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AND FUTURE REQUIREMENTS
IN LEBANON

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PRESENT CONSUMPTION OF WOOD PRODUCTS
AND FUTURE REQUIREMENTS
IN LEBANON

by

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Beirut, April 1966

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

	<u>PAGE</u>
I N T R O D U C T I O N	1
S U M M A R Y	3
1.0 M E T H O D O L O G Y	7
1.1 G E N E R A L	7
1.2 C O N S U M E R C A T E G O R I E S	8
1.21 R u r a l H o u s e h o l d s	9
1.22 R u r a l N o n - H o u s e h o l d s	10
1.23 U r b a n H o u s e h o l d s	10
1.24 U r b a n N o n - H o u s e h o l d s	11
1.25 P u b l i c S e c t o r	11
1.26 I n d u s t r i a l U s e	11
1.3 S U R V E Y D E S I G N	12
1.31 R u r a l S e c t o r s	12
1.311 S t r a t i f i c a t i o n	12
1.312 S e l e c t i o n o f t h e S a m p l e	12
1.313 C o l l e c t i o n o f D a t a	13
1.32 U r b a n S e c t o r	14
1.321 C o n s t r u c t i o n	14
1.322 O t h e r U s e s	14
1.33 I n d u s t r i a l U s e	15
1.331 P a c k a g i n g o f F r u i t a n d V e g e t a b l e s	15
1.332 O t h e r I n d u s t r i a l U s e	15

	<u>PAGE</u>
1.4	PROCEDURE FOLLOWED TO ESTIMATE CURRENT CONSUMPTION. 15
1.41	Rural Sectors 15
1.42	Urban Sectors 16
1.43	Industrial Sectors 16
1.44	Public Sector 16
1.5	PROCEDURE FOLLOWED TO PROJECT FUTURE REQUIREMENTS.. 17
2.0	B A C K G R O U N D 19
2.1	GENERAL BACKGROUND 19
2.2	SUPPLY OF WOOD PRODUCTS..... 22
2.21	Forest Resources 22
2.22	Forest Industries 23
3.0	E S T I M A T E S O F C U R R E N T C O N S U M P - T I O N 25
3.1	CONSUMPTION OF WAWN SOFTWOOD AND BEECH, QUALITY HARDWOOD, BLOCKBOARD, OTHER BOARDS, VENEER AND PLYWOOD 25
3.11	Rural Households 25
3.12	Rural Non-Households..... 27
3.13	Urban Households 28
3.14	Urban Non-Households..... 29
3.15	Public Sector 30
3.16	Industrial Sector 30
3.161	Packaging 30
	3.1611 Export of Fruit 32
	3.1612 Local Transport of Fruit..... 34

	<u>PAGE</u>
3.1613 Transport of Vegetables.....	34
3.1614 Packaging of Beverages and Other Commodities	34
3.162 Other Industrial Uses	34
3.17 Total Current Consumption of Sawn Softwood and Beach Quality, Hardwood, Blockboard, Other Board, Veneer, Plywood	35
3.2 CONSUMPTION OF POLES	36
3.21 Agricultural Use	36
3.22 Industrial Use	36
3.3 CONSUMPTION OF FUELWOOD AND CHARCOAL	36
3.31 Rural Sector	37
3.32 Urban Sector	37
3.4 CONSUMPTION OF PULP AND PAPER PRODUCTS.....	38
3.5 TOTAL CURRENT CONSUMPTION OF WOOD PRODUCTS AND ITS ROUNDWOOD EQUIVALENT.....	40
4.0 ESTIMATES OF FUTURE REQUIRE - MENTS	41
4.1 FACTORS INFLUENCING CONSUMPTION OF WOOD PRODUCTS....	41
4.11 Developments in Taste and Technology	41
4.12 Population Trends	43
4.13 Changes in Income	44
4.14 Wood Availability	47

	<u>PAGE</u>
4.2 REQUIREMENTS OF SAWNSOFTWOOD PLYWOOD AND BOARDS..	48
4.21 Rural Households	48
4.211 Wood Used for Construction	48
4.212 Wood Used for Furniture	53
4.22 Rural Non-Households	55
4.23 Urban Households	56
4.231 Wood Used for Furniture	56
4.232 Wood Products Used for Urban Construction	57
4.24 Urban Non-Households	59
4.25 Public Sector	60
4.26 Requirements of the Industrial Sector.....	61
4.261 Packaging	61
4.2611 Export of Fruit	62
4.2612 Local Transport of Fruit .	65
4.2613 Transport of Vegetables...	65
4.262 Other Packaging and Other Industrial Use	67
4.27 Total Future Requirements of Sawnwood Building, Boards, Veneer and Plywood.....	68
4.3 REQUIREMENTS OF POLES	70
4.31 Agricultural Use	70
4.32 Industrial Use	70
4.4 REQUIREMENTS OF FUELWOOD AND CHARCOAL	70
4.5 FUTURE REQUIREMENTS OF PULP AND PAPER PRODUCTS ..	79
4.51 Packaging of Fruit and Vegetables for Export	79
4.52 Other Uses	80

	<u>PAGE</u>
4.6 TOTAL FUTURE REQUIREMENTS OF WOOD PRODUCTS AND THEIR ROUNDWOOD EQUIVALENT	82
5.0 CONCLUSION	84

A P P E N D I X E S

<u>APPENDIX</u> A. DETAILS OF SAMPLE SURVEY	86
A.I STRATIFICATION OF THE RURAL AREA	86
A.II DETAILS OF SAMPLING FRAME IN RURAL LEBANON	88
A.III DETAILS OF RURAL SURVEY DESIGN AND LIST OF SAMPLE VILLAGE WITH RESPECTIVE STRATUM AND PROVINCE	89
A.IV RESULTS OF THE RURAL SAMPLE SURVEY BY STRATUM	94
A.V DETAILS OF URBAN SAMPLING SURVEY	96
A.VI AREA OF FLOOR SURFACE ANNUALLY CONS- TRUCTED BY THE PRIVATE SECTOR FROM 1959 TO 1963 1000 m ²	98
<u>APPENDIX</u> B. IMPORT-EXPORT STATISTICS OF WOOD AND PAPER PRODUCTS EXTRACTED FROM "STATIS- TIQUES DU COMMERCE EXTERIEUR, AND APPA- RENT CONSUMPTION	99
<u>APPENDIX</u> C. APPARENT CONSUMPTION, COMPARISON WITH ESTIMATE OF ACTUAL CONSUMPTION	101
<u>APPENDIX</u> D. USE OF WOOD IN RURAL CONSTRUCTION	102

	<u>PAGE</u>
<u>APPENDIX</u> E. REGROUPING OF SAMPLE UNITS ON PER CAPUT- INCOME BASIS	103
<u>APPENDIX</u> F. CONVERSION FACTORS	104
F.1 Furniture	104
F.2 Rural Joinery	106
F.3 Urban Joinery	107
F.4 Square meters of joinery opening per 100 m ² floor area in urban construction	108
F.5 <u>Construction</u> : Use of wood products used per 100 m ² of floor area for formwork and scaffolding	110
F.6 Use of wood products in m ³ per 100 m ² of floor area	111
F.7 Quantity of wood needed to package a ton of export fruit	112
F.8 Miscellaneous	113

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

Paragraphs 1.2.e and K.2.f. of the Plan of Operation of the Lebanon Forestry Education, Training and Research Project state as two of its activities: "(e) An investigation of the present pattern of forest industries in the country will be undertaken. This study will include an appraisal of present and potential forest industry requirements and an evaluation of local wood supplies for forest industry use;" "(f) A wood consumption survey will also be undertaken to determine the present pattern of consumption of all forest products in the Lebanon and; taking into account demographic and other relevant trends, e.g. fruit growing, a forecast of the future requirements of the country for wood products will be made".

These studies are of course closely related to or form part of the "Economic research studies into the most suitable forest and tree species to be used in the various parts of the Lebanon, aimed at ensuring a balanced but economically justifiable forest development for the country" of paragraph 1.2.d (I).

Paragraph 1.5.IV. summarizes the purpose of these studies when it states: "Investigations will also be carried out into the present wood consumption and future wood requirements of the country, taking into account economic and demographic trends. This investigation will include studies of forest industries, particularly those concerned with packaging. The findings of these studies will be translated into appropriate forest production goals for the Lebanon".

On completion of this study and others, "an economic plan for the development of forestry and forest industries in the Lebanon will be prepared containing up-to-date information on the forestry and forest industries situation in the country with recommendations for implementation of development works".

Any forecast of future requirements of a commodity must be based on the exhaustive evaluation of the pattern of the current consumption. Various techniques were applied to provide this knowledge: examination of official records, statistics of building construction and production of fruit, etc. as well as a direct appraisal of the use of forest products by the main wood-using industries. A scrutiny of the export-import figures supplied an indication of the magnitude of the quantities of the different forest products that are imported; imports form the almost exclusive source of forest products for the national consumption and wood industries.

However the deepest insight in the pattern of present consumption was obtained from a sample survey of the use of wood products by the ultimate consumers, o.g. households, shops, companies etc.; 1400 people were interviewed during this phase.

The study was divided into three phases. First, a reconnaissance was made of the data already available and the quantity and quality of information on which to base the planning of the survey, o.g. demographic and economic statistics. Second, the survey was planned and carried out and its results compiled and analysed with the emphasis on usefulness for the forecast of future requirements: how much of each category of forest product is used, by whom it is used, how it is used and how much of it is being replaced by alternative wood or non-wood materials. Finally these findings were combined with basic socio-economic data and trends to estimate the future requirements of the different forest products.

The report follows the same outline. It first describes the existing information relevant to this study and discusses the planning stage, next presents the results of the survey and finally gives the procedure and findings of the projection of future requirements.

The authors express their sincere recognition of the cooperation given by the government and private individuals of many Departments and Offices, the representatives of the Lebanese wood working industry who showed invaluable interest and initiative, the village Mukhtars, the population and last but not least the four students of the American University of Beirut who made up an enthusiastic and intelligent team.

S U M M A R Y

In order to provide a quantitative basis for the planning of forestry in Lebanon, a study was made of present consumption and future requirements of wood products as indicated in the Plan of Operations of the Lebanon U.N.S.F. Forestry Education, Training and Research Project, executed by F.A.O.

A variety of techniques were employed in determining present consumption, of which the most important were a series of surveys of ultimate consumers of wood products. The survey data were supplemented with related data like building records, fruit and vegetable production and export statistics, trade and production records of wood products. Large consuming units were usually treated directly.

The collected survey data of ultimate consumption were largely of an enumerative nature. Detailed studies of various building classes and furniture types permitted the derivation of appropriate conversion factors through which the survey data were converted into volumetric estimates of wood consumption.

To estimate future requirements of wood products the present consumption patterns were related through a cross-sectional analysis to the basic factors influencing the use of wood, namely income level, demography, developments in techniques and taste and wood availability.

As target years for the forecast 1975 and 2000 were chosen. A series of assumptions were made regarding changes in the above mentioned basic factors that will take place between 1963 and the target years. Two alternative rates of economic growth (4% and 5%) were assumed resulting in an upper and a lower level of forecast.

The estimates of present wood consumption and future requirements are summarized in table 1.

The salient features can be summarized as follows:

- a. Sawnwood is consumed at the rate of about 130.000 cubic meters per annum or 0.06 m³ per caput. The major uses are: packaging (40%), construction (40%) and furniture (19%). Most of the sawnwood for construction and furniture was used by the urban sector (75%).

The requirements of sawnwood are estimated to increase at first rather rapidly; after 1975 at a much slower rate, attaining in 1975 1.7 times and in 2000 double the amount of current consumption. The slowdown after 1975 is mainly caused by substitution of sawnwood by alternative materials in the industrial sector (packaging). In the other sectors this rate of replacement is assumed to be much slower.

However, the bulk of the substitutive materials will probably be made up by other wood products, e.g. paperboard and other boards.

80% of total sawnwood consumption is imported in the form of sawnwood, 8% as logs which are sawn locally and 8% in the form of packing material of imported goods which is recovered and re-used. About 4% originates from the nation's forests.

- b. Building boards are used at an annual rate of 24,000 cubic meters. The major use is furniture (85%), the major users are the urban households (50% of total).

Of total board consumption 83% is locally produced blockboard, 7% locally produced particle board and 10% imported fibre-board. About 3000 m³ of peeled veneer is incorporated in the locally produced boards.

The requirements of boards will increase rapidly, reaching in 1975 1.5 times and in 2000 3.5 times the amount of current consumption. A very important shift from blockboard to other boards is believed to occur, as a result of increasing scarcity of sawnwood (the main component of blockboard) and trend towards fuller utilization of availability raw material (fibre and particle board).

- c. Plywood and Veneer

Plywood is consumed at a rate of 4,100 m³ annually. Most of it (60%) is locally produced from imported logs from West Africa. Furniture (35%) and construction (63%) are the major uses plywood is put to, urban households (70%) and rural households (14%) are its principal consumers.

Veneer (Sliced) is used at a rate of 900,000 square meters per annum. It is used for furniture (86%) and joinery (14%). Urban households use 60% of the total, rural households 23%.

Requirements plywood and veneer are expected to rise and are estimated to attain in 1975 1.4 times, in 2000 2.3 times present consumption level.

- d. Poles are consumed at a rate of 13,000 m³ per year, mainly in agriculture (75%).

Requirements are assumed to follow largely local supplies, staying till 1975 at the present level, attaining in 2000 1.7 times the present consumption level.

- f. Wood fuel is the largest single consumption item. At present 377,000 m³ per year are used in the form of fuelwood and charcoal: 236,000 m³ of fuelwood and 21,700 tons of charcoal.

Future requirements of wood fuel will closely follow its availability and price relative to other combustibles. Increase of income levels, viz. standard of living, does not have a significant effect on wood fuel consumption in the relevant income ranges at present and in the foreseeable future. Forest policy has to take into account this fact.

The two levels of forecast for wood fuel are made on the basis of a conservative and rational forest policy compared to an exploitative forest policy (viz. no effective policy at all).

Under an exploitative policy, it is expected that wood fuel consumption will drop in 1975 to 60%, and in 2000 to 27% of its present level. A conservative and rational policy has to restrict consumption in 1975 to 37%, but will probably allow in 2000 a consumption level of 48% of present use.

- g. Pulp and Paper Products are consumed at a rate of 24 thousand tons per annum. Due to a fast increase in population, and national income, as well as replacement of wood by paperboard in the packaging industry, requirements are expected to rise quickly, reaching in 1975 two and a half times and in 2000 ten times the present level.

TABLE: I

S U M M A R Y

CURRENT CONSUMPTION AND FUTURE REQUIREMENTS OF WOOD PRODUCTS

	Units	1959-1963 1/	1975		2000		Lower level
			Upper level	Lower level	Upper level	Lower level	
<u>Population</u> Total	Thous.	2170		2860		4690	
Urban	"	1050		1600		2890	
Rural	"	1120		1260		1800	
Per caput disposable income	Ll.at 1963 Value	951	1300		1160	2690	1880
Sawnwood	1000 m ³	135	254		246	333	279
Building boards	1000 m ³	22	36		33	88	73
Vanner and plywood	million m ²	2.0	2.9		2.7	5.3	4.0
Poles	1000 m ³	13	12		11	25	18
Match stock	1000 m ³	1.6	2.9		2.7	9.7	7.1
Pulp and paper (total Paperboard	1000 tons	24.1 3.3	62.2 13.9		55.6 12.5	290.7 97.1	190.0 58.8
Wood Fuel (Fuelwood & Charcoal	1000 m ³	377	225		140	170	100
Total requirements Roundwood equivalent	1000 m ³	782	967		838	2010	1423

1/ In general, current consumption has been estimated as the average annual value for the period 1959-1963.
The population estimate is for 1963.

1.0 M E T H O D O L O G Y

1.1 GENERAL

The principal objectives of the survey were to obtain data on which to base an estimation of the present consumption of wood products, and to provide quantitative and qualitative information enabling a forecast of future requirements. The survey had to provide the data necessary to establish existing relationships between consumption of wood products and income level, standard and way of living.

Several alternative approaches are possible for studies of this type. A usual approach is that of estimating apparent consumption or "disappearance". The import-export balance is added to domestic production and adjusted for changes in inventories. The next step is forecasting future wood requirements. Past fluctuations in apparent consumption are related to historical changes in population, income level and prices, and some aspects of the supply of wood products and competing materials. Those relationships are applied to long range forecasts of population, income and other relevant factors, to project requirements into the future.

Consequently, one of the first tasks was to determine the availability of data which might permit such relationships to be prepared. The export-import statistics are not always sufficiently reliable and detailed and do not exist prior to 1957.

Data on wood intake and production by secondary industries, such as furniture making, is incomplete for 1963 and lacking for previous years. The same applies to the plywood and board industry.

Equally critical is the lack of past population and income statistics. Estimates of National Income only go back to 1950 and are too rough to show exactly small annual changes. The last and only population census of Lebanon took place in 1932.

From this lack of basic data it must be concluded that the approach of apparent consumption could not be used

It was decided to supplement the available data with information to be obtained through a survey of the ultimate and some of the intermediate consumers of wood products.

Similar studies in other parts of the world have shown a definite correlation between wood consumption and levels of both income and availability of wood products. Geographical units or strata were designed according to different levels of income and wood availability. The field survey was thus set up not only to assess the amount of wood products currently used in the country, but to obtain sufficient information on the economic, sociological and ecological factors which determine the type and quantity of wood products used. These factors and relationships from the cross-sectional data were used as a tool in estimating future requirements.

1.2 CONSUMER CATEGORIES

The consumers of wood products were first divided into two sectors: the ultimate and intermediate users. Since the main purpose was to estimate ultimate consumption of finished wood products, the emphasis of the survey was placed on the final consumer units.

Intermediate users transform wood into final products. Additional information was gathered from this sector to support and complement the estimates from the study of final consumption, and to gain insight in the development of forest industries as transformers and suppliers of forest products. In the rare case that the consumption of a specific product, e.g. matches, was not quite possible to be estimated from data of ultimate consumption, then the consumption of the transforming industry was used.

The ultimate consumers were divided into sectors for the purpose of data collection and later analysis. Four basic considerations were made:-

- 1) The existence of statistics for consumer groups.
- 2) The importance of various consumer groups.
- 3) The necessity of group adjustment to avoid duplications or omissions.
- 4) Differences which might exist in the pattern of consumption between consumer groups.

The private sphere is subdivided into rural and urban, then again into households and non-households.

The public sphere contains local and central government.

The industrial sector comprises the packaging, match and some other industries. However, the buildings occupied by the industry and its employees fall under the private non-household sector.

1.21 Rural Households

The rural household sector had to be defined carefully, since much shifting of dwelling and place of employment occurs between urban and rural areas. Most of it is seasonal and the major part of the year is spent in either city or village. Thus as rural households were defined those whose residence is permanently in the rural areas, whether the household income is earned there or not.

The Lebanese population size is not precisely known, as no census has been taken since 1932. Since then, several attempts have been made to estimate the population which, however, carry systematic errors.

The last attempt to estimate the rural population was made by the IRFED Mission during 1959. Estimates from the village headmen of the population of their village were compared with aerial photographs. Even if somewhat lacking in exactitude, sometimes much in cases of individual villages, these figures seemed to be the most up to date and reliable of all available data. The wood consumption sample survey itself provide a check on the figures of the sample villages and proved that they were sufficiently close to reality. After adjusting some of the figures and bringing them up to date, the total rural population was estimated at 1,050,000 in 1963.

The majority of the rural people are engaged in agriculture (56%) with over growing emphasis on cash crops instead of subsistence crops. The major crops are fruit and vegetables. The infrastructure is fairly well developed and primary educational facilities are widespread.

Rural households use wood products for the construction of their homes and annexes and for furniture. The predominant housing type constructed is flat concrete roofed with walls of concrete or natural stones. No structural use of timber occurs in the buildings as lumber is very scarce. In the houses of the poor much re-use of wood takes place. The furniture is modeled after European fashion.

Wood products used comprise sawnwood, plywood, veneer and board products; the first two are generally used for joinery, whilst all four are used for furniture. There is little substitution of wood used for these purposes.

Use of fuelwood and charcoal, as well as poles for fencing and other miscellaneous wood use is included in this sector.

1.22 Rural Non-Households

This sector comprises all private non-household units. It includes such institutions as churches, mosques, private hospitals and commercial, industrial and educational buildings in the rural areas. It excludes wood use by governmental agencies. The major use of wood products is for construction - formwork and joinery - shop shelving and furniture. There is abundant use of substitute materials for furniture and exterior joinery.

1.23 Urban Households

The towns of Beirut and its suburbs, Tripoli, Zahleh, Baalbeck, Saida, Tyr, Aley, Bhamdoun, Jounieh and Jbeil make up the urban sector. Their population is not precisely known. The urban population grows very fast rendering a close estimate rather difficult. However, municipalities have some means to estimate the population size in an indirect way. These estimates were compared with those of other sources (IRFED, American University of Beirut, Office of Electricity), resulting in the following:

Urban Population in 1963:-

Beirut City	410,000
Suburban Beirut	360,000
Tripoli	130,000
Other towns	200,000
	<hr/>
TOTAL:	1,100,000
	=====

To this figure might be added about 20,000 foreigners permanently residing in Lebanon. Excluded are Palestinian refugees living in camps (100,000) and some 100,000 temporary residents, a large proportion of whom are laborers from Syria and Jordan.

Great differences in standard of living are reflected by the range in building class. But, apart from the temporary shacks of the extremely poor, the building type is all the same: multi-story apartment buildings. Suburban areas with one or two family dwellings are practically non-existent. Construction is of concrete and does not incorporate structural timber. Sizable quantities of sawnwood are used for formwork and scaffolding. What little wood is used for joinery is frequently replaced by substitute materials.

Furniture is of modern European style, incorporating the whole range of wood products.

Fuelwood is little used in the cities, but charcoal holds much its own, due to the specific uses it is put to.

1.24 Urban Non-Households

This sector comprises all non-governmental non-residential units. Its importance as a consumer of wood products for construction and furniture is reflected in the large share of commercial and industrial construction of the total floor area built: one fifth. However, much substitution of wood products by alternative materials reduces this importance. Most of the sawnwood is used for scaffolding and formwork. Metal furniture is common but often incorporates board and plywood.

1.25 Public Sector

This sector is steadily growing in importance. Most of the construction for the government is done under contract, but recently a special branch of the Public Works Department was established to construct important government facilities. Most of the government departments and agencies put out to contract their own construction and purchase their furniture, but most of the control is centralized in the Ministry of Public Works.

1.26 Industrial Use

Industrial use excludes wood use for company factory and company-owned residential building, which falls under the non-household sectors. It includes wood used for packaging of fruit, vegetables, beverages etc., boat and lorry building. The wood intake of the match industry is included in this sector.

Export packaging of fruit is a major use of sawnwood. Packaging consists solely of sawnwood and veneer boxes. There are no signs of introduction of alternative materials of some scale.

1.3 SURVEY DESIGN

The survey design was tuned to the existence of statistics which would enable an estimate of the ultimate consumption of wood products. Thus the approach to the consuming sectors as distinguished in the previous chapter varies from sector to sector.

1.31 Rural Sectors

As reliable statistics on related variables such as the floor area of new buildings were not available, it was necessary to carry out a sample field survey.

The rural survey was designed as a two-stage stratified cluster sampling.

1.311 Stratification

The stratification was based on the assumption that income level is the most important factor influencing the consumption of wood products. Wood availability in terms of exploitable high forests does not play a rôle in the consumption of industrial wood products, since the quantity of industrial wood extracted from local timber resources is negligible. Economic availability of wood products is virtually uniform all over the country, as roads reach practically every community. Carpenter shops are present almost in every village, whilst the nearest township can easily be visited for the purchase of furniture.

Beside income level, wood availability and altitude play a dominant rôle in the pattern of fuelwood consumption. In most cases delimitations of areas with different wood availability coincided with those of altitudinal zones.

The country was divided into geographical strata by employing three levels of income and wood availability. The French IRFED Mission provided data on which the income stratification could be based, while the FAO Forest Inventory Officer helped in delimiting areas having different degrees of access to stands supplying fuelwood. Of the nine possible strata seven were present. These were transmitted to a map on which all communities were shown. (See Appendix A.)

1.312 Selection of the Sample

The size of the sample in each stratum was based in first instance on the population size of the stratum, but the minimum sample size for each stratum was 64 households. Since the pattern of consumption was expected to be more diverse in the higher income areas, the strata with higher income level were sampled heavier than the lower income strata of a total of about 170,000 households, 615 were visited.

Of each stratum all villages were taken from the map and listed with their population size. From this list the appropriate number of sample villages were drawn at random with selective probability proportional to size and with replacement. The district headquarters provided lists of village households. From these lists 8 households were randomly chosen to be visited (or double that number if the village was drawn twice).

The number of households to be visited in each village was fixed at 8, as it was believed that an enumerator could cover them in one day, transport time to the village included.

1.313 Collection of Data

The enumerator interviewed, whenever possible, the head of the household, who was mostly assisted by his wife to cover specific questions concerning female territory. A questionnaire was filled out with data of the household consumption of wood products. The enumeration was kept as simple as possible and was based on counting, supplemented by some very simple measurements. The head of the household was asked whether some construction or repair had been carried out during the last five years. If so, the enumerator counted the number of wooden joinery items installed or renewed (see appendix F2) and measured the surface of the constructed floor space. Any furniture items bought during the previous twelve months were recorded next.

Regarding fuel consumption, not only the use of firewood and charcoal was taken but also that of alternative fuels. The enumerators were to take care to get a reliable estimate of fuelwood use, especially in case this was collected from nearby forests free of charge.

Particular emphasis was placed on the determination of household income. A farmer was never asked to estimate his own farm income, but was to state the area under cultivation, size of crop, number and age of fruit trees, number of livestock, kind of land tenure. From this information his net income was estimated.

All non-household units of the sample village were visited. In some cases of very large villages where non-household units were too numerous to allow complete covering, a representative sample was taken. The assessment of their wood use took place in a similar way as described for the households.

1.32 Urban Sectors

1.321 Construction

For all towns annual records exist showing the floor area of private construction. These were divided into four classes of residential and one class of non-residential buildings.

To determine the relationship between the quantity of wood products used and the area of floor surface constructed, of the different classes of urban building, discussions were held with architects, contractors and carpenters. A number of building plans were examined in detail to assess the content of wood products per unit of floor area of the buildings they referred to. A visit was paid to a sample of seventy five buildings under 6 years old, to determine the rate of use of alternative materials and the rate of change in this substitution during recent years.

1.322 Other Uses

A sample survey of urban households and non-households was carried out to assess the quantity of wood products used for maintenance and repairs, for furniture and fuel. The sample was randomly drawn from the records of the electricity office. Its files of electricity users covered practically all permanent urban households. In view of the great variety of urban consumers, a considerable sample of 400 household and non-household units were visited. A difficulty formed the estimate of incomes, as more often than not an inquiry of the sort was met with a categorical refusal. In these cases the household was classified into one of five broad income groups upon judgement of the enumerator, supported by related information as to number and profession of the employed household member(s).

The furniture items acquired during the previous twelve months were recorded by the enumerator and converted by the FAO officer into quantities of wood products, making use of conversion factors developed through a special survey of carpenters and examination of furniture model designs.

Included in this sector were all wood products used by urban households in their summer residences, whether or not these were located in urban areas.

1.33 Industrial Use

1.331 Packaging of Fruit and Vegetables

The estimate of wood use by this sector was based on available statistics of agricultural production, export and domestic consumption of fruit and vegetables.

A series of conversion factors concerning the wood used to package a ton of commodity had to be developed. A number of major container manufacturers was visited and data collected on wood content per box, empty and full weight and content of each type of box. These figures were compared with data from the Fruit Office on prescribed dimensions, weight and content of fruit containers. A field survey yielded information on re-use and data on odd type containers.

1.332 Other Industrial Use

All other major users were personally visited and their consumption recorded. A supplemental survey of a random sample of other industrial units was carried out.

1.4 PROCEDURE FOLLOWED TO ESTIMATE CURRENT CONSUMPTION

1.41 Rural Sectors

Since the field enumeration was based on counting, a series of conversion factors had to be developed. Numerous wood items were measured in the field by the FAO officer and their wood content established. A survey of furniture manufacturers and examination of current models yielded conversion factors for each item of furniture. Different series of wood conversion factors were developed for urban and rural areas, for different strata and income classes. They are given in Appendix E.

These factors were applied to the data recorded on the questionnaires. For each stratum the total consumption of the sampled household was calculated, reduced to per caput level. These per caput figures were applied to the 1963 stratum populations to give the total stratum-consumption, which were added to give the total rural consumption.

The non-household consumption was calculated in a similar way. The per caput values were calculated by dividing total village non-household consumption by the population number of the sampled villages.

1.42 Urban Sectors

The average ratio content of wood products per unit of floor area constructed—shown in Appendix E — was applied to annual urban construction data for each of the residential and non residential building class. An average annual consumption of wood products for urban construction was calculated from the totals of the last five years.

The consumption of wood products for other uses was computed from the sample survey conducted. The per caput figures were blown up using the 1963 urban population estimate. Furniture conversion factors used consisted of three series: one for the rich and very rich, one for the medium and one for the poor and very poor income classes (see Appendix E).

1.43 Industrial Sectors

The wood needed for the export packaging of fruit was calculated using the export statistics and the conversion factors developed for the wood needed to package one ton of fruit.

The estimate of the quantity of wood consumed for transport of vegetables and locally consumed fruit was based on production and consumption statistics, a general conversion factor for the wood content of boxes and assumptions regarding re-use of boxes and frequency of transport in bulk.

The other industrial consumption was directly estimated from interviews of manufacturers who reported their annual wood use.

1.44 Public Sector

The consumption of wood products by the public authorities was directly estimated from reports of the consuming agencies— furniture— and indirectly from the annually constructed floor area, by employing the same conversion factors as were used for urban private non-household construction.

1.5 PROCEDURE FOLLOWED TO PROJECT FUTURE REQUIREMENTS

The procedure used was not the same for all categories of use and users. When relationships between wood consumption and income level could be established, these were used for projection. The current per caput level of consumption was used as the basic figure. Assumed future changes in population, attitude towards wood, technology of the use of wood products, income level and distribution, as well as wood availability were brought to bear on the established relationships, which resulted in the forecast of future requirements.

What is forecasted are thus requirements of which the concept is not synonymous with the economic concept of "demand", nor is it equivalent to "need". Rather, it is a forecast of probable consumption under specified, assumed, levels of income, population, wood availability, etc.

The procedure followed is described in detail under those chapters where the forecast of future requirements is given.

Here follows a discussion of the re-classification of households according to their income level, used to establish the above mentioned relationships. (See also Appendix C).

In the African wood consumption studies, regional cross-section analysis of the data on wood consumption was applied to establish relationships between wood-consumption and income level (as well as wood availability). Of each geographical group of sample units the average income per caput was plotted against the quantity of wood consumed. After grouping the data of units with income levels falling within the same range, clear relationships resulted.

Owing to the wide ranges of income existing in the same geographical strata in Lebanon, it was thought that an alternative approach was warranted, since these differences could not be stratified satisfactorily on a geographical basis. If individual household income, and thus income per caput, could satisfactorily be assessed during the field surveys, sufficiently exact relationships could be derived from a light sample. All ultimate sample units or households could be regrouped according to their income per caput. The average per caput consumption of wood products of each income group, plotted against income level would then reveal the wished relationships.

Great pains were thus taken during the planning, designing of the questionnaires and actual field survey to estimate the household income correctly. Cross-checks of the resulting data with the scarce statistics available from other sources, proved that they were sufficiently reliable to be employed for the cross-sectional analysis mentioned above.

The pattern of rural and urban consumption was quite different. This was partly due to differences in income level and distribution, but the main reason lays in differences in consumer behaviour. So the analysis of the urban and rural data was carried out separately and relationships for each of these sectors established. In each case five income groups were formed.

INCOME GROUPS

<u>Rural Sector</u>		<u>Urban Sector</u>	
<u>Income per caput</u>		<u>Income per caput</u>	
L.L.	0 - 300	L.L.	0 - 300
L.L.	301 - 500	L.L.	301 - 900
L.L.	501 - 800	L.L.	901 - 2,000
L.L.	801 - 1,500	L.L.	2,001 - 6,500
L.L.	1,501 and up	L.L.	6,501 and up

2.0 B A C K G R O U N D

2.1 GENERAL BACKGROUND

Lebanon is described in many publications, from tourist guides to elaborate socio-economic studies ^{1/}. A brief summary of the salient features of the Lebanese economy follows.

For centuries Lebanon has been, by virtue of its favourable climatic, topographic and demographic characteristics, a haven for refugees from the surrounding countries. At present its higher wages lure large numbers of foreign labourers, while others are attracted by its liberal cultural and economic climate. The resulting concentration of people makes Lebanon the most densely populated nation in the region.

For reasons of accessibility, the mountains formed the best place of refuge during the past century and the first quarter of this century.

Lack of safe communication and commerce caused the rural economy to assume an arid character. In the process of securing vegetal and animal subsistence commodities, the pressure on the land turned the Lebanese mountains into very intensively exploited highlands by means of terracing. Of course, large scale denudation and subsequent erosion of forest and range land was inevitable.

Since the dates of freedom and later independence, the Lebanese economy was integrated into the world economy at an accelerating rate. The outstanding assets of Lebanon are its human resources, expressed in a traditional flair for trade and banking, coupled with other natural endowments conducive to the promotion of services, e.g. geographical location, mild climate, variety of altitudes within a compact area.

^{1/} F.A.O. Mediterranean Development Project, Country Report on Lebanon. Rome, 1959.

I.R.F.E.D. Mission to Lebanon, "Besoins et Possibilités de Développement du Liban". 3 vols., 1960-1961.

The Lebanese culture, due to massive emigration, had kept contact with growing civilizations, which resulted in the adoption of Western education leading to greater skill and more versatility, especially in the fields of trade and finance.

The expected rôle of Lebanon in the economy of the region would thus be one of a supplier of services. Indeed, during the past decades the part of national product arising from the sector of trade and other services has been growing steadily, reaching about 60% in 1963.

A large-scale migration accompanied this shift from an agricultural economy to an economy of trade and services, concentrated in the coastal towns. This rural exodus is continuing at present, though at a slower rate. In the process, large tracts of arable land were abandoned. The relatively high living standard and wages in the cities had a direct repercussion on the labour costs in the rural areas. A government policy of subsidizing agricultural production lacked, neither did there exist an import policy protecting the nation's farmers.

The inevitable result was that in the mountains only capital intensive horticulture, growing high-priced quality products could provide the numerous small farmers an income that did not compare too unfavourably with that of wage-earners in the towns. In the plains, on the contrary, where mechanization could be introduced in the large holdings, growing cereals and industrial crops could remain a profitable enterprise.

Since land suited for intensive farming is scarce in the mountains (lack of water and soil, steep slopes), the labor intensity, and thus the population engaged in agriculture, is bound to continue to drop.

Still there are large over-populated regions in the country, which received only recently an infrastructure and which are still in the same initial stage of evolution and socio-economic integration as the province of Mount Lebanon was several decades ago.

Labour extensive forage crops and forestry seem a good proposition for the use of the abandoned terraced land, which is subject to severe erosion if not put under protective vegetation cover.

The favourable growth of the Lebanese economy during recent years could not hide concern with the precariousness of the principal source of income, namely trade and services. With the growing autarky of the surrounding Arab countries, the export of services will decline greatly. The export of services not rendered primarily for the neighbouring countries depend equally precariously on political stability and international disposition in the region.

Hopefully, during recent years a trend can be discerned towards a more vigorous government development program and greater co-ordination of public and private effort in developing industry and agriculture on a nation-wide scale. Narrowness of the domestic market calls for an extremely careful production planning. Marketing possibilities at home and abroad need to be assessed. To open up the export market, the emphasis has to be put on producing high quality products at competitive cost prices. Failure to do so caused the apple and orange dramas in 1963, when large proportion of the abundant crop could not be sold. This struck especially hard at the small farmers, who had indebted themselves already while shifting from subsistence crops to a cash crop.

2.2 SUPPLY OF WOOD PRODUCTS

2.21 Forest Resources

The area which could be classified as forest comprises about 130,000 hectares. However about half has a crown closure of less than 10% and includes scattered bare areas. Of the rest about 40,000 hectares are oak coppice and about 25,000 hectares bears coniferous forest.

The 7000 hectares covered with Pinus pinca are virtually all planted and under private ownership. They form the best stands of the country and should be capable of yielding good quality timber. The prime interest of Pinus pinca stands lies in their production of nuts, much appreciated by the Lebanese and commanding a high price. Annual production is estimated to value 7.5 million Lebanese pounds.

The other coniferous forest comprises Pinus brutia and Juniperus spp. of which the first is mostly relatively young and the latter badly degraded. Of the Cedars of Lebanon 2000 ha. have survived, forming scattered stands in various sites of the high mountains.

State plantations so far were limited to a few scattered small areas.

The oak coppice is severely over-cut and grazed. In practice virtually all forests, except the highly valued Pinus pinca stands bear the marks of mismanagement and are in various states of degradation. Significant in this context is that 50% of the total wooded area has a crown closure of less than 10% and interrupted by bare land. Much, if not all, is degraded closed forest in the act of disappearing.

The annual exploitation is estimated at 9,000 m³ of saw-logs 10,000 m³ of poles and 377,000 m³ of fuelwood. Compared with the annual increment of the existing forest, the exploitation of fuelwood can not be made on a sustained yield basis and represents thus a consumption of forest capital. This fact, coupled with the devastating effect of the severe over-grazing by goats explains the poor state of health of the forest resources.

2.22 Forest Industries

For a country so poor in raw material and with such a small internal market Lebanon possesses a surprisingly developed wood industry. It is, however, not very diversified and produces mainly plywood and blockboard apart from furniture and joinery items. Raw material is drawn from imports. Furniture and joinery making employs 3000, the three plywood plants 650, box manufacture about 600.

Sawmilling

Virtually all sawnwood used for furniture and construction is imported. One of the plywood factories "Behlock" operates a saw capable of handling big logs. It works far under capacity producing only 500 m³ annually. Another plant is being installed - Snibois - capable of sawing 30 m³ per day.

All of the numerous large and small fruit box makers handle or can handle small sized logs. In fact many of the small units are located near forested areas, where they drew all their logs from before this was outlawed. Now nearly all their raw material is imported, mostly sawn; but some illegal cutting still goes on. The box makers are equipped with circular bandsaws.

Veneer, Plywood, Blockboard, Particle Board

There are three plants operating while a fourth one is going to start shortly. Competition already is very severe and none of them are working at full capacity. The domestic market is too small to absorb their output while export possibilities are diminishing as the former client countries open their own plants.

Veneer is sliced in one factory "Behlock" while the new plant will also be equipped with a slicer. Present production is about 200,000 m² annually.

Plywood and blockboard is or will be produced by all four plants. Especially blockboard appears to be a profitable product. Annual production amounts to 25,000 m³ of blockboard and 7000 m³ of plywood. The plywood and cover of the blockboard consists of peeled veneer, which is peeled in the plant from tropical hardwood logs imported from West Africa. Sawn softwood for the blockboard is imported Fir from Eastern Europe and Russia.

Particle board has been manufactured since 1958 by one enterprise-"Okal" - mainly to be made into prefabricated door leaves. Its poor quality (Kreibaum process) did not make it popular with the Lebanese furniture makers, although a sizeable quantity was exported to Jordan. Mismanagement led

to bankruptcy in 1963; but "Okal" is still operating though far below capacity. The largest plywood plant - "Ghandour"- started particle board production in November 1963, while "Snibois" is going to produce it too. It will be of better quality, but a three-layer board is not envisaged. Raw material will be wood refuse of various nature.

Fruit Packaging

There exist many box manufacturers with capacities ranging from 10,000 to 500 boxes per day. Boxes are of fir, spruce and beech, most of it imported as sawnwood except beech. In good harvest years, production can not by far satisfy demand, and the price of the boxes is too high. A modern plant with a large capacity and able to shift output to other end-products during slack seasons, might be a successful venture, e.g. an integrated cardboard factory.

Wire-bound veneer boxes are produced by one plant with limited success. Its output is 500,000 boxes per annum, while its capacity is 4000 per 8 hours-working day. The obsoleted machinery will be replaced by American Rockaway machines, which are adjustable to different sizes; then production is expected to double as marketability will be greatly improved.

Two match factories are operating, after the disappearance of a third one in 1962. Raw material is poplar logs imported from Belgium at a rate of 1600 m³ annually. Locally produced poplar is not appreciated because of low quality, lack of uniformity, small size, tendency to warp and knot-tiness of the wood.

Furniture and joinery manufacturers number about 400; only 3 of them employ more than 100 workers. Carpenters keep up with developments in furniture design and use a wide variety of wood and non-wood products. Especially blockboard is favoured; the introduction of formica to replace veneer in low priced furniture has proved to be very successful.

All paper products are imported, save 3000 tons of low quality cardboard, which is produced locally from waste material. However, a paper mill is in the planning stage. Its requirements of raw material will be met mainly by imported pulp and locally available waste paper and rags. An integrated plant of a stripped down design producing not only corrugated carton for boxes for fruit export but also wrapping paper, bags and sacks would be called for.

3.0 ESTIMATES OF CURRENT CONSUMPTION

3.1 CONSUMPTION OF SAWN-SOFTWOOD AND BEECH QUALITY, HARDWOOD, BLOCKBOARD OTHER BOARDS, VENEER AND PLYWOOD

Different wood products are used in considerable quantities concomitantly or alternatively. Their use had to be estimated using a survey technique also covering the pattern of use of these products, e.g. to what extent sawnwood is replaced by board. Thus, during the sample surveys, care was taken to distinguish between plywood doors and solid sawnwood doors between furniture items covered with formica and with veneer etc. Different conversion factors were also developed for items used by household in different income classes as the content of wood products change with changing standards of living (see Appendices D and F).

A special survey was carried out in the town to estimate the rate of replacement of wood by steel in outside joinery.

3.11 Rural Households

The rural population was estimated at 1,050,000 in 1963. The households referred to here are made up of families which have their permanent residence in the rural areas. The wood used in villagos by urban people when they build a summer house and equip it with furniture is taken with the urban sector.

The building type which is widespread in the country, and is now built exclusively, is of reinforced concrete or natural stones. Wood is only employed in the construction of joinery items and for formwork and scaffolding. These building practices are common even in small remote villagos.

Much of the wood is re-used timber from packing cases and is often of inferior quality. Sometimes wood for a door or window comes from a pulled down house in Beirut (in which case care was taken to avoid an over-estimation by discounting it from the urban consumption). A minor part is sawn locally from locally grown logs, but the bulk of the wood used is imported.

European-type furniture is used and wood is employed in many forms: Sawnwood, Blockboard, Particle Board, Plywood and Veneer.

The following table gives the consumption of wood products by the rural household sector.

TABLE: 1

RURAL HOUSEHOLD CONSUMPTION OF WOOD PRODUCTS
BY CATEGORY OF USE

	Joinery	Formwork	Furniture	Total
Sawnwood - Softwood & Beech(m ³)	5,900	3,000	6,100	15,000
Sawnwood - Quality Hardwood(m ³)	-	-	350	350
Boards [≠] - Blockboard (m ³)	-	-	4,400	4,400
Particle Board (m ³)	-	-	100	100
Veneer (Sliced) (1000 m ²)	-	-	210	210
Plywood (m ³)	280	-	300	500

[≠] The volume of boards for furniture is referred to as the finished product. Both blockboard and particle board are delivered from the factory with a peeled veneer cover, which is mostly 1 mm. Thick on particle board and 2 mm. thick on blockboard. This means that on the average about 14% of the blockboard and 6% of the particle board are veneer, which is the same peeled veneer as that which comprises plywood.

3.12 Rural Non-Households

TABLE: 2

TOTAL WOOD CONSUMPTION OF RURAL NON-HOUSEHOLDS

	Joinery	Formwork	Furniture	Total
<u>Sawnwood</u> -				
Softwood & Beech(m ³)	400	300	2,500	3,200
Quality Hardwood(m ³)	-	-	100	100
<u>Boards</u> -				
Blockboard (m ³)	-	-	1,500	1,500
Particle & Fibre Board(m ³)	-	-	200	200
<u>Veneer</u> -				
(Sliced) (1000 m ²)	-	-	50	50
<u>Plywood</u> -				
(m ³)	30	-	150	180

The relatively high rate of furniture use is probably the result of the fact that the proportion of restaurants and hotels, needing much furniture, is very high due to business from tourism and summer resorts. The rate of wood use for joinery is low because virtually all the shops and many other non-household units have metal joinery.

Many of the shops and restaurants open only in the summer, catering mainly to the needs of the tourists and city folks, who reside temporarily in the villages.

3.13 Urban Households

The urban population was estimated at 1,120,000 in 1963

The use of wood products by urban household includes what they consume in the form of joinery and furniture for their summer houses in the mountains.

Apartment buildings are built exclusively of concrete. Suburban areas with one or two family dwellings and gardens are non-existent. Virtually the only non-apartment buildings in the urban areas are the shacks of the very poor. Wood is employed only in joinery items and during the construction as formwork and scaffolding. Much of the wood for outside joinery is replaced by steel or aluminium. Solid door leaves are only used for entrance doors, the other door leaves being mostly of plywood with partially hollow souls. Prefabricated particle board doors of a honeycomb structure covered with veneer are used on a small scale, while flushwood doors sometimes replace solid sawnwood entrance doors.

The furniture is of the European type. Rapidly changing styles are closely followed by the more well-to-do classes. The furniture industry consumes considerable quantities of sawnwood, blockboard, particle board, plywood and veneer.

Table 3 gives the consumption of wood products by urban households.

TABLE: 3
URBAN HOUSEHOLD CONSUMPTION OF WOOD PRODUCTS
BY CATEGORY OF USE

	Joinery	Formwork	Furniture	Total
<u>Sawnwood</u> - Softwood & Beech (m ³)	26,500	12,200	9,300	48,000
Quality Hardwood (m ³)	500	-	1,600	2,100
<u>Boards</u> [≠] - Blockboard (m ³)	-	-	10,000	10,000
Particle Board (m ³)	200	-	400	600
<u>Veneer</u> (Sliced) (1000 m ²)	90	-	450	540
<u>Plywood</u> (m ³)	2,000	-	800	2,800

Wood for joinery is virtually all used in new constructions, since repairs in urban areas are negligible owing to the rent legislation ~~≠~~

[≠] See Foot Note of Table 1

^{≠≠} Ref. "The City of Beirut" - C.W. Churchill (1954)

3.14 Urban Non-Households

In non-residential constructions, wood is frequently replaced by metal, both in the small one-room shops and the multi-story steel and concrete commercial buildings. Metal furniture, however, often incorporates board and/or plywood.

Table 4 gives the consumption of wood products by urban non-households.

TABLE: 4

URBAN NON-HOUSEHOLD CONSUMPTION OF WOOD PRODUCTS
BY CATEGORY OF USE

	Joinery	Formwork	Furniture	Total
<u>Sawnwood</u> -				
Softwood & Beech (m ³)	2,200	2,800	1,800	6,800
Quality Hardwood (m ³)	200	-	250	450
<u>Boards</u> *) -				
Blockboard (m ³)	-	-	3,100	3,100
Particle & Fibre Board (m ³)	150	-	450	600
<u>Veneer</u> - (Sliced) (1000 m ²)	10	-	50	60
<u>Plywood</u> - (m ³)	240	-	210	450

*) See Foot Note of Table 1

3.15 Public Sector

During the period 1960-63 average annual construction by or for public authorities amounted to about 70,000 m² of floor area. The use of wood per unit of floor area is comparable to that of private non-household buildings, so the same conversion factors were applied here. This gives the following consumption estimates.

TABLE: 5

CURRENT CONSUMPTION OF WOOD PRODUCTS BY THE PUBLIC SECTOR

		Joinery	Formwork	Furniture	Total
Sawn Softwood & Beech	(m ³)	550	700	450	1700
Quality Hardwood	(m ³)	50	-	60	110
Boards - Blockboard	(m ³)	-	-	780	780
Boards - Particle	(m ³)	40	-	110	150
Veneer - Sliced	(1000 m ²)	3	-	12	15
Plywood	(m ³)	35	-	25	60

3.16 Industrial Sector

This sector excludes consumption for industrial buildings and furniture. It includes wood used for packaging and manufacture of matches, but excludes wood used by furniture makers as this is considered elsewhere, (being intermediate consumption).

3.161 Packaging

Packaging is one of the most important end-uses for wood and wood products all over the world. Its place in the Lebanese economy is best illustrated by the fact that fruit is the biggest export commodity. The value of fruit export is about 15% of the total export value or about U.S. \$16 million annually over the years 1959/63. A Government Fruit Office controls the export of fruit from Lebanon.

Almost all the packaging of fruit and vegetables is done in nailed wooden boxes. Before 1957 much of the wood was cut from local forests. With a rapidly increasing demand for box boards and a very limited local supply, the government prohibited all exploitation of local timber to protect the fast diminishing forest reserve. At the same time, all use of Pine wood was outlawed for fruit boxes to ensure the protection of the remaining national Pine forests.

Since 1957 almost all the box boards are imported as sawn Fir from Eastern Europe. Recently, Beech wood was introduced for the ends of the boxes; it is imported as small logs and sawn in the box factory.

In spite of the government restrictions, many of the numerous small sawmills producing boxes still use local wood. These boxes are for local transport, but are mostly standardized. Most of the vegetables and fruit for local consumption, however, are transported in a variety of wooden boxes, which are repaired and re-used indefinitely. Most of these boxes are made from re-used wood, especially from old packaging material of imported goods. Much of the fruit exported to Syria and Jordan is also packed in these unstandardized boxes of re-used wood, but this quantity decreases with increasing government control and constitutes now only about 30% of all exported fruit.

The government decrees of 1957 and 1959 prescribed the kind of packaging required for fruit export. App. F gives a description of the different kinds of wooden boxes and calculates the quantity of sawnwood needed for the packaging of 1 ton of fruit according to these standards.

The Bruce-box of wire-bound veneer has been manufactured in Lebanon since the start of a plant in 1957. Originally Beech logs were imported and the box shooks sliced in the factory. Since 1960 only ready-made beech shooks are imported (from Rumania). Since 1959 no increase in output has taken place due to the ineffectiveness of the manufacturing process. The management plans to replace the obsolete French machinery by Rockaway machines which can be adjusted to the assembly of different box sizes.

The actual output is about 500,000 boxes yearly which is only 40% of capacity. App. F gives the size, wood content and capacity of the veneer box and the quantity of veneer needed to package 1 ton of fruit.

Cardboard boxes are allowed for fruit export, but up till now only trials have been made involving negligible quantities.

3.1611 Export of Fruit

The Government Fruit Office estimated that of the total quantity of fruit exported, about 16% is transported in bulk, about 35% in non-standard packaging, and the rest in standard boxes. A survey of the variety of non-standard boxes showed, however, that the quantity of wood needed per ton of fruit was on the average the same as in the case of the standard boxes. For all export packaging the same conversion factors were used.

Table 6 gives the calculation of the consumption of sawnwood and veneer for the export of the different kinds of fruit.

TABLE: 6

ESTIMATED QUANTITIES OF SAWN WOOD AND VENEER USED ANNUALLY FOR THE PACKAGING OF FRESH FRUIT
EXPORT 1959 - 1963 AVERAGE

KIND OF FRUIT	Quantities of Fresh Fruit Exported in 1000 tons				Conversion Factors in m ³		Requirements in m ³	
	in Sawwood Boxes	in Veneer Boxes	in Bulk	Total	of sawwood or veneer per ton of fruit		of Sawwood	of Veneer
					for Sawwood Boxes	for Veneer Boxes		
Citrus	70.2	3.0	13.0	86.2	0.33	0.11	23166	330
Apples	40.1	8.0	-	48.1	0.41	0.10	16762	800
Peaches, cherries, apricots	2.3	-	-	2.3	0.44	-	1012	-
Pears	1.4	-	-	1.4	0.46	-	647	-
Plums	1.2	-	-	1.2	0.41	-	488	-
Quinces & Loquats	2.0	-	0.6	2.6	0.44	-	880	-
Fresh, Grapes	0.8	-	-	0.8	0.51	-	405	-
Figs	0.2	-	-	0.2	0.22	-	44	-
Bananas	4.0	-	11.4	15.4	0.47	-	1892	-
TOTAL	122.2	11.0	25.0	158.2			45296	1130

NOTE 3: 1/ The cardboard box has been introduced recently, but only on trial in negligible quantities.
 Corrugated board is used for inside wall lining in first and second class apple export

2/ For the calculation of the conversion factors see **Appendix F.**

3.1612 Local Transport of Fruit

The local consumption of fruit is very high. The 1959-63 average was about 275 thousand tons, of which 23,000 tons of apples. An important part of the local apple consumption passes through refrigerator storehouses and is put in new boxes. The other apples are transported in re-used boxes. The annual consumption of wood for local apple transport is estimated at 4000 m³. The amount of wood needed for the transport of the quantity of other fruit is very hard to estimate closely. A certain amount is not packaged at all; the boxes are repaired and re-used many times. If we assume 20 uses per box, an average conversion factor of 0.35 m³ wood per ton of fruit and that 80% of the fruit is packed, then a very rough estimate would be of 3500 m³ annually.

3.1613 Transport of Vegetables

The packaging of vegetables is not subject to any government control. Of all vegetables, mainly tomatoes and cucumbers are packaged in wooden boxes or trays. The export of these products is small and the packaging for it is re-used very often. Therefore an overall estimate, similar to that for local transport of fruit, has to be made. The total production of vegetables was 250,000 tons annually in 1959/63, of which 70,000 tons were tomatoes and cucumbers. The transport of this amount of vegetables would require, assuming 20 uses per box, 50% of the total quantity packed in wooden boxes, and 0.3 m³ of wood per ton of vegetables, an estimated 1850 m³ of sawnwood annually

3.1614 Packaging of Beverages and Other Commodities

Much of this packaging is done in stool (boer), but still the beverage industry requires a substantial amount of timber for its cases. Interviews with the most important manufacturers led to an estimate of 1,000 m³ of sawnwood used annually

The packaging of other goods for local transport and export required 1,500 m³ of sawnwood per year.

3.162 Other Industrial Uses

Two match factories supply Lebanon with its matches. Their raw material consists mainly of poplar logs imported from Belgium. Annual consumption is 1600 m³ roundwood.

Use of wood for railway sleepers is negligible as rail traffic is unimportant and is not expanding.

Further industrial uses, including boat building and lorry-bodies consume 100 m³ of sawnwood annually.

TABLE: 7

3.17 Total Current Consumption of Sawn Softwood and Beech, Quality Hardwood, Blockboard, Other Boards, Veneer, Plywood

a/ BY CATEGORY OF USER

	Softwood and Beech (m ³)	Quality Hardwood (m ³)	Block-board (m ³)	Other Boards (m ³)	Veneer (Sliced) (1000m ²)	Plywood (m ³)	Veneer Box shocks (m ³)
Rural Households	15,000	350	4,400	100	210	580	-
Rural non-households	3,200	100	1,500	200	50	180	-
Urban households	48,000	2,100	10,000	600	540	2,800	-
Urban non-households	6,800	450	3,100	600	60	450	-
Public Sector	1,700	110	780	150	15	60	-
Industrial Sector	57,250	-	-	-	-	-	1,130
TOTAL [≠]	132,000	3,100	20,000	1,650	900	4,100	1,100

b/ BY CATEGORY OF USE

Joinery	35,550	750	-	390	103	2,600	-
Formwork & Scaffolding	19,000	-	-	-	-	-	-
Furniture	20,150	2,360	19,780	1,260	772	1,500	-
Packaging	57,150	-	-	-	-	-	1,130
Other	100	-	-	-	-	-	-
TOTAL [≠]	132,000	3,100	20,000	1,650	900	4,100	1,100

NOTES: Blockboard ^{≠≠} consists for 14% or 2,800 m³ of peeled veneer, 17,000 m³ of softwood.
 Other board ^{≠≠} for furniture is 6% or 80 m³ peeled veneer and the rest or 1180 m³ board.
 So actual total Sawn Softwood and Beech Consumption is 146000 m³, other board-consumption 1570 m³, plywood and peeled veneer consumption 7,000 m³.

[≠] Figures are rounded.

^{≠≠} See remark under table 1

3.2 CONSUMPTION OF POLES

3.21 Agricultural Use

Poles are mainly used for fencing and supports. The average sized pole measures 2.5 m. in length and 11 cm. in diameter. Poles have different origins: pine thinnings, pine branches, oak coppice, poplar stands and fruit orchards. The total annual consumption is estimated at 10,000 m³.

3.22 Industrial Use

Poles are no longer used for buildings, except in some rural construction as scaffolding, when there is local supply. This use is estimated at 300 m³.

The transmission poles are all imported. The annual consumption amounts to 3,000 m³.

3.3 CONSUMPTION OF FUELWOOD AND CHARCOAL

Wood fuel is one of the main sources of heat and energy in the country. It satisfies roughly one third of the rural need of combustibles for heating and cooking. Cutting for firewood and charcoal is by far the most important form of exploitation of the existing forest resources. Over-cutting is held largely responsible for the poor state of the forests in conjunction with the excessive grazing by goats.

In this light, knowledge of the quantities consumed and extent of substitution by alternative combustibles acquires special importance.

In cases where firewood was purchased, an estimate of the household consumption was not difficult to make. But in the numerous instances where wood was cut free of charge from a nearby forest, special care was required to obtain a reliable estimate. Several checks and cross checks had to be made both by the enumerators and the officers.

Use of firewood and charcoal was recorded in local units of weight which were converted into tons. In order to get an overall figure, the wood equivalent of charcoal and conversion to solid cubic meters of all wood used yielded an estimate of total consumption in cubic meters.

An estimated 20% of the total firewood used comes from fruit and olive orchards.

The public and industrial sectors burn other fuels than wood.

3.31 Rural Sector

Most of the rural population lives in the mountains and on the elevated plain of the Bekaa. During winter the weather is quite cold there and a considerable amount of combustibles is burned for heating. In most villages households use firewood for baking their own bread. Wood is also still used for cooking. Charcoal is used for heating, cooking and for smoking the water-pipe ("Nargileh").

Alternative combustibles are widely used, due to the scarcity of firewood and convenience of burning other fuels in some instances.

TABLE: 8
CONSUMPTION OF FIREWOOD AND CHARCOAL BY RURAL HOUSEHOLDS AND
NON-HOUSEHOLDS IN THOUSAND CUBIC METERS OF SOLID VOLUME

	Firewood	Charcoal ('000 t.)	Wood Equiva- lent of charcoal	Total wood
Rural Households	216	12	78	294
Rural Non-Households	1	0.8	5	6
Total Rural Sector	217	12.8	83	300

3.32 Urban Sector

In the towns heating is mostly provided by non-wood combustibles, but charcoal is still widely used for cooking of local dishes, and for the water-pipe.

TABLE: 9
CONSUMPTION OF FIREWOOD AND CHARCOAL BY URBAN HOUSEHOLDS AND
NON-HOUSEHOLDS IN THOUSAND CUBIC METERS OF SOLID VOLUME

	Firewood	Charcoal ('000 t.)	Wood Equi- valent of charcoal	Total Wood
Urban households	19	8.8	57	76
Urban Non-Households	-	0.12	1	1
Total Urban Sector	19	8.9	58	77

3.4 CONSUMPTION OF PULP AND PAPER PRODUCTS

Lebanon does not produce pulp nor does it import any. A small quantity of low-quality paperboard is produced from waste paper. Paper products have not been included in the sample survey, so apparent consumption figures were taken from the import-export statistics. The net import of all pulp and paper products, to which the local production was added, is shown below.

TABLE: 10

APPARENT CONSUMPTION OF PULP AND PAPER PRODUCTS IN TONS ^{1/}

	1959	1960	1961	1962	Average
Newsprint	1,110	480	3,160	3,200	1,987
Printing and writing paper	5,320	6,800	6,900	7,860	6,720
Fine papers	780	260	400	600	510
Coarse papers	5,620	7,600	10,500	8,180	7,975
Special industrial papers	130	260	490	380	315
Sanitary and tissue papers	890	1,450	720	3,400	1,615
Building paper	100	300	540	560	375
Container board and box board	1,030	2,550	2,420	3,260	2,315
Building board	200	400	420	600	405
Paper and board articles	1,500	900	2,000	1,740	1,535
Books, periodics and other printed products	380	230	500	310	355
TOTAL	17,060	21,230	28,050	30,090	24,107

^{1/} Quantities might need inflating, due to attempts to evade import duties.

The annual consumption of pulp and paper products averaged about 24,000 tons from 1959 to 1962, or 12 kgs. per caput. The highest single item is coarse papers, which include wrapping and packing paper, paper bags. The largest consumer of these is the cement industry which uses about 4,000 tons of kraft paper. The fruit export packaging requires 550 tons of fine wrapping paper and about 450 tons of cardboard.

Beirut's printers serve many of the surrounding countries. A substantial part of the printing paper is exported again as printed matter, amounting to about 1,000 tons annually.

The value of the 1962 trade of pulp and paper products is shown below.

Value in thousands of U.S. dollars

	Printed Matter	Other
Import	2,354	7,078
Export	1,623	613
Net Import	731	6,465

3.5 TOTAL CURRENT CONSUMPTION OF WOOD PRODUCTS AND ITS ROUNDWOOD EQUIVALENT

The estimates of total current consumption over all Lebanon are summarised in table 11. below. The last column, representing the consumption of the different wood products in the same units, is given to allow for a rough comparison of their relative quantitative importance. These roundwood equivalents should be interpreted cautiously. The degree of comparability is limited due to the fact that these units represent wood products of widely different economic values. This is especially true of the two major groups of products: fuelwood and the whole group of industrial wood products. However, they compete in many instances for the same limited production factors and then represent products of alternative land uses.

The conversion factors used are based on FAO standard figures and interviews with manufacturers of plywood, veneer and blockboard. Details of the converting procedure can be found in section 4.6 and Appendix F.O.

TABLE:11

SUMMARY OF ESTIMATED CURRENT ANNUAL CONSUMPTION AND EQUIVALENT ROUNDWOOD VOLUMES

Primary Product	Current Consumption		Conversion Factor	Roundwood ^{3/} Equivalent in cub.m.
	Unit	1959-63		
Sawn Softwood and Beech	M ³	132,000	1.8	237,000
Sawn Quality Hardwood	M ³	3,100	1.7	5,300
Roundwood ^{1/}	M ³	15,000	1	15,000
Blockboard ^{2/}	M ³	20,000	14% peeled veneer 86% Sawn softwood	6,700 31,000
Other Board ^{3/}	M ³	1,650	6% peeled veneer 94% board	200 Waste
Plywood(peeled veneer)	M ³	4,100	2.4	9,800
Veneer (box shocks)	M ³	1,130	2.4	2,700
Veneer (sliced)	1000M ²	900	2 M ³ 100 M ²	1,800
Pulp and Paper Products	ton	24,000	4 M ³ per ton	96,000
TOTAL	-	-	-	405,000
Fuelwood	M ³	236,000	1	236,000
Charcoal	ton	21,700	6.5 M ³ per ton	141,000
GRAND TOTAL	-	-	-	782,000

^{1/} Of which 1,600 M³ match stock.
^{2/} See footnote under table 1.
^{3/} Figures are rounded.

4.0 ESTIMATES OF FUTURE REQUIREMENTS

4.1 FACTORS INFLUENCING CONSUMPTION OF WOOD PRODUCTS

Forecasts of future requirements can be made by projecting historical series of past trends. They have to be based largely upon the pattern of current consumption when time series are not recorded and thus not available. In both cases knowledge of future changes in the factors influencing consumption is necessary. In our case, time series were not available, and therefore assumptions of future consumers' behaviour are less reliable. Consequently the target years (1975 and 2000) are employed only as dates of reference, indicating when certain levels of income, population, development of technology and wood-availability will probably be attained.

The forecast of consumption is based upon a series of assumptions concerning the rate of change in the above mentioned factors. Those assumptions lead to certain factor-levels by 1975 and 2000, resulting in corresponding consumption-levels. If the rate of growth and change is faster or slower than is assumed here, then the specific levels will be reached earlier or later. It should be stressed, therefore, that forecasts are made of future requirements under specific levels of the basic factors rather than of future consumption in the years 1975 and 2000. Therefore these projections are given for purposes of exposition rather than as prophecies.

4.11 Development in Taste and Technology

Industrial wood has for a long time been scarce and expensive in Lebanon, and virtually all of it is imported. This fact, coupled with the influence of the close contact with Western techniques and taste and the satisfactory availability of competing materials, has resulted in the abundant use of alternative materials. It is especially noticeable where good quality sawn-wood was used previously; either that wood is used more economically (e.g. plywood doors) or it is replaced by non wood materials (e.g. metal joinery). However, these changes have not taken place uniformly over the country.

In the rural areas, wood is not used any more for structural purposes, but is often completely replaced by reinforced concrete. However, this brings about the use of wood for scaffolding and formwork. The joinery of many shops and some other commercial units is made of iron. Wooden fencing is replaced by concrete or steel poles. Firewood is used as much as fueloil and kerosine.

In other categories of use, wood still holds its own. The partial replacement of sawnwood by plywood and board in furniture and joinery represents a substantial economy in the use of wood. There is no noticeable trend towards using metal in outside joinery. Wood seems to be preferred here for its esthetic and technical properties. The use of board in joinery will probably not be of much importance in the villages, where individual taste and small numbers stand in the way of standardization. The village carpenter finds it easier to make a plywood door himself than trying to fit a prefabricated door-leave in its not-standard frame.

For scaffolding and formwork sawnwood is the only material used and will most probably continue to be so.

In the towns the trend to replace wood is much stronger. In Beirut city 60% of the total new floor area is now built with metal outside joinery, compared to 25% in 1958.

The increase in standardization, knowledge of the properties of metal and techniques of handling it, coupled with a shift in relative prices are no doubt the main causes of this change. It seems that the severe corrosion caused by the close proximity of the sea does not pose a problem of great concern for the builders. The "de-luxe" constructions use aluminium which does not have the disadvantage of corrosion. Many of the other buildings are more of a temporary speculative interest to the owner than a long term investment. In this last instance, the first owner has sold out before corrosion of the steel joinery poses a serious problem. Only in dwellings of a simple but solid construction, either built for the owner to live in and/or to form a permanent investment, wood has not given way much to steel. This is well illustrated in the summer resort towns in the mountains. Here, of course, the necessity of having shutters and the superior insulating properties of wooden frames and leaves play a rôle too

Most of the inside doors are of plywood with a sawnwood frame. A trend is noticeable to use more prefabricated particle board doors, which will become more important in the future.

Office furniture is virtually all of steel, which sometimes incorporates particle board. Domestic furniture is of sawnwood, plywood, blockboard and particleboard. Carpenters do not like particle board of the quality as it is manufactured now, but will no doubt change their mind when its quality is improved. It will probably replace blockboard, which is at the moment much favored, to a large extent. It is expected that plywood and veneer will hold their own, in view of the present already high rate of replacement by plastic and board.

No replacement of sawnwood by other wood products or steel has occurred yet for formwork and scaffolding. Attempts were made by progressive contractors but the limited skill of the construction workers caused them to fail.

4.12 Population Trends

The last population census which deserves the name was taken in 1932. Since then several attempts have been made at estimating the population.

Direct and indirect estimates of others and the results of the team's sample survey has led to a population figure of 2,170,000 in 1963, of which 20,000 were non-Arab foreigners residing in Beirut.

Generally a current net annual population growth rate of 2.3% is assumed, which, however, differs from urban to rural areas. The past has witnessed a rural exodus to the towns and abroad, as a result of rural over-population, which was due to past political-religious factors. At the moment, half the population is urban, with 35% of the total population living in Beirut and its suburbs.

The government has begun to pursue a definite policy to check the migration from village to city. It encourages decentralization of industry, it has inaugurated several social development schemes and concentrates its efforts on development of the country's natural resources. However, in view of the low standard of living of the farming population compared to other sectors of the population and the limited potentialities of the arable land, a further population shift from rural to urban areas has to be envisaged. This fact is further illustrated by a comparison of the past growth in the agricultural sector, less than 1%, and the natural growth rate of the rural population, about 2.5%.

Projections of the Ministry of Planning seem to indicate that the measures taken by the government will enable the agricultural sector to absorb about two thirds of the natural population increase, while the rest has to find employment elsewhere.

The foregoing deliberations lead to the following assumptions:

- 1) the rural population will increase at 1.5% per annum over 1963 - 2000;
- 2) the urban population will grow at an annual rate of 3% over 1963 - 1975 and 2.5% over 1975 - 2000;
- 3) as a result, the total population growth rate will be 2.3% up to 1975 and 2% from 1975 to 2000.

TABLE: 12

POPULATION PROJECTIONS SEPARATED INTO URBAN AND RURAL AREAS

	Rural	Urban	Total Lebanon	Unit
1963	1.05	1.12	2.17	Million
1975	1.26	1.60	2.86	Million
2000	1.80	2.89	4.69	Million
1963-1975 Growth Rate	1.5%	3%	2.3%	Percent per year
1975-2000	1.5%	2.4%	2%	Percent per year

4.13 Changes in Income

Increase in income enables consumers to respond more freely to "purchasing urges" arising from secondary values attached to the items involved. The pattern of consumer behaviour indicates that after the demand for primary goods is saturated, status- and other luxury purchases become more important. This fact has to be kept in mind when analyzing the consumption level of wood products of different income groups.

A national income survey has not been conducted so far. But several sources are available, which estimate National Income using mostly economic indicators, some current statistics on product by sector, and a partial survey of National Product by sector in 1956/57 ^{1/}. Two previous sample surveys have been carried out, which included data on family income ^{2/3/}.

In carrying out the Sample Survey on Wood Consumption much care was taken to collect realistic data on family income. Cross checks with the available information assured that the data from our survey agreed with statistics from the mentioned sources.

- ^{1/} Badre A.Y. - Economic Developments of the Middle East, 1956-57.
- ^{2/} Churchill C.W. - The City of Beirut, American University of Beirut, 1954.
- ^{3/} I.R.F.E.D. Survey, 1959.

The following table shows total national income and its distribution over income groups.

TABLE: 13
GROSS NATIONAL INCOME AND DISPOSABLE INCOME - DISTRIBUTION
OVER RURAL AND URBAN INCOME GROUPS (1963)

Rural Income Groups	Average Disposable Income per Caput (LL/year)	Population	Total Disposable income (in million of LL.) (1963)
High	3,000	50,000 (4.7%)	150 (24%)
Medium-High	1,100	160,000 (15.3%)	176 (28%)
Medium-Low	650	210,000 (20%)	137 (22%)
Low	400	315,000 (30%)	126 (20%)
Very low	150	315,000 (30%)	47 (7%)
<u>Total Rural</u>	606	1,050,000 (100%)	636 (100%)
<u>Urban Income Groups</u>			
Very high	10,000	19,000 (1.7%)	190 (13%)
High	4,250	113,000 (10.1%)	480 (34%)
Medium	1,450	290,000 (25.9%)	421 (29%)
Low	600	513,000 (45.8%)	308 (22%)
Very low	150	185,000 (16.5%)	28 (2%)
<u>Total Urban</u>	1,274	1,120,000 (100%)	1,427 (100%)
TOTAL LEBANON	951	2,170,000	2,063
GROSS NATIONAL INCOME (1963): L.L. 2,232 million			

- NOTE:**
- 1) The figures for disposable income include income in kind, while G.N.P. excludes it. However subsistence income is very small as Lebanese agriculturo cultivates mainly cash crop.
 - 2) Figures have been rounded off to the nearest unit.
 - 3) Figures of disposable income originate from the Wood Consumption Sample Survey; the source of the G.N.P. is an estimate from the American Embassy based on Badre's national product survey of 1956/57.
 - 4) The figures of G.N.P. and D.I. are in Lebanese Pounds, valued in 1963. The 1963 value of the LL is 77% of 1954 value.

From 1950 to 1958 the Lebanese economy has been growing at annual rates varying from 3 to 9%, averaging about 5% per annum. A considerable decline occurred in 1958 because of political troubles, while from 1959 to 1962 the average growth has been only about 3%. During 1963 a reversal of this declining trend in growth was observed and the growth rate returned to its pre-1958 mark of 5%. The 1963 vitality in the most important economic sectors was the result of renewed confidence in the strength and potentialities of the Lebanese economy. This optimism was caused by internal stability, but above all by a favourable turn of events in the surrounding Arab countries.

Forecasts of futuro growth over the next decades is a hazardous adventure, especially in Lebanon, where the economic weakness lies in the precariousness of the principal sources of income, namely trade and services. Therefore, two alternative rates of growth were assumed - 4% and 5% over the period of forecast.

Available information on social policy does not indicate that drastic steps are likely to be taken leading to major changes in the pattern of distribution of disposable income. Thus it has been assumed that the present pattern of distribution will be maintained over the forecast period.

Table 14 gives the projections of income and its distribution.

TABLE: 14

PROJECTIONS OF DISPOSABLE INCOME

Total Disposable Income
(millions of LL)

Income Groups	Rural				Urban			
	1975		2000		1975		2000	
	High	Low	High	Low	High	Low	High	Low
Very high	270	240	912	641	342	304	1155	811
High	317	282	1070	752	864	768	2918	2050
Medium	246	219	833	584	758	674	2560	1798
Low	227	202	766	538	554	493	1873	1315
Very Low	85	75	286	201	50	45	170	120
TOTAL	1145	1018	3867	2716	2568	2284	8676	6094

N.B. Figures are constant relative to 1963 values, i.e. 77% of 1954 values.

4.14 Wood Availability

At the moment the quantity of industrial wood from indigenous sources is negligible. Virtually all sawn wood being imported, the economic availability of it is governed principally by its price, which is dependent on the fluctuations in the world market. Plywood and boards are produced in Lebanon from imported logs at competitive prices and are freely used as well as sawnwood.

Transportation facilities are generally good all over Lebanon and even households from remote hamlets, which do not possess a carpentry workshop, can easily reach or be reached by the furniture or joinery maker in a nearby village or township. As a result, the physical availability of wood products is virtually uniform all over the country.

Future availability of logs grown locally depends entirely on the forestry policy and planting programs. It is assumed, however, that the economic and physical wood availability would not change much from the present, even if by the year 2000, Lebanon could supply itself completely with industrial wood. The price of locally grown timber will probably not be lower than of wood supplied from the world market. It will have to come from forest plantations, most of which can be established only at a high cost, owing to the difficult physical characteristics of future forest sites. Most of the harvest may be demanded by the paper and board industries, not allowing for more liberal use of sawnwood in construction and furniture manufacturing. The trends in the pattern of wood use in countries where wood is relatively abundant confirm this.

4.2 REQUIREMENTS OF SAWWOOD, PLYWOOD AND BOARDS

Cross-sectional analysis of the data from the sample survey resulted in a series of relationships between per caput income level and consumption. These relationships are presented in the following graphs.

4.21 Rural Households

4.211 Wood Used for Construction

The current building type uniformly adopted all over the country during post-war years has walls of natural - or cement stones and a flat roof of reinforced concrete. outside joinery is virtually all of sawnwood, inside joinery uses sawnwood and plywood. Furthermore sawnwood is used for formwork and scaffolding.

Replacement of wood by alternative materials is negligible at present. Wood is preferred for its good insulating properties and because it is better suited for use in non-standard construction. Because of these reasons it is believed that in the foreseeable future no major replacement of wood by other materials will take place in the villages, if relative prices and economic availability remain constant (as is assumed). It is not believed that there is much scope for further economy of wood use in rural construction.

Graphs 1 and 2 show that wood consumption increases with rising income. When income rises people tend to build bigger houses with more floor space per inhabitant and are liable to use larger and more substantial doors and windows, resulting in an increase of wood quantity used per unit of floor area constructed.

It can be noticed that, when income increases beyond L.L. 3.000 per caput, consumption-increases level off and even appear to show a slight reverse trend. The wealthiest people build with better quality timber that lasts longer and requires less repair and they use more plywood doors, which economize on the quantity of wood but cost more than the solid sawnwood doors of poorer houses which use poor quality-or re-used wood. The continuous rise of plywood use seems to affirm this observation.

Under the assumed levels of income and population, taking into account trends in consumer's attitude, wood availability and using the income-consumption relationships, the following projections are proposed:-

TABLE: 16

FORECAST OF SAWWOOD AND PLYWOOD REQUIREMENTS FOR CONSTRUCTION
BY RURAL HOUSEHOLDS

	1975		2000	
Level of Income Estimate	Sawwood m ³	Plywood m ²	Sawwood m ³	Plywood m ²
High	13,600	92,000	24,100	208,000
Low	13,000	86,000	24,000	174,000

Figure 3 - Consumption of Board, Softwood and Beech, and Quality Hard wood for Furniture by Rural Households

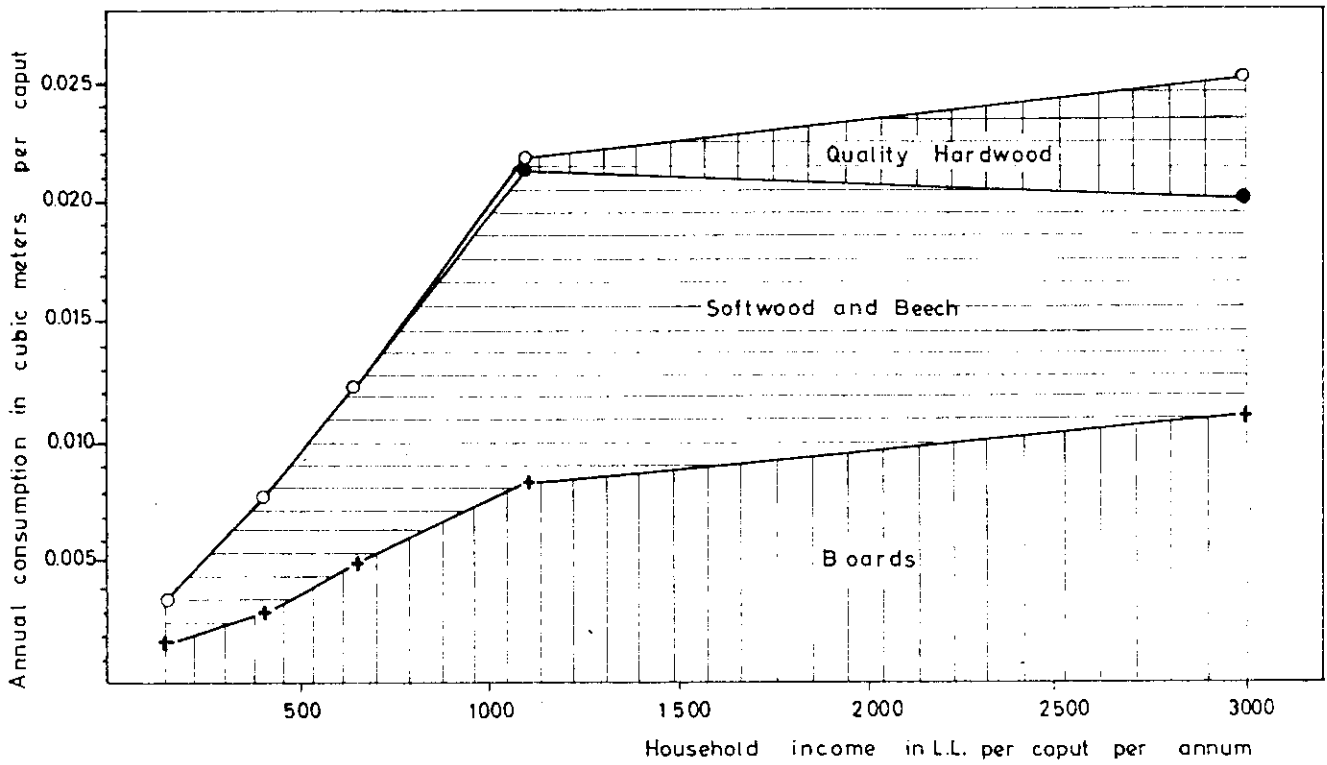


Figure 4 - Consumption of plywood and Veneer for Furniture by Rural Households

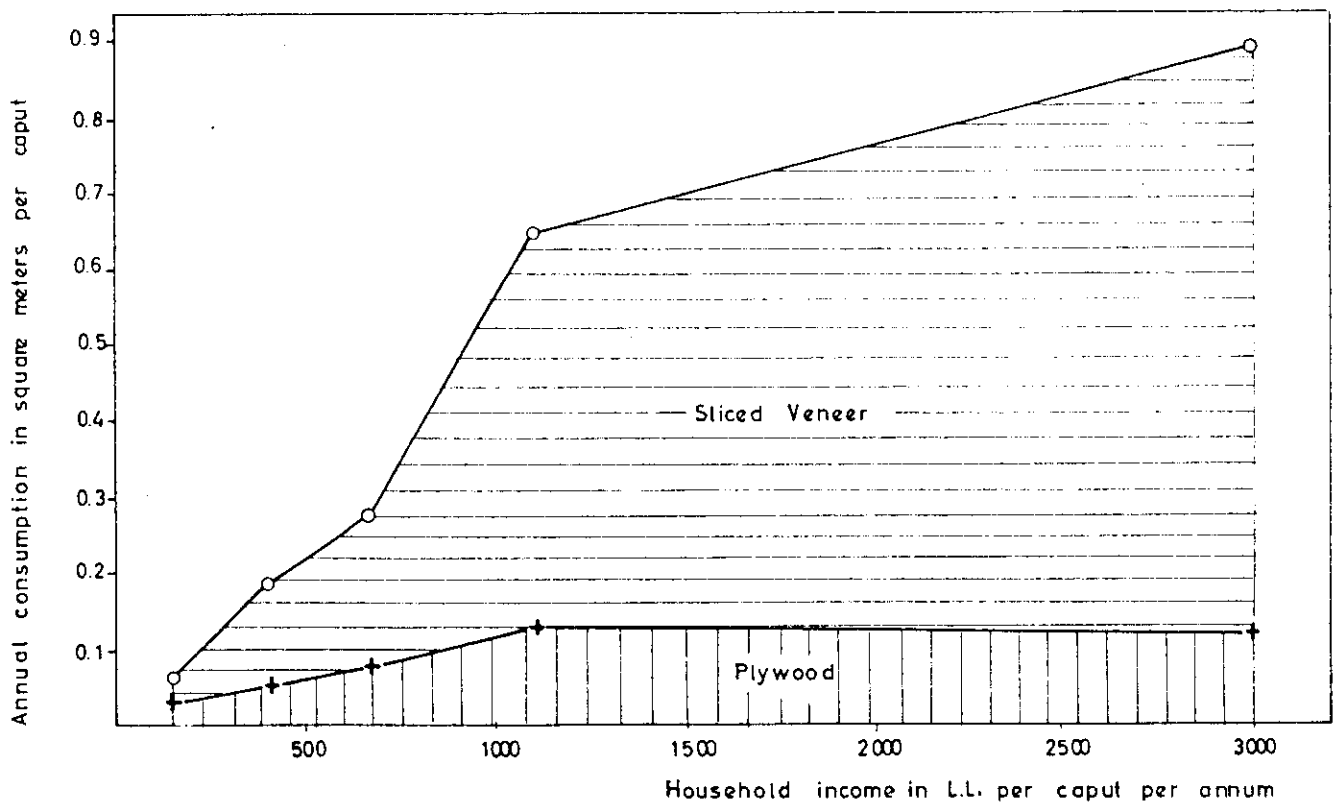


Figure 5 - Consumption of Boards, Softwood and Beech, and Quality Hardwood for Furniture by Urban Households

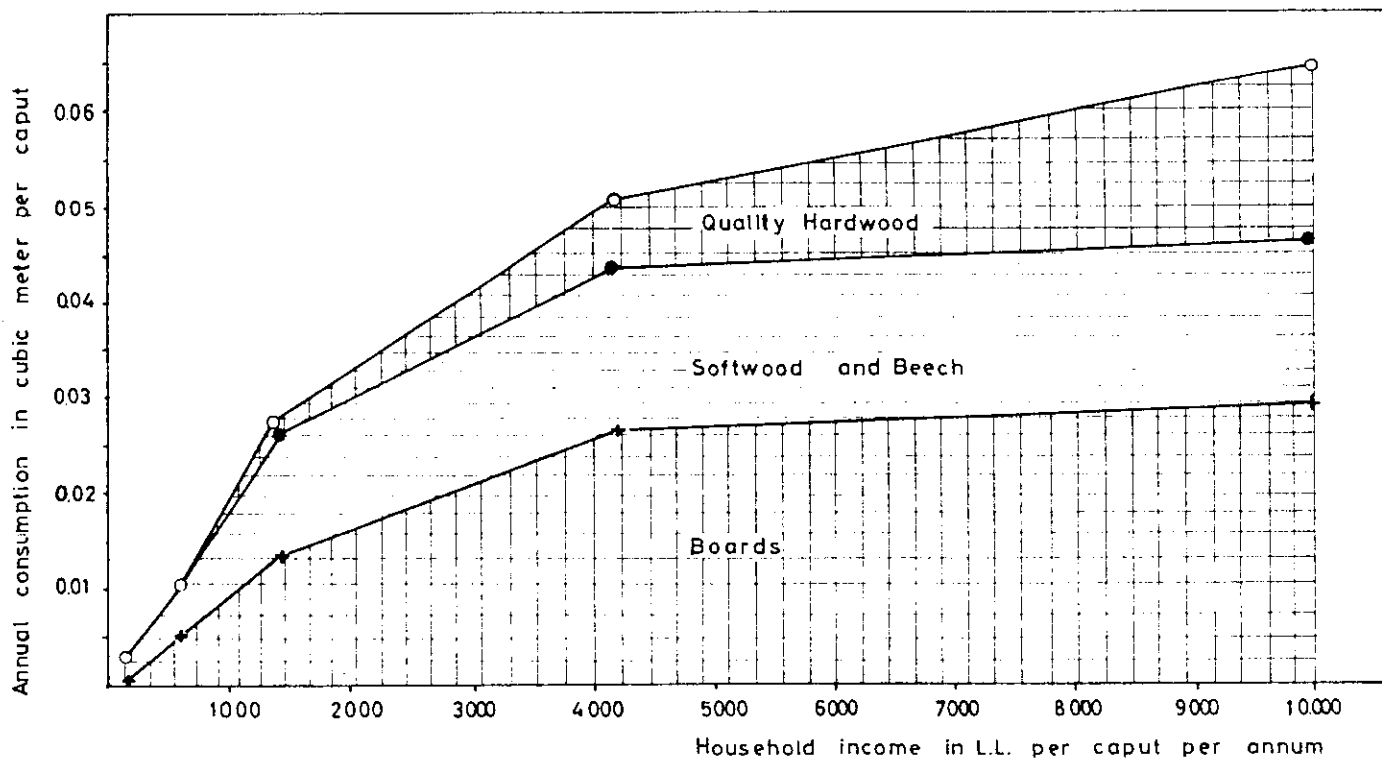
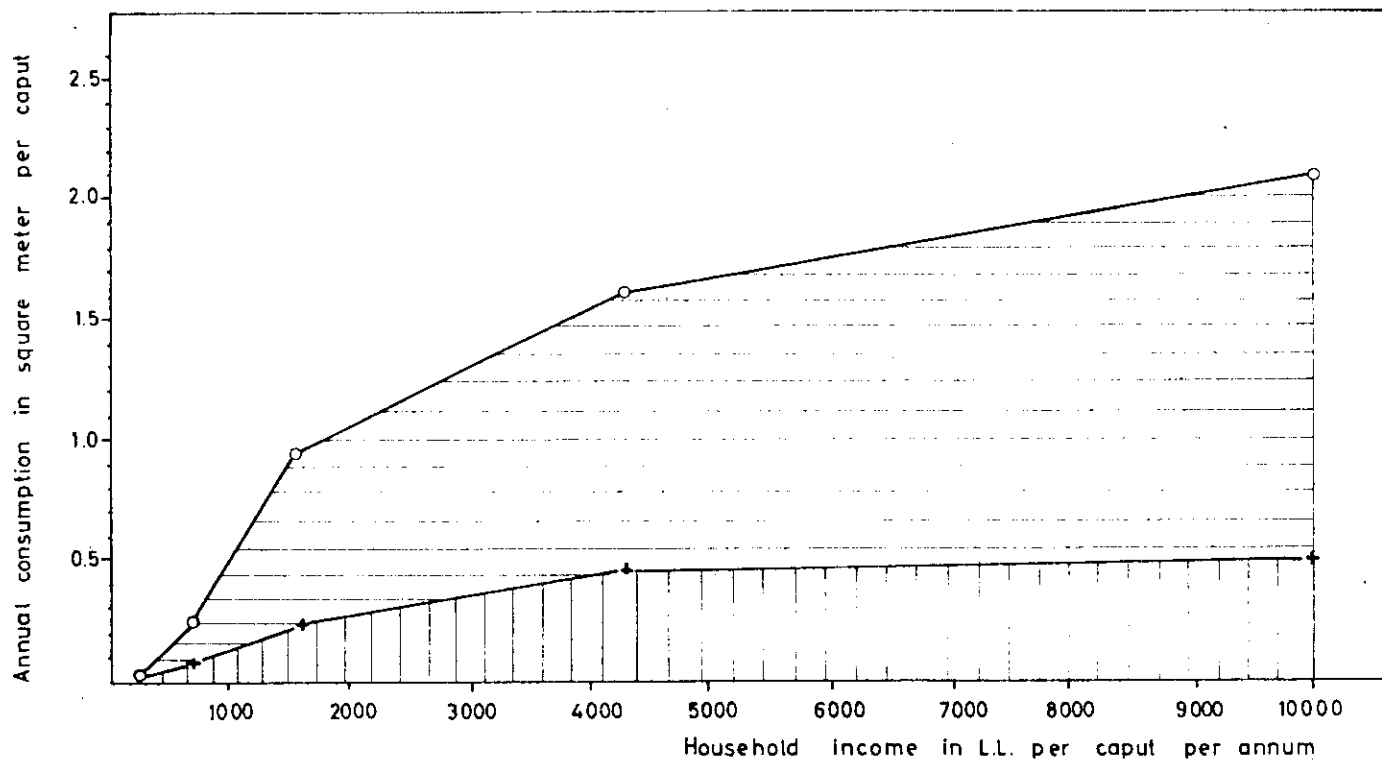


Figure 6 - Consumption of plywood and Veneer for Furniture by Urban Households



4.212 Wood Used for Furniture

Besides sawnwood, boards and plywood are employed frequently in the manufacture of furniture for rural households. Carpenters in the twons and large villages, who produce almost all of the furniture used in the rural areas, freely incorporate blockboard and plywood as well as sawnwood in their products. Most items are modeled after Western designs, but have been kept rather simple without much change in style over the years.

In the lowest income groups furniture use is extremely low and mostly consists of a few stools. From the very poorest to the slightly better off, acquisition of some furniture is on the priority list. With increasing income people tend to live in larger dwellings which require more furniture. In the highest income brackets, however, no significant increase in the quantity of furniture items takes place, but furniture is of higher quality. With rising incomes the use of veneer continues to increase while some of the softwood is replaced by quality hardwood. It seems that here a saturation point is reached for the total use of boards, and of sawnwood of low and high quality put together.

The pattern of use as related to income level is shown in graphs 3 and 4.

At present plywood and blockboard replace already much of the sawnwood used in furniture. This trend will continue over the forecast period, the more so when standardization and large scale manufacturing become more important with growing markets and improving technology. This will probably also entail a shift from blockboard to other boards, which are cheaper and easier to produce on a large scale. It is not thought that stool furniture will be considerably more used than at present in rural houses, except for out-door uses.

Taking into consideration these trends and income-consumption relationships the following projections are proposed under the assumed rates of income and population growth.

TABLE: 17

REQUIREMENTS OF SAWWOOD, PLYWOOD AND BOARDS
FOR FURNITURE IN RURAL HOUSEHOLDS

Level of Income Estimate	Year	Sawnwood (m ³)	Veneer and Plywood (m ²)	Boards (m ³)
High	1975	9,900	468,000	6900
	2000	9,400	443,000	6600
Low	1975	20,500	1135,000	14700
	2000	19,100	1002,000	13300

4.22 Rural Non-Households

A rough indication of the development of the rural commercial and industrial sector is given by the increase in per caput number of units established in areas of higher income level compared to areas of lower income level. From the sample survey, income elasticity of the number of units per caput appears to be 0.8 (expressed as relative increase in number per caput $(\frac{1. N\%}{1.1\%})$ over relative increase in per caput income $(1.1\%) = \frac{1. N\%}{1.1\%}$).

Under the assumed rates of income and population growth the annual growth rate of this sector would then be 3.5% to 4.3%. Further replacement of wood by other materials would result in a somewhat slower rate of growth in requirements, possibly 3-4%.

The growth in institutional building is expected to be a little higher than the population increase during the first decade, (due to present shortage of schools and the like) but will probably match population growth afterwards. The rates of increase of requirements in this sub-sector are assumed to be 1.5% up to 1975 and 1.3% to 2000 (a bit lower than the growth of this sector due to replacement of wood by alternative materials).

The following projections are proposed:

TABLE: 18

FUTURE REQUIREMENTS OF WOOD PRODUCTS BY THE RURAL
NON-HOUSEHOLD SECTOR

Level of Income Estimate	Target Year	Sawnwood (m ³)	Boards (m ³)	Plywood & Veneer (m ²)
High	1975	4,200	2,700	142,000
Low	1975	3,700	2,400	125,000
High	2000	10,400	6,300	351,000
Low	2000	7,300	4,600	246,000

4.23 Urban Households

4.231 Wood Used for Furniture

Furniture is modeled after European design and is subject to frequent style changes in the better quality classes. Carpenters freely use wood, plywood, veneer and boards besides formica, plastic and steel. Blockboard, which is delivered by the factory with cover sheets of peeled veneer, is especially popular with them.

In the lowest income brackets, furniture consumption is very low, but rises rapidly with increasing affluence. In the highest income classes a saturation level[‡] seems to be reached, which is, however, fixed at a much higher rate of consumption than in the rural sector. In the urban areas furniture consumption continues to rise with rising incomes while it seems to reach a saturation level much sooner in rural households. In the towns furniture of the most modern designs acts as a status symbol, while in the countryside simplicity and solidity prevail. Also affluent city dwellers often own or rent a second house in the summer resorts, which they often stock with a second set of furniture. Moreover the fashionable place to dwell often shifts from old to new town quarters creating an incentive to buy new furniture when moving into a new home.

Taking into account the observations and assumptions made in chapter 4.1, and applying the relationships presented in graphs 5 and 6, the following projections are proposed under the assumed levels of income and population.

TABLE: 19

FORECAST OF ANNUAL REQUIREMENTS OF BOARDS, SAWWOOD, PLYWOOD AND VENEER FOR FURNITURE BY URBAN HOUSEHOLDS.

Level of Income Estimate	Target Year	Sawnwood (m ³)	Boards (m ³)	Plywood & Veneer (m ²)
High	1975	17,800	16,900	1070,000
Low	1975	17,100	16,200	1020,000
High	2000	49,200	46,500	3140,000
Low	2000	39,200	37,300	2430,000

[‡] Of quantity of furniture used; expenditure for furniture still rises.

4.232 Wood Products Used for Urban Construction

During the last five years the average residential floor area constructed in urban areas amounted to 1,220,000 square meters annually, or 1.2 square meter per caput per annum. Strong yearly fluctuations occurred, reflecting the speculative character of a large part of the construction sector. Buildings, especially those of the "de-luxe" class, attracted a great part of the domestic and foreign investment. The bulk of post-war urban construction catered to foreigners, to high and medium high income groups and to the commercial sector, who could afford to pay the very high rent of new housing. This market appears now to be saturated, as evidenced by a great number of apartments staying empty and a slight decrease in building activity, observed in 1962 and again in 1964. However, a large market for low-cost housing is still untapped: the low-income groups living in overcrowded obsolete houses in a very bad state of repair, or in shacks. Government contributions will have to be made in this field, in the form of financial, organizational and technical help.

The construction figure for the period preceding the recent boom was 0.7 m² per caput per annum (of residential floor area). Taking into account the assumed annual urban population growth rate (2.7%) and the assumed annual rise in urban living standard (1.8%), for the low level of forecast 0.65 m², for the high level 0.75 m² was accepted.

The replacement of wood products by metal and other alternative materials was spectacular in the recent past. In the past 6 years the rate of replacement rose from 25% to 60% of the outside joinery in Beirut's new construction. In the newest buildings of the "de-luxe" class a return to wooden shutters is observed in some cases. These shutters, however, are of a new construction and incorporate much less sawnwood than the old type shutters. This, coupled with the fact that the "de-luxe" class construction forms only a small portion of the total and will probably proportionally decrease in the future, will render the impact on per unit wood use almost negligible. What eventually may adversely affect the use of iron in lower class housing is its increasingly bad reputation with regard to corrosion, unless frequently treated, under the effect of the over-blowing sea wind. However, some special anti-corrosion paints appeared on the market, which reduce the frequent necessity of treatment to only once per 10 years or less. Of course the main factors are still the financial and technological developments in the use of metal, wood and possibly other materials,

which are thought to bring about a further shift to other materials than wood in the coastal towns. In the mountain towns this shift will probably be of lesser importance, mainly because of less standardization, aesthetic reasons and insulation requirements.

The inside joinery will presumably remain of wood products. A shift to prefabricated particle board doors is expected, replacing many of the plywood doors.

Other materials are expected to replace sawnwood to some extent for formwork and scaffolding. Steel scaffolding and formwork of plywood or board will replace some of the sawnwood, which is at present the sole material used for this purpose. However, limited skill of construction workers will prevent these shifts to become soon important, so that it is expected that only after 1975 the impact of this change on total wood use for construction will be of importance.

At present the sawnwood for formwork and scaffolding is re-used very often, seven or more times, and employed too economically, resulting in poor quality of concrete structure ^{1/}. It is assumed, therefore, that with an improving building standard the consumption of material for formwork and scaffolding will augment per unit. The result may be that the effect of replacement of sawnwood will be off-set in 2000, while in 1975 consumption of sawnwood per unit will rise.

Foregoing considerations, besides the assumptions of chapter 4.1, lead to the estimate of future requirements of table 20.

TABLE: 20

FUTURE REQUIREMENTS OF WOOD PRODUCTS USED BY URBAN HOUSEHOLDS FOR CONSTRUCTION

Level of in- come estimate	Target Year	Sawnwood (m ³)	Boards (m ³)	Flywood and Veneer, (m ²)	Residential floor area to be cons- tructed(m ²)
High	1975	33,400	2,500	310,000	1200,000
Low	1975	29,300	2,200	260,000	1040,000
High	2000	47,500	8,300	590,000	2070,000
Low	2000	41,400	7,200	510,000	1880,000

N.B. An estimated 6% is added for maintenance of joinery and fittings.

^{1/} Also a result of the present speculative character of urban construction. The emphasis lies on finish, with a neglect for sound structure.

4.24 Urban Non-Households

At present there appears to be an over-supply of office space due to the construction boom of recent years. In the past, before this boom, non-residential construction accounted for 19% of total urban construction (Churchill's "The City of Beirut" gives, for the total floor space existing in 1954, 18% non-residential).

It is assumed that also during the period of forecast 19% of total urban construction will be for non-residential purposes, based on the fact that the urbanization rate itself reflects commercial and industrial growth.

The following projections are proposed.

TABLE: 21

REQUIREMENTS OF WOOD FOR CONSTRUCTION BY URBAN NON-HOUSEHOLDS

Level of Income Estimate	Target Year	Sawnwood (m ³)	Boards (m ³)	Veneer & Plywood (m ²)	Non-Residential floor area to be constructed (m ²)
High	1975	7,800	4,900	123,000	288,000
Low	1975	6,500	4,200	103,000	240,000
High	2000	12,600	9,300	259,000	520,000
Low	2000	10,500	7,800	574,000	434,000

4.25 Public Sector

From 1960 to 1963 governmental construction more than doubled. During the same period public expenditure rose at a rate of about 15% annually, while over the last 12 years this rate averaged about 20%. However, public receipts over the same period grew only 10% annually. The budget of 1965 is only 6.5% larger than that of 1964.

For the period up to 1975 the Ministry of Planning projects a similar annual rate of growth of public investment as of G.N.P. Our two levels of growth would then be 4% and 5%. It is probable that the high portion required for buildings will not decrease, since facilities for central and local government are still very insufficient. The governmental share in education is expected to rise, so that the requirements for school space will grow at a faster rate than the population increase of 2.3%. As a result the overall public expenditure on buildings is expected to rise by 4% to 5% annually up to 1975.

In 1975 physical public facilities are largely expected to suffice. Consequently it is believed that increase will follow the population trend after that year, resulting in an estimated growth of 2%.

Development in conversion factors will run parallel to those of other non-household constructions, (see Appendix E) while furniture consumption is assumed to rise at the same rate as total expenditure on buildings.

The proposed forecast is given in table 22.

TABLE: 22

REQUIREMENTS OF WOOD BY THE PUBLIC SECTOR

Level of forecast	Target Year	Sawnwood (m ³)	Boards (m ³)	Plywood & veneer (m ²)
High	1975	3,200	1,800	45,000
Low	1975	3,000	1,700	41,000
High	2000	4,700	3,100	84,000
Low	2000	4,300	2,800	78,000

4.26 Requirements of the Industrial Sector

4.261 Packaging

Packaging will remain a very important end-use for wood, and will even become more so with a fast increasing production of goods that have to be transported from producer to customer.

Fruit production is still relatively young in Lebanon and is in full development. It is more and more realized that the economy, which depends for about 60% on trade and services, needs a strong backbone in the productive sector. Development schemes undertaken or backed by the government aim at the exploitation of all natural resources of the country. Agricultural production in the form of fruit growing enjoys priority for economic as well as social reasons. Important irrigation projects are planned or are being carried out.

An important part of the increase in production will have to find a market outside Lebanon or will be processed, because the national consumption of fresh fruit will not grow at the same pace as production.

At the moment almost all the wood that is needed for packaging is imported and it can be anticipated that in 1975 it will still have to come from abroad. With rising prices and increasing scarcity of sawnwood, other than wooden boxes will be used to package at least part of the fruit for export. The wire-bound veneer box economizes much on the use of wood, but it requires high quality raw material, of which the economic availability and price will probably follow the same trend as that of sawnwood. Corrugated board and possibly other board will probably take over much of the market (although not to fast as in the U.S. where the share of corrugated board boxes for fruit packaging increased from 5% in 1950 to 50% in 1960). Much will depend on how the transport organization will develop, e.g. shipping methods. At any rate, the corrugated boxes have proved to be able to protect citrus fruit during sea transportation and to withstand the weight of stacking. At present, trials with cardboard boxes are being made and a paper-board mill is being planned. However, the box of sawnwood will only slowly yield its monopolistic position because of its good reputation, its flexibility and simplicity in production.

Thus it is assumed that in 1975 still 80% of the fruit export will be packed in boxes of sawnwood; that the production of wire-bound veneer boxes will double with the introduction of modern machines, and that the rest will be packed in paperboard boxes. For 2000 it is expected that sawnwood boxes pack 40% of the fruit, while paperboard boxes will pack the rest, veneer having disappeared from this market.

For local transport of fruit, sawnwood will probably hold its own; wooden boxes being suited to multiple re-use. Packaging of vegetables is expected to show similar developments as mentioned above for fruit packaging.

The use of material for other packaging will be related to the increase in industrial production. Sawnwood will probably be partly replaced by paper-board and other materials.

4.2611 Export of Fruit

The export packaging will become more and more standardized, whereas transport in bulk will probably cease to exist. It is assumed that there will be no change in the type of standard box currently in use. Therefore the same conversion factors as in 3.1611 for the quantity of wood needed to pack 1 ton of fruit are applied here.

Table 23 and figure 7 show the estimates of future fruit production, export and local consumption. The Ministry of Planning made the forecast for 1975. The projections for 2000 are made on the assumptions that production will increase at the same rate, resulting in an upper level; or at a rate 30% less, giving a lower level of forecast. This expectation of growth is likely since by 1975 many irrigation potential and other production factors will not yet be fully exploited.

Fast growth in wealth and population in Lebanon and the surrounding Arab countries is expected to solve on the long run the marketing problems which this sector experiences at present.

Table 23 a/ Growth of Production, Export and Local Consumption of Fruit in the past and Expected growth for the future.

TABLE: 23 a/

AVERAGE ANNUAL PRODUCTION (1000 tons)

	1955-1957	1958-1960	1961-1963	1975	2000 High	2000 Low
Citrus	108.7	148.7	196.7	365	700	600
Apples	29.3	53.3	79.2	170	350	300
Other	161.0	152.7	191.2	335	600	500

TABLE: 23 b/

ESTIMATED EXPORT QUANTITIES OF FRUIT (1000 tons)

	1975	2000 High	2000 Low
Citrus	190	260	190
Apples	125	240	200
Other	75	140	70

FIGURE 7

Annual production and
export of fruit in the
past and estimated for
1975

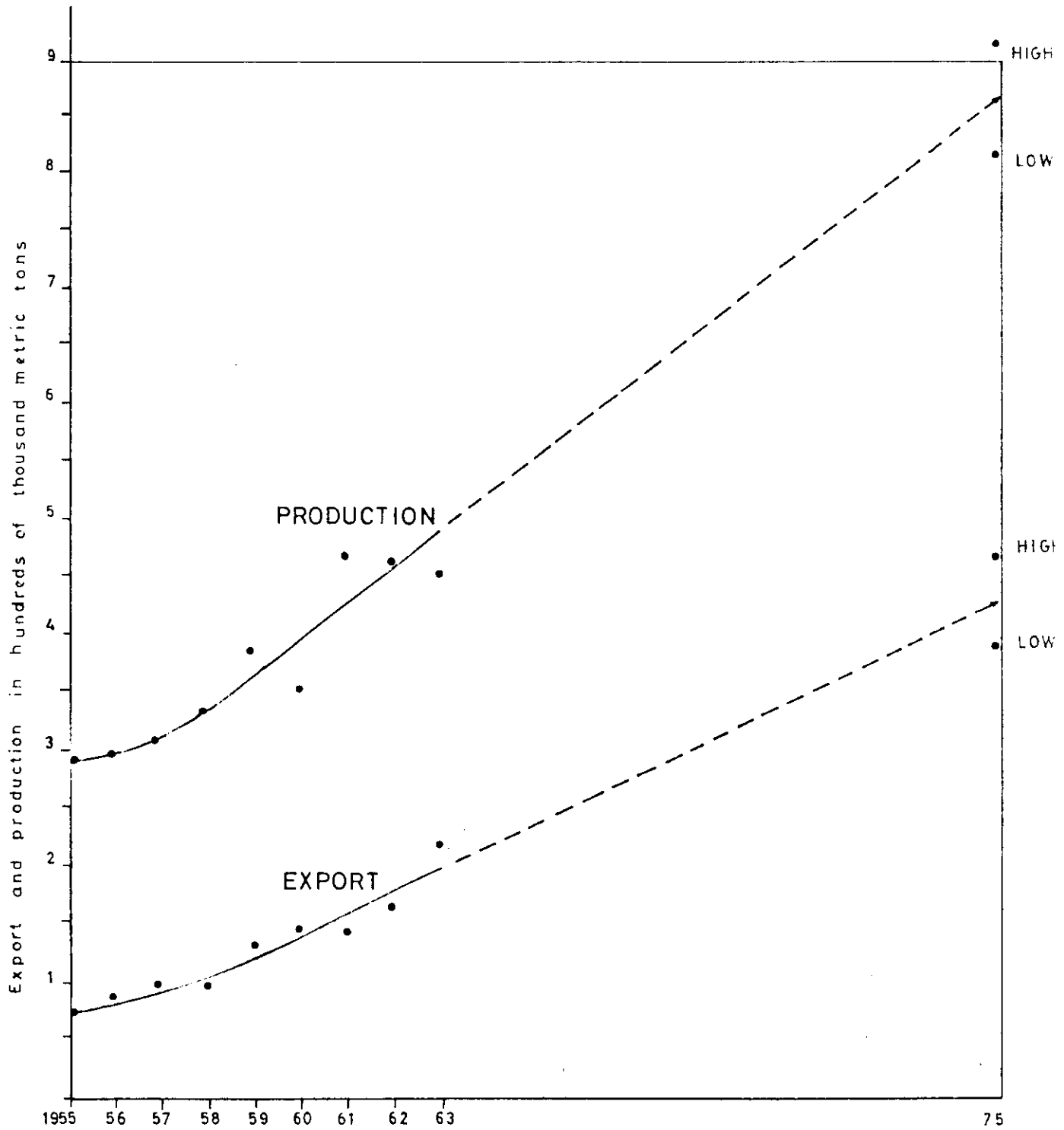


Table 24 gives the proposed forecast of requirements of Sawnwood, Veneer and Board for the Export of Fresh Fruit.

TABLE: 24

REQUIREMENTS OF SAWNWOOD, VENEER AND BOARD FOR THE EXPORT OF FRESH FRUIT

Kind of Fruit	1975		2000 High		2000 Low	
	Sawnwood and Veneer (m ³)	Paper Board (tons)	Sawnwood and Veneer (m ³)	Paper Board (tons)	Sawnwood and Veneer (m ³)	Paper Board (tons)
Citrus	50,800	1800	34,000	9,000	25,000	7,000
Apples	42,600	500	40,000	9,000	33,000	7,000
Other	27,000	800	25,000	4,000	13,000	2,000
Total	120,400	3100	99,000	22,000	71,000	16,000

Export of Canned Fruit and Fruit Juice is estimated to require about 100 tons of paperboard in 1975 and about 700 tons in 2000

4.2612 Local Transport of Fruit

The pattern of local transport is not expected to change much in the forecast period. Thus requirements of sawnwood are expected to rise proportionally with the quantity of fruit consumed locally. It is estimated that about 25,000 m³ are required in 1975 and about 36,000 m³ in 2000.

4.2613 Transport of Vegetables

The transportation pattern will probably not change much. There will be more export; the Ministry of Planning forecasts for 1975 a total production of about 370,000 tons of vegetables (of which 90,000 tons of tomatoes and cucumbers for local consumption; 13,000 tons of tomatoes and 64,000 tons of other vegetables for export).

The packaging for local consumption is estimated to need approximately 2200 m³ of sawnwood annually by 1975.

The export of tomatoes will require about 10,000 m³ of sawnwood, while for the other vegetables exported about 5,000 m³ of sawnwood will probably be needed.

For 2000 the local consumption of vegetables, based on the same per caput consumption as in 1975 (100 kgs.) and a population increase of 2%, will be 470,000 tons, which will require about 3,700 m³ of sawnwood for its transport. Export is estimated to roughly double between 1975 and 2000, probably requiring mostly carton boxes, but still needing about 13000 m³ of sawnwood annually (assumed is about 60% packaging in cartons).

The estimated quantities of wood and board needed for the transport of vegetables in 1975 and 2000 is summarized below in table 25.

TABLE: 25

	Production of Vegetables in 1000 tons - for:			Required Quantities of:	
	Local Consump- tion	Export	Total	Sawnwood (m ³)	Paperboard (tons)
<u>1975</u>	370	77	370	17,200	---
<u>2000</u>	520	150	670	16,700	1,000

4.262 Other packaging and Other Industrial Use

The requirements of other packaging will probably follow the industrial production of products now imported, and consumer expenditure for products now being made in Lebanon. It is thus assumed that, for the two levels of forecast, requirements will grow at a rate of 5 and 6% per annum. Substitution by alternative materials will result in an estimated reduction of 15% in 1975 and 30% in 2000.

The resulting projections are given below:

	1975 High	1975 Low	2000 High	2000 Low
Sawnwood required (m ³)	4,700	4,000	11,100	8,100

Under the assumption that the requirement of matches will grow at the same rate as national income, the following forecast has been made.

TABLE: 26

REQUIREMENT OF MATCH STOCK
(in cubic meters, roundwood measure)

Target Year	Level of Forecast	Requirement
1975	Low	2,700
	High	2,900
2000	Low	7,100
	High	9,700

4.27 TOTAL FUTURE REQUIREMENTS OF SAWWOOD BUILDING
BOARDS, VENEER AND PLYWOOD

TABLE: 27/a

BY CATEGORY OF USER

YEAR 1975				
Category of User	Level of Forecast	Sawnwood (m ³)	Boards (m ³)	Veneer and Plywood (1000 m ²)
Rural Households	High	23,500	6,900	560
	Low	22,500	6,600	529
Rural Non-Households	High	4,200	2,700	142
	Low	3,700	2,400	125
Urban Households	High	51,200	19,400	1380
	Low	46,400	18,400	1280
Urban Non-Households	High	7,800	4,900	123
	Low	6,500	4,200	103
Public Sector	High	3,200	1,800	45
	Low	3,000	1,700	41
Industrial Sector	High	164,000	---	575
	Low	164,000	---	575
TOTAL	High	254,000	36,000	2825
	Low	246,000	33,000	2653
YEAR 2000				
Rural Households	High	44,600	14,700	560
	Low	43,100	13,300	529
Rural Non-Households	High	10,400	6,300	351
	Low	7,300	4,600	246
Urban Households	High	96,700	54,800	3730
	Low	80,600	44,500	2940
Urban Non-Households	High	12,600	9,300	520
	Low	10,500	7,800	434
Public Sector	High	4,700	3,100	84
	Low	4,300	2,800	78
Industrial Sector	High	164,000	---	---
	Low	133,000	---	---
TOTAL	High	333,000	88,000	5245
	Low	279,000	73,000	4227

TABLE: 27 /b

BY CATEGORY OF USE

YEAR 1975				
Category of Use	Level of Forecast	Sawnwood (m ³)	Boards (m ³)	Veneer and Plywood (1000 m ²)
Construction	High	55,200	3,300	452
	Low	49,600	2,900	390
Furniture	High	34,500	32,400	1793
	Low	32,400	30,300	1695
Packaging	High	164,000	---	575
	Low	164,000	---	575
YEAR 2000				
Construction	High	85,000	10,600	926
	Low	77,000	8,900	796
Furniture	High	84,000	78,000	4840
	Low	69,000	64,000	3910
Packaging	High	164,000	---	---
	Low	133,000	---	---

4.3 REQUIREMENTS OF POLES

4.31 Agricultural Use

Replacement of wooden poles by metal or concrete poles has already become very frequent. One of the principal reasons is the lack of supply of good quality poles in sufficient numbers. If a regular supply can be secured from future forest plantations, this use should be an important outlet for thinnings. Many farmers will continue to favour wooden poles because of their ease of handling and their low price. Preservation of poles would add durability to these advantages. Consequently, it is expected that future requirements will remain unchanged up to 1975, but will be doubled by 2000. Thus the estimated requirements are 10,000 m³ for 1975 and 20,000 m³ for 2000.

4.32 Industrial Use

The requirements of wooden poles for scaffolding will also follow the supply, thus will remain at the 1963 level of 300 m³ up to 1975, whereas they will double in 2000 to 600 m³.

Transmission poles will be needed in lesser quantities in the years to come, as no more major extensions will be necessary. For maintenance, an estimated 1000 m² will be required in 1975 and 2000.

4.4 REQUIREMENTS OF FUELWOOD AND CHARCOAL

It is generally accepted that firewood consumption will decrease as a result of rising living standards. In other words, with time and rising income people will shift to other fuel for cooking and heating because of its greater convenience in use. This could imply that the present pressure on the forested area for firewood and charcoal will in due course be alleviated, allowing the forests to be managed on a sustained yield basis to produce industrial timber. It could also imply that the forest policy to be followed is: sit back and wait till income has risen high enough for people to leave the woods alone to us foresters to manage them for higher, sustained yields.

A careful analysis of the pattern of wood fuel consumption is thus called for.

The first observation is that, according to experts of silviculture and forest inventory, present growing forest stock cannot produce the 377,000 cubic meters which Lebanon burns each year as firewood or charcoal, on a sustained yield basis. Production of wood fuel over-exploits the already small forest reserves which are thus still shrinking.

Examination of the still existing forest land reveals that this situation has lasted for many years.

It is also known that before the last world war the rural use of alternative fuel was negligible, while in 1963 it replaced rural wood fuel to the extent of 60%. (Rural use makes up 80% of the total consumption of wood fuel).

Taking into consideration an overall demographic growth of 2.3% per annum and a rural population increase of 1.3% annually (emigration and rural exodus to towns), the rural population during the year preceding the second world war can be estimated at about 760,000. per caput fuel consumption can be estimated at 1350 thousand K. calories in 1938 ^{1/} (compared with 1650 thousand K. calories in 1963). Assuming that 90% of total fuel were wood and charcoal, we arrive at a 1938 consumption of 0.52 m³ fuelwood per caput, or a total rural household use of 392,000 m³ of fuelwood. Adding the non-household use (2%), we get a total rural fuelwood consumption of 400,000 m³ in 1938.

When we compare rural fuelwood consumption in the years 1938 and 1963, we see that rural per caput use decreased during the past 25 years by 0.24 m³ or 84% and total rural use by 100,000 m³ or 33%, whilst the rate of replacement by other fuels increased from 10% to 60%.

A cross-sectional analysis of current consumption data was made in order to establish a relationship between fuel consumption and influencing factors. Three factors were singled out viz. Income level, fuelwood availability and altitude.

Fuelwood availability and altitude were combined, since the geographical stratifications according to the two factors coincided almost everywhere in the sample.

Table 28 and figure 8 and 9 show the results, from which we can draw the following conclusions.

^{1/} Income level rose about 1% per caput per year between 1938 and 1963; the relationships between income level and fuel consumption shown in table 28 and figure 8 and 9 are used.

TABLE: 20

RURAL PER CAPUT CONSUMPTION OF COMBUSTIBLES (in 1000 K. Calories) RELATED TO INCOME LEVEL

ALTITUDE	0-199 m		200-399 m		400-599 m		600-799 m		800-999 m		1000-1200 m		AVERAGE	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
INCOME														
ILL. per caput														
150	269	408	316	200	642	436	513	574	605	696	929	453	546	461
400	504	540	350	485	548	786	575	720	688	1,047	555	1,064	537	773
650	602	653	528	525	765	690	777	883	688	1,070	701	1,160	677	830
1,100	408	657	355	747	713	934	714	886	773	4,290	675	2,763	606	1,213
3,000	560	542	605	1,258	897	1,660	945	1,734	1,219	1,998	921	3,200	858	1,732
AVERAGE	469	560	431	643	713	901	705	959	795	1,220	756	1,728	645	1,002
AVERAGE(1)+(2)	1,029		1,074		1,614		1,664		2,015		2,484		1,647	1,647

(1) Fuelwood and Charcoal
(2) Fueloil, Kerosine, Butagaz

Calory-value of combustibles:

Fuelwood: - 1 ton = 1.3 m³ = 3,500,000 K. Calories
Charcoal: - 1 ton = 6.5 m³ = 8,000,000 K. Calories
Fueloil: - 1 liter = 8,900 K. Calories
Kerosine: - 1 liter = 8,000 K. Calories
Butagaz: - 1 bottle = 200,000 K. Calories

SOURCES:

1. Vademecum du Forcstier, Paris 1961
2. Timber Trends and Prospects in the Asia - Pacific Region, FAO, 1961
3. Kollman, - Technologie du Bois

Figure 8 - Average rural per caput consumption of combustibles related to altitude.

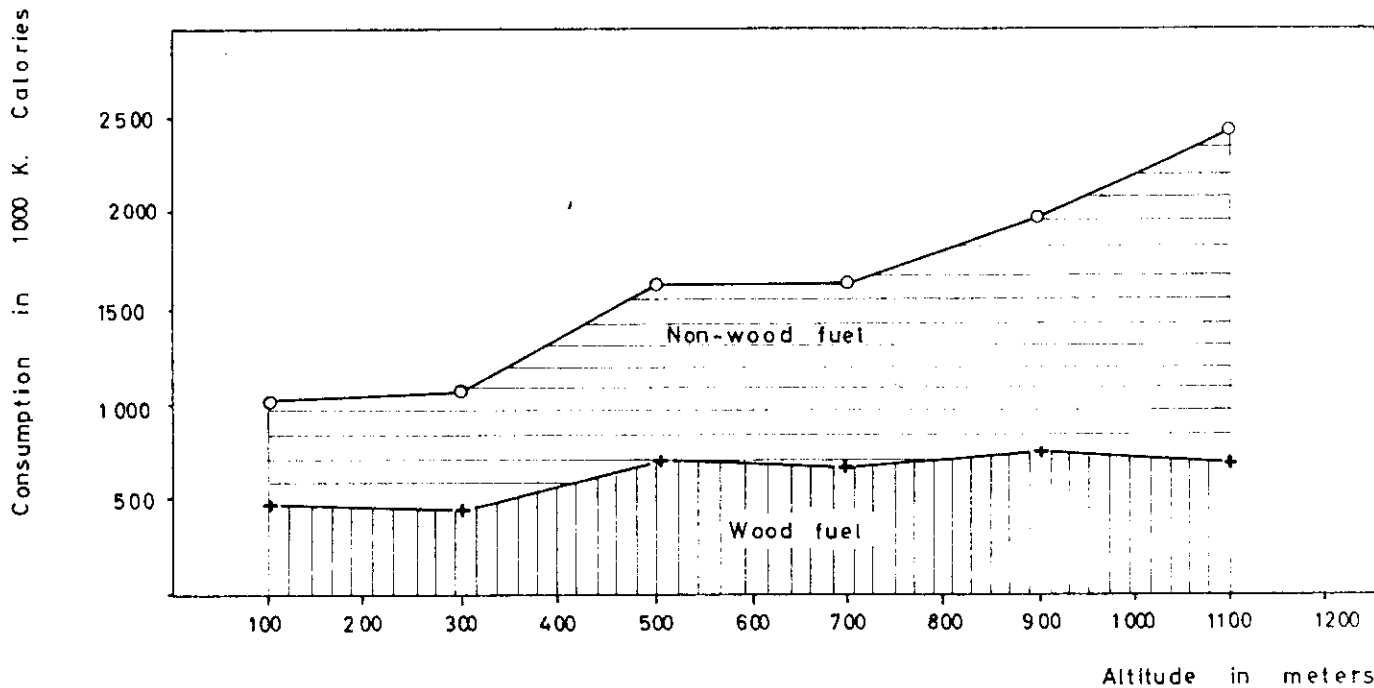
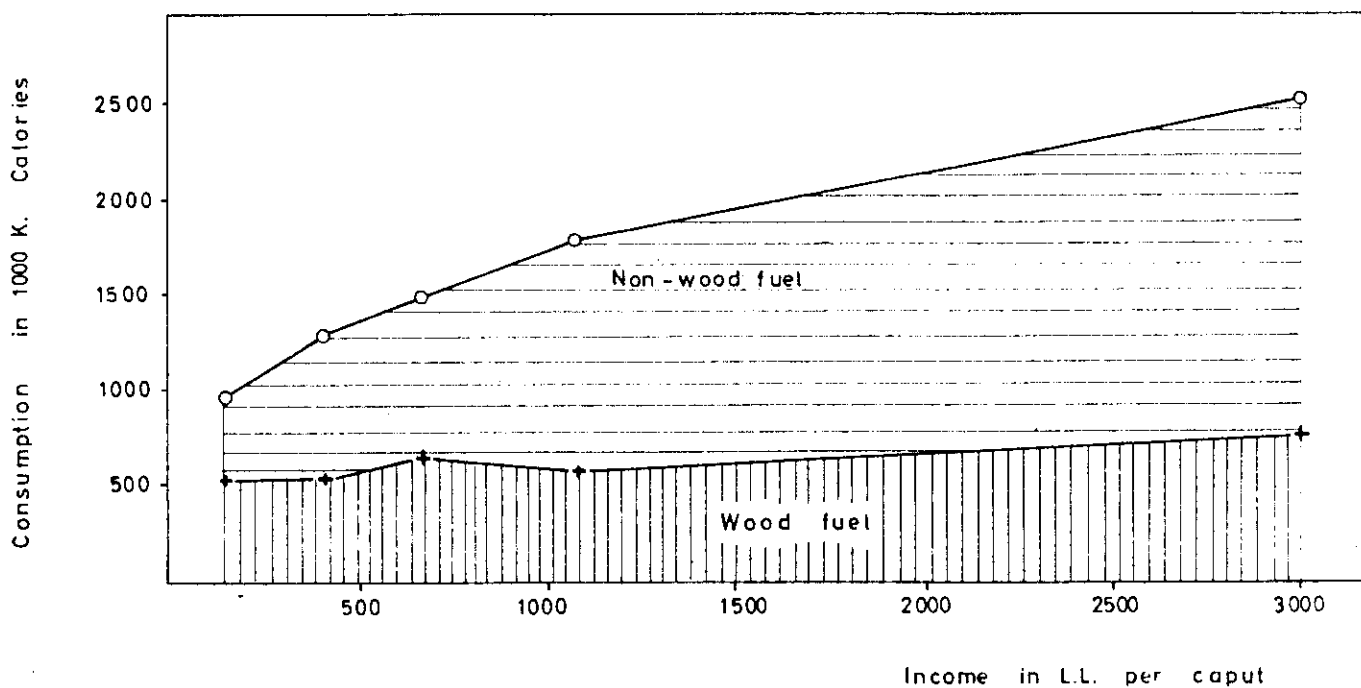


Figure 9 - Average rural per caput consumption of combustibles related to Income level.



There appears to be a considerable increase of fuel consumption when income level rises. Wood base fuel increases slightly, most of the increase of total fuel use is caused by a substantial increase of the use of alternative fuels.

With increasing altitude and improving wood availability, total fuel consumption rises fast. Use of wood fuel increases only slightly, due to the fact that no really great differences exist in economic fuel wood availability. Use of non wood fuels increases sharply, meeting the rapidly increasing need for combustible.

Whether the increase in consumption of combustible is due to rising income or increasing altitudes, in both cases the relative importance of wood base fuel decreases from about one half to one third of total fuel consumption.

When we review all the facts (viz. over-exploitation and degradation of fuelwood resources in the past and present; decrease of the use of wood-base fuel, both per caput and total (during the past 25 years); that with rising income levels we see increases of total fuel consumption, decreases of relative importance of fuelwood, but no decreases in absolute amount of fuelwood used 1/) they seem to point out that availability of fuelwood and alternative fuels, and not improving living standards 2/ was mainly responsible for the decrease in fuelwood use during the past. Economic availability of alternative fuels did not and does not keep pace with the rising need of combustible, as it is witnessed by the continuous over-exploitation of most wooded areas for fuelwood. Thus it is to be expected that the past pattern will repeat itself in the future, unless a constructive forest policy is applied, aimed at relieving the pressure on the forest.

Urban consumption makes up only 20% of national use. This proportion is likely to decrease in the future. Wood fuel will most probably become scarcer and more expensive all over the country under the influence of resource depletion and rising cost of extraction and transport, which bear specifically heavy on a bulky commodity like wood fuel. Rising costs and scarcity make themselves much more felt in the city than in the countryside, and fuelwood is affected to a much larger extent than charcoal.

1/ and 2/ At least not in the relevant income ranges of the present and of the future forecast period.

In the urban areas fuelwood and charcoal meet only a very minor part of the total need for combustible. Prices of charcoal and fuelwood have risen so high that other fuels have become more economical. Furthermore the advancing technology favours the use of other fuels, as do social changes taking place at present.

The following graph and table show the relationship between income level and fuelwood and charcoal use in the cities.

FG. 10. Average Urban per Caput Consumption of Fuelwood and Charcoal related to Income Level

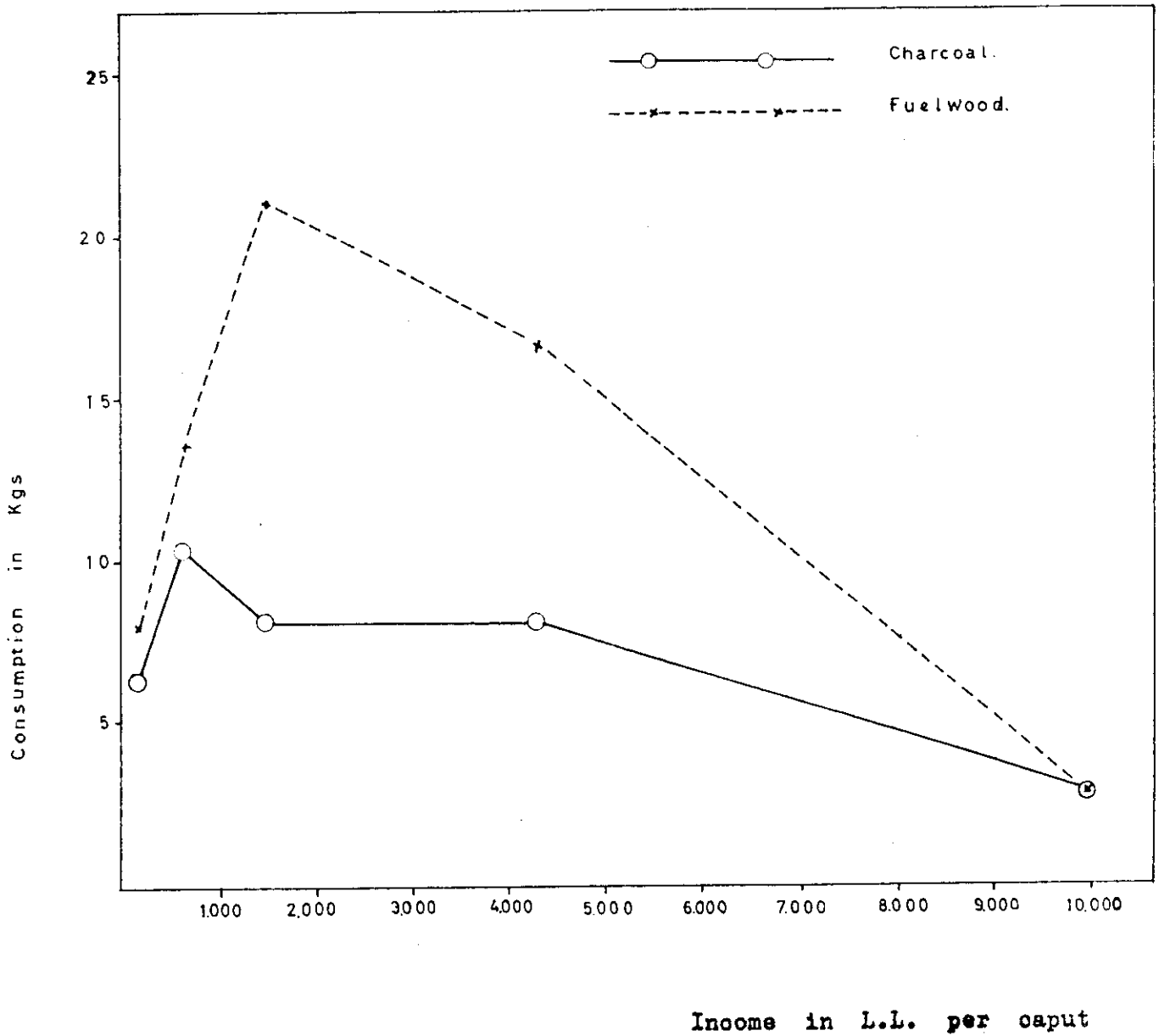


TABLE: 29

URBAN CONSUMPTION OF CHARCOAL AND FUELWOOD IN RELATION
TO INCOME LEVEL

Income Classes	Very Poor	Poor	Medium	Rich	Very Rich	Weighted Average
LL/caput/year	150	600	1,450	4,250	10,000	1,250
Fuelwood Use in Kgs/caput/year	8.0	13.7	21.3	16.9	2.9	16.2
Charcoal Use in Kgs/caput/year	6.5	10.6	8.2	8.2	2.9	7.7

Besides a generally very low rate of use, we notice a considerable drop in the consumption of wood-base fuels when moving from the rich to the very rich income group. This seems to indicate that in those very high income ranges, fuelwood consumption indeed decreases with rising income.

The forecast of future wood-base fuel is made on two levels. The lower level forecast takes into account a more conservative and effective forest policy, the higher one presumes a continuation of the exploitative forest utilization.

Thus the low level forecast is based entirely on the fuelwood supply of the wooded land if managed on a rational basis of sustained yield. Since demand will probably continue to exceed supply, the production could be marketed without difficulties. The high level forecast is based on:

- 1^o/ the relationship of fuel consumption to income level,
- 2^o/ the downward trend of fuelwood in the past due to exhaustion of resources and
- 3^o/ improvement of economic availability of alternative fuels.

Thus it is assumed that in the rural areas alternative fuels will have replaced fuelwood at the rate of 80% by 1975, to the extent of 95% by the year 2000. (as compared with 60% in 1963 and 10% in 1938).

Urban use is expected to follow a similar trend but at a much higher level of replacoment.

TABLE: 30

ESTIMATED REQUIREMENTS OF FUELWOOD AND CHARCOAL IN 1975 AND 2000

Target Year	Level of Forecast	Wood for Fuelwood and Charcoal (m ³)	Approx-percentage used in the form of charcoal +)
1975	High	225,000	50%
1975	Low	140,000	75%
2000	High	100,000	75%
2000	Low	170,000	80%

+) As wood equivalent of charcoal is used 6 m³ to a ton which is a better rate of recovery than the present 6.5 m³ to a ton; assumed are improving carbonization techniques.

NOTE:

By 2000, "high level" continuous over-exploitation would have depleted many forest resources of wood fuel; hence the "high level" exploitative utilization of the shrunken and degraded forest area would yield much less than the "low level" conservative utilization of the maintained and improved forest wealth resulting from a continuous "low level" conservative forest policy.

4.5 FUTURE REQUIREMENTS OF PULP AND PAPER PRODUCTS

The forecasts are made under the assumption that paper consumption will not be adversely affected by future restrictions of imports. Imports are expected to remain the principal source of supply in the near future so the consumption pattern will depend heavily on the import policy to be followed.

4.51 Packaging of Fruit and Vegetables for Export

It is expected that paperboard will substitute much of the wood that will be required to package the fast growing quantities of fruit export. This assumption is based on past experience in other fruit producing regions of the world. However, it is quite possible that the development of new techniques will enable the manufacture of containers using fibre of particle board on a commercial scale. The extent to which this will affect the use of cardboard for packaging is too difficult to gauge to allow a quantitative estimate in this sense.

In chapter 4.26 the required quantities of paper products for fruit and vegetable export packaging are projected. They are summarized in the following table.

TABLE: 31

FUTURE REQUIREMENTS OF PAPERBOARD AND FINE WRAPPING PAPER FOR EXPORT PACKAGING OF FRUIT AND VEGETABLES.(1000 of tons)

Target Year	Level of Forecast	Paperboard	Wrapping Paper
1975	-	4.2	1.4
2000	High	24.4	2.3
2000	Low	18.0	1.8

4.52 Other Uses

During 1955-62 the apparent consumption more than doubled from 14,000 tons to 30,000 tons, or increased from 7.5 kgs. to 14.2 kgs. per caput. During the same period, National Income rose from U.S. \$443 to \$532 million, or from \$239 to \$251 per caput (\$-figures are constant relative to 1954 values). This would indicate an income elasticity of demand of 16 if some other factors were neglected. The rapid decrease of illiteracy, creation or booming expansion of sectors of the economy which are heavy paper-users (services, cement industry) do not allow an analysis of consumption based on historical series. Also the reliability of the official statistics should be questioned, reliability improving with time. FAO's "World Demand for Paper to 1975" gives "normal" income elasticities of 1.9 to 1.6 at income levels of \$200 and \$400. The average 1959-1962 consumption is somewhat more than the "normal equation value", but approaches it close enough if we deduct the amount of paper re-exported with the fruit trade. Thus this average consumption was taken as a basis, at an income level of \$254 per caput. (1954 value) to project future requirements of paper products except those needed for the export packaging of fruit (the latter are calculated in chapter 4.26).

Using the "normal" equation, the following forecasts were made, under the assumed rates of growth of population and income.

TABLE: 32

FUTURE REQUIREMENTS OF PAPER PRODUCTS

	Level of Forecast	GNP ^{1/} per Caput			Requirements ^{2/}					
		1959- ' 62	1975	2000	Per Caput(Kgs)			Total (thousand tons)		
					1959- 62	1975	2000	1959- 62	1975	2000
Newsprint	High level	(254)	353	731	(1.0)	1.9	14.2	(1.99)	5.43	66.6
	Low level	(254)	329	534		1.8	9.6		5.14	45.0
Printing & writing	High level	(254)	353	731	(3.5)	5.9	10.6	(7.08)	16.86	49.7
	Low level	(254)	329	534		5.4	6.9		15.43	32.4
Other Paper	High level	(254)	353	731	(5.3)	8.6	16.0	(10.59)	24.58	75.0
	Low level	(254)	329	534		7.4	11.1		21.15	52.0
Paperboard	High level	(254)	353	731	(1.7)	3.4	15.5	(3.45)	9.72	72.7
	Low level	(254)	329	534		2.9	8.7		8.29	40.8
TOTAL	High level	(254)	353	731	(11.5)	19.8	56.3	(23.10)	56.59	264.0
	Low level	(254)	329	534		17.5	36.3		50.01	170.2

^{1/} In 1954 U.S. dollars.

^{2/} Excluding use for fruit-export.

During 1959 - 62 there has been a noticeable under-consumption of newsprint in relation with income level and an over-consumption of other cultural and industrial papers. Paperboard consumption was almost concurrent with the theoretical curve, whilst the total paper and board use was slightly more than the theoretical amount. Therefore the projections for 1975 were made using a parallel curve starting from the basic quantities of the 1959-62 period. It is expected that by 2000 the consumption pattern will have become normal, with consumption of the different paper products following the theoretical correlation of consumption with income.

TABLE: 33

TOTAL REQUIREMENTS OF PAPER AND PAPERBOARD (IN THOUSAND TONS)

	1975		2000	
	Low level	High level	Low level	High level
Export of Fruit and Vegetables	5.6	5.6	19.8	26.7
Other	50.0	56.6	170.2	264.0
TOTAL	55.6	62.2	190.8	290.7

4.6 TOTAL FUTURE REQUIREMENTS OF WOOD PRODUCTS

Only the requirements arising from future domestic consumption are given here. It is beyond the scope of this study to consider to what extent this quantity of wood products should be produced locally, which part of this quantity should be imported, or whether additional quantities can and should be provided for export. It is obvious that these questions should be approached on a regional basis, taking into consideration Lebanon's favourable potential position as a wood producing country in the Middle East.

The estimates for each type of forest product are converted into "roundwood equivalent", which is the volume of roundwood that must be grown to produce these products.

Converting estimates of future sawnwood requirements to estimates of the roundwood equivalents, necessitates prediction of the recovery rate for Lebanese sawmills in the target years. Present recovery rates are not available, since local production of sawnwood is negligible. It is expected that by the time local saw logs are available, modern equipment and appropriate logging and sawmilling techniques will allow recovery rates of 55 to 60%. It should be borne in mind that much of the sawmilling waste is likely to be recovered for the manufacture of fibre or particle board.

In order to translate paper requirements into pulpwood equivalents with any precision, one must know not only the kind and quantity of the products, but also the process by which they will be manufactured, the amount of waste paper that will be utilized, and the extent to which fibrous materials other than wood will be used. As little of this information is available, the estimates of roundwood volumes should be interpreted carefully. An overall figure of 4 m³ roundwood used for each ton of paper product consumed, was adopted. This figure might be slightly lower if substantial re-use of waste paper will take place.

Plywood, veneer and board requirements have been converted on the basis of FAO standard conversion factors and estimates of local manufacturers.

The final total domestic roundwood requirements are obtained by simple aggregation. It should be remembered that this estimate covers all requirements that should be met by imports and/or production from all resources and not only from the closed forests, whether present or to be established. Below, requirements for 1975 and 200 of wood products and their roundwood equivalents are proposed.

TABLE: 34

SUMMARY OF ESTIMATED FUTURE REQUIREMENTS AND EQUIVALENT ROUNDWOOD VOLUMES

Wood Product	Level of Forecast	Future Requirements		Conversion Factor	Roundwood Equivalent in cub.M.		
		Units	1975		2000	1975	2000
Sawnwood	Upper	M ³	254,000	333,000	1.8	457,000	600,000
	Lower	M ³	246,000	279,000	1.8	443,000	502,000
Building Boards 2/	Upper	M ³	36,000	88,000	5% peeled veneer,	4,300	11,000
	Lower	M ³	33,000	73,000	95% board	4,000	9,000
Plywood and veneer	Upper	1000 M ²	2,850	5,250	5. 8M ³ per 100M ²	17,000	30,000
	Lower	1000 M ²	2,650	4,000		15,000	23,000
Roundwood 1/	Upper	M ³	14,500	35,000	1	14,500	35,000
	Lower	M ³	13,500	25,000	1	13,500	25,000
Pulp and Paper Products	Upper	Ton	62,200	291,000		249,000	1164,000
	Lower	Ton	55,600	191,000	4 M ³ per Ton	222,000	764,000
Total Industrial wood	Upper	M ³				697,000	1786,000
	Lower	M ³				652,000	1264,000
Wood Fuel (Fuel-wood and Charcoal)	Upper	M ³	225,000	170,000	1	225,000	170,000
	Lower	M ³	140,000	100,000	1	140,000	100,000
TOTAL	Upper	M ³				967,000	2010,000
	Lower	M ³				838,000	1423,000

1- Of which about 25% match stock.

2- Roundwood Equivalent of Board is only for the cover sheets of peeled veneer (5% of board volume), milling and logging wood waste is supposed to provide sufficient raw material for the Board core.

5.0 C O N C L U S I O N

As a general conclusion several points may be emphasized.

This study has been conducted in order to provide a basis for a rational forest policy. But wood products are not the only benefit to be derived from the forest, and in many cases not even the most important. Most of Lebanon is mountainous and the major task for forestry lies in the higher altitudes. Therefore, to enable proper land use planning and a sound allocation of investment funds, additional studies should be undertaken to quantify or find sufficiently convincing indicators for the non commodity returns of protective forest. After comparing the cost and direct and indirect benefits of alternative land uses, the basis for a proper land use policy is complete.

Once it has been decided that a forest cover merits its investment, the results of this study could provide a guide in the choice of tree species and form of future forest management. The forecasted consumption pattern of the different wood products indicates fast growing requirements of small sized timber and a relative decrease in the importance of consumption of sawnwood. This would imply that, where possible, the choice of tree species and forest management is to aim at maximizing production of wood fibre in quantitative rather than qualitative terms.

Pulp and paper requirements are expected to increase at a fast rate. Meeting these from local sources could save import outlays of foreign currency. The problems regarding economics of scale, supply of raw material and marketing should be investigated on a regional rather than national basis.

The fruit packaging industry will make fast growing demands on packaging materials. Meeting this demand, either in the form of small sized sawnwood, veneer or paper and board products, is of particular importance to the country's economy, since fruit export is a major earner of foreign currency.

The furniture and building industry will continue to require considerable quantities of sawnwood, plywood and wood based board.

The estimated requirements of wood fuel are based on available supply, on a sustained yield basis. If no measures are taken to tune the exploitation of the forests to their sustained yield and if current over-exploitation continues, very serious problems of soil and water conservation will arise. Forests will disappear and with it will go their non-commodity values. Their re-establishment will cost more each year forest degradation is allowed to proceed. Analysis of the real loss to all actual and potential beneficiaries of forest products of all types, should convincingly show that, wherever the forest cover of the high ranges of a watershed is degrading and gradually disappearing, far reaching measures are warranted to save and improve this cover.

A P P E N D I X E S

APPENDIX: A

DETAILS OF SAMPLE SURVEY

A. I STRATIFICATION OF THE RURAL AREA

Three classes of wood availability and three levels of income give nine possible strata, of which seven were present.

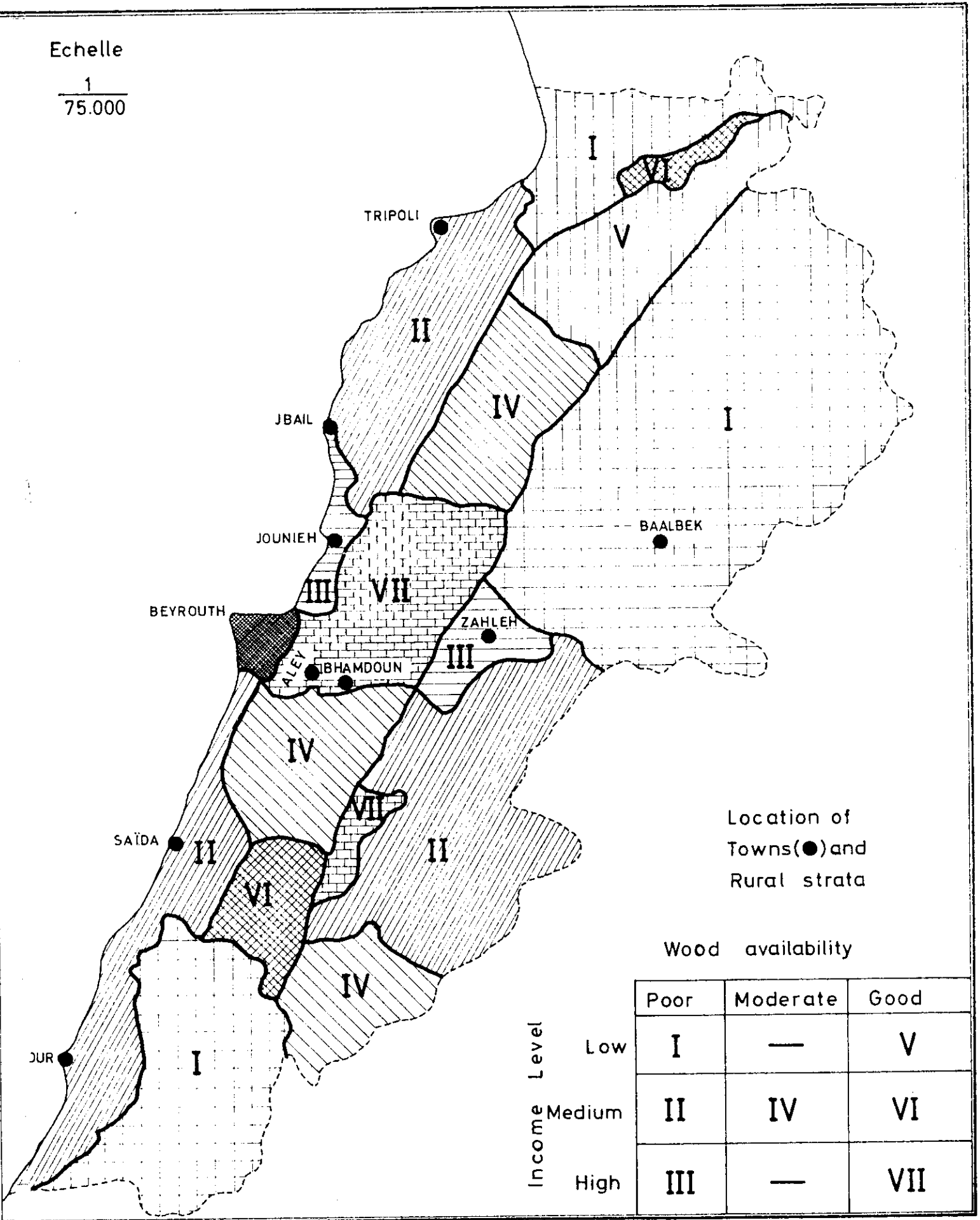
Income Level ^{1/}		Wood Availability Class ^{2/}		
GROUP	LL./CAPUT ^{3/}	POOR	MODERATE	GOOD
Low	380	I	NOT PRESENT	V
Medium	580	II	IV	VI
High	930	III	NOT PRESENT	VII

- ^{1/} The French IRFED Mission to Lebanon provided a map of Lebanon divided into zones according to living standards; parameters were educational, social, medical, cultural equipment of the village and economic and technical development.
- ^{2/} Criteria for the wood availability classes were based on subjective estimates of the author and of Mr. Baltaxe, FAO Forest Inventory Officer.
- ^{3/} Figures given are the results of the rural sample survey; they represent the average household income per caput in the sample. (1963 values).

The following map shows the rural strata and the urban areas.

Echelle

$\frac{1}{75.000}$



Location of
Towns(●)and
Rural strata

Wood availability

		Poor	Moderate	Good
Income Level	Low	I	—	V
	Medium	II	IV	VI
	High	III	—	VII

A.II

DETAILS OF SAMPLING FRAME IN RURAL LEBANON

	S T R A T A							TOTAL
	I	II	III	IV	V	VI	VII	
Rural Population (thousands)	288	237	129	176	52	50	118	1050
Primary Sample Units (village) enumerated	12	12	9	11	7	10	13	75
Ultimate Sample Units (households) enumerated	87	99	75	95	63	97	99	615
Population of Sampled Households	615	701	444	521	476	608	625	3990
Percentage of Rural Population Sampled	0.21	0.30	0.34	0.29	0.92	1.22	0.53	0.38
Number of correctly enumerated households per 10,000 persons	3.0	4.2	5.8	5.4	12.1	19.4	8.4	5.9
Number of Households originally in the sample per 10,000 persons	4.0	5.5	8.5	5.5	12.3	12.8	8.5	6.5
Number of Private Rural Non-Household Units in the Sample Villages	340	300	430	424	60	121	566	2241
Population of Sample Villages	31600	24240	20330	29220	10680	11750	31820	159640
Number of Private Rural Non-Households per 10,000 people	107	124	212	145	56	113	178	140
Average Income in LL. per Caput per annum	380	580	930	580	380	580	930	600

A.III DETAILS OF RURAL SURVEY DESIGN AND LIST
OF SAMPLE VILLAGES WITH RESPECTIVE
STRATUM AND PROVINCE

The delimitations of the geographical strata presented on the map of appendix A.I were transferred onto a large map showing all the 1500 rural localities. Then lists were prepared of all the villages in each stratum and their respective resident population entered. (As estimated by the IRFED Mission in 1959 See 1.21.) (These lists are left with the expert's counterpart in the Project).

From each strata the sample villages were selected in random fashion with selection probability proportional to size and with replacement. The size of the sample and other details are discussed in section 1.312. The following lists present the selected sample villages and also give the strata and provinces where they are located.

LIST OF SAMPLE VILLAGES BY STRATUM AND DISTRICT

	Name of Village	District (Mouhafazat)
Stratum. I	Hayun	Beka'
	Yunin	"
	Karayob	Beka'
	Bent Jbeil	South Lebanon
	Alma esh Shaab	" "
	Sinai	" "
	Yaroun	" "
	Habboush	" "
	Kherbet Solem	" "
	Nabatich	" "
	Ramich	" "
Ashash	North Lebanon	
Stratum. II	Kusaya	Beka'
	Mazraat Tabaya	South Lebanon
	Kfar Melke	South Lebanon
	Majdel Anjar	Beka'
	Kana	South Lebanon
	Aitit	" "
	Amyoun	North Lebanon
	Rashin	" "
	Housh el Harime'	" "
	Bakhoun	" "
	Naameh	Mount Lebanon
Barja	Mount Lebanon	

	Name of Village	District (Mouhafazat)
Stra- tum. III	Jurit Bedran	Mount Lobanon
	Chrine	" "
	Mazraat Yashoua	" "
	Dour esh Shouir	" "
	Zuq Moshbeh	" "
	Zuq Mikhaol	" "
	Jdita	Beka'
	Qab Elias [≡]	"
	Talabaya	"

[≡] Twice-selected villages; number of households enumerated doubled.

Stra- tum IV	Helta	North Lebanon
	Sebel	" "
	Ain Jarfa	South Lebanon
	Khyam [≡]	" "
	Kherbe	" "
	Charife'	Mount Lebanon
	Mishmish	" "
	Barouk	" "
	Deir el Kamar	" "
	Qartaba	" "
	Abaydat	" "

[≡] Sample villages were selected with replacement. Villages with asterisk were selected twice; in these villages the number of sample households is double (16 compared to 8).

	Name of Village	District(Mouhafazat)
Stra- tum. V	Shân *	North Lebanon
	Izal	" "
	Dinnbo	" "
	Fneidoq	" "
	Btormoz	" "
	Tiran	" "
	Kfar Bobnin	" "
Stra- tum. VI	Wadi Jezzine	South Lebanon
	Jezzine *	" "
	Ain Kana	" "
	Jarjouh	" "
	Kfarfila	" "
	Kaytoulch	" "
	Tikrite *	Northo Lebanon
	El Youn	" "
	Ghawaya	" "
Talleh	Mount Lebanon	

* Sample villages were selected with replacoment. Villages with astorisk were selected twice; in these villages the number of sample households is double (16 compared to 8).

	Name of Village	District(Mouhafazat)
Strat-	Sofar	Mount Lebanon
tum	Ras el Matn	" "
	Antolias	" "
VII	Abbadiyoh	" "
	Brumanah	" "
	Bzebdin	" "
	Baabdat	" "
	Kartada	" "
	Mashghara	" "
	Qobay	" "
	Kfarshima	" "
	Arsoun	" "
	Dahr es Suwan	" "

A.IV RESULTS OF THE RURAL SAMPLE SURVEY BY STRATUM

Volumes consumed annually, per caput, by category of use, by wood product and by stratum.

A - JOINERY

WOOD PRODUCTS	SECTOR		STRATA	
		I + V	II + IV + VI	III + VII
Sawn Softwood and Beech (Cub. M)	Household	0.0032	0.0054	0.0093
	Non-Households	0.0001	0.0003	0.0008
Plywood (M ²)	Household	0.011	0.031	0.155
	Non-Households	0.001	0.004	0.014

B - FORMWORK AND SCAFFOLDING

Sawn Softwood (Cub. M)	Household	0.0018	0.0027	0.0047
	Non-Households	0.0001	0.0002	0.0007

C - FURNITURE

WOOD PRODUCTS		SECTOR		STRATA		
				I + V	II + IV + VI	III + VII
Sawn - Wood	Softwood	Household	0.0026	0.0057	0.0104	
	and Beech (M ³)	Non-Households	0.0009	0.0022	0.0049	
	Quality(M ³) Hardwood	Household	0.0001	0.0003	0.0007	
		Non-Households	—	0.0001	0.0002	
Blockboard(M ³)		Household	0.0018	0.0041	0.0077	
		Non-Households	0.0003	0.0013	0.0028	
Particle Board (M ³)		Household	—	0.0001	0.0002	
		Non-Households	—	0.0002	0.0005	
Veneer(M ²)		Household	0.058	0.184	0.425	
		Non-Households	0.006	0.043	0.1134	
Plywood (M ²)		Household	0.029	0.070	0.132	
		Non-Households	0.007	0.033	0.077	

A.V DETAILS OF URBAN SAMPLING SURVEY

The following table gives the urban areas with their estimated population size in 1963.

<u>TOWN</u>	<u>POPULATION</u>
<u>Beirut and Suburbs</u>	
Beirut City	410,000
Bourj Hammoud	100,000
Dekouaneh	20,000
Sin-el-Fil	35,000
Furn esh Chebak	35,000
Chiah	15,000
Chobari	50,000
Harot Hrayk	15,000
Hadoth	21,000
Jdaideh-Baochrish	44,000
Bourj Brajni-T Chader	25,000
<u>Other Towns</u>	
Tripoli	130,000
Zahleh	65,000
Baalbeck	20,000
Saidah	35,000
Tyr	10,000
Jbeil	10,000
Jounieh	35,000
Aley	20,000
Bhamdoun	5,000
TOTAL	1,100,000
	=====

To the total figure of 1,100,000 might be added some 20,000 foreigners permanently residing in Lebanon.

In the above mentioned figures are included people who do not (yet) possess the Lebanese nationality for one reason or another, but who have been completely integrated into the Lebanese society since a long time.

Because of lack of personnel and time, sampling in the urban sector was restricted to Beirut and its suburbs.

This was assumed not to be a serious drawback, not causing a biased estimation of total consumption, since other socio-economic studies, coupled with results from a reconnaissance, permitted the application of the sample data. to the whole urban sector. Moreover, Beirut and suburbs comprise 70% of the total urban population. Finally, in the case of wood consumption for urban construction, the sampling frame was consisted of the annual floor area constructed. These data were obtained for each of the towns. Through simple and swift count, it was easy to estimate the frequency of specific building types, allowing the conversion factors obtained from the Beirut survey to be applied sufficiently accurately

A.VI AREA OF FLOOR SURFACE ANNUALLY CONSTRUCTED BY THE PRIVATE
SECTOR FROM 1959 to 1963 1000 M²

	1959	1960	1961	1962	1963
<u>Beirut and Suburbs</u>					
Beirut	606	704	665	572	770
Bourj Hammoud	91	105	75	68	46
Dekouanoh	20	20	25	16	32
Sin el Fil	28	44	36	23	30
Furn ech Chobak	65	90	56	19	18
Chiah	29	50	57	28	57
Chobari	24	41	46	48	48
Haret Hrayk	14	11	21	29	36
Hadeth	21	29	41	22	22
Jdeideh-Baoshrieh	42	58	82	44	44
Bourj Barajni-T Chader	22	30	42	23	23
<u>Other Towns</u>					
Tripoli	107	134	123	184	170
Zahlch	25	24	30	25	42
Baalbock	2	1	2	1	4
Saida	4	14	7	29	21
Tyr	4	3	2	-	-
Jbeil	4	4	5	4	6
Jounieh	5	15	33	42	46
Aley	13	29	32	20	18
Bhandoun	12	30	31	21	17

N.B. Clandestine construction (not included in figures given here) is estimated to amount to 5% of legal construction in Beirut, 20% in other towns.

APPENDIX: B

Recorded 1/

IMPORT - EXPORT STATISTICS OF WOOD AND PAPER PRODUCTS,
EXTRACTED FROM "STATISTIQUES DU COMMERCE EXTERIEUR"

IMPORT	METRIC TONS				AVERAGE 1959 - 62	
	1959	1960	1961	1962	Tons	Cub. meter ^{4/}
Tropical Hardwood logs	10,663	13,842	18,586	2,306	11,349	17,500
Other logs	2,549	6,059	17,157	14,984	10,187	15,700
Transmission poles	831	1,825	1,760	2,418	1,709	3,100
Sawnwood	42,834	68,081	66,785	40,689	54,597	94,000
Veneer ^{2/}	515	1,797	1,845	1,019	1,294	1,800
Plywood	951	1,675	1,571	1,189	1,347	2,100
Particle Board	..	11	24	6	14	-
Wooden Manufactures	5,897	4,639	1,277	2,103	3,479	5,700
Newsprint	1,117	491	3,169	3,212	1,997	..
Printing & Writing Papers	5,370	6,856	6,975	7,941	6,786	..
Other Paper	7,626	9,750	12,823	13,375	10,894	..
Fibre-and Paperboard	1,230	993	881	1,226	1,083	..
Paper & Board Articles	2,691	2,495	3,731	3,870	3,197	..
<u>EXPORT</u>						
^{3/} Logs (non-tropical)	638	1,244	858	2,045	1,196	1,700
^{3/} Sawnwood	180	236	212	127	189	300
^{3/} Veneer	24	19	20	45	27	-
Plywood	1,240	1,235	1,631	2,176	1,571	2,700
Particle Board	..	440	437	556	478	700
Wooden Manufactures	635	693	1,404	2,330	1,266	2,100
^{3/} Newsprint	6	11	9	13	10	..
^{3/} Printing & Writing Paper	50	56	75	81	66	..
^{3/} Other Paper	106	140	173	258	169	..
^{3/} Fibre & Paperboard	25	43	36	37	35	..
Paper & Board Articles	811	1,366	1,231	1,820	1,307	..

1/ Recorded Imports of logs and Sawnwood are understated

2/ 61% is for Brude-boxes.

3/ Re-export

4/ Rounded to nearest hundred.

Trade, Production and Apparent Consumption of Industrial
Wood Products, Average over 1959-1962, in cubic meters

(Trade Figures Derived from Annual Trade Report of the Customs, other
Figures from Personal Interviews

Commodity	Export	Import ^{1/}	Domestic Production	Converted into other commodity	Apparent Consump- tion
Poles	-	3,100	10,300	-	13,400
Tropical Hardwood logs	-	21,000	-	21,000	-
Other logs	1,700	18,800	9,000	24,500	1,600
Plywood and Peeled Veneer	2,900	2,100	8,100	2,800	4,500
Sawnwood	1,900	119,500	15,400	18,000	115,000
Blockboard	-	-	19,000	-	19,000
Particle Board	700	-	2,400	-	1,700
Veneer Box Shocks	-	1,100	-	-	1,100
Veneer-Sliced	-	700	100	-	800
Paper Products (tons) ^{2/}	1,700	24,300	1,500	-	24,100

^{1/} 20% has been added to recorded imports of logs and sawnwood.
^{2/} Included are 600 tons imported fibre board.

N.B. -- Figures are rounded to the nearest hundred.

-- The wood content of traded secondary products is added to the relevant import-export figures and thus is incorporated in apparent consumption.

APPENDIX: C

APPARENT CONSUMPTION, COMPARISON WITH
ESTIMATE OF ACTUAL CONSUMPTION

In the last column of the Statistical Table in Appendix B apparent consumption is shown, as derived from the mentioned sources. When comparing these figures with those of table 34, showing actual consumption as derived from the survey, it has to be kept in mind that the base period is not exactly the same for the two estimates. The apparent consumption estimate is largely based on a four-year average (the trade statistics for 1963 had not yet been published). The present consumption figure from the field survey is based for a large part on per caput consumption over 1959-1963. These per caput figures were blown up using the 1963 population estimate. Thus, to arrive at estimates comparable with those of apparent consumption, these blown up figures have to be adjusted downwards by 5.9% to take into account two and a half years of population growth at the rate of 2.3% per annum.

Sawnwood

Apparent Consumption is 115,000 m³. To this figure should be added about 10,000 m³ which enter the country in the form of packing case material. The adjusted survey estimate is 130,000 m³.

Plywood

Apparent Consumption of peeled veneer in the form of plywood is 4,500 m³. The plywood industry having about 1000 m³ in stock, this figure could be reduced to 4300 m³. Adjusted estimated annual consumption amounts to 4000 m³.

Blockboard

Apparent Consumption amounts to 19,000 m³. The survey estimate, adjusted to a comparable basis gives a consumption of 18,800 m³.

Sliced Veneer

Apparent Consumption is 800 m³, or about 900,000 m². Adjusted survey estimate is 830,000 m².

APPENDIX: D

USE OF WOOD IN RURAL CONSUMPTION

The conversion factor used for formwork and scaffolding is given in Appendix E. The conversion factors used for joinery are on a per item basis as shown in Appendix E.

To provide a basis for comparison with construction elsewhere and to emphasize the extent to which wood has been replaced or eliminated due to the extremes scarcity of home grown timber, the rural sample data were analysed to obtain a quantification of wood use in rural construction.

No wood is used structurally. The wooden beams and rafters of the traditional building have made place for reinforced concrete. Floors are of cement or tiles.

The wood used for joinery is often recognizable as having been recovered from old packing cases. It is of limited thickness. Houses of the more affluent households often have plywood doors, which economize on wood.

As a result, wood-use per unit of floor area constructed is very low, as shown in the following table.

WOOD USED PER 100 M² OF RURAL RESIDENTIAL FLOOR AREA

	Sawnwood (M ³) for			Plywood (M ²)
	Joinery	Formwork	Total	
Low Income Strata	0.84	0.4	1.24	2.8
Medium " "	1.24	0.5	1.74	7.8
High " "	0.97	0.5	1.47	16.2
Weighed Average	1.03	0.5	1.53	10.2

For comparison with urban construction see Appendix E, which gives as current wood use per 100 m² of residential floor area: Sawnwood 3.2 m³; Plywood 32 m².

APPENDIX: E

REGROUPING OF SAMPLE UNITS ON PER CAPUT INCOME BASIS

The rural and urban sample households were regrouped on a country-wide basis according to per caput income. This per caput income was calculated for each sample household from the data recorded on the questionnaires.

The quantities of wood products consumed by the sample households in each group, as recorded on the questionnaires, was added, giving the total quantity consumed by the sample households of each income group. By dividing this total by the total number of persons in the sample households, the per caput consumption in each income group was calculated. These per caput figures were plotted against the average per caput income of each income group, giving the desired relationship between income level and consumption.

Simultaneously an attempt was made to classify the whole of the rural and urban population into income groups. This was first done for each original sampling stratum separately, using the field results of the sample households. Thus proportions of the stratum population belonging to each income-group were obtained for each of the three original income strata. These proportions, weighted by their stratum population, were averaged, giving the overall classification.

Since the sample was random within strata, the error of this country-wide re-classification might be considerably greater than the error within each stratum. Therefore, all possible checks were made with available sources. First the total national income was compared to the figure calculated using our results. (Re. page 45). Then a number of socio-economic studies[⊗] were scanned for comparable information. These checks indicated that the income classification as resulted from the survey, reflected the reality to a satisfactory degree, and thus could be used for the purpose of projecting future requirements.

- ⊗ IRFED Mission to Lebanon "Besoins et Possibilites de Developpement du Liban" 3 vols., 1960 - 1961.
- ⊗ C.W. Churchill "The City of Beirut". A.U.B. Beirut 1954.
- ⊗ Socio-Economic Surveys of the UNSF Forestry Project. Perimeter I and IV.

APPENDIX: F

CONVERSION FACTORS

F.1 Furniture

Item	Income Class	Boards (m ³)	Quality Hardwood (m ³)	Softwood and Beech (m ³)	Veneer (m ²)	Plywood (m ²)
Armchair	I	-	-	0.030	-	-
	II	-	-	0.030	-	-
	III	-	-	0.030	-	-
Couch	I	-	-	0.070	-	-
	II	-	-	0.070	-	-
	III	-	-	0.060	-	-
Small chair	I	-	0.010	-	-	-
	II	-	-	0.010	-	-
	III	-	-	0.010	-	-
Large table	I	0.073	0.021	0.009	4	-
	II	0.058	0.017	0.007	3	-
	III	0.051	-	0.020	2.5	-
Small table	I	-	0.006	-	-	-
	II	-	0.006	-	-	-
	III	-	-	0.006	-	-
Wardrobe	I	0.334	0.020	0.028	16	8
	II	0.234	0.014	0.020	12	6
	III	0.180	-	0.030	5	5
Cupboard	I	0.237	0.016	0.025	12	6
	II	0.160	0.011	0.017	9	4
	III	0.130	-	0.023	4	3.5

Items	Income Class	Boards (m ³)	Quality Hardwood (m ³)	Softwood and Beech (m ³)	Veneer (m ²)	Plywood (m ²)
Doubled bed	I	0.071	0.017	0.060	6	-
	II	0.071	0.017	0.060	6	-
	III	0.057	-	0.061	5	-
Single bed	I	0.056	0.012	0.050	5	-
	II	0.056	0.012	0.050	5	-
	III	0.045	-	0.050	4	-
Chest of drawers	I	0.098	0.008	0.012	6	6
	II	0.098	0.008	0.012	6	6
	III	0.080	-	0.016	5	4
Stool	all	-	-	0.006	-	-
Desk	all	0.075	-	0.016	4	3
Toilet table	all	0.070	0.010	0.008	4	2
Formica items						
Dining table	all	0.060	-	0.015	-	-
Kitchen table	all	0.040	-	0.010	-	-
Restaurant table	all	0.030	-	0.006	-	-
Small table	all	0.006	-	-	-	-
Other Formica items	: Substitute Formica for Veneer, rest is the same					
Other Furniture Items were measured individually during the survey						

Income Classes: I = Urban Rich and Very Rich

II = Urban Medium and Rural Rich

III = Urban Poor and Very Poor, Rural Medium and Poor

F.2 Rural joinery

I. Rural Joinery per Item			
Item	Stratum	Softwood and Beech (m3)	Plywood (m2)
Solid Door Leave	I & V	0.052	-
	other	0.087	-
Part Wood Door Leave(solid)	I & V	0.072	-
	other	0.061	-
Plywood Door Leave	I & V	0.030	3.4
	other	0.030	3.4
Door Frame	I & V	0.033	-
	other	0.035	-
Window Leave Large	I & V	0.017	-
	other	0.023	-
Window Frame Large	I & V	0.031	-
	other	0.035	-
Window Leave Small	I & V	0.009	-
	other	0.010	-
Window Shutter Large	I & V	0.020	-
	other	0.046	-
Window Shutter Small	I & V	0.012	-
	other	0.014	-
Window Frame Small	I & V	0.028	-
	other	0.020	-
Ventilator	I & V	0.010	-
	other	0.010	-

F.3 Urban joinery

Quantity of Wood Used for:

i/Urban Joinery per m² of opening in 1963

Item	Sawnwood (m ³)	Peeled Veneer and Plywood (m ³)	Particle Board (m ³)
Solid Door	0.075	-	-
Part-wood Door (Plywood)	0.033	0.0058	-
Plywood Door	0.040	0.0085	-
Board Door	0.025	0.0034	0.020
Closet	0.050	0.0085	-
Window	0.095	-	-

ii/Urban joinery per m² of opening in 1975 is expected to economize a little on the wood used for solid doors, plywood doors, closets and windows; as a result conversion factors for these items are expected to decrease somewhat; more part-wood doors and closets are expected to be made of board.

iii/ Urban joinery per m² of opening in 2000 is not believed to differ substantially from that in 1975, except for windows where further economy in wood-use will cause a drop in per unit use of wood.

F.4 Urban Constructions

Square Meters of Joinery Opening per 100 m²
of Floor Area

1 - Residential Building

1a. Residential in 1963

	Inside doors	Entrance doors	Outside joinery	Closets
Items of solid Sawwood	--	2.4	11.7	--
Items of Plywood	16.2	0.6	--	2.0
Items of Particle Board	0.8	--	--	--
Items not of wood	--	--	--	--
Total	17.0	3.0	11.3	2.0

1b. In 1975 it is expected that use of sawwood will decrease in importance by about 30% , plywood-doors will probably give way to prefabricated board doors to a large extent. Outside joinery is expected to use more non-wood materials than at present. Total area of joinery-opening is assumed to increase a bit.

1c. By 2000 it is expected that use of sawwood will have declined further, while board-doors are expected to take the major share of this market. Total area of joinery-opening is expected to be somewhat higher than in 1975.

2. None residential

2a. In 1963

Square Meters of Joinery-Opening per 100 m² of
Floor Area

	Inside doors	Entrance doors	Outside joinery
Items of solid Sawnwood	--	1.5	3.2
Items of Plywood	6.0	--	--
Items of Board	2.5	--	--
Items not of wood	6.5	1.5	36.8
Total	15.0	3.0	40.0

2b. In 1975 and 2000 wood use in this sector is expected to decrease substantially because more use is assumed to be made of alternative materials to replace wood, while also some more economy of wood-use will be practiced.

F.5 Construction

Use of Wood Products Used per 100 m² of Floor area for
Formwork and Scaffolding

1 - Rural

	Required	Re-use	Consumption
Sawnwood (m ³)	5.0	10 times	0.5
Roundwood(m ³)	0.6	15 times	0.04

2 - Urban

Sawnwood Use (m³) per 100 m² of Floor Area.
(no roundwood is used).

Formwork	5.0	7 times	0.7
Scaffolding	3.0	10 times	0.3
Total	8.0	8 times	1.0

In 1975 - assumed improvements in building quality are expected to permit less re-use, resulting in an increase in use of sawnwood.

By 2000 - it is expected that plywood and boards will replace some of the sawnwood used in this sector. Also steel is expected to substitute some sawnwood.

F.6 Urban Construction

Use of Wood Products in m³ per 100 m² of Floor Area

	Joinery		Formwork and Scaffolding		Other		Total		
	Sawwood	Plywood	Sawwood	Plywood	Sawwood	Plywood	Sawwood	Plywood	
									Board
Residential 1963	2.061	0.154	1.0	-	0.156	0.008	3.217	0.162	0.01
Residential 1975	1.329	0.083	1.3	-	0.044	0.006	2.673	0.089	0.20
Residential 2000	1.080	0.081	1.0	0.02	0.026	0.006	2.106	0.089	0.31
Non-Resid. 1963	0.713	0.056	1.0	-	0.062	0.004	1.775	0.059	0.05
Non-Resid. 1975	0.424	0.029	1.3	-	0.042	0.007	1.766	0.036	0.13
Non-Resid. 2000	0.424	0.029	1.0	0.02	0.042	0.007	1.466	0.038	0.14

* Wooden stair-railings, partitions, air conditioning-frames, panoling, decoration etc..

F. 7 Quantity of Wood Needed to Package a Ton of
Export Fruit

Kind of box	Dimensions (cm)	Thickness of Boards (cm)		Box-wood ^{2/} Content (cm ³)	Average fruit Content (kgs)	Total m ³ of ^{3/} wood per ton of fruit
		ends	other			
Standard ^{1/} - Citrus ^{1/}	65x34x28	1.6	0.7	9810	33	0.33
Lemon-	63x33x27	1.6	0.7	9082	30	0.33
Standard- Apple-	46.5x29x27	1.6	0.8	6672	18	0.41
Half Apple Pear-	46.5x29x15	1.6	0.8	4666	11	0.46
Plum-	46.5x29x15	1.6	0.8	4666	12.5	0.41
Peach-	46.5x29x11	1.6	0.7	3625	9	0.44
Grape-	46.5x29x16	1.6	0.7	4414	9.5	0.51
Banana-	65. x55x30	1.6	0.8	14120	33	0.47
Other	Estimated average	0.44
Veneer- box	{ about 32x32x32	18 shocks of: 8.5x30x0.4cm ³ 12 shocks of: 3 x30x0.4cm ³	{ Apples Citrus	20 22.5	0.11 0.10	

^{1/} The citrus boxes have a partition-board of the same thickness as the end-boards.

^{2/} The wood quantities are the net amount of sawnwood. We have to add 10% wastage to arrive at the total amount of sawnwood required. This is done in ^{3/}. The wastage in the veneer-box factory is negligible as the shocks are imported ready-made.

F. 8 Miscellaneous

a/ Fuelwood and Charcoal

One ton fuelwood = 1.3 m³ Roundwood, solid measure.

One ton charcoal = 6.5 m³ Roundwood, solid measure.

b/ Roundwood Equivalents Used[⊠]

Beech and softwood: one m³ of sawnwood = 1.8 m³ of roundwood.

Blockboard : one m³ of blockboard = 1.4 m³ of round softwood.
0.6 m³ of round hardwood.

Quality hardwood : one m³ of sawnwood = 1.7 m³ of roundwood.

Plywood : one m³ = 2.4 m³ of logs.

Veneer (sliced) : one m² = 0.002 m³ of logs.

Paper and paper products: 1 ton of product = 4 m³ roundwood.

Particle board : 1 m³ = 2/3 ton = 1.3 m³ of roundwood.

[⊠] SOURCES: F.A.O. Standard and Interviews with Local Manufacturers.

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