

8.4 The Port of Algiers

8.4.1 Macro Forecast

(1) Time series analysis

1) Method

As shown in Table 8.4.1, the handling volume of each commodity at the port of Algiers varied greatly year by year showing no obvious trends. But as indicated in Figure 8.4.1, the total loaded and unloaded cargo volume by package type was relatively stable. So the cargo volume of each package type for the target years will be forecasted using a time series analysis. However, there was a significant drop in volume during 1985-89 in general cargo which seems to have been caused by the restriction placed on imports to stabilize external debt under the Algerian economic recession. Thus, data of general cargo from 1985 to 1989 are regarded as being irregular and therefore discarded.

2) Result of forecast

The cargo volume is assumed to be expressed as;

$$V = a + bT$$

where V ; Handling volume at the port of Algiers

a, b ; Constants

T ; Year

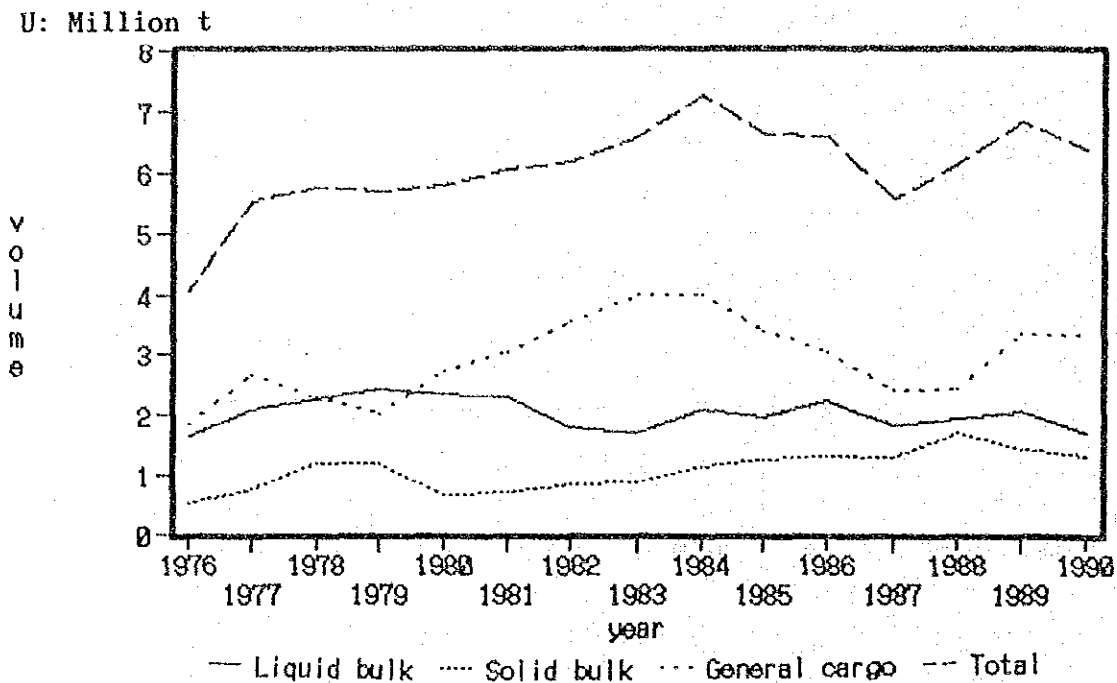
The constants are determined by the least fitting method. The handling volume of total and general cargo is supposed to increase at the same growth rate as that from 1976 to 1984, starting from the initial value in 1990 as shown in Figure 8.4.2. As for liquid bulk cargo, yearly variation is small but does not show any obvious growth trend. Therefore, handling volume is assumed to be the average volume handled at the port of Algiers from 1976 to 1990, 2032 thousand tons both in 1997 and 2010. Under the above assumptions, the cargo forecast obtained is shown in Table 8.4.2.

Table 8.4.1 Volume of Cargoes Handling at the Port of Algier

Commodity	U: Ton.												
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	%	
Agricultural Products and Livestock	953,345	1,002,490	1,186,592	1,241,254	1,252,163	2,324,234	3,421,448	2,541,377	535,256	259,818	292,187	870,881	38%
Livestock	464,469	1,409,841	517,266	560,084	682,100	262,000	2,620,000	16,646	826,225	16,646	594,000	5,584	0%
Wheat	133,033	168,399	263,898	197,106	221,237	182,220	303,673	290,866	599,530	974,192	31,442	974,665	17%
Potato	44,261	71,787	126,459	112,669	108,195	69,818	20,248	26,515	31,442	31,442	31,118	31,118	0%
Fruit, Vegetable	5,804	10,933	10,785	8,394	12,419	4,569	13,814	10,603	22,498	10,916	6,888	6,888	0%
Textile Materials	4,437	5,568	3,991	3,728	3,191	4,569	13,814	10,603	22,498	10,916	6,888	6,888	0%
Timber	254,574	293,291	284,591	372,838	319,170	54,936	211,051	116,369	183,469	233,055	42,157	216,457	4%
Others	45,967	38,325	14,000	1,062	8,894	11,936	11,936	348	1,050	4,007	4,007	4,007	0%
Foodstuff and Forage	647,522	763,302	763,266	792,883	795,640	802,845	867,132	848,663	890,464	898,262	896,843	18%	
Sugar	129,944	155,879	126,745	145,132	145,855	142,607	145,725	193,928	164,705	148,189	32,210	174,400	4%
Wine	11,822	7,207	10,746	72	2,467	2,467	2,467	2,500	8,888	5,162	2,758	2,758	0%
Milk	68,070	68,961	71,380	73,771	85,029	99,906	61,633	60,309	57,079	78,768	74,712	74,712	1%
Animal feed	9,100	22,632	36,450	41,658	31,456	27,345	38,330	23,320	23,802	85,743	133,257	2%	
Vegetable Oil	183,263	210,543	201,195	255,248	260,035	230,702	327,018	339,535	385,150	292,485	217,882	4%	
Others	245,323	296,088	316,750	277,001	273,265	239,818	290,226	229,051	260,730	292,915	258,020	5%	
Combustible Mineral	1,228	6,947	2,880	1,000	7,661	382	382	382	382	382	382	382	0%
Coal	1,228	6,947	2,880	1,000	7,661	382	382	382	382	382	382	382	0%
Others	1,228	6,947	2,880	1,000	7,661	382	382	382	382	382	382	382	0%
Petroleum Products	789,748	789,011	496,007	527,861	671,557	724,723	933,494	847,267	551,607	879,560	728,628	13%	
Crude oil	202,573	183,249	158,383	197,765	196,989	201,880	279,992	249,881	250,289	302,303	325,879	6%	
Hydrocarbon Gas	519,266	523,748	218,986	239,379	367,029	393,896	546,544	291,243	224,568	472,219	344,178	6%	
Refined Oil	47,909	52,014	119,228	90,817	107,589	129,167	108,958	106,143	78,780	105,339	58,570	1%	
Others	0	0	0	2,214	2,214	925	0	0	0	0	0	0	0%
Mineral, Metallurgical Scrap	0	0	0	2,214	2,214	925	0	0	0	0	0	0	0%
Mineral	0	0	0	2,214	2,214	925	0	0	0	0	0	0	0%
Scrap	0	0	0	2,214	2,214	925	0	0	0	0	0	0	0%
Others	0	0	0	2,214	2,214	925	0	0	0	0	0	0	0%
Metal Products	283,921	308,169	286,225	342,085	369,177	301,881	374,093	249,609	278,711	304,627	305,487	5%	
Ferrous	254,612	272,889	215,871	341,121	354,542	282,486	365,795	235,034	256,505	301,774	291,356	5%	
Non Ferrous	29,309	35,280	70,354	100,964	114,635	119,395	8,298	14,575	22,206	2,853	14,131	0%	
Minerals and Construction Materials	124,236	139,474	603,496	727,650	929,893	704,822	612,821	403,212	263,143	846,620	736,841	13%	
Mineral	17,567	63,076	63,076	94,608	135,503	184,544	134,405	87,323	87,310	20,740	37,510	1%	
Cement	60,612	44,613	510,831	555,933	649,041	520,274	466,702	311,242	191,365	317,054	656,702	12%	
Others	46,057	31,785	23,389	77,109	145,321	20,004	11,714	4,647	4,468	8,826	8,826	0%	
Fertilizers	102,028	97,851	7,874	22,307	22,680	28,073	59,872	40,419	22,576	33,715	20,652	0%	
Natural Fertilizers (Phosphates)	67,192	66,479	7,874	2,855	2,557	2,040	28,459	22,821	16,095	13,365	12,186	0%	
Natural Fertilizers (Others)	34,837	31,372	0	19,451	20,123	26,033	30,413	17,596	6,481	20,410	8,454	0%	
Manufactured Fertilizers	114,165	133,366	135,493	82,240	107,894	104,856	77,976	80,794	74,944	95,386	65,405	1%	
Chemical Products	114,165	133,366	135,493	82,240	107,894	104,856	77,976	80,794	74,944	95,386	65,405	1%	
Machine, Vehicles, Manufactured goods	177,311	284,935	498,151	780,499	638,333	430,757	652,483	852,483	970,228	633,482	1,098,788	20%	
Vehicles, Transport Equipments	134,861	213,364	112,659	135,846	156,139	137,923	75,451	57,522	64,708	90,497	96,368	2%	
Agricultural Machine	5,963	8,943	12,967	12,967	5,302	7,089	1,376	790	2,077	831	1,743	0%	
Engine, Machine, Parts	112,577	20,860	14,332	6,451	5,302	7,332	3,256	1,359	2,556	256	12,487	0%	
Glass	10,803	10,030	33,337	8,511	10,413	3,495	7,816	8,736	6,355	740	631	0%	
Leather, Textiles	15	760	4,817	2,694	299	6,790	387	271	6,481	20,410	1,923	0%	
Special transaction	912,932	224,141	135,251	318,392	274,591	252,116	233,003	679,194	874,038	906,817	539,126	16%	
Total	4,173,605	4,605,704	4,100,844	4,960,884	4,100,933	6,441,512	10,005,990	9,900,933	10,005,511	10,005,511	10,005,511	100%	

Commodity	U: Tcn.											
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	
	%	%	%	%	%	%	%	%	%	%	%	%
Agricultural Products and Livestock	0	0	0	770	2,004	3,197	5,455	14,661	3,091	150	365	0%
Livestock	0	0	0	0	0	0	0	19	0	0	0	0%
Wheat	0	0	0	0	0	0	0	0	0	0	0	0%
Other cereals	0	0	0	0	0	0	0	0	0	0	0	0%
Potato	0	0	0	570	1,820	436	5,244	14,493	6	0	28	0%
Fruit, Vegetable	0	0	0	0	184	2,655	3,068	14,493	3,068	150	336	0%
Textile Materials	0	0	0	0	0	106	208	106	19	0	0	0%
Timber	0	0	0	0	0	0	0	43	0	0	0	0%
Others	0	0	0	200	0	0	0	0	0	0	0	0%
Foodstuff and Forage	52,783	25,461	17,554	6,238	23,441	35,307	5,703	7,766	2,844	11,248	266	0%
Sugar	0	0	0	0	0	0	0	0	0	0	0	0%
Wine	52,073	22,361	17,594	6,238	20,441	36,307	6,630	7,766	2,834	10,822	0	0%
Milk	0	0	0	0	0	0	0	0	0	303	0	0%
Animal feed	1,160	3,100	0	0	0	0	0	0	0	0	226	0%
Vegetable Oil	9,500	0	0	0	3,000	0	73	0	10	0	40	0%
Others	0	0	0	0	0	0	0	0	0	0	0	0%
Combustible Mineral	0	0	0	0	0	0	0	0	0	0	0	0%
Coal	0	0	0	0	0	0	0	0	0	0	0	0%
Others	0	0	0	0	0	0	0	0	0	0	0	0%
Petroleum Products	1,410,224	263,188	1,063,561	926,813	1,509,856	893,444	884,991	825,167	807,302	859,944	740,097	84%
Crude oil	0	0	0	0	0	0	0	0	0	0	0	0%
Hydrocarbon gas	0	0	0	0	0	0	0	0	0	0	0	0%
Refined Oil	1,410,224	263,188	1,063,561	926,813	1,509,856	893,444	884,991	825,167	807,302	859,944	84%	
Others	0	0	0	0	0	0	0	0	0	0	0	0%
Mineral Metallurgical Scrap	50,156	32,468	38,250	48,548	67,705	94,063	96,198	74,856	66,195	13,113	8,428	1%
Mineral	0	0	0	0	0	0	0	0	0	0	0	0%
Scrap	50,156	32,468	38,250	48,548	67,705	94,063	96,198	74,856	66,195	13,113	8,428	1%
Others	0	0	0	0	0	0	0	0	0	0	0	0%
Metal Products	0	0	0	283	0	0	5	3,704	1,951	2,242	548	0%
Ferrous	0	0	0	283	0	0	5	3,704	1,951	2,242	548	0%
Non Ferrous	0	0	0	0	0	0	0	0	0	0	0	0%
Minerals and Construction Materials	1,800	0	0	0	150	0	0	0	0	0	0	0%
Mineral	1,800	0	0	0	150	0	0	0	0	0	0	0%
Cement	0	0	0	0	0	0	0	0	0	0	0	0%
Others	0	0	0	0	0	0	0	0	0	0	0	0%
Fertilizers	0	0	0	0	0	0	0	0	0	0	0	0%
Natural Fertilizers (Phosphates)	0	0	0	0	0	0	0	0	0	0	0	0%
Natural Fertilizers (Others)	0	0	0	0	0	0	0	0	0	0	0	0%
Manufactured Fertilizers	0	0	0	0	0	0	0	0	0	0	0	0%
Chemical Products	83,843	55	24	39	185	1,047	536	80	654	979	1,512	0%
Chemical	83,843	55	24	39	185	1,047	536	80	654	979	1,512	0%
Machine, Vehicles, Manufactured good	53,835	42,327	42,080	46,884	51,942	41,194	46,044	108,755	134,815	123,775	133,503	15%
Vehicles, Transport Equipments	0	0	0	0	0	0	0	0	0	0	0	0%
Agricultural Machine	0	0	0	0	21	188	158	122	365	137	74	0%
Engine, Machine, Parts	3,262	125	105	105	402	116	28	2,162	6,116	9	1,628	0%
Glass	0	0	0	0	0	0	0	0	0	0	0	0%
Leather, Textiles	26,946	11	0	1	0	167	12	34	28	0	0	0%
Special transaction	0	48,890	47,842	54,705	58,805	107,612	87,682	77,297	94,816	95,003	95,053	11%
Total	5,608,756	1,443,326	209,371	1,088,362	1,355,511	1,773,355	1,27,811	1,034,989	2,16,862	1,011,451	884,719	100%

Source: Ministry of Transport, Annuaire Statistique 1980-1990



Source: EPAL, Annuaire statistique

Figure 8.4.1 The movement of cargo traffic (Port of Algiers)

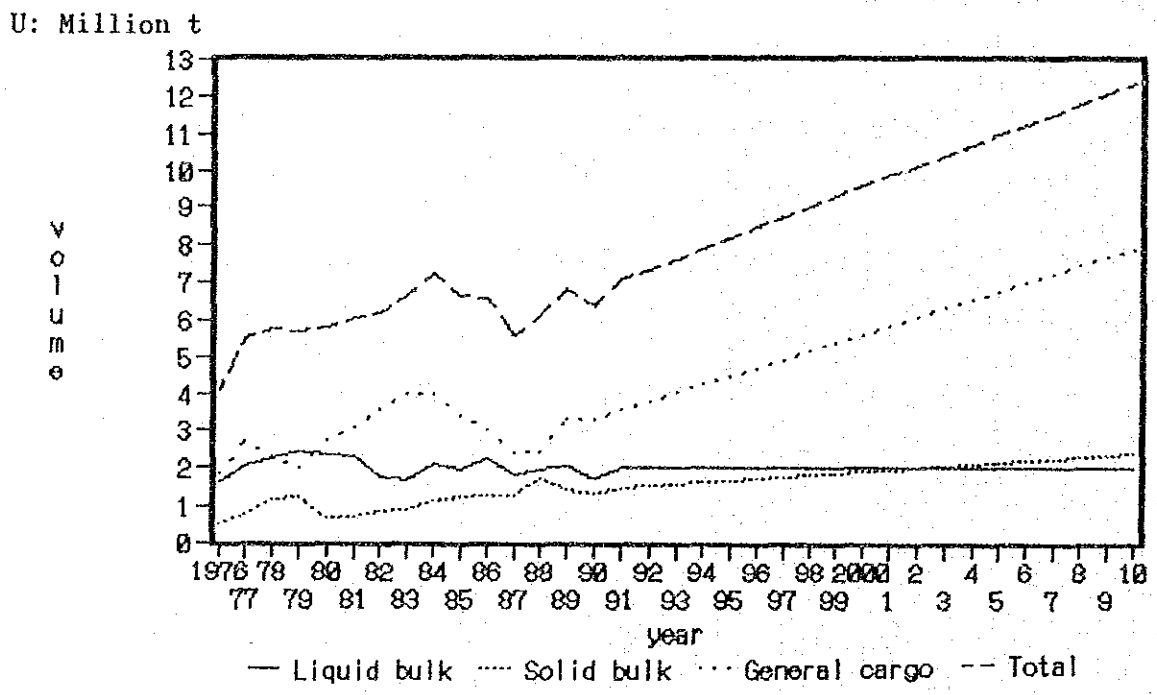


Figure 8.4.2 Cargo traffic forecast (Port of Algiers)

Table 8.4.2 Macro forecast by time series analysis

U: 1000t			
Item	1990	1997	2010
Estimate by total	6,366	8,366	12,081
Estimate by package type	Liquid bulk	1,707	2,032
	Solid bulk	1,330	1,882
	General cargo	3,329	5,185
	Total	6,366	9,099
			13,279

(2) Correlation with social and economic indices

Generally speaking, the cargo handling volume of a port has a close relation with the social and economic indices of the country.

In this section, the total cargo volume handled at the port of Algiers will be forecasted based on the correlation between the past handling cargo and total Algerian population or GDP (as shown in Table 8.4.3).

1) Correlation with GDP

Total cargo volume is forecasted by its relation with GDP. The correlation between cargo volume and GDP for 1974 through 1990 can be expressed by the following equations.

$$V = 14810.476 \times \text{GDP} + 1988984.383 \quad (r=0.834246)$$

When GDP in target years mentioned in chapter 8.2.2 are input into this equation, the forecast of cargo volume to be handled at the port of Algiers is given as;

	1997	2010
Handling volume (thousand tons)	8,652	14,094

2) Correlation with population

Total cargo volume is forecasted by its relation with population. The correlation between cargo volume and population for 1974 through 1990 can be expressed by the following equation.

$$V = 226.4278955 \times \text{POPULATION} + 1388184.322 \quad (r=0.753)$$

When population in target years mentioned in chapter 8.2.1 are input into this equation, the forecast of cargo volume to be handled at the port of Algiers is given as;

	1997	2010
Handling volume (thousand tons)	8,294	10,604

Table 8.4.3 Cargo volume, GDP and Population

(1974-1990)

	Cargo volume (t)	GDP (billions of 1987 AD)	Population (1000 persons)
1974	4,290,221	170.63	14,912
1975	4,168,223	179.33	15,417
1976	4,057,364	194.39	16,120
1977	5,529,962	204.7	16,781
1978	5,786,243	223.53	17,336
1979	5,711,904	240.07	17,864
1980	5,782,261	242.23	18,375
1981	6,049,030	249.52	18,956
1982	6,170,355	265.58	19,564
1983	6,597,384	279.88	20,192
1984	7,256,444	295.55	20,841
1985	6,618,847	311.4	21,510
1986	6,593,778	314.98	22,191
1987	5,557,256	312.71	22,807
1988	6,129,416	306.19	23,446
1989	6,831,007	316.69	24,095
1990	6,366,332	326.19	24,697

Source: The World Bank, World Table

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3) Result of macro forecast

The result of the macro forecast in target years is shown below.

	1997	2010
Handling volume (thousand tons)	8,300 - 9,100	10,600 - 14,100

8.4.2 Micro Forecast

Considering the present cargo volume, long term trend and package type by commodity, the cargo handled at the port of Algiers is classified into the following 15 categories for the micro forecast.

<Unloaded>

- (1) Cereal
- (2) Other agricultural products
- (3) Timber
- (4) Sugar
- (5) Vegetable oil
- (6) Other foodstuffs
- (7) Animal feed
- (8) Petroleum products
- (9) Metal products
- (10) Cements
- (11) Other construction materials
- (12) Manufactured goods and so on

<Loaded>

- (13) Petroleum products
- (14) Metallurgical scrap
- (15) Manufactured goods and so on

(1) Cereal

Among all the commodities handled at the port of Algiers, cereal is the largest cargo as shown in Table 8.4.1, and a major question is whether Algeria will increase imports of cereal in the future. It will be affected by Algerian agricultural policy, meteorological conditions and other factors.

The major imported cereals are wheat and barley as food staples and maize for the materials of animal feed. So in forecasting the volume of

imported cereals, these three different types of cereal must be considered.

The method of forecasting the volume of imported cereals consists of first determining the nation's domestic demand and production, then the difference between the demand and production will be assumed as the nation's import needs. The future values of domestic demand are determined using the data on the future population forecast and per capita consumption. The future values of domestic production are determined using the future area under cultivation and the future yield per unit area. Finally, volume of cereals unloaded at the study Ports are determined taking account of the share of population in the hinterland, capacity of silo and other factors.

1) Wheat

Table 8.4.4 and Figure 8.4.3 indicate the cultivated area, yield rate and total production of wheats in Algeria from 1970 to 1990. Total production is fluctuating year by year, and three year running average of yield rate shows a tendency to increase. Future production is estimated by multiplying the future cultivated area by the future yield rate, which are predicted from time series trends.

A. Cultivated area forecast

Figure 8.4.3 shows the national cultivated area of wheat from 1970 to 1987. Although the cultivated area was decreasing from 1970 to 1983 fluctuating annually, since 1983 there is a tendency to increase due to the change in agricultural policy of the Algerian government. It is assumed that the cultivated area in the future will increase at the same rate as it has since 1983 and the forecast area for the target years are as shown below.

	1997	2010
Cultivated area	1,759,748ha	2,009,205ha

B. Yield rate forecast

As shown in Figure 8.4.3, the yield rate of wheat has a tendency to increase fluctuating annually. Assuming that the yield rate will increase at the same tendency in the future, the estimated yield rate for the target years are;

	1997	2010
Yield rate (qx/ha)	8.14	9.33

Table 8.4.4 Cultivated area, production and yield rate of wheat

	Cultivated Area (ha)	Production (qx)	Yield rate (qx/ha)
1970	2,296,960	14,345,460	6.25
1971	2,148,070	13,173,920	6.13
1972	2,471,160	16,558,540	6.70
1973	2,346,900	11,580,770	4.93
1974	2,200,950	10,911,110	4.96
1975	2,222,780	18,477,930	8.31
1976	2,295,100	16,296,870	7.10
1977	1,907,170	8,271,230	4.34
1978	1,864,300	10,830,190	5.81
1979	1,945,510	10,804,350	5.55
1980	2,071,250	15,115,860	7.30
1981	1,813,170	12,183,800	6.72
1982	1,637,900	9,770,700	5.97
1983	1,401,500	7,897,860	5.64
1984	1,546,810	8,865,690	5.73
1985	1,667,990	14,780,180	8.86
1986	1,520,500	12,288,070	8.08
1987	1,510,600	11,748,030	7.78
1988	-	6,144,000	-
1989	-	11,521,000	-
1990	-	7,500,000	-

Source: ONS, L'Algerie en quelques chiffres,
Year book

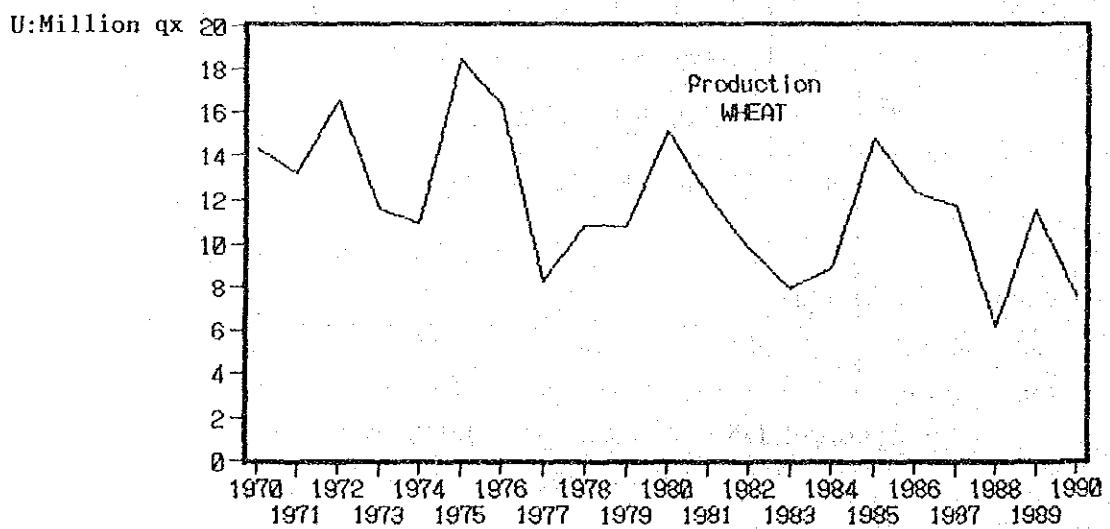
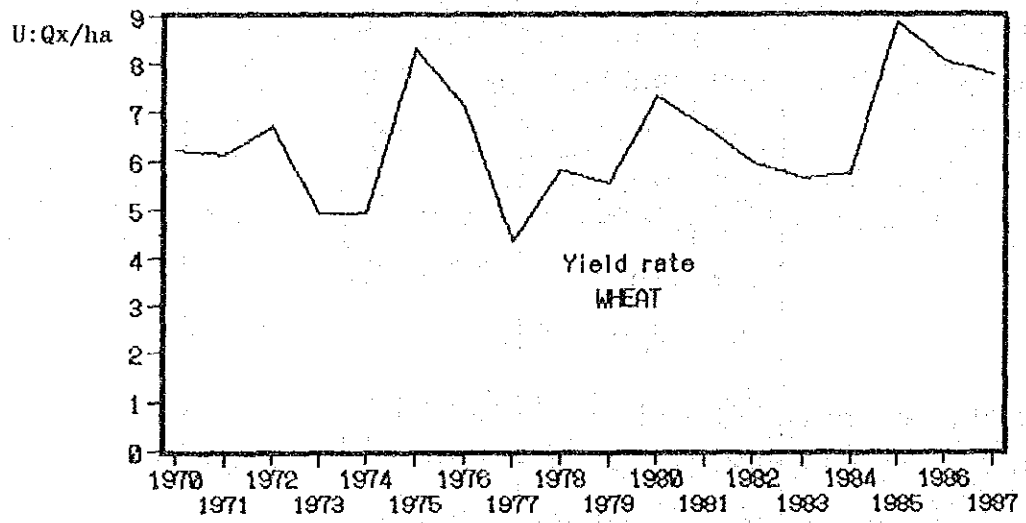
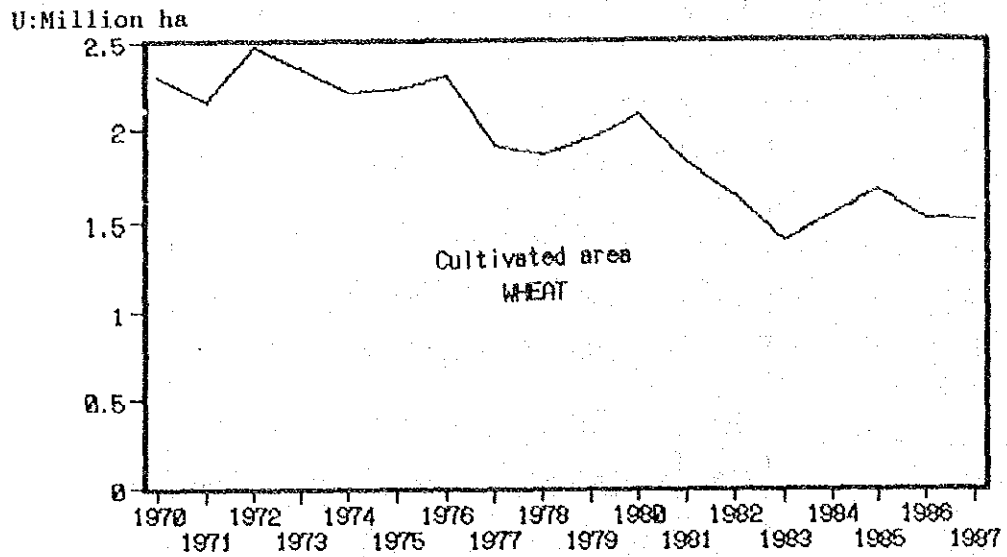


Figure 8.4.3 Cultivated area, production and yield rate of wheats

C. Production forecast

Production of wheat in the target years is obtained by multiplying the forecast cultivated area by the yield rate.

	1997	2010
Production (thousand tons)	1,433	1,875

D. Per capita consumption forecast

Total consumption is calculated by multiplying per capita consumption by total population. So per capita consumption can be expressed as;

$$(P + I) / \text{population}$$

where P : Total production
I : Import volume

Import volume should include conversion from semolina and flour imports, because semolina and flour imports will stop in the near future due to the increasing ability of domestic refinement. (The coefficient 0.7 is used for transforming wheat into semolina and flour.)

Table 8.4.5 lists the data for calculating per capita consumption of wheat from 1981 to 1989. Because it is fluctuating annually and doesn't show a clear growth tendency, we have adopted the average value during 1981-1989 as the future per capita consumption.

Per capita consumption; 192 kg/capita

Table 8.4.5 Per capita consumption of wheat

	Production QX	Import QX	Total QX	Semolina Flour import	Convert to Wheat(/0.7)	Total Consumption	Population (thousand)	Con.per capita(kg)
1981	15,115,860	13,129,034	28,244,894	3,893,297	5,561,853	33,806,747	18956	178.343
1982	12,183,800	19,339,107	31,522,907	5,339,461	7,627,801	39,150,708	19564	200.116
1983	9,770,700	21,285,680	31,056,380	3,456,618	4,938,026	35,994,406	20192	178.261
1984	7,897,860	20,055,220	27,953,080	3,000,982	4,287,117	32,240,197	20841	154.696
1985	8,865,690	30,273,950	39,139,640	3,834,646	5,478,066	44,617,706	21510	207.428
1986	14,780,180	26,174,380	40,954,560	4,239,679	6,056,684	47,011,244	22191	211.848
1987	12,288,070	18,223,440	30,511,510	4,160,813	5,944,019	36,455,529	22807	159.844
1988	11,748,030	28,244,850	39,992,880	3,838,856	5,484,080	45,476,960	23446	193.965
1989	6,144,000	45,707,512	51,851,512	5,024,666	7,178,094	59,029,606	24095	244.987

E. Total consumption forecast

Total consumption can be calculated from the per capita consumption and the estimated population mentioned in chapter 8.2.1.

	1997	2010
Total consumption (thousand tons)	5,861	7,821

F. Import forecast

From C and E, the total deficit(import) in target years is shown below.

	1997	2010
Import volume (thousand tons)	4,428	5,946

Of the total cereal imports, the volume to be handled at the study Ports will be estimated later.

2) Barley

Table 8.4.6 and Figure 8.4.4 indicate the cultivated area, yield rate and total production of barley in Algeria from 1970 to 1990. Future production is estimated by multiplying the future cultivated area by the future yield rate, which are predicted from time series trends.

A. Cultivated area forecast

Figure 8.4.4 shows the national cultivated area for barley. Although it was fluctuating annually, there is a slight tendency to increase. It is assumed that the cultivated area in the future will increase at the same pace, and the estimated area for the target years are shown below.

	1997	2010
Cultivated area (ha)	1,270,060	1,535,857

B. Yield rate forecast

As shown in Figure 8.4.4, the yield rate of barley has a tendency to increase fluctuating annually. Assuming that the yield rate will increase at the same tendency in the future, the estimated yield rate for the target years are;

	1997	2010
Yield rate (qx/ha)	8.67	10.23

Table 8.4.6 Cultivated area, production and yield rate of barley

	Cultivated area(ha)	Production (qx)	Yield rate (qx/ha)
1970	854,790	5,714,380	6.69
1971	728,160	3,717,680	5.11
1972	948,260	6,439,950	6.79
1973	785,610	3,738,690	4.76
1974	690,200	3,314,220	4.80
1975	854,680	7,427,200	8.69
1976	932,350	5,886,720	6.31
1977	740,510	2,603,090	3.52
1978	666,480	3,969,650	5.96
1979	808,920	4,565,840	5.64
1980	944,590	7,941,900	8.41
1981	870,770	5,248,040	6.03
1982	815,340	4,834,430	5.93
1983	718,910	4,467,530	6.21
1984	993,730	5,026,520	5.06
1985	1,398,700	13,301,810	9.51
1986	1,211,900	10,828,290	8.93
1987	1,088,950	8,198,940	7.53
1988	-	3,897,000	-
1989	-	7,899,000	-
1990	-	8,334,000	-

Source: ONS, L'Algerie en quelques chiffres,
Year book

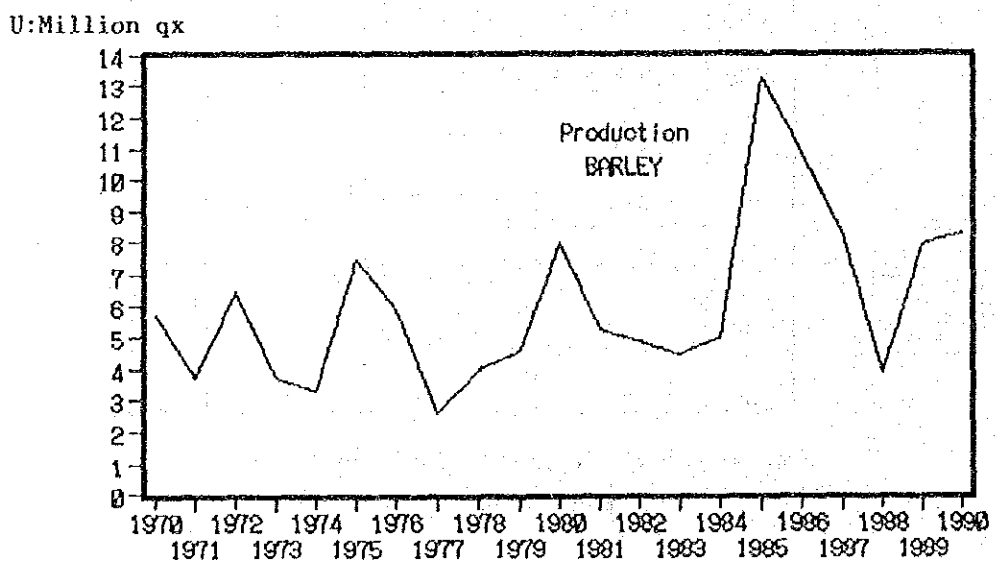
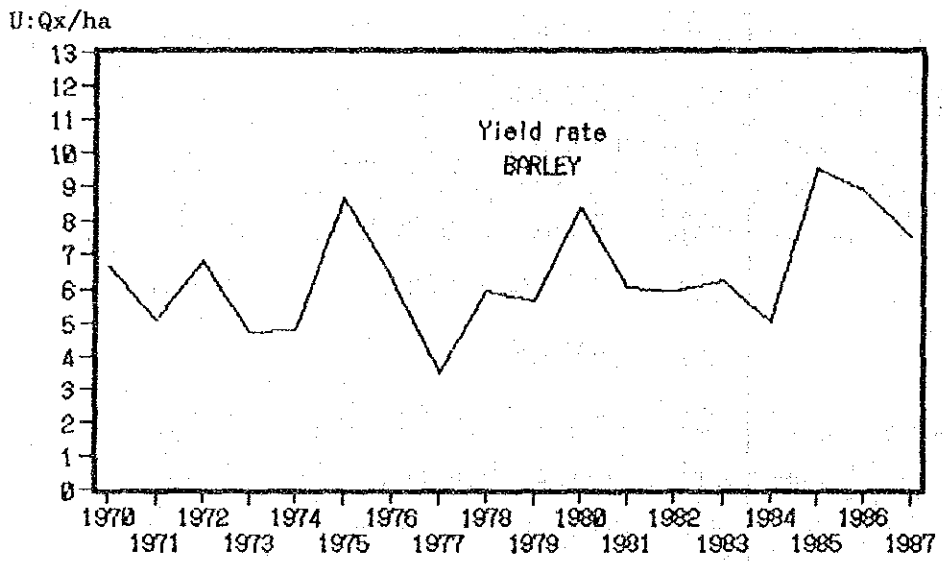
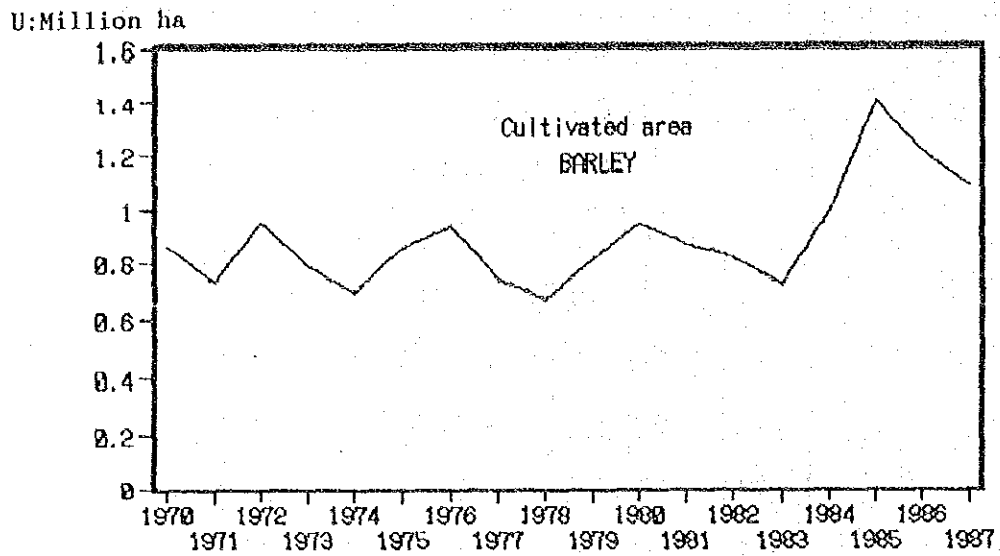


Figure 8.4.4 Cultivated area, production and yield rate of barley

C. Production forecast

Production of barley in target years is obtained by multiplying the forecast cultivated area by forecast yield rate.

	1997	2010
Production (thousand tons)	1,101	1,572

D. Per capita consumption forecast

Total consumption is calculated by multiplying per capita consumption by population. So, per capita consumption can be expressed as;

$$(P + I) / \text{population}$$

where P : Total production

I : Import volume

Table 8.4.7 lists the data for calculating per capita consumption of barley from 1981 to 1989. As it is fluctuating annually and does not show a clear growth tendency, the average value of during 1981-1989 have been adopted as future per capita consumption.

Per capita consumption; 50 kg/capita

Table 8.4.7 Per capita consumption of barley

	Production QX	Import QX	Total QX	Population	Consumption per capita(kg)
1978	2,603,090	4,974,800	7,577,890	17,336,000	43.712
1979	3,969,650	3,351,870	7,321,520	17,864,000	40.985
1980	4,565,840	2,690,680	7,256,520	18,375,000	39.491
1981	7,941,900	1,038,848	8,980,748	18,956,000	47.377
1982	5,248,040	4,654,231	9,902,271	19,564,000	50.615
1983	4,834,430	3,730,880	8,565,310	20,192,000	42.419
1984	4,467,530	6,135,160	10,602,690	20,841,000	50.874
1985	5,026,520	5,349,060	10,375,580	21,510,000	48.236
1986	13,301,810	-	13,301,810	22,191,000	59.942
1987	10,828,290	541,430	11,369,720	22,807,000	49.852
1988	8,198,940	5,616,880	13,815,820	23,446,000	58.926
1989	3,897,000	5,436,674	9,333,674	24,095,000	38.737

E. Total consumption forecast

Total consumption can be calculated from the per capita consumption and the estimated population mentioned in chapter 8.2.1.

	1997	2010
Total consumption (thousand tons)	1,515	2,021

F. Import forecast

From C and E, the total deficit (import) in target years is shown below.

	1997	2010
Import volume (thousand tons)	414	449

Of the total cereal imports, the volume to be handled at the study ports will be estimated later.

3) Maize

Table 8.4.8 and Figure 8.4.5 indicate the cultivated area, yield rate and total production of maize in Algeria from 1970 to 1987.

A. Production forecast

Production and the cultivated area are fluctuating annually and do not show a clear growth tendency. Therefore the average rate of production during 1983-1987 have been adopted as the future production in target years.

Production (tons) 3,000

B. Consumption per head of livestock

Consumption per head of livestock can be expressed as;

$(P + I) / \text{number of livestock}$

where;

P : Total production

I : Import volume

Table 8.4.9 lists the data for calculating per head consumption of maize from 1981 to 1989. As it shows a clear growth tendency each year, the consumption per head in target years is estimated by a time series analysis.

	1997	2010
Consumption per head(kg)	113	193

C. Number of livestock

Table 8.4.10 shows the number of livestock in Algeria from 1963 to 1990. It shows a clear growth tendency so the number of livestock in target years is estimated by a time series analysis.

	1997	2010
Number of livestock (thousand heads)	27,233	34,727

Table 8.4.8 Cultivated area, production and yield rate of maize

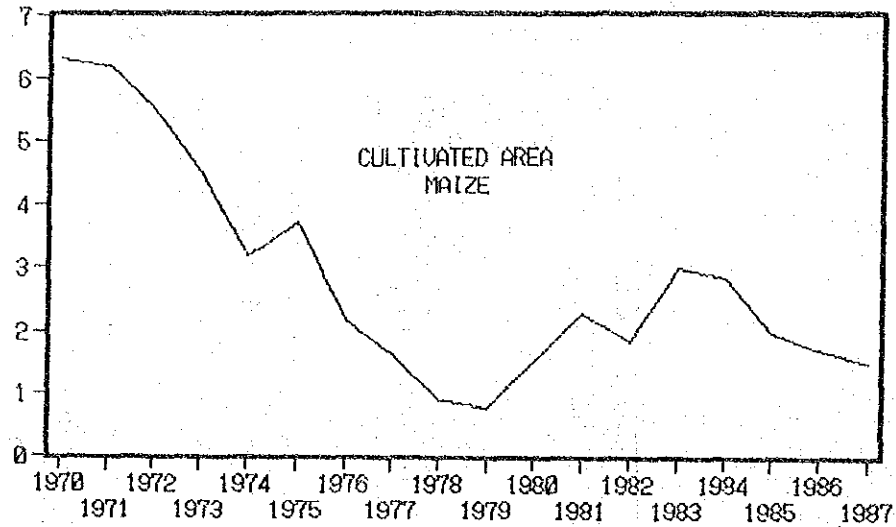
	Cultivated area (ha)	Production (qx)	Yield rate (qx/ha)
1970	6,290	64,380	10.24
1971	6,210	50,520	8.14
1972	5,530	47,160	8.53
1973	4,530	53,430	11.79
1974	3,180	42,950	13.51
1975	3,720	67,180	18.06
1976	2,160	27,620	12.79
1977	1,640	20,050	12.23
1978	910	9,840	10.81
1979	770	8,600	11.17
1980	1,530	14,780	9.66
1981	2,270	22,710	10.00
1982	1,830	14,340	7.84
1983	3,000	28,070	9.36
1984	2,850	53,210	18.67
1985	1,970	12,560	6.38
1986	1,710	14,420	8.43
1987	1,510	21,310	14.11

Source: ONS, L'Algerie en quelques chiffres, Year book

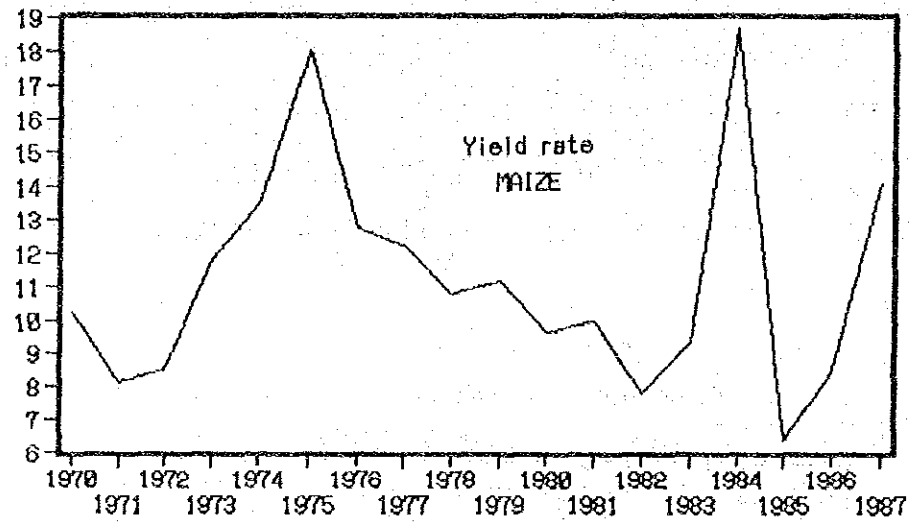
Table 8.4.9 Consumption per head of livestock

	Production QX	Import QX	Total QX	Number of livestock	Con. per head(kg)
1981	14,780	2,762,599	2,777,379	18,887,000	14.705
1982	22,710	3,727,898	3,750,608	20,858,000	17.982
1983	14,340	3,052,896	3,067,236	23,269,000	13.182
1984	28,070	5,193,299	5,221,369	20,652,000	25.283
1985	53,210	6,637,569	6,690,779	20,474,000	32.679
1986	12,560	9,184,680	9,197,240	18,297,000	50.266
1987	14,420	8,466,431	8,480,851	20,831,000	40.713
1988	21,310	9,127,461	9,148,771	20,734,000	44.124
1989	20,000	14,476,904	14,496,904	21,756,000	66.634

U: Thousand ha



U: Qx/ha



U: Thousand qx

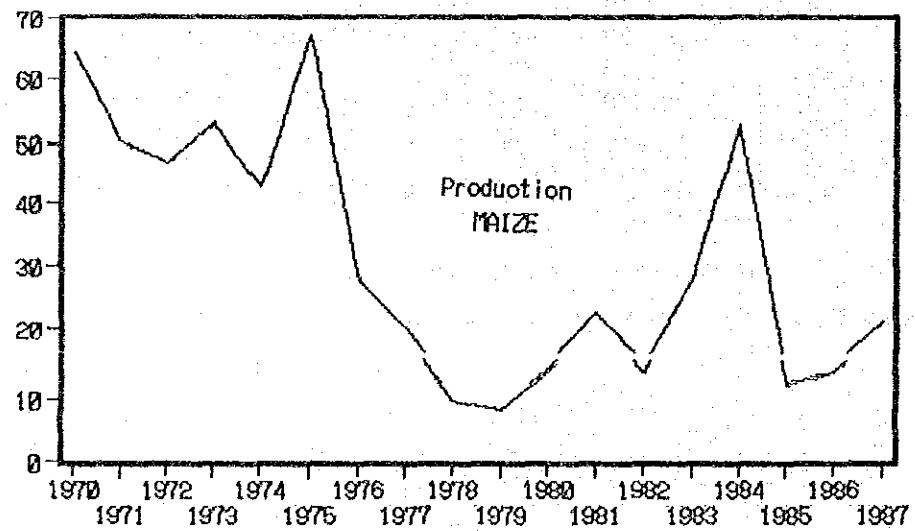


Figure 8.4.5 Cultivated area, production and yield rate of maize

Table 8.4.10 Number of livestock

U: Thousand head

	Cow	Sheep	Goat	Hourse	Others	Camel	Total
1963	525	3798	1356	100	335	162	6,276
1964	531	3981	1642	117	395	175	6,841
1965	602	5726	1762	114	411	176	8,791
1966	668	5714	1771	115	441	175	8,884
1967	801	7130	2322	132	539	175	11,099
1968	941	7534	2515	129	491	173	11,783
1969	871	7668	2557	139	517	178	11,930
1970	885	7786	2581	143	527	184	12,106
1971	918	8364	2499	143	525	158	12,607
1972	890	8825	2407	142	536	164	12,964
1973	872	8456	2407	144	573	165	12,617
1974	910	8687	2545	152	607	165	13,066
1975	1002	9773	2269	154	624	155	13,977
1976	1015	9337	2142	139	652	141	13,426
1977	1130	10298	2421	145	681	144	14,819
1978	1213	10863	2592	149	686	139	15,642
1979	1328	13223	2818	172	734	150	18,425
1980	1363	13370	2723	175	711	149	18,491
1981	1376	13739	2749	172	699	152	18,887
1982	1501	15499	2857	168	677	156	20,858
1983	1649	17702	2962	160	649	147	23,269
1984	1404	15664	2809	92	558	125	20,652
1985	1416	15660	2688	91	486	133	20,474
1986	1346	13766	2514	79	471	121	18,297
1987	1416	16148	2568	84	481	134	20,831
1988	1435	16428	2232	85	440	114	20,734
1989	1405	17316	2404	86	424	121	21,756
1990	1392	17698	2472	81	398	122	22,163

Source: ONS, Statistiques, L'Algerie en quelques chiffres

D. Total consumption forecast

Total consumption can be calculated from per head consumption and the estimated number of livestock.

	1997	2010
Consumption (thousand tons)	3,077	6,702

E. Import forecast

From A and D, the total deficit (import) in target years is shown below.

	1997	2010
Import volume (thousand tons)	3,074	6,699

4) Volume of cereals unloaded at the study ports

Total import cargo volume of cereals for all of Algeria has been forecast, as shown below.

	1997	2010	(U: Thousand tons)
Wheat	4,428	5,946	
Barley	414	449	
Maize	3,074	6,699	
Total	7,916(= 7,900)	13,094(= 13,100)	

Now the volume of cereals unloaded at the study ports will be determined.

A. Demand for the hinterland of the study ports

The demand for the hinterland of the study ports (mentioned in chapter 8.1) is determined in proportion to the share of population. The demand for the western, central and eastern area of Algeria is estimated as shown below.

	1997	2010	(U: Thousand tons)
Total volume of cereal imports	7,900	13,100	
Western area (24.8%)	1,900	3,300	
Central area (37.5%)	3,000	4,900	
Eastern area (37.6%)	3,000	4,900	

B. Secondly, the volume of cereals unloaded at the study ports is determined, considering the prediction of unloaded volume at the ports and plan of silo construction of OAIC. Specifically, the following factors are considered;

i) As for the capacity of silo at the ports, excluding study ports we adopt the plan of OAIC.

ii) The volume of cereals unloaded at the port of Mostaganem and Bejaia is offered to the central area(Chlef, Aindefla, etc.) if necessary.

iii) It is assumed that the volume unloaded at the port of Annaba and Djen Djen will increase at the same pace after 2000.

Considering these conditions, the volume of cereals unloaded at the ports in Algeria is calculated as shown in Table 8.4.11.

(2) Other agricultural products

The volume of other unloaded agricultural products (such as potato, vegetable, fruits and so on) will increase at the same rate of growth as population. The estimated volume is shown below.

1997	2010
73,000 t	97,000 t

Table 8.4.11 Volume of unloaded cereals by ports in target years

	Plan of OAIC		U: Tons		
	1995	2000	1997	2000	2010
[Demand for western area]			1,900,000	2,300,000	3,300,000
Ghazaouet	600,000 (30,000)	600,000 (30,000)	600,000	600,000	600,000
Oran	900,000 (45,000)	1,300,000 (65,000)	1,300,000	1,300,000	2,700,000
Mostaganem	600,000 (30,000)	600,000 (30,000)	offer to central area	400,000 200,000 to central area	offer to central area
[Demand for central area]			3,000,000	3,400,000	4,900,000
Tenes	100,000 (5,000)	100,000 (5,000)	100,000	100,000	100,000
Algiers	2,000,000 (100,000)	2,500,000 (125,000)	2,000,000	2,600,000	3,600,000
Volume offered from other area			900,000	700,000	1,200,000
	M:mostaganem B:Bejaia		M:600,000 B:300,000	M:200,000 B:500,000	M:600,000 B:600,000
[Demand for eastern area]			3,000,000	3,400,000	4,900,000
Bejaia	600,000 (30,000)	600,000 (30,000)	300,000 300,000 to central area	100,000 500,000 to central area	offer to central area
Skikda	400,000 (20,000)	400,000 (20,000)	400,000	400,000	400,000
Annaba	900,000 (45,000)	900,000 (45,000)	900,000	900,000	1,400,000
DjenDjen	1,400,000 (70,000)	2,000,000 (70,000)	1,400,000	2,000,000	3,100,000

Source: MOT, OAIC

() ; Capacity of silo

(3) Timber

The volume of unloaded timber had decreased from 1983 to 1987 under the influence of the economic recession, but it has shown a tendency to increase from 1988. Considering the recent tendency to increase, it is assumed that the volume of timber will increase at the same rate of growth as population. The estimated volume is shown below.

1997	2010
267,000 t	356,000 t

(4) Sugar

The volume of sugar unloaded at the port of Algiers shows a tendency to increase as shown in Figure 8.4.6. The future unloaded volume is estimated using the correlation between the three year running average volume of unloaded sugar and population. The correlation can be expressed by the following

equation.

$$V = 7.841979 \times P - 19829.55 \quad (r = 0.947)$$

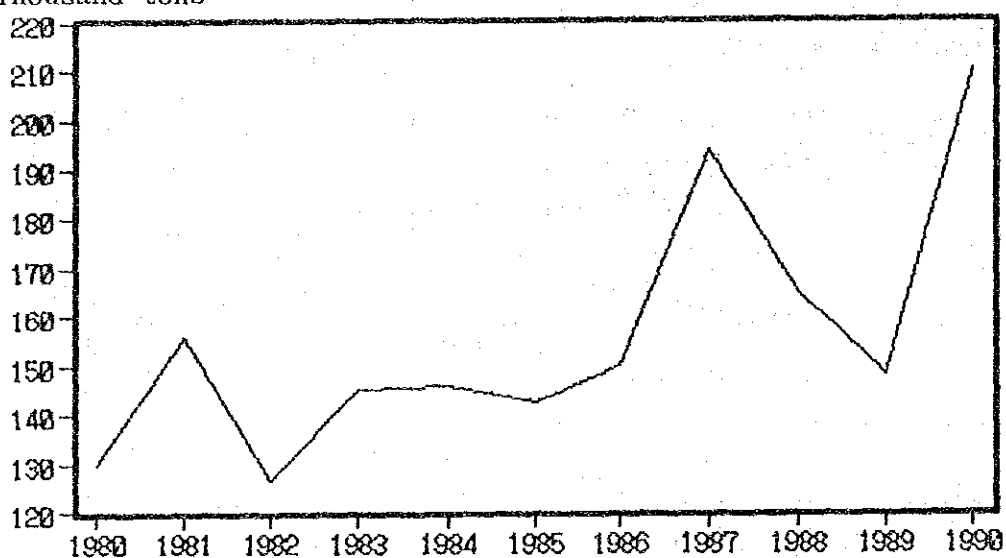
V = Volume of sugar unloaded at the port of Algiers.

P = Population

By substituting the target year population into this equation, the volume in the future is estimated as shown bellow.

1997	2010
219,000 t	299,000 t

U: Thousand tons



Source: EPAL, Annuaire statistiques

Figure 8.4.6 Volume of sugar unloaded at the port of Algiers

(5) Vegetable oil, (6) Other foodstuffs

The volume of unloaded these commodities will increase at the same rate of growth as population. The estimated volumes are shown below.

	1997	2010
(5) Vegetable oil	369,000 t	493,000 t
(6) Other foodstuffs	227,000 t	303,000 t

(7) Animal feed

Animal feed unloaded at the ports in Algeria is mainly lees of soybean used as ingredients for animal feed. The volume of animal feed unloaded at the study ports is estimated by forecasting future consumption in Algeria.

A. Consumption per head of livestock

Table 8.4.12 lists the data for calculating per head consumption of animal feed. As it shows a clear growth tendency, the consumption per head in target years is estimated by a time series analysis.

	1997	2010
Consumption per head	15.73kg	24.34kg

Table 8.4.12 Per head consumption of animal feed

	Import volume	Livestock (thousand)	Consumpt. per head
1980	37,775	18,491	2.04
1981	52,292	18,887	2.77
1982	187,385	20,858	8.98
1984	201,594	20,652	9.76
1985	151,699	20,474	7.41
1986	249,120	18,297	13.62
1987	141,742	20,831	6.80
1988	150,092	20,734	7.24
1989	335,154	21,756	15.41
1990	262,987	22,163	11.87

B. Total consumption forecast

Total consumption can be calculated from per head consumption and the estimated number of livestock mentioned in chapter 8.4.2,(1),3)C.

	1997	2010
Consumption (tons)	428,487	845,425

C. Volume unloaded at the study ports

The volume of animal feeds unloaded at the study ports is determined, considering the scale of the factory of ONAB in the hinterland, and by assuming the share of the ports in the hinterland remains constant. Considering these conditions, the volume of animal feed consumed at the factory in the hinterland is estimated as shown below.

	Total volume	Central area	Western area	Eastern area
Scale of factory	349	123(35.2%)	113(32.4%)	113(32.4%)
1997	428,487	151,014	138,736	138,736
2010	845,425	297,958	273,734	273,734

Also, the cargo volume handled in the central area will be unloaded only at the port of Algiers, and as for the cargo volume handled in the western area, it is assumed that 72% is unloaded at the port of Oran and 28% is unloaded at the port of Chazaouet. So, the estimated volume unloaded at the study ports is shown below.

	1997	2010
Port of Algiers	151,000 t	298,000 t
Port of Oran	125,000 t	246,000 t

(8) Petroleum products, (9) Metal products, (11) Other construction materials

It is assumed that the volume of these unloaded commodities will increase at the growth rate of GDP, since their consumption in the hinterland is closely related to the nation's macroscopic economic activities. So, the estimated volume is as follows.

	1997	2010
(8) Petroleum products	993,000 t	1,804,000 t
(9) Metal products	409,000 t	742,000 t
(11) Other construction materials	65,000 t	118,000 t

(10) Cements

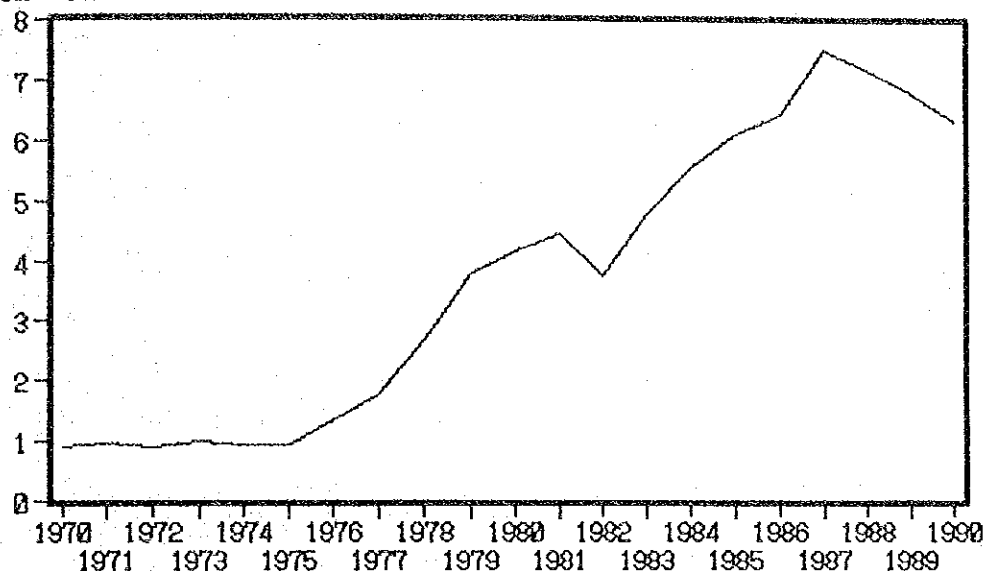
The national demand and supply of cements in target years are evaluated to estimate the future imports of cements in Algeria. Then the volume of unloaded cements at the study ports is determined, considering the capacity of cement factories and future consumption in the hinterland.

A. Production forecast

Figure 8.4.7 shows the production of cements from 1970 to 1990. There is a clear growth tendency, thus the production of cements in target years is estimated by a time series analysis.

	1997	2010
Production	10,136,292 t	15,031,434 t

U: Million tons



Source: ONS, Statistiques, L'Algerie en quelques chiffres

Figure 8.4.7 Production of cements

B. Per capita consumption forecast

Per capita consumption can be expressed as;

$$(P + I) / \text{population}$$

where

P: Total production

I: Import volume

Table 8.4.13 lists the data for calculating per capita consumption of cements from 1978 to 1990. The maximum per capita consumption in economically prosperous periods is adopted as future per capita consumption, namely, 431 kg/person in 1984.

Table 8.4.13 Per capita consumption of cements

	Production Ton	Import Ton	Total Ton	Population	Consumption Per capita
1978	2,700,000	1,608,090	4,308,090	17,336,000	0.249
1979	3,775,000	1,000,869	4,775,869	17,864,000	0.267
1980	4,156,000	815,168	4,971,168	18,375,000	0.271
1981	4,457,000	1,080,641	5,537,641	18,956,000	0.292
1982	3,743,000	2,953,413	6,696,413	19,564,000	0.342
1983	4,776,000	3,361,655	8,137,655	20,192,000	0.403
1984	5,539,000	3,435,174	8,974,174	20,841,000	0.431
1985	6,096,000	2,692,277	8,788,277	21,510,000	0.409
1986	6,448,000	2,834,971	9,282,971	22,191,000	0.418
1987	7,541,000	1,673,686	9,214,686	22,807,000	0.404
1988	7,195,000	1,035,423	8,230,423	23,446,000	0.351
1989	6,819,000	2,099,260	8,918,260	24,095,000	0.370

Source: Ministre de l'economie, Statistiques du commerce exterieur

C. Total consumption forecast

Total consumption can be calculated from per capita consumption and the estimated population mentioned in chapter 8.2.1.

	1997	2010
Total consumption	13,133,358 t	17,525,497 t

D. From B and C, the total deficit (import) in target years is shown below.

	1997	2010
Import volume	2,997,066 t	2,494,063 t

E. Volume of cement unloaded at the study ports.

When the volume unloaded at the study ports in target years is estimated, the following factors are considered;

a) It is estimated that the production of cements in the hinterland in 1997 in proportion to the capacity of cement making factories, because the estimated production in 1997 is less than the present capacity of the factories.

b) It is estimated that the production of cement in the hinterland in 2010 in proportion to the demand volume of cement in the hinterland, because the estimated production in 2010 is more than the present capacity of the factories, thus new investments in factories will be necessary in proportion to the demand volume.

c) Consumption volume in the hinterland is estimated in proportion to population in the hinterland.

d) The share of the ports in the hinterlands is assumed to remain constant.

Considering these conditions, the volume of cements unloaded at the ports in Algeria is estimated as shown in Table 8.4.14. So the estimated volume unloaded at the study ports are shown below.

	1997	2010
Port of Algiers	877,000 t	868,000 t
Port of Oran	357,000 t	433,000 t

Table 8.4.14 Volume of cements unloaded at the ports in Algeria

(1997)

	Capacity of factories	Production forecast	Consumption forecast	Import forecast	Handling ports
TOTAL	10,700,000	10,136,292	13,133,358	2,997,066	-
CENTER	3,900,000 36.4%	3,694,536 36.4%	4,571,722 34.8%	877,186	ALGER
EAST	3,900,000 36.4%	3,694,536 36.4%	5,304,563 40.4%	1,610,027	BEJAIA, SKIKDA
WEST	2,900,000 27.1%	2,747,219 27.1%	3,257,073 24.8%	509,853	ORAN(70%), MOSTAGANEM, ARZEW

(2010)

	Capacity of factories	Production forecast	Consumption forecast	Import forecast	Handling ports
TOTAL	-	15,031,434	17,525,497	2,494,063	-
CENTER	-	5,232,442 34.8%	6,100,626 34.8%	868,183	ALGER
EAST	-	6,071,196 40.4%	7,078,548 40.4%	1,007,352	BEJAIA, SKIKDA
WEST	-	3,727,796 24.8%	4,346,323 24.8%	618,528	ORAN(70%), MOSTAGANEM, ARZEW

(12) Manufactured goods and so on (unloaded)

A. Manufactured fertilizer

It is assumed that the volume of unloaded manufactured fertilizers will increase at the growth rate of GDP in the agricultural sector. The estimated volume is as follows.

1997	2010
36,000 t	68,000 t

B. Other manufactured goods, etc.

It is assumed that the volume of other unloaded manufactured goods such as chemical products, machine, parts and so on, will increase at the growth rate of GDP, since the demand for these commodities is closely related to the nation's macroscopic economic activities. So the estimated volume is shown below.

1997	2010
1,475,000 t	2,680,000 t

(13) Petroleum products (loaded)

Petroleum products loaded at the port of Algiers mainly consist of fuel oil, which is a surplus over demand in the hinterland, and naphtha.

The three years running average of loaded fuel oil has a correlation with GDP, and it can be expressed by the following equation.

$$V = -6126.954 \times \text{GDP} + 2606635.9 \quad (r = 0.93)$$

It is estimated that the loading of fuel oil will be stopped in the near future due to the increase of demand in the hinterland using the above equation. So only naphtha will continue to be a major petroleum product loaded at the port of Algiers in 1997 and 2010, and the estimated volume is assumed to be about 240,000 t.

(14) Metallurgical scrap (loaded)

The volume of loaded metallurgical scrap will increase at the growth rate of GDP because it is closely related to economic activities in the hinterland. So the estimated volume is shown below.

1997	2010
40,000 t	73,000 t

(15) Manufactured goods and so on (loaded)

Commodities included in this category are spinning and weaving products, machines, vehicles, parts, chemical products and so on. The government has a long-range policy to reinforce the nation's manufacturing industries and make them internationally competitive; the goal is to promote the export of non-hydrocarbon commodities thereby changing the Algerian trade structure which currently depends on hydrocarbon products exclusively. The volumes of these loaded products will increase at the growth rate of GDP in the sector of manufacturing industry, since it is closely related to the manufacturing industrial activities in the hinterland. So the estimated volume is shown below.

1997	2010
139,000 t	286,000 t

(16) Results of the forecasts

By way of conclusion, Table 8.4.15 shows a summary of the forecast cargo. Furthermore, Table 8.4.16 is a comparison of cargo volumes obtained by the macro and micro forecast methods described in chapter 8.4.1 and 8.4.2.

Although there is a slight difference between macro and micro forecasts,

the difference is negligible. Herein, the cargo volumes handled at the port of Algiers for the target years will be forecast as those obtained by the micro forecast method.

Table 8.4.15 Result of micro forecast (Port of Algiers)

U: Tons					
	PACKAGE TYPE	CONTAINER SUITABLE	1990	1997	2010
(UNLOADED)					
AGRICULTURAL PRODUCTS					
(1) CEREAL	SOLID BULK	U	1,627,621	2,340,000	4,053,000
(2) OTHER AGRICULTURAL PRODUCTS	GENERAL C.	S	1,340,156	2,000,000	3,600,000
(3) TIMBER	GENERAL C.	U	71,308	73,000	97,000
FOODSTUFF AND ANIMAL FEED					
(4) SUGAR	GENERAL C.	S	218,157	267,000	356,000
FLOUR AND SEMOLINA	GENERAL C.	U	896,843	966,000	1,393,000
(5) VEGITABLE OIL	LIQUID BULK	U	210,174	219,000	299,000
(6) OTHER FOODSTUFF	GENERAL C.	S	149,718	0	0
(7) ANIMALFEED	SOLID BULK	U	217,882	369,000	493,000
(8) PETROLBUM PRODUCTS	LIQUID BULK	U	185,812	227,000	303,000
(9) METAL PRODUCTS	SOLID BULK	U	133,257	151,000	298,000
MINERALS AND CONSTRUCTION MATERIALS					
(10) CEMENT	SOLID BULK	U	728,628	993,000	1,800,000
(11) OTHERS	SOLID BULK	U	305,487	409,000	742,000
(12) MANUFACTURED GOODS, ETC.			736,841	942,000	986,000
FERTILIZER	GENERAL C.	S	696,702	877,000	868,000
CHEMICAL P., MANUFACTURED G.	GENERAL C.	S,U	40,139	65,000	118,000
UNLOADED TOTAL			1,141,617	1,511,000	2,748,000
(LOADED)					
(13) PETROLEUM PRODUCTS	LIQUID BULK	U	20,652	36,000	68,000
(14) METALLURGICAL SCRAP	SOLID BULK	U	1,120,965	1,475,000	2,680,000
(15) MANUFACTURED GOODS, ETC.	GENERAL C.		5,437,037	7,161,000	11,722,000
CHEMICAL P., MANUFACTURED G.			734,447	240,000	240,000
LOADED TOTAL			8,428	40,000	73,000
TOTAL			97,406	139,000	286,000
			97,406	139,000	286,000
			840,281	419,000	599,000
			6,277,318	7,580,000	12,321,000
			6,277,318	7,580,000	12,321,000
	SOLID BULK	U	2,524,169	3,542,000	5,699,000
	LIQUID BULK	U	1,680,957	1,602,000	2,533,000
	GENERAL C.		2,072,192	2,436,000	4,089,000
		U	517,875	419,000	599,000
		S	1,554,317	2,017,000	3,490,000

U: Unsuitable for containerization

S: Suitable for containerization

Table 8.4.16 Forecast of Total Cargo Volume in Target Years

(Port of Algiers) U: Million tons

	1997	2010
Macro method	8,300-9,100	10,600-14,100
Micro method	7,580	12,321

8.4.3 Passenger

Figure 8.4.8 shows the three years running average of the number of passengers getting on and off at the port of Algiers. There was a clear growth tendency until 1985 when the taking out of foreign currency started to be restricted strictly due to the Algerian economic recession. The number of passengers in 1997 and 2010 is estimated using a time series analysis with number of passengers assumed to increase at the same growth rate as that from 1973-1985 starting from the initial number in 1990. The correlation equation is as follows:

$$N = 15409.93040 \times T - 30447948.496$$

where N : Number of passengers
 T : Year

When the target years are input into this equation, the number of passengers getting on and off at the port of Algiers can be estimated as shown below.

	1997	2010
Number of passengers (persons)	326,000	526,000

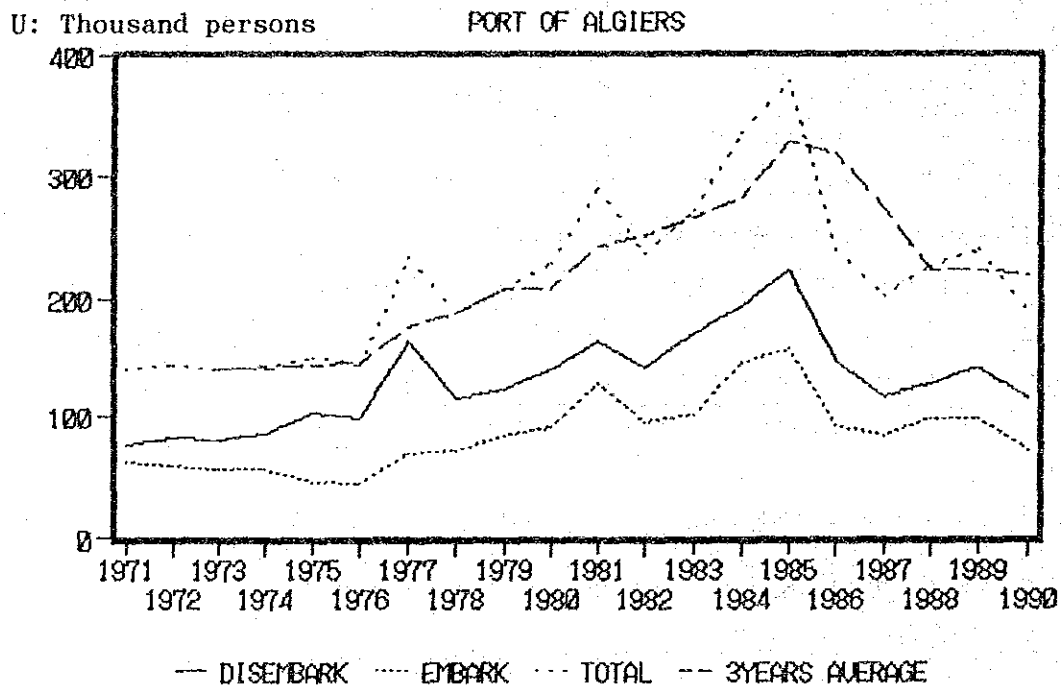


Figure 8.4.8 Passenger traffic

8.5 The Port of Oran

8.5.1 Macro Forecast

(1) Time series analysis

1) Method

As shown in Table 8.5.1, the handling volume of each commodity at the port of Oran varied greatly each year showing no obvious trends. But as indicated in Figure 8.5.1, the total loaded and unloaded cargo volume by package type was relatively stable. So the cargo volume of each package type for the target years will be forecasted using a time series analysis. However, there was a significant drop in volume during 1985-89 in general cargo which seems to have been caused by the restriction placed on imports to stabilize the external debt under the Algerian economic recession. Thus, data of general cargo from 1985 to 1989 are regarded as being irregular, and therefore are discarded.

2) Result of forecast

The cargo volume is assumed to be expressed as;

$$V = a + bT$$

where V ; Handling volume at the port of Oran

a,b ; Constants

T ; Year

The constants are determined by the least fitting method. The handling volume of general cargo is assumed to increase at the same growth rate as that from 1976 to 1984, starting from the initial value in 1990 as shown in Figure 8.5.2. As for liquid bulk cargo, yearly variation is small but does not show any obvious growth trend. Therefore, the handling volume is assumed to be the average volume handled at the port of Oran from 1976 to 1990, 637 thousand tons both in 1997 and 2010. Under the above assumptions, the cargo forecast obtained is shown in Table 8.5.2.

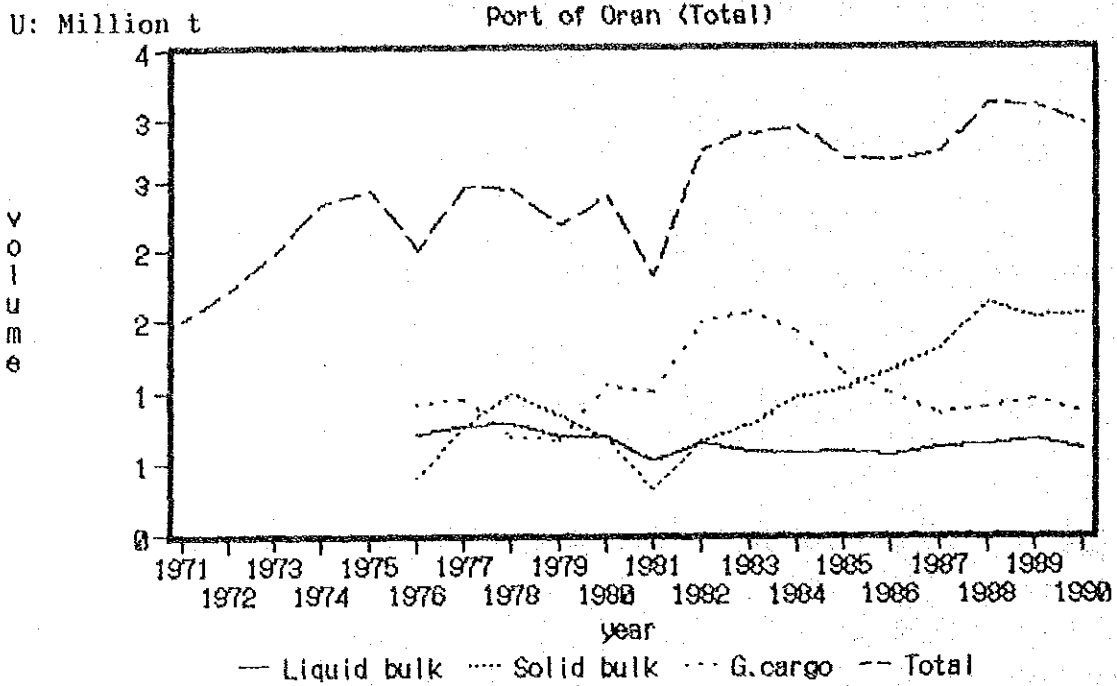
Table 8.5.1 Volume of Cargoes Handling at the Port of Oran

Commodity	1980 - 1990													L. Ton
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990			
Agricultural Products and Livestock	645,515	338,366	294,712	331,768	391,371	364,959	404,957	404,889	484,566	610,574	389,652	464,270	520,434	
Livestock	0	0	0	0	0	0	0	0	0	0	0	0	0	
Wheat	400,620	195,554	205,008	540,613	454,973	567,965	511,301	838,133	876,895	821,016	816,568	769,612	252,252	
Other cereals	104,895	56,485	222,084	222,084	403,413	298,438	383,532	382,151	609,488	204,445	742,154	415,947	144,744	
Potato	17,107	36,038	31,812	31,812	33,956	15,989	15,988	11,741	15,988	18,000	13,057	18,242	14,744	
Fruit, Vegetable	8,433	4,614	8,563	3,512	3,512	160	193	142	18	0	0	0	0	
Textile Materials	112,700	6,560	11,192	5,761	7,429	3,771	7,210	6,552	9,570	8,695	5,184	5,184	0	
Timber	7,331	46,738	77,081	106,294	82,805	63,384	36,992	34,426	66,316	95,983	60,512	24,886	24,886	
Others	7,331	10,928	1,583	21,704	5,282	9,527	11,825	20,324	20,324	9,381	0	886	0	
Foodstuff and Forage	320,023	303,575	392,388	383,027	295,704	271,754	349,614	365,998	443,550	154,478	555,184	414,932	142,000	
Sugar	56,916	27,034	51,671	55,424	49,030	32,306	32,955	52,778	117,934	102,819	103,289	42,000	42,000	
Milk	39,415	58,553	55,918	87,022	66,767	83,907	57,957	59,142	58,920	46,117	24,330	33,601	14,000	
Animal feed	3,840	5,158	52,770	36,425	45,385	35,761	74,187	78,484	107,115	120,635	93,904	93,904	34,000	
Vegetable Oil	11,009	99,923	93,727	79,660	75,024	75,800	81,848	93,454	100,784	85,813	80,378	80,378	34,000	
Others	110,090	54,112	138,185	122,496	59,518	43,880	82,855	42,140	58,799	123,002	103,760	103,760	42,000	
Combustible Mineral	1,050	0	51	0	0	0	120	0	388	0	0	650	0	
Coal	1,050	0	51	0	0	0	120	0	388	0	0	650	0	
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	
Petroleum Products	557,008	362,765	492,607	481,296	443,705	457,719	464,248	512,889	514,574	540,511	524,951	524,951	184,000	
Crude oil	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hydrocarbon gas	0	0	0	0	0	0	0	0	0	0	0	0	0	
Refined Oil	522,400	360,049	487,831	466,858	432,708	448,988	439,190	500,187	492,243	517,062	512,843	512,843	174,000	
Others	34,608	2,716	4,376	11,538	10,997	8,728	25,058	12,712	17,588	20,356	11,231	11,231	0	
Mineral, Metallurgical Scrap	1,000	0	45	0	0	0	0	0	9	0	28	0	0	
Mineral	1,000	0	45	0	0	0	0	0	9	0	28	0	0	
Scrap	0	0	0	0	0	0	0	0	0	0	0	0	0	
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	
Metal Products	281,956	213,228	254,664	330,621	307,937	163,353	152,637	103,910	140,355	184,559	147,568	147,568	54,000	
Non Ferrous	239,326	211,938	282,580	329,357	305,800	131,242	150,437	101,254	138,011	182,462	146,295	146,295	54,000	
Others	2,030	1,270	2,084	1,264	2,137	2,111	2,200	2,656	2,344	2,097	2,273	2,273	0	
Minerals and Construction Materials	32,272	25,505	323,229	284,435	192,558	17,828	58,200	82,654	72,539	164,895	305,823	305,823	104,000	
Mineral	16,877	12,277	5,904	17,769	22,588	43,924	49,459	67,996	51,219	19,196	25,128	25,128	14,000	
Cement	7,126	7,278	302,725	254,171	158,082	56,563	38,638	4,070	6,963	120,428	269,550	269,550	92,000	
Others	8,270	5,951	14,600	12,495	11,889	12,339	10,103	10,588	14,257	15,271	11,105	11,105	0	
Fertilizers	49,859	30,373	3,248	7,201	13,137	33,062	46,063	33,184	20,351	24,116	12,798	12,798	0	
Natural Fertilizers (Phosphates)	49,470	14,559	3,248	2,700	13,137	33,062	13,794	21,498	15,565	21,868	12,798	12,798	0	
Natural Fertilizers (Others)	7	14,312	0	4,501	0	0	30,382	11,366	0	2,250	0	0	0	
Manufactured Fertilizers	1,382	1,503	0	0	0	0	1,687	0	4,386	0	0	0	0	
Chemical Products	123,614	114,945	119,449	130,408	166,791	182,494	152,667	151,860	140,047	128,448	117,025	117,025	44,000	
Chemical Products	123,614	114,945	119,449	130,408	166,791	182,494	152,667	151,860	140,047	128,448	117,025	117,025	44,000	
Machine, Vehicles, Manufactured goods	203,501	274,567	250,185	274,224	305,833	268,820	166,805	128,195	128,741	111,800	135,320	135,320	54,000	
Vehicles, Transport Equipments	22,202	42,174	58,772	66,193	64,803	42,101	21,988	13,877	10,770	13,255	15,856	15,856	0	
Agricultural Machine	9,277	6,985	18,505	4,158	10,724	6,330	3,017	1,216	2,091	3,800	7,879	7,879	0	
Engine, Machine, Parts	92,241	68,282	80,388	95,262	87,414	89,854	68,934	42,966	36,350	27,483	20,957	20,957	0	
Glass	15,161	19,788	19,748	14,853	8,537	5,339	7,161	4,402	1,992	4,361	2,968	2,968	0	
Leather, Textiles	22,835	19,788	21,226	11,495	22,522	18,240	12,534	10,578	16,524	8,454	13,868	13,868	0	
Special transaction	42,365	134,428	51,546	82,787	111,833	95,756	73,171	58,156	61,104	54,247	73,952	73,952	34,000	
Total	2,195,800	1,663,445	1,928,758	2,002,890	2,028,428	1,644,246	1,602,428	1,802,428	1,902,428	2,028,428	1,802,428	1,802,428	1,802,428	

Loaded

Commodity	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
	%	%	%	%	%	%	%	%	%	%	%
Agricultural Products and Livestock	1,899	2,623	9	12,480	105,809	112,756	139,759	17,351	2,057	0	0
Livestock	0	0	0	0	0	0	0	0	0	0	0
Wheat	0	0	0	5,919	29,431	38,049	91,065	8,330	26	0	0
Other cereals	0	0	0	8,554	76,081	73,160	88,604	8,808	0	0	0
Potato	0	0	0	0	0	29	0	0	0	0	0
Fruit, Vegetable	1,423	483	0	0	0	1,172	67	53	262	0	11
Textile Materials	472	0	0	0	0	0	0	0	0	0	0
Timber	0	2,102	0	0	0	0	0	0	0	0	0
Others	4	38	9	7	287	346	3	129	1,768	0	0
Foodstuff and forage	113,019	108,134	88,733	44,675	59,358	55,522	33,906	13,711	16,656	45,323	3,760
Sugar	0	0	0	0	0	0	0	0	0	0	0
Wine	91,713	103,746	86,330	41,618	59,857	55,333	26,538	13,439	16,296	45,285	3,696
Milk	368	49	175	2,950	0	0	7,116	0	0	0	0
Animal feed	20,110	4,339	1,055	0	0	0	0	0	0	0	0
Vegetable Oil	3	0	0	0	0	0	0	0	0	0	0
Others	825	0	1,173	107	89	189	252	272	362	6	84
Combustible Mineral	0	0	0	0	0	0	0	0	0	0	0
Coal	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0
Petroleum Products	0	0	0	0	0	0	760	0	0	7,484	2,850
Crude oil	0	0	0	0	0	0	0	0	0	0	0
Hydrocarbon gas	0	0	0	0	0	0	0	0	0	0	0
Refined Oil	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0
Mineral, Metallurgical Scrap	13,370	10,325	15,938	3,785	13,311	15,893	16,774	16,271	13,047	751	14,286
Mineral	0	0	194	963	615	0	0	0	4,114	0	0
Scrap	12,935	10,651	15,693	2,713	12,459	14,185	13,585	13,436	8,933	0	14,286
Others	435	274	51	108	237	1,708	3,189	2,835	0	0	0
Metal Products	20	0	5	94	4	9	230	464	21	1,935	4
Ferrous	20	0	5	93	4	9	230	454	19	1,772	4
Non Ferrous	0	0	1	1	0	0	0	10	2	153	0
Minerals and Construction Materials	47,548	0	0	65	0	5	1,180	4,296	5,254	4,446	236
Mineral	633	0	0	0	0	0	1,180	125	4,030	4,446	236
Cement	46,758	0	0	0	0	0	0	1,500	1,204	0	0
Others	155	0	0	65	0	5	0	2,671	20	0	0
Fertilizers	3	0	0	0	0	0	0	0	0	0	0
Natural Fertilizers (Phosphates)	0	0	0	0	0	0	0	0	0	0	0
Natural Fertilizers (Others)	3	0	0	0	0	0	0	0	0	0	0
Manufactured Fertilizers	0	0	0	0	0	0	0	0	0	0	0
Chemical Products	7	683	0	171	118	519	175	196	39	39	2,868
Chemical Products	7	693	0	171	118	519	175	196	39	39	2,868
Machine, Vehicles, Manufactured good	21,480	28,511	18,829	30,016	43,945	40,063	31,848	27,024	24,371	23,068	18,092
Vehicles, Transport Equipments	8,414	13,656	6,862	13,078	24,267	18,344	10,853	6,365	6,365	5,216	4,508
Agricultural Machine	133	14	4	1,420	8	140	0	0	660	85	228
Engine, Machine, Parts	2,322	357	277	1,431	1,431	4,543	3,041	3	1,748	3,823	570
Glass	4	0	28	0	0	117	360	0	0	0	0
Leather, Textiles	59	40	32	36	1	20	0	0	34	703	40
Special transaction	10,528	14,444	11,606	15,482	18,238	16,919	17,574	27,024	15,560	13,241	12,745
Total	197,324	150,286	123,514	31,286	223,143	224,767	244,632	79,313	61,447	83,016	42,156

Source: Ministry of Transport, Annuaire statistique 1980-1990



Source: EPOR, Annuaire statistique

Figure 8.5.1 The movement of cargo traffic

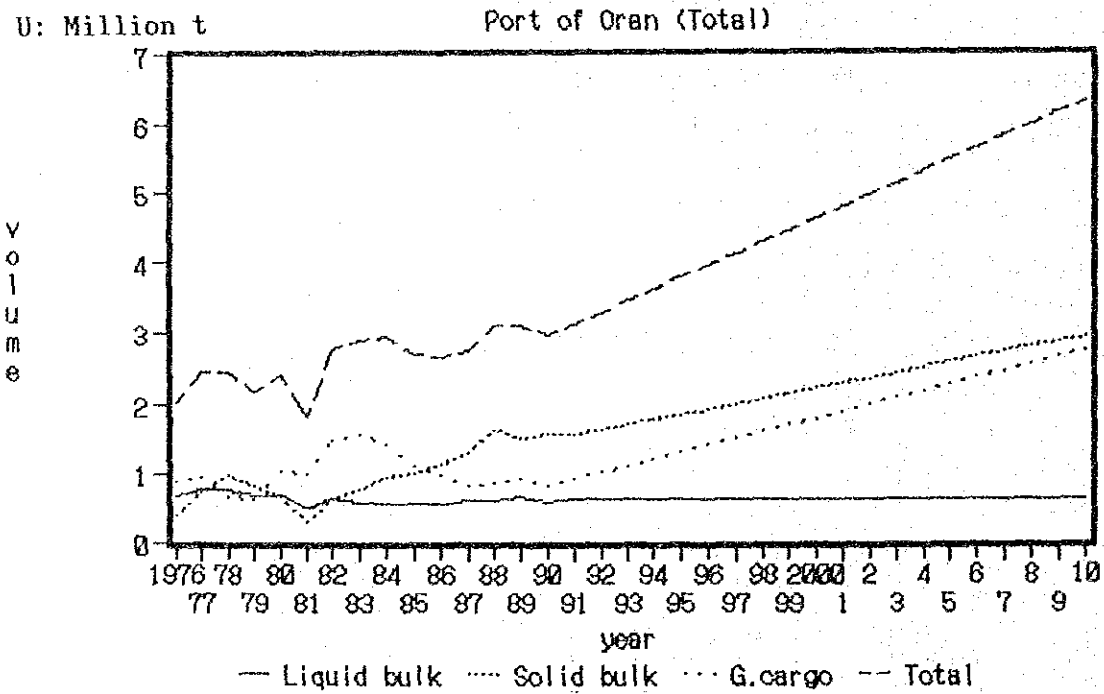


Figure 8.5.2 Cargo traffic forecast

Table 8.5.2 Macro forecast by time series analysis

U: 1000t

Item	1990	1997	2010
Estimate by total	2,972	3,568	4,445
Estimate by package type	Liquid bulk	596	637
	Solid bulk	1,542	1,993
	General cargo	834	1,505
	Total	2,972	4,135
			6,339

(2) Correlation with social and economic indices

Generally speaking, the cargo handling volume of a port has a close relation with the social and economic indices of the country.

In this section, the total cargo volume handled at the port of Oran will be forecasted using the correlation between the past handling cargo and the total Algerian population or GDP (as shown in Table 8.5.3).

1) Correlation with GDP

Total cargo volume is forecasted by its relation with GDP. The correlation between cargo volume and GDP for 1971 through 1990 can be expressed by the following equation.

$$V = 6121.852201 \times \text{GDP} + 965895.5383 \quad (r=0.8374)$$

When GDP in target years mentioned in chapter 8.2.2 are input into this equation, the forecast of cargo volume to be handled at the port of Oran is given as;

	1997	2010
Handling volume (thousand tons)	3,720	5,970

2) Correlation with population

Total cargo volume is forecasted by its relation with population. The correlation between cargo volume and population for 1971 through 1990 can be expressed by the following equation.

$$V = 112.0177610 \times \text{POPULATION} + 343871.0320 \quad (r=0.838)$$

When population in target years mentioned in chapter 8.2.1 are input into this equation, the forecast of cargo volume to be handled at the port of Oran is given as;

	1997	2010
Handling volume (thousand tons)	3,760	4,903

Table 8.5.3 Cargo volume, GDP and Population

(1974-1990)

	Cargo volume (t)	GDP (billions of 1987 AD)	Population (1000 persons)
1971	1,491,748	120.14	13,523
1972	1,702,575	153.06	13,955
1973	1,977,599	158.87	14,387
1974	2,338,935	170.63	14,912
1975	2,430,337	179.33	15,417
1976	2,008,159	194.39	16,120
1977	2,460,928	204.7	16,781
1978	2,442,708	223.53	17,336
1979	2,171,009	240.07	17,864
1980	2,393,124	242.23	18,375
1981	1,813,731	249.52	18,956
1982	2,752,272	265.58	19,564
1983	2,894,266	279.88	20,192
1984	2,940,169	295.55	20,841
1985	2,689,013	311.4	21,510
1986	2,673,043	314.98	22,191
1987	2,738,892	312.71	22,807
1988	3,108,812	306.19	23,446
1989	3,105,480	316.69	24,095
1990	2,971,844	326.19	24,697

Source: The World Bank, World Table

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3) Result of macro forecast

The result of the macro forecast in target years is shown below.

	1997	2010
Handling volume (thousand tons)	3,600 - 4,100	4,400 - 6,300

8.5.2 Micro Forecast

Considering the present cargo volume, long term trend and package type by commodity, the cargo handled at the port of Oran is classified into the following 17 categories for the micro forecast.

<Unloaded>

- (1) Cereal
- (2) Other agricultural products
- (3) Timber
- (4) Sugar
- (5) Vegetable oil
- (6) Other foodstuffs
- (7) Animal feed
- (8) Petroleum products
- (9) Metal products
- (10) Cements
- (11) Other construction materials
- (12) Alumina
- (13) Manufactured goods and so on

<Loaded>

- (14) Wine
- (15) Metallurgical scrap
- (16) Aluminum
- (17) Manufactured goods and so on

(1) Cereal

Among all the commodities handled at the port of Oran, cereal is the major cargo as shown in Table 8.5.1, and the estimate volume of cereal unloaded at the port of Oran was mentioned in chapter 8.4.2,(1).

	1997	2010
Cereal (thousand tons)	1,300	2,700

(2) Other agricultural products

The volume of other unloaded agricultural products (such as potato, vegetable, fruits and so on) will increase at the same rate as the growth of population. The estimated volume is shown below.

1997	2010
38,000 t	50,000 t

(3) Timber

The volume of unloaded timber will increase at the same rate as the growth of population. The estimated volume is shown below.

1997	2010
94,000 t	125,000 t

(4) Sugar

The volume of sugar unloaded at the port of Oran shows a tendency to increase as shown in Figure 8.5.3. The future unloaded volume is estimated using the correlation between the three year running average volume of unloaded sugar and population. The correlation can be expressed by the following equation.

$$V = 13.258477 \times P - 227879.8 \quad (r = 0.877)$$

V = Volume of sugar unloaded at the port of Oran.

P = Population

By substituting the target year population into this equation, the future volume is estimated as shown below.

1997	2010
177,000 t	312,000 t

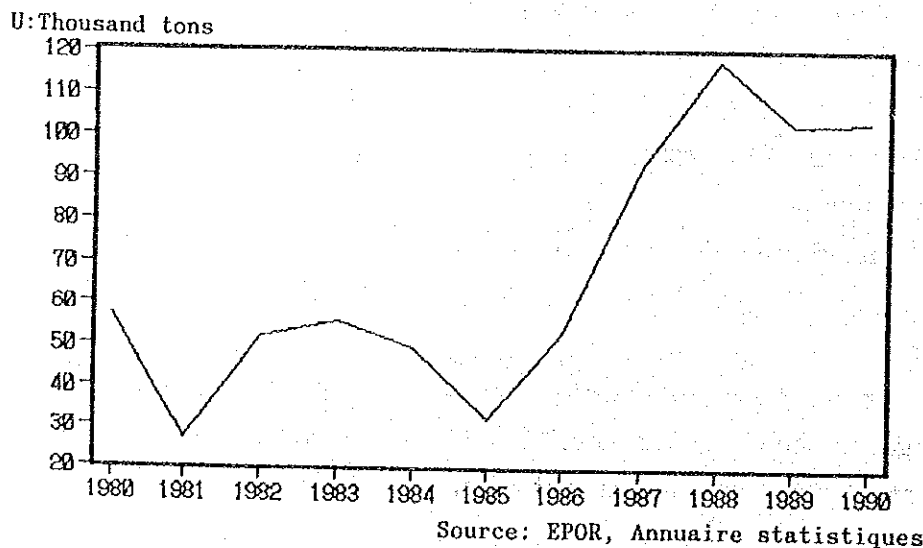


Figure 8.5.3 Volume of sugar unloaded at the port of Oran

(5) Vegetable oil, (6) Other foodstuffs

The volume of these unloaded commodities will increase at the same rate as the growth of population. The estimated volume is shown below.

	1997	2010
(5) Vegetable oil	113,000 t	150,000 t
(6) Other foodstuffs	104,000 t	139,000 t

(7) Animal feed

The estimated volume unloaded at the port of Oran was mentioned in chapter 8.4.2,(7).

	1997	2010
	125,000 t	246,000 t

(8) Petroleum products, (9) Metal products, (11) Other construction materials

It is assumed that the volume of these unloaded commodities will increase at the growth rate of GDP, since their consumption in the hinterland is closely related to the nation's macroscopic economic activities. So, the estimated volume is shown below.

	1997	2010
(8) Petroleum products	726,000 t	1,320,000 t
(9) Metal products	217,000 t	395,000 t
(11) Other construction materials	63,000 t	114,000 t

(10) Cements

The estimated volume of cements unloaded at the port of Oran was mentioned in chapter 8.4.2,(10).

	1997	2010
	357,000 t	433,000 t

(13) Manufactured goods and so on (unloaded)

A. Manufactured fertilizer

It is assumed that the volume of unloaded manufactured fertilizers will increase at the growth rate of GDP in the agricultural sector. The estimated volume is shown below.

	1997	2010
	27,000 t	51,000 t

B. Other manufactured goods, etc.

It is assumed that the volume of other unloaded manufactured goods such as chemical products, machine and so on, will increase at the growth rate of GDP, since the demand for these commodities is closely related to the nation's macroscopic economic activities. The estimated volume is shown below.

1997	2010
335,000 t	608,000 t

Besides the above volume, the parts needed for the FIAT factory in Tebessa must be considered. It is estimated that the volume of parts for FIAT will be about 36,000 tons.

(12) Alumina(unloaded), (16) Aluminum(loaded)

METANOH is planning to construct an aluminum refinery in Bethioua. Assuming that this project will start to operate after the year 2000, according to the materials of EPOR the volume of unloaded alumina and loaded aluminum in 2010 is estimated as shown below.

	2010
(12) Alumina(unloaded)	600,000 t
(16) Aluminum(loaded)	220,000 t

(14) Wine (loaded)

Figure 8.5.4 shows the cultivated area and harvest of grapes for wine during 1970-1989. Both are decreased steadily during 1970-1989 and will continue to decrease in the future. In this study, it is assumed that the estimated volume of loaded wine is about 10,000 t in the future in according to the materials of ONCV.

(15) Metallurgical scrap (loaded)

The volume of loaded metallurgical scrap will increase at the growth rate of GDP because it is closely related to economic activities in the hinterland. The estimated volume is shown below.

1997	2010
11,000 t	19,000 t

(17) Manufactured goods and so on (loaded)

The volume of these loaded products will increase at the growth rate of GDP in the manufacturing industry sector, since it is closely related to the

manufacturing industrial activities in the hinterland. The estimated volume is shown below.

1997 2010
 16,000 t 34,000 t

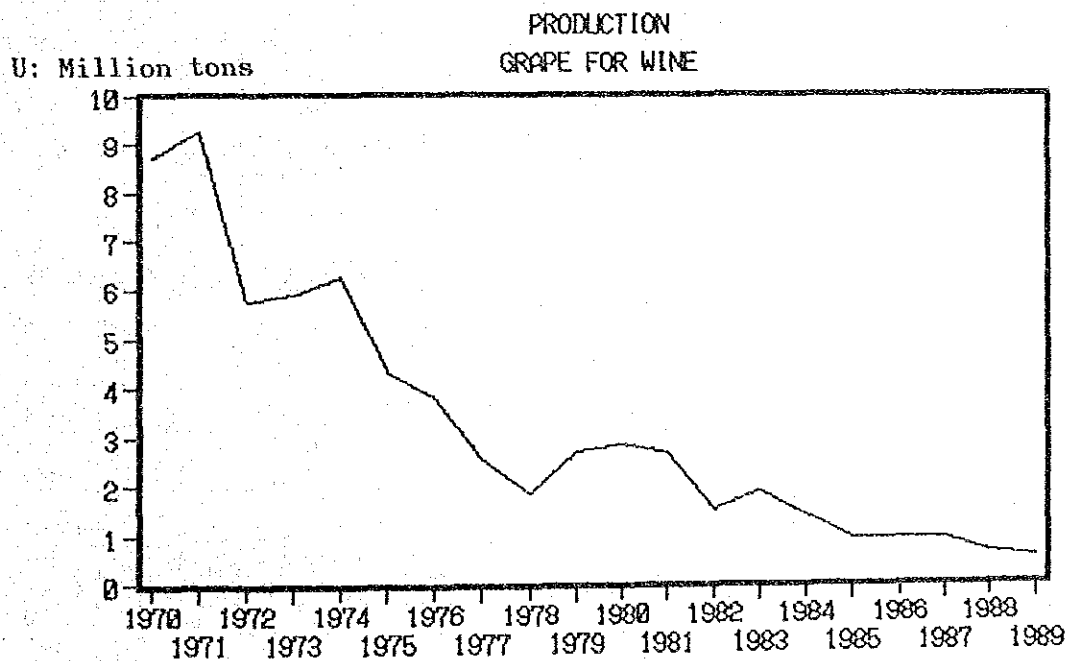
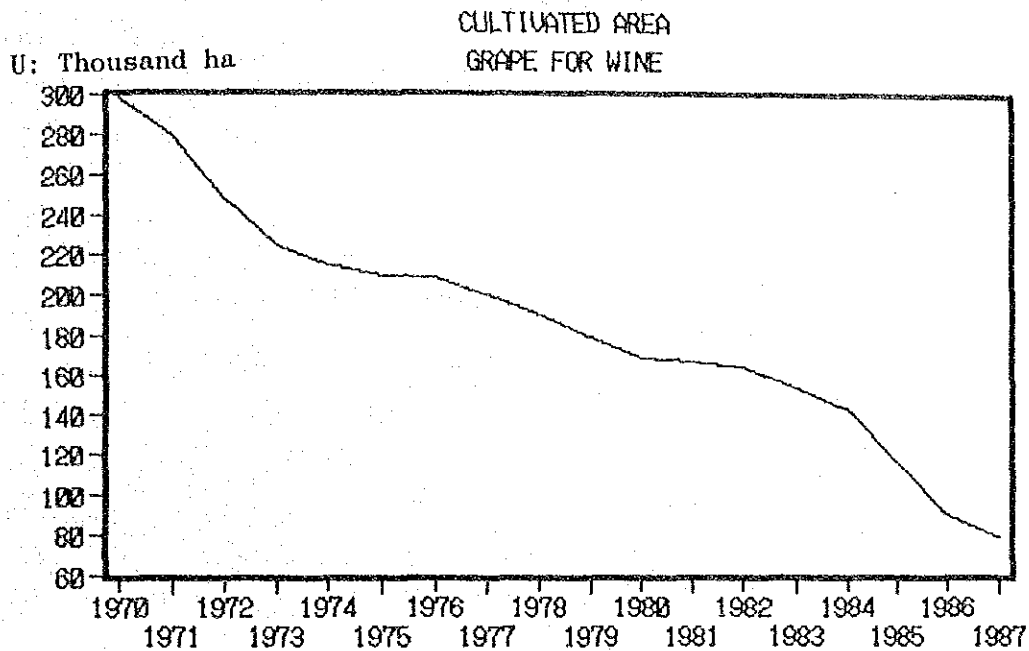


Figure 8.5.4 Cultivated area and harvest of grape for wine

(18) Results of the forecasts

By way of conclusion, Table 8.5.4 shows a summary of the forecast cargo. Furthermore, Table 8.5.5 is a comparison of cargo volumes obtained by the macro and micro forecast methods described in chapter 8.5.1 and 8.5.2.

Although there is some difference between the macro and micro forecasts in 2010, the forecast by the micro method seems to be reasonable, if we take into account the aluminum refinery project is a new factor. Herein, the cargo volumes handled at the port of Oran for the target years will be forecasted as those obtained by the micro forecast method.

Table 8.5.4 Result of micro forecast (Port of Oran)

			U: Tons		
	PACKAGE TYPE	CONTAINER SUITABLE	1990	1997	2010
(UNLOADED)					
AGRICULTURAL PRODUCTS			1,270,363	1,432,000	2,875,000
(1)	CEREAL	SOLID BULK U	1,185,559	1,300,000	2,700,000
(2)	OTHER AGRICULTURAL PRODUCTS	GENERAL C. S	24,292	38,000	50,000
(3)	TIMBER	GENERAL C. U	60,512	94,000	125,000
FOODSTUFF AND ANIMAL FEED			414,643	519,000	847,000
(4)	SUGAR	GENERAL C. S	103,000	177,000	312,000
	FLOUR AND SEMOLINA	GENERAL C. U	66,487	0	0
(5)	VEGETABLE OIL	LIQUID BULK U	80,378	113,000	150,000
(6)	OTHER FOODSTUFF	GENERAL C. S	70,874	104,000	139,000
(7)	ANIMALFEED	SOLID BULK U	93,904	125,000	246,000
(8)	PETROLEUM PRODUCTS	LIQUID BULK U	524,951	726,000	1,320,000
(9)	METAL PRODUCTS	SOLID BULK U	147,668	217,000	395,000
MINERALS AND CONSTRUCTION MATERIALS			305,823	420,000	1,147,000
(10)	CEMENT	SOLID BULK U	269,590	357,000	433,000
(11)	OTHERS	SOLID BULK U	36,233	63,000	114,000
(12)	ALUMINA	SOLID BULK U		0	600,000
(13)	MANUFACTURED GOODS, ETC.	GENERAL C.	250,599	398,000	695,000
	FERTILIZER	S	12,798	27,000	51,000
	CHEMICAL P., MANUFACTURED G.	S, U	237,801	335,000	608,000
	FIAT PARTS	S		36,000	36,000
UNLOADED TOTAL			2,914,047	3,712,000	7,279,000
(LOADED)					
(14)	WINE	GENERAL C. S	3,696	10,000	10,000
(15)	METALLURGICAL SCRAP	SOLID BULK U	14,286	11,000	19,000
(16)	ALUMINIUM	S		0	220,000
(17)	MANUFACTURED GOODS, ETC.	GENERAL C.	10,470	16,000	34,000
	CHEMICAL P., MANUFACTURED G.	S, U	10,470	16,000	34,000
LOADED TOTAL			28,452	37,000	283,000
TOTAL			2,942,499	3,749,000	7,562,000
			2,942,499	3,749,000	7,562,000
SOLID BULK U			1,747,240	2,073,000	4,507,000
LIQUID BULK U			605,329	839,000	1,470,000
GENERAL C.			589,930	837,000	1,585,000
U			150,999	118,000	163,000
S			438,931	719,000	1,422,000

U: Unsuitable for containerization
S: Suitable for containerization

Table 8.5.5 Forecast of Total Cargo Volume in Target Years

(Port of Oran)		U: Million tons
	1997	2010
Macro method	3,600-4,100	4,400-6,300
Micro method	3,749	7,562

8.5.3 Passenger

Figure 8.5.5 shows the three years running average of the number of passengers getting on and off at the port of Oran. There is a clear growth tendency, so the number of passengers in 1997 and 2010 have been estimated using a time series analysis, where the number of passengers is assumed to increase at the same growth rate as that from 1975-1985 starting from the initial number in 1990. The correlation equation is as follows:

$$N = 11821.26061 \times T - 23379187.6139$$

where N: Number of passengers
T: Year

When the target years are input into this equation, the number of passengers getting on and off at the port of Oran can be estimated as follows.

	1997	2010
Number of passengers (persons)	228,000	382,000

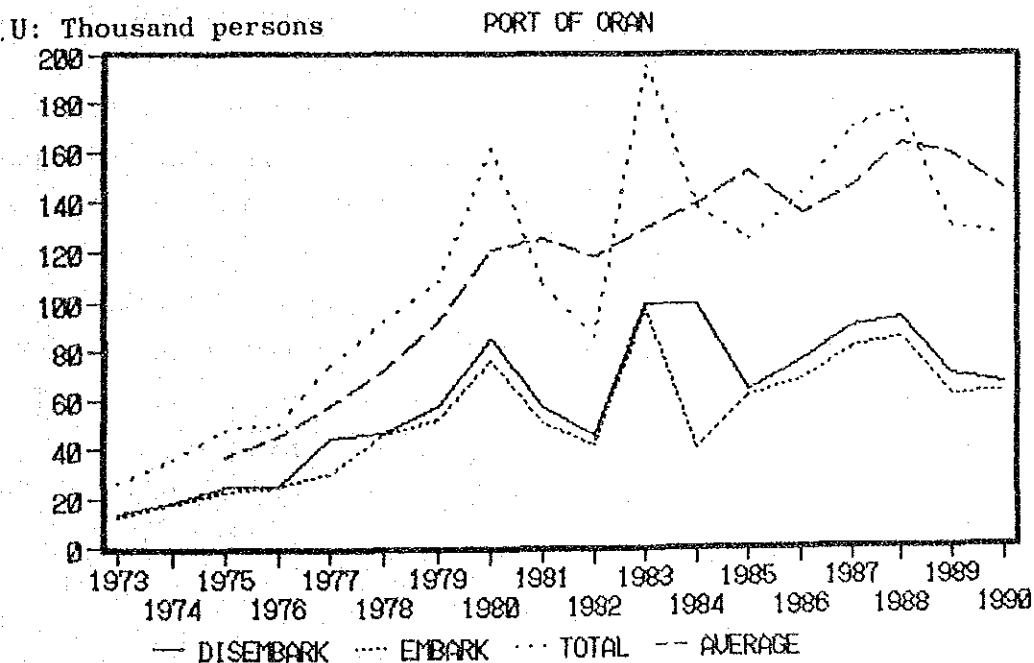


Figure 8.5.5 Passenger traffic

8.6 The Port of Annaba

8.6.1 Macro Forecast

(1) Time series analysis

1) Method

As shown in Table 8.6.1, the handling volume of each commodity at the port of Annaba varied greatly each year showing no obvious trends. But as indicated in Figure 8.6.1, the total loaded and unloaded cargo volume by package type was relatively stable. So the cargo volume of each package type for the target years will be forecasted using a time series analysis. However, there was a significant drop in volume during 1985-89 in general cargo which seems to have been caused by the restriction placed on imports to stabilize external debt under the Algerian economic recession. Thus, data on general cargo from 1985 to 1989 are regarded as being irregular and therefore discarded.

2) Result of forecast

The cargo volume is assumed to be expressed as;

$$V = a + bT$$

where V ; Handling volume at the port of Algiers

a, b ; Constants

T ; Year

The constants are determined by the least fitting method. The handling volume of total and general cargo is assumed to increase at the same growth rate as that from 1976 to 1984, starting from the initial value in 1990 as shown in Figure 8.6.2. As for liquid bulk cargo, yearly variation is small but does not show any obvious growth trend. Therefore, the handling volume is assumed to be the average volume handled at the port of Annaba from 1976 to 1990, 611,000 tons both in 1997 and 2010. As for solid bulk cargo, it does not show any obvious growth trend because the loading of iron ore ceased in 1985. So when the forecast of cargo volume in the target years is made with a time series analysis, the volume of loaded iron ore before 1985 is disregarded.

Under the above assumptions, the cargo forecast obtained is shown in Table 8.6.2.

Table 8.6.1 Volume of Cargoes Handling at the Port of Annaba

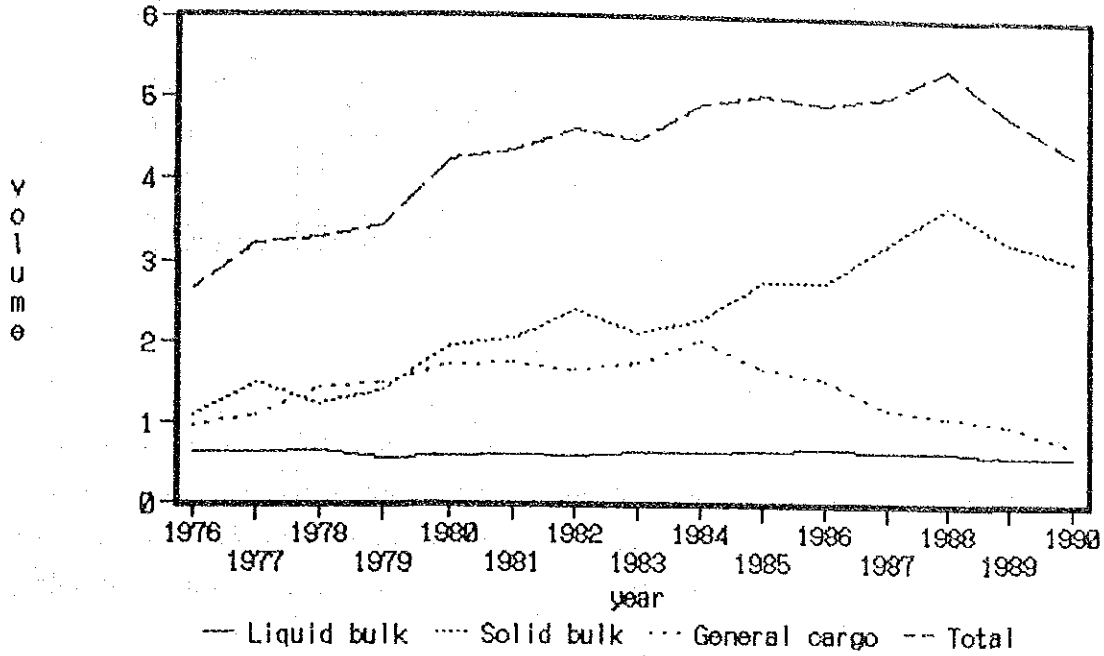
Commodity	1980		1981		1982		1983		1984		1985		1986		1987		1988		1989		1990	
	Volume	%	Volume	%	Volume	%	Volume	%	Volume	%	Volume	%	Volume	%	Volume	%	Volume	%	Volume	%	Volume	%
Agricultural Products and Livestock	257,974	84	249,859	83	333,839	124	473,872	134	519,430	134	456,593	124	442,793	124	591,454	174	430,369	264	966,632	294	971,157	314
Livestock	128,334	44	108,851	34	178,433	54	227,987	64	186,453	54	191,417	54	234,259	64	338,557	104	466,831	134	465,947	144	540,108	174
Wheat	41,991	14	72,708	24	126,840	34	127,928	44	209,820	54	138,406	34	152,026	44	189,175	54	473,928	134	411,668	124	325,167	104
Other cereals	6,803	2	11,238	4	21,528	7	27,919	14	23,668	14	18,377	5	9,818	3	6,407	2	4,554	1	3,957	1	16,138	5
Potato	4,139	1	3,260	1	13,302	4	13,957	4	20,221	5	10,880	3	9,348	3	7,845	2	11,805	3	13,579	4	13,277	4
Fruit, Vegetable	76,847	24	51,358	17	52,845	17	76,981	24	79,016	24	86,550	24	34,915	14	42,088	14	52,208	14	70,969	24	72,853	24
Textile Materials	287,326	94	370,874	114	382,289	104	413,878	124	399,008	104	382,474	104	383,547	104	397,141	114	435,808	124	372,709	114	394,077	114
Timber	100,374	34	148,593	44	101,826	34	135,281	44	129,372	34	127,765	34	145,763	44	136,904	44	178,692	54	137,142	44	161,992	54
Others	854	0	1,074	0	2,386	0	2,539	0	2,539	0	2,539	0	2,539	0	2,539	0	2,916	0	2,916	0	2,916	0
Foodstuffs and Forage	23,470	8	16,120	5	36,614	14	51,366	14	47,825	14	65,547	24	30,828	14	35,704	14	32,864	14	40,558	14	34,721	14
Sugar	11,787	4	20,866	7	34,196	14	23,864	7	22,806	6	10,899	3	33,892	14	26,216	8	19,042	6	44	0	44	0
Wine	24,637	8	29,517	10	34,588	14	34,442	14	28,546	7	33,021	14	7,516	3	36,515	14	39,217	14	35,035	14	38,681	14
Milk	126,824	44	154,704	54	170,578	54	166,398	54	169,859	54	145,242	44	165,948	54	161,802	54	163,077	54	160,430	54	158,773	54
Animal feed	869,345	274	895,327	274	1,170,438	324	870,133	244	882,169	274	1,306,624	304	1,701,171	324	992,268	324	3,181,036	354	1,071,667	334	926,227	304
Vegetable Oil	869,845	274	895,327	274	1,170,438	324	870,133	244	882,169	274	1,306,624	304	1,701,171	324	992,268	324	3,181,036	354	1,071,667	334	926,227	304
Others	512,453	164	501,735	154	504,807	144	561,696	164	549,142	144	577,134	154	585,655	164	521,087	154	430,206	124	489,418	144	441,362	144
Petroleum Products	9,029	3	7,022	2	7,215	3	4,303	1	29,204	7	71,605	24	90,192	24	58,026	14	3,536	0	31,119	8	16,397	5
Crude oil	451,957	144	446,532	144	466,658	134	507,036	144	491,637	124	500,173	134	485,407	134	458,168	134	422,130	114	431,262	134	423,573	144
Hydrocarbon gas	51,457	17	48,161	14	30,934	11	50,957	14	28,301	7	5,368	2	10,096	4	4,893	1	4,540	1	7,017	2	1,392	0
Refined Oil	0	0	623	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Mineral, Metallurgical Scrap	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Mineral	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Scrap	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Metal Products	508,454	164	466,123	144	355,189	104	245,038	74	370,601	94	238,137	64	127,492	44	83,078	24	105,911	34	136,390	44	102,676	34
Ferrous	507,871	164	466,123	144	351,196	104	245,038	74	370,601	94	238,137	64	127,492	44	83,078	24	105,911	34	136,390	44	102,676	34
Non Ferrous	783	0	0	0	3,993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Minerals and Construction Materials	402,655	124	414,999	134	524,361	144	628,136	184	675,167	174	602,721	164	630,746	174	195,545	64	128,832	44	110,229	34	102,377	34
Sulfur	32,204	14	28,594	14	28,594	14	68,528	24	68,503	24	118,906	34	70,267	24	92,673	34	101,886	34	87,342	34	75,033	24
Cement	355,853	114	384,000	124	486,033	134	515,900	144	486,436	124	430,632	114	506,163	144	79,794	24	22,878	14	20,819	14	27,344	14
Others	14,598	5	30,599	14	37,734	14	48,708	14	122,223	34	55,183	14	54,316	14	22,878	14	27,146	14	20,819	14	27,344	14
Fertilizers	94,197	34	101,702	34	46,504	14	52,044	24	83,696	24	97,498	34	97,784	34	119,989	34	67,106	24	40,345	14	85,875	24
Natural Fertilizers (Phosphates)	94,197	34	101,702	34	46,504	14	52,044	24	83,696	24	97,498	34	97,784	34	119,989	34	67,106	24	40,345	14	85,875	24
Potash	0	0	67,027	24	26,941	14	48,383	14	68,102	24	96,572	34	86,883	24	108,419	34	67,106	24	40,345	14	80,875	24
Manufactured Fertilizers	0	0	34,675	14	15,474	5	15,283	5	15,594	5	10,901	4	10,901	4	10,570	4	10,570	4	10,570	4	10,570	4
Chemical Products	135,442	44	139,749	44	85,428	24	89,742	24	83,108	24	72,140	24	69,330	24	63,989	24	79,320	24	48,604	14	48,315	14
Chemical Products	135,442	44	139,749	44	85,428	24	89,742	24	83,108	24	72,140	24	69,330	24	63,989	24	79,320	24	48,604	14	48,315	14
Machine, Vehicles, Manufactured good	182,312	64	165,513	54	185,056	54	240,531	74	225,100	64	227,349	64	121,755	34	78,480	24	61,241	24	75,645	24	69,864	24
Vehicles, Transport Equipments	4,433	1	10,912	4	16,105	5	3,064	1	15,915	4	19,486	6	19,486	6	19,486	6	19,486	6	19,486	6	19,486	6
Agricultural Machine	5,956	2	16,168	5	8,348	3	237,467	74	209,185	54	207,863	54	7,648	3	7,393	3	8,433	3	8,433	3	8,433	3
Engine, Machine, Parts	96,975	34	110,624	34	126,911	34	126,911	34	126,911	34	126,911	34	126,911	34	126,911	34	126,911	34	126,911	34	126,911	34
Glass	6,332	2	2,035	1	1,264	0	1,264	0	1,264	0	1,264	0	1,264	0	1,264	0	1,264	0	1,264	0	1,264	0
Leather, Textiles	68,976	24	25,776	8	32,429	14	32,429	14	32,429	14	32,429	14	32,429	14	32,429	14	32,429	14	32,429	14	32,429	14
Special transaction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	3,250,668	100	3,307,504	100	3,647,911	100	5,685,070	100	6,415,100	100	6,794,670	100	6,223,628	100	8,447,302	100	6,849,100	100	16,327,849	100	16,327,849	100

U: Ten.

Loaded Commodity	1980 %	1981 %	1982 %	1983 %	1984 %	1985 %	1986 %	1987 %	1988 %	1989 %	1990 %
Agricultural Products and Livestock	0	0	0	0	148	232	248	188	30	0	0
Livestock	0	0	0	0	0	0	0	0	0	0	0
Wheat	0	0	0	0	0	0	0	0	0	0	0
Other cereals	0	0	0	0	0	0	0	0	0	0	0
Potato	0	0	0	0	0	0	0	0	0	0	0
Fruit, Vegetable	0	0	0	0	148	232	248	3	30	0	0
Textile Materials	0	0	0	0	0	0	0	185	0	0	0
Timber	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0
Foodstuff and Forage	0	0	0	0	56	0	140	0	0	0	0
Sugar	0	0	0	0	0	0	0	0	0	0	0
Milk	0	0	0	0	0	0	0	0	0	0	0
Wine	0	0	0	0	0	0	0	0	0	0	0
Animal feed	0	0	0	0	56	0	0	0	0	0	0
Vegetable Oil	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0
Combustible Mineral	0	0	0	0	24,925	41,357	5,247	34,578	27,406	17,498	3,081
Cokes	0	0	0	0	24,925	41,357	5,247	34,578	27,406	17,498	3,081
Others	0	0	0	0	0	0	0	0	0	0	0
Petroleum Products	11,240	17,764	36,654	29,865	27,431	21,224	42,702	76,864	129,109	50,866	88,347
Crude oil	0	0	0	0	0	0	0	0	0	0	0
Hydrocarbon gas (ammonia)	0	0	0	0	0	0	3,844	40,065	99,570	30,087	66,812
Tar	11,240	17,764	36,654	29,865	27,431	21,224	38,858	36,619	29,539	30,779	11,414
Others	0	0	0	0	0	0	0	0	0	0	0
Mineral, Metallurgical Scrap	1,366,128	480,363	435,902	300,255	553,881	11,205	88,516	62,976	77,648	60,149	18,513
Mineral	1,366,010	480,363	435,902	300,255	553,881	6,995	49,213	13,363	21,636	19,420	18,000
Scrap	1,116	0	0	0	0	2,410	39,303	49,613	55,966	40,729	513
Others	0	0	0	0	0	1,800	0	0	0	0	0
Metal Products	170,419	236,719	201,311	253,298	307,140	336,500	289,746	517,547	510,740	317,000	303,794
Ferrous	170,419	236,719	201,311	253,298	307,140	336,500	289,746	517,547	510,740	317,000	303,794
Non ferrous	0	0	0	0	0	0	0	0	0	91	0
Minerals and Construction Materials	0	0	0	0	0	0	0	0	4,789	7,650	2,152
Mineral	0	0	0	0	0	0	0	0	4,789	7,650	2,152
Cement	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0
Fertilizers	761,532	780,297	718,283	584,568	582,900	825,147	889,972	803,288	976,651	1,005,813	791,088
Natural Fertilizers (Phosphates)	778,832	777,197	718,283	586,019	562,900	810,285	836,935	848,703	995,240	879,021	747,157
Manufactured Fertilizers	2,700	3,100	0	8550	0	1,4862	3,037	5,586	71,611	126,792	439,31
Chemical Products	0	0	0	0	0	237	66	103	327	0	321
Chemical Products	0	0	0	0	0	237	66	103	327	0	321
Machine, Vehicles, Manufactured good	3,987	2,451	2,442	2,763	15,783	15,775	20,285	5,230	4,721	6,506	6,777
Vehicles, Transport Equipments	139	0	0	0	0	0	0	0	0	0	0
Agricultural Machine	0	0	0	0	0	0	0	0	0	0	0
Engine, Machine, Parts	347	0	0	0	0	0	0	0	0	0	0
Glass	0	0	0	0	0	0	0	0	0	0	0
Leather, Textiles	0	0	0	0	0	0	0	0	0	0	0
Special transaction	3,511	2,451	2,442	2,763	15,783	15,775	20,295	9,230	4,721	6,506	6,777
Total	2,333,814	2,517,594	2,399,709	2,180,750	2,922,274	2,516,677	3,168,934	4,604,575	7,316,619	4,755,522	2,212,083

Source: Ministry of Transport, Annuaire Statistique 1980-1990

U: Million t



Source: EPAN, Annuaire statistiques

Figure 8.6.1 The movement of cargo traffic
Port of Annaba (Except iron ore)

U: Million t

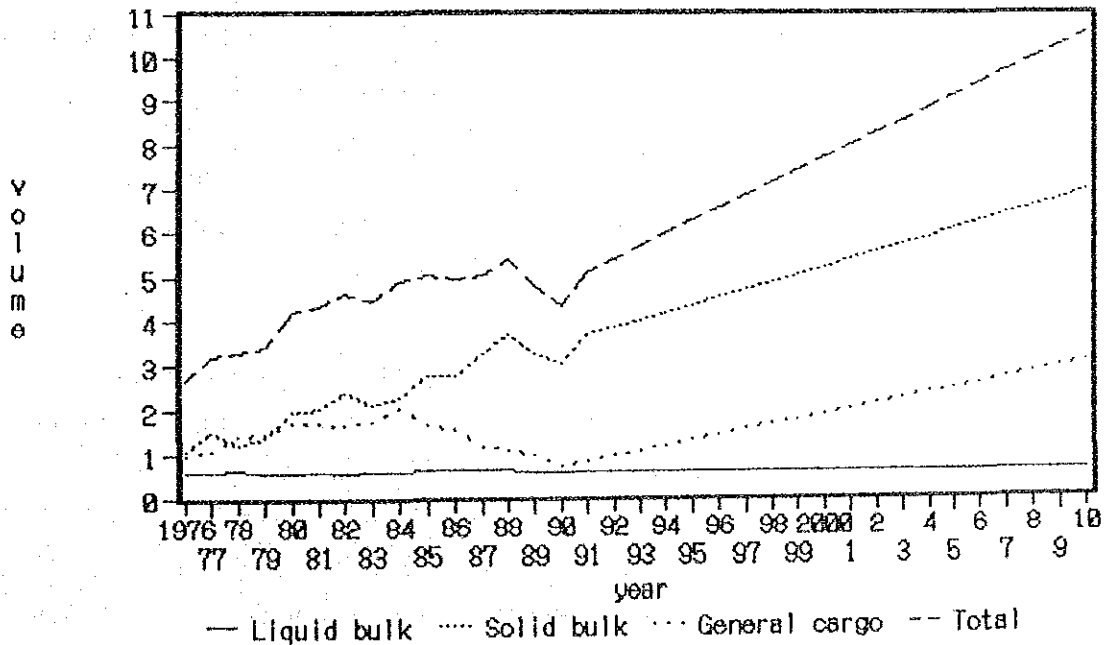


Figure 8.6.2 Cargo traffic forecast
Port of Annaba (Except iron ore)

Table 8.6.2 Macro forecast by time series analysis

U: 1000t

Item	1990	1997	2010
Estimate by total	4,334	6,253	9,816
Estimate by package type	Liquid bulk	565	611
	Solid bulk	3,042	4,702
	General cargo	727	1,532
	Total	4,334	6,845
			10,560

(2) Correlation with social and economic indices

Generally speaking, the cargo handling volume of a port has a close relation with the social and economic indices of the country.

In this section, the total cargo volume handled at the port of Annaba will be forecasted using a correlation between the past handling cargo and total Algerian population or GDP (as shown in Table 8.6.3).

1) Correlation with GDP

Total cargo volume is forecasted by its relation with GDP. The correlation between cargo volume and GDP for 1974 through 1990 can be expressed by the following equation.

$$V = 16704.57367 \times \text{GDP} - 239683.082 \quad (r = 0.85669)$$

When GDP in target years mentioned in chapter 8.2.2 is input into this equation, the forecast of cargo volume to be handled at the port of Annaba is given as;

	1997	2010
Handling volume (thousand tons)	7,275	13,414

2) Correlation with population

Total cargo volume is forecasted by its relation with population. The correlation between cargo volume and population for 1974 through 1990 can be expressed by the following equation.

$$V = 267.5847799 \times \text{POPULATION} - 1157790.24 \quad (r = 0.766)$$

When population in target years mentioned in chapter 8.2.1 is input into this equation, the forecast of cargo volume to be handled at the port of Annaba is given as;

	1997	2010
Handling volume (thousand tons)	7,004	9,733

3) Result of macro forecast

The result of the macro forecast in target years is shown below.

	1997	2010
Handling volume (thousand tons)	6,300 - 7,300	9,700 - 13,400

Table 8.6.3 Cargo volume, GDP and Population

(1974-1990)			
	Cargo volume (t)	GDP (billions of 1987 AD)	Population (1000 persons)
1974	2,711,163	170.63	14,912
1975	2,545,187	179.33	15,417
1976	2,662,078	194.39	16,120
1977	3,203,622	204.7	16,781
1978	3,277,690	223.53	17,336
1979	3,420,827	240.07	17,864
1980	4,218,972	242.23	18,375
1981	4,348,401	249.52	18,956
1982	4,615,857	265.58	19,564
1983	4,467,488	279.88	20,192
1984	4,924,798	295.55	20,841
1985	5,046,277	311.4	21,510
1986	4,946,157	314.98	22,191
1987	5,051,937	312.71	22,807
1988	5,408,468	306.19	23,446
1989	4,803,361	316.69	24,095
1990	4,334,013	326.19	24,697

Note: Except iron ore

Source: The World Bank, World Table

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8.6.2 Micro Forecast

Considering the present cargo volume, long-term trend and package type by commodity, the cargo handled at the port of Annaba is classified into the following 21 categories for the micro forecast.

<Unloaded>

- (1) Cereal
- (2) Other agricultural products
- (3) Timber
- (4) Sugar
- (5) Vegetable oil
- (6) Other foodstuffs
- (7) Coal
- (8) Petroleum products
- (9) Metal products
- (10) Sulfur
- (11) Iron ore
- (12) Other construction materials
- (13) Potash
- (14) Manufactured goods and so on

<Loaded>

- (15) Cokes
- (16) Tar
- (17) Ammonia
- (18) Metal products
- (19) Phosphate
- (20) Manufactured fertilizers
- (21) Manufactured goods and so on

(1) Cereal

Cereal is the largest cargo among all the commodities handled at the port of Annaba, except coal and phosphate. The estimated volume of cereal unloaded at the port of Annaba was mentioned in chapter 8.4.2,(1).

	1997	2010
Cereal (thousand tons)	900	1,400

(2) Other agricultural products

The volume of other unloaded agricultural products (such as potato, vegetable, fruits and so on) will increase at the same rate as the growth of population. The estimated volume is shown below.

1997	2010
28,000 t	37,000 t

(3) Timber

The volume of unloaded timber will increase at the same rate as the growth of population. The estimated volume is shown below.

1997	2010
83,000 t	110,000 t

(4) Sugar

The volume of sugar unloaded at the port of Annaba shows a tendency to increase as shown in Figure 8.6.3. Future unloaded volume is estimated using the correlation between three year running average volume of unloaded sugar and population. The correlation can be expressed by the following equation.

$$V = 7.8651922 \times P - 37139.18 \quad (r = 0.952)$$

V = Volume of sugar unloaded at the port of Annaba.

P = Population

By substituting the target year population into this equation, the future volume is estimated as shown below.

1997	2010
203,000 t	283,000 t

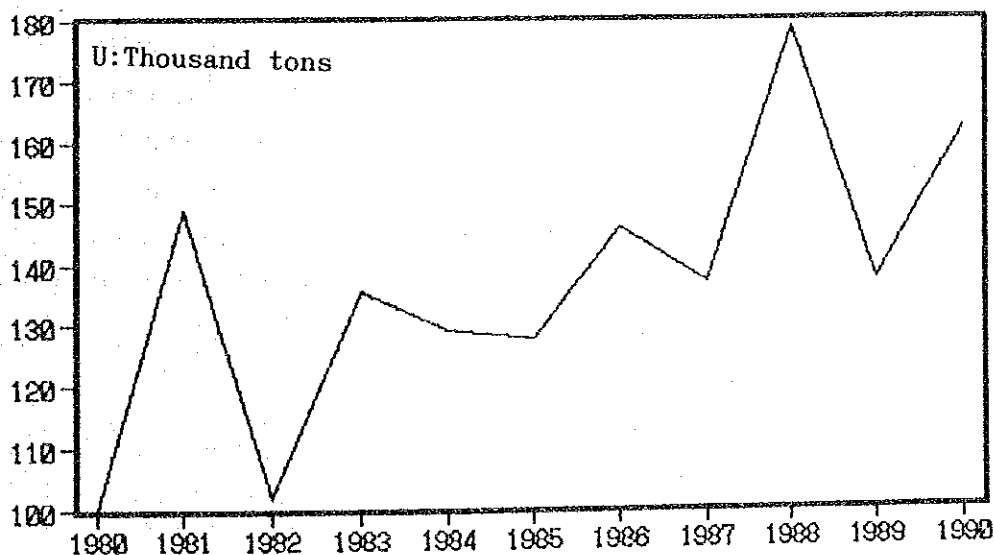


Figure 8.6.3 Volume of sugar unloaded at the port of Annaba

(5) Vegetable oil, (6) Other foodstuffs

The volume of these unloaded commodities will increase at the same rate as the growth of population. The estimated volume is shown below.

	1997	2010
(5) Vegetable oil	138,000 t	154,000 t
(6) Other foodstuffs	111,000 t	149,000 t

(7) Coal

According to SIDER, the actual operating ratio of the steel making factory in El-hadjar was about 50% in the past three years. When the volume of unloaded coal is estimated, it is assumed that the operating ratio will be improved to match the growth rate of GDP in the manufacturing industrial sector, and the volume of coal consumed in the factory will increase at the same rate.

And it is assumed that the upper limit of coal consumption is about 2,200,000 t taking account of the actual consumed volume and operating ratio. Considering these conditions, the volume of unloaded coal in target years is estimated as shown below.

	1997	2010
	1,647,000 t	2,200,000 t

(8) Petroleum products, (9) Metal products, (12) Other construction materials

It is assumed that the volume of these unloaded commodities will increase at the growth rate of GDP, since their consumption in the hinterland is closely related to the nation's macroscopic economic activities. The estimated volume is as follows.

	1997	2010
(8) Petroleum products	616,000 t	1,120,000 t
(9) Metal products	159,000 t	288,000 t
(12) Other construction materials	35,000 t	63,000 t

(10) Sulfur

According to ASMIDAL, the actual operating ratio of the sulfuric acid making factory was about 48% in 1990. When the volume of unloaded sulfur is estimated, it is assumed that the operating ratio will be improved to match the growth rate of GDP in the manufacturing industrial sector, and the volume of sulfur consumed in the factory will increase at the same rate. It is also assumed that the upper limit of sulfur consumption in the factory is about 160,000 t taking account of the actual consumed volume and operating ratio. Considering these conditions, the unloaded sulfur in target years is estimated as shown below.

	1997	2010
	130,000 t	160,000 t

Besides the above volume, it must also be considered the demand of sulfur for the factory which will begin operations in Tebessa by 2010, and that demand is estimated to be about 175,000 t according to EPAN.

(11) Iron ore

Steel making factory in El-Hadjar is consuming iron ore mined in Ouenza and Boukhadra. According to SIDER and FERPHOS, as the volume mined from these mines might decrease in the future, the deficit would have to be imported. In this study, it is assumed that the volume of imported iron ore will be about 750,000 tons in 2010.

(13) Potash

According to ASMIDAL, the actual operating ratio of the manufacturing fertilizer's factory was about 37% in 1990. When the volume of unloaded potash is estimated, it is assumed that the operating ratio will be improved to match the growth rate of GDP in the manufacturing industrial sector, and the volume of potash consumed in the factory will increase at the same rate. It is also assumed that the upper limit of potash consumption in the factory is about 160,000 t taking account of the actual consumed volume and operating ratio. Considering these conditions, the volume of unloaded potash in target years is estimated as shown below.

	1997	2010
	83,000 t	160,000 t

(14) Manufactured goods and so on (unloaded)

A. Carbonic chemical

The volume of carbonic chemical consumed by ASMIDAL will increase at the growth rate of GDP in the manufacturing industrial sector, and the upper limit of carbonic chemical consumption in the factory is assumed to be about 28,000 t taking account of the actual consumed volume and operating ratio. Considering these conditions, the volume of unloaded carbonic chemical in target years is estimated as shown below.

1997	2010
18,000 t	28,000 t

Besides the above volume, it must also be considered the demand of carbonic chemical for the factory which will begin operations in Tebessa by 2010, and that demand is estimated to be about 33,000 ton according to EPAN.

B. Other manufactured goods, etc.

It is assumed that the volume of other unloaded manufactured goods such as chemical products, machine and so on, will increase at the growth rate of GDP, since the demand for these commodities is closely related to the nation's macroscopic economic activities. The estimated volume is shown below.

1997	2010
151,000 t	274,000 t

(15) Cokes (loaded), (16) Tar (loaded)

The volume of these commodities will increase parallel to the increase in the consumption of coal. The estimated volume is shown below.

	1997	2010
(15) Cokes(loaded)	34,000 t	46,000 t
(16) Tar(loaded)	35,000 t	47,000 t

(17) Ammonia (loaded)

The volume of ammonia loaded by ASMIDAL will increase at the growth rate of GDP in the manufacturing industrial sector, and the upper limit of loaded ammonia is assumed to be about 140,000 ton according to the materials of ASMIDAL. Considering these conditions, the volume of loaded ammonia in target years is estimated as shown below.

1997	2010
98,000 t	140,000 t

(18) Metal products

The present volume of production in El-Hadjar steel mill and consumption for the hinterland is about one million tons and seven hundred thousand tons respectively, and the surplus over the consumption (about three hundred thousand tons) is exported from the port of Annaba. When the volume of loaded metal products is estimated, it is assumed that production will increase at the growth rate of GDP in the manufacturing industrial sector and consumption in the hinterland will increase at the growth rate of GDP. Taking account that the capacity of the product is about two million tons, the volume of loaded metal products in target years is estimated as shown in Figure 8.6.4.

1997	2010
509,000 t	246,000 t

(19) Phosphate

Figure 8.6.5 shows the volume of phosphate loaded at the port of Annaba during 1980-1990. There has been no clear growth tendency in the past ten years, but FERPHOS intends to open up a new international market, in addition to European countries, by transporting phosphate with larger carriers (45,000 ton class). In this study, it is assumed that the volume of phosphate will increase at the growth rate of GDP. The estimated volume is shown below.

1997	2010
1,164,000 t	2,114,000 t

(20) Manufactured fertilizers

The present volume of production in the Annaba fertilizer factory and consumption for the hinterland is 315,409 tons and 234,631 tons respectively, and the surplus over the consumption (80,778 tons) is exported from the port of Annaba. When the volume of loaded manufactured fertilizers is estimated, it is assumed that production will increase at the growth rate of GDP in the manufacturing industrial sector and consumption in the hinterland will increase at the growth rate of GDP in the agricultural sector. Considering these conditions, the volume of loaded manufactured fertilizers in target years is estimated as shown in Figure 8.6.6.

1997	2010
135,000 t	207,000 t

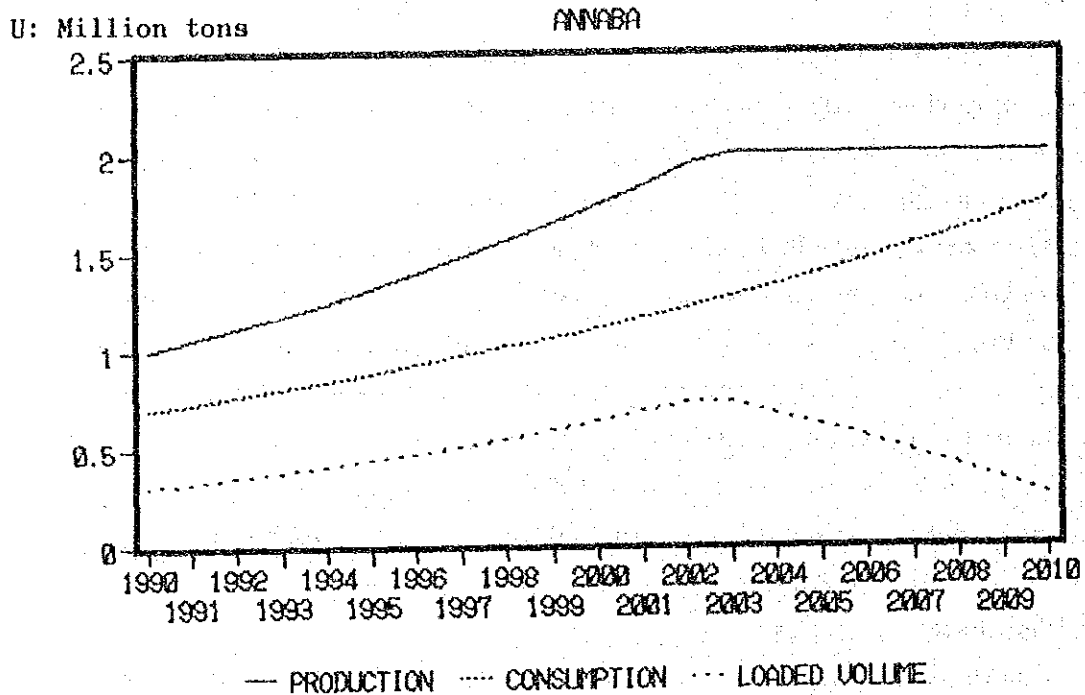


Figure 8.6.4 Volume of loaded metal products

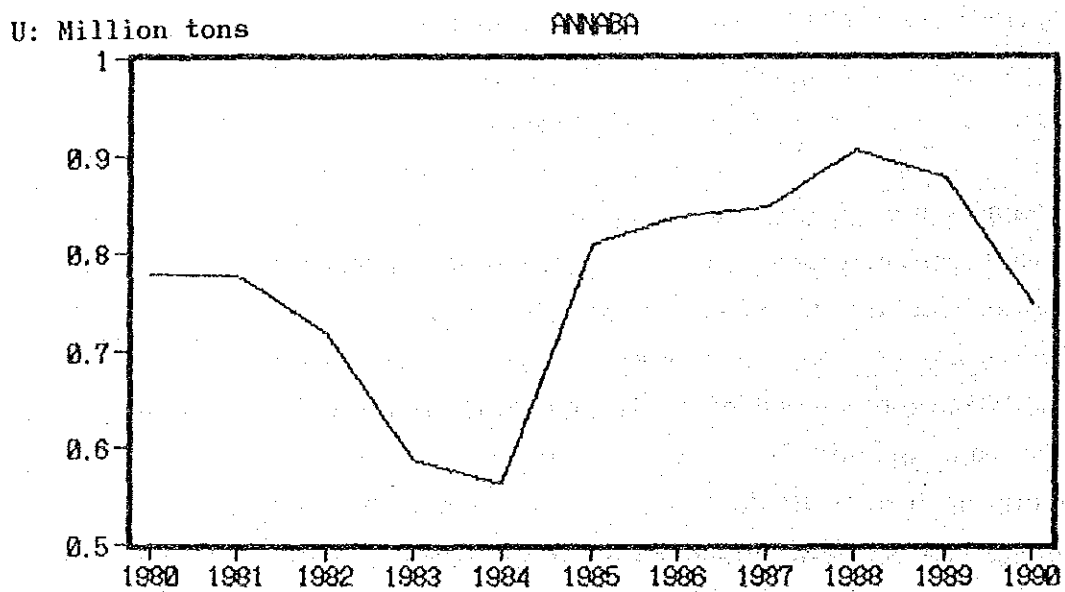


Figure 8.6.5 Volume of loaded phosphate

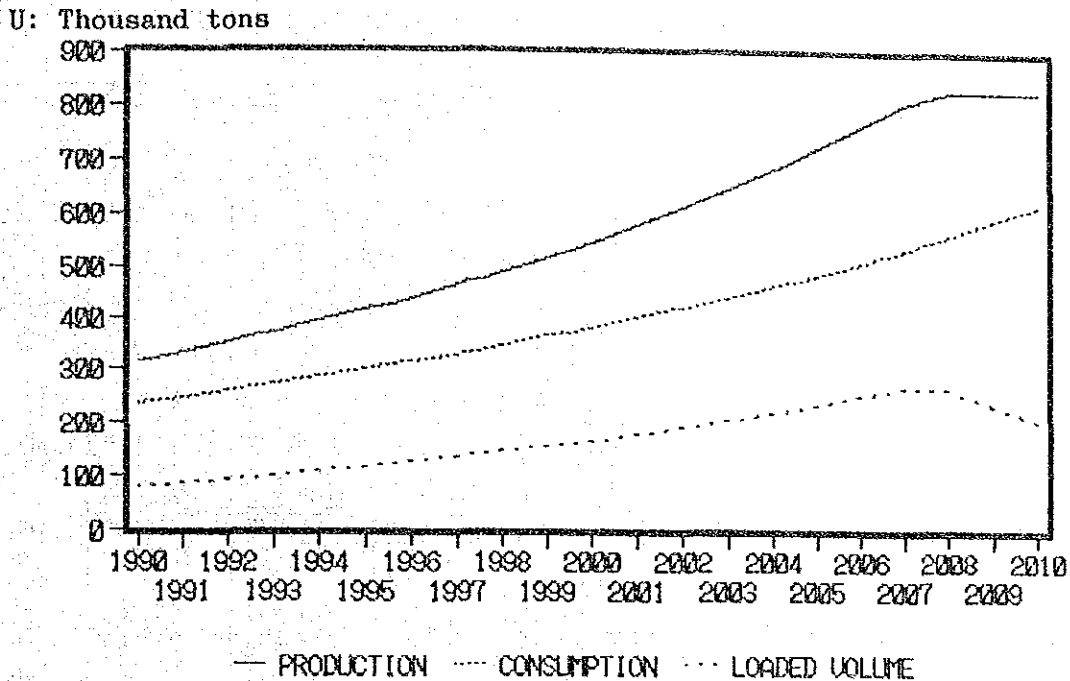


Figure 8.6.6 Volume of loaded manufactured fertilizers

Besides the above volume, it must also be considered the exported manufactured fertilizers from the factory which will begin operations in Tebessa by 2010, and that is estimated to be about 100,000 tons according to EPAN.

(21) Manufactured goods and so on (loaded)

The volume of these loaded products will increase at the growth rate of GDP in the sector of manufacturing industry, since it is closely related to the manufacturing industrial activities in the hinterland. The estimated volume is shown below.

	1997	2010
	6,000 t	13,000 t

(22) Results of the forecasts

BY way of conclusion, Table 8.6.4 shows a summary of the forecast cargo. Furthermore, Table 8.6.5 is a comparison of cargo volumes obtained by the macro and micro forecast methods described in chapter 8.6.1 and 8.6.2.

The result of the micro forecast almost corresponds with that of the macro forecast. Herein, the cargo volumes handled at the port of Annaba for the target years will be forecast as those obtained by the micro forecast method.

Table 8.6.4 Result of micro forecast (Port of Annaba)

U: Tons

	PACKAGE TYPE	CONTAINER SUITABLE	1990	1997	2010
(UNLOADED)					
AGRICULTURAL PRODUCTS			970,603	1,011,000	1,547,000
(1) CEREAL	SOLID BULK	U	866,275	900,000	1,400,000
(2) OTHER AGRICULTURAL PRODUCTS	GENERAL C.	S	31,475	28,000	37,000
(3) TIMBER	GENERAL C.	U	72,853	83,000	110,000
FOODSTUFF AND ANIMAL FEED			394,077	452,000	586,000
(4) SUGAR	GENERAL C.	S,U	161,902	203,000	283,000
FLOUR AND SEMOLINA	GENERAL C.	U	110,470	0	0
(5) VEGETABLE OIL	LIQUID BULK	U	38,681	138,000	154,000
(6) OTHER FOODSTUFF	GENERAL C.	S	83,024	111,000	149,000
(7) COAL	SOLID BULK	U	926,227	1,647,000	2,200,000
(8) PETROLEUM PRODUCTS	LIQUID BULK	U	441,362	616,000	1,120,000
(9) METAL PRODUCTS	SOLID BULK	U	102,676	159,000	288,000
MINERALS AND CONSTRUCTION MATERIALS			102,377	165,000	1,168,000
(10) SULFUR	SOLID BULK	U	75,033	130,000	335,000
(11) IRON ORE	SOLID BULK	U			770,000
(12) OTHER CONSTRUCTION MATERIALS	SOLID BULK	U	27,344	35,000	63,000
(13) FERTILIZER (POTASH)	SOLID BULK	U	65,875	83,000	160,000
(14) MANUFACTURED GOODS, ETC.	GENERAL C.		115,502	169,000	335,000
CARBONIC CHEMICAL		S	10,102	18,000	61,000
CHEMICAL P., MANUFACTURED G.		S	105,400	151,000	274,000
UNLOADED TOTAL			3,118,699	4,302,000	7,404,000
(LOADED)					
(15) COKES, MINERAL	SOLID BULK	U	20,665	34,000	46,000
(16) TAR	LIQUID BULK	U	11,414	35,000	47,000
(17) AMMONIA	LIQUID BULK	U	68,812	98,000	140,000
(18) METAL PRODUCTS	SOLID BULK	U	303,794	509,000	246,000
(19) PHOSPHATE	SOLID BULK	U	747,157	1,164,000	2,114,000
(20) MANUFACTURED FERTILIZERS	GENERAL C.	S	43,931	135,000	307,000
(21) MANUFACTURED GOODS, ETC.	GENERAL C.		4,590	6,000	13,000
CHEMICAL P., MANUFACTURED G.		S	4,590	6,000	13,000
LOADED TOTAL			1,200,363	1,981,000	2,913,000
TOTAL			4,319,062	6,283,000	10,317,000
			4,319,062	6,283,000	10,317,000
	SOLID BULK	U	3,135,046	4,761,000	7,722,000
	LIQUID BULK	U	560,269	887,000	1,461,000
	GENERAL C.		623,747	635,000	1,134,000
		U	183,323	83,000	110,000
		S	440,424	552,000	1,024,000

U: Unsuitable for containerization
S: Suitable for containerization

Table 8.6.5 Forecast of Total Cargo Volume in Target Years

(Port of Annaba) U: Million tons

	1997	2010
Macro method	6,300-7,300	9,700-13,400
Micro method	6,283	10,317

8.6.3 Passenger

Figure 8.6.7 shows the three year running average of the number of passengers getting on and off at the port of Annaba. There is a clear growth tendency until 1985, when the taking out of foreign currency started to be restricted strictly due to the Algerian economic recession. The number of passengers in 1997 and 2010 are estimated using a time series analysis with the number of passengers assumed to increase at the same growth rate as that from 1973-1985 starting from the initial number in 1990. The correlation equation is as follows:

$$N = 4.19370 \times T - 40474.20079$$

where N: Number of passenger
T: Year

When the target years are input into this equation, the number of passengers getting on and off at the port of Annaba can be estimated as shown below.

	1997	2010
Number of passengers (persons)	56,000	88,000

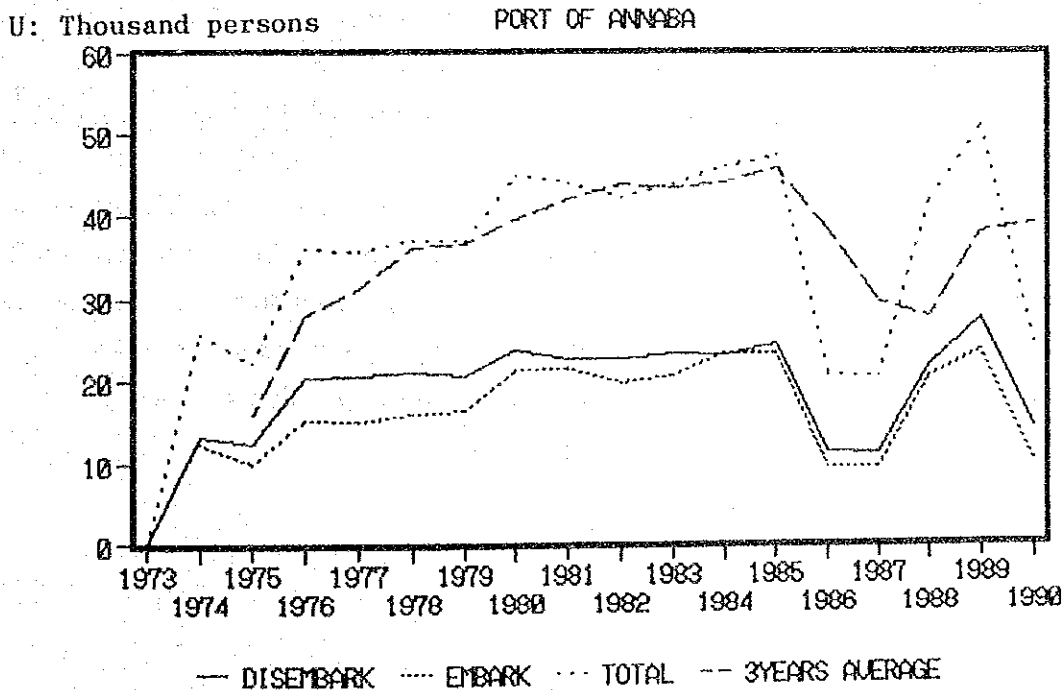


Figure 8.6.7 Passenger traffic

8.7 Forecast on Volume of Container Cargoes

(1) Trend of containerization at the study ports

Percentage of containerization by load/unload is shown in Table 8.7.1. The percentage of containerization is the ratio of the volume of container cargoes to the volume of containerizable cargoes. The volume of containerizable cargo was estimated by an assessment of the physical characteristics of the major cargo categories and their suitability for containerization from the port statistic data. The main categories of goods suitable for containerization include most foodstuffs, manufactured goods, refined sugar, chemical product and so on. Other cargoes such as cements, stone, cereals, bulk liquids, timber and metal products have been pronounced unsuitable for containerization.

According to the experience in other countries, the containerization at the study ports is presently at the stage immediately before a remarkable increase in the percentage of containerization.

(2) Estimation of volume of container cargoes in target years

The percentage of containerization in target years is estimated by using the logistic curves in Figure A.6. Then, the volume of container cargoes in target years can be obtained by multiplying the volume of cargo suitable for containerization by these percentages. Table 8.7.2 shows the estimated volume of container cargoes at the study ports obtained by application of logistic curves see A.6.

However, in order that containerization may proceed favorably as shown in Figure A.6, it is indispensable that not only adequate facilities are provided but also institutional problems, such as the complicated procedure of custom clearance, tariff structures, lack of proper knowledge concerning container system among potential users and so on, be resolved. (These problems cause the present low rate of containerization in the study ports.)

Table 8.7.1 Percentage of containerization at the study Ports

Port of Algiers

	1986	1987	1988	1989	1990
(Unloaded)					
Container cargo	142,437	130,445	136,525	159,042	141,959
Containerizable cargo	1,486,410	1,242,809	1,350,573	1,413,790	1,512,523
Percentage of containerization	9.6%	10.5%	10.1%	11.2%	9.4%
(loaded)					
Container cargo	8,816	12,224	22,584	16,933	20,509
Containerizable cargo	73,238	75,216	70,893	60,106	61,289
Percentage of containerization	12.0%	16.3%	31.9%	28.2%	33.5%

Port of Oran

	1986	1987	1988	1989	1990
(Unloaded)					
Container cargo	84,615	60,092	68,042	62,054	50,486
Containerizable cargo	588,469	514,490	515,935	458,327	433,196
Percentage of containerization	14.4%	11.7%	13.2%	13.5%	11.7%
(loaded)					
Container cargo	-	-	-	-	-
Containerizable cargo	13,494	13,530	7,570	6,285	6,056
Percentage of containerization	0.0%	0.0%	0.0%	0.0%	0.0%

Port of Annaba

	1986	1987	1988	1989	1990
(Unloaded)					
Container cargo	13,482	9,541	8,575	8,519	11,489
Containerizable cargo	364,078	319,228	348,339	296,379	311,827
Percentage of containerization	3.7%	3.0%	2.5%	2.9%	3.7%
(loaded)					
Container cargo	-	-	96	258	883
Containerizable cargo	51,399	64,249	74,950	131,685	48,521
Percentage of containerization	0.0%	0.0%	0.1%	0.2%	1.8%

Table 8.7.2 Forecast Volume of Container Cargo

Volume Unit: Tons

Port of Algiers

	1997	2010
(unloaded)		
Percentage of containerization	30.9%	77.8%
Volume of containerizable cargo	1,931,000	3,314,000
Volume of container cargo	597,000	2,578,000
(loaded)		
Percentage of containerization	61.2%	86.4%
Volume of containerizable cargo	86,000	176,000
Volume of container cargo	53,000	152,000

Port of Oran

	1997	2010
(unloaded)		
Percentage of containerization	34.9%	79.7%
Volume of containerizable cargo	701,000	1,174,000
Volume of container cargo	245,000	936,000
(loaded)		
Percentage of containerization	19.3%	67.9%
Volume of containerizable cargo	18,000	248,000
Volume of container cargo	3,000	168,000

Port of Annaba

	1997	2010
(unloaded)		
Percentage of containerization	12.7%	60.1%
Volume of containerizable cargo	411,000	704,000
Volume of container cargo	52,000	423,000
(loaded)		
Percentage of containerization	19.3%	67.9%
Volume of containerizable cargo	141,000	320,000
Volume of container cargo	27,000	217,000

(3) Perspective of cargoes transported by Ro-Ro vessels

As shown in 5.1.1 (4) 2), the kinds and package types of cargo transported by Ro-Ro vessels are almost the same as those transported by general cargo vessels. Also, portion of cargoes transported by trailer unit or trucks in Ro-Ro vessels is very small for the following reasons.

A. Tractor or trailer system is more costly than container system because of loading inefficiency.

B. In Algeria, an intermodal transportation system with counterpart countries is not provided.

C. There is little movement of suitable cargo for tractor system such as frozen or fresh raw foods.

Taking account of these factors, it is supposed that these trends in which cargo is transported by Ro-Ro vessels will continue, so a part of these cargoes will be containerized as well as the cargo transported by general cargo vessels.

CHAPTER 9 FUNCTIONAL ALLOTMENT OF PORT ACTIVITIES AMONG THE THREE STUDY PORTS

The three study ports of Algeria are used primarily for solid bulk and general cargoes. The total volume of such cargoes excluding liquid bulk handled at the three ports was around 11 million tons in 1990, accounting for two thirds of the total handled in Algeria. According to the origin and destination survey conducted by the Study Team, the hinterlands of the ports of Algiers, Oran and Annaba are the central, western and eastern areas of Algeria, respectively, with little overlap of their hinterlands. Thus, these three ports are playing important roles in supporting industrial activities and people's lives in their hinterlands and are expected to contribute to their regional development.

The major function of the ports is to receive cargoes transshipped mainly from foreign countries and partly from other Algerian regions.

As mentioned previously, cereals are accounted for the largest share of the cargoes unloaded at the ports. Presently, berths for unloading cereals are excessively congested at the ports and consequently, cereal carriers are being forced to wait off-shore for long periods of time before berthing. In order to reduce such congestion and meet the future demand that is forecast to increase with the population growth in their respective hinterlands, it is necessary to increase cargo-handling productivities and storing capacities at the cereal terminals. In addition to the three study ports, other principal ports such as Skikda, Bejaia and Mostaganem are also used for discharging cereals. Since consumption areas of cereals are spread widely in the country and transportation cost for cereals by land is very costly compared with that by water, not only the three study ports but also other principal ports need to be developed so as to reduce the land transportation cost for imported cereals, and consequently, reduce the total transportation cost from origin to the final destination. It is necessary to transport other agricultural products and foodstuffs through most of the principal ports including Djen Djen; these products should not be concentrated in the three study ports only.

Other solid bulk cargoes such as steel products, wood and cement should be transported through the above principal ports in order to save costly delivery charges of land transportation, though the share of the three study ports is high reflecting their larger hinterlands.

Liquid bulk cargoes mainly comprising petroleum products such as butane, diesel fuel, gasoline and chemical products, should be transported through the above principal ports so as to lessen the need of costly and dangerous transportation by land.

On the other hand, as for transportation of valuable general cargoes such as machinery and medicine, not only economic but also swift, safe and convenient transportation measures are essential. For that purpose, containerization has progressed remarkably in international shipping. This worldwide tendency is expected to take hold in Algeria. Presently, the container terminal development projects financed by the World Bank are on-going. However, in order to meet the forecast demand in the target year of 2010 of the Master Plan, additional container terminals need to be established. Since, generally, capital costs for an efficient container terminal are very high and daily ship costs are very expensive compared with conventional vessels, based on experience, the number of containers to be handled at a full-scale container terminal must exceed at least around 100 thousand TEUs per annum. Judging from the forecast demand of container number to be handled at the Algerian ports in 2010, it is advisable to put an emphasis on the three study ports for the development of container terminals without distributing the limited amount of resources to other ports.

CHAPTER 10 MASTER PLAN FOR THE PORT OF ALGIERS

10.1 The Basic Concept of the Port Development

The purpose of the Master Plan (target year 2010) is to serve as a target and guideline for phase plans including the Short-Term Plan (target year 1997). The Master Plan shall be an integrated plan covering the layout plans for new facilities, modernization plans for existing facilities and effective management and operation systems. In making the Master Plan for the Port of Algiers, the following various aspects concerning the port development are recognized:

- Port congestion

Presently, the Port of Algiers is suffering from serious port congestion. Consequently, many calling vessels are being forced to wait off-shore, especially cereal carriers and general cargo vessels. Narrow marshaling space for discharging and loading cargoes from and onto vessels causes low cargo-handling productivity. Shortage of storage space is also a serious problem which causes chaotic congestion in the port district.

- Lack of modern terminals

In order to ensure efficient cargo-handling productivity, systematically-organized modern terminals equipped with efficient cargo-handling facilities and sufficient storing facilities specialized for cargoes such as cereals and containers need to be prepared. However, the Port of Algiers has no such modern terminals and that fact is one of the main reasons for the above-mentioned port congestion.

- Future demand for use of the port

According to the demand forecast mentioned in Chapter 8, the volume of cargoes to be handled at the Port of Algiers in the year of 2010 is estimated as 12,321 thousand metric tons, twice as much as the volume in 1990. The volume of unloaded cargoes is estimated as 11,722 thousand tons, accounting for 95.1% of the total. As for unloaded cargoes, the volume of cereals, manufactured goods and petroleum products are expected to take large shares, accounting for 30.7%, 23.4% and 15.4% of the total unloaded cargoes, respectively.

- Economic transportation

In making the port plan, it is necessary to put an emphasis on economic transportation, considering both the investment cost for port facilities and ship transportation cost from the standpoint of the national economy.

- Effective utilization of the existing facilities

In the first step of the planning, the effective utilization of the existing facilities to meet the forecast demand needs to be examined so as to save investment cost for a new project as much as possible.

- Modernization of the cereal terminal

The volume of cereals to be unloaded at the port in 2010 is estimated as 3,600 thousand tons, 2.7 times as much as the volume in 1990. At present, Quay No.33-1, No.35-1 and No.35-3 are mainly handling cereals. Presently, the percentages of berth occupancy are already almost 100%, and therefore, there is no room to receive the above amount of cereals without modernization of the existing facilities.

- Establishment of an additional container terminal

The number of containers to be handled at the port in 2010 is estimated as 532 thousand TEUs. In order to cope with the progress of containerization, a new container terminal financed by the World Bank is about to be constructed by restructuring the existing facilities. However, the cargo-handling capacity of the new terminal is insufficient to handle the above number of containers, and therefore, an additional full-scale container terminal will be required by the year 2010.

- Preparation of open yards for steel products and wood just behind berths

Excluding cereals, steel products and wood are the major commodities among solid bulk cargoes, accounting for 8.2% of the total in 2010, approximately twice the present volume. In order to handle bulky and heavy cargoes such as steel products and wood, berths with spacious open yards behind them are necessary so as to ensure efficient cargo-handling and storage. However, existing berths have limited areas and their capacities are insufficient to handle these cargoes. Accordingly, yards will be required by the year of 2010.