

KINGDOM OF MOROCCO
MINISTRY OF PUBLIC WORKS
GENERAL DIRECTORATE OF
HYDRAULICS

JAPAN INTERNATIONAL
COOPERATION AGENCY
(JICA)

THE STUDY
ON
RURAL WATER SUPPLY IN THE PRE-RIF REGION
IN
MOROCCO

FINAL REPORT
VOLUME III SUPPORTING REPORT

AUGUST 1996

JICA LIBRARY



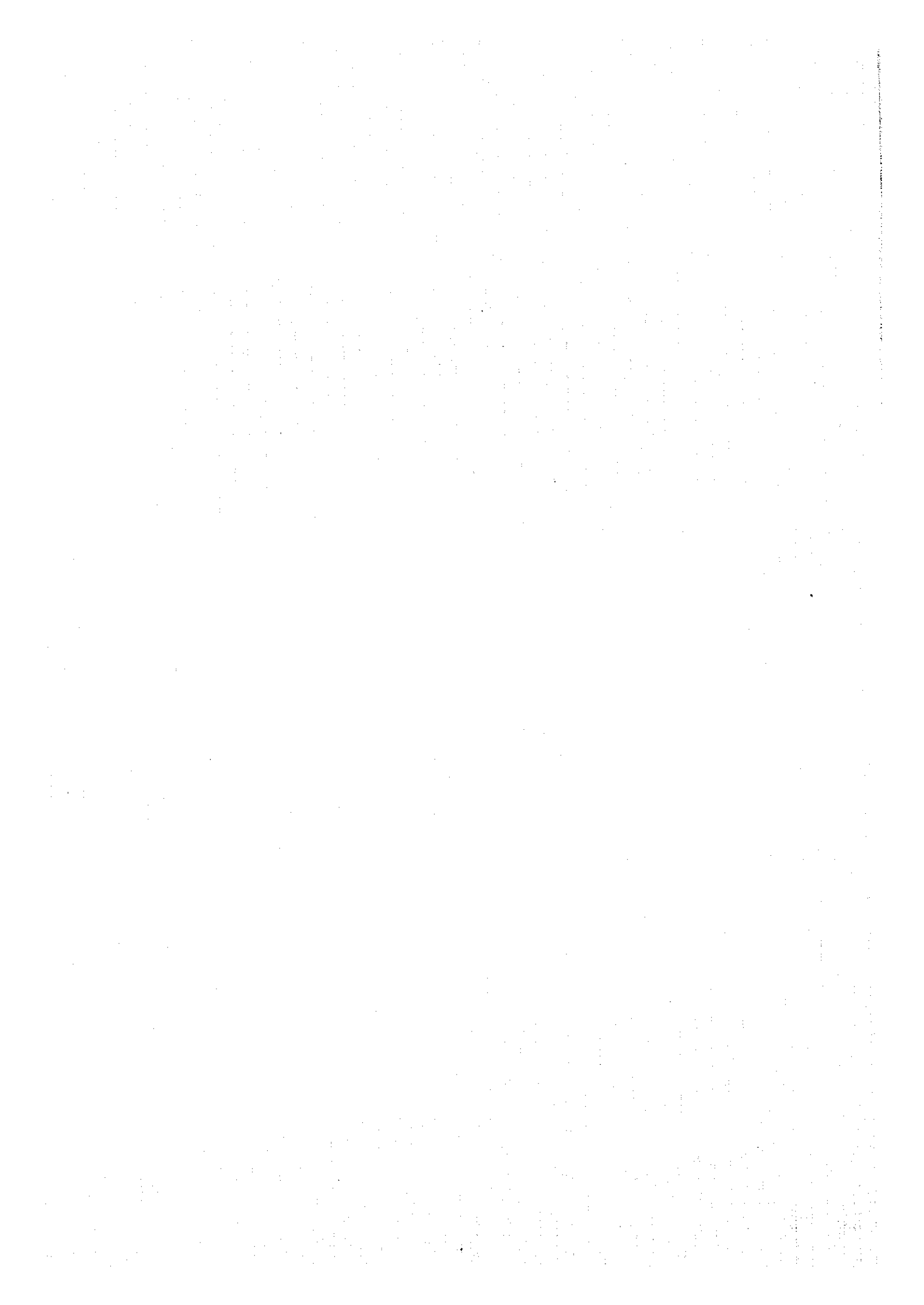
J 1131798 (9)

NIPPON KOEI CO., LTD.

S S S

J R

96-093



**KINGDOM OF MOROCCO
MINISTRY OF PUBLIC WORKS
GENERAL DIRECTORATE OF
HYDRAULICS**

**JAPAN INTERNATIONAL
COOPERATION AGENCY
(JICA)**

**THE STUDY
ON
RURAL WATER SUPPLY IN THE PRE-RIF REGION
IN
MOROCCO**

**FINAL REPORT
VOLUME III SUPPORTING REPORT**

AUGUST 1996

NIPPON KOEI CO., LTD.



1131798{9}

1. INTRODUCTION

The master plan of potable water supply discussed in the Main Report was formulated in compliance with the investigations and studies on socio-economy, natural conditions, water resource and supply facility, etc. This Supporting Report presents the basic data and findings which have been accumulated through the said investigations and studies on the respective fields. Contents of the report are itemized below.

Section 2. Socio-economy

- 1) Socio-economic conditions comprising of administration and demography, social infrastructure, industry and employment, land use and household income, etc.
- 2) Life and works of women constituting the baseline of WID issues.
- 3) Existing conditions of water use representing the practical situation of water use in rural areas.

Section 3. Meteorology, Hydrology and Surface Water Development

- 1) Hydrological characteristics in the Study Area in terms of runoff ratio and low flow rate.
- 2) Water balance study by runoff simulation model for estimating groundwater recharge.
- 3) Preliminary assessment of possible surface water development for potable water supply.

Section 4. Hydrogeology

- 1) General information of the groundwater potential structures identified at the thirteen locations in the Study Area.
- 2) Data analysis results of geophysical prospecting.
- 3) Inventory of ground water sources including dugholes, wells and springs in the Study Area.
- 4) Details of exploratory well drilling and pumping test.
- 5) Evaluation of resources by ground water simulation.

Section 5. Water Supply

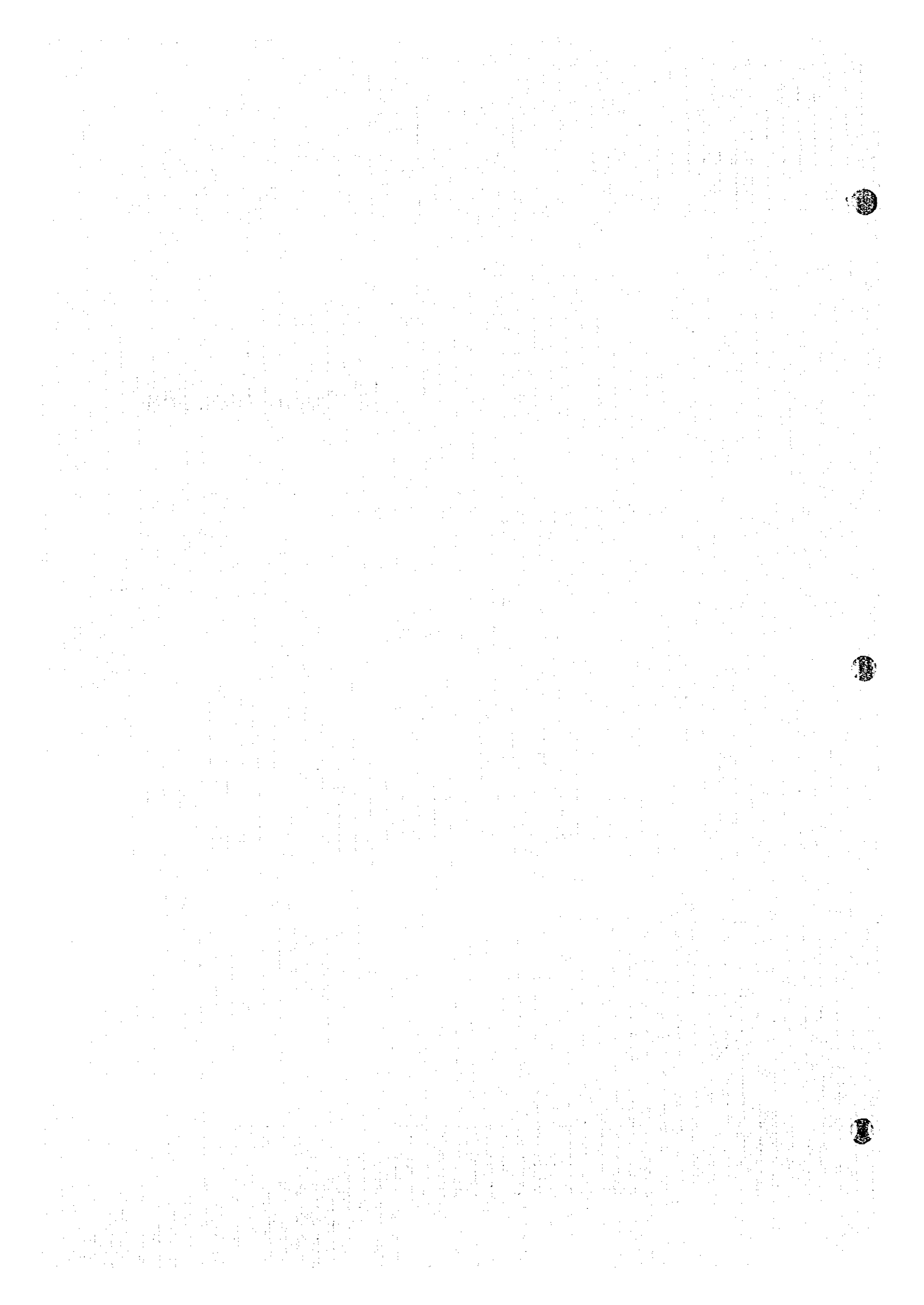
- 1) Covered area by existing water supply systems.
- 2) Information of water supply facilities in rural area.
- 3) Water demand projection for the Study Area.

Section 6. Cost Estimate

- 1) Data necessary for providing unit costs for rural water supply.
- 2) Investment cost or per capita investment for water supply facility.



2. Socio-economy



Supporting Report 2. Socio-economy

Contents

	Page
2.1 Introduction	2-1
2.2 Socio-economic conditions in the Model Areas.....	2-1
2.2.1 Administration and Demography	2-1
2.2.2 Present Conditions of Infrastructure	2-2
2.2.3 Industry and Employment.....	2-3
2.2.4 Land Use.....	2-3
2.2.5 Household Income	2-5
2.2.6 Migration	2-6
2.2.7 Education	2-7
2.2.8 Sanitary Conditions	2-8
2.2.9 Housing.....	2-10
2.3 Life and Work of Women.....	2-11
2.3.1 Water Supply.....	2-11
2.3.2 Firewood Supply.....	2-12
2.3.3 House Keeping.....	2-13
2.3.4 Household Duties.....	2-14
2.3.5 Agricultural Activities.....	2-14
2.3.6 Crafting Activities.....	2-15
2.4 Existing Conditions of Water Use	2-16
2.4.1 Water Consumption.....	2-16
2.4.2 Means of Water Transportation and Storage.....	2-17
2.4.4 Time and Distance.....	2-18
2.4.5 Cost of Water Collection and Willingness-to-pay	2-19
2.5 Water Supply Facilities Desired by Local People	2-20
2.6 Priorities of Infrastructure	2-21
2.7 Perception of the Population on the Impact of Water Supply.....	2-23

	Page
Table 2.1	Number of Men and Women Surveyed by Douar----- 2-26
Table 2.2	Infrastructure and Socio-economic Conditions in the Model Areas----- 2-27
Table 2.3	Percentage of Women Heads of Households in the Model Areas----- 2-30
Table 2.4	Waterborne Diseases Reported by the Surveyed Population in the Model Area----- 2-31
Table 2.5	Daily and Seasonal Work Program Prepared by 4 Women in Douar Oued Ktir in Ain Defali ----- 2-32
Table 2.6	Existing Conditions of Water Use----- 2-33

2. Socio-economy

2.1 Introduction

This chapter presents the analysis of socio-economic conditions including existing conditions of water use in the model areas; Ain Defali, Teroual and El Bibane. The detailed survey was carried out in order to prepare for various socio-economic data of the douars in the model areas. Out of 98 douars comprising the model areas, the detailed survey was conducted in 37 douars where the useful data were considered to be difficult to collect. The number of people surveyed in the 37 douars is 1,041 consisting of 746 men and 295 women. The number of people surveyed by douar is shown in Table 2.1.

The chapter contains the general socio-economic conditions of the model areas, life and work of women including social status of them, and the water-related studies. The last content, the water-related studies were made on the basis of various data collected during the survey. The results were effectively used for project evaluation and women in development presented in the Main Report.

2.2 Socio-economic Conditions in the Model Areas

2.2.1 Administration and Demography

The three model areas comprise the three communes of Ain Defali, Teroual and El Bibane. Both Ain Defali and Teroual are located in the circles of Had Kourt and Quzzane in the province of Sidi Dacem, whereas El Bibane located in the circle of Rhafsai in the Province of Taounate. The number of douars are ninety eight (98) consisting of 60 in Ain Defali, 28 in Teroual and 10 in El Bibane.

The national census conducted in September 1994 shows that the population in the model areas is 41,943 consisting of 22,930 in Ain Defali, 11,740 in Teroual and 6,273 in Rhafsai. The field survey was executed in the model areas from June to July of 1995. The population was counted by douar, indicating that the population (43,723) surveyed is somewhat larger than the official figure of the national census. The discrepancy between the official figures and the surveyed may be ascribed to social movement of population for job seeking elsewhere where and seasonal time when the census and field survey were conducted respectively. In this study, actual population is based on the

surveyed figures which are the base date for population projection and water demand. The population surveyed by douar is shown in Table 2.2 and summarized as follows.

Administration and Population

Province	Circle	Commune	Area (km ²)	Nos of douars	Surveyed population	Census population
Sidi Kacem	Had Kourt	Ain Defali	234	60	25,116	23,930
		Teroual	72	28	12,096	11,740
Taounate	Rhafsai	El Bibane	36	10	6,511	6,273
Total			342	98	43,723	41,943

2.2.2 Present Conditions of Infrastructure

Infrastructure and social facilities are mostly concentrated at rural centers of the communes. Those at douar level are confined to one or two mosques and a school. The type of infrastructure and social facilities in the model areas is shown as follows;

Infrastructures and Facilities in the Model Areas

Description	Ain Defali	Teroual	El Bibane
Kinder garden	2	0	0
Primary school	4	1	1
Classes	17	6	3
College	1	1	0
Mosques	56	20	14
Post office	1	1	0
Primary roads	1	0	0
Secondary roads	1	1	0
Slaughter houses	1	1	0
Electricity	center	center	center + 2 douars
Agricultural center	1	1	0
Telephone	center	center	2 douars
Commune clinic	1	1	under construction
Forestry office	1	1	
Agricultural cooperative	5	0	0

The more detailed conditions of infrastructure by douar is shown in Table 2.2. The distance to the nearest road ranges from 5 to 8 km at some douars where local people are

forced to take a walk for movement to other areas. The distance to water points (spring water or dug wells) depending on locations of them extends to more or less 10 km at some douars in Ain Defali. In general, accessibility to other areas tends to be more difficult in hilly area such as Teroual and mountainous area such as El Bibane. Such a physical constraint limit the agricultural development and trade between the model areas and the urban areas. The constraint also has a negative impact on women to reach health care centers and shops concentrated at rural centers.

2.2.3 Industry and Employment

Industrial activities are almost non-existent in the three model areas with the exception of the tobacco company in Ain Defali. However, the recent severe drought in 1994 caused a sharp drop in tobacco production and consequently the tobacco company operates only three months a year.

The migration for job seeking is envisaged in the model areas. Such a social movement is in particular conspicuous for landless small farmers. Hence, farm activities and management are dependent on women left at home. This situation, together with the lack of basic infrastructure facilities such as water, access roads, electricity, etc. encourage rural exodus from the model areas towards the urban centers or to regions where intensive agricultural activities exist.

In view of the importance of this social phenomenon and its impact on the socio-economic development in the pre-rif region, the rural migration issue has been examined in more details in subsequent sections.

2.2.4 Land Use

Agriculture is the dominant sector in the model areas. The following table shows the pattern of land use (area) the type of crops in the three model areas.

Major Crops Cultivated in the Model Areas in Hectares

Crop	Ain Defali	Teroual	El Bibane
unit: ha			
Annual Crops			
Hard Wheat	4500	1100	470
Tender Wheat	7000	1650	570
Barley	2000	550	200
Vegetables	10	60	50
Legumes	1850	1000	26
Beets	20		-
Sun flower	300	50	-
Tobacco	350	150	-
Fodder	-	240	10
Trees			
Forest	462		
Fig			450
Olive	1030*	660*	520*
Citrus	99		
Pomegranate	9		
Posture	120	900	
Uncultivated land	-	-	600

Note: Number of trees.

A wide variety of crops is cultivated in the commune of Ain Defali. Some of the vegetables, tobacco plants and certain fruit trees which are water demanding crops, call for numerous interventions such as weeding and harrowing, are confined to (the valley of Oued Rdat) extending along river beds. Dry farming comprises mainly cereals and covers vast areas of the agricultural lands in the plain of Had Kourt.

Eucalyptus trees utilized for the purposes of fuel or fire wood supply, cover an important area in the rural landscape. Hilly lands are utilized for olive tree growing. The areas of Teroual and El Bibane are homogeneous in terms of land use. Land is extensively for olive growing and arbori-culture, and a part of land is reserved for annual food crops.

The results of the survey indicates that some cash crops have been abandoned for a number of problems. Grapes, sorghum and broad beans are no more grown due to plant disease (e.g. phylloxero on grapes), sparrow attack on sorghum, legumes and broad beans. Actually, it is widely known that these problems render real obstacles to the development of these types of crops.

Other crops including vegetables have also been abandoned either due to water shortages and low commercial value. The following table shows the list of abandoned crops as well as potential crops to be cultivated in the model areas.

Abandoned Crops and Farmers Desire

Type		Ain Defali		Teroual	El Bibane
Abandoned crops	Sugar beets	Flax	Corn	Corn	Sorghum
		Tobacco	Tobacco	Vine	Alfalfa
		Medical plants	Beans	Tobacco	Vine
			Vine	Flax	Vegetables
			Arboculture		
			Vegetables		
Desired crops to be introduced	Legumes	Beets	Vine	Capre	None
	Vegetables		Carob	carob	
	Beets				

Livestock breeding is very extensive and consists of oxen and cows. The equidae are utilized in agricultural works, hauling of water or for transport inside the area. The numbers of livestock per douars in the three model areas are presented in Table 2.2. Poultry and rabbit farming and bee keeping are traditional agricultural activities and are widely praised in the model areas.

2.2.5 Household Income

The purchasing power of households can be estimated by both sides of income and expenditures. The Provincial Office of Agriculture annually estimates the net agricultural income per person, household or hectare. Though such income entirely depends on prevailing climatic conditions, the annual income in Taounate province was reported to be about DH 3,900 in 1994-95. The same income in Sidi Kacem for the year 1990-91 was reported to be DH 19,944 per household or DH 3,680 per hectare.

Household expenditures are another method of evaluating purchasing power of rural households. Prior to estimation of expenditures, households surveyed was classified on the basis of the holding size of farm land, the number of livestock and arboricultural trees (i.e. olive trees) a farm house owns. The distribution of wealth class in the model areas is estimated to be as follows.

Distribution of Wealth Class

Commune	Rich	Middle	Poor	Total
Ain Defali	29	33	38	100
Teroual	20	30	50	100
El Bibane	13	34	53	100

From the above table, the distribution of poor class is substantially higher in El Bibane than in other areas. This correlates mainly to the holding size of farm land. The estimation of the monthly per capita expenditure was computed from the average expenditure reported by the heads of household by income class. The monthly per capita expenditure by class is as follows.

Expenditures per Capita and Month by Class

Commune	Rich	Middle	Poor	Total
Ain Defali	316	295	171	260
Teroual	288	256	147	230
El Bibane	490	276	156	308

The per capita expenditure of the rich in El Bibane is substantially high, DH 490. This may be explained by non-agricultural income generated from economic activities in the fields of commerce and crafting works. Accordingly the average expenditure (DH 308) appears to be high, but the expenditure of the poor who constitutes more than 50 % of households is low, DH 156.

The average expenditures are simply multiplied by twelve (12) months to estimate annual average expenditure per person, resulting in DH 3,120 in Ain Defali, DH 2,760 in Teroual and DH 3,700 in El Bibane.

2.2.6 Migration

The model area is characterized by the migration of men for job seeking elsewhere. The migration causes a social problem called women heads of household. Women left at home are entirely responsible for economic activities in place of men in order to earn a

livelihood. The percentage of women heads of household is relatively high in the hilly and mountainous areas.

Model Area	Number of Surveyed Households	Number of Women Heads of Households	Percentage (%)
Ain Defali	1,880	313	17
Teroual	1,072	237	22
El Bibane	1,250	347	28
Total	4,202	897	21

The percentages of women heads of household are 17 in Ain Defali, 22 in Teroual and 28 in El Bibane respectively. The percentages of women heads of household by douar is shown in Table 2.3. The poverty is actually the main cause of rural exodus. The poor living condition is closely related to the problem of water scarcity. The recent drought occurred in 1994 forced people to migrate elsewhere since local people felt it difficult to sustain a livelihood by agricultural income.

Local people surveyed say that water scarcity is the primal factor influencing rural exodus. The 1994's draught in the Pre-Rif region had a negative impact on employment. Small size of livestock breeders were unable to provide feed for their animals and some farmers had abandoned their farm lands seeking for jobs elsewhere.

2.2.7 Education

Education and literacy are not considered essential requirement as long as rural families have not reached a certain level of economic prosperity. The literacy rate of women is considerably low in rural areas of the Morocco. Such a condition is also true of the model areas. A number of factors deprive women of their opportunity to receive education. They tend to cause youngsters not to attend school.

- Poverty,
- Absence of teachers,
- Distance to school,
- Requirement of children as agricultural labor, and
- Distance to water sources.

The following table shows the attending rate of students of primary schools at the time of socio-economic survey.

Model Area	Nos of Douars Surveyed	Nos of Students Attended		Nos of Students in total		Attending Rate (%)	
		Boy	Girl	Boy	Girl	Boy	Girl
Ain Defali	5	135	64	199	200	68	32
Teroual	19	766	173	934	961	82	18

It is obvious that the attending rates of girls' students are far lower than those of boys. This is mainly ascribed to the disregard for female education. The traditional custom to use girls as labors for water collection and agricultural works are still influential in rural society.

2.2.8 Sanitary Conditions

(1) Wastewater Collection and Disposal

None of the douars of the three areas has a public wastewater collection system. This lack of infrastructure forces the rural population to manage this problem by their own means. Actually, out of the 4364 surveyed dwellings, only 1414 or 32.4 % have latrines. When examining each model area separately, it can be noticed that 52.7 % of households in the commune of El Bibane have sanitary facilities; whereas this percentage is only 32.8 % and 19.3 in Teroual and Aïn Defali respectively. The difference between the three areas is better explained by the availability and abundance of water at household level. All of the surveyed persons have expressed their wish of having an on-site wastewater collection system.

Schools and open markets are not better off and are deprived of latrines. Open air slaughter houses are common in the three model areas where blood and viscera constitute a breeding ground for mosquitos and insects. The following table recapitulates the number of households equipped with latrines and septic tanks in each of the three model areas.

Types of Sanitary Facilities in the Model Areas

Designation	Model Area			Total
	Ain Defali	Teroual	El Bibane	
Number of houses surveyed	1,980	1,134	1,250	43,64
Number of reinforced concrete houses	313	46	104	463
% of reinforced concrete houses	14.7	3.0	8.3	10.6
Number of latrines and septic tanks	383	372	659	1414
% of houses with sanitary facilities	19.3	32.8	52.7	32.4

The figures in the above table indicate that the type of construction material is not related to the presence of a septic tank or other sanitary facilities. The availability of a water closet is a function of the standard of living. People living in unequipped dwellings use the open air or construct a wooden privy with a dry pit.

The surveyed people are aware of the eventual pollution of the springs and wells that results from leaks of septic tanks and ground holes. In this regard, certain conflicts have already occurred between the population of douar Ouled Bekkal in the model area of Teroual. The pollution of the spring is quite noticeable, particularly, on sloping grounds where the houses are situated upstream of the water source. This negative effect is observed in douar Ouled Ktir in Teroual and douar Tazghadra in El Bibane.

(2) Solid Waste Disposal and Cleanness of Water Sources

Household solid waste and animal excreta are collected and stocked in front of the dwellings in an area called "Zebbala". The manure is used later on as fertilizer. The volume of manure gives an indication on the wealth and well being of its proprietor.

In Ain Defali, the problem of solid waste collection is severe as the population pays a certain tax for the collection, but no service is done in return. Unfortunately, the three model areas lack the presence of a public service responsible for the hygiene and the cleanness of the water sources. Water sources examined during the survey were found to suffer from the presence of animal excreta and feed as well as large areas of stagnant water.

(3) Waterborne Diseases

It is quite difficult to evaluate waterborn diseases from a field survey. Actually the surveyed population ignore the origine and the causes of their own diseases. An approximate evaluation of the waterborn diseases that were encountered in the three communes during the last five years are presented in Table 2.4. Out of the 35 douars surveyed, the 16 douars are reported to suffer from the cholera in Teroual and El Bibane. Other diseases such as diarrhea, typoids and scabies are very frequent and present in the three model areas.

It is worth noting that waterborn diseases are present in the areas of Teroual and El Bibane where the existing water sources are mainly springs. According to the surveyed population, other dermic diseases are originated from lack of proper hygiene.

2.2.9 Housing

The type of housing constitutes an important element in the water supply projects. The type of housing was divided into three categories, clustered, semi-clustered and scattered types. The type of housing in the model area are summarized as follows.

Percentage of Housing Type in the Model Areas

Type of Housing	Model area			unit : (%)
	Ain Defali	Teroual	El Bibane	
Clustered + Semi Clustered	94	60	70	
Scattered	6	40	30	
Total	100	100	100	

The percentage of scattered houses is relatively small. The clustered and semi-clustered housing constitutes 94 % in Ain Defali, 60 % in Teroual and 70 % in El Bibane. The distance between scattered housing and the clustered type is found to be 1.7, 2.5 and 3 km in the model areas of Ain Defali, Teroual and El Bibane respectively.

2.3 Life and Work of Women

This section explains the ideas that were brought forward by the surveyed women concerning their activities, the assessment of their jobs as well as their ideas regarding the development of the socio-economic conditions in their localities. These priorities are ranked according to the order of importance that the surveyed women themselves have answered.

2.3.1 Water Supply

The severe problem of potable water supply in the three model areas is best expressed by the surveyed population. As an example, in douar Lahjafna of the commune of Ain Defali, a household head instructed his wife that "if the neighbors ask for water give them olive oil". Another husband, in douar Chouia Bouryatel, prefers to loose one can of oil than its equivalent in water.

Actually, in nearly all of the surveyed douars, potable water scarcity is considered as the major annoyance to women. In general, women consider water as a priority issue, while men, particularly in Teroual and El Bibane, tend to put urgent priorities on other issues than water. This clear distinction is really a function of the nature of work itself and which member of the household executes it.

Although the participation of men in water supply is only limited to the summer and drought periods for reasons of distance and incurred risks, the water task is generally the responsibility of women and children. More often, when the man is in charge of supplying water, he facilitate his task by using other means of transport such as mules or tractors.

The considerable difficulties related to the supply of water to households induce significant negative impact on the rural population such as the diminutive percentage of literate youngsters, particularly girls, and the risky and uncertain hygiene conditions that cause the proliferation of water borne diseases such as cholera and, typhoids which is related to the transport of heavy water containers. These issues are explained in subsequent paragraphs.

Time schedules allocated to water collection are variable. In general, the rural population adopts a strict daily schedule for water supply of the various localities and douars.

Disputes over water rights are usually resolved by local authorities. During drought periods, priority of water supply is given to the population of the douar owning the water source.

Time devoted by women to the supply and the transport of water varies from one douar to other. The frequency of trips for water collection increases as the distance of the water source to the douar is reduced. Normally, this task is the duty of women and children, particularly girls. Nonetheless, women who are heads of households are not spared from this task, irrespective to the distance of the water source.

On the other hand, as to the area where the water supply facilities were already constructed, men and women used to share the responsibility of water collection prior to the construction of the existing water supply facilities (i.e. standpipes). Today, this task is the responsibility of women alone.

In addition to the considerable distance of water sources from households the rugged nature of the terrain complicates further this task. In douar Ghalou in the model area of Teroual, men and women suffer from scars on their shoulders as a result of transporting heavy water containers over long distances.

Other problems arise during the rainy season, as wet clayey soil covering the area becomes slippery and accidents occur more frequently. In order to overcome this problem, women tend to store rain water and use it in their daily activities (i.e. dish washing, laundry and other domestic works).

The time allocated for water collection is quite important and varies from season to another and according to the distance of water sources. Women try to get organized when collecting water in order to reduce waiting time at the water source. In dry season and particularly in the summer period, waiting time at the water source becomes considerably longer as a result of the high demand and the limited amount of available water.

2.3.2 Firewood Supply

The task of firewood supply and collection in the three model areas is less tiresome in comparison with other rural areas in Morocco. Three distinct situations are identified with respect to the collection of firewood in the surveyed model areas:

- Extensive usage of butane gas for cooking and baking bread.
- Use of butane gas together with firewood for cooking activities.
- Use of butane gas for the preparation of tea only.

In general, the type of usage depends on household income. The rich families tend to utilize butane gas more extensively. However, it is worth noting that, irrespective of their social category, all families in the surveyed areas utilize the traditional firewood for baking bread. Traditional cooking using firewood is observed during crop harvesting and olive collection periods since additional on-site food has to be prepared for the large number of labor to be mobilized.

The types of firewood utilized as fuel consists, of stubbles, wood from olive trees or from vine trees. In some of the surveyed douars, where firewood is scarce, the families join together to use in turn their baking and cooking stoves so as to economize as much as possible firewood usage. Based on the survey results, the time allocated for firewood collection varies according to the period of year and with household needs.

2.3.3 House Keeping

In all the three model areas, women are the main responsible for house keeping and maintenance activities. In this respect, they periodically carry out the following maintenance activities of their households:

Temlass : To smooth the walls of the house by means of clay material mixed with fine straw. This activity takes place when house frontage is damaged by rain.

Tebiad : To white walls during the spring and summer seasons and at the time of religious ceremonies.

Tehnak : To polish house floor in order to get rid of fleas and reduce dust effect in the house. This activity is carried out at the beginning of the winter season and is repeated two to three times a month during the summer.

2.3.4 Household Duties

Besides the maintenance of their dwellings, women in the model areas look after household duties such as preparation of meals, daily house cleaning, maintaining stables and cowsheds, food preservation, laundry, dishwashing, care of children and looking after elderly persons in the house.

Lack of certain essential equipment such as refrigerators or freezers makes food conservation very difficult and laborious. The survey also indicated that, particularly during the food cooking period, women are exposed for long hours to smoke emanating from cooking facilities in badly ventilated and poorly lit rooms called "noualas".

2.3.5 Agricultural Activities

Agriculture activities including livestock breeding, cereal and olive growing constitute the major profession in the surveyed three model areas. Women are heavily concerned with these activities as they participate in various field works such as seeding, maintaining and harvesting of crops as well as feeding and maintaining livestock.

Land plowing, harvesting and cereal threshing are the only agricultural activities, carried out by men. In the model area of Ain Defali, women divide the year into four seasons which is quite logical. However, the designation of one season seems peculiar as it is called by the name of the predominant agricultural activities during that season. As such, winter is called "Al Hart" (i.e. plowing activity). The agricultural activities carried out by women consist of weeding, harrowing, pulling up weeds, collection of tobacco leaves, harvesting of cereals legumes, vegetables, fruits and shaking of olive trees, straw picking, scouring of stables, maintenance of dwelling, collection and supply of water and wood, preparation of meals, dish washing,, laundry, etc.

However, when surveyed women were asked to classify these activities in decreasing order of difficulty and annoyance, slight differences appeared to exist between the douars. Nonetheless, the majority of surveyed women and also men declared that the harvesting activity is the most difficult and tiresome task.

It is to point out that the agenda of daily and seasonal activities is almost occupied by the agricultural works. Some women in douar Oued Ktir in Ain Defali say that they work

between 19 and 20 hours a day during the fall season, 14 hours in spring and 13 hours in the winter as indicated in Table 2.5.

In the model area of El Bibane, the seasons of the year are called according to the predominant activity of the season. In this respect, the summer, fall, winter and spring are called Saïf, khrif, olive and plowing and Rbia respectively. The various agricultural activities in which women are involved consist of cereal harvesting, collection of fruits and olive, livestock grazing, weeding, collection and supply of water and firewood, fruits drying and preserving, maintenance of the dwelling, harrowing and crop gathering. Nevertheless, women sustain enormous difficulties, particularly, during the olive collection, harvesting and gathering of fruits. Other women hired as laborer feel depressed when asked to harrow land or to chase birds away from crops and fruit trees.

In the model area of Teroual, women in douar Zourak divide the year into five seasons : winter, spring, "sboulat" or harvesting, summer and fall. Surveyed women declared that their daily activities cover a large number of tasks and consist of cereal harvesting, shaking down olive trees, weeding, grazing of livestock, fruit gathering, extraction of oil, collecting tobacco leaves, supply of water and firewood.

As for the salaries of those women who are employed on daily basis, it is the lowest in the country and varies between 15 and 20 DH which is equivalent to a half day salary though their daily shift exceeds 10 hours of work. However, their pay is doubled when they are engaged to work outside their home towns.

2.3.6 Crafting Activities

The socio-economic survey results indicated that, among the investigated douars, women in 14 douars engage themselves in various activities or participate with their husbands in such work. The majority of the craft workers are found in the model areas of Teroual and El Bibane where the major crafting activities are:

Draza : which is the local name for wool work for making traditional clothes, cover sheets, belts for women, traditional table cloth and others (e.g douars S. Allal Zghari, Tazghadra and Babet Bir).

Njara : which is the local name of wood crafting to make farming tools, kitchen instruments and others (e.g douar Zourouk).

Doume : which is the local name of basket and tray making and is practiced in the douar of Aghbalou.

Traditional and modern cloth making is manufactured in Ain Defali and douar Hjfana.

2.4 Existing conditions of Water Use

The section of 2.4 presents the existing conditions of water use in the model areas. The details are presented in Table 2.6.

2.4.1 Water Consumption

The average water consumption per capita and day is almost identical in the three model areas. The daily water consumption per capita ranges from 15 to 17 liters in summer and 13-14 liters in winter. The following table shows the proportion of daily water consumption by different use in the model areas.

Commune	(Unit : liter)							Total
	Cooking	Drinking	Dish washing	Vegetable washing	Shower	Religion	Cloths	
Ain Defali (percent)	1.1 (6.2)	7.0 (41.1)	2.6 (15.5)	0.8 (4.6)	4.4 (25.7)	0.2 (1.5)	0.9 (5.4)	17.0 (100.0)
Teroual (percent)	0.9 (5.8)	5.1 (34.3)	2.9 (19.2)	0.7 (4.9)	4.5 (29.8)	0.1 (0.6)	0.8 (5.4)	15.0 (100.0)
El Bibane (percent)	1.1 (6.4)	6.5 (38.3)	3.0 (17.9)	0.9 (5.3)	4.2 (24.8)	0.2 (0.9)	1.1 (6.4)	17.0 (100.0)

Drinking is the biggest water use, followed by shower. It is comprehended that rural people use scarce water for various purpose.

The surveyed data on water consumption is considerably lower than the statistical data (i.e. 35 to 40 l/c/d) projected by the Department of Research and Planning of Water (DRPE). This difference can be explained as follows;

- Water consumption is constrained due to scarce availability of water resources.
- The surveyed data show consumption from spring water and existing wells, but does not include consumption from rainfall or another water sources.

Water consumption is subject to proximity of water source, the distance between household and water source.

2.4.2 Means of Water Transportation and storage

The means of water transportation are either human beings or animals consisting of donkeys and mules. The following table shows the means of water transportation.

Proportions of Means of Water Transportation

Model Areas	Animals	Vehicles	Human	unit: %
				Total
Ain Defali	93	6	1	100
Teroual	81	-	19	100
El Bibane	86	-	14	100

The use of animals for water transportation is conspicuous in ht model areas. Local people in Ain Defali often use vehicles, tractors and carts thanks to the flat plain area. The recent drought causing water shortage forced people to make an inter-douar movement by use of tractor for the purpose of water collection. The proportion of human beings is relatively high in the hilly and mountainous areas.

The made involvement in water transportation is indispensable, particularly during the dry season when off-site collectors have to wait for long time at water sources, and households being for from water sources. In Ain Defali where the water shortage is severe, the male involvement in water transportation is relatively high, 35 percents. The involvement of children in water transportation is substantially high in all the model areas. But this should be considered with precaution. This is due to the fact that the survey was conducted during the summer when children are out of school and are available in this task. The following table shows the proportions of men, women and children involved in water transportation.

Proportions of Men, Women and children Involved in Water Transportation

Model Areas	Men	Women	Children	unit: %
				Total
Ain Defali	35	16	49	100
Teroual	28	36	36	100
El Bibane	17	22	61	100

Local people use containers made from plastics, metals and clay. Water is normally stored in the same transport containers for the period from a day to a week. It is obvious that the quality of water stored eventually degrade. Such water is not entirely acceptable from the hygienic standard.

2.4.3 Existing Water Sources

The following table shows the number of existing water sources by area. The number of dried sources is tremendous, 99 of spring water and 309 of wells. The duration of water scarcity is 5 to 6 months in a drought year and 2 to 3 months in a normal year.

Existing Water Sources

Model Area	Number of Douars	Number of Springs		Number of Wells		Depth of Wells	
		Active	Dry	Active	Dry	Max.	Min.
El Bibane	10	11	18	28	17	19.5 m	7.9 m
Teroual	28	52	58	17	97	9.8 m	5.9 m
Ain Defali	60	25	23	73	195	15.5 m	7.5 m
Total	97	88	99	118	309	14.9 m	7.1 m

The average depth of existing wells is not deep ranging from 7 to 19 m. Ain Defali is featured by the large number of water sources scattered extensively, but dried sources are conspicuous in number, which is perhaps caused by the availability of groundwater.

Almost the existing wells are neither maintained nor equipped. On the other hand, more than 50 percent of springs are refurbished by communes themselves financed by local government budget. The legal status of a well is different from that of a spring. Most of springs is, in general, public, while more than 90 percent of wells are privately owned.

2.4.4 Time and Distance

The following table shows the distribution of population according to distance from dwelling units to water sources by model area.

Distribution of Population According to Distance

Model Area	House connection	0.1 to 1 km	1.1 to 4 km	More than 4 km	Total
Ain Defali	3	39	33	25	100
Teroual	17	52	31	0	100
El Bibane	0	53	47	0	100

The marked feature is that the distance to water sources is relatively longer in Ain Defali than in Teroual and El Bibane. About 25 percent of population collect water at a distance of more than 4 km in Ain Defali, while none of them is observed at a distance of more than 4 km in Teroual and El Bibane. Most of people collect water in the range from 0.1 to 4 km in Teroual and El Bibane. This indicates that water sources are relatively close to the douars in Teroual and El Bibane. On the other hand, Ain Defali is marked with water sources widely scattered. The rate of house connection is the highest, 17 percent in Teroual, followed by 3 percent in Ain Defali. House connection concentrated on rural center of respective commune.

Time spent by people to collect water varies by season and area. About 66 percent of population spend more than two hours for water collection in summer, while the proportion decreases to 7 percent in winter in Ain Defali. The seasonal variation is similar in the other areas. Time required is closely related to the distance to water sources. Time is much shorter in Teroual and El Bibane than in Ain Defali. The following table shows the ratio's of population distribution by time.

Ratios of Population Distribution by Time

Model Area	Season	Time Required (hrs)					Total
		0-0.5	0.5-1.0	1.0-2.0	2.0-4.0	more than 4.0	
Ain Defali	summer	10	15	8	38	29	100
	winter	35	19	9	7	0	100
Teroual	summer	27	35	38	0	0	100
	winter	63	37	0	0	0	100
El Bibane	summer	24	13	63	0	0	100
	winter	69	31	0	0	0	100

2.4.5 Cost of Water collection and Willingness-To-Pay

It is important to estimate the present cost of water collection and supply in the three model areas. This estimation could make rural people be aware of the actual cost incurred in water transportation. The actual costs differ according to a number of

parameters such as the distance to the water sources, means of transport and the material used for water collection, etc. A number of cases were encountered during the socio-economic survey with the following items:

- Breeding of animals could cost in the range from DH240 to DH720 per month.
- Use of a tractor could cost DH400 per month excluding rental charge.
- Guarding fees ranging from DH10 to DH20 per month and household if water source is located within the douar.

Willingness-to-pay for water differs according to economic standard of living. social classes of local residents in the model areas are divided into three categories, poor, average and rich. Table 3.2.11 shows the rough estimate of the expenditures which a household is willing to pay for water every three months.

WILLINGNESS-TO-PAY OF HOUSEHOLD PER THREE MONTHS

Commune	unit: DH		
	Poor	Average	Rich
Ain Defali	60	183	340
Teroual	45	81	150
El Bibane	65	85	143

A household belonging to the average and rich classes in Ain Defali are able to pay more than the double of expenditures to be paid by the same classes in El Bibane and Teroual. The difference of willingness-to-pay between the poor and the rich is also substantial, more than five times in Ain Defali.

2.5 Water Supply Facilities Desired by Local People

The survey was conducted to inquire the type of water supply systems desired by local people. The questionnaires regarding the type of water supply systems are i) the supply mode and ii) the implementation body, which is shown as follows.

TYPES OF WATER SUPPLY SYSTEMS DESIRED BY LOCAL PEOPLE

	Unit : percent		
	Ain Defali	Teroual	El Bibane
Supply Modes			
(1) Stand pipes	---	31	21
(2) House connections	83	57	57
(3) Common use (1)+(2)	17	12	22
(4) Total	100	100	100
Implementation Bodies			
(1) Local community	11	22	22
(2) Commune	---	22	33
(3) ONEP	78	22	45
(4) Public corporation	11	34	---
Total:	100	100	100

More than a half of the people surveyed opts for connection type of facilities. High percentages of house connection is ascribed to the people's desire to control and manage water use inside their dwellings. The people who selected the other type of facilities are, in general, located in poor douars.

The percentages of ONEP as the implementing body is substantially high, 78 percent in Ain Defali and 45 percent in El Bibane. This may be explained by local people's information about the existing water supply services by ONEP implemented in the nearby locations (i.e. Had Kourt near Ain Defali and Rhafsai adjacent to El Bibane). Local community implies local people's participation in operation and management of water supply services.

2.6 Priorities of Infrastructure

The questionnaire survey was conducted to evaluate the priority order of social infrastructural facilities in the model areas. The items of facilities were firstly classified and then ranked according to the frequency of priority expressed by local people surveyed.

(1) Ain Defali

The survey results indicate that both men and women put the first priority on water supply. The need for utility services is placed on top rank. Local need for water supply as the top priority is clearly explained by water scarcity in Ain Defali.

Infrastructure	Order of Priority	
	Men	Women
Water supply	1	1
Electricity supply	2	2
Road	3	3
School	4	5
Clinic	5	4
Public bath	6	5

(2) El Bibane

The construction of communal road is actually ranked as high priority for both men and women. This result is ascribed to local people's desire to make it easier to access to the outside area due to the steep topographic condition in mountainous area. Women put the first priority on water supply since water collection in such mountainous area is the tiresome work for them. The establishment of clinic is ranked as the third priority since people is no longer necessary to go to public health clinic outside.

Infrastructure	Order of Priority	
	Men	Women
Road	1	2
Water supply	2	1
Clinic	3	3
Electricity supply	4	5
School	4	4

(3) Teroual

The order of priority in Teroual is almost identical to those of the other model areas. Both men and women put the first priority on water supply. The need for communal road may be the same reason as expressed in El Bibane.

Infrastructure	Order of Priority	
	Men	Women
Road	1	2
Water supply	1	1
Electricity	3	2
School	4	5
Clinic	5	4

2.7 Perception of the Population on the Impact of Water Supply Facilities

The perception of the surveyed population on the impact of water supply facilities differs from one model area to another due to the different social categories, geographic location, water related problems and others.

In general, all investigated people evoked positive impact with the exception of the population of douar Tazgharda, in the area of El Bibane, who fear that some negative effects could occur on the volume of water allocated for their agricultural activities.

The rural population in the three model areas brought forward a total of 16 parameters that are economically dependent on the development of potable water supply facilities. These parameters are summarized and are ranked according to their frequency of occurrence as follows.

Parameters	Frequency of occurrence			
	Ain Defali	Teroual	El Bibane	Total
- Change of household equipment and water facilities	11	7	6	24
- Improve ment of hygiene conditions	9	6	7	22
- Increase of free time	8	0	0	7
- Construction of parks	1	6	9	16
- Decrease of hardship work	10	2	5	17
- Reduction of rural exodus	6	0	2	8
- Increase of livestock breeding	3	3	2	8
- Increase of real estate value	5	0	1	6
- Investment in agriculture & crafting	0	4	3	7
- Increase of the attending rate of girls in school	5	0	1	6
- Reduction of water tariff	5	0	0	5
- Increase Allocation of time for farming activities	4	1	0	5
- Increase of free time to family	1	2	0	3
- Decline of water-born disease	0	0	2	2
- Decrease of rental costs of animals	2	0	2	4
- Change of life style	0	1	1	2

Note: 14 douars were examined in Ain Defali, 8 in Teroual and 8 in El Bibane

According to the surveyed population in Ain Defali and Teroual, the primary impact of a water supply system concerns the refurbishment of dwellings and the switch to a higher type of water service facility (i.e. house connection). In El Bibane this parameter is ranked third as the population places the creation of public park and the improvement of the hygiene conditions in the first and second rank respectively.

The second difference concerns the impact on the reduction of hardship related to water collection and supply which is ranked second by the population of Ain Defali, whereas in Teroual and El Bibane this parameter is ranked fourth. This explains the severe water shortage in Ain Defali.

According to the surveyed men in Ain Defali, the time saving is ranked as fourth positive impact of the provision of water supply facilities. This indicates the involvement of men in water collection and supply. While in the other two areas, this parameter is ranked last.

Other important effects such as encouraging investment in agriculture, increase of revenue and development of livestock breeding are also observed in all three model areas.

Table 2.1 Number of Men and Women Surveyed by Douar

Commune	Douar	Number of Men	Number of Women	Total
EL Bibane	Babet El Bir	26	9	35
	Ouled Benjam.a	20	6	26
	Zaouia	15	5	20
	Ras Lakbour	12	7	19
	Rkiba	20	14	34
	Jama. El Rif	14	6	20
	Aounane	10	7	17
	Astar	20	8	28
	Douihear	13	3	16
	Tazghadra	20	4	24
	Total	170	69	239
	Teroual	Zourak	20	10	30
Lahjar Touil		80	14	94
Ouled Bakkal		30	9	39
Jamae El Oued		12	0	12
Ain Haddad		7	4	11
Ghbalou		20	11	31
Koudia + Khandek El Berd		50	12	62
Bakkala		12	7	19
Sidi Allal Zghari		24	8	32
Teroual Centre		30	4	34
Total		285	79	364
Ain Defali		Lahjafna	6	30	36
	Ain Defali centre	20	1	21
	Ain Defali Douar	25	20	45
	Ain Chamia	20	7	27
	Chaouia Bouryatel	10	6	16
	Chwaker	40	5	45
	La.mania	12	1	13
	Chaouia Rmel	30	1	31
	Bni Zid	10	6	16
	Slim	35	6	41
	Lahjajma	7	8	15
	Ouled Salem	9	9	18
	Fadilia	20	11	31
	Ouled Ktir	14	12	26
	Souhate	20	6	26
	Wafae	5	13	18
	Boutayeb	8	5	13
	Total	291	147	438
	Grand Total	746	295	1041

Table 2.2 Infrastructures and Socio-economic Conditions in the Model Areas (Ain Defali)

Douar	Number of Houses	Population	Distance to Road (km)	Electricity	Distance to School (km)	Distance to Water (km)	Number of Livestock S/L/E
AAOUFAT	40	320	8	NE	0.8	D	100/250/60
AIN CHAMIA	160	710	14	NE	0	0.5 - 12	400/220/80
AIN DEFALI CENTER	100	750	---	---	---	---	---
AIN SEDDINE	13	100	0.2	NE	1	0.1	350/210/80
AIN SFESSEF	12	102	0	NE	1	0.5	60/20/20
AMAMA	52	350	2	NE	3	2	120/30/50
BNI CHELLAH	41	250	3	NE	0.2	4	280/60/35
BNI SENNANA	100	640	1	NE	1.5	0.4	580/40/80
BNI ZID	150	850	8	NE	0	0.4 - 6	750/110/160
BOUJAJAT	16	74	3	NE	0.5	2	25/35/12
BOUJOUJLAT	64	261	1	NE	0.5	2	700/130/90
BOUKOURATT	40	250	1.5	NE	1.5	3 - 5	180/30/40
CHAOUIA BIR	125	730	0	NE	0	2	900/300/80
CHAOUIA BOURYATEL	80	550	2	NE	0	1 - 20	670/120/82
CHAOUIA RMEL	172	1032	0.1	NE	0	0.6	1300/600/50
CHLEUH	23	140	4	NE	2	0.5	250/60/25
DAAF LAHFIRA	52	230	2	NE	3	6	706/60/45
AIN DEFALI	136	930	0			0.5	550/50/100
DAAF OULAD ALI	27	100	2	NE	2	12	516/60/35
DHAR KHARAZ	20	158	2	NE	3	1 - 3	105/55/12
DRIOUCHAT	24	96	3	NE	0.2	2	305/30/40
FADILIA	50	345	2	NE	0	2 - 12	512/130/47
FSSAHYEN	36	224	4	NE	2	4	120/43/56
HJAFNA RDAT	150	800	0	NE	0	1 - 4	550/250/50
JAAOUNA	30	192	4	NE	1	2	200/30/26
JDID	120	700	0	NE	0	0.2	700/80/50
JRAMNA	30	300	0	NE	0.5	5	280/50/25
KELAA	31	219	5	NE	0.2	3.5	80/20/18
KHOBZIANNE	120	790	2	NE	0	1	360/40/100
KRANES	40	320	4	NE	1	5	100/30/40
KRAOCHA	120	720	4	NE	0	3 - 5	510/125/110
LAAMIRAT	100	616	2	NE	0	2	500/40/35
LAAOUAOULA	60	700	1	NE	1	1	250/60/25
LAHASBA	20	126	4	NE	3	2 - 4	212/50/20
LAHJAFRA BOUGDOUR	120	720	0	NE	0	15	12/1000/20
LAHJAJMA	130	894	7	E	4	1 - 5	820/350/300
LAHRAHRA	50	250	0.5	NE		0	180/40/30
MAADID	15	60	1	NE	1	1	210/30/30
MKAM ROUGUI	10	70	12	none	4	2 - 4	800/100/50
MOUALDA	62	372	5	none	1	2	440/100/30
MRABIH	74	454	7	none	0	4	400/210/13
OULAD BOUCHRIHA	70	350	0.5	none	0	0	400/160/100
OULD MAHYOU	40	291	1	none	3	2	300/50/30
OULED SALEM	18	110	2.5	none	2	7	210/54/49
OULED AAROUB				avec Lahrahra			1700/160/100
OULED BENYEFOU	60	378	0	none	2	3	340/60/37
OULED BOUAMER	15	90	4	none	2	1	340/60/37
OULED BOUTAYEB	31	190	0	NE	0.3	2 - 3	180/40/46
OULAD BOUBKER	61	427	8	NE	2	1	360/50/67
OULED CAID	124	820	2	NE	0	1	860/140/210
OULED KTIR	330	2240	7	NE	0	0 - 1	1050/300/250
OULED NOUEL	33	200	1	NE	1	1	330/50/30
SLIM	226	1536	9	NE	0	5 - 12	1200/300/120
SOUHATE	35	210	1	NE	0	4	600/200/150
SLAHMA	39	231	1	NE	1	2	600/80/43
AIN MASMOUDA	4	20	3	NE	---	2	200/30/14
REQUADA	10	70	3	NE	---	2	160/30/10
SOUISSAT	30	270	0	NE	0	1	200/25/20
LAOULA SAYED	14	100	0	NE	0	2	60/30/10
COOP. EL MASSIRA	10	88	0	NE	1	0	600/70/50
TOTAL	3965	25176					10121/5461/2118

Table 2.2 Infrastructures and Socio-economic Conditions in the Model Areas (Teroual)

Douar	Number of Houses	Population	Distance to Road (km)	Electricity	Distance to School (km)	Distance to Water (km)	Number of Livestock S/L/E
ACHIRA	38	210	8	N.E	1	1	190/117/75
AIN ARSA	65	350	1 + (2)*	N.E	4	2	167/138/75
AIN HADDAD	80	480	5	N.E	1	0.5	260/80/95
AMALOU	30	180	3 + (2)*	N.E	4	1	59/46/20
BAKKALA	50	320	3	N.E	0.5	0.3	240/150/90
BERIAT RMEL	32	190	6	N.E	0.5	1	
GHBALOU	200	1200	15	N.E	2 to 3	1	2000/600/250
GLITA	55	300	6	N.E	2	2	250/154/100
HADDARINE	70	380	10	N.E	3	1	125/180/70
HJAR TOUIL	160	800	7	N.E	1	0.2	300/120/100
HOUMAR	22	131	4	N.E	2	2	
INDGHAR	12	60	6 + (3)*	N.E	4	2	143/60/30
KHANDAK BERD	92	540	9 + (3)*	NE	4	1 to 4	280/105/100
KOUDIA	42	240	9 + (3)*	N.E	3	1	65/84/35
LALLA AICHA	20	110	8	N.E	1	2	70/49/30
LATAMNA	45	240	5	N.E	3	2	80/63/40
MERRAKINE	28	150	7	N.E	3	2	70/38/40
MGUEROUEL	65	350	3	N.E	3	2	220/125/105
OULAD IMRANE	18	100	9	N.E	4	1	280/57/45
OULAD BAKKAL	62	380	7	N.E	1	0.5	100/60/60
OULAD LAHCEN	18	110	8 + (1)*	N.E	3	2	120/55/45
REMLA	27	170	6 + (2)*	N.E	0	2	120/97/60
SIDI ALLAL ZGHARI	160	900	7	N.E	0	0.2	350/50/100
TEROUAL	350	2050	0	E	0	0	150/50/40
ZLAYERH	28	170	9 + (4)*	N.E	4	1	127/91/51
ZOURAK	130	740	10	N.E	4	1	160/80/100
OULAD BENTAHAR	19	110	3	N.E	3	3	85/79/27
OULAD HMIDOU	28	135	3	N.E	3	3	65/50/18
JMAA EL OUAD	200	1000	9	N.E	1.5	3	300/160/160
Total	2146	12096					

Table 2.2 Infrastructures and Socio-economic Conditions in the Model Areas (El Bibane)

Douar	Number of Houses	Population	Distance to Road (km)	Electricity	Distance to School (km)	Distance to Water (km)	Number of Livestock S/L/E
AOUNANE	140	752	10	E	0	4	152/46/43
ASTAR	73	420	10	E	0	4	57/22/59
BABET EL BIR	210	1203	3	E	0	0.2	300/200/300
DOUEHAR	55	287	10	E	0	4	139/12/34
OULAD BEN JEMAA	55	301	16	N.E	0	0.1	58/22/43
RAS LAKBOUR	46	307	10	E	0	4	110/12/43
JAMAE RIF	60	303	10	E	0	4	226/37/43
RKIBA	230	1022	10	E	0	4	163/67/163
TAZGHADRA	346	1636	6	E	0	0.5	427/350/280
ZAOUIA SIDI AHMED	35	280	14	N.E	3	0.4	103/27/24
Total	1250	6511					1735/795/1032

Remarks : (1) Abbreviations

1) Electricity : Existing (E), Not Existing (N.E)

* Indicates that access to the douar is by footpath or track road only

Table 2.3 Percentage of Women Heads of Households in the Model Areas

Commune	Douar	Nbr. of Surveyed Households	Nbr. of Women Heads of Households	Percentage (%)
AÔn Dfali	Boutayeb	31	5	16.13
	Wafae	20	2	10.00
	Souhate	35	10	28.57
	Ouled Ktir	290	15	5.17
	Fadidlia	50	3	6.00
	Ouled Salem	18	2	11.11
	Lahjajma	130	20	15.38
	Slin	350	40	11.43
	Beni Zid	140	30	21.43
	La,mama	52	15	28.85
	Chaoui R'mel	200	60	30.00
	Chouaker	80	20	25.00
	Chaouia Bouyatet	78	15	19.23
	AÔn Chama	120	20	16.67
	Douar AÔn Dfali	136	41	30.15
	Lahjafna	150	15	10.00
	Total	1880	313	16.65
Teroual	Lhjar Touil	160	50	31.25
	Zourak	130	13	10.00
	Allal Zghar	160	20	12.50
	Bakkala	50	15	30.00
	Khandar el Bard	92	19	20.65
	Ghbatou	200	40	20.00
	AÔn Haddad	80	20	25.00
	Janane el Oued	200	60	30.00
	Total	1072	237	22.11
El Bibane	Douiehear	55	20	36.36
	Astar	73	25	34.25
	Aounana	140	40	28.57
	Jnana Rif	60	10	16.67
	Rkiba	230	46	20.00
	Ras Lakbour	46	3	6.52
	Zaouia	35	8	22.86
	Benjam	55	4	7.27
	Rabet el Bir	210	53	25.24
	Tazghadra	346	138	39.88
Total	1250	347	27.76	
Grand Total		4202	897	21.35

Table 2.4 Waterborne Diseases Reported by the Surveyed Population in the Model Areas

Commune	DOUAR	YEAR				
		1991	1992	1993	1994	1995
Aïn Defali	COOP. EL Wafa				Scabies Pimple	Diarrhea
	Od. SALEM					Diarrhea Scabies
	CHWAKER					Diarrhea
	LAHJAJMA	Diarrhea	Pimple	Fever		
	Oued SLIM		Cholera			
	BENI ZID		Scabies			
	AIN CHAMIA	Nothing declared				
	DOUAR BOUTAYEB					Diarrhea
	LAHJAFNA	Cholera, Fever, Tummy ache, Diarrhea typhoid				
	OULED KTIR CH.RMEL LAAMAMA BOURYATEL AIN DEFALI	Nothing declared				
El Bibane	TAZGHADRA	Nothing declared				
	JAMAA EL RIF				Diarrhea Cholera	
	ZAOUIA				Cholera Diarrhea (frequent)	
	ASTAR				Diarrhea Cholera Skin Diseases Thyphoid	
	RQUIBA				Typhoid	Cholera
	AOUNANE				Diarrhea (frequent)	Cholera (children)
	RAS LAKBOUR				Cholera	Diarrhea
	OULED BENJAMAE				Diarrhea (frequent)	
	DOUIHER					Cholera Diarrhea
	BABET EL BIR				Typhoid (frequent)	Cholera Diarrhea
Teroual	OULED BEKKAL	Nothing declared				
	GHBALOU				Cholera	
	SIDI ALLAL ZGHARI	Nothing declared				
	ZOURAK	Cholera Diarrhea	Diarrhea	Cholera Diarrhea Typhoid	Cholera Diarrhea Typhoid Kidneys	Diarrhea Typhoid Scabies Kidneys
	JAMAA EL OUED	Cholera	Cholera		Cholera (6 dead)	
	AIN HADDAD				Cholera Diarrhea Typhoid Pimples	Cholera Diarrhea Typhoid Pimples
	BAKKALA HJAR TOUIL	Nothing declared			Cholera	Diarrhea Typhoid

Table 2.5 Daily and Seasonal Work Program Prepared by 4 Women in Douar Oued Ktir in Ain Defail

SEASON	Schedule	3:00 - 3:30	3:30 - 4:00	4:00 - 5:00	5:00 - 5:30	5:30 - 6:30	6:30 - 7:00	7:00 - 17:00	17:00 - 18:00	18:00 - 19:00 or 20:00 depending on the day	21:00 - 22:00 or 23:00
FALL	Activity	Deposit of water container at the spring	Preparation of bread	Preparation of breakfast	Baking of bread	Cleaning of stables and house	Breakfast	Collection of olives	Various house-work or collection of fire wood	Transporting water containers from spring	Preparation of dinner
	Schedule	3:00 - 3:30	3:30 - 4:00	4:00 - 5:00	5:00 - 5:30	5:30 - 13:00	13:00 - 13:30	13:30 - 14:30	14:30 - 16:30	16:30 - 18:00	19:00 - 23:00
SUMMER	Activity	Same activity as in Fall	Same activity as in Fall	Preparation of breakfast	Same activity as in Fall	Harvesting	Return to the house	Preparation of lunch	Lunch time and rest	housekeeping work	Preparation of dinner and rest
	Schedule	3:00 - 3:30	3:30 - 4:00	4:00 - 5:00	5:00 - 5:30	5:30 - 13:00	13:00 - 13:30	13:30 - 14:30	14:30 - 16:30	16:30 - 18:00	19:00 - 23:00
SPRING	Activity	Preparation of breakfast and cleaning	Breakfast	Cleaning of stables and house	Preparation of lunch and bread	Water collection	Bread baking	Lunch	Agriculture weeding and mowing	Various house work	Dinner and rest
	Schedule	6:00 - 7:00	7:00 - 7:30	7:30 - 10:00	10:00 - 11:00	11:00 - 12:00	12:00 - 12:30	12:30 - 13:00	13:00 - 17:00	17:00 - 18:00	19:00 - 20:00
WINTER	Activity	Preparation of breakfast and cleaning	Breakfast	Various house works	Preparation of lunch and bread	Water collection	Bread baking	Lunch	various works or rest	Livestock feeding indoor	Preparation of dinner
	Schedule	7:00 - 8:00	8:00 - 8:30	8:30 - 10:00	10:00 - 11:00	11:00 - 12:00	12:00 - 12:30	12:30 - 13:00	13:00 - 15:00	15:00 - 17:00	17:00 - 18:00
											18:00-20:00

Table 2.6 Existing conditions of water Use (1/3)

Douar	Nombre de Ménages Enquêtés	Unité de Bétail		Consommation d'Eau (l/j)				Moyen de Transport	Personne Chargée		Temps (hr)		Distance (Km)		
		Petit	Large	Été	Hiver	Bétail	Total		Homme (%)	Femme (%)	Enfant (%)	Et		Hiver	
Lahjafna	34	168	88	6470 (24)	6780 (25)	4360 (36)	10830 (60)	6780 (25)	38% véhicule	44	3	53	6	1	1.4 - 1.5
Lahjajma	9	3 (o) 42 (h)	11 (o) 30 (h)	1870 (24)	1550 (20)	1410 (37)	3280 (61)	1550 (20)	62% mulet	17	5	78	5 (j) 2 (h)	1	1 - 5
Benzid	7	---	12 (o)	775 (10)	775* (10)	1765 (29)	2540 (39)	775* (10)	5% véhicule	---	---	14	1 - 12	1	0.4 - 6
Ouled Salem	10	105	51	775 (9)	775* (9)	2565 (36)	3340 (45)	775* (9)	100% mulet	50	10	40	6	2	7
Chouaker**	13	244	100	1620 (9)	1720 (10)	5220 (35)	6840 (44)	1720 (10)	8% tracteur	35	---	65	6	---	12
C. Fedila	18	158	99	6055 (28)	3070 (14)	4750 (36)	10805 (64)	3070 (14)	92% mulet	35	65	65	5	0.5	2 - 12
C. Bouryatel	15	99 (o) 116 (h)	73 (o) 33 (h)	3450 (19)	1830 (10)	1900 (34)	5350 (53)	1830 (10)	6% véhicule	27	6	67	4	0.5	1 - 20
Larmama	9	24 (o) 26 (h)	14 (o) 19 (h)	1060 (14)	950 (12)	890 (37)	1950 (51)	950 (12)	94% mulet	39	11	50	8 (j) 3 (h)	---	2
Chaouia Rmel	22	---	46 (o)	2720 (16)	1780 (10)	1210 (30)	3930 (46)	1780 (10)	100% mulet	27	9	64	2 - 4	---	0.6
Slim	57	138 426	198	10070 (21)	10070* (21)	10050 (35)	20120 (56)	10070* (21)	4% individu	44	7	49	3 - 4	0.5	5 - 12
O. Boutayeb	21	101 (o)	54 (o)	3150 (16)	1640 (9)	---	3150 (16)	1640 (9)	96% mulet	72	14	14	2 - 4	---	2 - 3
Ain Charnia	23	---	48 (o) 53 (h)	1905 (9)	1905* (9)	2845 (35)	4750 (44)	1905* (9)	4% individu	17	13	70	1 - 5	---	0.5 - 12
C. Wafa	10	147	58	1045 (12)	1045* (12)	3055 (35)	4100 (47)	1045* (12)	100% indiv.	9	24	67	0.5 - 3	0.5	0.05 - 2
D. Ain Defali	27	33	29	1965 (9)	1965* (9)	485 (14)	2450 (23)	1965* (9)	7% individu	33	43	24	6	---	au douar
Total 14 Douars	275	1981 (h) 227 (o)	768 (h) 258 (o)	42930 (17)	35855 (14)	40505 (35)	83435 (52)	35855 (14)	93% mulet	35	17	48			

** Douar situé à limite de Ain Defali

Table 2.6 Existing conditions of water Use (2/3)

Douar	Nombre de Ménages Enquêtés	Population	Unité de Bétail		Consommation d'Eau (l/j)				Moyen de Transport	Personne Chargée		Temps (hr)		Distance (Km)
			Petit	Large	Domestique	Bétail	Total	Homme (%)		Femme (%)	Enfant (%)	Et	Hiver	
S. Allal Zghari	23	160	25	16	4115 (26)	2915 (18)	765 (36)	4880 (62)	2915 (18)	74% individu	67	33	0.5	0.2
Bekala	12	125	90 (a)	69 (a)	2910 (23)	2910* (23)	---	2910 (23)	2910* (23)	26% mulet	21	79	0.4-3	au douar
K. El Berd	18	131	28 (b)	25 (b)	1310 (10)	1310* (10)	1140 (37)	2450 (47)	1310* (10)	17% individu	33	25	1-2	1-4
Ghbalou	21	153	96	80	1560 (10)	2640 (17)	3680 (37)	5240 (47)	2640 (17)	83% mulet	14	67	2	1.5
Ain Haddad	7	38	24	18	810 (21)	810* (21)	840 (37)	1650 (58)	810* (21)	28% individu	72	14	2	0.5
J. El Oued	15	98	54	38	2275 (23)	2060 (21)	1790 (37)	4065 (60)	2060 (21)	100% mulet	47	30	1	au douar
Ouled Bakkal	27	217	71 (b)	31 (b)	2145 (10)	1910 (9)	1595 (35)	3740 (45)	1910 (9)	11% individu	20	34	2	0.5
Hjar Touil	29	226	45 (a)	36 (a)	1905 (8)	2115 (9)	890 (34)	2195 (42)	2115 (9)	89% mulet	48	17	1	au douar
Zoumak	40	266	73 (a)	108 (a)	4420 (17)	2650 (10)	---	4420 (17)	2650 (10)	14% individu	15	45	1.5	1
Total 9 Douars	192	1414	348	224	21450 (15)	19320 (14)	10700 (36)	32150 (51)	19320 (14)	19% individu	27	36	37	
			29 (o)	33 (o)						81% mulet				
			145 (a)	123 (a)										

Table 2.6 Existing conditions of water Use (3/3)

Douar	Nombre de Ménages Enquêtés	Population		Unité de Bétail		Consommation d'Eau (l/j)						Moyen de Transport		Personne Chargée		Temps (hr)		Distance (Km)
		Petit		Large		Domestique		Bétail		Total		Homme (%)	Femme (%)	Enfant (%)	Et	Hiver		
		Eté	Hiver	Eté	Hiver	Eté	Hiver	Eté	Hiver	Eté	Hiver							
Sabet El Bir	15	91	23	33	1245 (14)	1280 (14)	1435 (38)	2680 (52)	1280 (14)	1280 (14)	47% individu	7	70	23	1.3	---	au douar	
Douber	12	47	28	12	730 (16)	730 (16)	620 (35)	1350 (51)	730 (16)	730 (16)	100% mulet	29	8	63	1.3	---	3	
Aster	12	99	25(h)	3(h)	1575 (16)	1020 (10)	245 (31)	1820 (47)	1020 (10)	1020 (10)	100% mulet	42	---	58	0.5 - 2	---	3 - 4	
Aounane	8	45	10	9	710 (16)	540 (12)	410 (37)	1120 (53)	540 (12)	540 (12)	100% mulet	12	19	69	1	---	au douar ou 4	
Jamae Rif	5	31	2	10	670 (22)	460 (15)	410 (39)	1080 (61)	460 (15)	460 (15)	100% mulet	---	20	80	1 - 2	---	2 - 4	
Rkiba	13	96	13	18	1585 (17)	1100 (11)	785 (38)	2370 (55)	1100 (11)	1100 (11)	100% mulet	23	12	65	1 - 2	---	2 - 4	
Ras Lekbour	7	41	3	10	645 (16)	500 (12)	415 (39)	1060 (55)	500 (12)	500 (12)	100% mulet	7	14	79	0.5 - 2	---	au douar ou 4	
Ouled B.Jame	11	88	14	17	1430 (16)	1040 (12)	750 (38)	2180 (54)	1040 (12)	1040 (12)	100% indiv.	---	35	65	0.5	---	au douar	
Zaouia	11	78	39(h)	9(h)	965 (12)	660 (8)	555 (33)	1520 (45)	660 (8)	660 (8)	36% individu	27	36	37	1	---	au douar	
Tazghadra	11	77	60(a)	36(a)	2160 (28)	1880 (24)	---	2160 (28)	1880 (24)	1880 (24)	27% individu	18	9	73	0.5	---	au douar	
Total 10 Douars	105	693	157	121	11715 (17)	9210 (15)	5625 (37)	17340 (54)	9210 (15)	9210 (15)	13% individu	17	22	61				

(h) : Animaux abreuvés dans les habitations; (a) : Spring; (o) : Oued; (25) : Consommation journalière par personne ou par UBG;

775* : Consommation en hiver est égale à celle de l'été; (j) : Jour; (n) : Nuit

En hiver, le bétail s'abreuve en dehors des habitations.

3. *Meteorology, Hydrology and Surface Water Development*

Supporting Report
3. Meteorology, Hydrology and
Surface Water Development

Contents

	Page
3.1 Basic Data.....	3-1
Table 3.1.1 List of Principal Meteorological Station.....	3-3
Table 3.1.2 List of Raingauge Station.....	3-4
Table 3.1.3 Monthly Rainfall at Bab Merzouka.....	3-5
Table 3.1.4 Monthly Rainfall at Tissa.....	3-6
Table 3.1.5 Monthly Rainfall at Bab Ouender.....	3-7
Table 3.1.6 Monthly Rainfall at M'Jaara.....	3-8
Table 3.1.7 Monthly Rainfall at Ourtzagh.....	3-9
Table 3.1.8 Monthly Rainfall at Pont du Sker.....	3-10
Table 3.1.9 Monthly Rainfall at Rhafsai.....	3-11
Table 3.1.10 Monthly Rainfall at Tafrant.....	3-12
Table 3.1.11 Monthly Rainfall at Azib Soltane.....	3-13
Table 3.1.12 Monthly Rainfall at Had Kourt.....	3-14
Table 3.1.13 List of Stream Gauging Station.....	3-15
Table 3.1.14 Monthly Mean Discharge at Dar El Arsa.....	3-16
Table 3.1.15 Monthly Mean Discharge at Azib Soltane.....	3-17
Table 3.1.16 Monthly Mean Discharge at M'Jaara.....	3-18
Table 3.1.17 Monthly Mean Discharge at Tafrant.....	3-19
Table 3.1.18 Monthly Mean Discharge at Bab Ouender.....	3-20
Table 3.1.19 Monthly Mean Discharge at Ourtzagh.....	3-21
Table 3.1.20 Monthly Mean Discharge at Rhafsai.....	3-22
Table 3.1.21 Monthly Mean Discharge at Pont du Sker.....	3-23
Table 3.1.22 Monthly Mean Discharge at Had Kourt.....	3-24
Table 3.1.23 Monthly Mean Discharge at Bab Merzouka.....	3-25
Table 3.1.24 Monthly Mean Discharge at El Kouchat.....	3-26
Table 3.1.25 Monthly Mean Discharge at Tissa.....	3-27

	Page
Figure 3.1.1	Location of Meteorological Station----- 3-28
Figure 3.1.2	Location of Stream Gauging Station ----- 3-29

	Page
3.2	Rainfall and Runoff Analysis----- 3-1
3.2.1	Rainfall Analysis----- 3-1
3.2.2	Runoff Analysis ----- 3-2

Table 3.2.1	Basin Rainfall for Long Term Average (1932 - 1983)----- 3-36
Table 3.2.2	Rainfall Point-Area Coefficient ----- 3-37
Table 3.2.3	Annual Rainfall at Reference Station----- 3-38
Table 3.2.4	Basin Rainfall for Sub-basin----- 3-39
Table 3.2.5	Basin Rainfall for Gauged Catchment----- 3-40
Table 3.2.6	Basin Rainfall by Region----- 3-41
Table 3.2.7	Annual Mean Discharge at Reference Station----- 3-42
Table 3.2.8	Surface Runoff for Sub-basin----- 3-43

Figure 3.2.1	Study Area and Sub-basin----- 3-44
Figure 3.2.1	Isohyetal Map of Annual Rainfall (1932 - 1983)----- 3-45
Figure 3.2.3	Flow Duration Curve----- 3-46

	Page
3.3	Tank Model----- 3-49
3.3.1	Outline of Water Balnce Analysis----- 3-49
3.3.2	Objective Area ----- 3-53
3.3.3	Water Balance Analysis for Objective Area----- 3-54

Table 3.3.1	List of Data Used for Tank Model----- 3-57
Table 3.3.2	Application of Tank Model for Objective Area----- 3-57
Table 3.3.3	Potential Evapotranspiration at Ourtzagh----- 3-57
Table 3.3.4	Monthly Rainfall at Had Kourt----- 3-58
Table 3.3.5	Monthly Rainfall at Rhafsai----- 3-59

	Page
Table 3.3.6	Monthly Rainfall at M'Jaara 3-60
Table 3.3.7	Monthly Mean Discharge at Had Kourt 3-61
Table 3.3.8	Monthly Mean Discharge at Rhafsai..... 3-62
Figure 3.3.1	Tank Model..... 3-61
Figure 3.3.2	Comparison of Hydrograph..... 3-64
Figure 3.3.3	Comparison of Flow Duration Curve 3-65
Figure 3.3.4	Water Balance Estimated by Tank Model..... 3-66

	Page
3.4	Inventory of Medium and Small Scale Dams..... 3-67
Table 3.4.1	Inventory of Medium Scale Dams 3-68
Table 3.4.2	Inventory of Small Scale Dams 3-69
Table 3.4.3	Inventory of Hill Dams 3-72
Figure 3.4.1	Location of Medium Scale Dams Sites..... 3-76

	Page
3.5	Preliminary Water Balance Study..... 3-77
3.5.1	General..... 3-77
3.5.2	Water Balance Study..... 3-77
Table 3.5.1	Water Balance in Taounate Area (Average Year) 3-79
Table 3.5.2	Water Balance in Taounate Area (10 Year Drought)..... 3-80
Figure 3.5.1	Water Balance at Bouhouda Dam (Average Year)..... 3-81
Figure 3.5.2	Water Balance at Bouhouda Dam (10-Year Drought)..... 3-82
Figure 3.5.3	Water Balance at Zrizer Dam (Average Year)..... 3-83
Figure 3.5.4	Water Balance at Zrizer Dam (10-Year Drought)..... 3-84
Figure 3.5.5	Water Balance at Sahela Dam (Average Year) 3-85

	Page
Figure 3.5.6 Water Balance at Sahela Dam (10-Year Drought)	3-86
Figure 3.5.7 Water Balance in Taounate Area.....	3-87

3.1 Basic Data



3.1 Basic Data

DRPE (Direction de la Recherche et de la Planification de l'Eau) of AH is in charge of meteorological / hydrological observation and data management. For the Sebou river basin, daily operation of the observation works are managed by DRH (Direction de la Région Hydraulique) of Sebou - Fes.

Available meteorological and hydrological records for this Study were provided by DRPE/DRH. Prior to the rainfall and runoff study discussed in the succeeding section, all the collected records were reviewed and sorted out. In general, the records at the gauging stations with a relatively long period of observation were mainly used for the rainfall and runoff study.

As of the year 1994, the principal meteorological stations have been installed at 19 locations in the Sebou river basin as listed on Table 3.1.1. In addition, the 33 rainfall gauging stations have also been installed. Consequently, the total number of rainfall gauging stations are 52 in the Sebou river basin as listed on Table 3.1.2.

Figure 3.1.1 shows the rainfall gauging stations in and around the Study Area. Of them, the following 10 gauging stations were selected as the reference stations for the rainfall study. The monthly rainfall records of the respective stations are tabulated on Tables 3.1.3 to 3.1.12.

1564	Bab Merzouka
8440	Tissa
1568	Bab Ouender
5128	M'Jaara
6200	Ourtzagh
6288	Pont du Sker
6400	Rhafsai
7400	Tafrant
1424	Azib Soltane
4104	Had Kourt

Table 3.1.13 gives a list of stream gauging stations in and around the Study Area. Location of these gauging stations are shown in Figure 3.1.2. Of them, the 12 gauging stations listed below were selected as the reference stations for the runoff study. The

monthly mean discharge records of these gauging stations are tabulated on Table 3.1.14 to 3.1.25.

2263/15	Dar El Arsa
1540/15	Azib Soltane
609/9	M'Jaara
608/9	Tafrant
260/9	Bab Ouender
79/9	Ourtzagh
607/9	Rhafsai
81/9	Pont du Sker
1436/9	Had Kourt
551/16	Bab Merzouka
653/16	El Kouchat
1542/15	Tissa

Table 3.1.1 List of Principal Meteorological Station

No.	Station	Evaporation						Precipitation				Temperature		Wind		Solar Radiation		Relative Humidity	
		Pan	Pitcher	Manual	Auto	Anemo.	Vane	Psychro.	Thermo.										
198	Aguelman Sidi Ali	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
576	Ain Timedrine	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
748	Ait Khabbach	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1496	Azzaba	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1564	Bab Merzouka	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
3401	Barrage El Kansera	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
3492	El Mers	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
4104	Had Kourt	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
4250	Barrage Idriss 1er	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
5036	Lalla Mimouna	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
5124	Barrage Al Wahda	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
5128	M'jaara	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
5844	El Hajra	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
6153	Oulad Yaacoub	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
6200	Ouertzagh	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
6248	Pont du M'dez	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
6562	Sefrou	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
7188	Souk El Had	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
8440	Tissa	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Table 3.1.2 List of Raingauge Station

No.	Station	Coordinates		Elevation (m)	Year Installed
		X (km)	Y (km)		
198	Aguelman Sidi Ali	573.80	276.00	2078	1975
236	Ain Aicha	564.70	428.80	230	1981
576	Ain Timedrine	578.70	350.35	650	1958
748	Ait Khabbch	557.00	314.80	1478	1970
876	Barrage Allal Fassi	570.10	370.30	419	1989
1322	Assara	449.75	465.75	350	1970
1424	Azib Soltane	492.00	413.90	45	1961
1496	Azzaba	569.65	359.57	478	1957
1523	Bab Echhoub	622.47	406.25	402	1987
1564	Bab Marzouka	615.85	400.85	368	1970
1568	Bab Ouender	579.50	440.10	312	1956
1726	Behi Hitem	632.35	412.50	508	1987
2750	Chaara	504.72	464.80	460	1977
2764	Dar El Arsa	543.30	399.70	138	1973
2778	Dar El Hamra	591.50	352.25	830	1982
3401	Barrage El Kansera	452.10	382.62	100	1935
3451	El Kouchet	583.75	394.65	230	1975
3492	El Mers	593.10	318.62	1210	1984
3817	Fes DRH	535.40	384.80	415	1971
3924	Galez	555.32	439.85	214	1973
4104	Had Kourt	470.35	439.90	30	1967
4190	Hassasine	499.75	456.85	300	1977
4250	Barrage Idriss 1er	559.75	396.00	170	1974
4626	Jbel Oudka	553.00	459.00	1115	1978
4782	Kenitra	390.00	411.30	5	1990
4804	Kharrouba	496.62	458.15	180	1971
4868	Khenichet	473.70	426.90	28	1970
5036	Lalla Mimouna	435.00	472.60	15	1984
5124	Barrage Al Wahda	517.35	444.25	110	1990
5128	Mjaara	513.60	443.20	96	1958
5255	Bel Ksiri	448.25	441.00	16	1937
5520	My Ali Chrif	434.60	459.05	11	1984
5844	El Hajra	508.86	382.76	215	1970
6153	Ouled Yaacoub	498.90	460.20	280	1977
6170	Ouljet Soltane	456.25	338.06	305	1980
6200	Ourtzagh	541.00	437.92	150	1956
6248	Pont du M'Dez	581.40	341.90	725	1958
6272	Pont Sebou RP 26	523.25	412.20	85	1958
6288	Pont du Sker	573.40	441.99	315	1956
6400	Rhafsai	542.80	445.94	190	1956
6405	Billit	519.80	355.12	760	1972
6562	Sefrou	549.37	359.20	930	1968
6924	Sidi El Mokhfi	507.60	311.80	1075	1976
7188	Souk El Had	466.10	410.80	34	1962
7283	Tabouda	524.25	461.60	180	1978
7400	Tafrant	524.50	448.20	115	1956
7708	Tamchachat	512.33	274.34	1685	1975
8440	Tissa	576.27	413.10	230	1961
	Barrage de Garde	406.83	432.50	10	1991
	Hajjamine	519.85	455.70	147	1991

Table 3.1.3 Monthly Rainfall at Bab Merzouka

1564 BAB MERZOUKA													
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1970/71	-	-	29.5	98.3	188.8	2.7	150.9	202.2	93.0	45.5	-	0.0	-
1971/72	11.3	0.0	121.5	65.5	80.5	147.5	156.5	29.0	84.5	0.0	0.0	4.0	700.3
1972/73	14.0	102.5	36.0	37.0	61.7	118.2	82.4	74.8	20.7	6.0	0.0	3.0	556.3
1973/74	0.0	4.6	46.0	197.4	16.7	125.0	111.7	217.4	2.3	17.7	3.8	1.5	744.1
1974/75	0.0	36.6	4.7	0.0	30.2	97.4	185.8	97.1	38.8	37.9	0.0	0.7	529.2
1975/76	22.6	2.0	23.9	98.8	19.0	90.2	38.9	94.8	124.5	12.0	0.7	1.0	528.4
1976/77	4.0	115.1	0.5	117.2	173.9	106.5	79.1	6.5	71.0	11.5	0.0	0.0	685.3
1977/78	15.5	82.6	72.5	90.3	51.5	126.0	63.5	106.5	86.9	8.7	0.0	1.5	705.5
1978/79	0.0	5.3	33.5	103.9	105.1	311.1	70.7	41.2	10.7	0.0	2.4	0.0	683.9
1979/80	33.0	242.9	22.7	11.5	81.6	24.8	129.3	55.5	76.0	0.5	0.0	0.0	677.8
1980/81	27.0	55.0	89.5	19.5	33.0	39.1	64.2	104.8	14.3	14.2	0.0	0.0	460.6
1981/82	15.0	3.0	0.0	83.6	48.5	66.6	48.8	102.0	46.7	4.0	2.5	9.0	429.7
1982/83	0.3	74.7	73.4	62.7	0.0	141.3	37.8	18.3	42.5	11.5	0.0	4.4	466.9
1983/84	0.0	1.4	96.2	91.0	21.5	8.0	108.1	80.5	135.1	5.5	0.0	0.0	547.3
1984/85	0.0	5.0	127.0	8.7	115.5	39.2	17.8	41.5	30.8	0.0	0.0	0.0	385.5
1985/86	0.4	0.0	150.5	77.6	131.6	204.7	110.7	102.7	0.5	21.2	0.0	3.0	802.9
1986/87	3.2	16.9	40.3	25.7	266.6	129.0	2.9	41.8	7.1	0.6	3.2	0.0	537.3
1987/88	20.8	50.6	134.0	40.3	104.9	52.5	23.1	50.8	44.8	2.6	0.9	0.0	525.3
1988/89	1.0	30.0	72.6	11.1	19.3	37.6	59.4	162.9	11.7	5.6	0.0	5.0	416.2
1989/90	30.9	33.2	112.6	123.5	77.6	2.0	32.0	136.7	33.1	0.4	4.4	0.0	586.4
1990/91	21.4	27.6	77.6	124.0	20.4	107.2	178.4	23.9	5.8	0.6	3.3	3.8	594.0
1991/92	27.9	50.0	25.6	18.7	0.6	47.3	66.4	152.6	34.7	60.6	12.2	2.8	499.4
1992/93	1.2	63.1	17.4	21.7	15.9	43.0	56.8	78.9	23.1	1.3	2.8	0.8	326.0
1993/94	5.4	42.9	126.7	29.9	65.8	115.6	18.7	26.1	25.6	0.0	0.8	6.4	463.9
Ave.	11.1	45.4	63.9	64.9	72.1	90.9	78.9	85.4	44.3	11.2	1.6	2.0	571.7

Table 3.1.4 Monthly Rainfall at Tissa

8440 TISSA													
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1961/62	.	.	.	.	.	.	.	.	.	.	0.0	0.0	.
1962/63	.	.	.	87.2	225.6	203.9	12.4	40.6	117.4	.	0.0	6.6	.
1963/64	4.4	2.7	30.9	260.7	10.2	90.3	119.8	106.1	11.5	5.3	0.0	0.0	641.9
1964/65	2.5	11.1	155.4	149.5	84.2	82.5	101.5	59.8	1.5	35.7	0.3	0.0	684.0
1965/66	13.7	61.1	93.3	38.3	54.0	90.0	0.6	23.8	8.7	3.9	0.0	0.0	387.4
1966/67	3.7	104.2	37.7	3.1	29.7	89.3	31.8	65.8	10.5	27.9	0.0	0.0	403.7
1967/68	1.4	45.0	88.2	41.2	4.9	157.2	118.0	42.4	30.2	14.3	0.0	2.9	545.7
1968/69	0.3	0.0	197.4	88.6	115.4	222.9	140.0	83.7	18.3	26.3	8.8	3.0	904.7
1969/70	22.0	66.1	127.3	143.1	239.1	1.0	105.3	43.7	11.9	1.6	0.0	1.4	762.5
1970/71	0.6	31.8	35.1	116.8	174.1	5.8	113.8	197.4	49.7	47.4	0.4	0.3	773.2
1971/72	24.4	0.0	103.4	91.2	68.0	111.9	101.9	12.8	64.6	7.2	0.0	7.4	592.8
1972/73	32.0	.	42.1	39.1	54.9	63.1	61.1	45.6	17.1	0.0	3.5	0.0	.
1973/74	6.1	17.5	26.6	168.6	14.8	96.4	96.9	145.9	0.0	26.3	1.0	0.0	600.1
1974/75	0.0	32.4	10.1	0.0	31.3	76.1	116.3	88.6	44.3	19.9	0.0	3.0	422.0
1975/76	8.8	0.0	9.8	100.4	32.5	79.4	50.0	85.9	110.2	8.6	1.2	1.8	488.6
1976/77	12.3	87.5	3.2	109.9	162.2	86.1	6.1	5.3	9.0	2.1	0.0	0.0	483.7
1977/78	4.5	82.8	58.2	62.0	71.8	125.3	44.8	101.2	105.1	6.0	0.0	0.0	661.7
1978/79	0.0	4.2	14.6	80.2	116.4	236.3	65.4	29.6	20.5	0.0	0.0	0.0	567.2
1979/80	7.5	199.3	22.3	20.1	.	.	97.7	32.1	50.1	3.3	0.0	0.0	.
1980/81	56.1	59.3	66.9	27.6	16.0	27.5	51.5	101.0	14.4	0.9	0.0	0.0	421.2
1981/82	4.1	14.9	0.0	107.7	68.0	82.4	38.8	114.8	46.0	0.0	0.8	3.6	481.1
1982/83	0.0	102.6	63.9	28.5	0.0	135.9	27.3	15.6	12.7	1.9	0.0	0.0	388.4
1983/84	0.0	0.0	111.1	126.9	12.8	10.5	65.9	39.7	119.6	10.4	0.0	0.0	496.9
1984/85	0.5	0.0	127.7	19.8	105.3	36.9	19.1	26.8	21.9	0.0	0.0	10.9	368.9
1985/86	1.0	0.0	155.1	69.6	97.5	169.5	74.3	70.3	0.0	47.3	1.8	0.0	686.4
1986/87	5.6	36.1	30.4	24.9	182.9	95.7	4.3	19.3	7.4	0.0	0.0	0.0	406.6
1987/88	7.5	26.8	117.0	62.4	79.1	38.3	16.0	28.3	40.6	7.0	0.0	0.0	423.0
1988/89	0.0	39.4	68.0	7.8	19.3	40.9	39.9	106.2	17.6	7.1	0.0	4.0	350.2
1989/90	0.3	51.6	116.9	93.7	56.5	1.0	41.4	78.4	16.8	0.0	0.0	0.0	456.6
1990/91	21.4	37.9	57.9	93.9	4.0	120.4	138.8	1.0	0.9	0.0	0.0	0.0	476.2
1991/92	23.2	64.9	19.9	14.0	0.0	37.7	42.0	125.1	29.3	36.8	0.0	0.0	392.9
1992/93	0.0	26.4	15.0	18.4	8.3	18.3	48.1	46.8	32.5	0.0	0.0	0.0	213.8
1993/94	6.5	27.0	126.9	31.1	52.4	92.4	18.9	11.7	19.0	0.0	0.0	0.0	385.9
Ave.	8.7	41.1	68.8	72.7	70.7	87.9	62.8	62.4	33.1	11.2	0.5	1.4	521.2

Table 3.1.5 Monthly Rainfall at Bab Ouender

1568 BAB OUENDER													
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1956/57	.	.	.	.	0.0	0.0	33.1	89.6	18.2	9.5	.	0.0	.
1957/58	9.9	84.4	177.3	319.7	97.5	18.5	77.7	135.8	12.7	5.4	0.0	0.0	938.9
1958/59	.	40.7	45.8	435.1	42.5	63.8	119.0	35.2	97.2	0.0	1.0	0.0	880.3
1959/60	13.3	22.1	165.8	127.5	258.2	150.3	293.5	10.1	23.1	29.7	0.0	0.0	1093.6
1960/61	0.0	123.3	76.1	191.1	63.6	14.5	41.7	43.6	54.6	36.4	0.0	0.0	644.9
1961/62	7.7	49.2	238.8	124.7	38.7	14.8	328.1	75.6	17.5	9.5	0.0	1.8	906.4
1962/63	15.0	60.4	341.5	170.1	422.0	366.9	13.7	57.7	110.4	7.6	7.3	5.2	1577.8
1963/64	12.1	7.5	76.7	586.7	13.3	158.6	169.4	149.4	7.5	3.4	0.0	2.5	1187.1
1964/65	5.8	6.9	167.1	226.8	124.0	167.8	68.0	62.1	2.4	46.1	0.7	1.0	878.7
1965/66	61.4	133.1	121.4	85.9	132.2	183.4	16.9	21.8	19.7	2.4	0.0	0.0	778.2
1966/67	4.9	113.8	50.5	21.9	29.7	170.7	39.0	72.4	22.2	30.7	0.0	0.0	555.8
1967/68	6.2	41.3	172.6	52.3	8.4	216.7	180.5	49.7	43.2	16.5	0.0	9.6	797.0
1968/69	1.8	0.0	301.6	204.4	246.7	330.7	177.1	138.9	23.4	27.7	0.8	0.0	1453.1
1969/70	29.1	51.9	183.7	299.7	572.1	3.0	158.7	58.6	34.0	3.9	0.0	0.0	1394.7
1970/71	33.3	30.2	42.5	201.4	237.3	9.4	192.2	399.5	72.7	53.9	16.3	0.0	1288.7
1971/72	13.3	0.4	127.3	83.9	123.8	112.4	102.3	34.0	120.7	11.4	0.0	0.0	729.5
1972/73	18.2	192.1	50.9	46.6	94.2	61.2	65.1	29.0	24.9	15.9	0.0	2.1	600.2
1973/74	0.0	14.6	22.5	305.6	29.0	101.2	110.4	276.9	1.3	37.0	0.5	0.0	899.0
1974/75	0.0	24.7	18.5	0.0	61.9	76.4	213.4	77.8	41.1	27.9	0.0	0.0	541.7
1975/76	0.0	0.0	17.7	192.6	65.2	76.9	85.7	146.6	73.4	19.3	15.3	3.0	695.7
1976/77	7.9	153.2	4.9	260.7	287.6	112.3	14.3	0.5	54.1	3.5	2.2	0.0	901.2
1977/78	5.2	82.0	119.5	96.5	111.4	195.1	70.4	167.4	111.4	16.5	0.0	0.3	975.7
1978/79	2.0	3.1	8.9	144.3	206.1	290.6	.	44.4	32.9	0.0	4.5	0.0	.
1979/80	26.6	201.3	27.6	26.0	74.8	24.8	107.6	58.7	86.7	9.7	0.1	0.0	643.9
1980/81	7.2	96.1	130.3	41.4	16.9	18.4	56.0	114.4	39.2	4.3	0.0	3.3	527.5
1981/82	3.7	7.2	0.0	239.5	118.0	65.2	59.4	70.4	31.3	0.0	1.6	5.3	601.6
1982/83	0.0	73.4	85.9	33.3	0.0	192.1	36.2	24.3	17.4	1.5	0.0	0.1	464.2
1983/84	0.0	0.1	244.9	194.4	16.6	17.8	102.5	70.0	137.0	6.2	2.8	0.0	792.3
1984/85	0.3	0.3	152.4	15.6	110.9	94.7	23.4	42.1	32.4	6.2	0.0	0.7	479.0
1985/86	14.5	25.8	216.9	85.3	153.4	234.5	56.0	111.7	1.4	3.4	0.0	0.0	902.9
1986/87	8.3	47.7	33.0	16.8	243.7	167.4	0.8	24.5	1.0	0.2	4.5	0.0	547.9
1987/88	5.4	20.0	117.6	100.1	118.7	39.6	24.7	44.7	47.4	1.5	0.0	0.0	519.7
1988/89	0.0	38.4	111.0	14.3	29.9	93.1	61.7	164.7	39.8	11.7	0.0	0.9	565.5
1989/90	2.5	54.2	185.3	199.0	87.0	0.0	36.7	121.1	16.9	0.0	1.1	0.0	703.8
1990/91	19.2	43.4	82.1	160.3	16.0	161.2	213.8	12.2	4.0	0.0	2.1	0.1	714.4
1991/92	42.1	50.3	28.6	29.8	3.6	84.7	46.7	127.6	8.4	53.7	0.0	14.1	489.6
1992/93	2.6	73.4	4.2	46.1	6.3	14.5	53.0	77.8	54.8	0.0	0.0	0.0	332.7
1993/94	23.9	70.6	212.3	45.4	62.5	132.0	8.9	33.8	27.8	0.0	0.3	0.0	617.5
Ave.	11.2	55.1	112.5	146.6	113.8	111.5	93.4	86.2	41.2	13.5	1.7	1.3	787.9

Table 3.1.6 Monthly Rainfall at M'Jaara

5128 M'JAARA													
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1958/59	.	.	.	.	.	49.4	77.4	32.7	112.4	0.0	0.0	3.8	.
1959/60	8.5	23.8	91.1	71.1	201.8	99.4	185.1	9.1	61.9	3.8	3.6	.	.
1960/61	0.0	128.7	92.5	130.0	55.5	12.3	15.6	33.6	28.6	34.9	0.0	0.0	531.7
1961/62	25.7	22.7	207.0	88.2	13.2	18.3	188.1	19.2	23.2	7.0	0.0	0.0	612.6
1962/63	11.3	47.1	205.9	111.5	244.5	234.8	19.9	59.3	95.2	6.0	2.6	0.0	1038.1
1963/64	6.4	13.5	73.4	325.4	24.5	102.0	111.8	96.5	0.0	2.5	0.0	0.0	756.0
1964/65	0.0	0.0	122.8	120.2	65.8	91.7	40.7	35.2	0.0	11.5	2.0	0.4	490.3
1965/66	40.5	173.0	90.4	61.9	65.7	109.3	1.3	30.8	2.0	0.8	0.0	0.0	575.7
1966/67	7.5	83.1	37.3	7.6	29.9	100.5	21.3	43.7	38.5	43.3	0.0	0.6	413.3
1967/68	0.0	55.7	72.6	41.5	4.7	173.9	86.6	50.1	24.8	38.1	0.0	6.8	554.8
1968/69	3.7	13.9	193.7	108.7	134.5	308.0	101.1	65.6	10.9	24.9	0.0	2.0	967.0
1969/70	24.3	70.2	141.0	145.9	372.5	0.0	101.5	34.4	24.5	4.7	0.0	0.0	919.0
1970/71	0.6	15.4	13.1	180.5	167.7	2.0	137.0	256.9	77.4	15.8	0.0	0.3	866.7
1971/72	5.0	0.0	91.5	90.3	95.3	108.2	90.6	32.8	62.2	5.0	0.0	0.2	581.1
1972/73	27.4	151.7	8.6	36.6	74.4	53.3	57.6	15.8	15.4	0.0	0.0	0.8	441.6
1973/74	0.0	14.0	26.8	180.2	25.2	82.7	65.5	204.1	4.3	27.2	0.0	0.0	630.0
1974/75	0.0	26.1	12.3	0.0	53.2	85.8	168.8	51.1	46.2	27.1	0.0	0.6	471.2
1975/76	1.1	2.2	33.1	147.3	46.1	53.0	94.7	106.5	76.4	1.0	5.7	0.0	567.1
1976/77	29.6	142.7	4.0	194.0	290.1	101.9	6.9	0.5	18.9	15.6	0.0	0.0	804.2
1977/78	2.2	56.0	72.6	105.9	88.3	117.0	67.5	141.1	61.8	43.6	0.0	0.5	756.5
1978/79	0.6	1.9	28.3	142.3	136.2	204.0	60.9	38.2	1.6	5.1	14.3	0.0	633.4
1979/80	8.0	197.3	17.5	30.8	65.1	25.5	67.4	27.2	42.6	9.5	0.0	0.0	490.9
1980/81	8.0	53.1	100.7	19.5	9.8	13.6	36.0	79.3	22.9	10.1	0.0	0.0	353.0
1981/82	3.0	10.8	0.0	140.4	94.1	115.7	52.1	113.5	19.4	0.8	0.3	0.0	550.1
1982/83	1.3	85.9	84.3	38.8	0.0	121.1	28.7	22.9	15.8	0.0	0.0	0.0	398.8
1983/84	0.0	5.2	160.3	144.3	20.0	20.7	80.4	54.2	128.3	5.6	5.5	0.0	624.5
1984/85	0.3	1.5	115.7	20.3	98.3	44.7	20.0	34.1	27.9	1.3	0.0	0.0	364.1
1985/86	20.7	0.0	130.8	76.0	88.8	181.7	49.8	85.6	0.0	0.2	0.0	0.0	633.6
1986/87	7.2	15.5	72.5	31.5	155.7	118.1	9.1	17.9	2.4	0.0	8.7	0.0	438.6
1987/88	12.9	13.3	130.1	126.6	105.5	38.5	19.6	46.3	63.6	49.5	0.0	0.0	605.9
1988/89	0.1	72.9	146.1	10.5	33.6	109.7	44.9	120.1	42.2	0.0	0.5	3.3	583.9
1989/90	6.0	57.1	174.3	167.3	66.1	0.4	34.1	108.3	25.2	6.2	1.0	0.0	646.0
1990/91	6.7	34.9	71.2	209.5	2.7	116.0	165.8	9.2	0.2	29.7	0.2	2.1	648.2
1991/92	36.8	47.4	19.2	20.2	0.0	38.4	47.2	96.5	6.1	30.4	1.0	1.2	344.4
1992/93	5.3	97.7	13.9	23.3	10.1	29.7	61.4	70.3	49.2	0.5	0.0	0.0	361.4
1993/94	8.8	61.6	190.0	21.3	53.1	134.9	15.3	43.0	18.7	0.2	0.4	0.0	547.3
Ave.	9.1	51.3	87.0	96.3	85.5	89.3	67.5	63.5	34.7	12.8	1.3	0.6	599.0

Table 3.1.7 Monthly Rainfall at Ourtzagh

6200 OURTZAGH													
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1957/58	-	95.2	225.4	250.4	113.5	26.0	91.2	161.6	22.2	14.9	0.0	19.0	-
1958/59	3.0	23.1	53.9	394.8	54.3	44.0	136.9	42.7	92.2	0.0	0.0	3.5	848.4
1959/60	37.0	13.5	69.2	162.0	298.2	158.4	314.2	7.3	35.9	10.7	4.2	0.0	1110.6
1960/61	0.0	135.3	102.8	199.2	77.0	17.5	61.9	53.3	52.6	17.3	0.0	0.0	716.9
1961/62	34.7	45.1	236.0	117.9	30.2	16.8	304.1	28.6	22.1	7.5	0.0	0.0	843.0
1962/63	34.8	50.3	249.6	144.7	301.5	271.7	18.1	47.2	83.5	1.4	39.5	0.0	1242.3
1963/64	9.0	13.8	75.4	384.9	16.3	124.3	137.8	110.4	17.8	0.0	0.0	0.0	889.7
1964/65	-	5.2	156.5	160.5	107.5	139.4	59.8	52.8	3.8	28.9	0.0	0.0	-
1965/66	53.4	159.1	105.6	69.5	130.5	136.2	23.2	31.5	7.1	0.0	0.7	0.0	716.8
1966/67	4.4	137.9	38.0	16.2	44.4	87.0	26.3	88.1	28.7	47.2	0.0	0.0	518.2
1967/68	5.3	68.8	132.7	59.7	5.1	188.3	130.1	47.8	28.0	53.9	0.0	0.6	720.3
1968/69	6.3	1.7	236.7	146.7	164.9	278.9	171.7	84.5	30.3	11.8	0.0	0.0	1133.5
1969/70	27.1	59.0	152.6	179.5	323.1	2.5	111.3	47.1	27.1	3.8	0.0	0.0	933.1
1970/71	0.0	22.5	24.0	151.2	210.7	6.3	151.1	302.6	71.6	27.5	0.8	0.0	968.3
1971/72	20.0	0.0	111.1	90.5	115.7	143.5	107.7	37.3	108.3	10.6	-	0.0	-
1972/73	18.4	141.5	19.7	42.4	71.0	71.3	102.2	25.4	27.1	0.0	28.2	4.8	552.0
1973/74	0.0	20.5	34.7	225.6	33.6	97.7	88.4	224.4	2.9	20.9	0.0	0.0	748.7
1974/75	0.6	30.2	24.2	0.0	58.1	110.9	203.5	76.6	42.4	14.2	0.0	4.3	565.0
1975/76	2.8	0.5	27.7	179.0	54.0	90.4	80.6	104.4	72.2	14.2	1.7	0.8	628.3
1976/77	13.8	138.0	56.0	182.3	263.5	106.8	14.5	0.6	16.9	7.4	0.0	0.0	799.8
1977/78	13.0	70.6	86.8	91.2	95.2	162.8	51.3	163.2	73.2	56.3	0.0	0.0	863.6
1978/79	0.0	4.6	26.4	138.9	163.5	261.4	51.7	46.0	13.3	0.0	7.7	0.2	713.7
1979/80	13.1	236.0	24.6	32.7	57.3	21.6	92.2	50.4	69.2	13.5	0.0	0.0	610.6
1980/81	26.9	79.9	102.3	77.2	11.5	20.4	60.7	98.5	31.2	1.7	0.0	0.5	510.8
1981/82	3.6	6.5	0.0	179.7	97.6	94.2	44.1	99.1	27.0	0.0	1.5	5.5	558.8
1982/83	0.7	99.2	80.3	49.2	0.0	145.4	38.8	30.4	16.8	0.0	0.0	0.0	460.8
1983/84	0.0	1.3	173.2	166.5	21.8	19.2	103.5	113.2	168.3	22.0	7.4	0.0	796.4
1984/85	5.2	3.6	130.1	18.6	106.0	67.0	41.2	49.4	34.2	1.8	0.3	0.0	457.4
1985/86	2.8	11.1	182.4	86.6	130.2	269.7	87.6	120.9	0.4	4.7	0.0	0.0	896.4
1986/87	8.8	39.5	42.6	30.3	251.2	156.4	3.8	31.0	1.2	0.0	0.8	0.0	565.6
1987/88	10.3	22.0	149.5	112.6	122.9	64.4	26.4	44.5	47.3	18.7	0.0	0.0	618.6
1988/89	0.4	69.2	159.0	26.8	36.1	89.0	62.8	161.2	57.6	21.5	0.2	0.8	684.6
1989/90	2.0	74.0	193.3	150.0	75.0	0.0	40.4	126.6	12.2	0.4	0.0	0.0	673.9
1990/91	3.5	46.9	78.9	175.4	3.4	121.5	184.8	15.3	0.0	0.3	10.8	0.8	641.6
1991/92	44.0	74.7	32.4	39.1	0.6	60.7	75.3	127.6	15.8	53.0	0.6	2.6	526.4
1992/93	8.6	96.9	9.2	24.5	7.5	23.8	59.1	78.6	38.3	0.0	0.0	0.1	346.6
1993/94	6.6	64.1	187.8	30.5	78.9	147.4	31.4	46.5	19.1	0.3	0.3	0.0	612.9
Ave.	12.0	58.4	102.4	124.0	100.9	103.9	91.6	80.4	38.3	13.1	2.9	1.2	729.2

Table 3.1.8 Monthly Rainfall at Pont du Sker

6288 PONT DU SKER													
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1957/58	6.7	97.4	164.9	360.0	136.0	16.8	84.9	129.9	11.3	4.1	0.0	14.7	1026.7
1958/59	2.9	47.1	50.0	429.1	50.7	67.4	108.6	28.6	103.7	0.0	4.8	0.6	693.5
1959/60	26.7	19.2	197.1	128.5	258.3	175.1	308.4	8.4	30.1	16.2	3.1	0.0	1171.1
1960/61	0.0	140.6	95.7	205.0	88.6	8.1	44.2	42.0	54.2	51.4	1.1	2.5	733.4
1961/62	5.5	50.8	210.9	115.4	33.1	19.6	313.7	92.3	11.8	7.9	0.0	1.2	862.2
1962/63	12.1	81.5	326.4	179.2	368.2	321.1	18.3	69.5	94.3	2.4	13.8	5.6	1492.4
1963/64	12.9	9.1	69.2	558.5	14.9	144.0	150.2	136.2	8.4	2.7	0.0	26.3	1132.4
1964/65	5.1	3.1	163.3	221.5	118.6	163.3	72.8	39.1	7.8	42.4	1.2	0.7	838.9
1965/66	52.8	146.1	113.6	79.9	115.7	159.9	20.1	21.8	15.5	1.0	0.0	0.0	726.4
1966/67	4.9	101.0	47.9	21.5	27.9	150.0	40.1	67.7	15.3	23.2	0.0	0.0	499.5
1967/68	1.4	45.9	157.6	45.5	7.7	230.1	156.9	44.6	51.8	15.7	0.0	9.0	766.2
1968/69	0.0	0.0	277.3	181.8	212.4	317.5	149.4	108.3	20.6	17.4	1.1	0.3	1286.1
1969/70	26.4	49.8	191.1	241.5	541.9	1.5	133.8	46.4	34.4	10.2	0.0	0.0	1277.0
1970/71	2.9	26.3	22.6	194.4	210.8	6.6	233.3	674.5	92.5	68.3	0.3	0.3	1532.8
1971/72	43.1	0.2	104.9	63.5	138.6	146.5	101.8	47.2	124.1	36.1	0.0	0.1	806.1
1972/73	26.6	224.0	20.9	50.0	91.9	60.7	61.7	35.2	20.2	21.6	0.0	2.4	615.2
1973/74	0.0	21.0	54.2	296.6	30.7	112.2	113.7	249.2	6.3	38.1	0.7	0.0	922.7
1974/75	0.0	37.1	16.2	0.0	65.6	73.0	210.5	64.6	44.8	45.7	0.0	3.6	561.1
1975/76	7.5	0.7	23.5	194.2	70.1	70.8	101.0	.	67.5	26.8	10.5	3.8	.
1976/77	5.3	167.6	8.2	281.6	266.5	111.2	7.2	0.5	11.8	7.8	1.2	0.0	868.9
1977/78	3.6	65.5	88.6	94.9	105.1	192.4	66.9	154.9	76.8	15.0	0.0	0.3	864.0
1978/79	1.2	2.7	11.6	136.1	187.2	279.0	75.6	43.0	17.6	4.0	1.6	0.0	759.6
1979/80	20.8	220.2	20.5	27.3	79.6	23.7	78.0	45.7	78.1	9.1	0.4	0.0	603.4
1980/81	5.4	68.6	116.2	39.4	15.2	18.4	63.7	120.3	55.3	12.2	0.0	1.4	516.1
1981/82	4.3	13.2	0.1	230.5	116.6	70.8	63.1	81.2	34.5	0.0	0.9	1.9	617.1
1982/83	0.0	74.2	106.8	40.5	0.0	205.1	53.5	19.3	17.0	1.5	0.0	0.4	518.3
1983/84	0.0	0.3	225.3	217.6	17.4	17.1	96.6	47.1	123.7	1.6	4.2	0.0	750.9
1984/85	0.0	0.0	147.9	14.1	116.7	73.3	21.7	42.1	30.5	5.7	0.0	0.0	452.0
1985/86	37.5	0.0	155.5	75.2	129.7	223.3	44.0	78.5	0.0	1.8	0.0	0.0	745.5
1986/87	7.0	74.1	28.0	16.8	136.9	146.7	1.5	21.6	1.3	0.0	13.8	0.0	447.7
1987/88	8.5	17.2	108.8	98.6	123.7	42.4	23.3	43.2	43.6	0.0	0.0	0.0	509.3
1988/89	0.0	39.2	108.9	13.6	26.9	85.4	44.9	164.7	35.4	8.6	0.0	0.0	527.6
1989/90	0.0	54.5	201.2	212.3	75.3	4.5	36.5	128.0	18.6	0.0	0.0	0.0	730.9
1990/91	1.3	47.8	78.7	166.4	10.3	164.3	219.4	8.7	0.0	0.0	2.6	0.0	699.5
1991/92	37.3	42.4	4.4	50.3	1.2	70.0	49.6	117.5	6.0	45.6	0.0	6.6	430.9
1992/93	2.2	77.0	6.2	42.4	5.0	30.7	60.8	82.1	107.0	0.0	0.0	0.0	413.4
1993/94	16.4	69.4	206.6	57.2	61.9	118.6	20.3	44.6	21.9	2.1	3.5	0.0	622.5
Ave.	10.5	57.7	106.2	145.4	109.6	111.4	93.2	87.5	40.4	14.8	1.8	2.2	780.7

Table 3.1.9 Monthly Rainfall at Rhafsal

6400 RHAFSAI													
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1957/58	3.5	98.1	193.3	351.3	152.1	17.3	105.3	144.7	18.3	4.1	0.0	16.5	1104.5
1958/59	3.2	31.9	49.2	519.6	48.4	61.7	139.5	29.9	119.0	0.0	0.7	1.8	1004.9
1959/60	62.3	15.7	169.7	173.5	290.6	202.1	386.7	19.2	41.2	10.5	1.0	0.0	1372.5
1960/61	1.5	191.2	121.3	218.9	72.7	8.6	64.9	35.0	79.5	35.1	0.0	0.0	828.7
1961/62	17.3	45.9	301.4	148.1	41.2	32.8	251.7	49.7	22.1	5.3	5.2	2.1	922.8
1962/63	17.7	97.9	388.6	197.3	434.8	363.7	16.0	86.9	65.5	6.0	12.5	5.0	1691.9
1963/64	11.0	20.8	100.2	595.6	22.4	200.3	196.0	122.7	20.8	0.0	0.0	0.0	1289.8
1964/65	6.5	5.1	174.4	188.7	114.0	142.1	48.7	41.5	3.7	39.2	0.0	0.0	763.9
1965/66	67.4	172.1	100.8	80.1	157.2	179.9	22.1	43.1	7.7	1.7	1.3	0.0	833.4
1966/67	4.0	130.9	44.8	18.9	47.2	157.4	28.8	71.6	37.8	22.6	0.0	0.0	564.0
1967/68	6.4	72.3	167.8	53.9	6.6	272.7	147.5	67.3	27.3	45.9	0.0	0.0	867.7
1968/69	3.6	0.0	271.3	207.5	220.6	330.2	183.7	109.9	35.2	15.5	2.6	0.0	1380.1
1969/70	33.8	75.9	208.4	234.6	554.6	1.9	161.6	68.7	39.3	11.2	0.0	0.0	1390.0
1970/71	0.0	23.3	27.6	202.3	227.2	8.7	226.5	379.1	81.6	14.0	4.0	0.0	1194.3
1971/72	17.3	0.0	147.0	92.7	164.9	108.3	115.0	45.5	79.3	11.7	0.0	0.0	781.7
1972/73	17.6	200.9	23.0	42.7	107.3	80.8	63.1	19.8	29.8	15.5	0.0	5.2	605.7
1973/74	0.0	23.5	34.5	306.5	36.0	117.4	87.6	274.8	1.9	35.1	0.0	0.0	917.3
1974/75	0.0	27.3	14.0	0.0	69.7	124.6	217.4	56.6	45.4	13.8	0.0	2.5	571.3
1975/76	0.9	0.4	35.7	195.8	71.7	92.8	108.5	131.7	83.1	11.4	3.8	1.8	737.6
1976/77	15.9	185.1	6.5	311.7	369.7	115.2	15.0	0.2	15.9	8.9	0.0	0.0	1044.1
1977/78	1.7	67.6	99.5	118.8	130.9	195.7	78.8	183.4	74.1	58.6	0.0	0.0	1009.1
1978/79	0.0	3.3	14.3	180.7	191.4	359.2	85.6	46.8	9.5	1.0	13.9	0.0	905.7
1979/80	13.1	283.9	39.8	25.4	69.5	30.7	82.3	46.6	69.7	10.5	0.0	0.0	671.5
1980/81	49.7	83.2	165.4	29.6	14.4	22.2	67.1	120.8	40.1	1.9	0.0	0.0	594.4
1981/82	3.3	8.2	0.0	260.2	123.7	106.6	61.6	133.5	30.0	0.0	2.9	4.4	734.4
1982/83	0.4	87.8	120.9	47.9	0.0	196.9	49.8	24.2	22.8	0.0	0.0	0.0	550.7
1983/84	0.0	1.8	231.8	281.5	24.8	38.6	113.6	101.7	132.7	2.0	5.4	0.0	933.9
1984/85	3.7	1.6	181.2	17.7	137.2	96.9	28.7	55.1	44.4	3.4	4.3	0.0	574.2
1985/86	0.6	1.2	214.2	68.0	233.6	298.5	79.4	110.8	0.1	4.5	0.0	0.0	1010.9
1986/87	8.8	72.0	58.6	30.3	269.0	171.3	1.5	23.2	2.7	0.0	4.1	0.0	641.5
1987/88	21.1	27.2	136.9	155.4	159.4	53.2	27.6	65.5	56.7	8.5	0.0	0.0	711.5
1988/89	1.7	66.9	151.9	22.1	41.6	154.4	74.9	161.2	54.4	1.9	0.6	8.3	739.9
1989/90	0.1	71.1	257.5	211.7	92.9	6.4	21.0	138.2	18.0	0.2	2.5	0.0	819.6
1990/91	6.5	58.6	116.7	195.1	3.3	134.1	311.6	15.1	0.1	0.0	0.9	1.7	843.7
1991/92	43.7	87.9	21.8	42.2	0.1	62.5	80.6	157.1	17.0	45.6	0.0	2.2	560.7
1992/93	8.5	91.4	11.1	45.4	9.5	12.6	73.0	89.8	53.1	0.0	0.0	1.1	395.5
1993/94	13.5	61.0	222.3	50.3	86.6	146.3	41.3	41.4	22.6	0.1	0.0	0.0	685.4
Ave.	12.6	67.4	125.0	160.1	129.6	127.2	104.4	89.5	40.6	12.0	1.8	1.4	871.6

Table 3.1.10 Monthly Rainfall at Tafrant

7400 TAFRANT													
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1956/57	-	5.1	50.8	59.2	120.7	0.0	66.1	101.1	41.8	5.0	0.0	0.0	-
1957/58	9.5	59.3	131.6	286.9	149.5	12.5	95.9	148.3	28.9	23.3	0.0	10.1	955.8
1958/59	6.5	16.4	59.8	373.8	54.7	57.4	124.3	58.3	100.1	0.0	2.1	5.1	858.5
1959/60	22.6	17.0	153.6	156.4	268.5	164.7	283.3	19.9	42.3	26.9	0.0	0.0	1155.2
1960/61	0.0	165.7	131.0	199.6	71.7	10.6	55.1	46.0	77.7	29.4	0.0	0.0	786.8
1961/62	13.1	27.1	284.8	127.5	30.3	38.0	296.8	27.8	22.0	9.8	0.0	0.0	877.2
1962/63	7.5	74.4	299.4	173.7	395.5	294.2	16.5	72.1	74.5	11.4	16.0	0.0	1435.2
1963/64	9.7	21.7	74.4	259.8	22.1	172.4	157.3	99.0	15.2	2.2	0.0	0.0	833.8
1964/65	0.0	1.9	148.0	142.6	118.9	118.0	52.3	49.5	12.4	23.3	2.3	0.0	669.2
1965/66	38.8	193.8	103.5	70.2	170.1	130.1	1.3	30.4	4.2	1.4	0.0	0.0	743.8
1966/67	6.9	111.6	35.9	20.8	41.0	115.2	17.7	49.2	27.7	49.8	0.0	0.0	475.8
1967/68	0.0	50.1	118.5	44.5	4.7	253.3	121.9	34.4	30.4	29.7	0.0	2.7	690.2
1968/69	4.0	12.0	218.8	162.3	211.1	306.3	156.0	81.5	24.1	13.3	0.8	1.4	1191.6
1969/70	23.5	101.2	164.6	180.1	417.1	3.1	110.8	43.3	27.4	5.1	0.0	0.0	1076.2
1970/71	1.8	25.6	29.9	184.9	174.7	5.8	166.3	315.0	63.4	18.2	0.3	0.3	986.2
1971/72	8.4	4.2	126.8	83.0	140.5	94.7	112.8	54.8	77.2	8.2	0.0	0.0	710.6
1972/73	18.9	183.2	11.6	27.7	92.2	64.1	88.6	16.5	20.3	0.0	0.0	4.6	527.7
1973/74	0.0	21.7	26.2	222.8	32.1	101.2	77.3	186.5	3.5	46.5	0.0	0.0	717.8
1974/75	0.1	32.4	10.0	0.0	58.1	112.1	172.7	79.0	34.1	8.6	0.0	3.7	510.8
1975/76	0.2	1.2	25.2	157.7	51.8	74.2	112.9	134.4	89.7	1.7	3.8	0.2	653.0
1976/77	25.2	168.2	4.5	234.9	311.7	111.4	8.4	0.0	14.2	10.1	0.0	0.0	888.6
1977/78	4.1	73.8	72.2	122.6	128.1	143.5	50.8	154.4	72.1	52.0	0.0	0.5	874.1
1978/79	0.0	1.5	19.3	175.6	154.9	270.4	69.5	33.6	12.7	0.1	13.0	0.0	750.6
1979/80	13.8	246.1	32.8	24.6	63.4	32.1	68.1	35.0	46.4	8.5	0.0	0.0	570.8
1980/81	22.7	49.0	129.2	36.6	9.9	10.7	70.8	100.0	28.0	14.1	0.0	0.0	471.0
1981/82	4.9	16.4	0.0	260.2	101.0	85.2	78.4	155.7	15.2	0.0	1.4	0.0	718.4
1982/83	0.4	67.4	92.1	40.7	0.0	139.3	26.7	13.3	24.3	0.0	0.0	0.5	404.7
1983/84	0.0	2.8	190.3	169.8	21.2	27.8	97.8	64.6	138.3	14.4	4.1	0.0	731.1
1984/85	2.8	1.3	18.8	-	108.5	62.1	33.8	41.1	32.7	1.5	0.0	0.0	-
1985/86	8.7	8.3	173.9	108.4	154.1	274.4	72.0	94.9	0.0	-	-	-	-
1986/87	-	-	51.6	29.2	-	-	-	-	-	1.1	3.0	0.4	-
1987/88	8.9	20.5	131.1	120.8	137.4	29.5	17.4	54.2	64.8	12.4	0.0	0.0	597.0
1988/89	0.0	89.7	145.9	19.7	47.9	135.5	64.3	123.8	53.0	0.0	1.6	2.8	684.2
1989/90	10.8	49.6	212.4	173.6	72.9	0.4	42.7	112.1	16.4	1.9	15.0	0.0	707.8
1990/91	6.1	58.6	60.7	200.0	3.4	120.1	189.7	19.4	1.8	8.7	9.7	1.5	679.7
1991/92	59.6	56.9	24.5	26.6	0.0	43.9	44.2	118.8	10.9	46.4	0.0	2.0	433.8
1992/93	6.4	81.3	8.1	31.7	6.4	18.0	63.2	57.8	53.1	0.0	0.0	0.0	326.0
1993/94	10.8	68.2	212.4	18.2	66.0	142.7	17.6	40.7	19.5	0.1	0.0	0.0	596.2
Ave.	9.9	59.1	99.6	127.7	108.4	102.0	89.2	77.5	38.4	13.1	2.0	1.0	727.9

Table 3.1.11 Monthly Rainfall at Azib Soltane

1424 AZIB SOLTANE													
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1961/62										0.9	0.0	0.0	
1962/63	4.8	18.9	115.7	74.9	199.5	193.9	17.7	53.2	84.1	15.4	0.0	2.2	780.3
1963/64	11.9	4.7	60.7	226.5	32.6	86.6	88.0	130.5	0.0	0.0	0.0	0.0	641.5
1964/65	0.0	2.3	106.6	118.5	73.5	59.8	91.4	40.9	13.6	13.5	6.9	0.0	527.0
1965/66	52.5	107.1	81.1	51.9	24.8	115.4	5.7	33.2	11.8	0.0	0.0	0.0	483.5
1966/67	1.2	69.4	35.9	3.5	24.6	39.9	17.7	21.6	31.7	9.6	0.0	0.0	255.1
1967/68	0.0	19.2	82.2	21.6	0.0	137.3	55.5	14.6	7.7	23.0	0.0	0.0	361.1
1968/69	0.0	0.0	196.2	80.8	73.6	161.7	81.9	40.0	68.2	8.8	0.0	1.9	713.1
1969/70	19.8	41.8	97.7	93.5	150.6	0.0	54.1	27.4	14.6	3.9		0.0	
1970/71	0.0	13.4	9.8	80.2	116.8	3.5	92.0	148.2	35.5	14.8	0.0	0.0	514.2
1971/72	0.0	0.0	77.7	71.4	67.5	54.9	55.1	12.3	62.1	2.9	0.0	0.0	403.9
1972/73	25.9	63.8	5.6	29.0	50.3	41.0	37.6	18.4	14.1	0.0	0.0	2.2	287.9
1973/74	0.0	12.7	14.3	128.8	21.7	52.4	69.5	202.1	1.3	19.4	0.0	0.0	522.2
1974/75	0.0	15.8	17.3	0.0	33.8	62.3	132.4	59.2	49.6	4.4	0.0	0.0	374.8
1975/76	3.8	0.0	39.7	143.4	29.2	52.1	67.9	61.4	99.8	11.3	0.0	0.0	508.6
1976/77	12.8	118.4	2.8	127.1	192.0	106.5	21.5	2.6	31.6	4.9	4.8	0.0	625.0
1977/78	0.1	64.5	53.1	45.1	79.4	103.4	49.3	148.0	88.0	41.1	0.0	1.7	673.7
1978/79	0.0	2.0	5.1	107.8	122.2	178.1	44.3	43.5	2.0	0.2	15.4	0.2	520.8
1979/80	27.0	130.7	21.5	10.9	71.6	35.0	83.1	40.0	31.9	2.2	0.0	0.0	453.9
1980/81	0.8	76.9	98.2	6.9	18.2	9.2	37.6	60.6	9.7	5.2	0.0	0.0	323.3
1981/82	1.1	13.2	0.0	97.0	57.1	52.1	19.3	86.5	12.2	0.2	0.2	0.0	338.9
1982/83	1.1	95.3	69.2	54.0	0.0	142.8	41.1	21.7	19.2	8.0	0.0	0.0	452.4
1983/84	0.0	4.7	129.7	96.8	17.1	24.9	81.9	34.6	142.8	11.7	0.0	0.0	544.2
1984/85	1.1	1.2	112.9	15.6	105.9	26.0	9.6	32.2	25.7	5.2	14.2	0.2	349.8
1985/86	4.3	0.0	115.0	58.8	105.6	142.9	46.6	66.2	0.5	11.6	0.0	0.0	551.5
1986/87	3.9	9.6	42.4		107.1	94.8	6.0	26.1	5.9	0.4	0.0	8.3	
1987/88	26.8	19.5	126.0	98.6	92.6	42.4	23.5	36.2	26.6	4.5	0.0	0.0	496.7
1988/89	0.3	71.5	118.7	7.7	43.4	67.9	43.1	74.6	40.3	0.0	22.8	3.6	493.9
1989/90	3.2	98.9	107.8	121.7	59.1	0.2	32.5	72.0	104.2	0.0	0.0	0.0	599.6
1990/91	5.0	39.7	68.2	207.8	7.8	123.5	111.5	31.4	0.1	2.4	0.2	1.2	598.8
1991/92	59.2	57.7	12.3	30.1	0.0	36.3	88.9	85.2	9.0	45.5	7.8	1.7	433.7
1992/93	6.3	60.7	15.3	11.0	9.6	22.3	43.8	70.0	48.5	0.7	0.0	0.0	288.2
1993/94	2.5	40.3	177.6	22.2	53.5	122.6	15.4	15.9	16.4	0.0	0.0	0.3	466.7
Ave.	8.6	39.8	69.3	72.4	63.8	74.7	52.0	56.6	34.6	8.2	2.3	0.7	483.0

Table 3.1.12 Monthly Rainfall at Had Kourt

4104 HAD KOURT													
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1965/66	-	102.4	57.9	43.0	-	92.7	11.2	4.0	0.0	0.0	0.0	0.0	-
1966/67	0.0	79.5	-	-	18.5	42.7	12.5	-	0.0	0.0	0.0	0.0	-
1967/68	3.0	38.5	76.5	80.5	-	-	-	8.5	0.0	0.0	0.0	0.0	-
1968/69	0.0	0.0	194.6	93.6	89.8	216.8	132.6	58.1	27.2	15.2	4.2	0.0	832.1
1969/70	32.9	39.5	101.2	128.2	213.5	2.5	78.1	64.1	-	4.7	-	0.0	-
1970/71	0.0	27.4	21.2	141.0	127.1	5.3	147.9	190.4	73.3	6.1	0.0	0.8	742.5
1971/72	0.0	0.0	105.0	75.6	89.6	94.4	71.8	21.2	40.6	3.8	0.0	1.1	503.1
1972/73	11.4	122.0	14.7	57.9	50.8	48.6	45.0	4.7	24.7	11.3	0.0	8.6	399.7
1973/74	1.0	7.9	40.9	144.2	21.6	64.1	72.4	154.9	4.5	20.3	2.5	0.0	534.3
1974/75	0.6	10.4	10.2	0.0	60.9	56.6	120.3	80.5	25.8	56.9	0.0	0.0	422.2
1975/76	0.3	3.9	45.7	173.3	43.6	50.0	43.3	94.7	66.6	5.1	0.0	0.0	526.5
1976/77	13.0	100.6	5.4	157.7	221.3	82.0	8.0	1.4	29.6	-	0.0	-	-
1977/78	0.0	100.3	58.7	54.5	84.4	131.4	57.5	124.0	44.0	27.9	0.0	0.0	682.7
1978/79	0.0	8.6	16.4	138.5	82.3	147.1	51.6	29.7	0.0	0.5	24.0	0.0	498.7
1979/80	2.4	-	13.7	17.0	62.1	12.9	78.4	30.5	37.5	3.5	0.0	0.0	-
1980/81	6.1	51.5	-	16.5	10.8	14.2	39.7	49.9	32.5	0.0	0.0	0.0	-
1981/82	4.5	4.7	0.0	125.3	67.5	87.6	32.1	89.2	15.7	0.0	0.0	0.0	426.6
1982/83	0.0	98.1	91.9	44.8	0.0	118.9	33.0	15.7	10.6	0.0	0.0	0.5	413.5
1983/84	0.0	2.4	153.9	125.1	22.9	26.6	89.1	30.5	132.0	-	-	0.0	-
1984/85	5.6	124.9	-	10.9	64.6	36.7	9.3	14.7	23.2	2.0	0.0	0.0	-
1985/86	6.4	10.0	125.0	105.3	100.1	152.4	51.9	81.5	0.0	17.0	0.0	0.0	649.6
1986/87	1.1	11.5	46.0	30.5	125.3	110.1	14.0	15.3	0.0	0.0	-	5.0	-
1987/88	0.0	27.5	133.6	101.0	99.4	38.4	34.0	37.1	18.5	12.2	0.0	0.0	501.7
1988/89	0.0	56.4	138.1	13.5	49.4	100.1	51.4	85.5	15.5	2.0	0.0	2.0	513.9
1989/90	6.6	73.7	129.0	156.0	62.5	3.5	40.2	81.1	46.0	15.0	0.0	0.0	613.6
1990/91	0.0	32.6	64.3	152.5	7.0	100.7	117.5	27.0	8.0	0.0	0.0	1.0	510.6
1991/92	49.0	56.0	16.5	16.5	0.0	49.5	58.0	69.0	7.5	56.0	0.0	2.0	380.0
1992/93	6.5	60.0	17.0	21.0	14.5	12.0	62.0	59.3	41.5	0.0	0.0	0.0	293.8
1993/94	8.0	54.0	150.0	15.5	58.0	117.0	0.0	35.0	14.0	0.0	0.0	0.0	451.5
Ave.	5.7	46.6	70.3	80.0	68.4	72.0	55.8	55.6	26.4	9.7	1.2	0.8	492.3

Table 3.1.13 List of Stream Gauging Station

River	No.	Station	Catchment Area (km ²)
Sebou	2263/15	Dar El Arsa	7680
Sebou	1540/15	Azib Soltane	16150
Sebou	633/8	Mechra Bel Ksiri	25980
Mikkès	2244/15	El Hajra	680
Ouergha	609/9	M'Jaara	6190
Aoudour	1215/9	Tabouda	861
Aoudour	608/9	Tafrant	953
Ouergha	1217/9	Ain Aicha	2460
Ouergha	260/9	Bab Ouender	1756
Ouergha	79/9	Ourtzagh	4392
Aoulai	607/9	Rhafsai	777
Amzaz	1216/9	Galez	500
Sra	81/9	Pont du Sker	486
Rdat	1436/9	Had Kourt	673
Inaouen	551/16	Bab Merzouka	1500
Inaouen	653/16	El Kouchat	2570
Lebene	1542/15	Tissa	792

Table 3.1.14 Monthly Mean Discharge at Dar El Arsa

2263/15 DAR EL ARSA											7620	KM2	
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1970/71	16.10	17.70	18.00	20.40	41.10	42.20	48.50	84.20	86.00	55.70	32.90	24.60	40.60
1971/72	21.50	20.50	32.30	32.90	41.80	59.00	85.00	68.00	55.70	37.50	25.80	19.80	41.60
1972/73	19.20	27.70	23.70	25.90	31.40	46.40	59.10	58.90	39.00	25.80	18.80	15.90	32.50
1973/74	12.50	13.80	15.20	17.40	18.30	21.90	38.90	61.00	50.50	26.10	18.60	14.10	25.70
1974/75	13.10	14.90	13.80	10.80	11.40	21.60	37.30	61.40	48.60	29.10	16.60	13.90	24.30
1975/76	12.50	12.40	13.30	16.00	14.90	28.10	32.30	51.20	74.50	29.70	21.30	14.70	26.70
1976/77	15.20	19.00	21.30	33.80	66.50	81.20	50.30	40.20	25.90	20.40	15.60	13.50	33.30
1977/78	14.10	17.30	17.20	22.00	22.70	39.60	36.40	40.10	31.00	20.90	14.70	12.90	24.00
1978/79	11.30	11.70	11.90	14.70	18.30	64.20	62.10	41.40	25.60	19.60	15.10	11.80	25.40
1979/80	21.40	26.60	32.50	23.20	21.00	21.70	35.10	25.70	28.20	16.90	13.20	11.70	23.10
1980/81	12.80	15.00	18.50	14.60	15.40	18.00	20.20	28.90	22.70	14.00	10.60	9.45	16.60
1981/82	8.21	11.20	8.42	11.00	13.50	16.90	20.40	34.50	26.70	16.00	11.00	9.36	15.60
1982/83	8.23	22.70	17.50	21.10	19.50	20.30	20.90	18.40	13.20	10.10	8.76	7.68	15.70
1983/84	7.36	7.83	11.30	11.90	11.40	9.18	12.50	15.60	27.00	16.70	11.10	9.33	12.60
1984/85	7.99	7.48	13.80	13.50	16.30	19.20	16.50	15.20	24.20	13.90	10.00	7.05	13.70
1985/86	6.45	6.13	8.41	11.00	24.80	56.60	60.90	40.70	25.70	24.50	13.60	12.00	24.00
1986/87	10.10	12.60	10.80	10.60	14.30	55.70	32.60	18.60	14.10	12.60	13.00	8.09	17.50
1987/88	12.20	19.30	16.50	18.50	22.40	30.70	37.10	18.30	18.60	13.50	10.60	9.60	18.90
1988/89	6.91	7.82	7.78	8.74	6.59	8.01	17.30	38.70	20.60	14.10	8.15	7.03	12.60
1989/90	7.30	16.90	11.70	19.10	25.20	21.20	15.40	15.30	24.60	10.00	7.98	6.45	15.10
1990/91	10.60	6.75	8.59	15.10	4.04	11.30	55.70	37.10	14.40	14.30	12.80	11.10	16.80
1991/92	9.95	5.50	7.05	5.51	5.52	5.39	5.52	15.90	19.40	14.20	7.19	6.45	8.96
1992/93	11.70	7.17	7.61	4.84	4.77	5.79	5.34	8.98	11.00	14.00	4.52	13.00	8.23
1993/94	4.66	4.77	6.15	3.77	3.96	25.90	26.80	12.00	6.62	4.91	4.83	-	-
Ave.	11.72	13.86	14.72	16.10	19.80	30.42	34.67	35.43	30.58	19.77	13.61	11.72	20.96

Table 3.1.15 Monthly Mean Discharge at Azib Soltane

1540/15 AZIB SOLTANE											16150	KM2	
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1958/59												9.27	
1959/60	12.50	14.20	20.60	107.00	275.00			144.00	69.60	58.00		20.30	
1960/61	16.30	25.80	37.60	115.00	134.00	95.60	62.60	56.50	37.00	32.10	15.70	11.40	54.00
1961/62	11.50	18.60	42.60	50.80	42.30	28.30	214.00	103.00	51.80	30.50	15.20	10.80	51.90
1962/63	10.60	18.60	148.00	81.00	488.00	594.00	199.00	80.90	147.00	96.90	44.50	33.80	159.00
1963/64	27.50	26.90	31.20	264.00	83.70	98.90	131.00	293.00	65.20	41.80	30.00	23.80	93.10
1964/65	22.20	23.20	50.50	71.10	136.00	125.00	227.00	120.00	58.90	40.50	28.20	21.30	76.90
1965/66	22.50	33.10	40.60	39.50	55.20	68.40	42.70	30.80	19.90	14.30	8.92	8.63	31.80
1966/67	10.20	56.10	32.90	23.90	19.20	26.20	28.50	27.70	23.50	17.50	7.32	5.59	23.20
1967/68	7.13	17.40	25.20	29.40	33.80	89.80	177.00	122.00	70.30	34.30	16.60	12.60	52.90
1968/69	11.00	10.60	57.80	161.00	241.00	337.00	335.00	158.00	94.30	63.90	38.90	27.30	127.00
1969/70	27.10	33.20	46.40	114.00	663.00	120.00	134.00	94.90	46.60	31.70	21.30	18.50	113.00
1970/71	17.60	20.00	21.20	26.70	130.00	93.60	90.60	299.00	173.00	97.60	42.80	29.30	86.60
1971/72	26.20	24.50	49.20	52.80	89.30	120.00	188.00	100.00	88.30	45.30	28.40	20.70	69.30
1972/73	19.90	44.60	29.90	36.00	55.70	97.10	90.20	74.70	43.30	25.40	17.60	19.90	45.90
1973/74	25.10	28.20	27.60	45.80	26.00	42.40	56.40	121.00	98.70	31.30	35.40	37.30	47.90
1974/75	38.40	45.50	44.80	15.20	17.20	24.20	50.30	68.20	52.50	31.30	22.40	24.60	36.20
1975/76	24.70	25.30	20.90	22.80	15.50	45.00	36.60	61.10	96.20	34.70	27.20	29.60	36.60
1976/77	32.80	33.20	33.60	70.30	222.00	306.00	85.20	45.20	31.10	32.10	24.40	25.00	77.10
1977/78	24.70	25.70	21.90	28.40	31.90	72.80	80.10	76.60	77.50	33.70	33.80	30.70	44.60
1978/79	35.30	27.60	23.80	28.10	39.30	240.00	143.00	83.90	33.60	25.70	26.50	30.70	60.20
1979/80	37.80	54.50	64.80	36.00	33.10	26.50	45.90	29.00	36.90	27.00	27.10	30.50	37.50
1980/81	29.80	27.10	24.00	18.70	17.90	18.90	18.50	34.20	26.50	20.50	23.20	27.80	23.90
1981/82	27.20	23.30	21.30	29.10	31.90	29.10	24.40	44.30	30.30	18.80	17.30	17.80	26.20
1982/83	19.10	32.40	20.40	24.90	21.50	41.90	24.70	20.00	15.50	17.10	18.30	22.40	23.10
1983/84	19.10	18.90	16.80	31.70	14.50	12.00	17.10	16.30	41.40	17.90	18.20	23.00	20.70
1984/85	18.30	15.10	19.20	15.40	27.80	29.90	18.60	15.70	22.60	13.60	19.40	21.20	19.70
1985/86	22.90	17.80	22.80	13.20	46.90	177.00	92.10	61.30	34.70	24.40	19.30	23.50	45.40
1986/87	30.20	21.90	19.00	13.00	31.30	122.00	40.70	19.80	19.40	34.60	49.40	44.30	36.60
1987/88	37.40	30.10	16.60	19.10	30.60	27.30	34.40	16.50	20.30	26.20	26.00	27.30	26.00
1988/89	24.60	17.20	13.60	11.80	10.90	12.00	16.70	43.50	19.30	19.10	21.10	24.20	19.50
1989/90	10.20	28.30	16.50	43.30	38.70	19.10	14.20	15.60	23.50	10.70	17.50	22.20	21.80
1990/91	19.90	18.40	11.40	30.00	7.55	25.50	110.00	56.40	24.90	27.20	33.10	31.80	33.10
1991/92	22.40	7.41	11.20	11.00	11.90	11.40	9.73	36.90	21.30	28.40	26.20	39.30	19.70
1992/93	34.50	15.50	13.00	7.16	8.39	8.12	8.89	11.70	17.10	28.70	33.50	36.00	18.60
1993/94	16.80	8.03	17.40	6.16	8.84	32.80	34.70	11.00	6.21	20.50	26.60		
Ave.	22.67	25.38	31.84	48.38	89.71	94.64	84.76	74.08	49.66	32.95	25.33	24.07	50.03

Table 3.1.16 Monthly Mean Discharge at M'Jaara

609/9 M'JAARA											6190	KM2	
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1959/60	6.57	3.28	27.80	243.00	376.00	457.00	742.00	180.00	42.20	22.00	6.42	3.01	175.00
1960/61	2.44	37.50	80.10	196.00	141.00	52.40	25.50	20.60	10.50	21.10	2.23	0.68	49.40
1961/62	0.84	2.69	198.00	288.00	139.00	49.60	507.00	108.00	39.10	13.60	4.41	2.08	113.00
1962/63	2.21	12.40	275.00	209.00	1119.00	924.00	135.00	86.60	82.90	31.50	10.80	5.27	237.00
1963/64	4.31	3.60	33.30	889.00	87.80	190.00	259.00	288.00	40.30	16.70	7.01	3.57	152.00
1964/65	2.96	3.01	62.80	129.00	205.00	194.00	312.00	57.60	18.40	12.00	3.92	3.75	83.50
1965/66	8.08	39.70	95.20	77.60	228.00	291.00	97.30	44.90	15.30	6.03	2.06	1.44	74.20
1966/67	1.51	17.50	23.60	8.94	15.90	136.00	51.50	31.20	16.50	8.46	1.64	0.41	25.30
1967/68	0.70	7.78	61.30	23.40	22.00	276.00	245.00	90.60	40.50	14.00	3.34	2.00	64.80
1968/69	1.42	1.44	74.00	310.00	464.00	631.00	440.00	213.00	91.00	29.80	7.71	4.50	186.00
1969/70	4.89	17.70	94.60	226.00	1553.00	106.00	120.00	118.00	41.60	18.40	6.31	3.51	194.00
1970/71	2.71	4.73	5.80	41.40	269.00	99.30	198.00	684.00	192.00	80.90	19.20	8.96	133.00
1971/72	6.90	5.03	18.90	24.40	215.00	202.00	265.00	71.20	121.00	23.90	8.32	3.96	80.40
1972/73	3.96	59.30	25.30	26.40	82.90	71.00	51.00	34.90	14.50	6.07	1.94	1.55	31.40
1973/74	0.75	1.60	3.64	189.00	60.20	99.50	104.00	372.00	141.00	32.10	7.47	2.75	84.30
1974/75	2.22	3.99	5.20	4.26	19.60	35.30	169.00	94.50	59.90	28.20	4.64	1.58	35.70
1975/76	1.28	1.71	2.33	74.90	26.10	181.00	74.80	177.00	167.00	36.10	13.70	2.97	62.80
1976/77	3.90	41.60	39.20	436.00	643.00	464.00	115.00	39.90	18.60	9.24	3.51	1.91	150.00
1977/78	3.48	7.63	6.62	111.00	137.00	334.00	250.00	164.00	237.00	48.00	15.30	4.31	108.00
1978/79	3.67	4.20	5.20	76.80	271.00	686.00	251.00	93.40	20.20	5.02	2.78	1.20	114.00
1979/80	2.88	109.00	45.20	19.50	56.90	33.40	74.40	-	107.00	13.70	2.50	0.95	-
1980/81	2.48	6.73	76.50	16.70	10.20	5.20	6.64	74.60	104.00	9.95	2.63	0.33	26.30
1981/82	0.24	1.27	1.53	134.00	24.80	88.50	55.90	162.00	43.50	7.68	2.22	0.86	62.20
1982/83	0.75	6.22	51.20	38.00	14.20	164.00	55.60	103.00	11.60	2.78	0.68	0.14	36.30
1983/84	0.09	0.08	104.00	414.00	63.90	17.20	144.00	78.20	234.00	55.70	9.19	2.57	94.50
1984/85	1.16	1.20	31.10	28.00	90.50	168.00	33.80	20.20	17.70	4.13	1.10	0.24	32.20
1985/86	1.03	1.25	54.10	22.40	181.00	645.00	167.00	120.00	33.00	14.20	3.29	1.07	99.90
1986/87	1.24	9.26	11.70	8.87	203.00	368.00	65.80	32.60	9.48	3.63	1.51	1.16	57.70
1987/88	1.76	3.75	20.30	95.40	118.00	38.00	20.90	34.30	18.50	51.90	1.31	0.10	30.00
1988/89	0.19	2.35	19.10	17.60	9.36	74.40	48.70	119.00	34.70	13.70	1.92	0.63	28.00
1989/90	2.02	3.72	199.00	316.00	140.00	31.40	12.30	54.60	143.00	5.09	1.42	0.57	76.40
1990/91	0.99	2.53	10.10	101.00	19.20	94.40	432.00	97.60	24.70	6.72	1.50	0.73	86.10
1991/92	0.83	16.80	5.18	13.10	5.90	11.10	7.49	144.00	8.77	11.10	1.96	1.47	18.80
1992/93	0.21	7.30	4.57	9.69	5.35	3.67	11.80	13.80	45.90	2.80	0.16	0.00	8.85
1993/94	0.00	2.90	113.00	22.30	83.50	91.70	91.90	19.10	7.18	1.31	-	-	-
Ave.	2.30	12.88	53.84	136.30	202.87	208.94	161.15	118.89	64.36	19.07	4.83	2.07	81.79

Table 3.1.17 Monthly Mean Discharge at Tafrant

608/9 TAFRANT												953	KM2	ANNUAL
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG		
1952/53	-	-	-	16.00	49.60	20.80	10.60	5.84	3.44	0.66	0.12	0.03	-	
1953/54	0.19	3.20	0.53	4.23	0.50	34.10	62.70	11.50	5.32	1.54	0.20	0.04	10.60	
1954/55	0.10	0.04	0.58	11.60	55.00	159.00	73.40	23.10	3.25	1.30	0.25	0.10	26.40	
1955/56	0.01	2.40	8.51	20.80	25.60	80.20	82.00	83.90	22.40	3.64	0.78	1.39	27.40	
1956/57	0.24	0.27	0.78	0.66	10.60	6.38	5.41	-	14.40	2.00	0.21	0.05	-	
1957/58	0.02	0.67	11.70	50.70	28.30	7.16	13.80	29.10	4.49	1.12	0.18	0.05	12.30	
1958/59	0.19	0.11	0.64	254.00	27.60	31.20	26.50	7.74	16.80	3.87	0.43	0.05	31.00	
1959/60	0.47	0.27	4.56	52.50	70.30	91.60	143.00	27.60	6.01	2.17	0.31	0.13	33.20	
1960/61	0.07	7.89	18.10	41.40	28.10	9.05	4.85	4.30	2.09	3.97	0.32	0.03	10.00	
1961/62	0.02	0.19	62.80	80.60	22.30	6.78	82.00	20.00	3.01	0.94	0.23	0.06	23.40	
1962/63	0.04	1.70	49.30	39.10	203.00	161.00	23.00	12.70	6.51	2.59	0.66	0.33	41.40	
1963/64	-	-	-	-	-	-	-	-	-	-	-	-	-	
1964/65	-	-	-	-	-	-	-	-	-	-	-	-	-	
1965/66	-	-	-	-	-	-	-	-	-	-	-	-	-	
1966/67	-	-	-	-	-	-	-	-	-	-	-	-	-	
1967/68	-	-	-	-	-	-	-	-	-	-	-	-	-	
1968/69	-	-	-	-	-	-	-	-	-	-	-	-	-	
1969/70	-	-	-	-	-	-	-	-	-	-	-	-	-	
1970/71	0.14	0.27	0.35	12.70	60.60	15.00	38.60	137.00	38.50	13.50	2.06	0.58	26.60	
1971/72	0.31	0.22	2.04	3.82	70.90	51.70	72.20	15.10	28.60	2.76	0.78	0.43	20.70	
1972/73	0.42	8.78	2.16	2.84	21.50	15.10	9.58	4.57	1.83	0.76	0.12	0.03	5.61	
1973/74	0.02	0.06	0.18	44.90	12.80	21.70	18.90	77.60	22.60	4.01	0.63	0.18	16.90	
1974/75	0.15	0.17	0.34	0.29	5.04	10.90	38.70	13.60	7.41	2.25	0.45	0.16	6.63	
1975/76	0.06	0.05	0.10	15.40	5.61	41.50	13.50	39.60	30.70	3.56	1.13	0.20	12.50	
1976/77	0.13	11.60	6.28	124.00	137.00	85.00	15.40	4.58	1.87	1.05	0.27	0.14	32.20	
1977/78	0.04	0.70	0.83	24.50	26.00	65.80	40.60	26.80	39.90	4.85	1.15	0.22	19.00	
1978/79	0.15	0.09	0.17	20.00	55.40	117.00	42.10	15.40	3.06	1.12	0.57	0.20	20.70	
1979/80	1.08	21.20	6.58	2.89	9.55	4.59	11.00	3.89	19.50	2.02	0.26	0.02	6.94	
1980/81	0.07	0.69	14.40	3.26	2.13	1.36	2.07	14.40	20.70	1.82	0.53	0.18	5.15	
1981/82	0.04	0.17	0.13	25.00	43.80	14.60	8.79	24.40	5.69	0.87	0.14	0.05	10.30	
1982/83	0.04	0.61	14.10	7.76	3.05	27.10	7.64	4.18	2.41	0.43	0.15	0.10	5.47	
1983/84	0.06	0.06	24.80	92.40	10.30	4.59	26.60	9.18	39.70	7.62	0.71	0.29	18.10	
1984/85	0.22	0.25	16.20	6.70	26.70	42.30	9.16	4.14	3.82	0.69	0.22	0.17	9.00	
1985/86	0.17	0.17	10.70	7.16	49.90	171.00	46.10	26.40	3.45	0.38	0.26	0.23	25.30	
1986/87	0.32	0.40	2.46	0.78	40.90	52.50	3.49	0.63	0.04	0.51	0.27	0.18	8.26	
1987/88	0.21	0.58	5.67	28.20	28.60	8.89	4.48	6.40	3.39	1.00	0.26	0.16	7.36	
1988/89	0.14	0.72	5.31	4.94	2.72	18.90	12.10	24.20	6.70	2.46	0.30	0.20	6.45	
1989/90	0.19	0.48	58.90	79.50	29.20	9.94	4.63	12.80	5.65	1.37	0.32	0.22	16.90	
1990/91	0.23	0.59	3.63	24.20	6.10	25.50	70.10	11.50	3.84	1.24	0.34	0.23	12.20	
1991/92	0.50	3.36	1.26	5.46	1.53	1.97	1.72	34.40	1.22	1.51	0.45	0.02	4.41	
1992/93	0.00	1.73	1.19	2.84	1.38	1.02	3.78	6.48	10.60	0.60	0.01	0.00	2.49	
1993/94	0.11	1.98	33.40	4.60	23.60	18.50	18.70	4.84	1.91	0.34	0.02	0.00	8.92	
Ave.	0.18	2.11	10.84	31.88	34.29	40.96	29.92	22.00	11.17	2.30	0.43	0.18	15.39	

Table 3.1.18 Monthly Mean Discharge at Bab Ouender

260/9 BAB OUENDER											1758	KM2	
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1951/52	.	.	.	.	.	32.80	19.60	33.70	33.10	10.00	4.18	2.87	.
1952/53	3.09	.	.	.	40.60	20.40	15.60	9.35	5.08	2.47	1.80	1.74	.
1953/54	2.26	8.21	2.64	4.66	4.36	23.30	50.70	28.40	10.80	4.12	1.88	1.16	11.80
1954/55	.	.	.	6.72	19.40	137.00	107.00	45.00	15.50	10.40	4.17	4.42	.
1955/56	2.60	6.80	8.33	11.50	26.70	90.80	85.70	111.00	40.80	7.75	3.33	2.14	32.80
1956/57	2.75	2.44	3.35	3.02	5.42	4.50	4.52	18.00	9.47	2.43	1.28	1.22	4.85
1957/58	1.10	2.82	10.00	54.10	37.90	15.60	9.74	20.10	8.06	5.16	1.94	1.26	14.00
1958/59	1.37	2.75	3.12	184.00	32.00	26.20	34.30	15.10	17.10	6.10	2.87	1.72	27.50
1959/60	1.88	1.85	5.78	43.20	61.80	95.60	165.00	52.40	15.10	14.70	3.53	1.90	38.50
1960/61	1.62	15.20	8.19	28.90	22.40	10.40	5.80	5.82	2.99	3.91	1.22	0.76	8.98
1961/62	1.12	2.00	25.70	51.30	31.50	9.00	107.00	37.70	18.60	6.38	2.39	1.75	24.80
1962/63	2.14	3.94	68.30	.	229.00	191.00	43.40	30.50	40.50	14.40	5.39	3.01	.
1963/64	2.88	2.28	6.24	.	28.90	36.00	53.00	.	8.86	.	.	.	.
1964/65	.	.	.	.	.	.	79.40	17.70	7.34	5.79	3.16	2.98	.
1965/66	3.57	6.53	13.60	13.00	29.30	69.00	24.10	6.98	5.50	2.93	1.75	1.73	14.50
1966/67	1.87	4.93	4.68	2.73	3.24	17.00	10.60	7.28	3.82	3.07	1.03	0.80	5.01
1967/68	0.97	1.64	10.10	4.03	5.56	43.20	57.00	32.80	13.50	4.55	2.49	1.83	14.70
1968/69	1.84	1.56	19.40	52.60	.	.	75.40	42.80	18.70	8.42	4.19	2.19	.
1969/70	2.24	4.44	18.40	62.40	.	30.30	29.40	27.50	11.90	6.17	2.94	1.97	.
1970/71	1.78	2.27	2.23	10.50	63.00	27.60	50.60	169.00	38.60	25.80	9.37	4.27	33.70
1971/72	3.83	1.69	7.86	6.78	36.90	31.30	45.40	19.60	25.70	7.61	4.10	2.84	16.10
1972/73	3.02	23.20	10.50	5.50	13.80	14.00	11.40	9.83	4.93	2.95	1.63	1.61	8.52
1973/74	0.99	1.32	2.09	37.30	17.50	20.30	25.60	81.30	40.10	12.50	3.84	2.19	20.40
1974/75	1.92	2.28	2.64	2.18	6.28	5.19	37.90	32.50	18.50	6.82	2.26	1.71	10.00
1975/76	1.27	1.44	1.68	19.10	8.51	31.50	15.50	39.30	53.70	11.70	6.88	0.57	15.90
1976/77	3.28	11.90	8.62	64.20	119.00	98.70	29.40	10.50	6.90	3.96	2.19	1.52	29.70
1977/78	2.81	3.44	4.07	24.90	24.80	59.80	54.50	26.70	46.70	10.40	3.89	2.29	22.00
1978/79	1.93	2.17	2.05	8.14	45.40	113.00	52.40	24.40	9.51	4.41	2.59	1.61	21.70
1979/80	8.64	24.30	7.25	5.05	10.80	8.31	13.20	8.83	15.30	4.38	1.76	1.30	8.64
1980/81	2.25	3.23	15.10	4.68	3.80	2.75	2.41	10.00	10.90	2.98	1.28	0.86	5.02
1981/82	0.81	1.38	1.14	18.30	29.50	11.50	8.81	25.50	9.14	3.19	1.63	1.35	9.36
1982/83	1.29	2.93	7.44	4.78	3.13	24.80	11.60	4.75	33.10	1.38	0.83	0.68	7.97
1983/84	0.67	0.71	15.30	60.90	12.30	6.92	17.70	15.00	32.90	12.40	4.20	2.77	15.20
1984/85	2.04	2.15	7.55	6.97	16.10	24.80	8.37	4.75	4.04	1.54	0.72	0.51	6.51
1985/86	1.25	0.95	13.90	5.51	31.60	114.00	44.80	34.90	9.04	5.25	1.77	0.95	21.40
1986/87	1.04	3.18	2.78	2.10	37.50	70.80	16.10	7.88	2.63	1.47	1.28	0.95	11.90
1987/88	1.24	1.40	3.23	15.60	13.20	5.91	4.65	6.48	3.87	1.92	1.14	0.73	4.97
1988/89	0.70	1.31	2.97	2.68	2.27	7.74	5.87	31.60	8.89	3.45	1.12	0.68	5.72
1989/90	1.87	2.77	31.30	58.50	39.10	12.40	6.18	32.70	12.20	3.10	1.85	1.35	17.00
1990/91	1.98	2.38	6.34	20.60	5.45	14.20	127.00	27.20	7.76	2.74	1.22	1.21	18.30
1991/92	1.17	3.17	1.75	2.12	1.11	3.26	2.04	27.40	2.56	4.73	1.31	2.99	4.43
1992/93	0.72	1.73	1.64	2.22	1.39	0.76	2.30	2.66	5.88	0.79	0.35	0.19	1.73
1993/94	0.22	0.87	17.70	5.00	9.93	13.10	13.50	4.25	2.01	0.70	0.40	0.47	5.62
Ave.	2.0	4.3	9.9	24.1	29.0	38.4	36.8	28.6	16.1	6.1	2.6	1.7	16.51

Table 3.1.19 Monthly Mean Discharge at Ourtzagh

79/9 OURTZARH											4392	KM2	
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1951/52	.	8.55	310.00	50.70	104.00	101.00	31.30	99.00	83.60	8.93	1.99	0.88	.
1952/53	2.86	.	.	.	.	.	.	.	.	.	.	.	.
1953/54	.	.	.	.	.	.	.	.	.	.	.	.	.
1954/55	.	.	.	.	.	.	.	.	.	.	.	.	.
1955/56	.	12.10	29.50	59.10	109.00	347.00	326.00	327.00	110.00	23.10	9.55	5.16	.
1956/57	3.96	3.51	4.95	5.36	21.60	14.30	16.00	40.30	39.00	6.38	5.00	.	.
1957/58	.	5.28	.	.	113.00	45.00	35.00	79.70	23.60	8.53	2.81	1.29	.
1958/59	1.52	2.21	6.16	512.00	110.00	89.00	127.00	40.70	58.60	17.40	5.09	2.16	81.70
1959/60	4.73	3.06	13.90	161.00	260.00	323.00	564.00	144.00	34.50	20.80	5.38	2.82	128.00
1960/61	2.45	25.90	40.60	126.00	94.40	35.80	17.50	14.40	7.60	13.70	1.80	0.76	31.90
1961/62	1.03	2.47	123.00	210.00	99.70	32.80	358.00	85.60	34.60	11.70	3.99	1.95	81.20
1962/63	2.44	8.90	194.00	173.00	797.00	658.00	103.00	72.10	75.80	27.00	8.19	4.83	174.00
1963/64	4.09	3.30	19.70	573.00	55.40	144.00	209.00	259.00	36.00	14.30	5.88	3.39	110.00
1964/65	2.88	2.75	44.50	87.70	146.00	146.00	245.00	42.00	12.20	11.40	3.23	4.60	62.20
1965/66	7.82	27.20	70.40	58.20	154.00	214.00	67.10	27.30	10.50	4.61	2.09	1.72	52.80
1966/67	1.83	13.90	16.70	6.88	11.10	84.90	34.50	23.40	13.70	7.15	1.77	0.73	17.50
1967/68	1.09	3.08	32.90	13.60	14.90	183.00	193.00	80.10	32.60	9.92	3.10	2.12	46.90
1968/69	1.69	1.64	52.60	201.00	315.00	395.00	295.00	128.00	56.60	21.40	7.43	3.63	121.00
1969/70	4.02	10.50	64.70	170.00	1003.00	67.90	89.00	88.20	34.20	15.00	5.32	3.07	131.00
1970/71	2.90	3.75	3.94	25.30	185.00	65.50	138.00	459.00	132.00	57.70	16.60	7.52	91.30
1971/72	5.90	4.30	15.00	18.70	154.00	117.00	166.00	41.20	77.20	16.80	6.48	3.53	52.20
1972/73	3.50	44.40	18.90	14.10	52.90	46.00	33.30	24.60	12.70	5.61	1.66	1.91	21.50
1973/74	1.13	1.57	3.34	116.00	46.10	70.60	81.70	272.00	106.00	23.40	7.57	3.32	60.90
1974/75	2.65	3.69	5.11	4.27	11.90	16.70	117.00	66.40	35.70	15.40	3.39	1.81	23.80
1975/76	1.27	1.46	2.01	43.90	14.20	102.00	38.10	117.00	114.00	16.90	9.19	3.15	38.40
1976/77	3.54	25.40	18.30	265.00	404.00	283.00	62.60	19.80	11.80	7.06	3.02	1.94	91.50
1977/78	3.38	6.37	6.32	59.90	74.60	207.00	156.00	95.10	156.00	29.70	8.44	3.65	66.50
1978/79	2.77	32.90	3.38	37.90	186.00	452.00	146.00	69.80	28.80	8.14	2.96	0.89	76.20
1979/80	2.55	69.90	30.80	12.80	36.40	23.10	49.20	23.10	68.80	11.10	2.05	0.60	27.70
1980/81	2.57	6.10	44.10	11.60	7.63	5.31	6.02	46.80	60.30	7.14	1.47	0.45	16.60
1981/82	0.33	1.05	1.30	67.30	128.00	43.60	29.30	94.40	31.90	6.91	2.17	1.10	34.00
1982/83	0.86	5.64	28.10	24.70	10.30	91.50	36.60	16.00	9.06	2.27	0.61	0.41	18.30
1983/84	0.30	0.36	57.50	276.00	31.30	14.40	73.60	35.50	135.00	27.40	5.18	2.00	55.40
1984/85	1.46	1.50	21.30	22.00	61.70	125.00	21.80	12.90	13.30	2.99	1.06	0.62	23.10
1985/86	1.28	1.21	37.10	14.40	121.00	405.00	108.00	79.60	20.60	8.88	2.44	1.36	64.50
1986/87	1.47	5.86	6.72	4.49	132.00	280.00	47.60	23.00	5.73	2.27	2.27	1.19	41.20
1987/88	1.62	2.45	11.00	65.60	77.10	23.30	13.60	26.20	12.80	2.99	1.31	0.62	19.90
1988/89	0.45	1.81	13.10	10.50	4.80	45.70	28.20	87.20	25.90	8.71	1.65	1.08	18.80
1989/90	3.05	4.29	129.00	187.00	100.00	37.90	16.20	56.90	26.90	5.47	2.89	2.15	47.60
1990/91	2.67	3.80	11.80	68.10	12.90	56.10	244.00	59.20	16.20	4.13	1.40	1.24	40.20
1991/92	1.22	9.70	0.89	7.02	3.00	6.71	4.59	80.20	4.25	6.53	1.08	1.30	10.40
1992/93	0.60	1.84	1.93	6.72	2.27	1.46	8.79	10.00	30.80	1.34	0.22	0.04	5.57
1993/94	0.10	1.34	74.80	12.50	52.10	56.20	58.70	10.50	3.18	0.69	0.13	0.17	22.20
Ave.	2.37	9.38	40.24	97.01	132.93	136.39	109.91	84.43	45.05	12.52	3.95	2.08	55.93

Table 3.1.20 Monthly Mean Discharge at Rhafsal

607/9 RHAFSAI											777		KM2
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1949/50	-	-	-	-	-	11.70	8.27	6.36	1.66	-	-	-	-
1950/51	-	-	-	73.80	56.90	82.50	61.10	6.14	4.73	1.35	0.43	-	-
1951/52	0.02	0.36	89.60	14.20	31.40	22.50	14.60	48.20	14.40	2.41	0.48	0.13	19.70
1952/53	0.08	0.10	2.13	16.70	41.80	17.60	7.26	3.87	3.21	0.66	0.23	0.02	7.81
1953/54	0.53	4.74	0.60	2.67	3.45	31.20	48.00	8.77	4.12	0.86	0.26	0.06	8.65
1954/55	0.01	0.05	0.43	6.66	37.70	134.00	61.20	18.80	2.85	1.21	0.26	0.11	21.20
1955/56	0.15	-	6.91	-	-	166.00	-	66.80	20.80	4.33	1.86	0.38	-
1956/57	0.07	0.07	0.65	-	6.83	3.17	3.35	13.30	12.50	1.92	0.46	0.18	-
1957/58	0.08	1.36	9.39	-	23.30	8.98	7.32	21.90	4.50	1.07	0.29	0.05	-
1958/59	0.20	0.11	0.50	59.10	26.70	24.80	28.30	7.04	13.30	3.54	0.51	0.14	13.70
1959/60	0.97	0.22	4.65	29.70	67.80	77.50	130.00	19.80	3.57	1.47	0.30	0.08	28.00
1960/61	-	5.38	14.90	32.50	23.30	6.70	3.19	2.20	2.04	3.21	0.18	0.02	-
1961/62	0.02	0.10	38.90	54.60	22.00	5.78	97.40	12.70	3.29	1.07	0.23	0.06	19.80
1962/63	0.08	2.03	51.70	43.70	324.00	151.00	15.80	13.10	8.86	3.55	0.71	0.21	50.80
1963/64	0.20	0.17	4.42	159.00	3.24	25.70	39.00	45.60	1.74	0.83	0.52	0.40	23.50
1964/65	-	-	-	-	-	-	-	-	-	-	-	-	-
1965/66	-	-	-	-	-	-	-	-	-	-	-	-	-
1966/67	-	-	-	-	-	-	-	-	-	-	-	-	-
1967/68	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/69	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/70	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/71	0.15	0.26	0.30	7.41	36.30	11.70	30.40	98.60	25.40	9.91	1.76	0.74	18.50
1971/72	0.59	0.52	1.99	3.17	33.30	32.20	44.80	7.09	19.60	2.30	0.83	0.53	12.20
1972/73	0.28	6.61	1.38	2.04	10.20	8.82	5.03	2.97	1.42	0.49	0.12	0.04	3.26
1973/74	0.03	0.05	0.13	27.80	7.48	15.10	16.70	50.10	16.20	2.56	0.52	0.20	11.30
1974/75	0.15	0.20	0.32	0.28	2.03	3.52	25.90	10.30	6.40	2.68	0.34	0.07	4.38
1975/76	0.04	0.04	0.09	11.60	3.73	25.80	9.34	29.80	22.70	2.68	0.98	0.25	8.85
1976/77	0.19	5.96	3.50	61.90	87.80	60.70	11.90	3.74	2.07	0.84	0.28	0.18	19.70
1977/78	0.11	0.55	0.81	11.20	17.40	38.90	24.60	20.20	29.80	4.08	1.50	0.26	12.30
1978/79	0.13	0.10	0.11	14.90	42.20	81.70	32.70	11.20	2.81	0.85	0.34	0.08	15.20
1979/80	0.43	15.60	4.07	1.74	7.61	3.20	11.00	4.75	16.20	1.40	0.27	0.18	5.59
1980/81	0.19	0.61	10.70	1.72	0.92	0.55	1.18	10.30	15.40	1.01	0.23	0.06	3.58
1981/82	0.05	0.10	0.07	17.80	33.90	11.90	11.00	28.50	4.74	0.85	0.30	0.12	9.13
1982/83	0.04	0.50	5.27	4.26	1.68	25.00	4.86	3.78	3.52	1.32	0.74	0.52	4.14
1983/84	0.26	0.24	15.10	19.50	0.77	0.29	2.42	1.12	3.88	0.76	0.21	0.11	3.74
1984/85	0.09	0.09	0.78	0.82	1.97	3.70	0.90	0.62	0.66	0.29	0.17	0.09	0.83
1985/86	0.05	0.07	0.79	0.98	3.62	10.30	3.46	2.47	0.65	0.37	0.27	0.23	1.88
1986/87	0.22	0.33	0.43	0.34	17.10	57.40	8.03	3.68	1.82	1.36	1.71	1.42	7.49
1987/88	1.17	1.35	3.44	19.70	23.30	4.49	2.87	5.93	3.31	1.77	1.24	0.99	5.84
1988/89	0.85	1.14	4.40	3.67	2.21	15.00	7.79	20.30	7.23	2.37	1.02	0.84	5.48
1989/90	0.84	0.97	40.10	58.10	27.60	7.05	2.47	8.66	3.32	0.61	0.24	0.10	12.50
1990/91	0.14	0.34	1.96	17.70	2.47	14.80	56.30	7.83	2.84	1.04	0.48	0.36	8.88
1991/92	0.48	2.87	-	0.67	-	1.09	0.78	20.20	0.87	0.96	0.25	0.03	-
1992/93	0.00	1.64	0.63	2.05	0.88	0.61	2.69	3.07	8.53	1.37	0.14	0.09	1.82
1993/94	0.31	1.25	22.40	2.30	19.00	16.50	16.20	2.27	0.77	0.35	0.06	0.00	6.72
Ave.	0.26	1.56	9.54	22.41	29.22	31.27	22.58	16.72	7.74	1.83	0.55	0.25	11.89

Table 3.1.21 Monthly Mean Discharge at Pont du Sker

81/9 PONT DU SKER											486	KM2	
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1951/52	.	.	.	.	.	.	.	.	.	.	0.63	0.20	.
1952/53	0.27	0.38	3.01	9.83	27.60	14.50	7.07	5.01	2.77	0.98	0.33	0.10	5.96
1953/54	0.30	5.07	0.89	3.69	3.80	21.50	41.30	14.00	7.32	1.54	0.38	0.08	8.27
1954/55	0.06	1.93	0.65	4.57	20.90	93.60	56.10	19.00	3.77	1.60	0.39	0.25	16.20
1955/56	0.26	2.02	9.01	12.40	.	50.70	67.40	.	24.20	6.59	2.33	1.06	.
1956/57	0.83	1.02	1.57	1.66	4.93	4.99	6.03	13.00	12.00	2.83	0.64	0.22	4.14
1957/58	0.17	1.63	11.10	30.40	21.10	9.36	.	13.00	4.50	1.56	0.56	0.26	.
1958/59	0.48	0.77	1.21	77.90	15.00	11.60	.	6.84	10.80	3.49	0.71	0.36	.
1959/60	0.75	0.46	2.52	24.80	38.00	49.10	79.20	22.40	5.51	2.92	0.48	0.18	18.80
1960/61	0.02	2.73	6.23	19.40	13.50	5.73	2.46	8.12	1.32	3.13	0.26	0.02	5.26
1961/62	0.06	4.24	21.60	36.20	14.90	4.97	59.10	13.20	5.94	1.83	0.55	0.26	13.70
1962/63	0.36	1.36	29.60	31.40	109.00	94.00	12.70	12.60	12.20	4.50	1.95	1.68	25.60
1963/64	3.34	2.78	5.47	97.90	9.98	23.40	35.70	35.40	5.83	3.20	2.06	1.76	18.90
1964/65	.	.	.	.	.	.	.	.	.	.	.	.	.
1965/66	.	.	.	.	.	.	.	.	.	.	.	.	.
1966/67	.	.	.	.	.	.	.	.	.	.	.	.	.
1967/68	.	.	.	.	.	.	.	.	.	.	.	.	.
1968/69	.	.	.	.	.	.	.	.	.	.	.	.	.
1969/70	.	.	.	.	.	.	.	.	.	.	.	.	.
1970/71	0.29	0.50	0.52	5.27	39.00	12.00	28.60	83.60	27.80	12.20	2.57	0.68	17.70
1971/72	0.50	0.35	1.90	2.34	28.30	28.60	31.50	9.59	16.10	3.64	1.05	0.42	10.30
1972/73	0.45	6.56	1.98	2.38	10.60	6.82	7.14	5.15	2.41	0.80	0.29	0.15	3.72
1973/74	0.05	0.22	0.49	17.20	8.93	11.80	15.20	50.30	20.70	3.62	0.75	0.20	10.70
1974/75	0.17	0.40	0.51	0.44	2.04	2.51	18.70	10.30	5.54	2.45	0.41	0.12	3.65
1975/76	0.13	0.17	0.26	7.49	3.63	19.00	9.61	24.60	18.10	3.54	1.07	0.24	7.27
1976/77	0.24	4.80	4.47	50.20	61.50	38.20	9.68	3.73	2.12	1.05	0.28	0.09	14.60
1977/78	0.24	0.89	1.29	11.30	11.50	35.80	22.90	14.70	25.10	3.98	0.90	0.33	10.60
1978/79	0.30	0.33	0.37	5.63	30.90	58.30	20.90	9.77	2.61	0.56	0.21	0.08	10.50
1979/80	0.15	10.90	3.93	2.22	4.36	3.20	7.74	3.36	13.90	1.71	0.50	0.23	4.39
1980/81	0.41	0.76	10.00	1.81	1.25	0.92	1.07	9.16	11.70	1.83	0.65	0.25	3.31
1981/82	0.22	0.37	0.19	12.10	25.60	7.56	6.16	16.30	4.69	1.05	0.35	0.18	6.25
1982/83	0.20	0.74	5.72	4.24	2.13	13.60	7.30	3.36	2.02	0.42	0.17	0.13	3.26
1983/84	0.12	0.13	12.00	41.80	5.38	1.85	11.30	7.42	22.40	6.15	1.11	0.28	9.25
1984/85	0.15	0.23	5.08	5.26	14.00	23.30	5.19	3.87	4.09	1.58	0.60	0.32	5.19
1985/86	0.78	0.47	5.95	6.26	20.20	67.80	21.30	18.70	6.08	3.11	1.50	1.08	12.30
1986/87	1.13	2.83	3.27	2.71	24.80	35.70	7.20	3.21	0.93	0.50	0.36	0.28	6.74
1987/88	0.27	0.41	1.48	12.60	10.00	3.99	2.58	5.30	2.86	0.90	0.42	0.20	3.43
1988/89	0.19	0.47	2.08	1.97	1.04	7.27	5.79	12.90	5.31	2.74	0.81	0.63	3.39
1989/90	0.56	0.74	17.20	25.50	14.30	9.17	2.92	8.97	4.91	1.33	0.61	0.43	7.22
1990/91	0.40	0.90	2.30	14.00	1.82	11.00	38.70	8.59	3.54	1.21	0.13	0.08	6.91
1991/92	0.07	1.65	0.92	1.80	1.12	1.65	1.60	15.80	1.52	1.72	0.47	0.16	2.35
1992/93	0.06	1.90	1.02	2.19	1.11	0.79	2.57	2.43	6.51	0.75	0.10	0.03	1.63
1993/94	0.08	0.71	15.00	3.42	6.96	7.71	8.49	2.81	1.63	0.30	0.08	.	.
Ave.	0.39	1.72	5.30	16.40	17.41	22.00	19.45	14.19	8.58	2.54	0.72	0.36	9.02

Table 3.1.22 Monthly Mean Discharge at Had Kourt

1436/8 HAD KOURT											673	KM2	
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1966/67	-	-	-	-	-	-	0.25	2.22	0.19	0.13	0.09	0.04	-
1967/68	0.04	0.09	0.20	0.18	0.19	8.60	5.57	1.21	0.58	0.08	0.01	0.00	1.36
1968/69	0.00	0.00	0.39	12.10	21.00	39.90	24.20	8.21	1.79	1.04	0.48	0.14	8.95
1969/70	0.14	0.27	1.48	10.10	69.50	3.25	2.83	3.56	1.14	0.67	0.23	0.05	7.88
1970/71	0.05	0.05	0.06	0.39	7.67	2.48	7.40	30.20	6.94	1.27	0.52	0.22	4.76
1971/72	0.02	0.00	0.04	0.33	5.25	8.59	13.90	1.48	1.54	0.45	0.07	0.00	2.63
1972/73	0.00	0.34	0.03	0.09	1.58	1.51	0.59	0.42	0.04	0.00	0.00	0.00	0.38
1973/74	0.00	0.00	0.00	4.87	0.30	2.41	1.34	13.00	2.45	0.64	0.10	0.00	2.08
1974/75	0.00	0.00	0.00	0.00	0.02	0.25	2.55	1.18	0.84	0.27	0.00	0.00	0.43
1975/76	0.00	0.00	0.00	1.21	0.09	5.90	1.35	2.79	4.61	0.59	0.02	0.00	1.36
1976/77	0.00	0.20	0.20	18.90	46.20	29.70	2.49	0.81	0.46	0.25	0.13	0.05	8.20
1977/78	0.05	0.10	0.11	2.09	4.89	9.26	7.55	10.90	8.02	2.01	0.93	0.16	3.80
1978/79	0.00	0.00	0.00	0.86	5.76	38.00	8.96	2.34	0.84	0.13	0.05	0.01	4.52
1979/80	0.00	1.08	0.25	0.11	0.78	0.38	0.90	0.45	0.48	0.01	0.00	0.00	0.37
1980/81	0.00	0.00	0.51	0.04	0.01	0.00	0.00	0.14	0.70	0.00	0.00	0.00	0.12
1981/82	0.00	0.00	0.08	1.84	4.16	3.33	0.77	5.32	0.35	0.01	0.00	0.00	1.30
1982/83	0.00	0.00	0.06	0.09	0.01	6.65	0.17	0.03	0.00	0.00	0.00	-	-
1983/84	-	-	-	20.50	0.57	0.08	1.72	0.21	3.28	0.50	0.01	0.00	-
1984/85	0.00	0.00	0.00	0.24	1.94	1.73	0.14	0.02	0.03	0.00	0.00	0.00	0.34
1985/86	0.00	0.00	-	0.12	4.49	33.70	6.95	2.88	0.10	0.01	-	-	-
1986/87	0.00	0.00	0.00	0.00	2.58	11.50	1.31	0.31	0.03	0.00	0.00	0.00	1.24
1987/88	0.00	0.00	0.00	1.20	7.94	1.15	0.44	0.45	0.13	0.01	-	0.00	-
1988/89	-	0.00	0.04	0.19	0.13	5.00	3.84	7.22	2.84	1.77	0.57	0.33	-
1989/90	0.44	0.67	3.67	20.00	9.54	5.10	4.37	4.65	4.15	3.48	2.41	0.50	4.93
1990/91	-	-	-	6.93	-	7.80	19.50	5.01	4.11	-	-	-	-
1991/92	0.00	0.00	0.21	0.50	-	0.00	-	2.27	-	0.00	0.00	0.00	-
1992/93	0.00	0.00	0.01	0.28	0.05	-	0.00	-	0.53	-	0.00	-	-
1993/94	0.00	0.00	2.52	0.49	2.51	3.64	3.70	1.77	0.39	0.00	0.00	0.00	1.23
Ave.	0.03	0.11	0.41	3.84	7.89	8.84	4.55	4.04	1.72	0.51	0.23	0.06	2.65

Table 3.1.23 Monthly Mean Discharge at Bab Merzouka

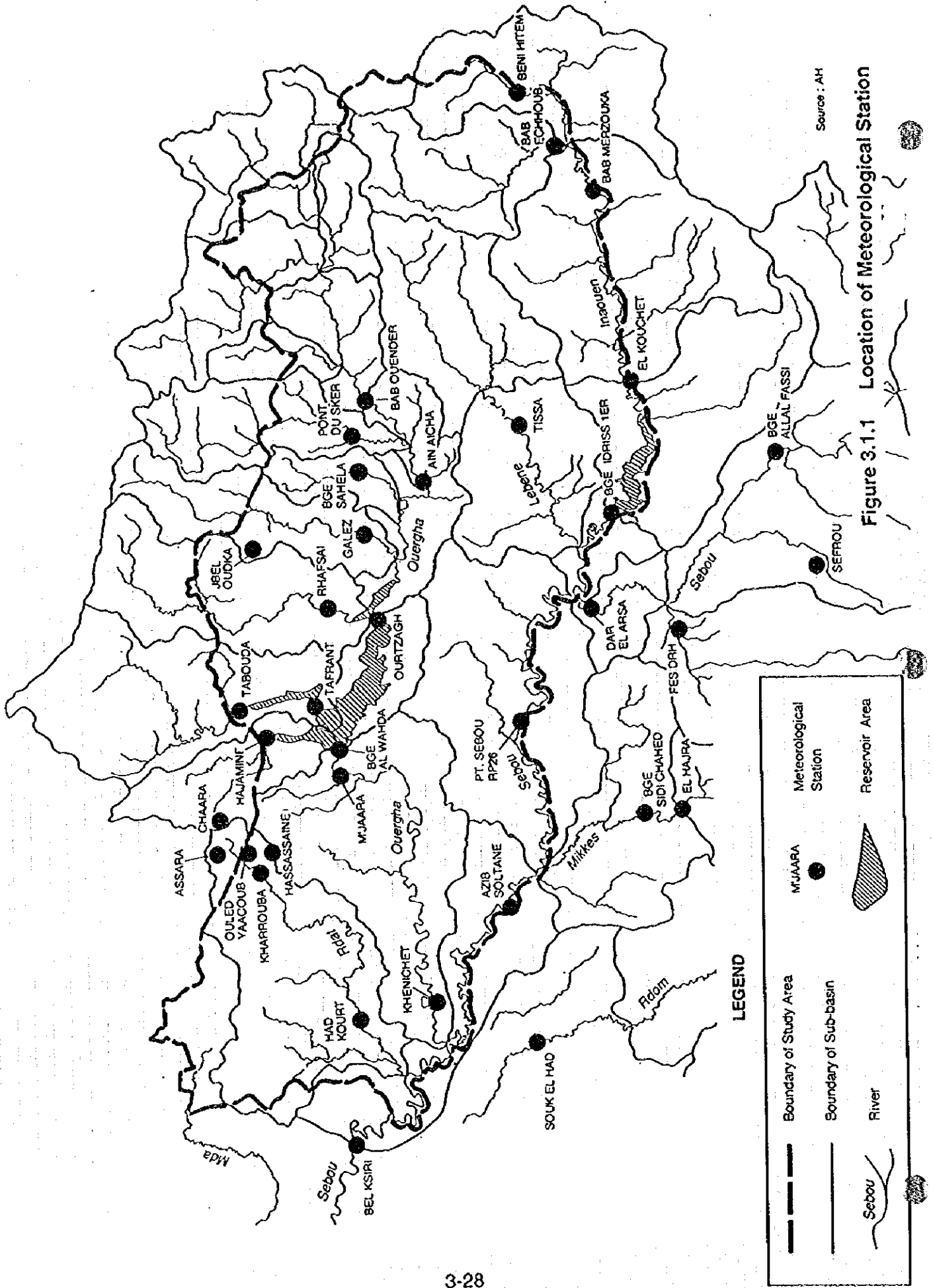
551/16 BAB MERZOUKA												1500	KM2
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1970/71	0.55	0.64	0.75	2.94	36.80	13.10	16.60	76.30	14.80	7.54	1.61	0.69	14.30
1971/72	0.69	0.54	2.99	3.46	9.69	12.70	19.80	5.19	7.61	1.51	0.79	0.44	5.47
1972/73	0.67	7.88	2.94	1.64	7.50	17.00	7.35	6.62	2.08	0.82	0.30	0.21	4.50
1973/74	0.16	0.18	1.35	23.70	4.63	15.30	23.50	45.00	15.90	5.28	1.10	0.51	11.30
1974/75	0.35	0.55	0.58	0.64	0.91	2.08	13.60	10.80	4.57	1.50	0.36	0.17	3.01
1975/76	0.19	0.21	0.31	5.54	0.95	11.70	3.46	8.27	17.70	2.27	6.33	0.21	4.27
1976/77	0.20	1.77	1.45	15.50	41.80	38.10	8.54	3.48	2.60	1.49	0.52	0.34	9.52
1977/78	0.99	1.28	0.92	4.65	6.02	23.50	21.30	12.90	13.10	2.33	0.79	0.44	7.27
1978/79	0.42	0.53	0.53	2.95	6.24	70.10	22.70	8.40	2.47	1.41	0.74	0.40	9.33
1979/80	0.77	9.22	5.22	2.10	7.12	3.10	7.86	2.62	4.04	0.69	0.34	0.33	3.63
1980/81	0.57	1.36	3.57	1.36	1.35	1.48	1.40	-	1.36	0.55	0.22	0.16	-
1981/82	0.39	0.30	0.30	6.21	8.53	5.72	-	-	-	0.78	0.30	0.14	-
1982/83	0.11	0.68	1.42	1.90	0.49	11.10	1.55	1.08	0.45	0.25	0.10	0.07	1.53
1983/84	0.11	0.68	1.42	1.90	0.49	11.10	1.55	1.08	0.45	0.25	0.10	0.07	1.53
1983/84	0.08	0.08	1.04	9.99	1.95	0.75	3.43	2.48	6.19	1.00	0.03	0.01	2.27
1984/85	0.01	0.01	0.93	1.69	7.68	5.97	3.65	1.32	1.92	0.67	0.12	0.10	1.98
1985/86	0.11	0.10	3.17	1.05	14.70	64.50	25.50	18.60	4.43	4.51	0.04	0.03	11.00
1986/87	0.20	0.08	0.84	0.27	27.70	44.70	8.37	2.38	0.84	0.35	0.73	0.03	6.92
1987/88	0.65	2.46	7.36	2.93	9.16	2.01	2.48	1.51	3.33	0.52	0.23	2.28	2.92
1987/88	0.65	2.46	7.36	2.93	9.16	2.01	2.48	1.51	3.33	0.52	0.23	2.28	2.92
1988/89	0.10	3.25	2.83	1.04	0.53	2.40	1.66	11.30	1.15	0.88	0.23	0.21	2.11
1988/89	0.10	3.25	2.83	1.04	0.53	2.40	1.66	11.30	1.15	0.88	0.23	0.21	2.11
1989/90	1.15	1.10	4.51	13.00	11.30	3.12	1.34	11.60	6.26	0.55	0.38	0.38	4.58
1989/90	1.15	1.10	4.51	13.00	11.30	3.12	1.34	11.60	6.26	0.55	0.38	0.38	4.58
1990/91	2.30	0.46	4.13	14.60	0.55	9.94	20.30	4.32	1.13	0.67	0.36	0.36	4.92
1990/91	2.30	0.46	4.13	14.60	0.55	9.94	20.30	4.32	1.13	0.67	0.36	0.36	4.92
1991/92	0.31	0.91	0.63	0.64	0.53	0.98	0.74	6.26	0.69	0.92	0.19	0.09	1.06
1991/92	0.31	0.91	0.63	0.64	0.53	0.98	0.74	6.26	0.69	0.92	0.19	0.09	1.06
1992/93	0.07	0.32	0.40	0.26	0.26	0.26	0.97	0.77	1.47	0.11	0.07	0.02	0.42
1992/93	0.07	0.32	0.40	0.26	0.26	0.26	0.97	0.77	1.47	0.11	0.07	0.02	0.42
1993/94	0.04	0.14	7.27	1.04	2.91	6.42	3.47	0.59	0.28	-	-	-	-
1993/94	0.04	0.14	7.27	1.04	2.91	6.42	3.47	0.59	0.28	-	-	-	-
Ave.	0.47	1.42	2.31	4.96	8.72	15.25	9.55	10.99	4.97	1.59	0.69	0.33	5.04

Table 3.1.24 Monthly Mean Discharge at El Kouchat

653/16 EL KOUCHAT											2570	KM2	
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1975/76	-	-	-	-	-	31.70	8.27	19.40	41.20	6.23	2.27	1.11	-
1976/77	0.89	5.06	4.78	35.00	80.10	86.60	20.50	9.51	5.40	3.08	1.24	0.81	20.70
1977/78	2.20	3.10	2.82	10.20	14.20	43.60	41.50	37.30	32.50	8.41	2.52	1.34	16.40
1978/79	1.11	1.28	1.48	5.17	12.70	130.00	47.50	19.30	8.35	4.61	2.19	1.11	18.80
1979/80	1.71	19.00	15.90	5.29	14.20	7.10	18.70	8.32	11.70	3.21	1.13	0.76	8.97
1980/81	1.01	2.07	5.87	3.54	3.94	3.49	3.64	11.80	5.43	1.34	0.72	0.47	3.60
1981/82	0.64	1.17	0.28	6.27	12.00	9.15	5.60	12.30	5.05	1.70	0.76	0.28	4.58
1982/83	0.37	2.83	3.40	6.53	3.40	16.40	6.60	3.02	2.56	1.30	0.91	0.82	3.93
1983/84	0.80	0.87	3.75	-	3.83	2.88	9.54	5.63	22.90	6.48	1.29	0.55	-
1984/85	0.31	0.32	4.70	4.17	-	9.64	6.12	4.31	5.77	2.15	0.51	0.15	-
1985/86	0.04	0.06	13.30	6.28	35.30	106.00	86.90	46.80	3.01	2.40	1.26	0.71	24.60
1986/87	0.66	0.95	1.25	1.28	32.90	61.70	13.40	5.61	2.52	1.34	1.44	0.67	9.99
1987/88	0.92	6.02	8.47	4.49	12.30	6.73	6.00	4.13	4.98	1.76	0.65	0.77	4.77
1988/89	0.27	0.92	1.75	1.77	1.20	2.62	4.31	10.60	2.46	1.00	0.76	0.17	2.30
1989/90	1.27	1.16	3.88	11.10	9.63	4.14	1.86	7.62	3.61	0.68	0.21	0.14	3.78
1990/91	0.95	0.53	3.24	15.50	2.57	10.00	38.90	14.90	5.75	1.95	0.55	0.29	7.97
1991/92	0.39	1.51	1.43	1.85	1.04	1.68	1.78	20.20	2.68	3.70	0.73	0.51	3.10
1992/93	0.29	1.35	1.22	0.89	0.91	0.87	4.94	3.40	4.40	0.72	0.26	0.12	1.62
1993/94	0.12	0.22	9.94	2.35	5.94	15.10	9.47	2.33	1.33	0.65	0.09	-	-
Ave.	0.78	2.69	4.86	7.16	14.48	28.92	17.66	12.97	9.03	2.77	1.03	0.60	8.45

Table 3.1.25 Monthly Mean Discharge at Tissa

1542/15 TISSA											792	KM2	
YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	ANNUAL
1960/61	0.46	1.58	1.49	13.80	10.60	4.34	2.06	1.82	0.61	0.93	0.16	0.08	3.17
1961/62	0.14	0.35	5.23	7.34	3.86	1.29	43.40	6.53	2.14	0.70	0.10	0.02	5.99
1962/63	0.04	0.27	24.20	9.39	79.60	82.30	11.30	3.50	4.21	1.41	0.39	0.24	17.60
1963/64	0.23	0.22	0.59	49.90	3.58	13.20	16.10	37.30	2.76	1.02	0.38	0.13	10.40
1964/65	0.10	0.10	4.33	11.70	19.30	14.60	23.40	6.15	1.01	1.04	0.12	0.07	6.82
1965/66	0.26	1.27	2.08	2.16	10.80	14.30	3.00	1.12	0.47	0.14	0.06	0.07	2.91
1966/67	0.10	2.08	0.57	0.38	0.42	3.45	2.45	1.11	0.34	0.16	0.05	0.04	0.92
1967/68	0.05	0.07	1.19	0.88	0.64	9.41	17.50	5.77	1.85	0.62	0.16	0.23	3.17
1968/69	0.13	0.10	11.10	22.10	30.50	43.10	33.50	8.03	1.40	0.25	0.05	0.01	12.30
1969/70	0.01	0.07	3.53	22.00	88.70	9.97	14.60	7.16	2.96	1.04	0.40	0.11	12.60
1970/71	0.03	0.10	0.48	3.10	30.70	8.56	13.50	58.80	17.60	8.41	2.84	2.35	12.10
1971/72	2.77	2.54	5.38	6.01	10.90	18.30	25.00	5.29	8.23	2.20	0.41	0.21	7.26
1972/73	0.11	5.38	1.10	1.29	6.08	8.99	5.60	2.94	0.99	0.32	0.07	0.01	2.70
1973/74	0.35	0.07	0.28	17.00	4.09	15.00	15.50	33.80	10.40	2.30	0.53	0.13	8.20
1974/75	0.10	0.13	0.27	0.21	0.56	1.85	11.50	7.04	3.52	0.86	0.15	0.06	2.19
1975/76	0.03	0.11	0.14	5.57	1.15	14.80	2.70	8.01	13.70	1.51	0.47	0.09	3.99
1976/77	0.11	2.73	1.04	22.50	42.60	36.30	4.30	1.32	1.25	0.44	0.12	0.06	9.28
1977/78	0.49	1.56	0.94	9.87	12.00	70.40	31.00	14.00	19.60	2.22	0.62	0.17	13.20
1978/79	0.07	0.15	0.23	3.69	13.00	75.30	14.20	4.00	1.77	0.56	0.23	0.08	9.00
1979/80	0.57	15.30	5.82	2.37	6.57	1.69	5.54	1.95	3.35	0.53	0.15	0.09	3.69
1980/81	0.70	2.49	3.85	2.01	0.94	0.23	0.60	5.32	2.26	4.62	0.12	0.03	1.58
1981/82	0.01	1.49	0.10	22.30	15.40	7.42	3.01	6.24	1.73	0.38	0.21	0.19	4.89
1982/83	0.10	1.05	1.32	1.11	0.35	16.20	1.93	0.57	0.22	0.04	0.02	0.01	1.82
1983/84	0.01	0.01	4.56	18.60	1.78	0.94	3.17	1.73	10.20	1.64	0.36	0.08	3.63
1984/85	0.02	0.06	7.67	3.17	25.10	-	12.70	8.53	1.25	0.61	0.28	0.16	-
1985/86	0.12	0.40	0.33	-	-	-	24.20	18.60	2.70	0.63	0.11	0.04	-
1986/87	0.02	0.65	0.32	0.33	19.40	37.00	4.42	1.48	0.34	0.11	0.05	0.05	5.15
1987/88	0.05	0.10	1.53	2.17	8.34	2.67	2.43	1.83	0.54	0.09	0.04	0.03	1.65
1988/89	0.02	0.21	1.14	0.56	0.46	3.43	2.00	10.00	1.95	0.59	0.16	0.05	1.68
1989/90	0.19	0.74	4.61	13.20	8.89	2.54	1.00	6.73	1.63	0.30	0.09	0.02	3.34
1990/91	0.06	0.15	2.47	8.19	1.03	11.70	32.90	5.08	1.11	0.38	0.07	0.01	5.25
1991/92	0.01	0.04	0.03	0.18	0.07	0.35	0.48	14.00	0.42	0.44	0.08	0.05	1.32
1992/93	0.06	0.09	0.11	0.13	0.11	0.11	0.58	0.37	1.30	0.05	-	0.00	-
1993/94	0.00	0.04	2.35	0.82	3.54	4.83	5.32	0.62	0.26	0.08	0.00	0.00	1.47
Ave.	0.22	1.23	2.95	8.61	13.97	16.71	11.50	8.73	3.65	1.08	0.27	0.15	5.69



Source : AH

Figure 3.1.1 Location of Meteorological Station

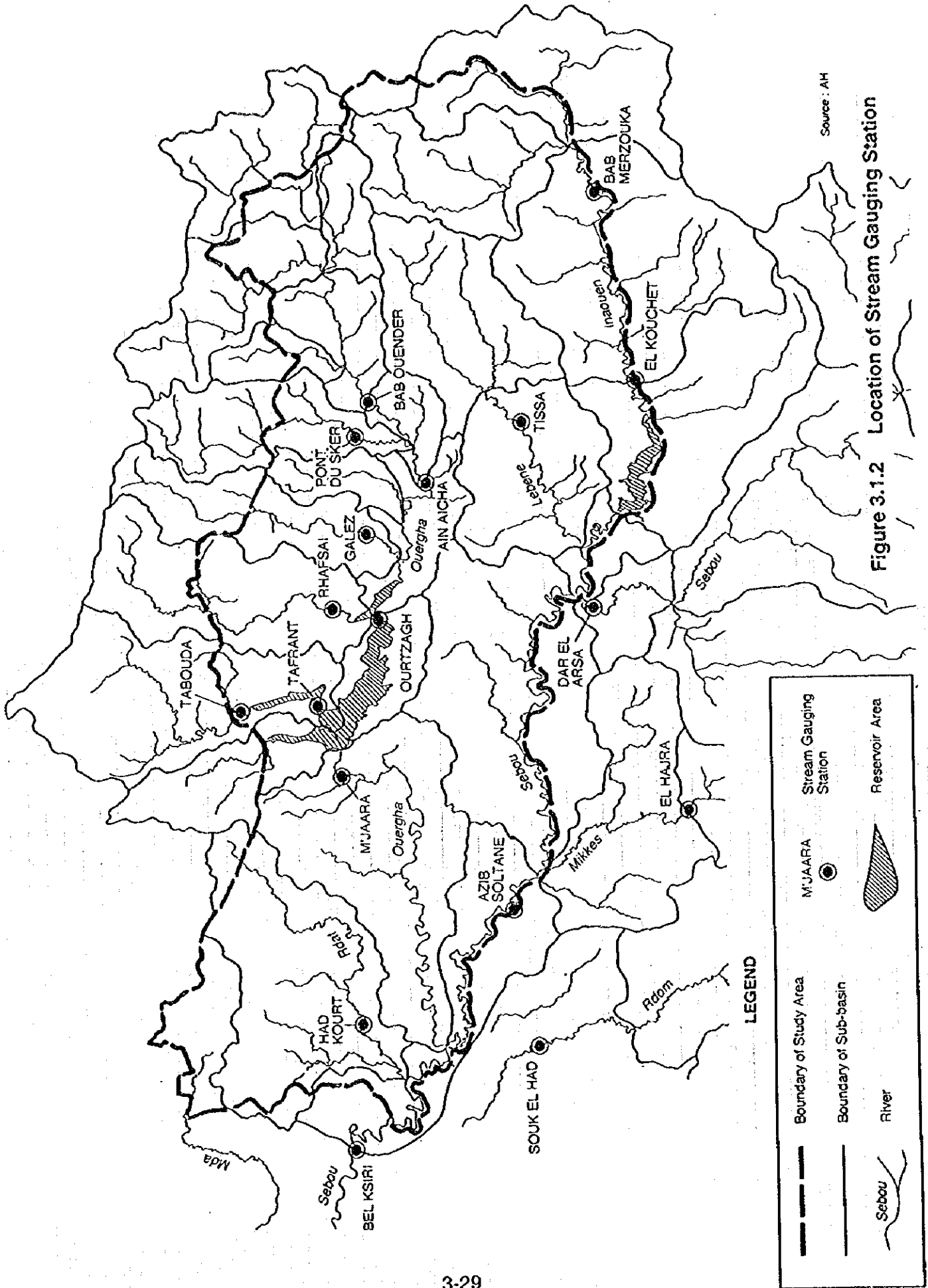


Figure 3.1.2 Location of Stream Gauging Station

3.2 Rainfall and Runoff Analysis

3.2 Rainfall and Runoff Analysis

3.2.1 Rainfall Analysis

(1) Basin Rainfall

1) Basin Division

The Study Area covering some 10,000 km² was defined on the basis of the administrative boundary on the north and Sebou and Inaouen Rivers on the south. When the hydrological study is to carry out for such a wide area, the basin division is generally to be considered in order to clarify the different hydrological characteristics by region. Figure 3.2.1 gives the basin division for the Study Area. Although the Study Area does not exactly correspond with the watershed, it can be mostly covered by the sub-basins.

2) Basin Rainfall on Long Term Average

The basin rainfall on the long term average was computed based on the isohyetal map which was established by the SBO study. This isohyetal map indicates the average annual rainfall in the Sebou basin for the period from 1932 to 1983 (52 years) as shown in Figure 3.2.2. Using the isohyetal map, computation of basin mean rainfall was made by the following equations.

$$R_b = \frac{\sum (a_i \times R_i)}{A}$$
$$A = \sum a_i$$

where, R_b : Basin rainfall
 A : Catchment area
 a_i : Catchment area sub-divided by isohyetal line
 R_i : Catchment rainfall for area a_i

Computation of basin rainfall was carried out for the respective sub-basins and the catchments of the hydrological gauging stations as shown in Table 3.2.1.

3) Annual Basin Rainfall

To obtain the series of annual basin rainfall in each year for the sub-basins and the catchments of the hydrological gauging stations, a coefficient between point and area

rainfall was applied. The coefficient was derived from a ratio of basin rainfall to rainfall at the existing AH's rainfall gauging stations.

$$K = R_b / R_g$$

where, K : Point-Area coefficient
 R_b : Basin rainfall (long term average)
 R_g : Rainfall at AH's gauging station (long term average)

Location of the rainfall gauging stations are shown in Figure 3.1.1. Out of them, 10 stations were selected as the reference stations in which the relatively long period of records are available. For estimation of rainfall on long term average at each reference station, assumption was made that the value of rainfall could be obtainable on the isohyetal map. Thus, the point-area coefficient was obtained as listed on Table 3.2.2 for the sub-basins and the catchments of the hydrological gauging stations.

The series of annual rainfall were prepared for the period of the hydrological years from 1957/58 to 1993/94 (37 years) as shown in Table 3.2.3. The series of annual rainfall include the recorded values as well as some of the estimated values for the gauging station with a shorter period of record.

The series of annual basin rainfall were computed using those at the reference stations and the point-area coefficient.

$$R_b^* = R_g^* \times K$$

where, R_b^{*} : Annual basin rainfall
 R_g^{*} : Annual rainfall at reference station
 K : Point-Area coefficient

For the catchment area of the hydrological gauging stations with a relatively wide area, the basin rainfall was obtained from those of the upstream sub-basins by weighted average of the catchment area.

$$R_b^* = \sum (a_i \times R_i^*) / A$$

$$A = \sum a_i$$

where, R_b^{*} : Basin rainfall

- A : Catchment area
- a_i : Catchment area of upstream sub-basin
- R_j : Basin rainfall for upstream sub-basin

The series of annual basin rainfall are attached on Tables 3.2.4 and 3.2.5 for the sub-basins and the catchments of the hydrological gauging stations, respectively.

(2) Typical Drought Year

Drought is caused by variation of annual runoff which mainly depends on annual basin rainfall. Thus, a drought year was evaluated using annual basin rainfall. The evaluation was carried out by regions in consideration of basin hydrology and rainfall distribution. The sub-basins covering the Study Area can be generally classified into the following three regions in consideration of basin hydrology and rainfall distribution.

- 1) Ouergha, Upstream M'Jaara
- 2) Lebene and Inaouen
- 3) Rdat and Lower Ouergha
- 4) Middle Sebou

The series of annual basin rainfall for the three regions were obtained from those of the sub-basins belonging to the respective regions. The basin rainfall by regions is tabulated on Table 3.2.6.

The hydrological year corresponding to 10-year drought was defined as 'typical drought year'. This typical drought year was selected by regions. The selected hydrological year gives the annual rainfall of the closest value to the estimated annual rainfall for 10-year drought. The typical drought year and its annual rainfall are shown below.

Region	Estimated Rainfall for 10-year Drought	Corresponding Hydrological Year	Rainfall in Corresponding Hydrological Year
Ouergha, Upstream M'Jaara	583	1991/92	574
Lebene & Inaouen	432	1988/89	421
Rdat and Lower Ouergha	408	1991/92	406
Middle Sebou	365	1986/87	370

3.2.2 Runoff Analysis

(1) Runoff Rate

Figure 3.1.2 gives the location of the AH's hydrological gauging stations in and around the Study Area. The series of average annual runoff are prepared for the selected 10 hydrological gauging stations in which the relatively long period of records are available. To get the runoff for the corresponding period to that of the annual basin rainfall, the values for partial duration of years on Table 3.2.7 were given by estimation.

The surface runoff for all the sub-basins was estimated with reference to the runoff rate estimated for the catchments of the hydrological gauging stations. Since variation of runoff rate in the Study Area is significantly depending on rainfall, the surface runoff for sub-basins were estimated by the following equations.

$$C_b = C_g \times (R_b / R_g)$$

$$D_b = R_b \times C_b$$

where,

- C_b : Runoff rate for sub-basin
- C_g : Runoff rate for catchment of reference station
- R_b : Basin rainfall for sub-basin
- R_g : Basin rainfall for catchment area of reference station
- D_b : Runoff depth for sub-basin

The estimated runoff rate and surface runoff are tabulated on Table 3.2.8. The rainfall and runoff for the average 37 years and the 10-year drought are summarized by regions. In the 10-year drought, the annual rainfall reduces to around 65 % of the average, while the reduction of annual surface runoff is significant at around 25 and 21 % of the average in the Upper Ouergha and Inaouen/Lebene basins, and only around 10 % in the Rdat basin and the Middle Sebou sub-basins. The results show that variation of surface runoff is much larger than that of rainfall in the Study Area in drought years.

Region	Average for 37 Years		10-year Drought (Ratio to Average)			
	Rainfall (mm)	Runoff (10 ⁶ m ³)	Rainfall (mm)	Runoff (10 ⁶ m ³)	Rainfall	Runoff
Ouergha Upstream M'Jaara	930	2657	583	653	63 %	25 %
Lebene & Inaouen	651	785	432	154	66 %	21 %
Rdat and Lower Ouergha	611	218	408	21	67 %	10 %
Middle Sebou	540	152	365	15	68 %	10 %

(2) Low Flow Rate

Figure 3.2.3 shows the flow duration curves for the 12 hydrological gauging stations. The monthly discharge records for 37 years are arranged in descending order. For the period of 37 years, frequency of discharge exceeding some value is given by the percentage of time corresponding to the exceeded discharge on the flow duration curve. The flow duration curves indicates that the stream flow condition of the Sebou river shows the quite different flow condition from the other rivers in the Study Area.

Comparison of low flow rate was made on the basis of discharge per unit catchment area. The average discharge of M'Jaara is much larger than that of Dar El Arsa, while the low flow discharge dependable for 90 % period within 37 years of Dar El Arsa is 4 times more than that of M'Jaara. A rate of 90 % dependable discharge to average discharge becomes only 1.7 % for M'Jaara and 3.1 % for Bab Merzouka. In contrast to these, the rate for Dar El Arsa is 31 %.

A rate of baseflow is generally depending on groundwater runoff which is recharged by rainfall from ground surface and moves through under ground layer, then gradually comes into rivers. The low flow rate indicates that the Upper Sebou basin is the region with a relatively high recharging rate, while those of the Ouergha and Inaouen basin are quite low and the most of all the runoff is likely to be direct runoff in these basins.

Average Flow

Station	Catchment Area (km ²)	Average Discharge	
		m ³ /sec	(10 ⁻³ m ³ /sec/km ²)
Dar El Arsa (Sebou)	7620	24.43	3.206
M'Jaara (Ouergha)	6190	81.99	13.246
Bab Merzouka (Inaouen)	1500	6.84	4.560

Low Flow

Station	Catchment Area (km ²)	Dependable Discharge for 90 % Period within 37 Years	
		m ³ /sec	(10 ⁻³ m ³ /sec/km ²)
Dar El Arsa (Sebou)	7620	7.53	0.988
M'Jaara (Ouergha)	6190	1.42	0.229
Bab Merzouka (Inaouen)	1500	0.21	0.143

Table 3.2.1 Basin Rainfall for Long Term Average (1932 - 1983)

Estimated from Isohyetal Map shown in Figure 3.2.1.

Sub-Basin			
River System	Sub-basin	Catchment Area (sq. km)	Basin Rainfall (mm)
Sebou	SE-1	1,282	530
	SE-2	477	480
	SE-3	333	560
Rdat	RD	1,124	680
Ouergha	OU-1	560	770
	OU-2	210	900
	OU-3	490	860
	OU-4	336	940
	OU-5	160	1,110
	OU-6	155	770
	OU-7	549	1,190
	OU-8	313	670
	OU-9	193	1,000
	OU-10	573	1,280
	OU-11	853	1,130
	OU-12	295	730
	OU-13	1,053	1,180
	OU-14	413	1,110
	OU-15	1,172	610
Lebene	LE-1	728	750
	LE-2	651	540
Inaouen	IN-1	744	820
	IN-2	582	800
	IN-3	1,244	770
	IN-4	970	540
	IN-5	162	510

Catchment Area of Hydrological Gauging Station

River System	Gauging Station	Catchment Area (sq. km)	Basin Rainfall (mm)
Rdat	Had Kourt	673	730
Ouergha	Bab Ouender	1,756	870
	Pont du Sker	486	1,240
	Ain Aicha	2,460	860
	Galez	500	1,350
	Rhalsai	777	1,160
	Ourtzagh	4,392	1,000
	Tabouda	861	1,260
	Tafrant	953	1,190
	M'Jaara	6,190	1,020
Lebene	Tissa	792	730
Inaouen	Bab Mezouka	1,500	800
	Ei Kouchet	2,570	790

Table 3.2.2 Rainfall Point-Area Coefficient

Estimated from Isohyetal Map shown in Figure 3.2.1.

Sub-basin						
River System	Sub-basin	Catchment Area (sq. km)	Basin Rainfall (mm)	Reference Station	Approx. Rainfall Ref. Station (mm)	Point-Area Coefficient
Sebou	SE-1	1,282	530	Azib Soltane	470	1.13
	SE-2	477	480	Azib Soltane	470	1.02
	SE-3	333	560	Had Kourt	520	1.08
Rdat	RD	1,124	680	Had Kourt	520	1.31
Ouergha	OU-1	560	770	Bab Ouender	880	0.88
	OU-2	210	900	Bab Ouender	880	1.02
	OU-3	490	860	Bab Ouender	880	0.98
	OU-4	336	940	Bab Ouender	880	1.07
	OU-5	160	1,110	Bab Ouender	880	1.26
	OU-6	155	770	Bab Ouender	880	0.88
	OU-7	549	1,190	Pont du Sker	950	1.25
	OU-8	313	670	Ourtzagh	790	0.85
	OU-9	193	1,000	Pont du Sker	950	1.05
	OU-10	573	1,280	Rhafsai	900	1.42
	OU-11	853	1,130	Rhafsai	900	1.26
	OU-12	295	730	Ourtzagh	790	0.92
	OU-13	1,053	1,180	Tafrant	830	1.42
	OU-14	413	1,110	Tafrant	830	1.34
	OU-15	1,172	610	M'Jaara	660	0.92
Lebene	LE-1	728	750	Tissa	550	1.36
	LE-2	651	540	Tissa	550	0.98
Inaouen	IN-1	744	820	Bab Merzouka	700	1.17
	IN-2	582	800	Bab Merzouka	700	1.14
	IN-3	1,244	770	Bab Merzouka	700	1.10
	IN-4	970	540	Bab Merzouka	700	0.77
	IN-5	162	510	Bab Merzouka	700	0.73

Catchment of Gauging Station

River System	Stream Gauging Station	Catchment Area (sq. km)	Basin Rainfall (mm)	Reference Raingauge Station	Approx. Rainfall Ref. Station (mm)	Point-Area Coefficient
Rdat	Had Kourt	673	730	Had Kourt	520	1.40
Ouergha	Bab Ouender	1,756	870	Bab Ouender	880	0.99
	Pont du Sker	486	1,240	Pont du Sker	950	1.31
	Ain Aicha	2,460	860 *			
	Galez	500	1,350	Rhafsai	900	1.50
	Rhafsai	777	1,160	Rhafsai	900	1.29
	Ourtzagh	4,392	1,000 *			
	Tabouda	861	1,260	Tafrant	830	1.52
	Tafrant	953	1,190	Tafrant	830	1.43
M'Jaara	6,190	1,020 *				
Lebene	Tissa	792	730	Tissa	550	1.33
Inaouen	Bab Mezouka	1,500	800	Bab Merzouka	700	1.14
	El Kouchet	2,570	790 *			

Note : * Weighted average of basin mean rainfall for upstream sub-basins can be applied.

Table 3.2.3 Annual Rainfall at Reference Station

Year	Unit : mm													
	1424 Azib	1564 Bab	1568 Bab	4104 Had Kourt	5128 M'Jaara	6200 Ourzagh	6288 Pont du Sker	6400 Rhalisal	7400 Tairant	8440 Tissa				
1957/58	667	877	939	711	857	1029	1027	1105	956	759				
1958/59	565	732	884	599	713	848	894	1005	859	630				
1959/60	601	943	1094	638	763	1111	1171	1373	1155	818				
1960/61	436	626	645	459	532	717	733	829	787	535				
1961/62	475	732	906	521	613	843	862	923	877	622				
1962/63	780	1091	1578	850	1038	1242	1492	1692	1435	942				
1963/64	642	754	1187	632	756	890	1132	1290	834	642				
1964/65	527	801	879	427	490	726	839	764	669	684				
1965/66	484	467	778	401	576	717	726	833	744	387				
1966/67	255	486	556	234	413	518	500	564	476	404				
1967/68	361	645	797	424	555	720	766	868	690	546				
1968/69	713	1049	1453	832	967	1134	1286	1380	1192	905				
1969/70	508	889	1395	692	919	933	1277	1390	1076	763				
1970/71	514	856	1289	743	867	968	1533	1194	986	773				
1971/72	404	700	730	503	581	751	806	782	711	593				
1972/73	288	556	600	400	442	552	615	606	528	462				
1973/74	522	744	899	534	630	749	923	917	718	600				
1974/75	375	529	542	422	471	565	561	571	511	422				
1975/76	509	528	696	527	567	628	720	738	653	489				
1976/77	625	685	901	639	804	800	869	1044	889	484				
1977/78	674	706	976	683	757	864	864	1009	874	662				
1978/79	521	684	815	499	633	714	760	906	751	567				
1979/80	454	678	644	414	491	611	603	672	571	493				
1980/81	323	461	528	303	353	511	516	594	471	421				
1981/82	339	430	602	427	550	559	617	734	718	481				
1982/83	452	467	464	414	399	461	518	551	405	389				
1983/84	544	547	792	599	625	796	751	934	731	497				
1984/85	350	386	479	385	364	457	452	574	321	369				
1985/86	552	803	903	650	634	896	746	1011	911	686				
1986/87	337	537	548	370	439	566	448	642	543	407				
1987/88	497	525	520	502	606	619	509	712	597	423				
1988/89	434	416	566	514	594	685	528	740	684	350				
1989/90	600	586	704	614	646	674	731	820	708	457				
1990/91	599	594	714	511	648	642	700	844	680	476				
1991/92	434	499	490	380	344	526	431	561	434	393				
1992/93	288	326	333	294	361	347	413	396	326	214				
1993/94	467	464	618	452	547	613	623	685	596	386				
Ave.	491	643	796	519	609	729	782	872	731	544				

Table 3.2.4 Basin Rainfall for Sub-basin

UNIT: mm

Year	SEBOU						RDAT						OUERGHGA						LEBENE						INAOUEN					
	SE-1	SE-2	SE-3	RD	OU-1	OU-2	OU-3	OU-4	OU-5	OU-6	OU-7	OU-8	OU-9	OU-10	OU-11	OU-12	OU-13	OU-14	OU-15	LE-1	LE-2	IN-1	IN-2	IN-3	IN-4	IN-5				
1957 / 58	754	681	767	931	826	958	920	1005	1183	826	1283	874	1078	1568	1392	946	1357	1281	789	1032	744	1026	1000	965	676	640				
1958 / 59	636	576	647	784	778	901	866	946	1113	778	1117	721	938	1427	1266	781	1219	1150	656	856	617	857	805	805	564	535				
1959 / 60	679	613	689	836	962	1115	1072	1170	1378	962	1464	944	1230	1949	1729	1022	1840	1548	702	1112	801	1104	1075	1038	726	689				
1960 / 61	493	445	495	601	568	658	632	690	813	558	917	609	770	1177	1044	660	1117	1054	489	728	525	733	714	689	482	457				
1961 / 62	537	484	563	683	798	925	888	970	1142	798	1078	717	905	1310	1163	776	1246	1175	564	846	610	856	834	805	563	534				
1962 / 63	882	796	918	1114	1388	1609	1546	1688	1988	1388	1866	1056	1567	2402	2132	1143	2038	1923	955	1281	923	1277	1244	1200	840	796				
1963 / 64	725	654	683	828	1045	1211	1163	1270	1496	1045	1416	756	1189	1832	1625	819	1184	1117	696	873	629	882	859	829	580	550				
1964 / 65	596	538	461	559	773	896	861	940	1107	773	1049	617	881	1085	963	668	950	897	451	930	670	937	913	881	617	585				
1965 / 66	546	493	433	526	685	794	763	833	981	685	908	609	763	1183	1050	659	1056	997	530	527	380	547	533	514	360	341				
1966 / 67	288	260	252	306	489	567	545	595	700	489	624	440	524	801	711	477	676	638	380	549	396	568	554	534	374	355				
1967 / 68	408	368	458	555	701	813	781	853	1004	701	958	612	805	1232	1093	663	980	925	510	742	535	755	736	710	497	471				
1968 / 69	806	727	899	1090	1279	1482	1424	1555	1831	1279	1608	963	1350	1960	1739	1043	1692	1597	890	1230	887	1228	1196	1154	808	766				
1969 / 70	574	519	747	906	1227	1423	1367	1492	1757	1227	1596	793	1341	1974	1751	858	1528	1442	845	1037	747	1041	1014	978	685	649				
1970 / 71	581	524	802	973	1134	1314	1263	1379	1624	1134	1916	823	1609	1896	1505	881	1400	1322	797	1052	758	1001	975	941	659	625				
1971 / 72	456	412	543	659	842	744	715	781	919	642	1008	639	846	1110	985	691	1009	952	535	806	581	819	798	770	539	511				
1972 / 73	325	294	432	524	528	612	588	681	756	528	769	469	646	890	763	508	749	707	406	628	452	651	634	612	428	406				
1973 / 74	590	533	577	700	791	917	881	962	1133	791	1153	636	969	1303	1156	689	1019	962	580	816	588	871	848	819	573	543				
1974 / 75	424	382	456	553	477	553	531	580	683	477	701	480	589	811	720	520	725	684	434	574	414	619	603	582	407	386				
1975 / 76	575	519	569	690	612	710	682	744	877	612	900	534	756	1047	929	578	927	875	522	664	479	618	602	581	407	386				
1976 / 77	706	638	690	837	793	919	883	964	1136	793	1086	680	912	1483	1316	736	1262	1191	740	900	648	825	804	776	543	515				
1977 / 78	761	687	737	894	859	995	956	1044	1229	859	1080	734	907	1433	1271	795	1241	1171	696	771	556	800	780	752	527	499				
1978 / 79	589	531	599	653	717	831	799	872	1027	717	950	607	798	1286	1141	657	1066	1006	583	771	556	800	780	752	527	499				
1979 / 80	513	463	448	543	567	657	631	689	811	567	754	519	634	954	846	582	811	765	452	670	483	793	773	746	522	495				
1980 / 81	365	330	327	397	464	538	517	564	665	464	645	434	542	844	749	470	669	631	325	573	413	539	525	507	355	336				
1981 / 82	383	346	461	559	529	614	590	644	758	529	771	475	648	1043	925	514	1020	963	506	654	471	503	490	473	331	314				
1982 / 83	511	461	447	542	408	473	455	497	585	408	648	392	544	782	694	424	575	542	367	528	381	546	532	514	360	341				
1983 / 84	615	555	647	785	697	808	776	848	998	697	939	677	788	1326	1177	733	1038	980	575	676	487	640	624	602	421	400				
1984 / 85	395	357	416	505	422	489	469	513	604	422	565	389	475	815	723	421	455	430	335	502	362	451	439	424	297	281				
1985 / 86	623	563	702	851	795	921	885	966	1138	795	932	762	763	1435	1274	825	1294	1221	583	934	673	939	915	883	618	586				
1986 / 87	380	343	399	484	462	559	537	586	690	482	560	481	470	911	808	520	771	728	404	559	398	629	613	591	414	392				
1987 / 88	561	507	542	657	457	530	509	556	655	457	637	526	535	1010	896	569	848	800	557	575	415	615	599	578	404	383				
1988 / 89	558	504	555	673	498	577	554	605	713	498	660	582	554	1051	932	630	972	917	537	476	343	487	474	458	320	304				
1989 / 90	678	612	663	804	619	718	690	753	887	619	914	573	767	1164	1033	620	1005	948	594	621	447	686	668	645	452	428				
1990 / 91	677	611	551	669	629	729	700	764	900	629	874	545	734	1198	1063	590	965	911	596	648	467	695	677	653	457	434				
1991 / 92	440	410	498	442	431	499	480	524	617	431	539	447	452	796	706	484	616	581	317	534	385	584	569	549	385	365				
1992 / 93	326	294	317	385	293	339	326	356	419	293	517	295	434	562	498	319	463	437	332	291	210	381	372	359	251	238				
1993 / 94	527	476	488	591	543	630	605	661	778	543	778	521	654	973	864	564	847	799	504	525	378	543	529	510	357	339				
Ave.	555	501	560	680	700	812	780	851	1003	700	978	620	821	1238	1098	671	1039	980	560	740	533	753	733	708	495	470				

Table 3.2.5 Basin Rainfall for Gauged Catchment

UNIT : mm

Year	RDAI		OUERCHA							LEBENE			INAOUEN		
	1436/8	Had Kourt	260/9	Bab Ouender	81/9	Pont du Sker	607/9	Rhafsai	79/9	Taifrant	609/9	M'Jaara	255/1/15	Tissa	551/16
1957 / 58		995	930	1253	1425	1146	1367	1181	1009	1000	991				
1958 / 59		838	875	1090	1296	1042	1228	1067	837	835	827				
1959 / 60		893	1083	1429	1771	1361	1652	1405	1087	1075	1065				
1960 / 61		642	638	895	1069	823	1125	881	712	714	707				
1961 / 62		730	897	1052	1190	1009	1254	1050	828	834	826				
1962 / 63		1190	1562	1821	2183	1778	2052	1802	1253	1244	1232				
1963 / 64		885	1175	1382	1664	1344	1192	1276	854	859	851				
1964 / 65		597	870	1023	985	917	957	910	910	913	905				
1965 / 66		562	770	886	1075	881	1064	908	515	533	528				
1966 / 67		327	550	609	728	612	680	618	537	554	549				
1967 / 68		594	789	935	1119	912	987	913	726	736	729				
1968 / 69		1165	1439	1569	1780	1543	1704	1548	1203	1196	1185				
1969 / 70		968	1381	1558	1793	1508	1539	1476	1014	1014	1004				
1970 / 71		1040	1276	1870	1541	1433	1410	1394	1028	975	966				
1971 / 72		704	722	983	1008	856	1016	881	788	798	791				
1972 / 73		560	594	751	781	675	755	682	614	634	628				
1973 / 74		748	890	1126	1183	1010	1026	993	798	848	840				
1974 / 75		591	536	685	737	625	730	641	561	603	598				
1975 / 76		737	689	879	952	798	934	815	650	602	597				
1976 / 77		895	892	1060	1347	1058	1271	1086	643	781	774				
1977 / 78		956	966	1054	1302	1078	1250	1098	880	804	797				
1978 / 79		698	807	927	1168	934	1073	948	754	780	772				
1979 / 80		580	637	736	866	723	816	733	655	773	765				
1980 / 81		424	522	630	767	616	674	619	560	525	520				
1981 / 82		597	596	753	947	731	1027	786	640	490	485				
1982 / 83		579	460	632	710	568	579	560	517	532	527				
1983 / 84		839	784	916	1205	940	1045	950	661	624	618				
1984 / 85		539	474	551	741	571	459	534	491	439	435				
1985 / 86		909	894	910	1304	1025	1303	1075	913	915	907				
1986 / 87		517	542	546	828	635	777	659	541	613	607				
1987 / 88		702	515	621	918	668	854	703	563	599	593				
1988 / 89		719	560	644	954	708	978	763	466	474	470				
1989 / 90		859	697	892	1057	842	1012	866	607	668	662				
1990 / 91		715	707	853	1088	848	972	860	633	677	671				
1991 / 92		532	485	526	723	569	620	574	523	569	564				
1992 / 93		411	329	504	510	417	466	421	284	372	368				
1993 / 94		632	611	759	864	721	853	740	513	529	524				
Avc.		726	788	954	1124	917	1046	930	723	733	726				

Table 3.2.6 Basin Rainfall by Region

Unit : mm

Year	Region			
	Ouergha Upstream M'Jaara	Lebene & Inaouen	Rdat & Lower Ouergha	Middle Sebou
1957/58	1181	894	847	734
1958/59	1067	745	710	621
1959/60	1405	961	758	661
1960/61	881	636	538	480
1961/62	1050	742	615	522
1962/63	1802	1111	1018	858
1963/64	1276	765	751	706
1964/65	910	813	498	580
1965/66	908	471	516	532
1966/67	618	490	332	281
1967/68	913	653	523	397
1968/69	1548	1068	976	785
1969/70	1476	904	859	559
1970/71	1394	882	873	566
1971/72	881	709	589	444
1972/73	682	560	460	317
1973/74	993	744	631	575
1974/75	641	528	487	412
1975/76	815	548	599	560
1976/77	1086	663	775	688
1977/78	1098	735	786	741
1978/79	948	689	607	573
1979/80	733	660	490	499
1980/81	619	476	356	356
1981/82	786	473	523	373
1982/83	560	471	452	498
1983/84	950	565	674	599
1984/85	534	404	418	385
1985/86	1075	815	713	607
1986/87	659	529	437	370
1987/88	703	525	598	546
1988/89	763	421	598	543
1989/90	866	581	693	660
1990/91	860	593	622	659
1991/92	574	496	406	477
1992/93	421	310	353	317
1993/94	740	468	539	513
Ave.	930	651	611	540

Table 3.2.7 Annual Mean Discharge at Reference Station

Year	UNIT : m ³ /sec													
	ROAT					OUERGHA					LEBENE		INAOUJEN	
	1426/8 Had Kourt	260/9 Bab Ouender	81/9 Pont du Siker	607/9 Rhatsai	79/9 Ourtzagh	608/9 Tairant	609/9 M'Jaara	2251/15 Tissa	551/16 Mezrouka	653/16 Sab El Kouchat				
1957 / 58	1.96	14.02	8.34	9.74	47.81	12.34	67.63	4.80	7.75	14.83				
1958 / 59	3.22	27.46	12.56	13.71	81.63	31.06	110.93	9.94	14.57	27.19				
1959 / 60	5.09	38.31	18.74	27.83	127.40	33.03	174.74	14.00	20.33	37.65				
1960 / 61	1.43	8.97	5.25	7.87	31.86	10.06	49.34	3.17	4.17	8.31				
1961 / 62	3.29	24.74	13.69	19.86	81.07	23.40	113.57	5.99	5.00	9.82				
1962 / 63	6.88	56.18	25.54	50.78	174.20	41.38	237.09	17.66	18.65	34.61				
1963 / 64	4.42	33.09	18.94	23.50	110.71	30.32	152.30	10.44	10.84	20.42				
1964 / 65	2.42	20.84	10.28	12.57	62.07	16.66	83.34	6.81	8.13	15.51				
1965 / 66	2.17	14.48	8.85	10.96	52.72	14.85	74.19	2.91	2.24	4.81				
1966 / 67	0.78	5.00	3.47	2.83	17.56	5.17	25.30	0.91	1.38	3.26				
1967 / 68	1.35	14.60	7.90	9.35	46.52	12.85	64.08	3.16	5.84	11.35				
1968 / 69	8.92	36.04	19.42	29.73	121.81	37.10	186.56	12.35	19.08	35.38				
1969 / 70	7.87	41.47	20.83	30.99	131.03	38.71	194.68	12.67	16.09	29.95				
1970 / 71	4.76	33.63	17.73	18.54	91.21	26.58	133.46	12.18	14.29	26.70				
1971 / 72	2.61	16.08	10.28	12.18	52.00	20.66	80.02	7.22	5.44	10.62				
1972 / 73	0.38	8.51	3.72	3.26	21.54	5.60	31.40	2.71	4.50	8.92				
1973 / 74	2.08	20.38	10.75	11.36	60.83	16.89	84.18	8.22	11.33	21.32				
1974 / 75	0.43	10.04	3.64	4.37	23.74	6.61	35.74	2.19	3.01	6.22				
1975 / 76	1.35	15.83	7.23	8.79	38.12	12.40	62.37	3.95	4.73	10.45				
1976 / 77	8.19	29.71	14.64	19.78	98.66	32.16	150.16	9.27	9.50	20.72				
1977 / 78	3.80	22.00	10.60	12.30	71.61	19.02	108.61	13.21	7.25	16.46				
1978 / 79	4.52	21.71	10.53	15.19	78.57	20.67	114.71	8.99	9.32	18.80				
1979 / 80	0.37	9.12	4.98	5.59	27.69	6.94	41.89	3.69	3.64	9.95				
1980 / 81	0.12	5.01	3.31	3.58	16.62	5.14	26.34	1.93	1.60	3.60				
1981 / 82	1.30	9.36	6.24	9.11	33.96	10.31	43.18	4.89	2.84	4.57				
1982 / 83	0.54	7.97	3.26	4.14	18.32	5.46	36.28	1.81	1.53	3.93				
1983 / 84	2.61	15.26	9.25	12.54	55.48	18.22	94.58	3.63	2.28	6.50				
1984 / 85	0.33	6.51	5.19	4.72	23.13	8.98	32.19	5.66	1.99	4.38				
1985 / 86	3.97	21.33	12.38	14.72	64.34	25.32	99.78	7.98	11.01	24.61				
1986 / 87	1.24	11.93	6.73	7.48	41.14	8.26	57.67	5.14	6.97	9.98				
1987 / 88	0.95	4.96	3.43	5.84	19.96	7.35	33.72	1.65	2.92	4.76				
1988 / 89	1.80	5.71	3.39	5.48	18.78	6.44	27.99	1.69	2.11	2.90				
1989 / 90	4.93	16.98	7.21	12.55	47.72	16.97	76.24	3.34	4.57	3.78				
1990 / 91	3.66	18.30	6.90	8.87	40.22	12.27	66.13	5.25	4.91	7.94				
1991 / 92	0.31	4.43	2.35	2.46	10.44	4.42	18.81	1.33	1.06	3.10				
1992 / 93	0.16	1.73	1.63	1.82	5.56	2.49	8.85	0.25	0.42	1.62				
1993 / 94	1.23	5.62	3.96	6.71	22.27	8.91	35.69	1.47	1.85	3.91				
Ave.	2.74	17.76	9.26	12.46	55.90	16.62	81.99	6.01	6.84	13.17				

Table 3.2.8 Surface Runoff for Sub-basin

Average 1957/58 - 1993/94 (37 Years)

River System	Sub-Basin	Catchment Area (sq. km)	Basin Rainfall (mm)	Reference Catchment Basin			Runoff Rate	Runoff Depth (mm)	Runoff Volume (MCM)
				Name of Gauge	Basin Rainfall (mm)	Runoff Rate			
Sebou	SE-1	1,282	555	Had Kourt	726	0.178	0.136	76	97
	SE-2	477	501	Had Kourt	726	0.178	0.123	62	29
	SE-3	333	560	Had Kourt	726	0.178	0.137	77	26
Rdat	RD	1,124	680	Had Kourt	726	0.178	0.167	113	127
Ouergha	OU-1	560	700	Bab Ouender	788	0.405	0.360	252	141
	OU-2	210	812	Bab Ouender	788	0.405	0.417	339	71
	OU-3	490	780	Bab Ouender	788	0.405	0.401	313	153
	OU-4	336	851	Bab Ouender	788	0.405	0.437	372	125
	OU-5	160	1003	Bab Ouender	788	0.405	0.516	517	83
	OU-6	155	700	Bab Ouender	788	0.405	0.360	252	39
	OU-7	549	978	Pont du Sker	954	0.567	0.581	568	312
	OU-8	313	620	Ourtzagh	918	0.437	0.295	183	57
	OU-9	193	821	Pont du Sker	954	0.567	0.488	401	77
	OU-10	573	1238	Rhafsai	1124	0.450	0.496	614	352
	OU-11	853	1098	Rhafsai	1124	0.450	0.440	483	412
	OU-12	295	671	M'Jaara	930	0.449	0.324	217	64
	OU-13	1,053	1039	Tafrant	1046	0.526	0.522	543	572
	OU-14	413	990	Tafrant	1046	0.526	0.493	483	199
	OU-15	1,172	560	Had Kourt	726	0.178	0.137	77	90
Lebene	LE-1	728	740	Tissa	723	0.330	0.338	250	182
	LE-2	651	533	Tissa	723	0.330	0.243	130	84
Inaouen	IN-1	744	753	Bab Merzouka	733	0.196	0.201	152	113
	IN-2	582	733	Bab Merzouka	733	0.196	0.196	144	84
	IN-3	1,244	708	El Kouchat	726	0.223	0.217	154	192
	IN-4	970	495	El Kouchat	726	0.223	0.152	75	73
	IN-5	162	470	El Kouchat	726	0.223	0.144	68	11

Typical Drought Year (10-year Drought)

River System	Sub-Basin	Catchment Area (sq. km)	Typical Drought Year	Basin Rainfall (mm)	Reference Catchment Basin			Runoff Rate	Runoff Depth (mm)	Runoff Volume (MCM)
					Name of Gauge	Basin Rainfall (mm)	Runoff Rate			
Sebou	SE-1	1,282	1986/87	380	Had Kourt	517	0.027	0.020	8	10
	SE-2	477	1936/87	343	Had Kourt	517	0.027	0.018	6	3
	SE-3	333	1986/87	399	Had Kourt	517	0.027	0.021	8	3
Rdat	RD	1,124	1991/92	498	Had Kourt	532	0.027	0.025	13	14
Ouergha	OU-1	560	1991/92	431	Bab Ouender	485	0.164	0.146	63	35
	OU-2	210	1991/92	499	Bab Ouender	485	0.164	0.169	84	18
	OU-3	490	1991/92	480	Bab Ouender	485	0.164	0.162	78	38
	OU-4	336	1991/92	524	Bab Ouender	485	0.164	0.177	93	31
	OU-5	160	1991/92	617	Bab Ouender	485	0.164	0.209	129	21
	OU-6	155	1991/92	431	Bab Ouender	485	0.164	0.146	63	10
	OU-7	549	1991/92	539	Pont du Sker	526	0.290	0.297	160	88
	OU-8	313	1991/92	447	Ourtzagh	569	0.132	0.104	46	15
	OU-9	193	1991/92	452	Pont du Sker	526	0.290	0.250	113	22
	OU-10	573	1991/92	796	Rhafsai	723	0.138	0.152	121	69
	OU-11	853	1991/92	706	Rhafsai	723	0.138	0.135	95	81
	OU-12	295	1991/92	484	M'Jaara	574	0.167	0.141	68	20
	OU-13	1,053	1991/92	616	Tafrant	620	0.236	0.234	144	152
	OU-14	413	1991/92	581	Tafrant	620	0.236	0.221	129	53
	OU-15	1,172	1991/92	317	Had Kourt	532	0.027	0.016	5	6
Lebene	LE-1	728	1988/89	476	Tissa	466	0.114	0.117	55	40
	LE-2	651	1988/89	343	Tissa	466	0.114	0.084	29	19
Inaouen	IN-1	744	1988/89	487	Bab Merzouka	474	0.047	0.048	24	17
	IN-2	582	1988/89	474	Bab Merzouka	474	0.047	0.047	22	13
	IN-3	1,244	1988/89	458	El Kouchat	470	0.081	0.079	36	45
	IN-4	970	1988/89	320	El Kouchat	470	0.081	0.055	18	17
	IN-5	162	1988/89	304	El Kouchat	470	0.081	0.052	16	3

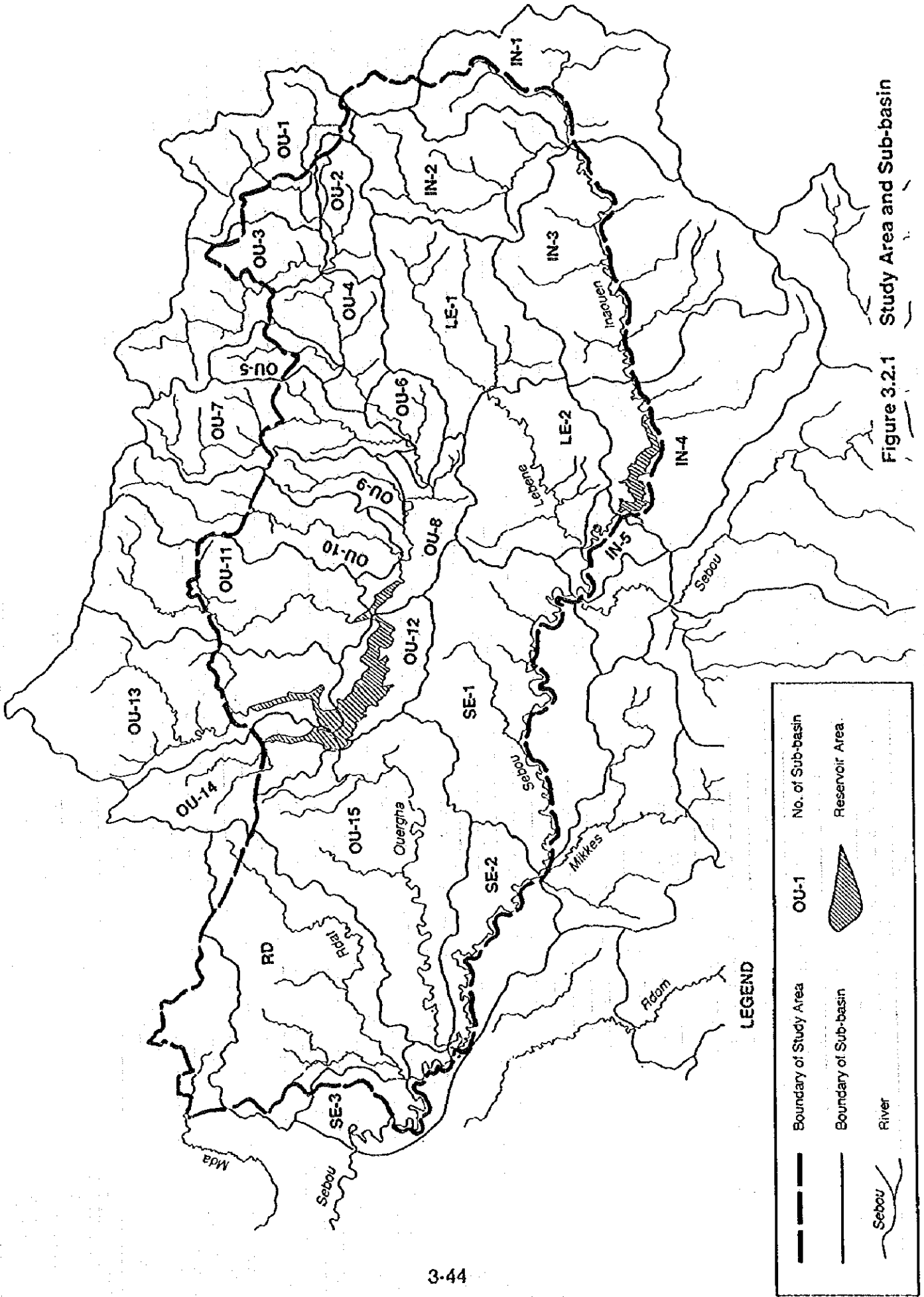


Figure 3.2.1 Study Area and Sub-basin

Source : The Integrated Master Plan on Water Resources Development
in the Sebou, Bou Regreg and Oum Er Rbia Basins, 1992, AH

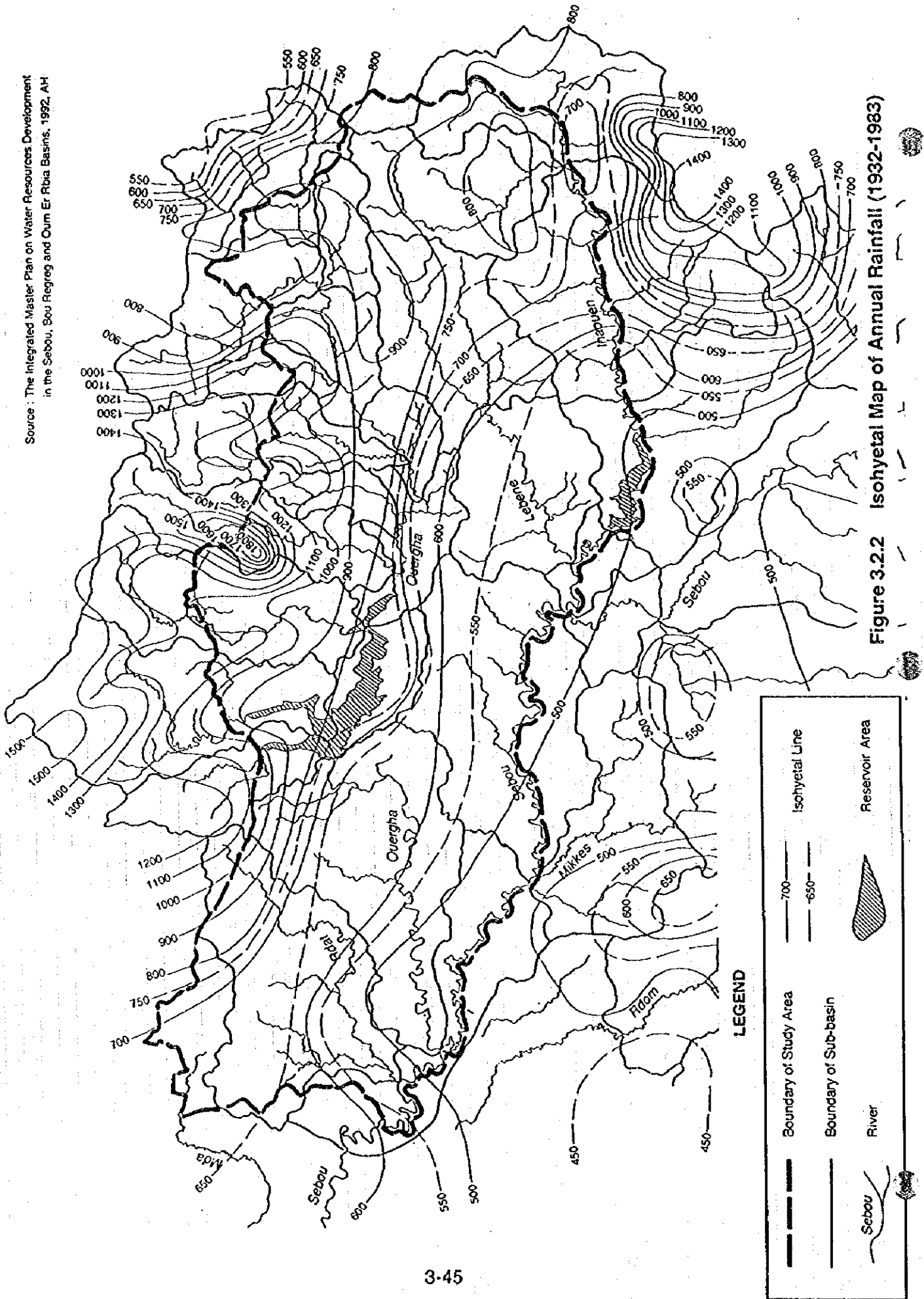
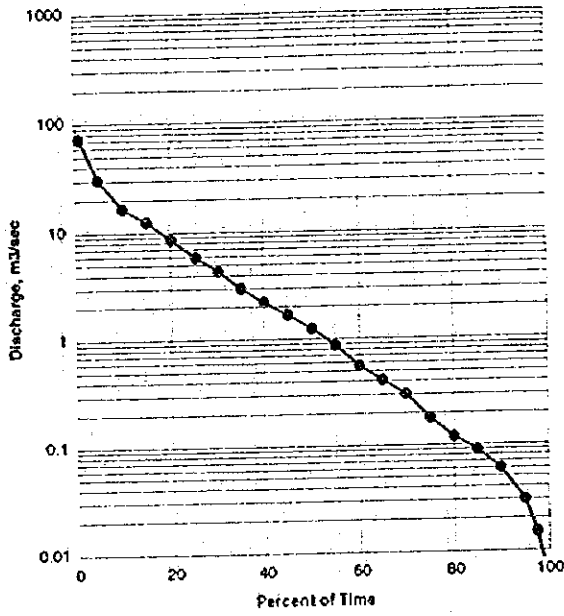
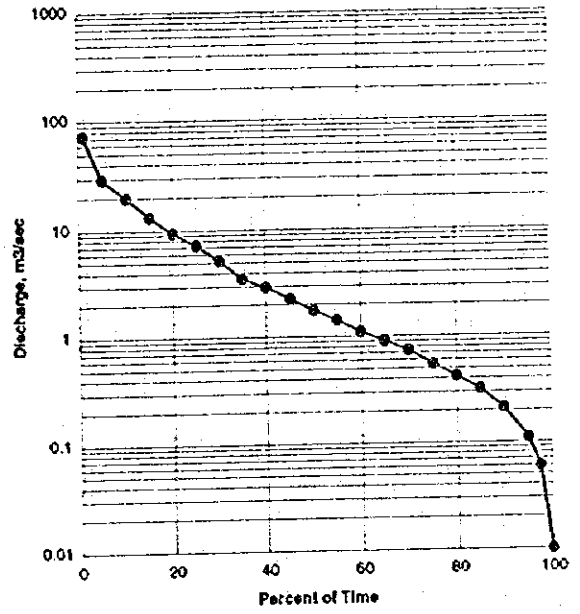


Figure 3.2.2 Isohyetal Map of Annual Rainfall (1932-1983)

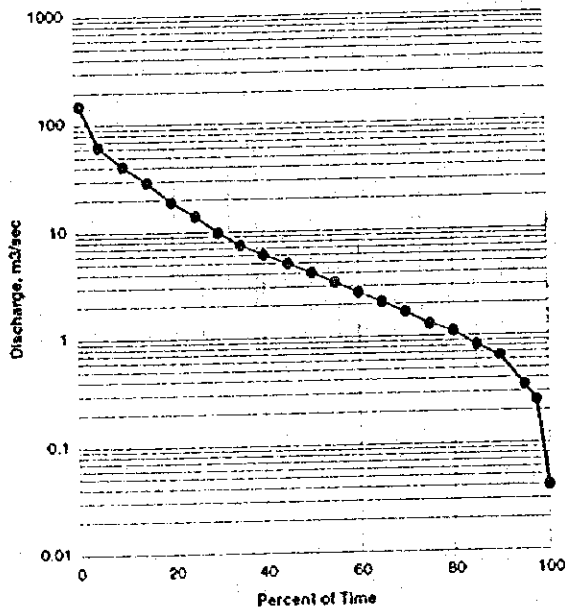
1542/15 TISSA



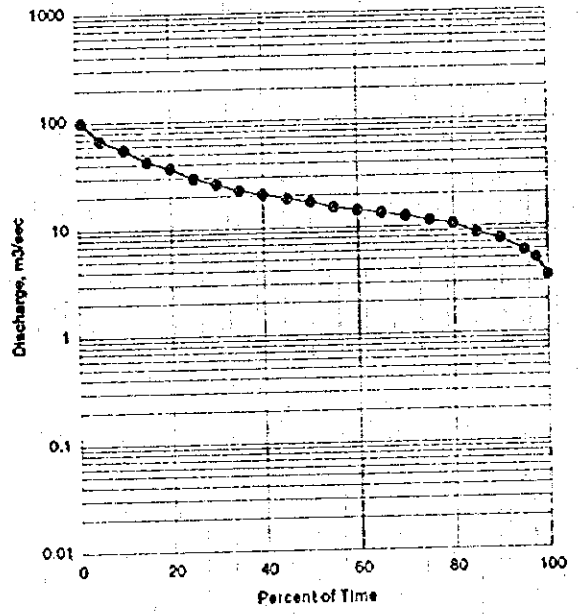
551/16 BAB MERZOUKA



653/16 EL KOUCHAT



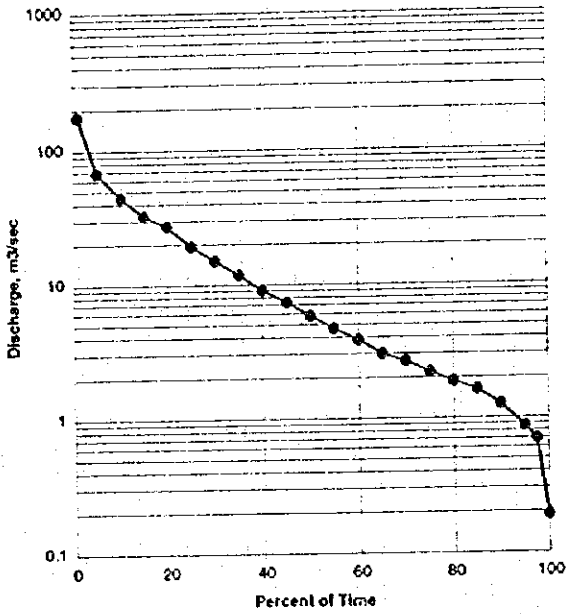
2265/15 DAREL ARSA



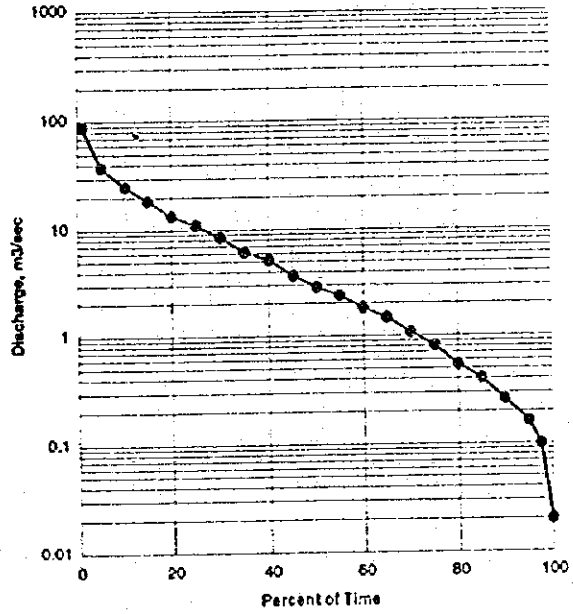
Period : 1957/58 - 1993/94 (37 Years)

Figure 3.2.3 Flow Duration Curve (1/3)

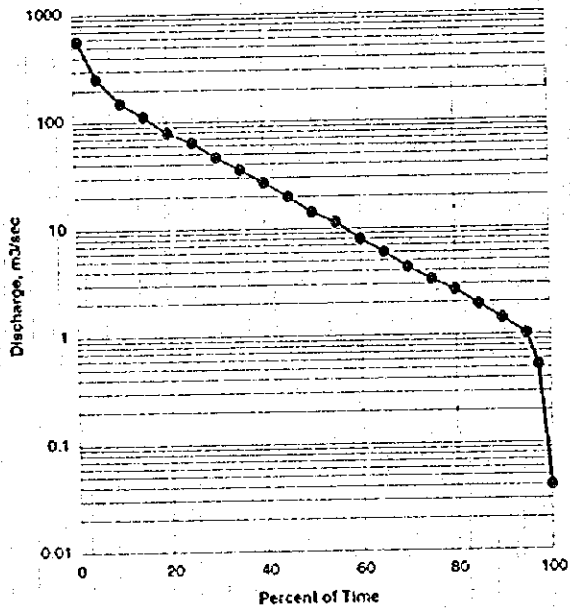
260/9 BAB OUENDER



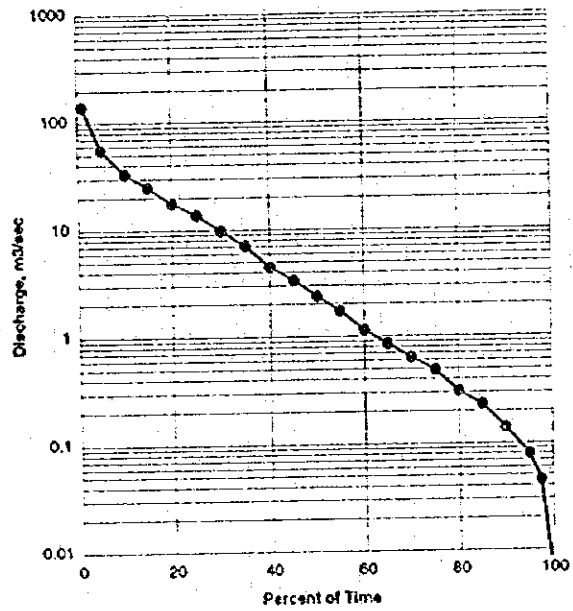
81/9 PONT DU SKER



79/9 OURTZAGH

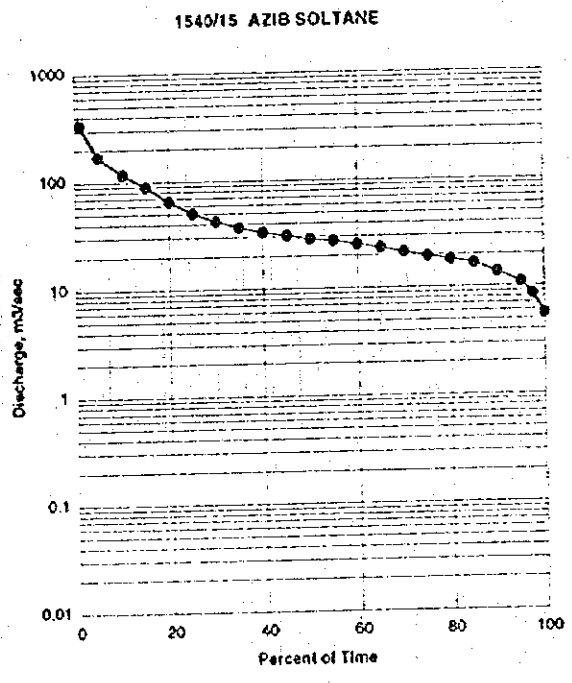
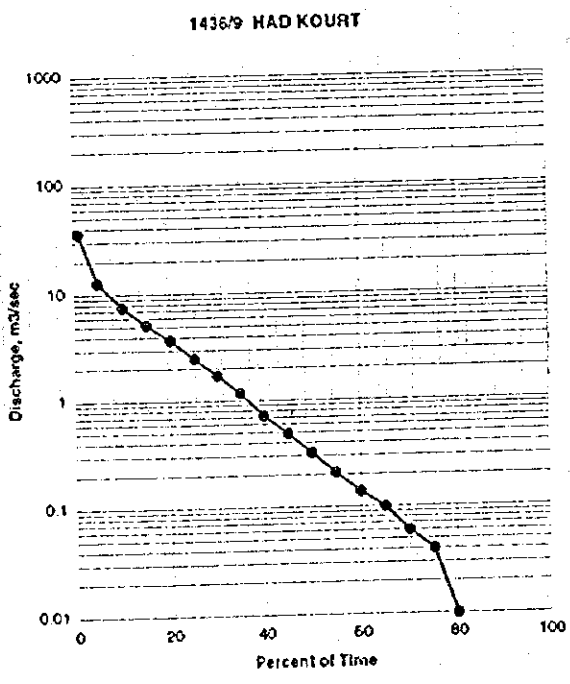
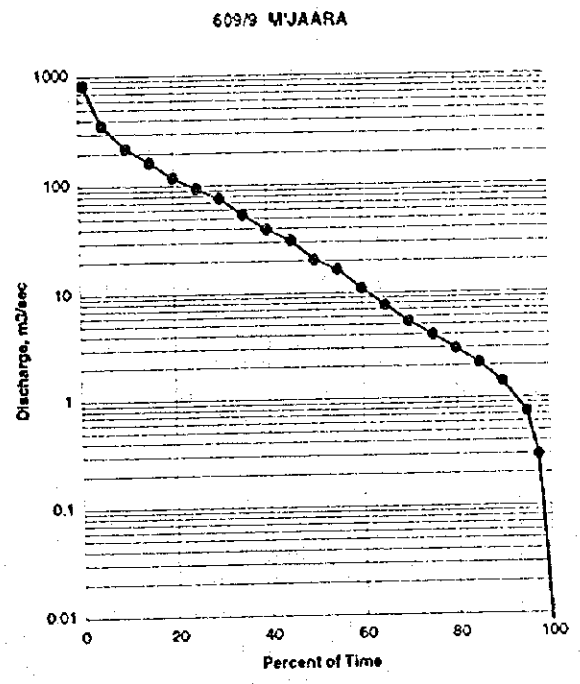
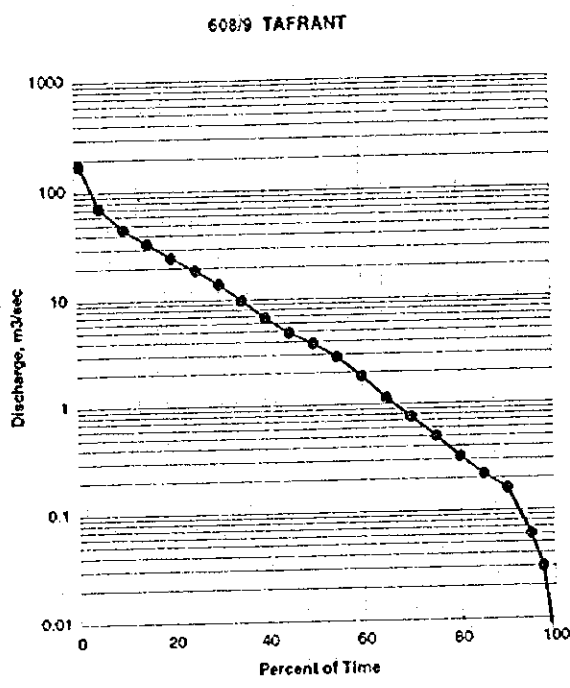


607/9 RHAFSAI



Period 37 Years (1957/58 - 1993/94)

Figure 3.2.3 Flow Duration Curve (2/3)



Period : 37 Years (1957/58 - 1993/94)

Figure 3.2.3 Flow Duration Curve (3/3)