machining technology; research institutes in Turkey should extend their activity in this field to contribute to a well balanced development of the industry. Wood industries, woodworking machinery industries and tooling industries should co-ordinate to support the development of the related domestic industry.

The existing Turkish woodworking machinery manufacturers in Bursa and Ankara should be encouraged to manufacture combined woodworking machines according to woodworking safety standards including the following:

Combined surfacing and thickening machines (two combined operations)



Combined circular saw, spindle moulding, slot-mortizing machines  
(three combined operations)

Combined surfacing, thickening, circular sawing, spindle moulding  
and slot-mortizing machine (five combined operations) :

Combined machines are preferred for workshop productions. Single-purpose  
machines should be delivered with a "performance test" certificate according to  
European standards and recommendations. :

Standards for testing the precision of woodworking machinery are available  
in France, the Federal Republic of Germany and the United Kingdom, and they  
are similar to the recommended standards of the European Committee of Woodworking  
Machinery Manufacturers (EUMABOIS).

It is essential for the Turkish woodworking machinery industry to be  
independent of foreign plants. Initially it should limit its product range  
to those machines which are easy to manufacture according to domestic requirements.

#### Tooling

Tool production for woodworking is a potentially very promising industry.  
There is a close relation between the tool industry and machinery manufacturers  
because of the connecting dimensions between spindles and fitting tools. For  
safety reasons tool design has to be carefully considered. Standards for safe  
tool designs are available so that production of woodworking tools could be built  
up according to European standards.

The development of secondary wood processing demands continuous imports  
of precision tooling for woodworking machines. Thus, it should be decided at the  
beginning of this sector's development programme to establish a tool-manufacturing  
industry to cover the demand of both the public and the private wood-processing  
industry. The factory has to include the production of the following equipment:

#### Phase I

Steel band-saws and circular saws including stellite tipping for  
sawmilling and woodworking

High-speed steel shaping tools, solid tools also with steel tipplings,  
tooling heads with inserted cutter blades

Straight planer knives and straight shaper knives :

Carbide-tipped circular saws (based on imported carbide tips) :

Carbide-tipped moulding heads (based on imported carbide tips) :

Routing bits, also carbide tipped (based on imported carbide tips)

Boring bits.

Phase II

Production of carbide tips

Production of solid carbide routing bits.

To introduce this development successfully an early standardization programme of interrelated dimensions of machines and tools has to be prepared.

Maintenance and service station

The ORUS Development Plan has to include a maintenance and service station to centralize spare part and tool orders and to have a special repair workshop for maintenance. To minimize costs for all ORUS industries it is necessary to store standard tools and cutters as well as cutter blanks. Regrinding service should initially be done on equipment of the proposed training centres.

Funds for expanding and developing the woodworking machinery and tooling industry should be granted by the government. Assistance should be given through the Ministry of Industry and the Ministry of Forestry.

Total investment excluding building

Tooling industry:           \$1,500,000

Service station:           \$1,700,000 (as part of industry development)

With the establishment of the training centres an applied research programme has to be introduced through the co-ordination of the forestry and wood-processing faculties of Universities in Turkey. The Forest Products Research Institute in Ankara has to expand its research activity in this field, to set up a training centre and to transform itself into a Forests Products and Wood-Processing Research Institute.

E. Vocational training in woodworking

The fast-growing wood-processing industry needs skilled labourers and supervisors. Therefore, the Ministry of Forestry has to set guidelines for the professional education of apprentices and trainees in carpentry, joinery, wood-cutting, cabinet-making and handicrafts. Proposals for syllabuses are given in annex IV. The courses for each subject on a six-months' or two-months basis should end with an examination. Apprentices and trainees should have to qualify in different subjects and should be awarded a certificate. Candidates who pass the proposed final examination should be able to pass on after three years of industrial experience to study at colleges.

### III. PROJECT ASSISTANCE REQUIREMENTS

#### A. Project evaluation

Discussions with the industry, machinery importers, consultants, lecturers and secretaries of wood industry associations proved that they are primarily thinking of Western European equipment because of its powerful development after the Second World War.

The Western European woodworking machinery industry has over 500 manufacturers. The strongest industries are in the Federal Republic of Germany (130 manufacturers) and Italy (120 manufacturers). Experts in the fields of project evaluation and equipment selection are submerged with offers from European machinery manufacturers and consulting firms. The prices quoted are not always the best guide to quality.

There have been many changes in this industry during the last five years. Some of the leading old establishments have closed or lost importance and are no longer competitive. Bearing in mind that several woodworking plants will be established, a group of manufacturers should be selected to achieve the following: a drop in prices through continuing business; the selection of standardized equipment so as to limit tool variations; a reduction in spare-part storage; less variation in the equipment range for better maintenance and service; direct sales contracting; an easier exchange of experience within the ORUS factory group.

Tenders need not consist of long lists of requirements, but have to be based on selected product drawings for the components to be machined.

While performance tests for individual machines are carried out in the plant of the machine manufacturer, the performance of a complete enterprise has to be proved after the factory start-up. This work has to be done through a project evaluation committee.

The committee will include representatives from the following bodies and industries: the existing ORUS industries, the Ministry of Planning, the Forest Products Research Institute, the Turkish woodworking machinery industry and the Turkish Industrial Development Bank.

UNIDO should be requested to provide the assistance of an expert on two occasions: for the initial preparation of the tenders; and at the time of the first evaluation of offers (for details concerning proposed UNIDO assistance see table 18).

B. Training centres

The central management of the ORUS organization in Ankara has to co-ordinate the work of the Forest Research Institute, which will be transformed during the industry development period into the Forest Products and Wood-processing Research Institute.

Kiln-drying equipment has to be installed in Ankara and Trabzon. Kilns with semi-automatic control should be the most appropriate.

Training centres

Total investment (government) for kiln-drying equipment: \$80,000

Proposed UNDP/UNIDO assistance

Kiln-drying expert (3 m/m): \$14,400

The tool maintenance equipment in the Tepe factory in Ankara should be completed to ensure full training facilities. A second centre for tool maintenance should either be created at the University of Trabzon or included in one of the integrated wood industries like the one in Bolu. An equipment inventory of maintenance machinery in Ankara and Bolu would probably justify the implementation of a tool maintenance station in Trabzon because general equipment is available. It only needs to be completed.

Total investment for tool maintenance equipment:	\$50,000
Experts (2 x 3 = 6 m/m):	\$28,800
Total (including cost of kiln-drying expert and equipment):	\$130,000 43,200

UNIDO consultants should be requested to assist in training Turkish staff in kiln-drying, tool maintenance and related machining technology.

The wood machinery centres could be at the Research Institute in Trabzon or Izmir so that the country will have decentralized training facilities.

A consultant would be needed to introduce up-to-date machining technologies and to propose a research programme and cover the field of safety in woodworking.

Total investment (government) for machining workshops:

Turkish machinery	\$60,000
Foreign machinery	\$240,000
Proposed UNDP/UNIDO assistance:	
Machining technology expert (6 m/m)	\$28,800
Total	\$300,000 28,800

For details concerning UNIDO assistance in this field, see table 18.

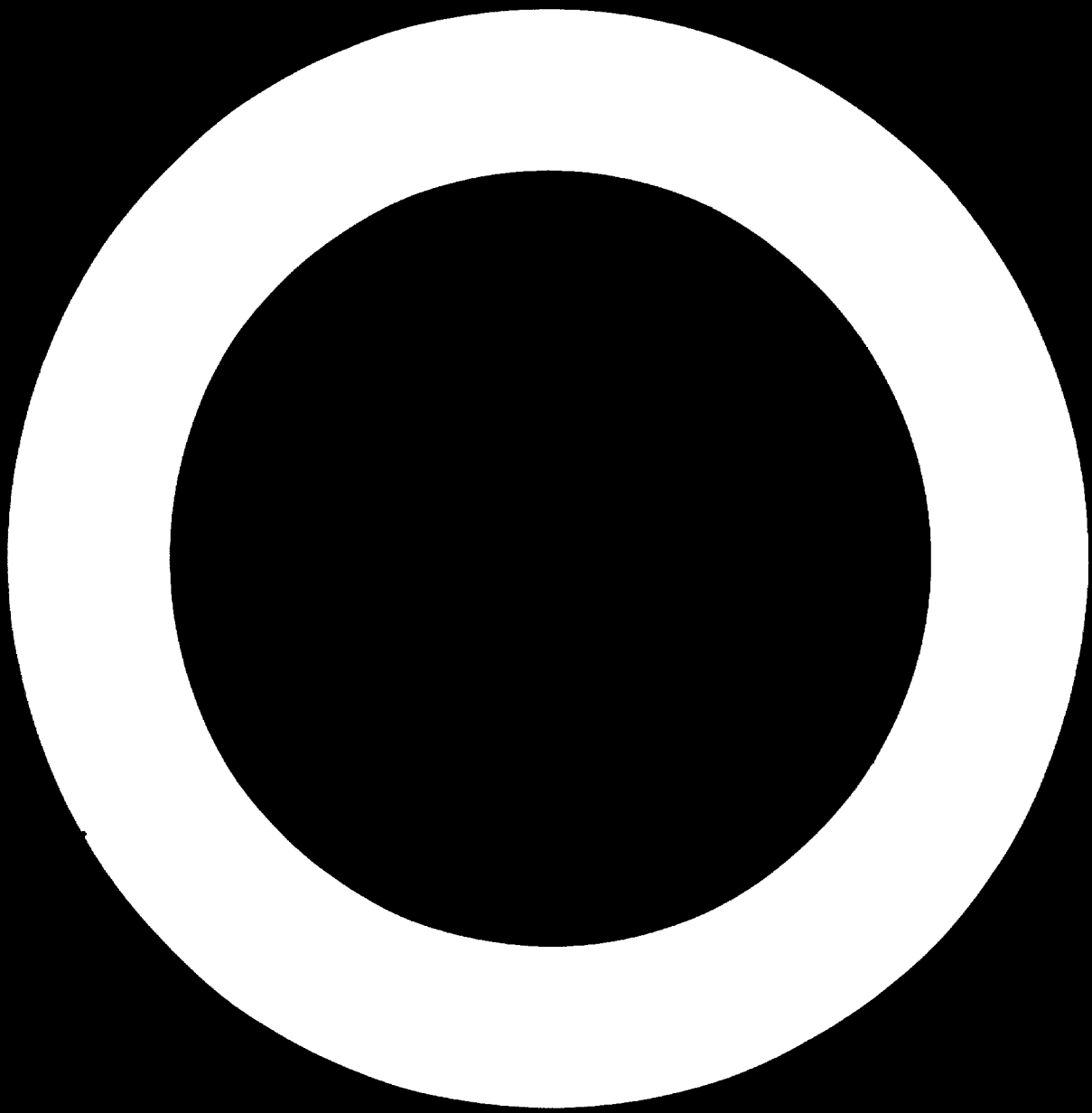


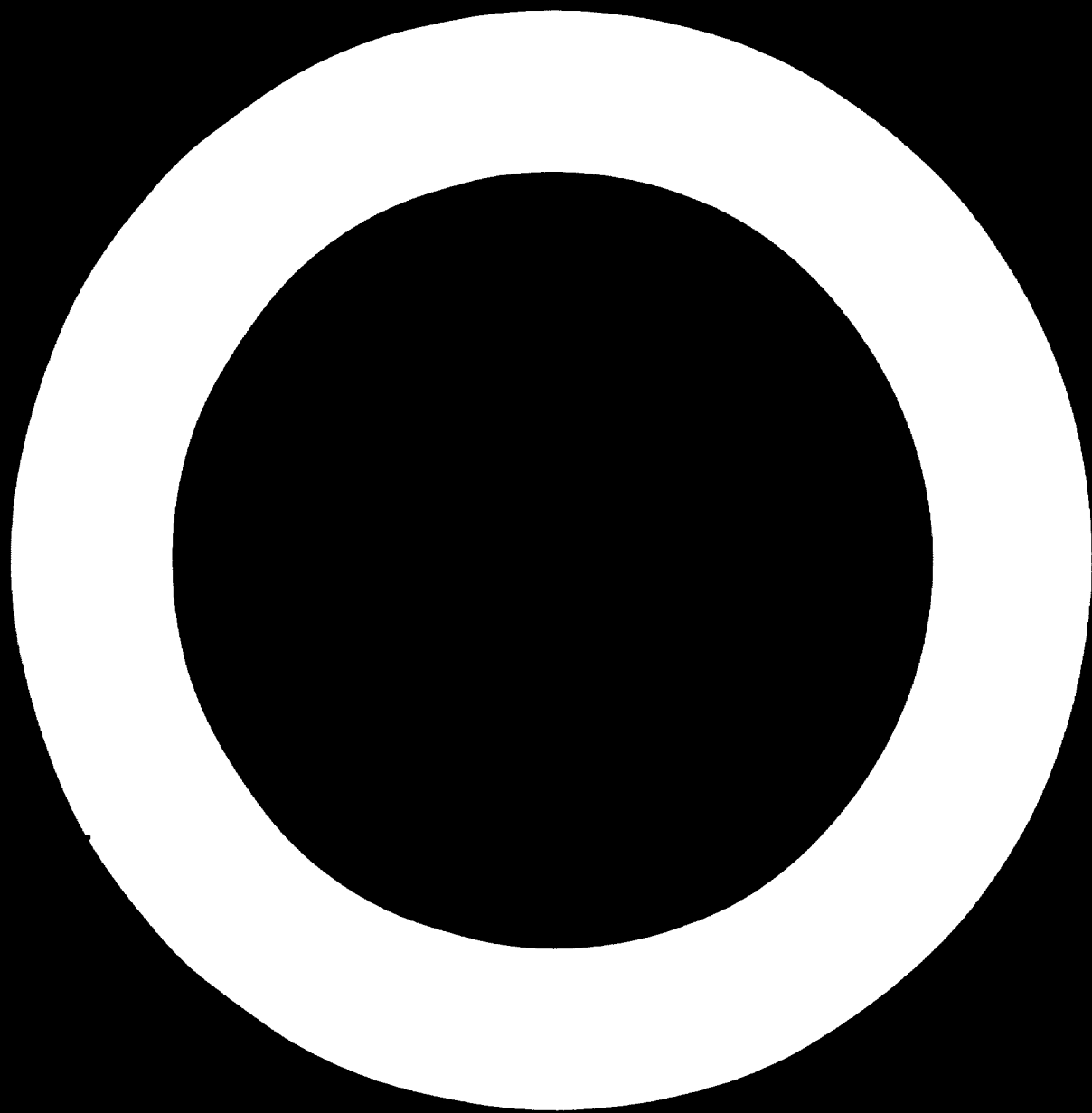
Table 18. Project assistance needed to complement wood processing

	LOCATION	GOVERNMENT INVESTMENT INPUT	m/m	UNDP-INPUT CONSULTANTS EQUIPMENT	FELLOWSHIPS STUDY TOURS SEMINARS
1. Founding a Project Evaluation Committee ORUS -- Ministry of Forest -- Ministry of Planning -- TSKB					
1.1 Assistance in Project Evaluation	Ankara		2 x 1 = 2	9.600	
2. Establishing Training Centres	Ankara/Trabzon				
2.1 Pilot Kiln Drying Equipment	"	80.000			
2.2 Assistance in Kilndrying	"		3	14.400	
2.3 Tool Maintenance Equipment	"	50.000			
2.4 Assistance in Tool Maintenance	"		2 x 3 = 6	28.800	
2.5 Wood Machining Equipment	"				
2.51 Turkish Woodworking Machinery	"	60.000			
2.52 Foreign Woodworking Machinery	"				
2.6 Assistance in Machining Technology	"	240.000			
3. Expanding the Forest Products and Wood Proc. Research Inst.			6	28.800	
3.1 Forest Research Laboratory Equipment	Ankara	50.000			
3.2 Expanding the Forest Products Library through a Documentation Centre	Ankara	25.000		30.000	
3.21 Fellowship Documentation Centre	England/Germany		2	20.000	2.400
3.22 Equipment for Documentation Centre					
3.3 Founding of Information Centre					
3.31 First Issue of Journal: "Wood Processing in Turkey"	Ankara	40.000			
4. Assistance in Industry Development					
4.1 Consultant in Case Good Furniture Design	Bolu/Ankara				
4.2 Consultant in Production Management	Karaman/Denizli		2 x 2 = 4	19.200	
4.3 Consultant in Chair and Upholstery Design			2 x 3 = 6	28.800	
4.4 Consultant for Prefab-Components and Housing	Duzce/Kastamonu/Zonduldak		3	14.400	
4.5 Study Tour on Standardization and Quality Control	Adana/Amasya		2	9.600	
5. First Seminar on Technology Transfer Changing Technology from Craftsmanship to Industry Production Criteria in Selecting Woodworking Machinery for Medium and Large Scale Production	England/Denmark/Germany				15.000
5.1 Translation of Documents English-Turkish	Ankara				
5.2 Seminar Assistance through UNIDO				10.000	
6. Second Seminar on Technology Transfer Co-ordination of Primary and Secondary Wood Processing Production Demands for Export	Trabzon				6.000
6.1 Translation of Documents		10.000			
6.2 Seminar Assistance through UNIDO					
7. Villagers' Training Course	Tucelli, Bingöl, Bitlis Akdagmaden, Gökşun	20.000			

Technical assistance needed to complement wood processing industry development

ELEMENT	m/m	UNDP INPUT CONSULTANTS EQUIPMENT	FELLOWSHIPS STUDY TOURS SEMINARS	PRELIMINARY WORK	1. YEAR		2. YEAR		3. YEAR		4. YEAR		5. YEAR	
	2 x 1 = 2	9.600		4.800		4.800								
					80.000									
	3	14.400			14.400									
					30.000									
	2 x 3 = 6	28.800					14.400		14.400					
							60.000							
	6	28.800					240.000							
							28.800							
		30.000				80.000								
	2	20.000	2.400		5.000	20.000	2.400	5.000	5.000	5.000	5.000	5.000	5.000	5.000
								40.000						
	2 x 2 = 4	19.200				9.600			9.600					
	2 x 3 = 6	28.800				14.400			14.400					
	3	14.400							14.400					
	2	9.600									9.600			
			15.000					15.000						
		10.000						10.000						
			6.000					6.000						
										10.000				
			6.000						6.000					
						10.000		10.000						







C. Forest products and wood processing research institute

An equipment inventory and the proposed future research programme have shown the need for a reorientation. UNDP should provide assistance in equipment selection and could perhaps finance partial implementation.

Research Institute

Total investment (government) for laboratory equipment:	\$50,000
Proposed UNDP/UNIDO input for equipment	\$30,000
Total	\$80,000

The existing library has to be expanded to become at the same time a documentation centre.

A fellowship for a Turkish documentation specialist to visit a European documentation centre should be requested from UNDP/UNIDO. Some equipment and/or reference material could also be requested. The development of industrial woodworking will make it possible to compete with other developed countries only through an exchange of production experience, research results and information about other development problems of the industry. It is therefore necessary to observe foreign markets and their development trends.

Documentation Centre

Total investment for literature	\$25,000
Proposed UNDP/UNIDO input	
Fellowships (2 m/m)	\$2,400
Equipment	\$20,000
Total	\$27,400 \$20,000

The Documentation Centre itself is simultaneously part of the new information centre with its own journal Forestry and Wood Processing in Turkey. Management needs to be informed about facts in its own field in order to update knowledge and follow up industry developments.

At the beginning it should be issued every second month, with production highlights of the Turkish wood industry and a review in Turkish of domestic and foreign research work. The foreign research results can be presented in English, German or French, with a translation of the title into Turkish.

A readers' service comparable to that of similar publications should be included. News about equipment development etc. should be given in Turkish.

Information Centre

Total investment (government) for a Centre	\$40,000
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D. Industry development

Successful development of the wood industry, with the latter's assistance in the co-ordination of training programmes, research work, information and association services, will be ensured only by systematic follow-up action through the Ministry of Forestry and the Directorate of Planning and Co-ordination. UNIDO could provide assistance along the following lines in the establishment of the first factories.

A consultant on case-goods furniture design would work in the first phase with a production management consultant in the training of counterparts and the preparation of a seminar to introduce management officers and supervisors to the organization of industrial production. In the second phase the consultant in production management would work together with the consultant in chair and upholstery design. At this stage the first trained counterparts have to use their first-year experience to help introduce their Turkish colleagues to the new job, while being trained at the same time in the different problems of manufacturing case goods, seating furniture and joinery products. Simultaneously, production specialization and problems of manufacturing mixed products (joinery and furniture) have to be examined in the light of domestic conditions.

A consultant on prefab components and housing would have to advise on the manufacture of pre-cut or prefab components and housing that is partly or fully assembled at the factory site. He would consider the special problems of disaster-area prefab housing for so-called "on-the-site assembly". His work would also include the flexible production, in co-ordination with the hotel-furniture factory at Karaman, of built-in units for prefab vacation houses. In addition the possibility of prefab school buildings has to be envisaged in co-operation with the Duzce school furniture factory. At the end of the first consultancy phase, a study tour would be organized for Turkish management officers and supervisors of the established wood industry to study standardization and quality control of wood products. The knowledge received through the various institutions has to be transferred to their counterparts in the second phase of management consultancy in Turkey.

Total investment (government) for the woodprocessing industries:		\$13,960,000	
Proposed UNDP/UNIDO assistance:			
Consultancy:			
Case-good furniture design	4 m/m		\$19,200
Production management	6 m/m		28,800
Chair and upholstery design	3 m/m		14,400
Prefab components and housing	2 m/m		9,600
Fellowship:			
Documentation Centre			2,400
Study tour on standardization and quality control			<u>15,000</u>
Total		\$13,960,000	\$89,400

Any of the proposed projects for the development of the secondary wood industry can be considered partially, so that government authorities can set out preferences and priorities according to their budget ceilings.

#### E. Seminars and training courses

The consultancy work provided by UNIDO will influence the first seminar on technology transfer. At that time the first ORUS wood-processing factories will be built, so that a technology transfer seminar will support their activities and to a certain extent solve machining and production problems.

UNIDO will provide documents in English, while under the supervision of the Information Centre translations into Turkish will be prepared.

The second seminar will follow the same procedure as for the first, and, according to the development stage of the industry, complement UNIDO assistance during the development period of the secondary wood-processing industry.

#### Seminars:

Total investment for document translations (English into Turkish) by ORUS		\$20,000	
Proposed UNDP/UNIDO assistance (course preparation)			<u>\$12,000</u>
Total		\$20,000	\$12,000

Under the guidance of the ORUS training centre some forest villagers have to be trained to supervise the villagers' workshops. Permanent retraining through the different training centres in Ankara, Trabzon and Izmir has to be provided. After establishing the workshop a permanent check-up should be ensured by ORUS through a travelling maintenance service station.

It must be of interest to the ORUS group to find through this channel better ways of training workers to build up the necessary supply of personnel and junior woodworkers for the industry. Regional directorates where workshops are located have to follow up their activities. Training courses will be held twice; the estimated costs will be \$10,000 for each course.

## CONSLUSIONS AND RECOMMENDATIONS

### A. Conclusions

1. Turkey, thanks to its geographical location and the 20% of its land area covered by usable forests, could achieve a dominant place among the countries of Western Asia and the Southern Mediterranean in the supply of forest resources and the production of industrial wood.
2. UNIDO assistance to the secondary wood-processing industry will be required for project evaluation, the promotion of training centres, the expansion of the forest products and wood-processing research institute, industry development, and technology transfer seminars.
3. A secondary wood-processing industry group with a complete range of furniture and joinery products calls for a product distribution organization with display and storage facilities in different towns throughout the country selected primarily in provincial centres to cover their share of the market.
4. The establishment of factories planned by the private sector with the assistance of experienced consultants will soon have an impact on the existing market. It is therefore necessary for the ORUS group to establish a body of well-trained and skilled workers with highly qualified supervisors to run the new factories efficiently.
5. The satisfactory development of the secondary wood processing industry requires the inclusion of related products which are not yet, or which are insufficiently, manufactured in Turkey. In particular, the ability of local industry to produce woodworking machinery and tools is very important.
6. The progress of the secondary wood processing industry will be considerably influenced by, and have a substantial impact on, the development of the primary wood processing industry. The establishment of appropriate quality standards and grading rules for the basic wood products is therefore essential.

### B. Recommendations

1. Research on, and manufacture of, woodworking machinery and tools should be promoted in Turkey in order to cover the demand of both the public and the private wood processing industry.
2. Top management within the ORUS factory group should rotate on a five-year basis and other managerial staff members on a three-year basis in order to ensure a continuing exchange of experience.

3. UNDP should provide assistance to follow-up projects (for specific project requirements, see table 17) in the form of consultancy services, equipment and training, in order to ensure the successful development of the wood industry.
4. The Ministry of Forestry should schedule the activities of planned industries and workshops on the basis of issued import licenses and granted requests for bank loans to wood processing plants, thereby helping to justify the proposed development plan for ORUS factories.

Annex I

HOST COUNTRY STAFF

Bahattin Ayık	Ministry of Forestry
Özdemir Demirtas, Director	General Directorate of Forest Products Industries
Mr. Eici, Assistant Director	Forest Research Institute
Nurettin Elbir	Ministry of Forestry
Özdemir Erelemir	Ministry of Forestry
Irfan Gürsu	Forest Research Institute
Adnan Kir, Director	Directorate of Planning and Co-ordination, Ministry of Forestry
Erol Öktem	Forest Research Institute
Mr. Savaser, Director	Forest Research Institute
Ölçütekir Telgeren	Forest Research Institute
Dr. Topcuoglu	Forest Research Institute
Remzi Uzunoglu	Ministry of Forestry
Erol Yildirim	Directorate of Planning and Co-ordination, Ministry of Forestry

Annex II

MISSION TRAVELS, INDUSTRY VISITS AND CONTACTS

Ankara

Yuksel-Mobilya, Furniture Manufacturing  
Domsan-Mobilya, Furniture Manufacturing  
Tepe-Mobilya, Furniture and Joinery Manufacturing

Antalya

Mediterranean route  
Workshops, small sawmills, small box plants  
Antalya Box Factory

Bolu

Integrated wood complex: sawmill, particle board mill, flush-door production  
Fibreboard mill (laminated with melamine and phenol resins)

Duzce

Sawmill, parquet mill  
Parquet mill (private enterprise)  
Particle-board mill - Kapsan  
Villagers' products shop

Istanbul

Discussion with woodworking machinery importers  
(information about project implementation in the private sector)  
Furniture Bazar  
Furniture factory (700 employees)  
Cabinet-making and Joinery Workshop  
Contacts with the Wood Industry Association "TASIS"

Izmir

Aegean route to Denizli and Mugla  
Tannin plant  
Resin plant "DYO"  
Denizli: furniture factory "Yonga"

Trabzon

Black Sea route to Artvin  
Artvin: Fibreboard plant  
Boroka: Sawmill  
Ardesen: Sawmill, cabinet-maker workshops, small sawmills  
Surmene: School visit  
Trabzon research experimental station  
Trabzon shoe heel production  
Discussions on private industry development  
Discussions at Trabzon University, Faculty of Forestry



Annex III

BASIC DATA ON THE WOOD INDUSTRY IN TURKEY

Table 19. Wood consumption from 1967 to 1974

Year	Industrial wood (%)	Fuel wood (%)
1967	25.20	74.80
1970	27.40	72.60
1972	32.98	67.02
1974	32.60	67.40

Table 20. Forecast of wood products demand up to 1995

Product	Demand (1,000 m <sup>3</sup> )		
	1977	1987	1996
Logs	8,386	10,446	13,459
Sawn timber	5,683	9,150	11,850
Joinery	383	590	765
Plywood	160	456	494
Others	160	250	350
Pulpwood	<u>840</u>	<u>2,045</u>	<u>2,609</u>
Total (excluding logs)	7,226	12,491	16,068

Table 21. Furniture production demand for the 1962-1987 period

	1962	1967	1972	1977	1987 (Forecast)
Production TL	590.0	742.5	944.0	1,439.1	3,341.0
Increase %	100	126	160	244	566

Table 22. Distribution and capacity of establishment producing wool-based panel, veneer and matches in 1975

Regions	Flywood		Blackboard		Particle board		Fibre board		Veneer		Matches	
	Number of Capacity establishments- (m <sup>3</sup> )	Number of Capacity establishments- (m <sup>3</sup> )	Number of Capacity establishments- (m <sup>3</sup> )	Number of Capacity establishments- (m <sup>3</sup> )	Number of Capacity establishments- (m <sup>3</sup> )	Number of Capacity establishments- (m <sup>3</sup> )	Number of Capacity establishments- (m <sup>3</sup> )	Number of Capacity establishments- (m <sup>3</sup> )	Number of Capacity establishments- (m <sup>3</sup> )	Number of Capacity establishments- (m <sup>3</sup> )	Number of Capacity establishments- (m <sup>3</sup> )	Number of Capacity establishments- (m <sup>3</sup> )
Marmara	10	74,000	3	3,500	4	125,000	1	15,000	3	6,000	4	10,100
West Black Sea	1	1,500	-	-	1	27,000	1	15,000	-	-	-	-
East Black Sea	1	3,000	-	-	-	-	1	28,600	-	-	-	-
West Anatolia	-	-	-	-	-	-	1	1,000	-	-	-	-
Central Anatolia	2	6,200	1	2,650	-	-	-	-	-	-	-	-
West Mediterranean	-	-	-	-	1	30,000	-	-	1	5,000	-	-
<b>Total</b>	<b>14</b>	<b>84,700</b>	<b>4</b>	<b>6,150</b>	<b>6</b>	<b>182,000</b>	<b>4</b>	<b>59,600</b>	<b>4</b>	<b>11,000</b>	<b>4</b>	<b>10,100</b>

Source: Ormencilik Ana Planı (1973-1995) (corrected additions).

Table 23. Regional situation of the joinery and box industry

Regions	Joinery industry			Box industry		
	Number of establishments	Annual Capacity m <sup>2</sup>	Average m <sup>3</sup>	Number of establishments	Annual Capacity 1,000 m	Average m <sup>3</sup>
Marmara	455	1 078.9	155	490	230.8	471
West Black Sea	516	960.9	120	17	11.3	650
East Black Sea	231	452.1	135	19	0.2	540
West Anatolia	258	426.8	90	130	58.9	450
Central Anatolia	434	972.7	110	71	29.7	420
East Anatolia	238	249.5	65	14	5.3	380
West Mediterranean	196	272.4	90	95	59.4	565
East Mediterranean	109	215.8	130	108	51.5	250
<b>Total</b>	<b>2 437</b>	<b>4 629.1</b>	<b>120</b>	<b>944</b>	<b>457.1</b>	<b>484</b>

Source: D.P.T. Orman Ürünleri Arastirmasi.

Table 24. Wood species and panel products (1,000 m<sup>3</sup>) used in secondary woodworking

Product	Number of factories	Walnut	Beech	Pine	Fir	Particle board	Flywood	Fibre board
Furniture	21,500	125	250	-	-	250	55	60
Joinery	16,000	-	-	300	400	120	100	50
Upholstery furniture	7,000	-	-	-	-	-	-	-
Chairframes	2,000	-	125	-	-	-	10	-
Chairs finished	3,000	50	150	-	-	-	10	-
Turnings	1,500	5	10	-	-	-	-	-
Carvings	750	2	8	-	-	-	-	-
Cooperage	1,000	-	50	50	-	-	-	-
Truck containers	1,000	-	55	35	-	-	5	5
Wheelwrights	500	-	15	15	-	-	-	-
Sawn wood	2,500	-	-	-	-	-	-	-
<b>Total</b>	<b>56,750</b>	<b>182</b>	<b>663</b>	<b>400</b>	<b>400</b>	<b>370</b>	<b>180</b>	<b>115</b>

Wood product prices in LT per m<sup>3</sup> (average values)

Sawn walnut:	3,000-8,000	Particle board:	2,800-3,600
Sawn beech:	2,500-4,500	Plywood:	12,000-16,000
Sawn pine:	2,000-4,500	Fibre board:	3,000-4,000
Sawn fir:	2,000-4,500		

Table 25. Production development trends and forecast

Product	1962	1967	1972	1977
Sawn timber (1,000 m <sup>3</sup> )	1,426.0	1,900.0	2,900.0	4,320.0
Joinery (1,000 m <sup>2</sup> )	1,654.9	2,250.0	3,112.0	4,125.0
Parquetry (1,000 m <sup>2</sup> )	259.0	800.0	1,393.0	2,235.0
Cooperage (1,000 pieces)	28,000.0	40,000.0	64,000.0	82,000.0
Plywood (1,000 m <sup>3</sup> )	19.3	32.7	40.0	57.4
Fibre board	12.8	30.0	40.0	70.0
Chipboard (1,000 m <sup>3</sup> )	2.0	14.5	70.0	210.0
Furniture (1,000 pieces)	437.2	550.0	736.0	1,066.0
Veneer (m <sup>2</sup> )	1,750.0	1,928.0	2,765.0	5,000.0
Truck container (1,000 m <sup>3</sup> )	1.8	3.5	6.5	9.0
Preservation (1,000 m <sup>3</sup> )	6.3	23.0	52.0	91.6

Source: Devlet (347-351).

Table 26. Production targets in the wood industry

Product	1975	1976	1977	1978	1979	1980	1981	1982	1983-1985	Percentage increase (average/year)
Sawn timber (1,000 m <sup>3</sup> )	-	-	3,302	3,923	4,276	4,276	4,461	5,086	6,286	9
Parquet (1,000 m <sup>2</sup> )	-	-	3,190	3,457	3,748	4,063	4,405	4,785	4,785	8.4
Plywood (1,000 m <sup>3</sup> )	-	-	129	137	145	155	164	174	208	6.2
Cooperage (1,000 pieces)	-	-	101.6	105.3	109.2	113.3	117.5	121.9	121.9	3.7
Fibre board (1,000 tons)	-	-	69	69	69	69	69	89	89	5.2
Particle board (1,000 m <sup>3</sup> )	-	-	439	456	475	494	513	533	533	4
Furniture (1,000 pieces)	-	-	1,066	1,148	1,236	1,332	1,434	1,544	3,760	7.7
Veneer (1,000 m <sup>2</sup> )	-	-	5,000	5,625	6,328	7,119	8,009	9,010	9,010	12.5
<u>Production of ORUS mills</u>										
Sawn logs (1,000 m <sup>3</sup> )	110	152	152	187	222	232	279	309	414	
Sawn timber (1,000 m <sup>3</sup> )	189	189	189	235	282	322	361	400	400	
Matched parquet (1,000 m <sup>2</sup> )	500	500	500	600	700	800	950	1,100	1,100	
Mosaic parquet (1,000 m <sup>2</sup> )	100	100	100	200	200	200	400	400	400	
Cooperage (1,000 pieces)	2.5	2.5	2.5	4.0	5.0	5.0	5.0	5.0	5.0	
Fibre board (1,000 tons)	-	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	
Particle board (1,000 m <sup>3</sup> )	-	30	30	30	70	70	70	70	220	
Plywood (1,000 m <sup>3</sup> )	-	-	-	9	27	27	27	27	54	
Household furniture (1,000 pieces)	-	-	-	-	-	-	20	20	20	
School furniture (1,000 pieces)	-	-	-	-	-	-	50	50	50	
Prefab houses (1,000 pieces)	-	-	-	-	-	-	2.5	2.5	2.5	
Cooperage (barrel) (1,000 pieces)	-	-	-	-	-	10	10	10	10	
Bee hives (wood)	2	2	2	2	2	2	2	2	2	

Source: ORUS

Annex IV

SYLLABUS OUTLINE FOR WOODWORKING APPRENTICES OR TRAINEES

First Course

Subjects of instruction

Wood species and their properties, utilization of solid wood and wood-derived products, plastics, metal and ancillary materials

Reading and preparing of sketches and drawings

Manual woodwork

Use of veneers

Second Course

Subjects of instruction

Wood laminating

Surface treatment

Product checking

Training and studies

- (a) Wood species: introduction of most common domestic and foreign wood species;
- (b) Lumber grading;
- (c) Wood technology: weight, density, moisture content, behaviour, defects;
- (d) Timber seasoning: air and kiln drying;
- (e) Wood-derived products: plywood, particle board, fibre board;
- (f) Plastics: thermosettings and thermoplastics and their use in woodwork;
- (g) Metals: joining nails, staples, pins, screws, assembling hardware, joining hardware (hinges, locks, catches);
- (h) Ancillary materials: abrasives etc.

- (a) Basic standards in drawing;
- (b) Basic symbols, tolerances in woodwork and their importance;
- (c) Drawing exercises.

- (a) Measuring, scribing, use of marking tools, try squares, metre squares, marking gauge, dividers;
- (b) Selection of glues for various applications;
- (c) Bonding wood to wood, plastic to wood.

- (a) Properties of veneers;
- (b) Application of veneers.

Training and studies

- (a) Veneer jointing, splicing, matching;
- (b) Plastic laminating.

- (a) Sanding, brushing, sandblasting;
- (b) Surface bleaching, staining, base coating, satin finishing, lacquer coating, buffing.

- (a) Checking moisture content, size, accuracy and quality;
- (b) Use of measuring means, go-no-go gauges, dial gauges, calibres;
- (c) Necessity of quality control.

**Metalworking**

**Basic metalworking**

Fixtures, jigs and templates

(a) Facilitating work by means of fixtures, jigs, templates;

(b) Preparation of jigs and templates.

Mechanization of work

(a) Basic means for mechanization;

(b) Application of pneumatic, hydraulic and electrical means.

**Third Course**

**Subjects of instruction**

**Training and studies**

Individual manufacturing

(a) Preparing of material list;

(b) Work preparation.

Batch production

(a) Material ordering according to material list;

(b) Operation sequence;

(c) Joining and assembling work.

Production differencies

(a) Comparison of production

solid wooden products, panel products, material combinations.

**Fourth Course**

**Subjects of instruction**

**Training and studies**

Machining wood

(a) Basic introduction of machines;

(b) Basic introduction of tools;

(c) Machining operations;

(d) Adjusting of tools and machines;

(e) Safety in machining operations;

(f) Trouble shooting.

Factory organization

(a) Industrial woodworking;

(b) Production planning and control.

Production calculation

(a) Piece work;

(b) Cost accounting and control.

**Fifth Course**

After basic training in woodworking the fifth course is specialized in the following fields:

(a) Wood-cutting mechanics;

(b) Case-good and seating furniture production;

(c) Joinery production;

(d) Pallets, boxes and cooperage production;

(e) Moulding and wall panneling production;

(f) Parquet production;

(g) Prefabrication of carpentry.

Duration of courses for apprentices:

6 months each, or a total of 2.5 years (skilled)

Duration of courses for trainees:

2 months each, or a total of 1 year (trained)

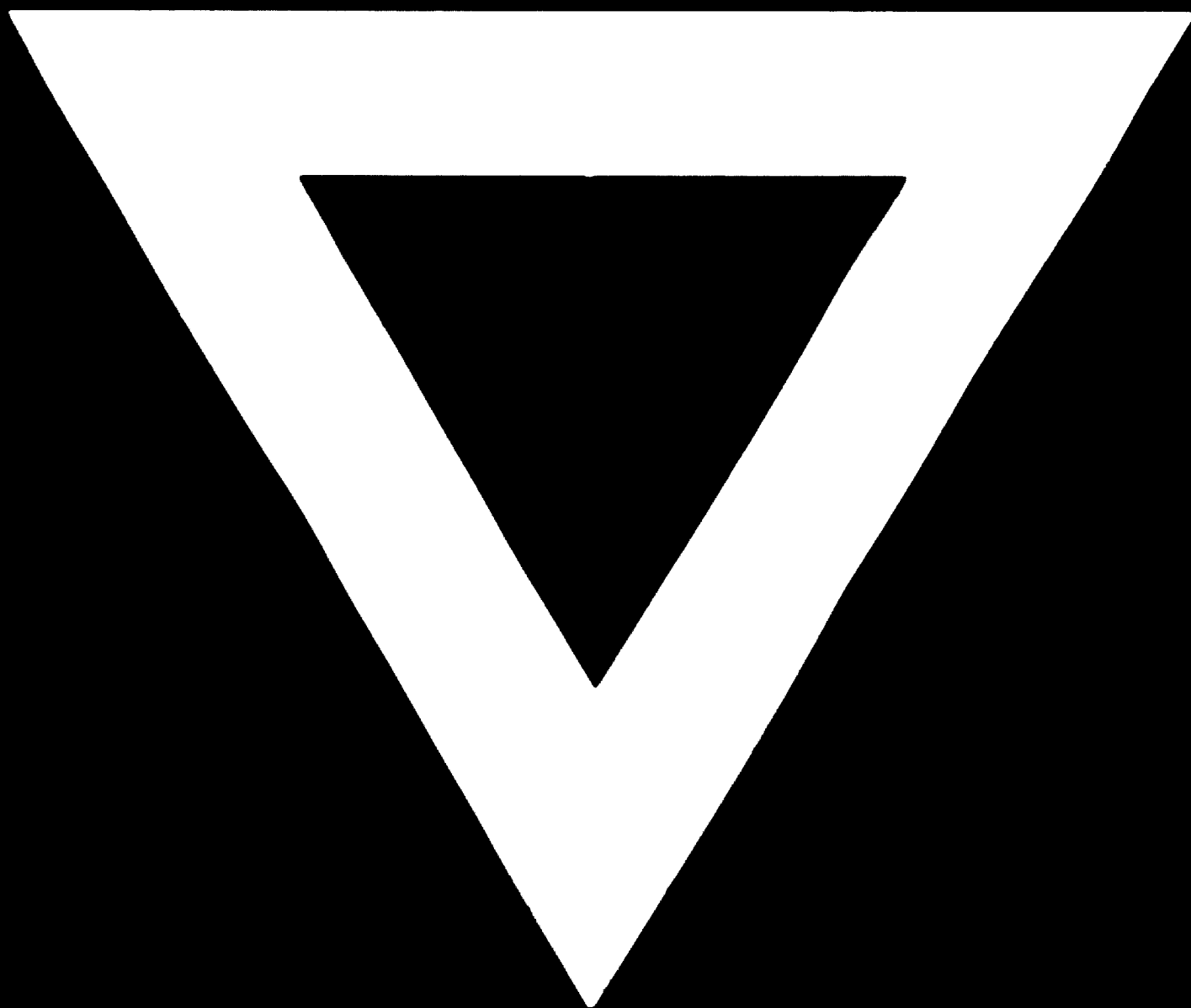


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