

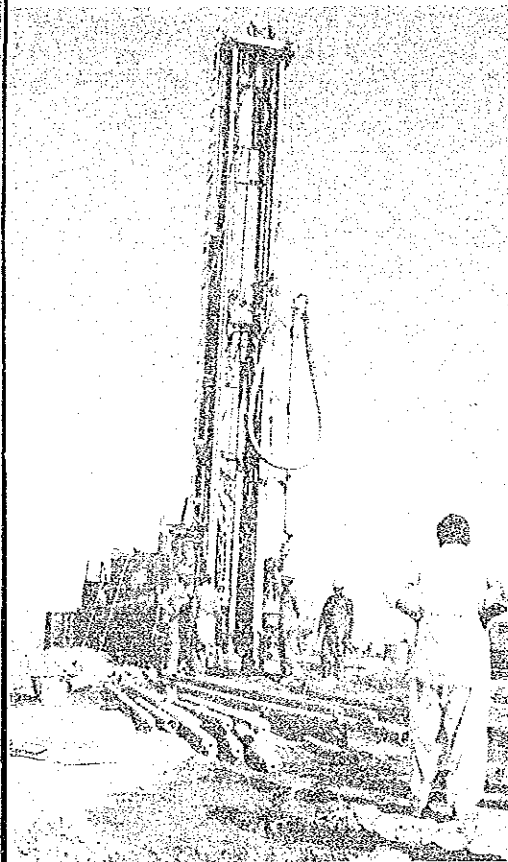
THE ISLAMIC REPUBLIC OF PAKISTAN

**MASTER PLAN STUDY ON
BALUCHISTAN IRRIGATION DEVELOPMENT PROJECT
THROUGH GROUNDWATER DEVELOPMENT**


FINAL REPORT

**VOLUME II
APPENDICES**

MARCH 1988



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VOLUME II

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1. INTRODUCTION

1.1 Work Flow of the Study

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- FIG A-1.1.2 Work Flow of Aerial Selective
Gamma-ray Spectro Prospecting
- FIG A-1.1.3 Work Flow of Seismic Prospecting
- FIG A-1.1.4 Overall Work Schedule
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1.2 Study Team Member and counterparts

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- TABLE A-1.2.1 Counterparts for the Study

1.3 Officials Concerned

- TABLE A-1.3.1 Officials Concerned

1.1 WORK FLOW OF THE STUDY

FIG A-1.1.1 Overall Work Flow of the Study

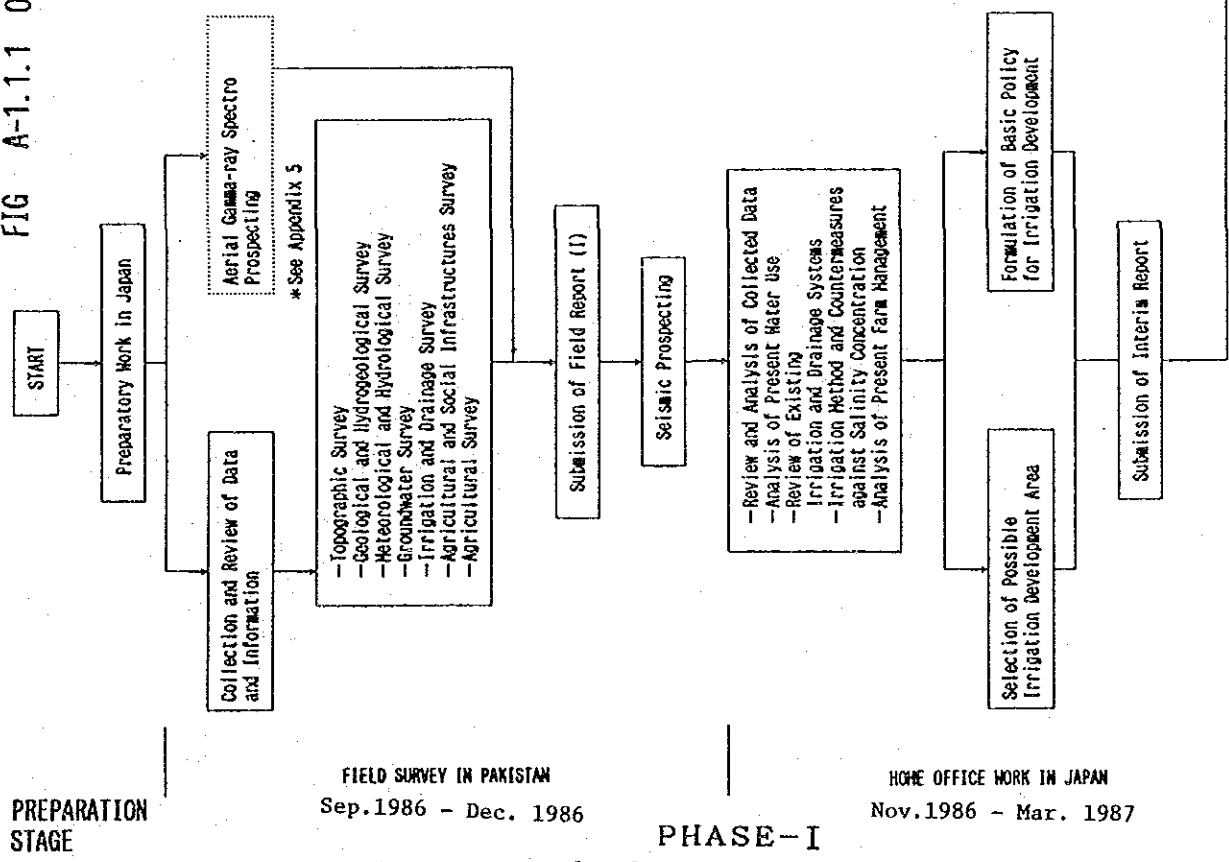
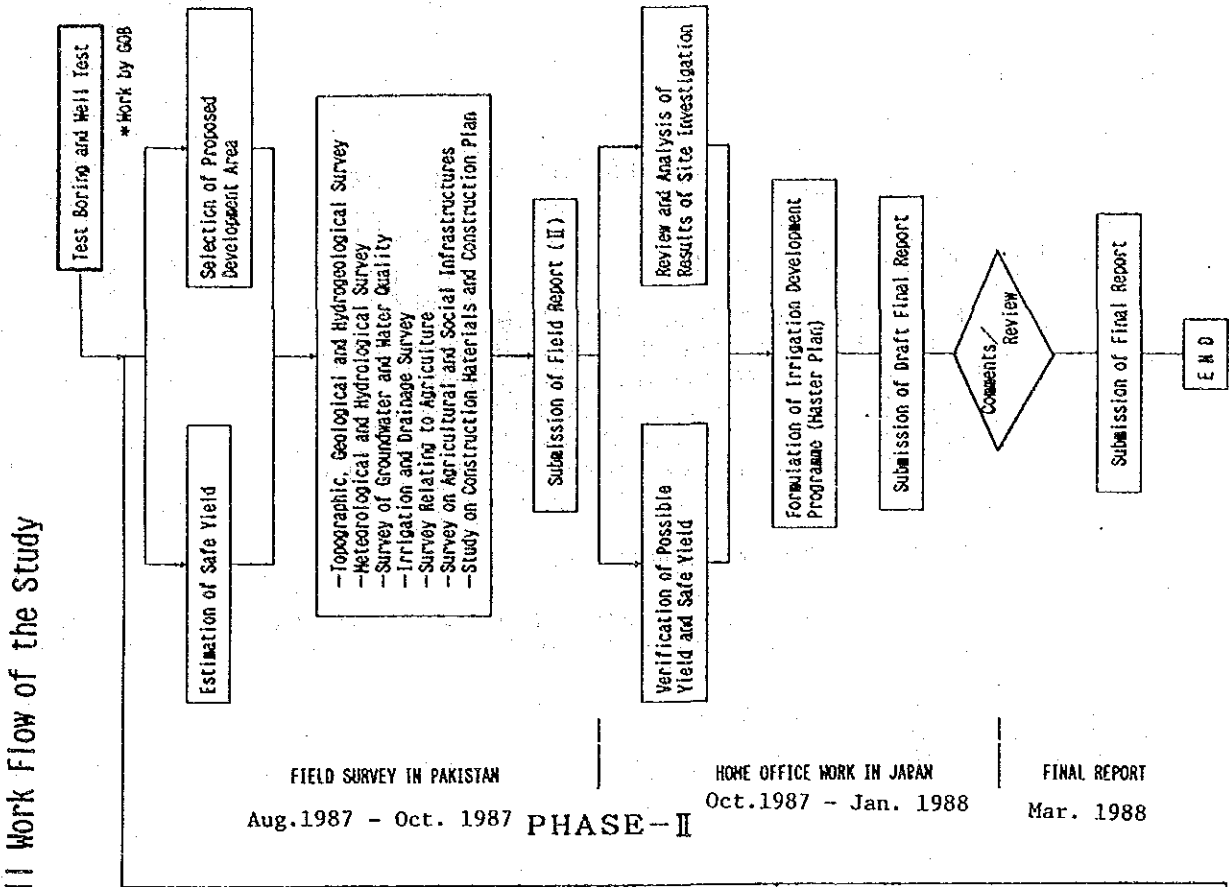
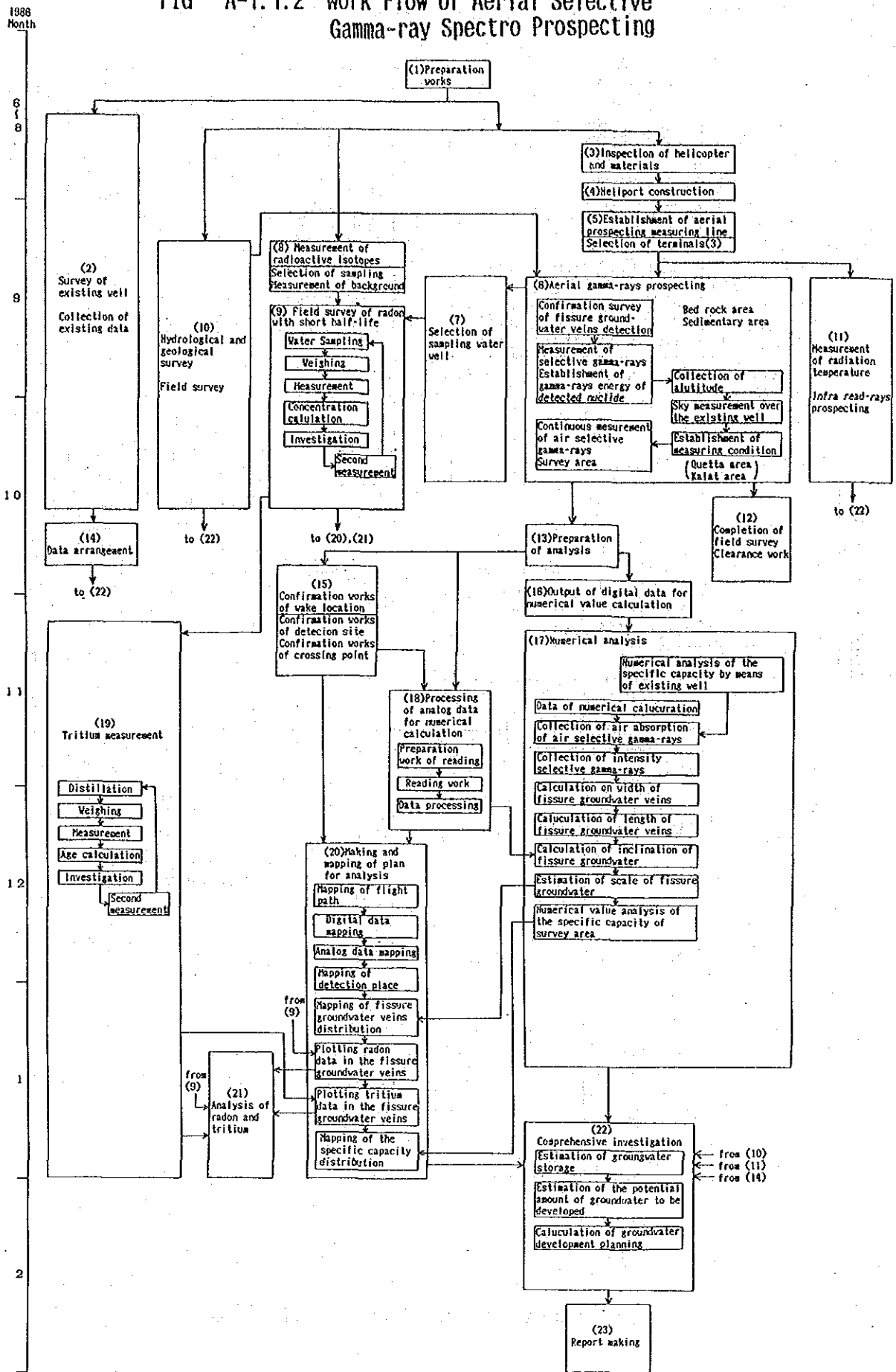


FIG A-1.1.2 Work Flow of Aerial Selective Gamma-ray Spectro Prospecting



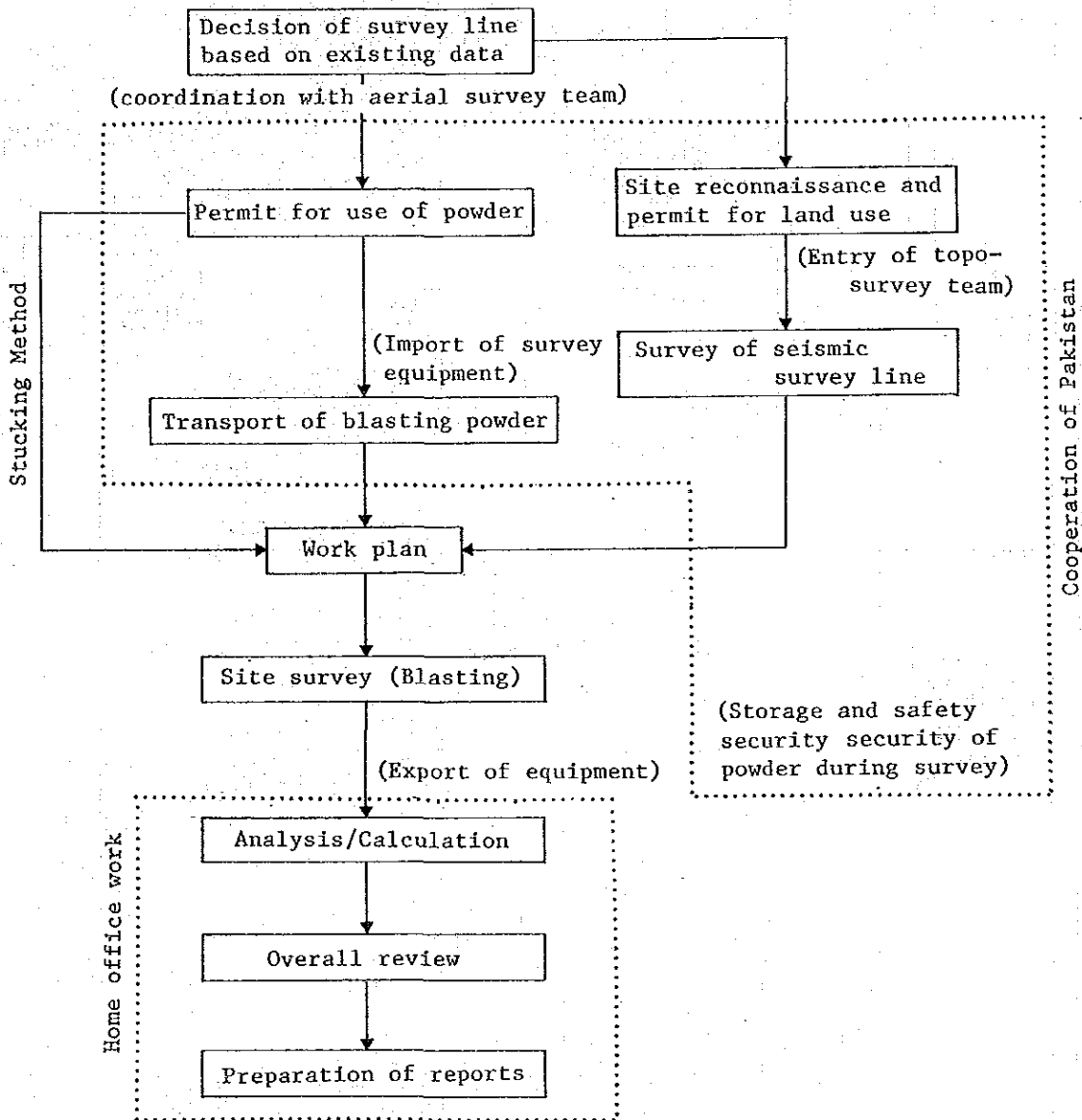


FIG A-1.1.3 Work Flow of Seismic Prospecting

I t e m s	1986			1987			1988														
	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	
PHASE-I - Study of Groundwater Resources - Preliminary Study of Irrigation Development - Installation of Rain Gauge & Water Level Gauges - Seismic Survey																					
PHASE-II - Study of Groundwater - Test Boring - Study of Irrigation Development																					
REPORTING																					

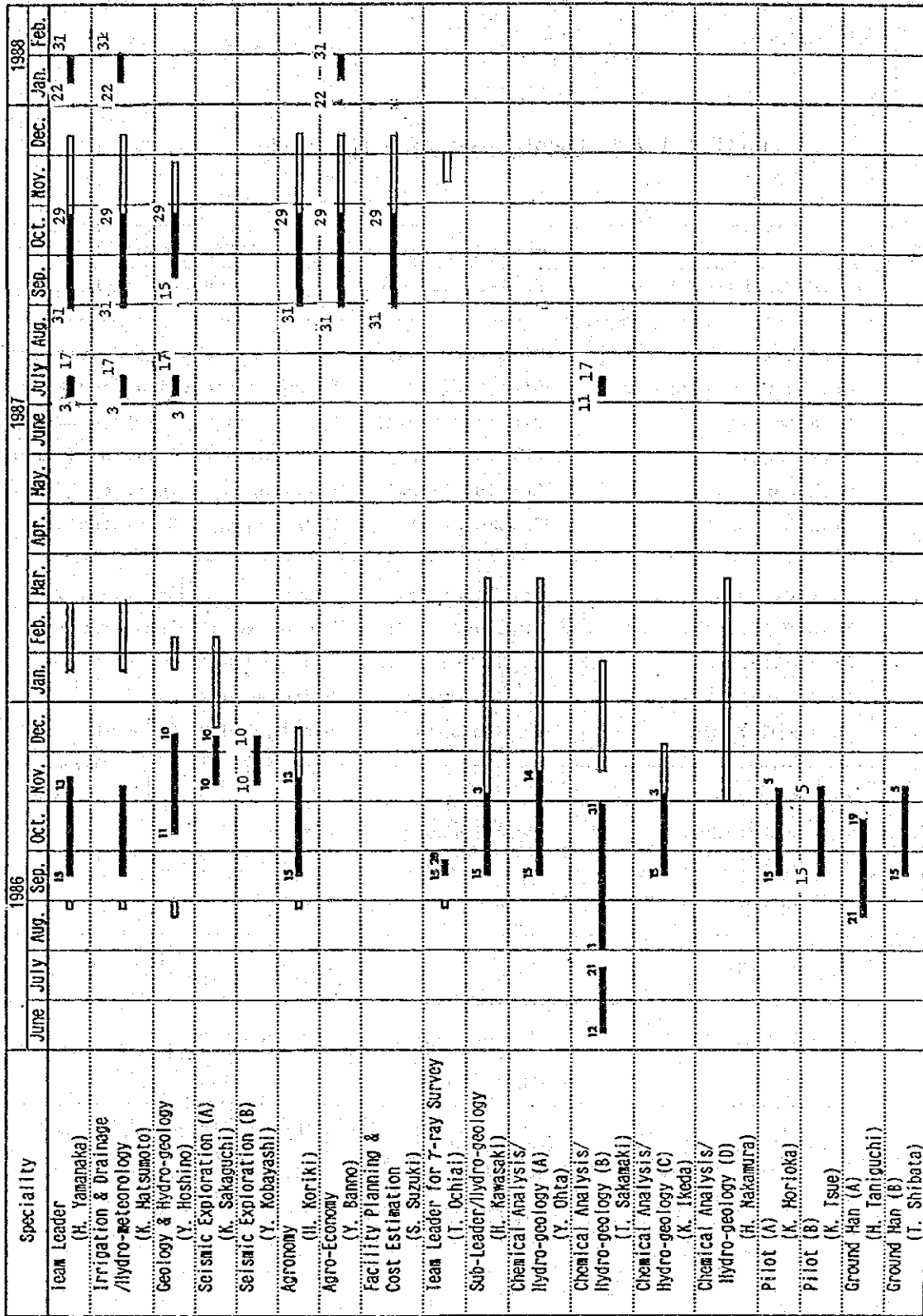
Note:
 ■ Field Survey
 ▬ Home Office Work in Japan
 - - - Drilling and Installation Works by GOB

FIG A-1.1.4 Overall Work Schedule

I t e m	1986				
	Aug.	Sept.	Oct.	Nov.	Dec.
(1) Survey of Existing Wells		█	█		
(2) Check of Helicopter and its Equipment	█	█			
(3) Construction of Heli-pad		█			
(4) Decision of Survey Lines		█			
(5) Operation of Aerial Gamma-ray Spectro Prospecting		█	█		
(6) Collection of Test Waters		█	█		
(7) Examination of Radio-active Isotope		█			
(8) Field Examination of Short Half-life Radon		█	█		
(9) Hydrological Survey		█	█		
(10) Observation of Temperature		█	█		
(11) Final Check of Field Work and Supplemental Survey				█	

FIG A-1.1.5 Field Work Schedule of Aerial Selective Gamma-ray Spectro Prospecting

1.2 STUDY TEAM MEMBER AND COUNTERPARTS



Note: Field Survey
 Home Office Work in Japan

FIG A-1.2.1 Study Team Members and Assignment Schedule

TABLE A-1.2.1 Counterparts for the Study

S.No.	Name	Designation	Assignment
1.	Mr. Nazar Hussain	Project Director	Overall Incharge
2.	Mr. Akbar H. Mirza	Director (P&R)	Planning. Report & Maps (Phase 1)
3.	Mr. Abu-ul Hassan Naqvi	Director (P&R)	Planning Reports & Maps (Phase 2)
4.	Mr. Asim Ali	Director (Field)	Hydrogeology - Field Studies.
5.	Mr. M. Jamil	XEN (Drilling)	Drilling - Engineering (Phase 1)
6.	Mr. Younus	XEN (Drilling)	Drilling - Engineering (Phase 2)
7.	Mr. M. S. Bhatti	Sr. Geologist	Hydrogeology- Co-ordination
8.	Mr. Peer Bukhsh	Sr. Geophysicist	Geophysical/Seismic survey
9.	Mr. Akbar Habibi	Jr. Geophysicist	Geophysical/Seismic survey
10.	Mr. M. Yousaf	Sr. Geologist	Hydrogeology
11.	Mr. Shakil Akhter	Jr. Geologist	Hydrogeology
12.	Mr. Abdul Wahid	Jr. Geologist	Hydrogeology
13.	Ch. Mohd Ali	S.R.O (Soil)	Soils-Survey/Classification
14.	Mr. Bashir Zafar	Sr. Agronomist	Agronomy
15.	Mr. M. Nisar Khan	A.R.O. (Soil)	Chemist/Analysis
16.	Mr. Masood A. Bajwa	Jr. Hydrographer	Meteo-Hydrology
17.	Major Tariq Ch.	-	Pilot - From Pak Army
18.	Mr. Zubair Ahmed	Jr. Geologist (Irrigation Department)	Hydrogeology

1.3 OFFICIALS CONCERNED

TABLE A-1.3.1 Officials Concerned

A. PAKISTAN FEDERAL GOVERNMENT

- A-1. Economic Affairs Division of MOF
Mr. Mohammad Faheem Former Deputy Secretary
Mr. Akhtar Iqbal Deputy Secretary

B. GOVERNMENT OF BALUCHISTAN

- B-1. CHIEF SECRETARY
Mr. S. R. Poonegar Chief Secretary
- B-2. PLANNING AND DEVELOPMENT DEPARTMENT
Mr. M. S. Khan Paracha Minister of P&D
Mr. Fateh Mohd Khajjak Additional Chief Secretary (ACS)
Mr. Syed Asghar Ali Chief Economist
Mr. S. H. Sharif Khan Secretary of P&D
- B-3. IRRIGATION AND POWER DEPARTMENT
Mr. Sadar Yaqub Khan Nasir Minister of I&P
Mr. Abdul Raziq Khan Secretary of I&P
Mr. Muhammad Amin Chief Engineer
Mr. Haji Mohammad Raza Deputy Secretary
Mr. Shamsul Zohabutt Executive Engineer
Mr. Ali Moh. Shah Hashmi Executive Engineer of Quetta District
Mr. Muzafar Iqbal Executive Engineer of Mastung District
- B-4. AGRICULTURE DEPARTMENT
Mr. Arbab Muhammad Nawaz Khan Minister
Mr. Zulfiqar Ali Khan Ch. Director General
- B-5. PUBLIC HEALTH ENGINEERING DEPARTMENT
Mr. Taj M. Naeem Secretary
- B-6. GEOLOGICAL SURVEY OF PAKISTAN
Dr. S. H. Ibrahim Shah Director
Dr. Farah Sr. Geologist

2. BACKGROUND

2.1 Brief Description of the Country

(None)

2.2 National Economy and Agriculture

TABLE A-2.2.1 GDP Composition and Growth

TABLE A-2.2.2 Percentage Distribution of Employed Persons of 10 Years
Age and Above by Major Industry Division : 1985-86

TABLE A-2.2.3 Trade Balance and Growth

TABLE A-2.2.4 Trade Composition

TABLE A-2.2.5 Public Sector Expenditure

TABLE A-2.2.6 Number & Area of Private Farms, Classified by Size, 1980.

2.3 Regional Economy and Agriculture

TABLE A-2.3.1 (Quetta District) Farmer's Organization

TABLE A-2.3.2 Agricultural Research Institutes (Baluchistan)

TABLE A-2.2.1 GDP Composition and Growth

	GDP Composition (%)					Growth Ratio (%)		
	1949-50	1959-60	1969-70	1979-80	1985-86	1970-75	1975-80	1980-85
Agriculture	53.4	46.3	39.0	30.5	25.8	1.4	3.0	2.5
Major Crops	27.7	23.1	23.4	17.6	14.4	1.1	3.1	1.9
Minor Crops	6.6	5.3	4.2	4.0	3.2	3.4	2.6	2.1
Others	19.1	17.9	11.4	8.9	8.2	1.2	3.3	4.2
Manufacturing	7.8	12.0	16.0	17.1	19.9	3.3	6.1	7.5
Large Scale	2.3	6.9	12.5	12.4	14.5	2.6	5.8	7.5
Small Scale	5.5	5.1	3.5	4.7	5.4	5.8	7.0	7.4
Other Service Sectors	38.8	41.7	45.0	52.4	54.3	4.4	5.8	5.6
GDP	100.0	100.0	100.0	100.0	100.0	3.3	5.0	5.1
GNP (in Million Rupees)	-	17,831	47,754	252,812	580,896	3.4	5.8	5.1
Population (in million)	-	45.03	59.70	81.36	97.67	2.6	2.4	2.5
Per Capita Income (in Rupees)	-	396	800	3,107	5,948	1.6	3.0	2.7

Source : Federal Bureau of Statistics

TABLE A-2.2.2 Percentage Distribution of Employed Persons of 10 Years Age and Above by Major Industry Division : 1985-86

Major Industry Division	PAKISTAN	BALUCHISTAN	NWFP	PUNJAB	SIND
Total	100.00	100.00	100.00	100.00	100.00
Agriculture, Forestry, Hunting and Fishing	54.01	67.78	59.24	52.93	51.91
Quarrying	0.26	1.17	0.07	0.28	0.12
Manufacturing	13.14	4.01	6.97	14.87	13.20
Electricity, Gas and Water	0.52	0.05	0.83	0.47	0.58
Construction	5.24	3.67	6.84	5.59	3.87
Wholesale, Retail Trade, Restaurant and Hotels	11.40	10.03	10.30	11.00	13.16
Transport, Storage and Communication	4.42	6.24	4.82	4.17	4.56
Financing, Insurance, Real Estate & Business Services	0.94	0.37	0.49	0.77	1.70
Community, Social and Personal Services	10.01	6.65	10.40	9.84	10.84
Activities Not Adequately Defined	0.07	0.02	0.05	0.08	0.06

Source: Labour Force Survey, 1985-86 Federal Bureau of Statistics

TABLE A-2.2.3 Trade Balance and Growth

(Unit : 10⁶Rs)

Year	Export	Import	Balance
1975-76	11,253	20,465	Δ9,212
1980-81	29,280	53,544	Δ24,264
1985-86	49,592	90,946	Δ41,354

Growth Ratio (%)			
1960-70	10.8	2.2	
1970-80	6.3	6.0	
1980-86	2.9	2.4	

Source : Federal Bureau of Statistics

TABLE A-2.2.4 Trade Composition

(Unit : %)

Items	Export				Import			
	1975-76	1980-81	1985-86	Items	1975-76	1980-81	1985-86	
1. Rice	22	19	11	1. Petroleum & Products	18	28	18	
2. Raw Cotton	9	18	17	2. Machinery: Non Electrical	14	11	16	
3. Cotton Yarn	13	7	9	3. Transport Equipment	7	9	10	
4. Cotton Cloth	12	8	10	4. Iron & Steel manu.	8	5	5	
5. Ready Made Garments	3	3	8	5. Electrical goods	6	4	3	
6. Carpet & Rugs	6	8	5	6. Chemicals	2	5	7	
7. Leather	5	3	6	7. Vegetable Oils	5	5	7	
8. Fish & Prep	2	2	3	8. Grains & Pulses	9	1	6	
9. Others	28	32	31	9. Others	31	32	28	
Total	100	100	100	Total	100	100	100	

Source : Federal Bureau of Statistics

TABLE A-2.2.5 Public Sector Expenditure

(Unit : %)

Sector	First Plan (1955-60)	Second Plan (1960-65)	Third Plan (1965-70)	Non-Plan Period (1970-78)	Fifth Plan (1978-83)	Sixth Plan (1983-88)
1. Agriculture	9.5	8.5	10.4	8.6	9.7	5.0
(a) Agriculture	9.5	6.5	6.2	5.5	4.0	4.0
(b) Fertilizer Subsidy	-	2.0	4.2	3.1	5.7	1.0
2. Water	19.9	43.3	34.2	16.9	10.3	10.5
3. Energy	12.4	12.2	13.3	18.3	25.4	38.2
(a) Power	11.8	11.0	11.9	14.4	18.4	28.7
(b) Fuels	0.6	1.2	1.4	3.9	6.9	9.0
(c) Renewables Energy	-	-	-	-	0.1	0.5
4. Industry	15.3	4.5	6.0	15.0	16.6	6.7
5. Minerals	2.5	0.9	2.0	0.7	0.3	1.9
6. Transport and Communications	22.2	15.0	19.1	20.7	23.0	18.9
7. Physical Planning and Housing	10.4	9.0	5.3	7.5	5.9	5.1
8. Educations and Manpower	4.8	4.4	4.3	4.6	3.7	6.5
9. Health	1.6	1.6	2.1	3.1	3.0	4.3
10. Population Planning	-	0.2	1.1	1.1	0.4	0.7
11. Others/Misc. Programmes	1.4	0.4	2.2	3.5	1.7	2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source : Planning and Development Division

TABLE A-2.2.6 Number & Area of Private Farms, Classified by Size, 1980.

Size of Farms (ha)	Farms		Farm Area		
	x 10 ⁶	%	x 10 ⁶ ha	%	Cultivated Area Percent
under 0.5	0.33	8	0.10	-	-
0.5 to under 1	0.37	9	0.28	1	2
1 to under 2	0.69	17	0.97	5	6
2 to under 3	0.68	17	1.63	9	9
3 to under 5	0.92	23	3.57	19	21
5 to under 10	0.71	17	4.70	25	26
10 to under 20	0.26	6	3.39	18	17
20 to under 60	0.10	3	3.80	15	13
60 and above	0.01	-	1.62	8	6

Source : Agriculture Census 1980

2.3 REGIONAL ECONOMY AND AGRICULTURE

TABLE A-2.3.1 (Quetta District) Farmer's Organization

Sr.No.	Name of the Society	Tehsil	Number of Members	Kind of Farming
1.	2.	3.	4.	5.
1.	The Agri. Supply Coop. Society Ltd. Chashma Achozai.	Quetta	12	Agriculture Supply
2.	The Agri. Supply Coop. Society Rondozaï Aghbary	Quetta	12	-do-
3.	The Agri. Supply Coop. Society Killi Ghulam Jan Kachi Baig	Quetta	13	-do-
4.	The Agri. Supply Coop. Society No-Hissar Quetta	Quetta	12	-do-
5.	The Agri. Supply Coop. Society Panjpir	Quetta	13	-do-
6.	The Agri. Supply Coop. Society Kachi Baig Quetta	Quetta	12	-do-
7.	The Cooperative Fruit Marketing Society Hanna	Quetta	12	Fruit and Vegetable Marketing.
8.	The Rural Multipurpose Coop. Society Killi Rajab	Quetta	12	-do-
9.	The Rural Multipurpose Coop. Society Ltd. Shamozaï Sariab	Quetta	18	-do-
10.	The Baluchistan Coop. Marketing Union Ltd. Quetta	Quetta	59	-do-
11.	The Khalid Agri. Development Coop. Society Ltd. Quetta.	Quetta	20	Agri. Development
12.	The Kachi Baig Agri. Development Coop. Ltd. Kachi Baig	Quetta	58	-do-
13.	The Agri. Development Coop. Society Lor Kareze Quetta	Quetta	15	-do-
14.	The Jatak Agri. Development Coop. Society Ltd. Ahmad Khanzaï Sariab	Quetta	17	-do-
15.	The Sharan Agri. Development Coop. Society Ltd. No-Hissar	Quetta	13	-do-
16.	The Muchan Agri. Development Coop. Ltd. Kuchlak.	Quetta	16	-do-
17.	The Kooz Bagh Agri. Development Coop. Society Ltd. Kooz Bagh	Quetta	14	-do-
18.	The Agri. Development Coop. Society Ltd. Mian Ghundi Sariab	Quetta	14	-do-
19.	The Agri. Development Coop. Society Ltd. Chasham Achozai	Quetta	15	-do-
20.	The Agri. Development Coop. Society Ltd. Kuchlak.	Quetta	12	-do-

(to be cont'd)

(cont'd)

1.	2.	3.	4.	5.
21.	The Nar Agri. Multipurpose Coop. Society Ltd. Quetta.	Quetta	20	Agricultural Multipurpose
22.	The Kachibaig Multipurpose Coop. Society Ltd. Kachibaig.	Quetta	22	--do--
23.	The Sariab Multipurpose Coop. Society Ltd. Sariab	Quetta	11	--do--
24.	The Shah Multipurpose Coop. Society Kerani Quetta	Quetta	12	--do--
25.	The Azad Multipurpose Coop. Society Ltd. Ahmad Khanzai Quetta	Quetta	22	--do--
26.	The Rind Multipurposes Coop. Society Ltd. Brori Quetta	Quetta	15	--do--
27.	The Domar Multipurposes Coop. Society Killi Haji Barkat	Quetta	20	--do--
28.	The Nawan Killi Mulpurpose Coop. Society Killi Kotwal Quetta	Quetta	11	--do--
29.	The Ahmad Nawaz Multipurpose Coop. Society Ltd. No-Hissar	Quett	30	--do--
30.	The Lehri Multipurpose Coop. Society Ltd. Ghosabad	Quetta	15	--do--
31.	The Spainzer Multipurpose Coop. Society Ltd. Smungli	Quetta	14	--do--
32.	The Insaf Multipurpose Coop. Society Ltd. Kuchlak	Quetta	12	--do--
33.	The Ahmad Khanzai Multipurpose Coop. Society Ltd. Ahmad Khanzai Sariab	Quetta	12	--do--
34.	The Killi Shabo Multipurpose Coop. Society Killi Shabo Quetta	Quetta	20	--do--
35.	The Taj Multipurpose Coop. Society Ltd. Chashma Achozai	Quetta	15	--do--
36.	The Kambrai Multipurpose Coop. Society Ltd. Killi Kambrani Quetta	Quett	16	--do--
37.	The Samli Multipurpose Coop. Society Ltd. Killi Samli Kuchlak	Quetta	16	--do--
38.	The Sher Multipurpose Coop. Society Ltd. Smungli	Quetta	12	--do--
39.	The Babur Multipurpose Coop. Society Ltd. Sariab Quetta	Quetta	15	--do--
40.	The Kurd Multipurpose Coop. Society Ltd. Shamozaai Sariab	Quett	24	--do--

(to be cont'd)

(cont'd)

1.	2.	3.	4.	5.
41.	The Yakh Aab Multipurpose Coop.Society Ltd. Sariab	Quetta	11	Multipurpose Agriculture
42.	The Rural Multipurpose Coop.Society Ltd. Panjgur	Panjgur	72	-do-
43.	The Green Multipurpose Coop. Society Ltd. Quetta	Quetta	16	-do-
44.	The United Multipurpose Coop.Society Ltd. Quetta	Quetta	12	-do-
45.	The Rehman Kareze Multipurpose Coop. Society Ltd. Rehman Kareze Kuchlak	Quetta	15	-do-
46.	The Viala Katair Multipurpose Coop. Society Ltd. Viala Katair Kuchlak	Quetta	12	-do-
47.	The Quetta Cantt.Dairy Farming Coop. Society Ltd. Quetta Cantt.	Cantt.	11	Dairy Farming (Livestock)
48.	The Baluchistan Poultry Growers and Multipurpose Coop. Society Ltd. Quetta	Quetta	11	Poultry Grower (Livestock)
49.	The Tareen Shore Tubewell Coop.Society Ltd. Tareen Shore.	Quetta	14	Agricultural(T/Wells)
50.	The Killi Naik Mohammad Tubewell Coop. Society Ltd. Killi Naik Mohammad	Quetta	12	-do-
51.	The Zamindara Tubewell Coop. Society Ltd. Kuchlak	Quetta	11	-do-
52.	The Bangalzai Coop. Tubewell Society Ltd. Killi Ismail	Quetta	12	-do-
53.	The Domar Tubewell Coop. Society Ltd. Kuchlak	Quetta	12	-do-
54.	The Killi Sofiaman Coop.Tubewell Society Ltd. Killi Sofiaman	Quetta	14	-do-
55.	The Nasir Tubewell Coop. Society Ltd.Quetta	Quetta	15	-do-
56.	The Sardaran Tubewell Coop.Society Ltd. Killi Sardaran	Quetta	12	-do-
57.	The Chashma Karani Tubewell Coop. Society Ltd. Chashma Karani	Quett	16	-do-
58.	The Greebabad Tubewell Coop.Society Ltd. Greebabad	Quetta	16	-do-
59.	The Killi Azeem Tubewell Coop.Society Ltd. Killi Azeem Kuchlak	Quetta	12	-do-
60.	The Sanjar Tubewell Coop.Society Ltd. Killi Sanjar Kuchlak	Quetta	12	-do-
61.	The Smungli Tubewell Coop.Society Ltd. Killi Smungli, Quetta	Quetta	24	Agricultural (Tubewell)
62.	The New Jatak Tubewell Coop.Society Ltd. Shamozaï Sariab	Quetta	14	-do-
63.	The Hamdard Tubewell Coop.Society Ltd. Ltd. Kachibaig Sariab	Quetta	12	-do-
64.	The New Shah Tubewell Coop.Society Ltd. Shamozaï Sariab	Quetta	12	-do-

TABLE A-2.3.2 Agricultural Research Institute (Baluchistan)

No.	N a m e	Area in ha
1.	Orchard Development Programme (FAO) Quetta (All Fruits)	
2.	Nursary Demonstration Farm (FAO) Quetta	113
3.	Agriculture Research Centre Quetta	
4.	Potato and Vegetable Seed Production Farm Quetta	18
5.	Potato Seed Farm at Pishin	3
6.	Cereal Seed Production Farm Sibi	51
7.	Cereal Seed Production Farm Gandawa	1268
8.	Agricultural Training Institute Baleli, Quetta	12
9.	Development of Floriculture in Baluchistan, Quetta	1
10.	Arid Zone Research Centre, Quetta	5
11.	Fruit Development with Highly Salined Water, Experimental Farm Mastung.	4
12.	Vegetable and Other Crop Seed Production Farm Mastung	10
13.	Development of Floriculture Shahi Bagh, Mastung	11
14.	Saffran and Fruit Experimental Farm Mastung	21
15.	Fruit Experimental Station at Khuzdar (Almond and Pomegranate)	3
16.	Fruit Experimental Research Farm Ziarat (Apple)	10
17.	Fruit Experimental Research Farm at Loralai (Apple, Pomegranate and Pistachio)	10
18.	Fruit Experimental Station at Pishin (Apricot & Grapes)	8
19.	Installation of Trickle Irrigation on 100 Acres at Uthal	41
20.	Date Farm Turbat	41
21.	Katra Farm at Kachhi	5
22.	Seed Farm Usta Mohammad	114
23.	Vegetable Seed Farm Dhadar	12
24.	Modle Farm Sibi	8
25.	Fruit Research Farm Baghbana	9
26.	Mustafa Kareze Farm Zhob	10
27.	Fruit Experimental Farm at Rani Bagh Sariab Road, Quetta	3
28.	Seed Farm Giddar District Kalat.	595

3. THE STUDY AREA

3.1 Location and General Features

3.1.1 Maps

FIG A-3.1.1 Topographic Maps
FIG A-3.1.2 Geological Maps

3.1.2 Climatological Data

TABLE A-3.1.1 Available Climatological Data

3.1.3 Climatological Data at Killi Kotwal Station

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(published by Survey of Pakistan)

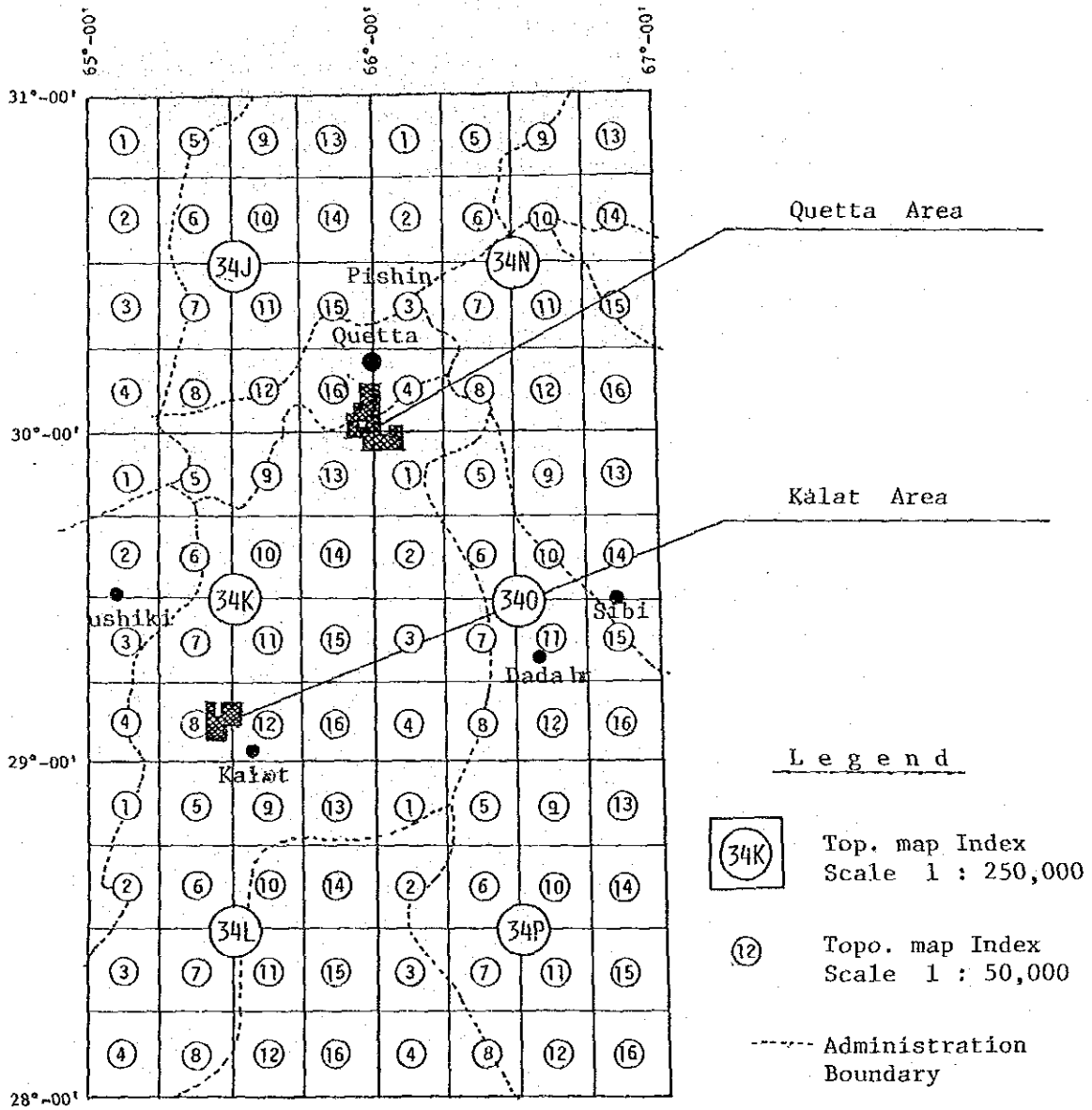
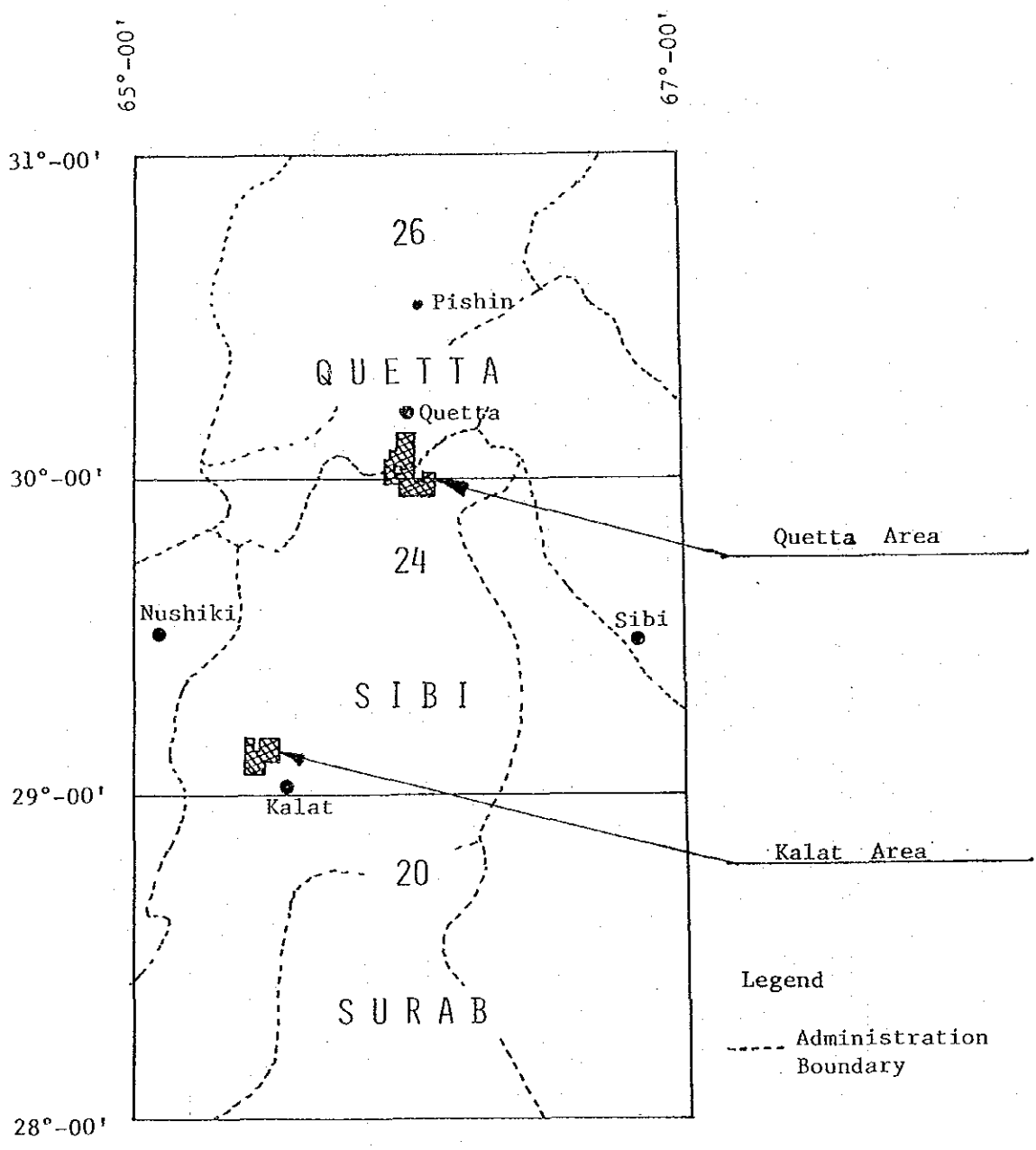


FIG A-3.1.1 Topographic Maps

(Reconnaissance Geology of Part of West Pakistan)
 (Published for the Government of Pakistan)
 by the Government of Canada



all geological maps are prepared at the scale of 1 : 253,440

FIG A-3.1.2 Geological Maps

3.1.2 CLIMATOLOGICAL DATA

TABLE A-3.1.1 Available Climatological Data

Item	Station Name	Killi Kotwal	Quetta Samunli	Quetta Murree Brewery	Sariab	Spezand	Kolpur	Mangochar	Kalat
Locat Altitude (N) tion Longitude (E) Attitude (ASL, m)		30° - 15' 67° - 01'	30° - 11' 67° - 00' 1,589	30° - 12' 67° - 01' 1,673	30° - 05' 66° - 58' 1,719	29° - 58' 67° - 01' 1,766	29° - 54' 67° - 08' 1,798	29° - 22' 66° - 37' 1,766	29° - 02' 66° - 35' 2,017
Opened/Closed Year	1870 -	1944 -	1888 - 1972	1900 - 1972, 1975 -	1903 - 1953, 1975 -	1891 - 1954	1912 -	1876 - 1984 -	
Operation Agency	WAPDA	MET	MET	PRO/MET, WAPDA	PRO/MET, WAPDA	PRO/MET	PROV/MET	MET	
Precipitation	Hourly Daily Monthly	1971 - 1979 1970 - 1986 1970 - 1986	* 1976 - 1985 1974 - 1985	* * 1910 - 1972	* * 2 1910 - 1986	* * 1910 - 1950	* * 1910 - 1950	* * 1912 - 1985	* * 1910 - 1970
Evaporation	Daily Monthly	1970 - 1986 1970 - 1986	* *	* *	* *	* *	* *	* *	* *
Temperature	Daily Monthly	1971 - 1986 1971 - 1986	* 1974 - 1985	* *	* *	* *	* *	* *	* *
Relative Humidity	Daily Monthly	1971 - 1986 1971 - 1986	* 1974 - 1985	* *	* *	* *	* *	* *	* *
Wind Speed	Daily Monthly	1971 - 1974 1971 - 1974	* *	* *	* *	* *	* *	* *	* *

3.1.3 CLIMATOLOGICAL DATA
AT KILLI KOTWAL STATION

TABLE A-3.1.2(1) Monthly Precipitation

(Unit : mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1970	—	—	—	—	—	—	—	—	—	0.0	0.0	6.1	—
1971	6.1	20.3	10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	50.3
1972	59.7	12.4	63.0	39.1	19.1	22.4	29.5	0.0	0.0	0.0	6.7	7.1	259.0
1973	41.7	18.3	4.6	5.3	0.0	0.0	39.1	0.0	0.0	0.0	0.0	—	—
1974	—	—	—	12.4	0.0	0.0	0.0	0.0	1.0	0.0	0.0	48.8	—
1975	69.9	43.7	34.8	16.3	0.0	0.0	2.3	67.6	0.0	0.0	0.0	10.9	245.5
1976	25.9	55.1	113.8	21.3	0.0	0.0	0.0	0.0	0.0	0.0	—	3.6	—
1977	56.4	3.0	1.8	16.5	4.6	16.5	68.1	0.0	0.0	0.0	19.3	20.3	206.5
1978	38.4	34.3	10.2	30.7	0.0	0.0	104.4	2.5	0.0	0.0	0.0	6.4	226.9
1979	26.7	62.2	81.8	3.8	0.0	—	0.0	0.0	0.0	0.0	0.0	48.3	—
1980	63.5	33.8	58.9	0.0	0.0	40.4	0.0	0.0	0.0	14.0	7.9	25.4	243.9
1981	75.7	91.9	33.5	2.5	14.7	0.0	0.0	0.0	0.0	1.8	0.0	2.3	222.4
1982	66.3	102.1	128.0	4.3	15.0	0.0	0.0	24.9	0.0	29.0	17.3	80.3	467.2
1983	36.8	4.6	56.4	59.4	24.1	0.0	1.3	39.9	0.0	0.0	0.0	26.7	249.2
1984	27.7	9.1	27.4	8.9	0.0	20.3	0.0	0.0	0.0	0.0	0.0	39.4	132.8
1985	34.8	0.0	2.3	45.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.3	116.9
1986	14.7	43.9	45.7	0.0	0.0	0.0	0.0	85.6	0.0	0.0	20.3	10.4	220.6
ΣT	644.3	534.7	673.1	266.0	77.5	99.6	244.7	220.5	1.0	44.8	71.5	383.3	2641.2
Mean	43.0	35.6	44.9	16.6	4.8	6.6	15.3	13.8	0.1	2.6	4.5	24.0	220.1

Note : "—" indicates no data available
Source : WAPDA, Surface Water Hydrology Project

TABLE A-3.1.2(2) Monthly Evaporation

(Unit : mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1970	--	--	--	--	--	--	--	--	--	--	--	93.7	--
1971	73.9	119.8	232.9	371.3	495.2	534.0	527.5	460.0	348.7	251.2	160.0	116.6	3691.1
1972	66.8	67.8	147.6	227.6	385.1	449.1	454.9	424.7	351.0	279.7	184.9	85.9	3125.1
1973	42.9	69.5	137.4	243.3	248.1	313.6	318.5	359.9	259.5	243.5	216.9	--	--
1974	--	--	--	--	--	--	--	--	--	--	--	--	--
1975	--	--	--	--	--	--	--	--	--	--	--	--	--
1976	63.0	54.6	93.5	181.1	320.8	365.0	351.3	320.6	257.6	232.9	*131.4	75.2	2447.0
1977	52.3	70.4	173.7	245.1	334.0	376.9	356.9	332.7	266.5	211.3	124.7	*167.9	2712.4
1978	68.1	74.9	145.5	244.1	361.6	381.5	343.9	341.1	261.1	182.1	141.5	98.6	2644.0
1979	61.2	82.9	100.8	217.4	350.0	*431.4	*386.5	*341.6	*241.0	184.9	94.0	60.5	2552.2
1980	54.9	82.3	136.9	219.5	315.0	326.9	355.6	325.4	275.1	207.5	130.0	101.3	2530.4
1981	62.2	81.3	144.0	211.8	315.2	375.4	396.7	306.1	231.5	155.1	112.5	84.6	2476.4
1982	47.0	33.3	56.1	152.4	274.3	325.4	355.1	276.6	250.2	165.9	106.2	52.1	2094.6
1983	* 60.9	77.0	105.7	138.4	286.5	356.6	316.2	270.5	268.2	189.2	134.9	66.0	2270.1
1984	59.4	78.7	162.8	218.7	281.4	321.8	316.0	315.0	255.8	190.0	162.8	65.0	2427.4
1985	52.3	126.0	*191.1	187.2	298.2	339.9	342.6	301.2	207.5	275.1	126.0	90.2	2537.3
1986	* 71.4	79.2	121.4	211.3	279.7	340.6	338.8	292.3	245.9	221.2	123.4	66.3	2391.5
ΣT	836.3	1097.7	1949.4	3069.2	4545.1	5238.1	5160.5	4667.7	3719.6	2989.6	1949.2	1130.2	--
Mean	59.7	78.4	139.2	219.2	324.7	374.2	368.6	333.4	265.7	213.5	139.2	86.9	2607.7

Notes : "--" indicate no data available
 "*" indicates numbers estimated by incomplete data
 Source : WAPDA, Surface Water Hydrology Project

TABLE A-3.1.2(3) Monthly Mean Maximum Temperature (Unit : °C)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1970	—	—	—	—	—	—	—	—	—	—	19.4	14.4	—
1971	10.0	*14.4	*21.7	27.2	32.2	36.1	35.0	*34.4	28.9	23.9	19.4	16.1	*24.9
1972	9.4	6.0	16.6	22.2	27.7	33.3	33.9	*32.2	30.0	*24.5	*20.1	10.0	*22.2
1973	4.5	12.1	15.5	25.4	31.1	35.5	34.6	35.0	31.3	24.2	19.8	—	—
1974	—	—	—	—	—	—	—	—	—	—	—	—	—
1975	—	—	—	—	—	—	—	—	—	—	—	—	—
1976	12.2	11.0	13.3	21.6	28.8	33.0	34.4	32.6	29.1	24.8	17.1	12.3	22.5
1977	8.8	13.3	22.6	24.6	29.1	33.7	35.2	33.7	29.5	26.3	19.9	*17.0	*24.5
1978	—	—	—	—	—	—	—	—	—	—	—	—	—
1979	* 9.2	12.3	13.4	25.9	25.9	33.6	35.5	32.4	30.7	24.9	14.6	10.8	*22.4
1980	7.8	12.1	15.7	25.5	30.2	33.8	35.1	33.4	30.0	21.1	—	*11.8	—
1981	8.7	11.2	16.1	24.5	28.9	31.2	33.4	32.8	29.0	20.2	17.0	12.9	22.2
1982	* 9.2	7.2	11.4	21.3	27.2	32.6	33.8	33.0	28.4	21.4	15.5	9.2	*20.9
1983	* 8.9	9.8	13.3	19.0	30.5	34.9	35.5	33.4	31.6	22.9	19.2	10.9	*22.5
1984	8.2	8.6	18.7	24.8	30.6	35.9	34.3	34.4	29.0	21.9	18.7	10.5	23.0
1985	8.3	15.5	*21.2	23.0	29.9	34.8	35.6	33.4	24.5	30.6	15.9	12.5	*23.8
1986	* 8.3	9.8	13.7	24.8	27.5	34.6	34.1	31.2	29.3	*27.0	18.1	10.2	*22.4
ΣT	113.5	143.3	213.2	309.8	379.6	443.0	450.4	431.9	381.3	313.7	234.7	158.6	—
Mean	8.7	11.0	16.4	23.8	29.2	34.2	34.6	33.2	29.3	24.1	18.1	12.2	22.8

Notes : "—" indicates no data available
 "*" indicates numbers estimated by incomplete data
 Source : WAPDA, Surface Water Hydrology Project

TABLE A-3.1.2(4) Monthly Mean Minimum Temperature

(Unit : °C)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1970	—	—	—	—	—	—	—	—	—	—	3.3	-0.6	—
1971	-3.3	* 0.9	* 6.3	12.8	16.7	21.7	21.1	*20.8	13.3	6.7	5.0	1.1	*10.3
1972	*-0.7	-4.6	5.0	9.4	14.4	18.9	20.6	*17.7	13.3	*13.1	*11.4	3.9	*10.2
1973	-3.4	2.4	6.3	11.7	18.6	21.9	11.5	22.1	16.9	9.3	19.8	—	—
1974	—	—	—	—	—	—	—	—	—	—	—	—	—
1975	—	—	—	—	—	—	—	—	—	—	—	—	—
1976	0.2	1.5	4.1	9.3	14.8	17.3	21.0	18.8	14.9	11.1	1.6	0.1	9.6
1977	-1.0	0.1	7.8	11.3	15.5	19.3	21.5	19.1	13.5	11.5	6.1	* 4.1	*10.7
1978	—	—	—	—	—	—	—	—	—	—	—	—	—
1979	* 1.0	1.5	4.2	12.3	12.8	18.6	21.2	18.7	14.4	11.4	3.5	1.5	*10.1
1980	-0.2	1.8	5.0	11.4	15.8	19.6	21.1	19.4	15.0	8.6	—	* 2.5	—
1981	1.0	2.4	7.2	12.2	16.0	17.5	21.2	19.8	15.7	7.8	3.6	1.6	10.5
1982	* 0.8	0.7	4.4	9.7	14.5	18.5	21.3	20.6	15.0	10.1	5.9	2.0	*10.3
1983	* 0.9	1.6	4.6	8.6	17.3	21.9	23.4	21.7	17.9	8.9	5.7	2.1	*11.2
1984	0.2	-0.4	7.5	12.2	17.5	21.5	23.2	22.5	15.8	8.0	6.6	1.4	11.3
1985	0.6	3.6	* 9.0	12.1	16.0	20.4	23.1	22.3	10.5	16.0	3.5	3.0	*11.7
1986	*-0.1	2.2	5.3	12.9	14.7	23.9	21.9	19.9	16.1	13.2	8.3	0.4	*11.6
ΣT	-4.0	13.7	76.7	145.9	204.6	261.0	272.1	263.4	192.3	135.7	84.3	23.1	—
Mean	-0.3	1.1	5.9	11.2	15.7	20.1	20.9	20.3	14.8	10.4	6.5	1.8	10.2

Notes : "—" indicates no data available
 "*" indicates numbers estimated by incomplete data
 Source : WAPDA, Surface Water Hydrology Project

TABLE A-3.1.2(5) Monthly Relative Humidity

(Unit : %)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1970	—	—	—	—	—	—	—	—	—	—	—	—	—
1971	60.9	46.3	37.9	39.5	39.4	41.4	43.7	48.6	42.7	42.9	54.4	56.2	46.2
1972	70.4	68.6	59.0	49.3	38.3	37.5	36.4	41.6	38.8	52.0	57.2	72.0	51.8
1973	55.0	67.6	45.7	36.5	26.7	26.0	43.2	43.2	37.2	46.8	53.2	—	—
1974	—	—	—	—	—	—	—	—	—	—	—	—	—
1975	—	—	—	—	—	—	—	—	—	—	—	—	—
1976	58.3	56.6	57.7	42.9	27.6	27.0	42.2	37.7	37.3	35.7	36.5	50.4	42.5
1977	55.6	48.7	34.4	32.7	25.4	33.4	41.6	37.4	32.9	36.1	41.6	35.6	38.0
1978	57.3	58.4	50.3	41.4	36.3	31.5	54.4	44.1	37.0	43.0	43.6	45.6	45.2
1979	57.1	55.0	57.8	42.9	26.6	26.5	33.1	38.7	34.7	36.2	41.5	52.8	41.9
1980	54.7	54.6	52.9	38.2	34.3	34.5	40.2	36.3	36.9	40.8	42.2	50.3	43.0
1981	65.5	59.8	51.9	43.1	37.2	32.1	41.2	42.1	37.7	47.4	43.6	46.9	45.7
1982	59.5	63.8	62.5	41.8	34.7	24.6	31.6	37.6	28.2	41.1	48.6	62.0	44.7
1983	58.3	58.2	50.3	50.0	35.9	32.2	40.6	50.0	37.6	32.7	32.3	52.6	44.2
1984	61.3	59.4	51.9	41.2	34.4	31.4	45.2	43.8	34.5	33.7	35.7	55.3	44.0
1985	60.7	39.9	44.4	44.8	28.8	31.6	45.7	39.6	43.8	40.0	30.6	48.1	41.5
1986	60.4	60.8	51.7	34.0	28.2	30.2	31.5	38.8	26.3	36.2	44.3	58.8	41.8
ΣT	835.0	797.7	708.4	578.3	453.8	439.9	570.6	579.5	505.6	564.6	605.3	686.6	2641.2
Mean	59.6	57.0	50.6	41.3	32.4	31.4	40.8	41.4	36.1	40.3	43.2	52.8	43.9

Note : "—" indicates no data available
 * indicates estimated based on incomplete data
 Source : WAPDA, Surface Water Hydrology Project

3.1.4 MEAN MONTHLY PRECIPITATION

TABLE A-3.1.3(1) Quetta Samungli

(Unit : mm)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1974	61.0	96.0	1.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	171.0
1975	73.0	41.0	53.0	4.0	0.0	0.0	24.0	41.0	-	0.0	10.0	6.0	-
1976	31.2	74.4	127.8	24.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	265.2
1977	91.5	6.0	0.6	10.4	16.0	19.2	48.1	14.0	0.0	0.0	25.2	8.6	239.6
1978	68.0	58.3	18.2	16.5	0.0	0.0	121.8	1.1	0.0	0.0	24.1	10.5	318.5
1979	66.7	20.5	9.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	1.0	34.9	132.6
1980	69.9	30.0	95.5	2.7	0.0	5.2	0.0	0.0	0.0	24.8	13.1	3.6	244.8
1981	109.9	105.1	63.5	0.0	17.0	0.0	2.0	0.0	0.0	13.0	0.0	35.0	345.5
1982	178.0	189.2	232.4	30.4	23.0	0.0	0.0	50.0	0.0	68.8	16.0	162.0	949.8
1983	61.0	61.0	68.1	148.0	29.0	0.0	22.0	173.0	0.0	0.0	0.0	71.2	633.3
1984	48.2	19.4	40.5	5.8	0.0	0.0	0.0	1.3	0.0	0.0	0.0	18.0	133.2
1985	54.6	0.0	78.0	88.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.7	257.1
Σ T	913.0	700.9	787.8	333.9	87.0	24.4	217.9	280.4	0.0	106.6	89.4	401.3	3690.6
Mean	76.1	58.4	65.7	27.8	7.3	2.0	18.2	23.4	0.0	8.9	7.5	33.4	335.5

Note : "-" indicates no data available

Source : Meteorological Department, Karachi (1976-1985)

Directorate General of Agriculture Department, GOB, Agricultural Statistics Baluchistan (1974-1975)

TABLE A-3.1.3(2) Quetta Murree Berwary

(Unit : mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1921	13.5	5.1	0.0	16.8	0.0	0.0	0.5	19.3	0.0	7.6	7.6	80.5	150.9
1922	33.3	33.3	35.6	2.0	3.0	0.0	0.0	0.0	0.0	0.0	0.3	23.1	130.6
1923	66.0	42.9	30.7	16.5	6.1	0.0	0.0	19.6	0.0	10.7	0.0	3.3	195.8
1924	50.5	62.2	18.5	73.2	16.7	0.0	0.0	3.3	0.8	0.0	0.0	52.1	277.3
1925	11.2	8.9	24.6	0.0	17.5	3.3	9.7	12.2	0.0	9.7	1.8	3.0	101.9
1926	45.2	45.2	78.5	18.5	41.4	0.0	4.1	2.3	17.0	0.0	0.0	33.5	285.7
1927	18.0	51.3	14.5	3.0	0.0	0.0	22.4	0.0	0.0	0.0	0.0	28.7	137.9
1928	37.1	56.9	72.6	4.6	0.3	0.0	4.1	0.3	0.8	0.0	30.0	21.8	228.5
1929	20.1	80.0	1.3	6.6	0.3	0.0	21.1	0.0	0.0	0.0	0.0	70.9	200.3
1930	69.3	20.8	12.4	55.6	0.8	12.7	56.9	0.0	0.0	4.6	3.8	5.3	242.2
1931	56.4	127.8	48.0	26.2	11.2	0.8	0.0	0.0	0.0	0.0	1.0	7.4	278.8
1932	10.4	16.3	31.2	7.6	9.7	0.0	52.3	18.0	0.0	0.0	0.0	10.7	156.2
1933	41.4	39.1	34.3	29.0	21.8	0.0	63.5	14.2	0.0	0.0	1.8	6.9	252.0
1934	21.3	3.0	27.4	8.4	4.1	67.6	0.5	0.0	0.0	0.0	0.0	94.0	226.3
1935	41.7	104.1	15.7	69.1	12.4	4.3	11.7	8.4	1.0	3.0	7.1	25.7	304.2
1936	50.0	87.1	17.8	4.8	30.7	3.0	0.3	0.0	0.0	0.0	0.0	112.8	306.5
1937	37.3	89.9	37.8	11.7	10.4	0.0	39.0	0.0	0.0	0.0	1.5	3.6	231.2
1938	128.5	33.8	29.7	28.4	0.0	0.3	21.1	2.3	0.0	0.0	7.6	10.9	262.6
1939	39.6	154.2	93.0	16.8	11.9	14.5	1.3	0.0	0.0	0.0	0.0	24.1	355.4
1940	91.4	68.3	44.5	13.2	5.6	8.1	3.3	0.0	3.6	0.0	2.5	9.4	249.9
1941	43.2	8.6	24.6	27.2	5.3	0.0	0.0	0.0	0.0	0.0	0.0	25.7	134.6
1942	105.2	50.5	17.5	0.3	0.8	2.8	21.3	0.3	0.0	1.5	1.3	51.8	253.3
1943	103.6	8.6	45.2	18.0	18.8	3.8	0.0	0.0	0.0	0.0	0.0	14.5	212.5
1944	88.6	101.1	87.1	11.7	26.4	0.0	13.7	16.5	0.0	0.0	9.1	23.6	377.8
1945	58.7	7.1	6.9	19.8	2.0	0.0	77.5	0.0	0.0	0.0	17.3	28.4	217.7
1946	29.5	19.1	32.3	1.8	0.0	5.8	0.0	51.8	0.0	2.5	0.0	21.6	164.4
1947	49.3	50.3	44.2	24.9	9.9	0.0	2.5	0.5	0.0	0.0	0.0	25.1	206.7
1948	11.9	53.8	33.3	21.3	0.0	1.5	2.8	0.3	0.0	8.1	0.0	26.4	159.4
1949	6.1	26.9	109.5	7.4	0.0	0.0	0.0	49.0	0.0	0.0	0.0	6.1	205.0
1950	80.8	43.4	79.8	22.1	5.1	0.0	34.8	1.3	0.0	0.0	0.0	2.0	269.3
Σ 1	1459.1	1499.6	1148.5	566.5	272.2	128.5	464.4	219.6	23.2	47.7	92.7	852.9	6774.9

(to be cont'd)

(cont'd)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1951	9.7	47.2	87.6	35.1	25.7	0.0	0.0	19.8	0.0	0.8	1.5	8.6	236.0
1952	55.9	66.5	14.7	9.9	0.5	2.3	7.6	0.0	0.0	2.8	0.8	19.1	180.1
1953	36.3	59.2	0.3	9.7	38.4	0.0	6.6	9.1	0.0	0.0	4.8	0.3	164.7
1954	48.8	148.3	21.8	12.2	3.8	0.0	1.8	0.0	0.0	0.0	3.0	0.5	240.2
1955	54.1	2.0	33.8	3.3	14.0	0.0	0.0	15.6	0.3	0.0	0.0	43.2	166.3
1956	41.7	23.9	90.9	28.2	0.0	8.9	182.1	5.6	0.0	3.0	0.0	2.3	386.6
1957	112.0	15.5	68.1	43.2	15.6	0.0	0.0	0.0	0.0	—	38.4	80.3	—
1958	23.4	27.4	23.6	6.9	10.4	0.0	0.0	0.0	0.0	0.0	0.0	46.0	137.7
1959	20.3	87.9	19.1	19.8	13.5	0.8	67.3	88.4	6.1	0.0	48.3	37.3	408.8
1960	49.3	9.7	45.2	39.6	5.6	0.8	6.1	0.0	0.0	0.0	0.0	11.4	167.7
1961	18.8	26.4	8.1	61.5	10.9	1.0	29.0	10.2	0.0	0.0	3.8	34.3	204.0
1962	0.5	14.5	73.4	33.5	1.3	0.0	0.0	0.0	0.0	0.0	0.0	15.7	138.9
1963	0.0	27.4	23.9	41.9	39.9	0.0	0.0	0.0	—	0.0	0.0	9.4	—
1964	85.9	11.7	38.1	28.2	0.3	0.0	8.6	0.0	—	0.0	0.0	7.1	—
1965	49.0	15.0	17.3	118.9	0.0	0.0	2.5	0.0	0.0	0.0	25.4	38.4	266.5
1966	3.8	52.3	10.2	38.9	0.0	0.0	25.1	0.0	0.0	10.4	0.0	0.0	140.7
1967	0.0	98.0	62.7	24.6	1.0	0.0	2.8	0.0	0.0	0.0	2.0	37.6	228.7
1968	53.6	62.2	11.9	6.1	4.6	0.0	11.2	0.0	0.0	0.0	0.0	48.3	197.9
1969	30.2	21.6	***	25.9	15.2	—	20.3	0.0	0.0	0.0	2.5	7.1	—
1970	29.2	15.7	44.7	1.3	0.0	0.0	0.0	4.6	7.6	0.0	—	—	—
Σ 2	722.5	832.4	695.4	588.7	200.7	13.8	371.0	153.3	14.0	17.0	130.5	446.9	3264.8
Σ T	2181.6	2332.0	1843.9	1155.2	472.9	142.3	835.4	372.9	37.2	64.7	223.2	1299.8	—
Mean	43.6	46.6	37.6	23.1	9.5	2.9	16.7	7.5	0.8	1.3	4.6	26.5	223.1

Note : "—" indicates no data available

Source : UNDP/WAPDA, Report on the Hydrometeorology of Baluchistan, UNPD-PAK/73/032, July 1980

TABLE A-3.1.3(3) Kalat

(Unit : mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1911	91.4	15.2	40.9	1.0	3.8	0.0	0.0	11.4	0.0	0.0	37.3	12.5	213.5
1912	12.5	0.0	1.3	49.8	9.4	0.0	15.2	7.9	0.0	0.0	1.0	34.3	131.4
1913	12.5	42.7	34.3	0.0	0.0	10.2	2.8	11.7	0.0	55.9	159.5	23.9	353.5
1914	38.1	37.6	17.0	31.0	1.0	6.4	67.6	0.0	9.1	60.5	49.0	0.0	317.3
1915	0.0	0.0	28.5	36.8	1.5	0.0	4.6	0.0	0.0	0.0	0.0	10.7	82.1
1916	46.2	19.8	13.0	15.0	12.7	0.0	3.1	61.0	0.0	0.0	0.0	0.0	170.8
1917	23.4	0.0	72.6	3.6	1.0	0.0	0.0	16.5	19.8	0.0	0.0	9.7	146.6
1918	0.0	2.3	62.0	6.1	2.3	0.0	0.0	0.0	0.0	0.0	0.0	32.3	105.0
1919	0.0	19.6	16.8	11.9	3.6	0.0	19.3	22.6	0.0	0.0	0.0	31.0	124.8
1920	19.6	27.7	34.0	0.0	5.3	0.0	2.3	0.0	0.0	0.0	0.0	4.8	93.7
1921	1.3	0.0	3.8	5.1	0.0	0.0	13.7	43.2	0.0	0.0	21.8	55.9	144.8
1922	29.0	20.6	9.7	0.0	3.3	0.0	4.8	0.0	6.9	0.8	0.0	9.4	84.5
1923	47.0	33.5	22.6	7.1	3.6	0.0	0.0	6.9	0.0	5.8	0.0	0.0	126.5
1924	41.9	76.5	11.7	38.1	7.1	0.0	0.8	5.8	34.0	0.0	0.3	46.7	262.9
1925	3.1	2.0	13.0	0.0	4.1	52.1	13.7	2.8	0.0	6.9	5.1	1.0	103.8
1926	54.9	10.2	17.1	13.7	19.3	1.5	0.0	4.6	19.1	0.0	0.0	25.7	166.1
1927	19.8	44.5	9.7	6.4	0.3	0.0	35.6	0.0	0.0	0.0	0.0	26.4	142.7
1928	22.1	30.0	20.6	4.1	0.8	0.0	3.1	5.6	0.0	0.0	20.1	8.1	114.5
1929	22.4	29.0	0.0	2.3	5.1	0.0	55.9	0.0	0.0	0.0	3.3	66.8	184.8
1930	41.6	12.2	19.6	30.7	1.5	0.3	43.7	0.0	0.0	4.8	0.8	0.8	156.0
1931	28.7	124.5	11.9	9.9	1.8	10.7	0.0	0.0	0.0	0.0	0.3	1.3	189.1
1932	12.5	4.6	53.1	2.3	1.0	0.0	49.5	31.8	0.0	0.0	0.0	7.1	161.9
1933	50.6	21.8	39.4	23.9	7.6	0.0	41.2	19.6	0.0	0.0	0.0	15.2	219.3
1934	15.8	0.0	20.8	21.6	4.6	2.8	4.3	45.5	0.0	0.0	0.0	81.3	196.7
1935	59.2	108.2	15.7	35.8	0.8	3.3	0.5	0.0	0.0	0.0	0.0	0.5	224.0
1936	30.5	71.6	28.7	1.0	15.2	2.0	4.1	0.0	5.1	0.0	0.0	71.9	230.1
1937	34.0	73.9	48.0	20.8	0.8	0.0	34.8	0.0	0.0	0.0	0.0	8.9	221.2
1938	99.6	34.0	5.1	14.2	0.0	3.3	26.7	10.7	0.0	0.0	1.5	16.0	211.1
1939	30.5	129.8	64.8	33.5	0.8	0.0	0.0	0.0	0.0	0.0	0.0	11.2	270.6
ΣT1	888.2	991.8	735.7	425.7	118.3	92.6	447.3	307.6	94.0	134.7	300.0	613.4	5149.3
Mean	30.6	34.2	25.4	14.7	4.1	3.2	16.0	10.6	3.2	4.6	10.3	21.2	177.6

(to be cont'd)

(cont'd)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1940	63.5	56.1	11.4	6.6	8.9	4.3	0.5	0.8	0.0	0.0	3.6	5.3	161.0
1941	17.8	8.6	18.3	23.4	0.0	0.0	5.6	0.0	0.0	0.0	0.0	3.8	77.5
1942	136.7	30.5	22.9	4.1	14.7	9.7	36.3	0.3	0.0	0.3	0.0	30.2	285.7
1943	128.8	3.3	27.4	14.2	7.9	0.0	0.8	4.6	0.3	0.0	0.0	0.0	187.3
1944	96.5	119.6	41.7	4.6	46.2	0.0	55.9	57.7	0.0	0.0	4.8	42.9	469.9
1945	47.8	7.1	4.3	11.4	0.0	3.0	71.6	0.0	0.0	0.0	1.8	13.5	160.5
1946	14.0	11.9	6.9	0.0	0.0	26.2	0.0	42.7	0.0	0.0	0.0	3.6	105.3
1947	33.3	35.3	26.7	14.2	5.1	4.8	4.3	4.6	0.0	0.0	0.0	15.2	143.5
1948	18.8	97.3	89.7	22.4	0.0	19.6	8.9	26.2	0.0	0.0	0.0	7.1	290.0
1949	0.0	21.1	167.4	5.3	0.0	0.0	25.7	14.5	0.0	0.0	0.0	6.4	240.4
1950	177.0	102.6	63.8	15.2	0.0	0.0	48.5	22.9	0.0	0.0	0.0	0.0	430.0
1951	—	50.0	112.8	34.3	8.1	0.0	2.5	17.0	0.0	0.0	13.2	10.9	—
1952	44.2	13.2	17.5	16.3	0.0	1.8	33.3	0.0	0.0	0.0	0.0	26.4	152.7
1953	34.3	50.0	10.2	4.8	9.4	5.1	2.5	77.7	0.0	0.0	0.0	1.0	195.0
1954	54.9	97.0	27.2	14.2	0.0	3.3	3.3	4.1	0.0	8.9	1.3	0.0	214.2
1955	109.2	1.5	18.3	0.0	2.5	0.0	0.0	10.7	0.0	0.0	0.0	12.7	154.9
1956	87.4	5.3	49.3	17.5	0.0	0.0	287.0	7.6	0.0	0.0	0.0	6.4	460.5
1957	106.4	7.6	43.4	40.4	18.0	0.0	0.0	0.0	0.0	0.0	19.3	55.4	290.5
1958	23.6	39.4	2.5	1.3	8.4	2.5	39.4	0.0	0.0	0.0	6.9	32.0	156.0
1959	11.2	55.4	16.0	17.0	22.9	1.3	74.2	25.4	58.2	0.0	39.6	24.4	345.6
1960	32.3	0.0	30.5	46.2	0.0	0.0	31.8	0.0	0.0	0.0	0.0	41.4	182.2
1961	90.7	134.7	19.6	5.1	12.4	0.0	11.2	15.0	2.8	0.0	4.6	29.7	325.8
1962	0.0	4.3	6.6	20.8	0.0	—	3.0	2.0	0.0	0.0	0.0	4.6	—
1963	3.8	7.4	10.9	12.2	29.0	0.0	0.0	1.0	0.0	0.0	7.1	0.0	71.4
1964	114.0	42.9	13.2	0.0	6.1	1.5	20.6	17.0	0.0	0.0	—	0.0	—
1965	48.8	31.8	19.6	47.2	2.5	0.0	0.0	1.8	0.0	0.0	6.4	24.1	182.2
1966	0.0	63.5	57.7	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	122.0
1967	0.0	62.7	—	15.0	0.0	0.0	31.5	0.0	0.0	0.0	0.0	82.8	—
1968	0.0	5.6	1.0	0.3	0.3	0.0	0.0	0.0	15.5	0.0	0.0	4.3	27.0
1969	13.5	6.9	6.6	1.8	5.1	10.7	21.8	0.0	0.0	0.0	0.3	0.0	66.7
Σ12	1508.5	1172.6	943.4	415.8	207.5	93.8	820.2	353.6	76.8	10.0	108.9	484.1	5497.8
Mean	52.0	39.1	32.5	13.9	6.9	3.2	27.3	11.8	2.6	0.3	3.8	16.1	211.5

(to be cont'd)

(cont'd)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1970	69.1	22.9	44.5	44.5	0.0	0.0	2.5	59.7	0.0	0.0	0.0	0.0	243.2
1971	0.0	2.5	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.6
1972	62.0	4.8	67.6	46.5	0.0	0.0	0.0	0.0	—	—	—	—	—
1973	—	—	—	—	—	—	—	—	—	—	—	—	—
1974	4.0	31.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.0
1975	71.0	35.0	18.0	10.0	8.0	0.0	12.0	33.0	0.0	0.0	0.0	3.0	190.0
1976	10.9	65.2	111.2	23.6	0.0	0.0	11.4	0.0	36.0	0.0	0.0	0.0	258.3
1977	—	—	—	0.0	0.0	7.6	0.0	3.0	0.0	0.0	0.0	0.0	—
1978	17.5	33.1	2.8	21.5	0.0	0.0	47.9	0.0	0.0	0.0	0.0	0.0	122.8
1979	0.0	14.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	7.1	0.0	32.1
1981	0.0	14.2	0.0	0.0	0.0	0.0	—	—	—	—	—	—	—
1982	—	—	—	—	—	—	—	—	—	—	—	—	—
1983	—	—	—	—	—	—	—	—	—	—	—	—	—
1984	—	—	—	—	—	—	—	—	—	—	—	—	—
1985	35.2	0.0	4.8	34.3	0.2	0.0	24.3	42.6	0.0	0.0	0.0	25.1	166.5
$\Sigma T3$	269.7	222.9	258.0	180.4	8.2	7.6	98.1	138.3	36.0	25.0	7.1	28.1	1073.7
Mean	24.5	20.3	23.5	15.0	0.7	0.6	8.9	12.6	3.6	2.5	0.7	2.8	119.3
ΣT	2666.4	2387.3	1937.1	1021.9	334.0	194.0	1365.6	799.5	206.8	169.7	416.0	1125.6	—
Mean	38.6	34.1	28.1	14.6	4.7	2.8	19.5	11.4	3.0	6.0	6.1	16.3	183.1

Note : "—" indicates no data available
Sources : UNDP/WAPDA, Report on the Hydrometeorology of Baluchistan, UNDP-PAK/73/032, July 1980
UNDP/WAPDA, Preliminary Hydrogeological Report No. 4 Kalat Area, Shirinab-Pishin Basin, 1978
Meteorological Department, Karachi (1976-1985), Agriculture Census of Baluchistan (1974-1974)
Directorate General of Agriculture Department GOB, Agricultural Statistics Baluchistan 1985-86

TABLE A-3.1.3(4) Sariab

(Unit : mm.)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Niv	Dec	Total
1911	71.1	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	12.7	27.9	11.4	125.6
1912	99.1	9.9	6.4	3.8	7.6	0.0	9.9	0.0	0.0	0.0	0.0	104.6	241.3
1913	8.1	58.9	75.2	0.0	0.0	0.0	5.3	0.0	0.0	4.6	22.1	18.5	192.7
1914	39.1	71.9	30.7	20.3	0.0	26.2	27.9	0.0	1.3	20.3	19.3	26.9	283.9
1915	12.7	7.4	55.9	55.9	0.0	0.0	5.8	0.0	0.0	0.0	0.0	0.8	138.5
1916	57.9	21.6	4.8	30.5	10.2	0.0	0.0	74.2	0.0	0.0	0.0	0.0	199.2
1917	40.9	3.3	43.4	0.0	8.1	0.0	0.0	60.7	16.5	0.0	14.5	8.1	195.5
1918	8.4	54.9	86.1	16.3	0.0	0.0	0.8	10.2	0.0	0.0	0.0	49.5	226.2
1919	20.3	15.7	15.7	18.5	50.3	0.0	4.1	2.0	0.0	0.0	0.0	0.0	126.6
1920	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	3.8
1921	0.0	0.0	0.0	13.5	0.0	0.0	0.0	0.0	1.3	1.5	0.0	35.3	51.6
1922	38.1	0.0	12.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.7	63.5
1923	69.9	0.0	24.1	5.1	22.9	0.0	0.0	43.2	0.0	12.7	0.0	0.0	177.9
1924	90.2	104.1	13.0	53.3	12.7	0.0	0.0	7.6	10.2	0.0	0.0	45.7	336.8
1925	0.0	0.0	12.7	0.0	0.0	22.9	83.8	0.0	0.0	5.6	0.0	0.0	125.0
1926	67.3	34.3	64.8	15.2	0.0	0.0	0.0	10.2	0.0	0.0	0.0	22.9	214.7
1927	10.2	57.9	12.7	0.0	0.0	0.0	26.7	6.4	0.0	0.0	0.0	15.7	129.6
1928	29.0	58.4	38.1	9.4	3.6	0.0	0.0	0.0	0.0	0.0	15.2	22.1	175.8
1929	21.1	36.8	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	39.9	100.3
1930	56.4	0.0	8.1	22.1	0.0	25.4	36.1	0.0	0.0	6.4	0.0	0.0	154.5
1931	35.8	145.8	12.4	30.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	229.8
1932	8.6	21.6	23.4	7.1	5.3	0.0	50.8	12.7	0.0	0.0	0.0	7.4	136.9
1933	25.4	20.3	30.2	35.1	2.8	0.0	43.2	6.4	0.0	0.0	0.0	0.0	163.4
1934	3.8	0.0	30.2	8.6	4.1	71.9	0.0	0.0	0.0	0.0	0.0	77.0	195.6
Σ11	813.4	722.8	600.6	344.7	133.4	146.4	296.9	236.1	29.3	63.8	99.0	502.3	3988.7

(to be cont'd)

(cont'd)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1935	49.5	74.2	7.1	62.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	193.5
1936	9.9	33.0	7.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.6	71.1
1937	12.7	71.6	12.7	0.0	0.0	0.0	31.8	0.0	0.0	0.0	0.0	0.3	129.1
1938	128.3	10.2	22.9	7.6	0.0	0.0	22.4	0.0	0.0	0.0	6.4	8.9	206.7
1939	24.1	116.8	86.4	0.0	5.1	0.0	0.0	0.0	0.0	0.0	0.0	14.2	246.6
1940	71.6	41.9	25.4	23.1	3.0	0.0	10.2	0.0	0.0	0.3	0.0	0.0	175.5
1941	38.1	7.6	10.2	20.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	83.8
1942	30.2	23.6	50.8	0.0	0.0	0.0	7.6	0.0	0.0	0.0	0.0	11.7	123.9
1943	43.7	0	16.5	21.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.8
1944	50.8	88.6	61.5	0.0	19.8	0.0	0.0	13.7	0.0	0.0	9.4	15.2	259.0
1945	15.5	4.6	7.6	11.9	0.0	0.0	25.4	0.0	0.0	0.0	0.0	5.1	70.1
1946	12.7	17.8	26.7	0.0	0.0	0.0	0.0	12.7	0.0	0.0	0.0	25.4	95.3
1947	38.9	35.1	31.5	16.3	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	127.1
1948	0.0	63.5	177.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.0	272.3
1949	0.0	24.1	124.7	0.0	0.0	4.3	0.0	42.2	0.0	0.0	0.0	4.3	199.6
1950	38.9	35.1	15.5	2.5	9.9	0.0	40.1	0.0	0.0	0.0	—	—	—
Σ12	564.9	647.7	684.9	166.0	43.1	4.3	137.5	68.6	0	0.3	15.8	144.3	2335.4
ΣT	1378.3	1370.5	1285.5	510.7	176.5	150.7	434.4	304.7	29.3	64.1	114.8	646.6	6324.1
Mean	34.5	34.3	32.1	12.8	4.4	3.8	10.9	7.6	0.7	1.6	2.9	16.6	162.2

(to be cont'd)

(Sariab Station of WAPDA)

(cont'd)

(Unit : mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1970	—	—	—	—	—	—	—	—	—	—	—	—	—
1971	26.4	15.0	21.1	0.8	1.3	0.0	0.5	0.0	0.0	0.0	0.0	16.0	81.1
1972	83.3	12.2	93.2	60.7	10.2	6.4	2.8	0.0	0.0	0.0	0.5	65.8	335.1
1973	—	—	—	—	—	—	—	—	—	—	—	—	—
1974	—	—	—	11.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	33.0	—
1975	50.0	40.0	67.0	2.0	0.0	0.0	10.0	62.0	33.0	0.0	0.0	11.0	275.0
1976	35.3	59.2	127.8	23.9	4.1	0.0	10.9	0.0	12.4	0.0	0.0	5.1	278.7
1977	71.9	16.0	7.4	27.7	2.5	21.6	16.5	45.2	0.0	0.0	0.0	24.9	233.7
1978	40.6	46.0	19.0	38.9	0.0	0.0	186.9	0.0	0.0	0.0	30.5	1.5	363.4
1979	31.2	91.4	84.8	26.4	0.0	0.0	0.0	16.5	0.0	0.0	0.0	47.5	297.8
1980	53.8	38.1	68.6	0.0	0.0	1.0	0.0	0.0	0.0	26.9	11.4	6.4	206.2
1981	94.2	96.5	87.8	3.6	15.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	299.6
1982	62.2	90.2	124.2	8.6	24.1	0.0	0.0	44.5	0.0	27.2	10.2	78.2	469.4
1983	27.7	15.2	55.1	50.0	25.4	0.0	28.2	77.5	5.1	0.0	0.0	27.9	312.1
1984	13.0	7.6	27.9	7.6	0.0	10.2	2.5	55.9	0.0	0.0	0.0	11.4	136.1
1985	22.9	0.0	2.5	16.0	0.0	0.0	6.4	5.1	0.0	0.0	0.0	14.5	67.4
1986	0.0	34.3	38.1	0.0	0.0	0.0	0.0	45.7	0.0	0.0	2.5	0.0	120.6
ΣT3	612.5	561.7	824.5	277.2	82.6	39.2	264.7	352.4	52.5	54.1	55.1	345.7	3476.2
Mean	43.8	40.1	58.9	18.5	5.5	2.6	17.6	23.5	3.5	3.6	3.7	23.0	248.3
ΣT	1990.8	1932.2	2110.0	787.9	259.1	189.9	699.1	657.1	71.8	118.2	169.4	992.3	9800.3
Ave.	36.8	35.8	39.0	14.3	4.7	3.5	12.2	11.9	1.3	2.1	3.1	18.4	181.5

Notes : " — " indicatea no data available

Source : " ΣT" and "Ave." are numbers combined with data during 1911 to 1950 of the old station
UNDP/WAPDA, Report on the Hydrometeorology of Baluchistan, UNDP-PAK/73/032, July 1980
WAPDA, Surface Water Hydrology Project

TABLE A-3. 1.3(5) Spezand

(Unit : mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1911	20.3	5.1	62.2	2.5	0.0	0.0	0.0	0.0	0.0	7.6	20.3	4.1	122.1
1912	196.9	5.6	3.3	15.5	0.0	0.0	20.6	0.0	0.0	0.0	0.0	34.0	275.9
1913	15.0	88.9	27.9	0.0	0.0	0.0	21.6	3.0	0.0	3.3	7.4	17.8	184.9
1914	20.3	53.3	15.2	18.8	0.0	1.5	21.6	0.0	12.7	14.6	15.2	0.0	173.2
1915	20.8	6.9	31.0	48.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	107.2
1916	21.8	31.2	0.0	15.2	10.2	0.0	0.0	24.9	0.0	0.0	0.0	0.0	103.3
1917	73.7	0.0	35.6	0.0	7.6	0.0	0.0	15.7	7.6	0.0	12.7	12.7	165.6
1918	7.6	21.6	71.1	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	35.6	136.7
1919	5.1	20.3	5.1	7.6	25.4	0.0	0.0	0.0	0.0	0.0	0.0	6.9	70.4
1920	13.0	41.9	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	78.0
1921	14.0	7.4	0.0	6.4	0.0	0.0	4.1	16.3	0.0	1.8	10.2	44.2	104.4
1922	21.3	20.6	20.3	5.6	0.0	0.0	0.0	0.0	3.3	0.0	0.0	26.4	97.5
1923	64.3	19.6	31.0	15.5	10.7	0.0	0.0	20.1	0.0	8.9	0.0	0.0	170.1
1924	23.6	68.6	3.3	52.3	12.2	0.0	0.0	9.7	15.7	0.0	0.0	18.3	203.7
1925	0.0	0.0	0.0	0.0	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1
1926	28.7	24.1	60.2	15.2	3.0	0.0	0.0	0.0	0.0	0.0	0.0	18.3	149.5
1927	25.4	45.7	0.0	0.0	0.0	0.0	15.7	0.0	0.0	0.0	0.0	20.8	107.6
1928	18.3	29.7	53.8	2.5	2.0	0.0	0.0	0.0	0.0	0.0	13.5	32.0	151.8
1929	22.9	43.2	0.0	0.0	0.0	0.0	10.7	0.0	0.0	0.0	0.0	31.2	108.0
1930	0.0	0.0	0.0	7.4	0.0	0.0	32.3	0.0	0.0	0.0	0.0	0.0	39.7
1931	29.5	55.9	13.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.6
1932	0.0	10.2	19.3	0.0	0.0	0.0	36.6	3.3	0.0	0.0	0.0	5.8	75.2
1933	21.3	20.8	17.8	3.8	0.0	0.0	35.6	0.0	0.0	0.0	0.0	0.0	99.3
1934	15.2	0.0	23.6	0.0	0.0	15.2	0.0	0.0	0.0	0.0	0.0	55.9	109.9
Σ 1	679.0	620.6	511.9	216.8	76.2	16.7	199.6	93.0	39.3	36.2	79.3	369.1	2937.7

(to be cont'd)

(cont'd)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1935	83.6	19.8	22.4	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	141.8
1936	0.0	17.8	20.3	0.0	17.8	0.0	0.0	0.0	0.0	0.0	0.0	23.1	79.0
1937	14.0	77.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	97.0
1938	113.8	23.1	19.1	24.6	0.0	0.0	31.2	0.0	0.0	0.0	0.0	11.9	223.7
1939	27.4	120.9	107.4	0.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	2.5	267.3
1940	77.0	37.1	27.2	9.1	7.6	0.0	5.3	0.0	0.3	0.0	0.0	3.0	166.6
1941	46.7	11.4	0.0	28.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.2	101.7
1942	115.1	49.8	20.3	0.0	0.0	0.0	20.3	0.0	0.0	0.0	0.0	21.6	227.1
1943	66.0	0.0	35.3	14.5	15.5	0.0	0.0	0.0	0.0	0.0	0.0	0.3	131.6
1944	32.8	97.3	33.3	0.0	0.0	0.0	0.5	11.4	0.0	0.0	8.1	44.5	227.9
1945	97.8	0.0	0.0	0.0	0.0	0.0	88.9	0.0	0.0	0.0	0.0	0.0	186.7
1946	0.0	0.0	0.0	0.0	0.0	20.3	0.0	0.0	0.0	0.0	0.0	7.6	27.9
1947	32.5	34.5	27.2	9.4	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	106.6
1948	0.0	91.4	119.4	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	213.8
1949	32.5	34.5	27.2	9.4	3.0	0.8	7.4	2.5	1.0	1.0	1.8	13.0	134.1
1950	32.5	34.5	27.2	9.4	3.0	0.8	7.4	2.5	1.0	1.0	—	—	—
Σ 2	771.7	649.8	486.3	120.8	62.0	21.9	161.0	16.4	2.3	2.0	9.9	148.0	2332.8
Σ I	1450.7	1270.4	998.2	337.6	138.2	38.6	360.6	109.4	41.6	38.2	89.2	517.1	5270.5
Mean	36.3	31.8	25.0	8.4	3.5	1.0	9.0	2.7	1.0	1.0	2.3	13.3	135.1

(to be cont'd)

(Spezand Station of WAPDA)

(cont'd)

(Unit : mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1970	—	—	—	—	—	—	0.0	—	—	—	0.0	4.3	—
1971	0.0	21.6	17.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.2	54.1
1972	—	—	—	—	—	—	—	—	—	—	—	—	—
1973	—	—	—	—	—	—	—	—	—	—	—	—	—
1974	—	—	—	—	—	—	—	—	—	—	—	—	—
1975	—	—	—	—	—	—	—	—	—	—	—	—	—
1976	26.7	59.7	44.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	132.2
1977	25.4	0.0	0.0	0.0	7.6	17.8	6.4	0.0	0.0	0.0	5.1	1.3	63.6
1978	11.4	38.1	2.5	0.0	0.0	0.0	36.8	6.4	0.0	0.0	5.1	0.0	100.3
1979	14.0	55.9	45.7	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	82.6	204.6
1980	45.7	81.3	116.1	0.0	0.0	15.2	0.0	0.0	0.0	10.2	14.0	5.1	287.6
1981	105.4	121.9	54.4	0.0	48.3	0.0	0.0	0.0	0.0	10.2	0.0	10.2	350.4
1982	76.2	177.8	232.2	8.9	59.9	0.0	0.0	30.5	0.0	27.9	0.0	47.8	661.2
1983	33.0	36.8	44.5	55.9	35.6	0.0	20.3	72.4	0.0	0.0	0.0	45.7	344.2
1984	19.6	14.0	12.7	2.5	0.0	0.0	22.9	12.7	0.0	0.0	0.0	29.7	114.1
1985	15.2	0.0	11.4	71.1	0.0	0.0	15.2	10.2	0.0	0.0	0.0	19.3	142.4
1986	2.5	88.9	66.0	0.0	0.0	0.0	12.7	26.9	0.0	0.0	0.0	5.1	202.1
ΣT3	375.1	696.0	647.3	144.8	151.4	33.0	114.3	159.1	0.0	48.3	24.2	267.6	2654.8
Mean	21.3	58.0	53.9	12.1	12.6	2.8	8.8	13.3	0.0	4.0	1.8	20.6	221.4
ΣT	1825.8	1966.4	1645.5	482.4	289.6	71.6	474.9	268.5	41.6	86.5	113.4	784.7	7927.3
Ave.	35.1	37.8	31.6	9.3	5.6	1.4	9.0	5.2	0.8	1.7	2.1	14.8	154.4

Note : " — " indicatea no data available

" ΣT " and " Ave. " are numbers combined with data during 1911 to 1950 of the old station

Source : UNDP/WAPDA, Report on the Meteorology of Baluchistan, UNDP-PAK/73/032, July 1980

WAPDA, Surface Water Hydrology Project (1970 - 1986)

TABLE A-3.1.3(6) Kolpur

(Unit : mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1911	133.4	6.4	86.9	1.5	0.0	0.0	0.0	26.7	0.0	5.3	65.8	3.8	329.8
1912	246.4	7.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.8	288.1
1913	35.1	50.0	56.1	0.0	0.0	0.0	0.0	5.1	0.0	0.8	14.0	35.1	196.2
1914	13.2	140.7	31.5	26.7	0.0	34.0	123.2	0.0	76.2	120.4	8.6	7.1	581.6
1915	25.2	7.9	11.4	43.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.7
1916	52.3	35.6	0.0	49.5	0.0	0.0	0.0	80.5	0.0	0.0	0.0	0.0	217.9
1917	34.3	0.0	51.8	0.0	0.0	0.0	0.0	84.6	0.0	0.0	0.0	0.0	170.7
1918	0.0	51.6	54.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	106.5
1919	0.0	0.0	27.9	15.0	34.3	0.0	12.2	0.0	0.0	0.0	0.0	27.9	117.3
1920	13.5	25.7	0.0	0.0	27.2	27.9	0.0	0.0	0.0	0.0	0.0	20.6	114.9
1921	1.3	0.0	0.0	0.0	0.0	0.0	13.7	56.9	0.0	0.0	2.3	81.3	155.5
1922	51.3	30.5	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.7	118.1
1923	19.8	1.8	4.6	1.0	0.0	0.0	0.0	0.0	0.0	13.2	0.0	0.0	40.4
1924	55.6	61.0	13.0	35.3	0.0	0.0	0.0	0.0	43.9	0.0	0.0	17.3	226.1
1925	0.0	33.0	12.7	0.0	0.0	0.0	91.9	0.0	0.0	3.6	0.0	0.0	141.2
1926	22.4	34.5	101.6	5.8	4.1	0.0	0.0	0.0	0.0	0.0	0.0	20.6	189.0
1927	0.0	58.7	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	68.1
1928	25.4	15.2	15.2	1.3	0.0	0.0	0.0	0.0	0.0	0.0	18.3	4.6	80.0
1929	24.9	21.6	0.0	0.0	0.0	0.0	53.3	0.0	0.0	0.0	0.0	76.2	176.0
1930	22.9	0.0	0.0	1.0	0.0	1.3	113.5	0.0	0.0	0.0	0.0	0.0	138.7
1931	50.8	41.7	8.9	0.0	5.1	0.0	0.0	0.0	0.0	0.0	0.0	1.3	107.8
1932	0.0	17.8	19.6	0.0	0.0	0.0	73.9	15.5	0.0	0.0	0.0	22.9	149.7
1933	21.1	22.9	41.9	23.9	3.3	0.0	14.0	45.0	0.0	0.0	0.0	0.0	172.1
1934	1.3	0.0	38.1	10.7	0.0	87.1	0.0	4.1	0.0	0.0	0.0	65.5	206.8
Σ 1	850.2	664.5	586.0	214.9	74.0	150.3	495.7	318.4	120.1	143.3	109.0	453.8	4181.2

(to be cont'd)

(cont'd)

(Unit : mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1935	55.4	90.4	9.4	35.1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	193.3
1936	31.8	65.0	1.3	0.0	9.4	0.0	7.6	0.0	0.0	0.0	0.0	76.2	191.3
1937	38.1	102.9	27.9	0.0	10.9	0.0	10.2	0.0	0.0	0.0	0.0	0.0	190.0
1938	25.4	0.0	0.0	0.0	0.0	0.0	38.1	0.0	0.0	0.0	0.0	0.0	63.5
1939	11.9	63.5	90.4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.4	189.2
1940	39.1	40.6	25.4	22.1	0.0	0.0	40.6	0.0	0.0	0.3	0.0	0.0	168.1
1941	23.4	14.0	14.7	12.7	14.7	0.0	0.0	0.0	0.0	0.0	0.0	17.8	97.3
1942	53.3	40.6	19.1	0.0	0.0	0.0	24.6	0.0	0.0	0.0	0.0	4.6	142.2
1943	182.9	0.0	6.4	2.8	3.3	0.0	0.0	0.0	0.0	0.0	0.0	1.3	196.7
1944	209.8	130.8	68.6	9.7	8.1	0.0	31.2	201.9	0.0	0.0	0.5	1.5	662.1
1945	81.3	0.0	0.0	0.0	1.0	0.0	19.1	0.0	0.0	0.0	0.0	0.0	101.4
1946	0.0	2.8	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0	11.4	18.0
1947	40.6	38.1	32.8	12.4	4.3	0.0	0.0	0.0	0.0	0.0	0.0	6.4	134.6
1948	0.0	19.1	63.5	0.0	4.3	0.0	0.0	11.4	0.0	0.0	0.0	23.1	121.4
1949	12.7	50.8	127.0	0.0	0.0	0.0	0.5	14.2	0.0	0.0	0.0	0.0	205.2
1950	32.3	16.8	0.0	0.0	0.0	19.1	7.9	12.7	0.0	0.0	—	—	—
Σ 2	838.0	675.4	486.5	95.8	59.0	19.1	183.6	240.2	0.0	0.3	0.5	164.7	2674.3
Σ T	1688.2	1339.9	1072.5	310.7	133.0	169.4	679.3	558.6	120.1	143.6	109.5	618.5	6855.5
Mean	42.2	33.5	26.8	7.8	3.3	4.2	17.0	14.0	3.0	3.6	2.8	15.9	175.8

Note : " — " indicates no data available

Source : UNDP/WAPDA, Report on the Hydrometeorology of Baluchistan, UNDP-PAK/73/032, July 1980

TABLE A-3.1.3(7) Mangochar

(Unit : mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1911	25.4	27.4	20.8	8.6	1.0	1.8	16.5	7.1	2.8	2.5	6.6	19.6	140.1
1912	25.4	27.4	20.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	90.6
1913	3.3	27.4	43.7	0.0	0.0	1.5	2.5	5.1	0.0	25.4	94.0	20.3	223.2
1914	35.6	81.3	7.9	16.8	4.1	0.0	27.9	0.8	0.8	42.7	32.0	1.8	251.7
1915	15.2	2.0	26.2	63.5	0.0	0.0	40.6	0.0	0.0	0.0	0.0	0.0	147.5
1916	41.9	25.1	21.6	7.9	0.0	0.0	30.7	32.8	0.0	0.0	0.0	8.1	168.1
1917	33.3	0.0	78.7	0.0	0.0	0.0	0.0	6.1	1.0	0.0	0.0	16.0	135.1
1918	0.0	22.1	63.8	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.3	127.0
1919	26.2	32.5	11.9	4.3	2.3	0.0	9.1	25.4	0.0	0.0	0.0	38.1	149.8
1920	13.0	10.4	29.7	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	62.0
1921	5.6	0.0	1.5	27.9	0.0	0.0	0.0	20.1	0.0	0.0	34.5	70.1	159.7
1922	22.1	18.0	17.5	0.0	1.3	0.0	0.0	0.0	25.4	0.0	0.0	20.3	104.6
1923	56.6	33.8	15.2	0.0	7.9	0.0	0.0	5.8	0.0	7.4	0.0	0.0	126.7
1924	33.0	3.8	0.0	3.3	0.0	0.0	0.0	0.0	19.1	0.0	10.2	31.8	101.2
1925	1.0	1.0	1.8	0.0	0.0	25.9	52.8	0.0	0.0	0.0	0.0	0.0	82.5
1926	0.0	0.0	20.8	8.6	1.0	0.0	0.0	0.8	25.4	0.0	0.0	3.3	59.9
1927	0.0	1.8	0.0	0.0	0.0	0.0	46.5	0.0	0.0	0.0	2.5	34.3	85.1
1928	19.1	23.6	20.1	1.3	0.0	0.0	0.0	12.4	7.1	0.0	15.2	0.0	98.8
1929	8.6	18.5	0.0	1.0	2.0	0.0	35.6	0.0	0.0	0.0	0.0	66.8	132.5
1930	64.0	15.2	15.2	15.7	0.0	0.0	26.2	0.0	0.0	0.0	0.0	0.0	136.3
1931	29.5	112.8	11.2	6.6	0.0	3.8	0.0	0.0	0.0	0.0	0.0	6.4	170.3
1932	11.4	9.1	26.7	0.0	0.0	0.0	38.6	11.7	0.0	0.0	0.0	37.1	134.6
1933	31.9	15.2	56.1	12.4	1.5	0.0	45.7	22.9	0.0	0.0	0.8	29.2	215.7
1934	13.7	0.0	16.5	25.4	0.0	17.8	0.0	44.5	0.0	0.0	0.0	42.7	160.6
Σ 1	515.8	508.4	527.7	214.5	21.1	50.8	372.7	195.5	81.6	78.0	195.8	501.7	3263.6

(to be cont'd)

(cont'd)

(Unit : mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1935	62.5	92.5	22.4	9.4	20.6	0.0	1.8	16.5	7.1	0.0	0.0	0.0	232.8
1936	0.0	49.3	29.2	0.0	17.8	0.0	0.0	0.0	0.0	0.0	0.0	62.5	158.8
1937	7.8	50.0	36.8	0.0	12.7	0.0	27.2	0.0	0.0	0.0	0.0	8.9	143.4
1938	110.7	51.1	7.1	21.3	0.0	0.0	79.8	8.1	0.0	0.0	0.0	6.9	285.0
1939	23.6	39.4	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	79.3
1940	41.1	33.8	27.2	3.3	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	108.7
1941	3.0	3.0	15.7	15.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.9
1942	90.2	33.3	34.8	30.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	222.1
1943	69.9	0.0	12.7	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	92.8
1944	113.0	57.2	41.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.3	229.4
1945	6.4	0.0	0.0	0.0	0.0	0.0	28.4	0.0	0.0	0.0	0.0	0.0	34.8
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.5	77.5
1947	25.4	27.4	20.8	8.6	1.0	0.0	0.0	7.6	0.0	0.0	0.0	0.0	90.8
1948	25.4	39.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.6	84.4
1949	8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1
1950	25.4	0.0	0.0	0.0	0.8	0.0	16.5	0.0	0.0	0.0	—	—	—
Σ 2	612.5	476.4	258.8	98.5	56.2	0.0	153.7	32.2	7.1	0.0	0.0	232.1	1927.5
Σ I	1128.3	984.8	786.5	313.0	77.3	50.8	526.4	227.7	88.7	78.0	195.8	733.8	5191.1
Mean	28.2	24.6	19.7	7.8	1.9	1.3	13.2	5.7	2.2	2.0	5.0	18.8	133.1

Notes : " — " indicates no data available

Source : UNDP/WAPDA, Report on the Hydrometeorology of Baluchistan, UNDP-PAK/73/032, July 1980

3.1.5 DAILY MAXIMUM RAINFALL

TABLE A-3.1.4(1) Daily Maximum Rainfall

(Unit : mm/day)

Year	Q u e t t a				K a l a t	
	M. Berwery	Sariab	Spezand	Kolpur	Kalat	Mangochar
1891	20.6	*	*	30.5	40.6	*
1892	37.3	*	*	30.5	20.3	*
1893	36.1	*	*	12.7	27.9	*
1894	36.3	*	*	48.3	101.6	*
1895	19.8	*	*	27.7	50.8	*
1896	22.4	*	*	26.7	50.8	*
1897	26.7	*	*	19.8	16.0	*
1898	30.2	*	*	24.8	19.6	*
1899	24.9	*	*	36.6	12.2	*
1900	35.1	20.8	*	71.1	26.4	*
1901	5.6	14.5	*	8.4	22.9	*
1902	22.1	10.2	*	6.6	15.5	*
1903	40.6	21.6	27.7	20.3	23.4	*
1904	23.9	20.3	15.2	25.4	5.3	*
1905	34.0	25.9	76.2	45.7	41.1	*
1906	30.7	22.4	25.4	66.5	23.6	*
1907	31.8	25.4	25.4	38.9	19.6	*
1908	29.2	25.4	50.8	25.9	19.1	*
1909	25.9	152.4	12.7	38.6	24.1	*
1910	15.2	45.7	15.2	72.1	39.1	*
1911	37.1	27.9	19.1	34.5	28.9	*
1912	34.0	50.8	76.2	28.4	15.2	*
1913	38.1	33.0	27.9	27.9	94.0	50.8
1914	24.1	24.1	17.8	76.2	48.5	22.9
1915	16.3	23.1	24.1	25.4	19.5	40.6
1916	46.7	43.7	17.8	42.2	24.4	17.8
1917	***	***	***	***	***	***
1918	24.1	22.9	17.8	18.0	33.5	24.4
1919	19.6	46.7	25.4	16.3	18.5	26.2
1920	18.5	3.8	17.8	27.9	11.7	12.7
1921	19.3	25.4	11.2	38.1	27.9	26.7
1922	13.7	25.4	12.4	36.2	14.0	25.4
1923	25.4	43.2	19.1	10.2	11.4	29.3
1924	26.2	76.2	35.6	51.8	59.2	170.2
1925	10.7	38.1	5.1	53.3	32.2	50.8
1926	22.6	26.7	25.4	36.1	33.0	25.4
1927	14.2	19.1	15.2	25.4	17.5	39.1
1928	42.2	43.2	23.4	18.3	16.3	15.2
1929	27.9	30.5	21.1	76.2	27.7	25.4
1930	35.6	29.2	20.8	38.1	29.2	31.0
1931	25.7	53.3	20.3	38.1	43.4	40.6
1932	36.3	25.4	15.2	30.5	27.9	25.4
1933	31.8	25.4	25.4	32.5	24.1	25.4
1934	55.1	54.6	25.4	63.5	23.1	38.1

(to be cont'd)

(cont'd)

Year	Q u e t t a				K a l a t	
	M. Berwary	Sariab	Spezand	Kolpur	Kalat	Mangochar
1935	33.0	24.6	20.8	36.8	45.7	25.7
1936	38.6	15.2	12.7	20.3	27.9	25.4
1937	33.3	25.4	27.9	25.4	26.4	22.9
1938	49.3	48.3	30.7	23.6	38.6	38.1
1939	37.1	22.9	25.4	24.4	37.6	17.8
1940	45.7	27.9	25.4	40.6	40.4	29.2
1941	24.1	30.5	33.0	17.8	17.0	13.2
1942	33.3	38.1	35.6	15.2	50.8	24.1
1943	26.7	17.8	38.1	76.2	36.8	14.0
1944	53.3	27.9	61.0	106.7	20.8	20.3
1945	29.2	12.7	35.6	27.9	34.3	15.0
1946	25.4	12.7	12.7	6.4	33.3	77.5
1947	24.6	11.4	23.6	6.4	22.4	17.8
1948	18.0	25.4	50.8	19.1	46.5	15.7
1949	41.9	59.4	0.0	50.8	59.4	8.1
1950	40.6	16.5	2.3	23.1	68.6	17.8
1951	19.3	*	*	*	27.9	*
1952	27.9	*	*	*	24.9	*
1953	34.3	*	*	*	46.2	*
1954	48.5	*	*	*	46.0	*
1955	25.4	*	*	*	53.3	*
1956	31.8	*	*	*	68.6	*
1957	27.7	*	*	*	23.1	*
1958	19.3	*	*	*	33.0	*
1959	47.5	*	*	*	22.6	*
1960	37.3	*	*	*	25.7	*
1961	34.3	*	*	*	44.5	*
1962	15.7	*	*	*	17.5	*
1963	16.0	*	*	*	10.9	*
1964	30.0	*	*	*	54.6	*
1965	25.4	*	*	*	18.8	*
1966	19.8	*	*	*	13.7	*
1967	42.9	*	*	*	38.6	*
1968	21.1	*	*	*	15.5	*
1969	16.5	*	*	*	11.7	*
1970	15.2	*	*	*	*	*

Note : "*" indicates no data available

Source : UNDP/WAPDA, Hydrometeorology of Baluchistan,
UNDP-PAK/73/032, July 1980

(Unit : mm/day)

Year	Q u e t t a				Kalat
	Samungli	K.Kotwal	Sariab	Spezand	Kalat
1970	*	*	*	*	*
1971	*	11.9	16.5	15.2	*
1972	*	20.8	54.4	73.7	*
1973	*	*	*	*	*
1974	*	*	*	*	*
1975	*	45.0	*	13.0	*
1976	25.7	21.6	*	*	48.7
1977	26.8	36.8	*	*	*
1978	45.6	30.7	*	*	14.3
1979	61.7	24.9	*	*	14.2
1980	34.7	31.2	*	*	17.0
1981	42.0	32.5	*	*	*
1982	69.0	42.2	*	*	*
1983	102.0	27.7	*	*	*
1984	30.0	20.3	*	*	*
1985	75.0	24.6	*	*	42.4
1986	*	80.8	*	*	*

Note : "*" indicates no data available

Source : WAPDA, Surface Water Hydrology Project
Meteorological Department of Pakistan, Karachi

TABLE A-3.1.4(2) Storm Frequency Analysis

(Unit : mm/day)

Station Name	Base Data Used	Return Period in Year			
		5	10	20	50
Samungli	1976-1985(10)	54.1	63.5	72.5	
M.Berwary	1891-1970(80)	36.7	42.7	48.5	
	1935-1970(36)	38.4	44.5	50.4	
	1935-1950(15)	41.5	47.1	52.5	59.5
Sariab	1935-1950(15)	35.3	42.8	50.0	59.3
Spezand	1935-1950(15)	38.8	46.9	54.7	64.7
Kolpur	1935-1950(15)	50.8	65.7	80.0	98.5
Mangochar	1935-1950(15)	35.1	44.1	52.8	64.1
Kalat	1935-1950(15)	47.7	55.6	63.2	73.0

Source : UNDP/WAPDA, Report on the Hydrometeorology of Baluchistan
UNDP-PAK/73/032, July 1980
Meteorological Department, Karachi

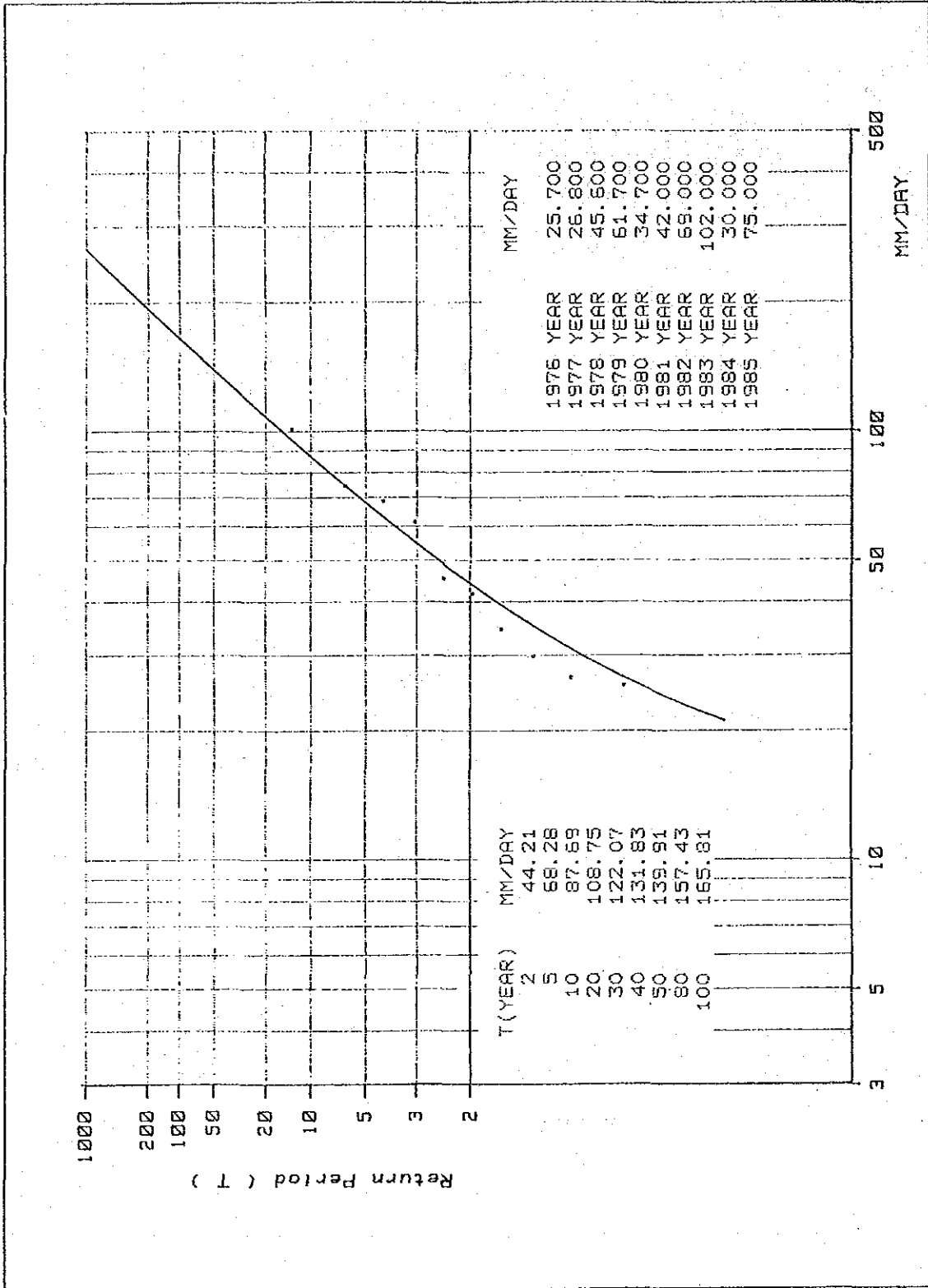


FIG A-3.1.3(1) Storm Frequency Analysis at Quetta Samugli

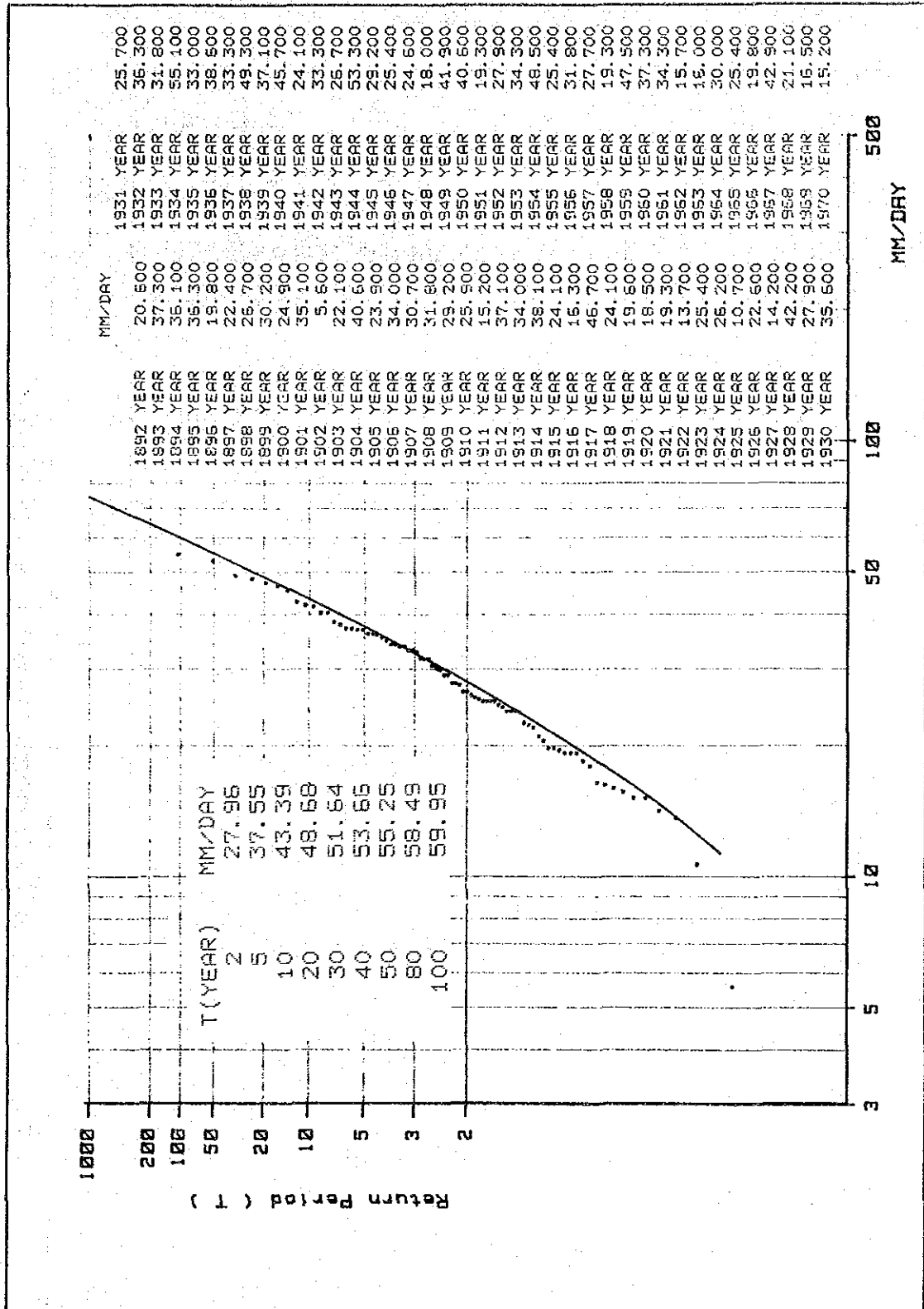


FIG A-3.1.3(2) Storm Frequency Analysis at Murree Brewery

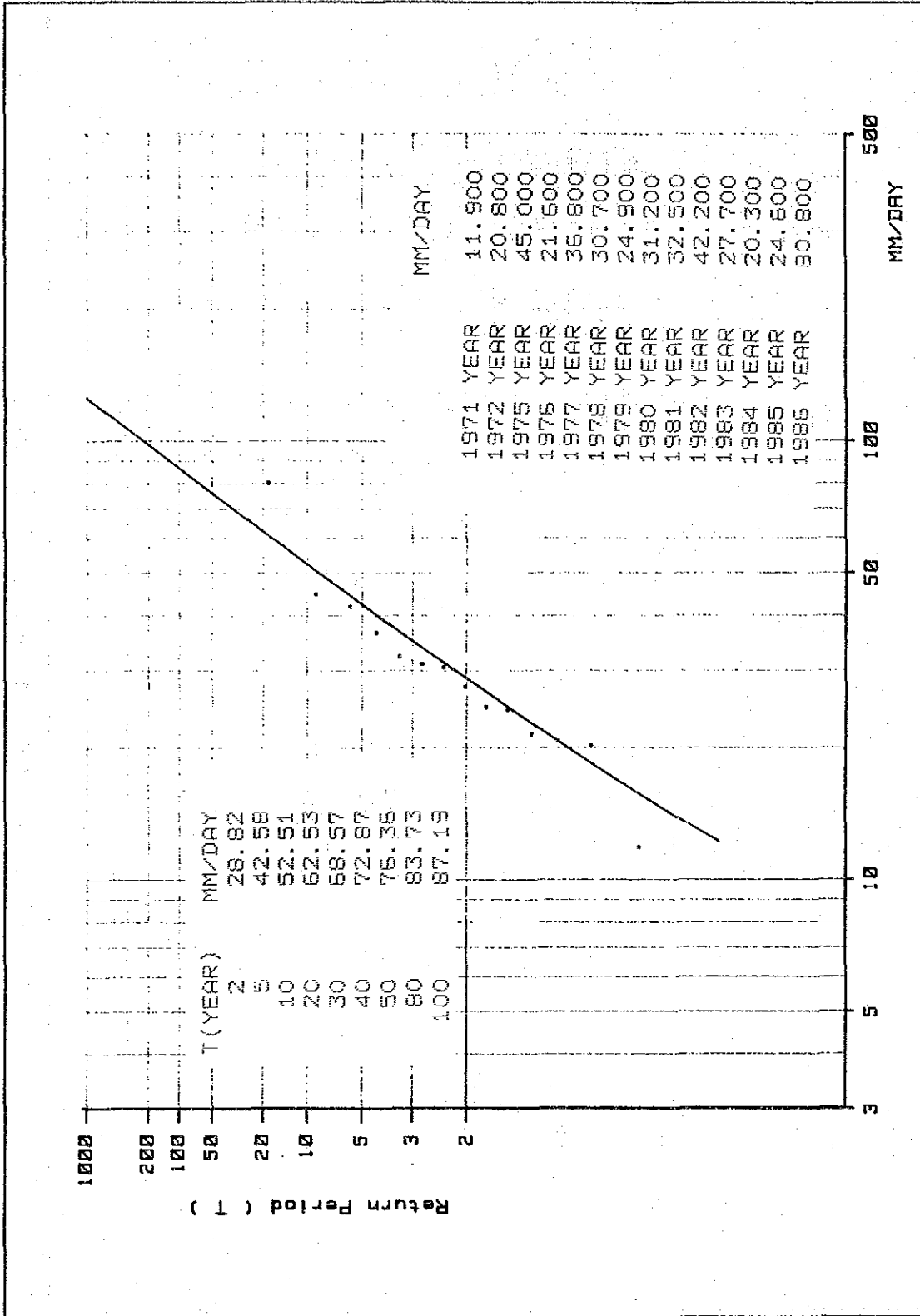


FIG A-3.1.3(3) Storm Frequency Analysis at Killi Kotawal

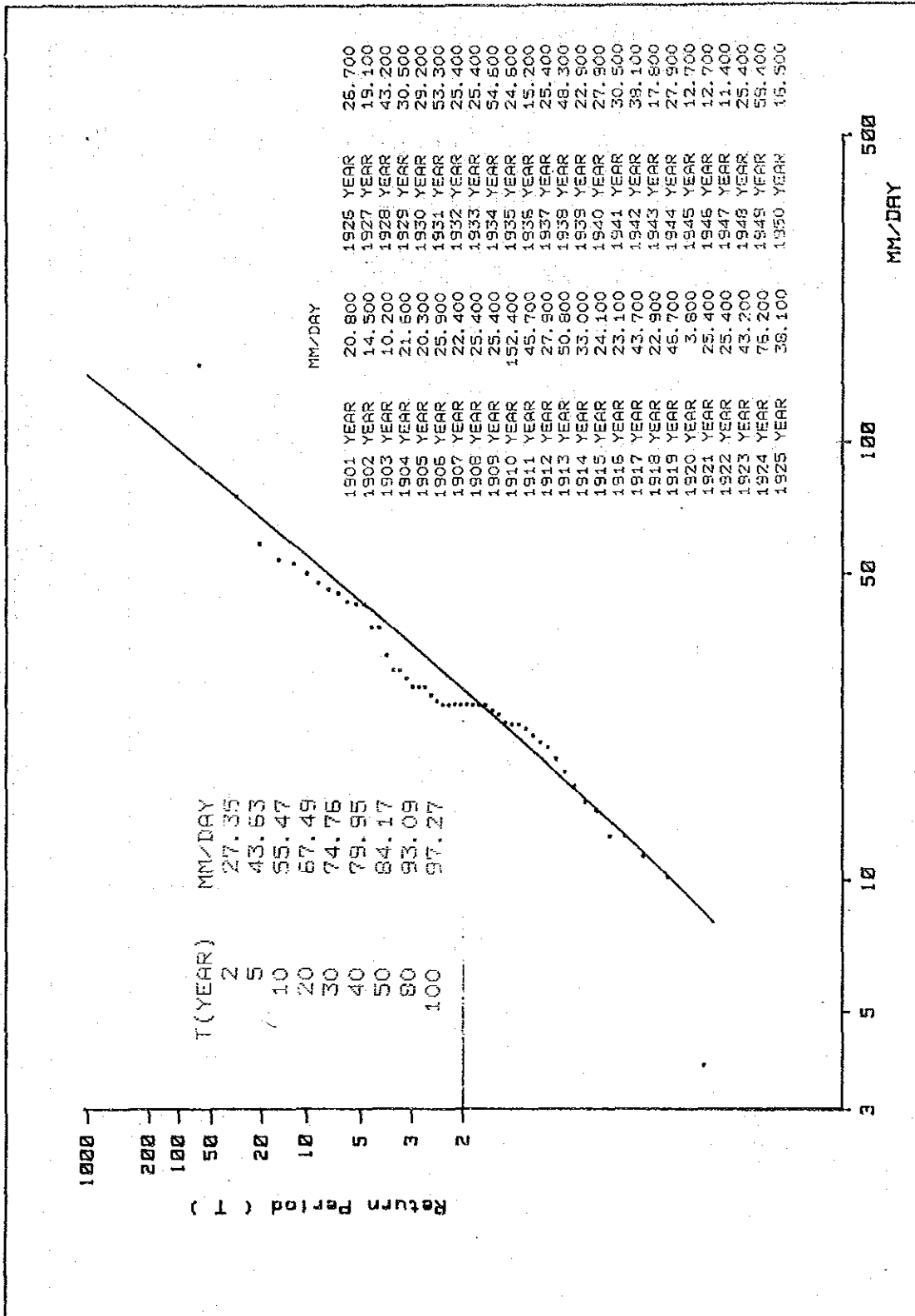


FIG A-3.1.3(4) Storm Frequency Analysis at Sariab

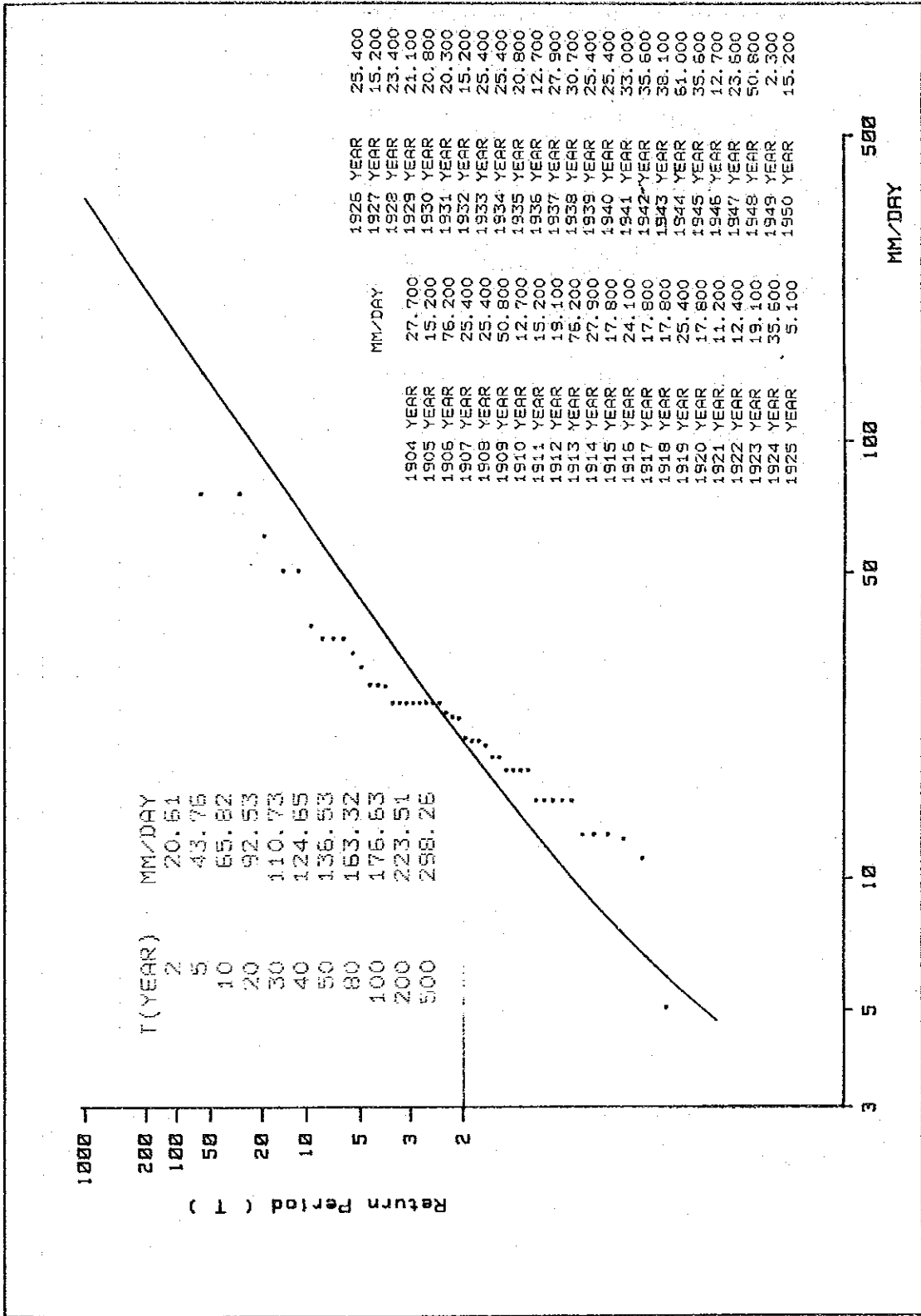


FIG A-3.1.3(5) Storm Frequency Analysis at Spetzard

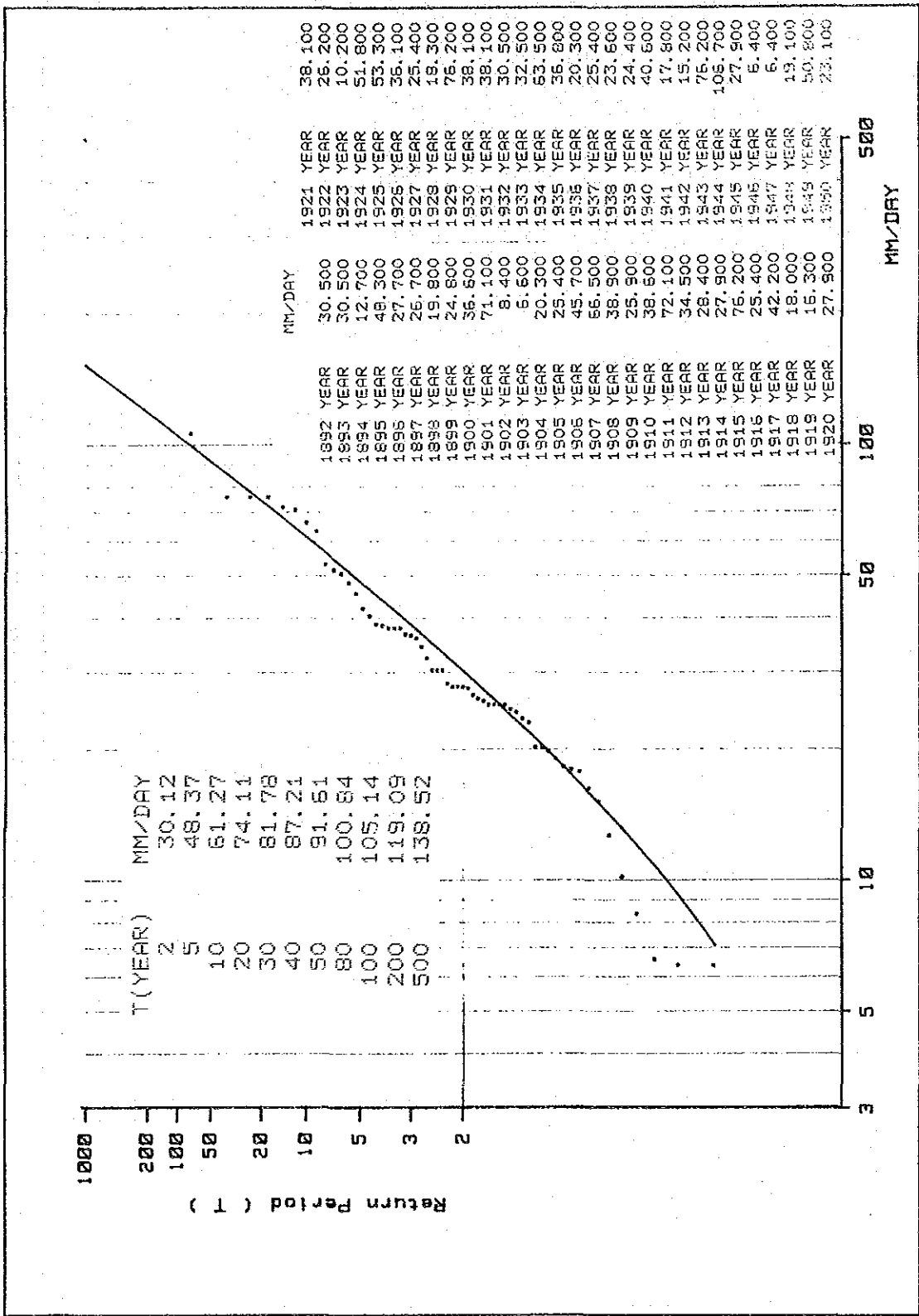


FIG A-3.1.3(6) Storm Frequency Analysis at Kolpur

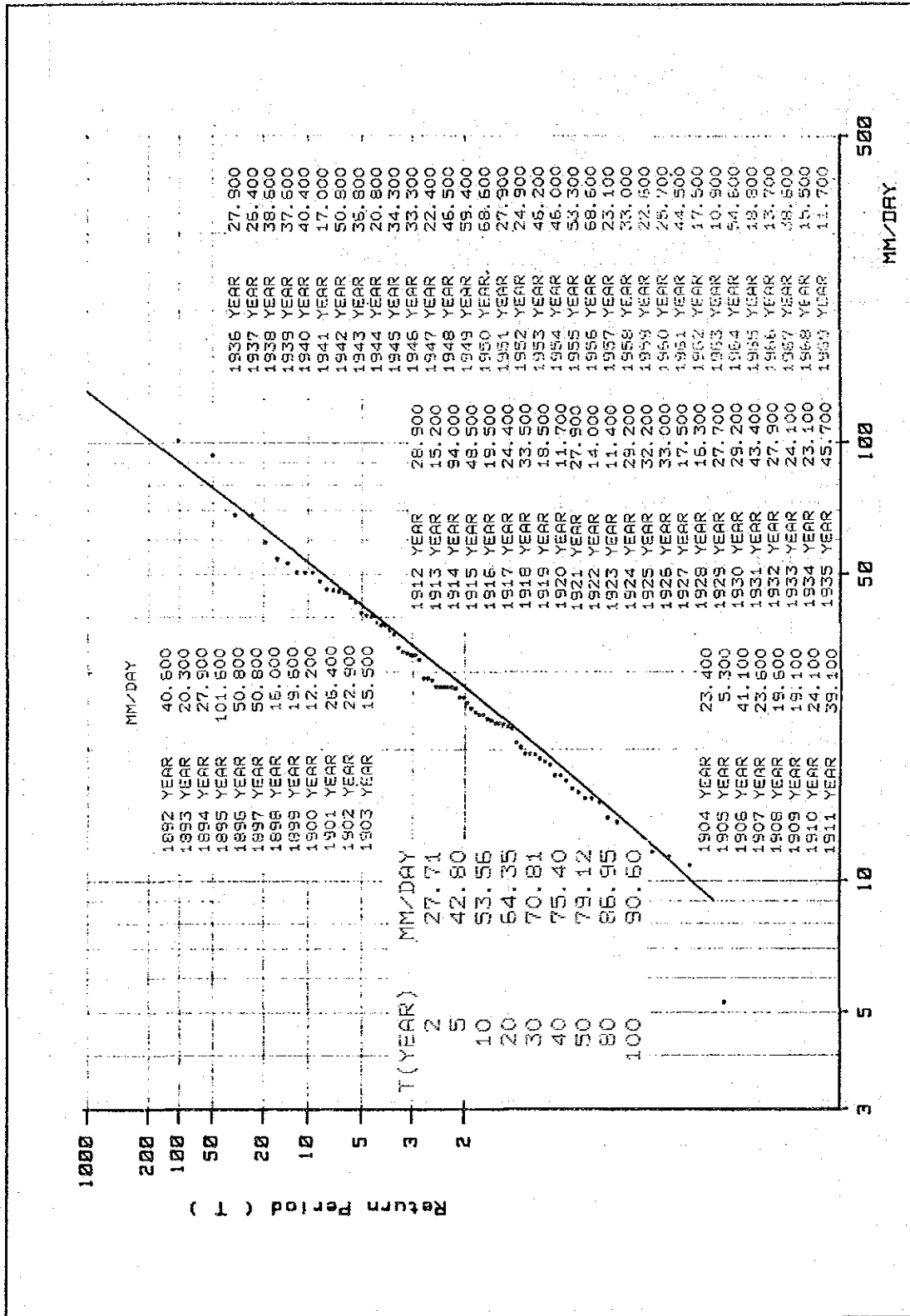


FIG A-3.1.3(7) Storm Frequency Analysis at Kalat

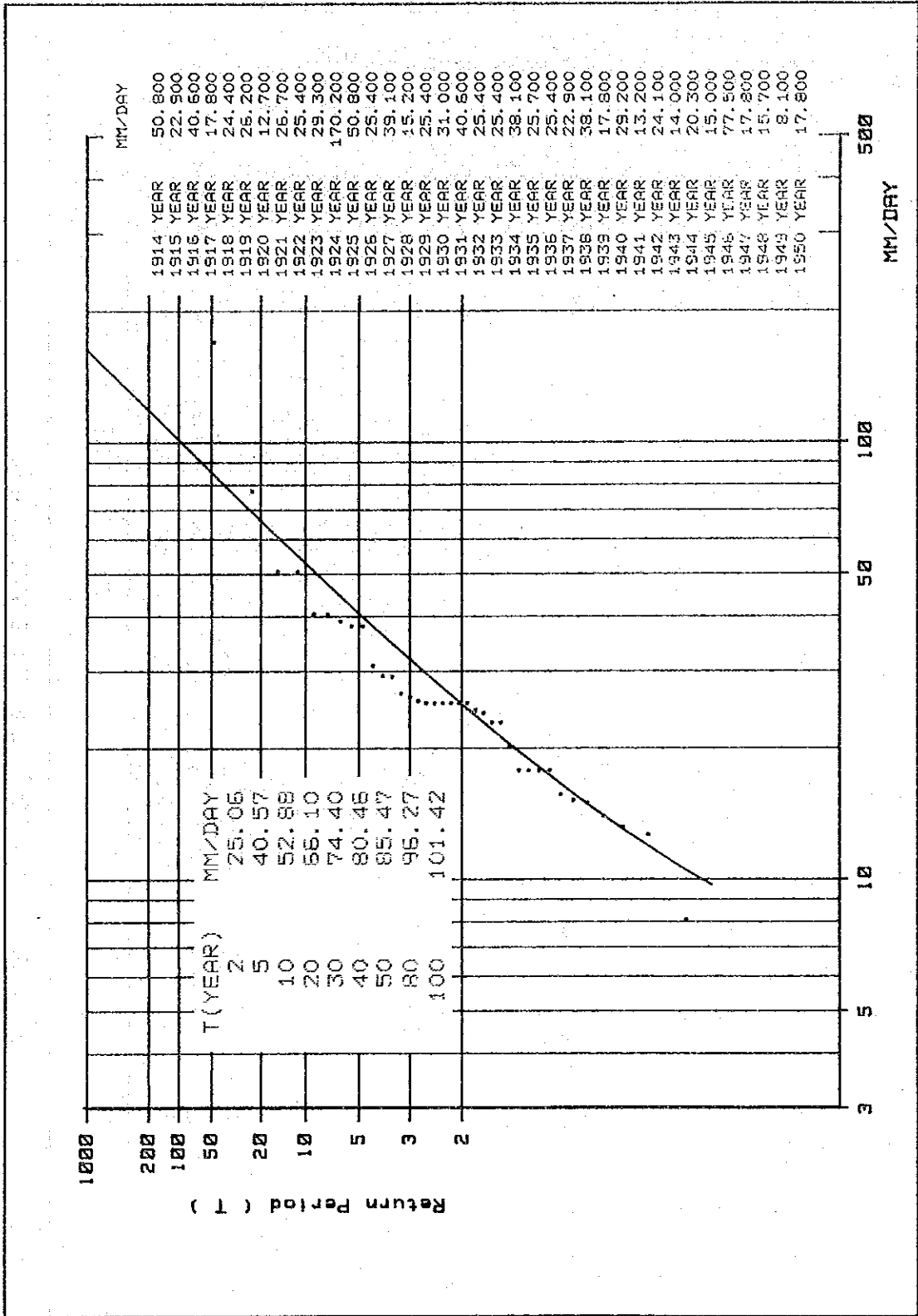


FIG A-3.1.3(8) Storm Frequency Analysis at Mangochar

3.1.6 ANNUAL DROUGHT RAINFALL ANALYSIS

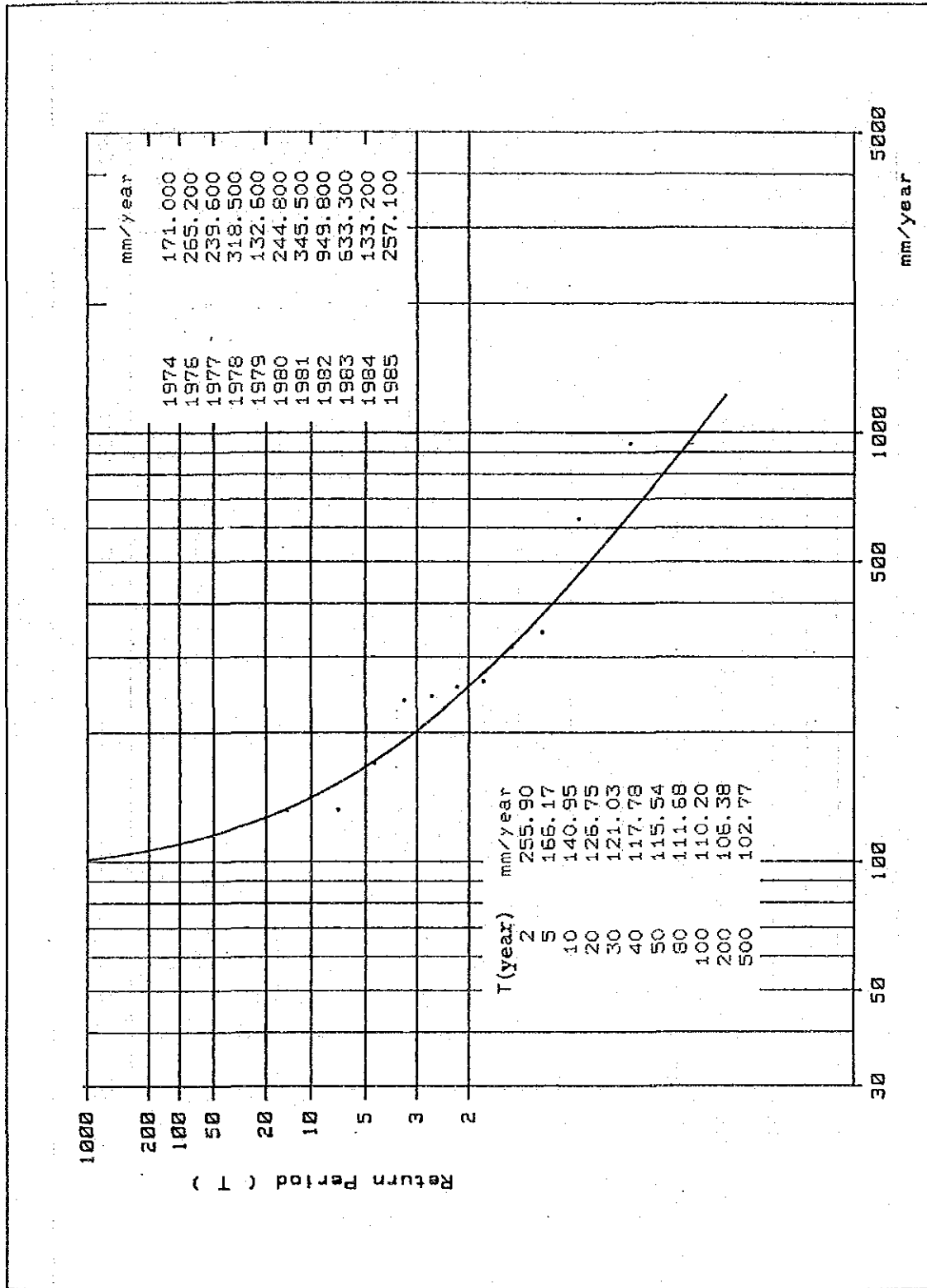


FIG A-3.1.4(1) Drought Rainfall Analysis at Quetta Samungli

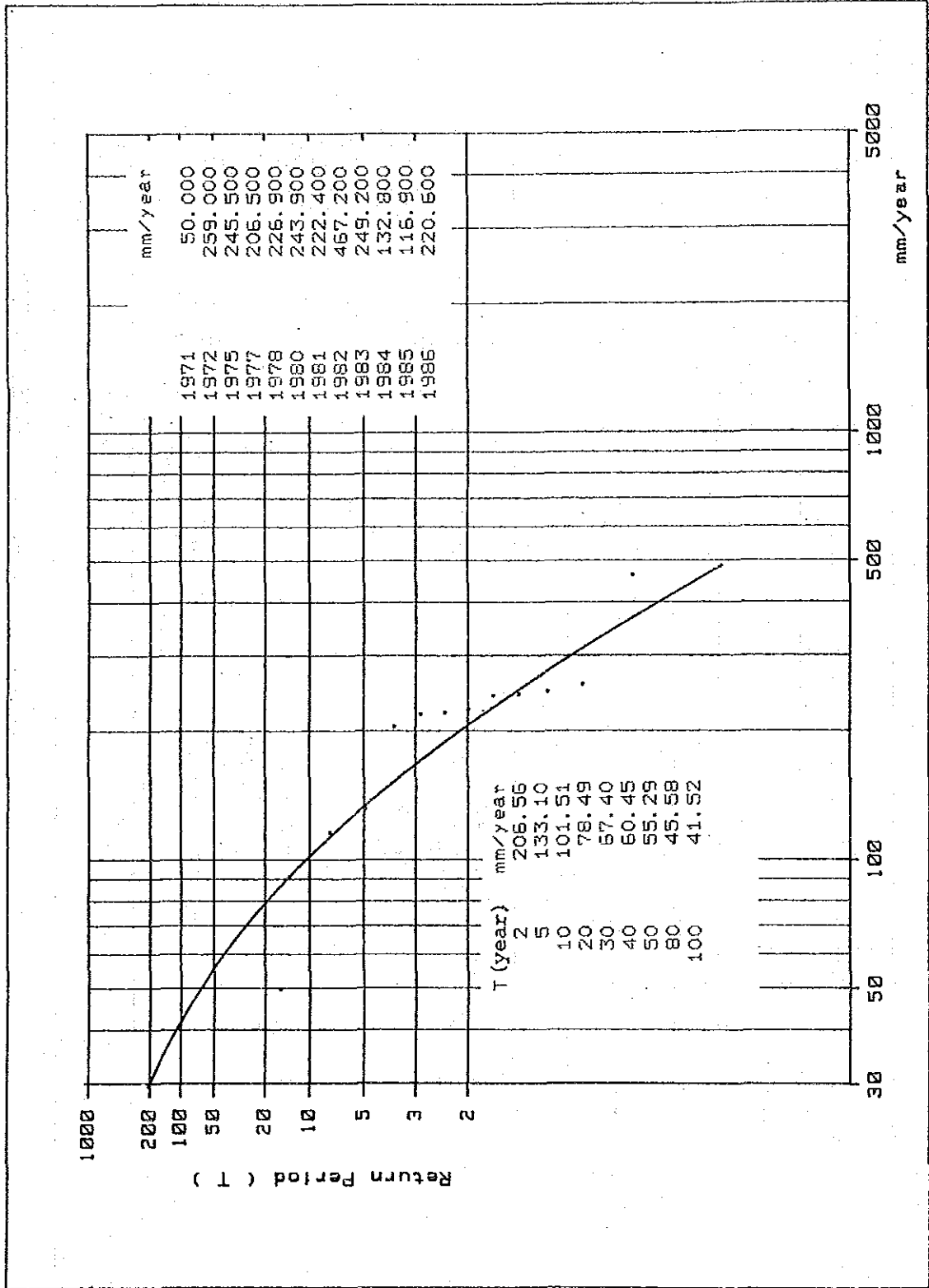


FIG A-3.1.4(2) Drought Rainfall Analysis at Killi Kotwal

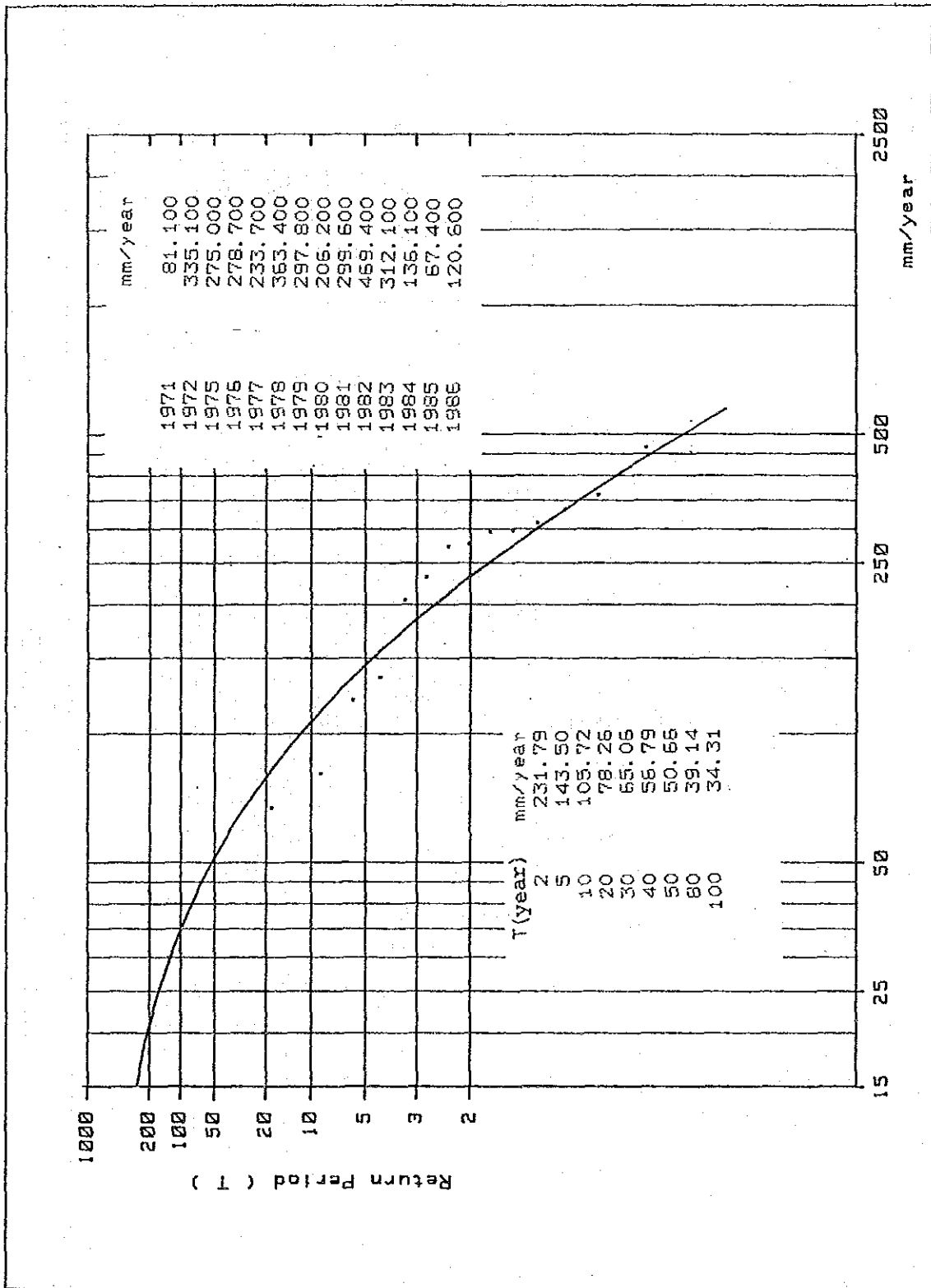


FIG A-3.1.4(3) Drought Rainfall Analysis at Sariab/WAPDA

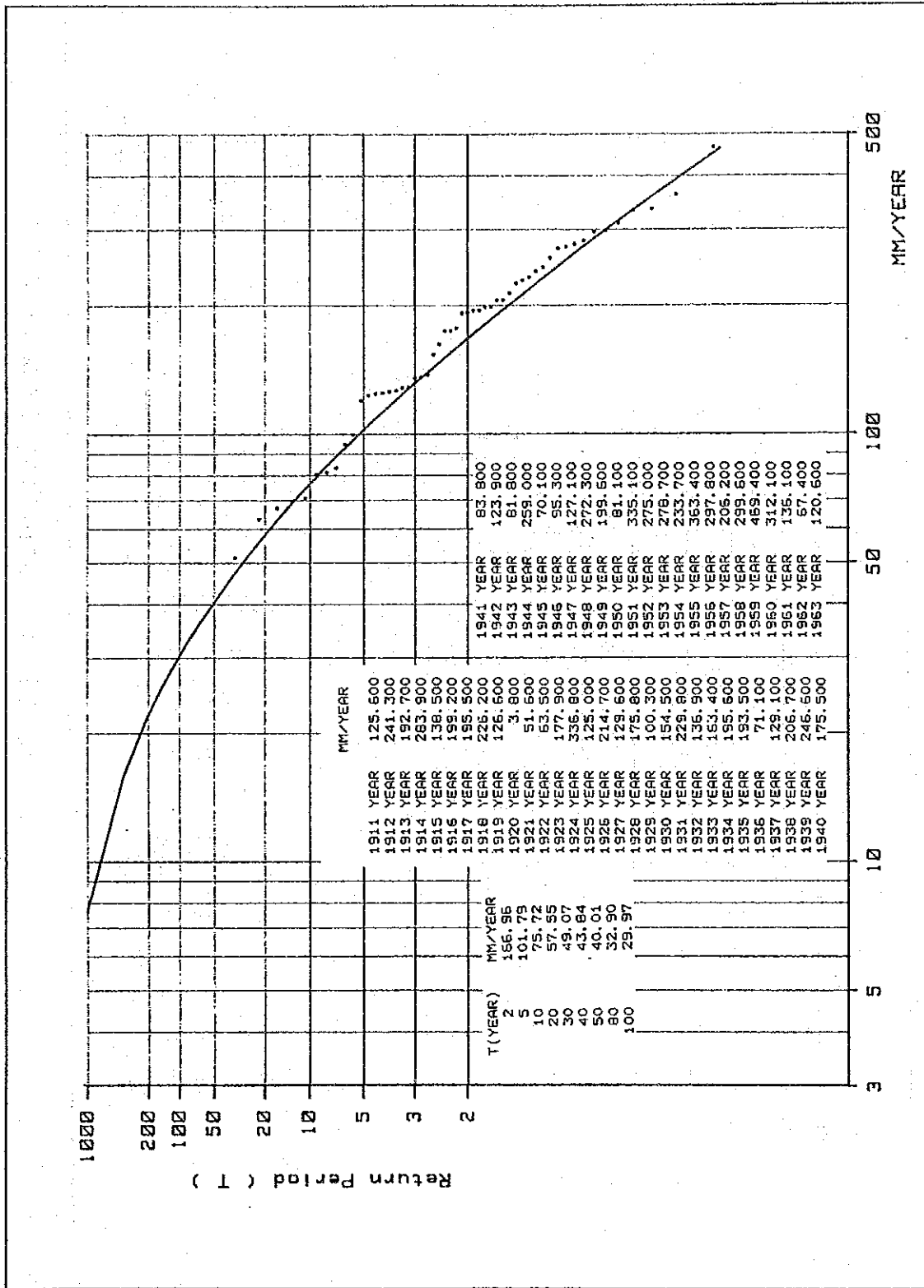


FIG A-3.1.4(4) Drought Rainfall Analysis at Sariab(2)

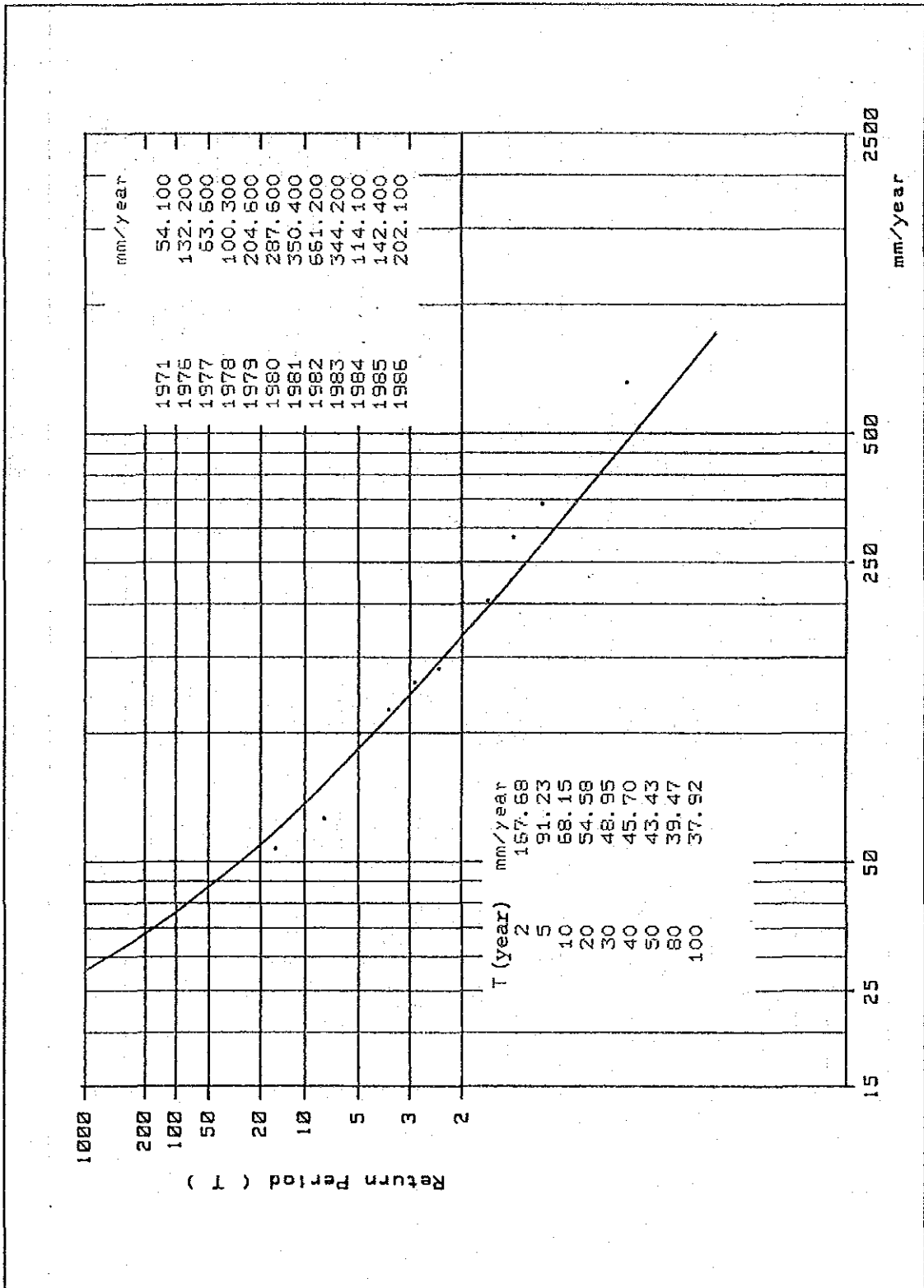


FIG A-3.1.4(5) Drought Rainfall Analysis at Spezand

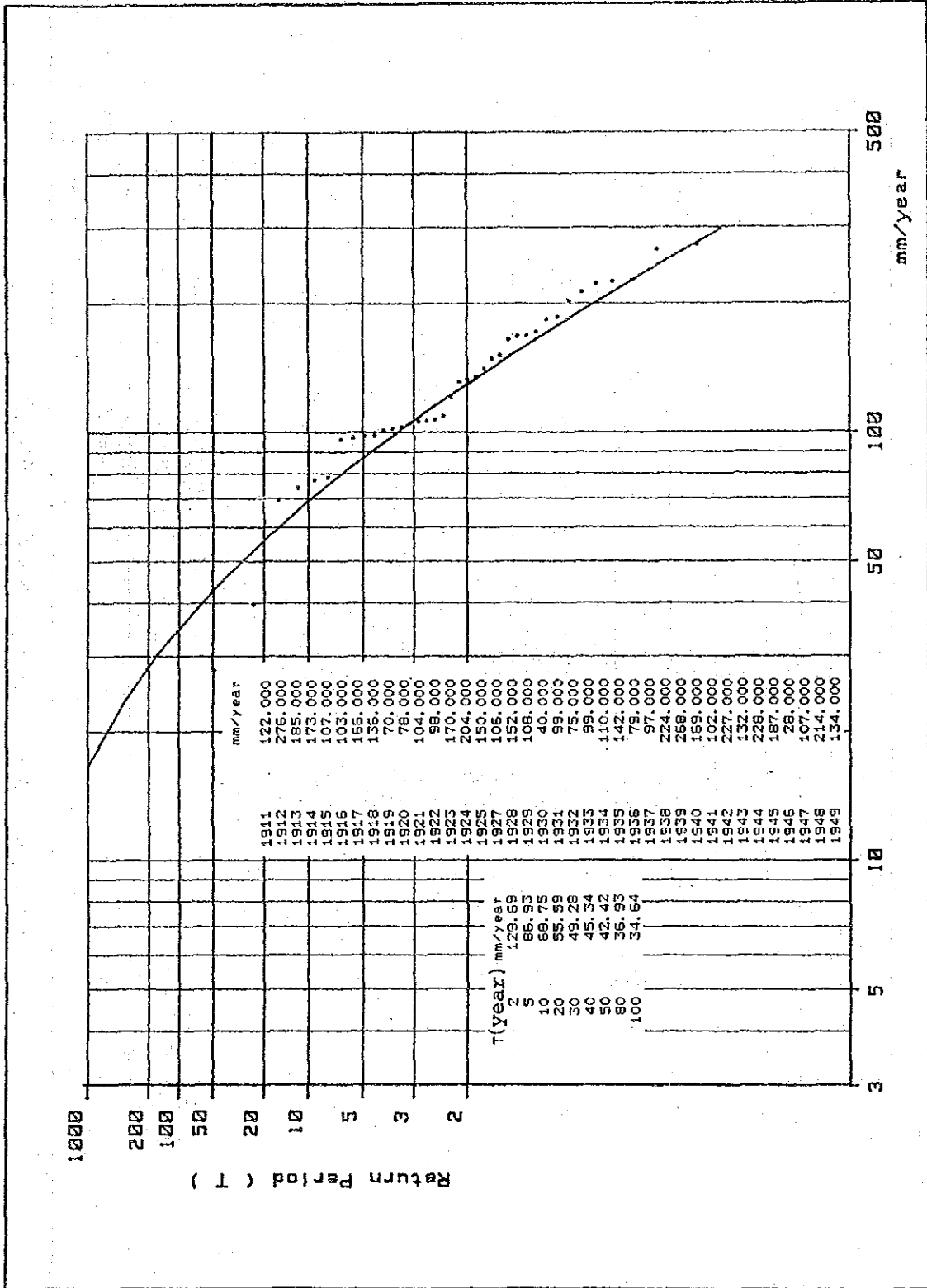


FIG A-3.1.4(6) Drought Rainfall Analysis at Spezand(except 1925)

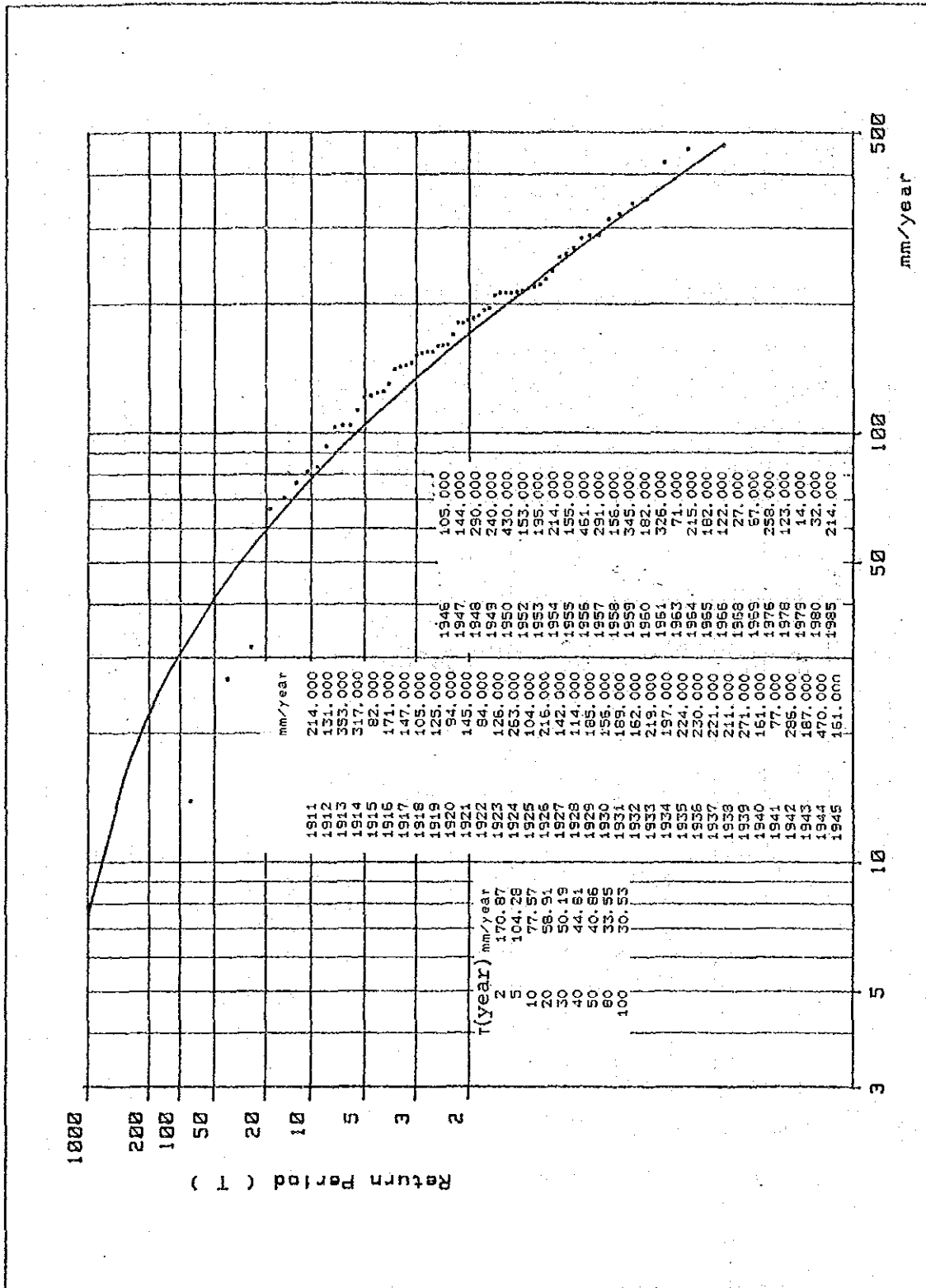


FIG A-3.1.4(7) Drought Rainfall Analysis at Kalat

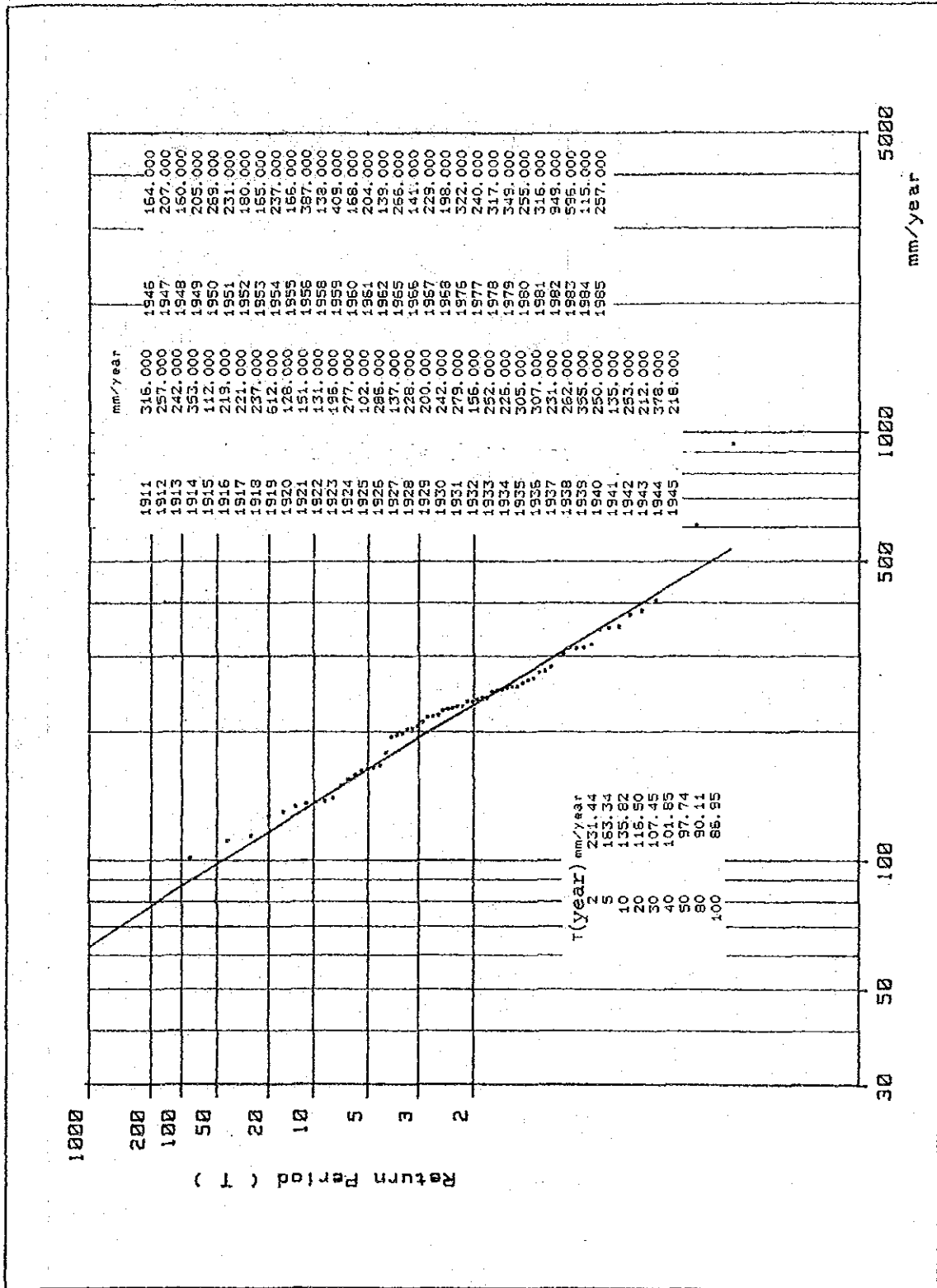


FIG A-3.1.4(8) Drought Rainfall Analysis at Quetta

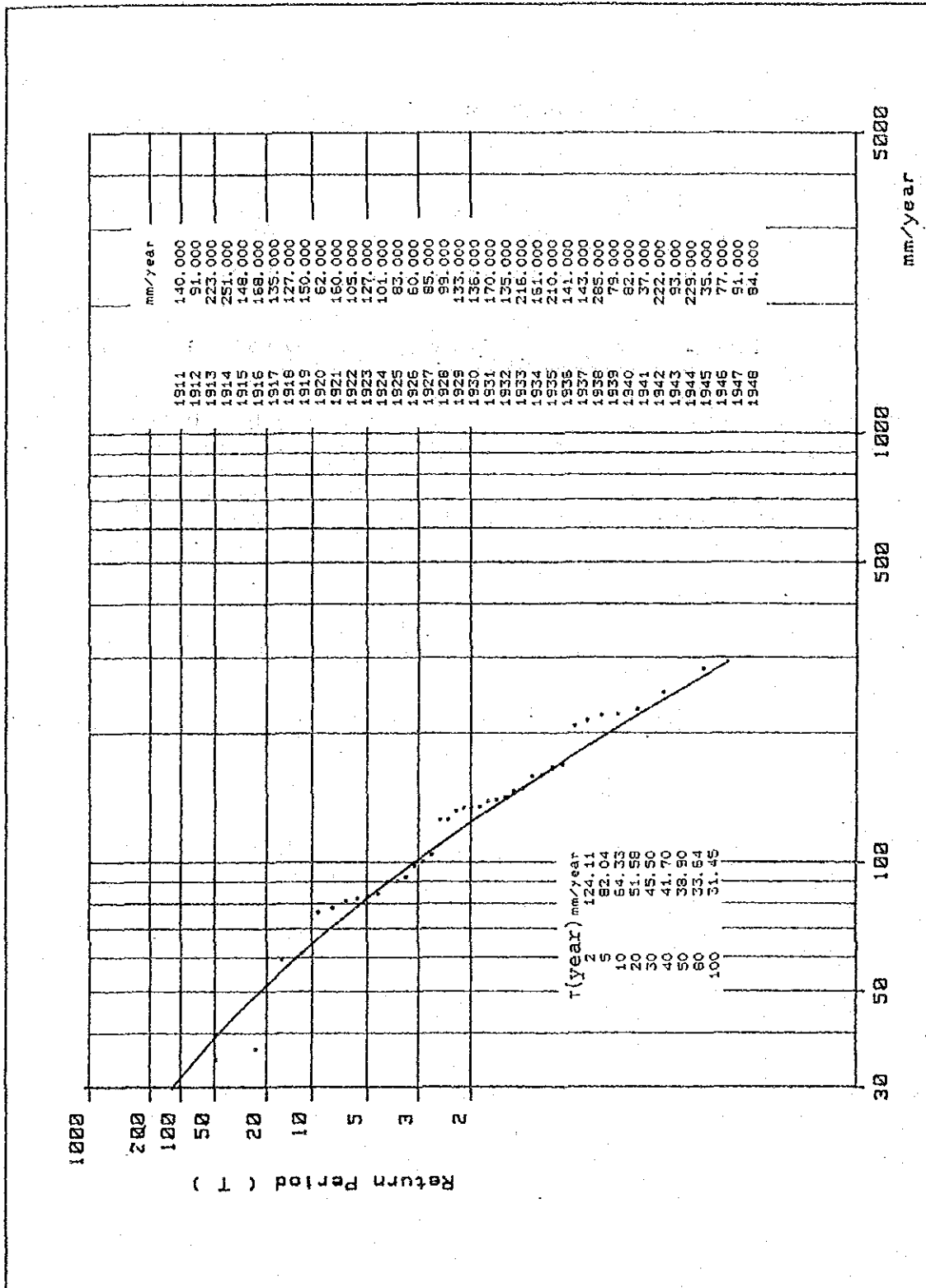


FIG A-3.1.4(9) Drought Rainfall Analysis at Mongochar

3.1.7 SNOWFALL

TABLE A-3.1.5 Snowfall Frequency Analysis
(Unit : times)

Station	Data used	Dec.	Nov.	Jan.	Feb.	Mar.	Year
Kalat	1953-1975	0.0	0.2	0.2	0.1	0.0	0.5
M.Berwary	1953-1975	0.2	0.7	0.7	1.5	0.8	3.4
Samungli	1969-1975	0.1	0.3	0.3	4.0	1.0	4.0

Source : UNDP/WAPDA, Report on the Hydrometeorology of
Baluchistan, UNDP-PAK/73/032, July 1980

3.1.8 CORELATION OF RAINFALL

TABLE A-3.1.6 Correlation of Annual Rainfall

Y	X	I t e m	Samungli	M. Berwery	K. Kotwal	Sariab	Spezand	Kolpur	Kalat	Mangochar
		No. of Data			8	10	10		6	
		Coef. of Correlation			0.893	0.698	0.864		0.63	
		A , B			2.82, 268.3	3.18, -496.	1.62, -37.8		1.12, 114.2	
		No. of Data				39	39	39	53	39
		Coef. of Correlation				0.570	0.543	0.648	0.609	0.450
		A , B				1.68, -47.6	2.03, -50.2	0.36, 160.5	1.10, 8.28	4.90, 159.7
		No. of Data				10	9		4	
		Coef. of Correlation				0.830	0.870		0.621	
		A , B				0.64, 73.4	0.47, 114.7		1.41, 180.9	
		No. of Data					39	39	39	39
		Coef. of Correlation					0.583	0.423	0.525	0.261
		A , B					1.98, -106.	0.25, 118.5	0.46, 76.7	0.23, 94.8
		No. of Data						39	39	39
		Coef. of Correlation						0.337	0.529	0.177
		A , B						1.51, -130.	0.40, 60.5	0.17, 112.1
		No. of Data							39	39
		Coef. of Correlation							0.701	0.373
		A , B							1.05, -19.2	0.72, 80.2
		No. of Data								39
		Coef. of Correlation								0.481
		A , B								2.73, -168.
		No. of Data								
		Coef. of Correlation								
		A , B								

Sources : UNDP/WAPDA, Report on the Hydrometeorology of Baluchistan, UNDP-PAK/73/032, July 1980
 WAPDA Surface Water Hydrology Project
 Meteorological Department of Pakistan, Karachi

3.1.9 SOIL SURVEY

(1) Quetta Area

1) Introduction

A semi detailed type of soil survey in four patches of land denoted as QT-A, QT-C, QT-D and QT-E Area was conducted in Quetta Valley in accordance with the instructions issued by JICA Study Team in order to assess their potential for irrigated agriculture. These patches of land were singled out by JICA as promising groundwater zones after heliborne gamma ray spectro prospecting survey. Soil survey was conducted by excavating pits upto 150 cm depth and collecting soil samples from different horizons. Moreover some auger holes were also made near the surveyed tracts so that surrounding soils may also be identified.

In all 7 pits were sampled and 30 soil samples collected which were then subjected to various tests in the Water & Soil Laboratory such as saturation percentage, pH, E_{ce}, Ca+Mg, Na, CO₃, Cl, SO₄, Specific gravity and porosity, etc.

Keeping in view field observations as well as the laboratory data, the area was classified into different land capability classes and soil series. The method of classification is the same as used by the U.S. Bureau of Reclamation except some modifications made according to the local conditions.

The total area of the four patches amounts to 1,337 hectares.

2) Land Classification

Based upon the field observations and the chemical analysis data, the area surveyed was classified into five land classes according to the degree of suitability for irrigated agriculture. Class-I land is most suitable for agriculture as no physical or chemical limitation is present in this land. Lands falling in Class-II to IV are handicapped by minor to moderate limitations of relief, erosion and varying quantities of grit and gravel. Class-V is infested with gravels and boulders and hence not suitable for agriculture. It may be used for grazing or afforestation. A detailed description of different land classes, their location and extent is given below:

a. Class-I: Good Arable Land

These lands are level to nearly level, deep, well drained and free from any physical or chemical limitations. All types of climatically suited crops may be grown here. The fertility of these lands may be maintained by using ordinary farm management practices. At present these lands are dry cropped and whenever enough precipitation occurs wheat, maize, melons and cumin, etc. are grown here.

Class-I lands are located around Killi Karim Dad in QT-D Area and between the villages Sherdil and Rasul Bakhsh in QT-E Area. The area of these two patches has been computed as 310 and 78 hectares respectively.

b. Class-II: Fairly Good Arable Land

Class-II lands were encountered in QT-E and QT-F Areas. These are naturally handicapped by uneven and undulating surface relief. These lands are also deep, well drained, free from excessive salts and possess good water holding capacity.

Slight to moderate reclamation measures such as levelling, bulldozing and a little cut and fill shall make them behave as Class-I lands. These lands have been marked as IIu on the map. Their combined area amounts to 366 hectares.

c. Class-III: Fair Arable Land

One patch of Class-III has been found between the road and the railway line in QT-D Area. This has been marked as IIIu which indicates that the land patch is limited by strongly uneven surface relief. Extensive bulldozing and levelling shall be needed to bring this patch under economically feasible agriculture. The area of IIIu has been calculated as 101 hectares.

d. Class-IV: Limited Arable Land

These lands have a little potential for irrigated agriculture as they are so severely limited by more than one hazards that their use presently is not economically possible. They have severe erosion hazard, very irregular local relief and shallow soil depth underlain by gravel. One patch of Class-IV land has been delineated as IVg2 on both sides of metalled road in QT-D Area. At present 35 to 60 percent land surface is covered with grit and gravel. If water is made available the land may be used for growing of orchards after applying reclamation measures. Total area of the patch is 109 hectares.

e. Class-V: Tentatively Non-Arable Land

This class of land is not suitable for agriculture due to the presence of permanent limitations such as 60 to 90 percent gravels and boulders, deep ravines

and nullahs and excessive slopes. However the land may be utilized for grazing, forestry and woodland, etc.

The whole of QT-C Area has been classified as Vg3. It is already part of Hazarganji National Park where the Forest Department is busy in growing conifer trees. Total area of QT-C is 373 hectares. If tubewells are installed in this area, Hazarganji National Park may be benefitted from them.

3) Soils

The soils of the area have been formed from the alluvium derived from the surrounding Chiltan and Murdar ranges consisting mostly of limestone and shale. The soils are homogenised and inherently productive. These are well drained permeable and slightly to strongly calcareous. The soils of the valley floor are deep, have good productive potential and all sorts of climatically adaptable crops may be raised here. The soils of piedmont plain are generally gravelly and various quantities of grit and gravel occur on the surface as well as in the profile.

The surface soils are mostly medium textured but QT-D & QT-E Areas also contain CL and SiCL on the surface, at some places. The colour of the surface soil varies from 10 YR 6/3 pale brown to 19 YR 7/3 very pale brown. These are friable when moist and slightly hard when dry. The structure of the soils is predominantly massive. However weak sub-angular blocky structure is also found. Medium and fine roots are frequent. Many large and fine pores are present in the surface layer. Insect action is also visible. The horizon boundaries are mostly diffused. pH of the surface soils varies from 7.8 to 8.3.

The subsoils consist of L and SiL except in QT-D area where CL and SiCL is dominant in the subsoil. The colour of the subsoils ranges from 10 YR 5/6 yellowish brown to 10 YR 7/3 very pale brown. The soils are friable when moist and slightly hard to hard when dry. Massive structure is dominant but in QT-D Area sub-angular blocky structure is found in subsoil. Many large, medium and fine roots and pores are present just below the surface layer. The intensity decreases as the depth increases with the result that roots almost disappear after the depth of 90 cm and only micropores exist. Boundaries between different layers are diffused. The subsoils are slightly to strongly calcareous. They do not have any definite zone of lime accumulation but a few fine soft lime nodules are found scattered in the subsoil. Due to high lime content the soils are very hard when dry due to the cementing effect of lime but they are soft and friable when moist.

In the Quetta Area 30 soil samples were collected from 7 pits and analysed in the water and soil laboratory.

The laboratory data shows that the electrical conductivity of the soil samples ranges from 0.43 to 3.3 millimhos/cm at 25°C and pH ranges from 7.7 to 8.4. The sodium adsorption ratio (SAR) of the soil samples was computed from the formula

$$SAR = \frac{Na}{\sqrt{\frac{Ca + Mg}{2}}}$$

Its values range from 2.0 to 1.4. The values of EC , pH and SAR indicate that the area surveyed has no salinity or sodicity problem. The soil samples were also subjected to specific gravity and porosity tests. Laboratory data indicates that the values of specific gravity range from 2.14 to 2.47 and those of porosity fluctuate between 32 and 45%.

Keeping in view the physical and chemical properties of the soils, the area was classified into Tirkha, Badenzai and Psha series. These series were at first identified in Qila Saifullah area of Baluchistan. On the soil classification map, these series have been denoted as 3, 4 and 5. The second figure in the classification indicates the texture of the surface soil.

A detailed description of the above named soil series is as follows:

TORAK SOIL SERIES

Torak soils are level to nearly level, moderately coarse in texture and found in valley floor. These are deep, well drained and highly calcareous throughout their depth.

The surface soils to an average depth of 7 inches consist of light brownish grey sandy loam, friable and massive in structure. Very fine and medium roots and pores are present.

The subsoils from 18-112 cm (7-44 inches) consist of light olive grey sandy loam, interlayered loam or silt loam also occur at places. The soils are friable, massive and highly calcareous. A few fine roots and pores are visible.

Soils from 112-183 cm (44-72 inches) comprise fine sandy loam, light grey to light olive grey in colour, friable and massive in structure. Krotovinas and fine decayed roots are visible.

Torak soils are sometimes marked with slight topography which can be removed by levelling the land. A representative soil profile which was exposed near Torak Killi in the Quetta Valley is described below.

- 0 - 18 cm light brownish grey (2.5 Y 6/2) dry, greyish brown (2.5 Y 5/2) moist, sandy loam, friable moist, massive very fine and medium roots, very fine and medium pores, strongly calcareous diffused horizon boundary, no colour with phenolphthalein, pH 8.2.
- 18 - 36 cm olive grey (5 Y 6/2) dry, olive grey (5 Y 5/2) moist sandy loam, friable, massive, a few fine and medium roots, a few fine and medium pores, strongly calcareous, diffused horizon boundary, no colour with phenolphthalein, pH 8.1.
- 36 - 51 cm light olive grey (5 Y 6/2) dry, olive grey (5 Y 5/2) moist sandy loam, friable, massive, a few fine and medium roots, a few fine and medium pores, strongly calcareous, diffused horizon boundary, no colour with phenolphthalein, pH 8.1.
- 51 - 112 cm light olive grey (5 Y 6/2) dry, olive grey (5 Y 5/2) moist, sandy loam, yellow mottles, friable massive, a few fine roots, a few fine and medium pores, strongly calcareous diffused horizon boundary, slight colour with phenolphthalein, pH 8.1.
- 112-168 cm light grey (5 Y 7/2) dry, light olive grey (5 Y 6/2) moist, fine sandy loam/silt loam light brownish (10 Y 6/4) mottles, friable, weak sub-angular blocky structure, a few fine decayed roots, a few fine pores, krotovinas, strongly calcareous, slight colour with phenolphthalein, pH 8.2.

168-183 cm, light olive grey (5 Y 8/2) moist, fine sand loam, brown mottles (10 YR 5/4 & 5/6) friable, massive, a few very fine roots, a few fine pores, strongly calcareous, slight colour with phenolphthalein, pH 8.2.

TIRKHA SOIL SERIES

Tirkha soils are level to nearly level, medium in texture and developed in valley floor. These are deep and low in organic matter content. The soils are highly calcareous. They are located in the south of Tirkha village.

The surface soils to an average depth of ten inches consist of pale olive loam, hard dry, friable moist. Many fine roots and many large, medium and fine pores are present. Insect action and krotovinas are also visible. The subsoils from 25-137 cm (10-54 inches) consist of pale yellow to pale olive, friable massive silt loam. Medium and fine roots and pores are visible. The soil from 137-183 cm (54-72 inches) comprises pale yellow to pale olive loam, friable and massive. A few fine roots and many fine pores are present.

Tirkha soils are free from all limitations except slight salinity at certain places which can be leached with first few irrigations.

The soil profile of a representative member of the series is discussed below.

0 - 25 cm, pale yellow (5 Y 7/3) dry, pale olive (5 Y 6/3) moist loam, hard dry friable moist, massive, many fine roots many large, medium and fine pores, insect action, krotovinas strongly calcareous, no kankars, clear horizon boundary, no colour with phenolphthalein, pH 8.2.

25 - 64 cm, pale yellow (5 Y 7/3) dry, pale olive (5 Y 6/3) moist, silt loam, friable, moist, massive, a few medium and many fine roots, many large, medium and fine pores, insect action, krotovinas, strongly calcareous, no kankars, clear horizon boundary no colour with phenolphthalein, pH 8.1.

64 - 137 cm, pale yellow (5 Y 7/3) dry, pale olive (5 Y 6/3) moist, silt loam, friable moist, massive, a few fine roots, a few medium and many fine pores, no insect action and no krotovinas, strongly calcareous, no kankars, diffused horizon boundary no colour with phenolphthalein, ph 8.0.

137-183 cm, pale yellow (5 Y 7/3) dry, pale olive (5 Y 6/3) moist loam, friable, massive, a few fine roots, micropores, no kankar, slight colour with phenolphthalein, ph 8.2.

BADENZAI SOIL SERIES

Badenzai soils are level to nearly level, developed in valley floor. These are moderately fine in the upper subsoil and medium texture in the lower subsoil. These are located in Badenzai area.

The surface soils to average depth of 15 cm (6 inches) consist of very pale brown to yellowish brown loam or silt loam, slightly hard dry and friable moist. A few medium and fine roots are present. Many medium and fine pores are visible. Insect action is also noticed. These possess a weak platy structure.

The upper subsoils consist of light yellowish brown to dark brown clay loam. It is hard dry and firm moist. A few large and many medium and fine roots and pores are present. Insect action is also visible. These have weak sub-angular blocky structure.

The lower subsoils mostly consist of loam or fine sandy loam having very pale brown to dark brown colour. These are slightly hard when dry and friable when moist. Fine roots and micropores are present. The structure is massive.

Badenzai soils have slight salinity and erosional problems which can easily be removed. A representative profile is described below.

0 - 15 cm very pale brown (10 YR 7/4) dry, yellowish brown (10 YR 5/4) moist, loam, slightly hard, dry, friable moist, platy structure, a few medium and fine roots, many medium and fine pores, insect action, strongly calcareous, diffused horizon boundary, no colour with phenolphthalein, pH 8.0.

15 - 43 cm light yellowish brown (10 YR 6/4) dry, dark yellowish brown (10 YR 4/4) moist, clay loam, hard dry, sticky wet, weak sub-angular blocky structure, a few large, a few medium and many fine decayed roots. A few large and many medium and fine pores, insect action, strongly calcareous diffused horizon boundary, slight colour with phenolphthalein, pH 8.1.

43 - 81 cm, brown (10 YR 5/3) dry, dark yellowish brown (10 YR 4/4) moist, clay loam, hard dry, sticky wet weak sub-angular blocky structure, many fine decayed roots, many medium and fine

These are calcareous. The soils to an average depth of 102-183 cm (40-72 inches) consist of light greyish loam or silt loam, massive, hard dry and friable moist. No roots observed. Fine and medium pores are present. The soils are calcareous.

The major limiting factors in the soils are relief, salinity, erosion and a cover of grit, gravel, and or boulders of varying degrees. The soil profile of a representative member of the series is discussed below.

0 - 23 cm light grey (10 YR 7/2) DRY AND GREYISH BROWN (10 YR 6/2) moist, loam, massive, slightly hard dry, friable moist, slightly sticky wet, porous, fine and medium roots, calcareous, pH 8.0.

23 - 43 cm pale yellow (10 YR 7/3) dry and pale brown (10 YR 6/3) moist, loam, admixed with about 20% grit, gravel, massive, hard dry, friable moist, slightly sticky wet, slightly plastic wet, porous, fine and medium roots, strongly calcareous, pH 8.0.

43 - 66 cm pale brown (10 YR 6/3) dry and brown (10 YR 6/3) moist, loam, admixed with about 50% grit, gravel, massive, hard dry, friable moist, very slightly sticky, wet porous, no roots, calcareous, pH 8.0.

66 - 102 cm light grey (10 YR 7/1) dry and light grey (10 YR 6/1) moist, loam, admixed with about 55% of grit gravel, massive, hard dry, friable moist, very slightly sticky wet, porous, no roots, calcareous, pH. 8.0.

pores, insect action, strongly calcareous
diffused horizon boundary, slight colour with
phenolphthalein, pH 8.0.

81 - 130 cm, very pale brown (10 YR 7/4) dry, dark
yellowish brown (10 YR 4/4) moist, loam,
slightly hard dry, friable moist, weak
sub-angular blocky structure, a few fine roots,
many medium and fine pores; insect action
moderately calcareous, diffused horizon
boundary slight colour with phenolphthalein,
pH 8.0.

130-183 cm, pale brown (10 YR 6/3) dry, dark
brown/brown (10 YR 4/3) moist, fine sandy loam,
slightly loose dry, massive structure no roots,
micropores, no insect action slightly
calcareous, slight colour with phenolphthalein,
pH 7.9.

PSHA SOIL SERIES

The Psha soils are nearly level to undulating formed in
piedmont plain. These are medium in texture, deep, low
in organic matter content, calcareous and contain
gravelly material in the subsoil. The soils generally
occur in the piedmont plain.

The surface soils to an average depth of 23 cm
(9 inches) consist of light greyish to greyish brown
sandy loam and silt loam, massive hard when dry, friable
when moist. Roots and pores are present. These soils
are calcareous. The subsoils to an average depth of
23-102 cm (9-40 inches) consist of pale yellow greyish
brown loam or silt loam admixed with varying quantities
of grit and gravel. The soils are massive, hard dry,
friable moist. A few roots and pores are present.

104-183 cm light grey (10 YR 7/2) dry and light
brownish grey (10 YR 6/2) moist, loam, massive,
hard dry, friable moist, slightly sticky wet,
porous, no roots calcareous, pH 7.9.

(2) Kalat Area

1) Introduction

Soil survey of three patches of land i.e., KL-A, KL-B and KL-C Areas totalling 2,497 hectares and situated near Shahr Haji, Kallu and Dallo villages in Kalat Area was conducted in accordance with the instructions given by JICA Study Team. These patches of land were selected by JICA as potential groundwater zones. In all 13 pits were excavated upto 150 cm and sampled and 7 number auger holes made in order to ascertain the soil potential of the area and classify it into different land capability classes as also to establish different soil series. The soils were studied in terms of texture, colour, structure, roots, pores, calcareousness and limiting factors such as topography, erosion and surface salinity. Source of irrigation, cultivated crops and/or natural vegetation were also recorded.

During soil survey 61 soil samples were collected from the pits and subjected to saturation percentage, pH, electrical conductivity Ca+Mg, Na, HCO₃, Cl, SO₄ specific gravity and porosity tests in the Water and Soil Laboratory of the Hydrogeology Project, WAPDA, Quetta. Delineation of land classes was then done based on the field observation and laboratory data.

2) Land Classification

Based on the physical features and chemical properties of the soils, the area has been classified into three land capability classes. Class-I land has the greatest potentialities and least limitations for response to management while Class-II and III have relatively less potential for irrigated agriculture. The limiting factors have also been indicated as suffixes with

Class-II and III lands. The distribution of these classes is shown in the land classification map and discussion below:

a. Class-I: Good Arable Land

These lands are free from limiting factors and are most suitable for sustained agriculture. These are deep, well drained, level to nearly level, non-saline and non-sodic. All climatically suitable crops can be grown in this land class and normal management practices are sufficient to maintain their fertility over a long period of time.

A path of Class-I land spread over 264 hectares was marked in the south of Shahr Haji which extends to the northwest upto the eroded land near KL-C Area.

b. Class-II: Fairly Good Arable Land

These lands suffer either from uneven and undulating surface relief or slight rill erosion and have been marked as IIu and IIe on the map. At present, these are not as productive as Class-I land and require minor to moderate reclamation measures to improve their agricultural potential.

These lands occupy the entire KL-B Area of the surveyed area and are also located around Shahr Haji and Glawandora villages. One patch of Class-II land also lies in the east of Dallo village. A total of 964 hectares of land is occupied by Class-II lands.

c. Class-III: Fair Arable Land

This class of land suffers from moderate limitations which require special and careful reclamation measures. These include salinity/sodicity problem

in the subsoil, presence of upto 30% grit and gravel on the surface as well as in the profile and moderate rill and gully erosion hazard. Although the cost of reclamation of these soils is high, yet if their deficiencies are removed, Class-III land may respond equally as Class-I or Class-II lands. Class-III lands have been marked as IIIs, IIIg, and IIIe on the map. A total of 1,500 hectares have been separated as Class-III lands which occur in the west and south of village Kallu, south of Glawandora and in north east of Dallo village.

3) Soils

The soils of Kalat Area are alluvial in nature and were formed in recent age from the material derived from the surrounding mountains composed mainly of limestone and shale. Texturally the soils are moderately coarse to moderately fine. Generally, these are medium textured but at places are interlayered with moderately coarse and moderately fine material. The colour of the soils varies from very pale brown (10 YR 7/3) to brown (10 YR 5/3). The soils are calcareous and well drained. Water holding capacity is fair to moderate. The permeability of some soils is low due to the presence of moderately fine material. Such soils generally occur in Chappar area. As the soils are recent their structure is not well developed. However, weak sub-angular blocky structure was observed at places. Abundant medium and fine pores and roots are present in the subsoil. Insect action in the upper subsoil was also noted. The soils are almost free of surface salinity. However, at two sampling sites in KL-A Area strong salinity/sodicity has been reported by the soil laboratory below the depth of 45 centimeters. In their present position, the salts are harmful for plants particularly the deep rooted plants. If excessive

irrigation water is applied to these soils, the salts may be leached down and soils reclaimed. The electrical conductivity of the soils ranges from 0.35 to 14.0 millimhos/cm at 25°C and the pH ranges from 7.2 to 8.5. The sodium adsorption ratio (SAR) of the soil samples was computed from the formula

$$SAR = \frac{Na}{\sqrt{\frac{Ca + Mg}{2}}}$$

Its values range from 1.9 to 44. Assessing the soil samples with respect to salinity/sodicity problem, the following breakup has been made:

Sr. No.	Salinity/Sodicity Class	No. of Samples	Percentage
1.	Normal	57	93.4
2.	Saline Sodic	3	4.9
3.	Non-saline Sodic	1	1.7
Total		61	100.0

The soil samples were also subjected to specific gravity and porosity tests. Laboratory data indicate that the values of specific gravity range from 2.05 to 2.49 and those of porosity fluctuate between 30 to 46%.

Keeping in view the physical and chemical properties of the soils, the area was classified into four soil series namely Torak, Tirkha, Badenzai and Psha series. These series were at first identified in Qila Saifullah area of Baluchistan. On the soil classification map these series have been denoted as 2, 3, 4 and 5. The second figure in the classification indicates the texture of the surface soil.

A detailed description of the above named soil series is described previous sub-section.

TABLE A-3.1.7 Area of Different Land Classes in Quetta Area
(Unit : ha)

C	D			E		F	Total	%
V	I	III	IV	I	II	II		
Vg3 = 373	I=310	IIIu=101	IVg2=109	I=78	IIu=153	IIu=213	I=388 II=366 III=101 IV=109 V=373	29.0 27.4 7.6 8.2 27.8
Total = 373	310	101	109	78	153	213	1,337	100.0

TABLE A-3.1.8 Area of Different Soil Series in Quetta Area
(Unit : ha)

C	D	E	F	Total	%
53g3 = 373	43u=310 52u= 8 54u= 93 53g2=109	32u=34 33u=78 33u=62 34u=57	33u=213	TIRKHA(3)=444 BADANZAI(4)=310 PSHA(5)=583	33.2 23.2 43.6
Total = 373	520	231	213	1,337	100.0

TABLE A-3.1.9 Area of Different Soil Series in Quetta Area
(Unit: ha)

A			B	C			Total	%
I	II	III	II	II	III	Eroded Land		
264	IIe=340 IIu=347	IIIe= 96 IIIs=295	IIu=637	IIe=277	IIIg=109	132	I= 264 II=1,601 III= 500 Eroded Land= 132	10.6 64.1 20.0 5.3
264	687	391	637	277	109	132	Total=2,497	100.0

TABLE A-3.1.10 Area of Different Land Classes in Kalat Area
(Unit : ha)

A	B	C	TOTAL	%
32e=277	33u=637	22g1=109	TORAK(2)= 109	4.3
33 =264		33e=277	TIRKHA(3)=2,134	85.5
33e=158		Eroded Land =132	BADENZAI(4)= 122	4.9
33s=296				
33u=225				
44u=122				
Total=1,342	637	518	2,497	100.0

TABLE A-3.1.11 Soil Characteristics in the Study Area

Village /Site	Pt-No	Depth (cm)	Texture	S.P	PH	Ece	CATIONS		ANIONS			Sodium Adsorption	CO ₃ (meq/100gm)	SP-Gravity	Poro-sity	Remarks
							Ca ⁺ Mg	Na	HCO ₃	Cl	SO ₄					
Q/V	QD-1	0-17	SII	36	8.1	0.57	1.99	3.47	3.30	1.57	0.59	3.5	1.31	2.31	55	N
	QD-1	17-85	SICl/SII	34	7.9	0.52	2.85	2.73	2.20	2.50	0.88	2.3	-	2.28	37	
	QD-1	85-119	SICl	45	7.8	0.57	2.28	3.30	2.25	2.10	0.73	3.1	0.47	2.27	36	
	QD-1	114-150	SII/I	44	8.3	0.55	2.56	2.86	3.02	2.08	0.32	2.5	0.46	2.24	37	
Q/V	QD-2	0-15	SIL	33	8.3	0.57	2.85	2.86	3.41	2.10	0.20	2.4	0.19	2.14	35	N
	QD-2	15-45	SICL	38	8.3	0.45	2.28	2.60	2.47	2.50	0.31	2.4	0.19	2.14	35	
	QD-2	45-90	SIL	39	8.3	0.85	2.28	6.52	3.19	3.67	1.94	6.1	0.91	2.14	32	
	QD-2	90-150	SIL	41	7.7	2.5	4.56	20.82	2.47	15.86	7.05	14.0	-	2.14	43	
Dallo	KC-2	0-20	L	34	7.8	0.75	4.56	2.87	4.12	1.57	1.74	1.9	-	2.27	34	N
	KC-2	20-45	SII	31	7.7	0.46	1.42	3.17	2.47	1.84	0.28	3.8	1.05	2.15	30	
	KC-2	45-90	FSL	32	7.9	0.50	2.28	2.52	3.02	1.31	0.47	2.3	0.74	2.40	38	
	KC-2	90-160	FSL	30	7.8	0.52	2.28	3.30	3.02	1.57	0.99	3.1	0.74	2.39	39	
Chappir	KA-2	0-15	L	32	7.8	0.51	1.99	3.30	2.75	1.84	0.70	3.3	0.76	2.47	43	SS
	KA-2	15-45	SIL/L	33	7.9	0.35	1.14	2.60	2.47	1.05	0.22	3.5	1.33	2.39	41	
	KA-2	45-64	SL	30	8.4	0.52	1.71	3.73	3.02	1.57	0.85	4.0	1.37	2.39	45	
	KA-2	64-90	SIL	33	8.2	0.85	2.28	6.52	4.12	3.15	1.53	6.1	1.84	2.56	43	
	KA-2	90-105	SIL	34	8.2	1.75	2.28	14.60	3.30	10.50	3.08	14.0	1.02	2.40	36	
	KA-2	105-150	SL	30	8.0	2.60	2.28	23.21	4.40	16.53	4.56	22.0	2.12	2.46	42	
Near KL-JICA-2	KB-2	0-15	SIL	30	7.9	0.53	2.28	3.04	3.30	1.31	0.71	2.8	1.02	2.22	37	N
	KB-2	15-45	CL	33	7.8	0.47	1.71	2.86	2.75	1.31	0.51	3.1	1.04	2.19	35	
	KB-2	45-90	L	38	7.9	0.45	1.71	3.17	2.47	1.31	1.10	3.4	0.76	2.26	39	
	KB-2	90-150	L	39	7.9	0.66	3.13	3.74	2.20	2.36	2.31	3.0	-	2.26	42	

3.2 SOCIO-ECONOMIC CHARACTERISTICS

TABLE A-3.2.1 Population Statistics

Item	AREA (km ²)	POPULATION IN 1981 (thousand)	SEX RATIO		POPULATION DENSITY (PERSON/km ²)	POPULATION GROWTH 1972-1981	AVERAGE ANNUAL GROWTH
			MALE	100 FEMALES			
PAKISTAN	796,095	84,254	111		106	29.0	2.9
BALUCHISTAN PROV.	347,190	4,332	112		12	78.4	6.6
QUETTA DIVISION	110,510	1,630	114		15	76.0	6.5
QUETTA DISTRICT	2,653	382	126		144	51.2	4.7
QUETTA TEHSIL	-	374	126		-	-	-
KALAT DIVISOIN	138,033	1,044	109		8	91.0	7.5
KALAT DISTRICT	12,517	341	101		27	126.5	9.5
MASTUNG TEHSIL	-	65	98		-	-	-
KALAT TEHSIL	-	59	102		-	-	-

Sources ; Pakistan Statistical Yearbook 1986
 1981 Census Report of Baluchistan
 1981 District Census Report of Quetta & Kalat

TABLE A-3.2.2 Estimated Population and Household in the Project Area

Project Area	No of Vilages Cencerned	Population	Household
QT-D	2	3,600	-
QT-E	3	5,400	-
Sub-Total	5	9,000	1,200
KL-B	3	1,500	-
KL-C	2	1,000	-
Sub-Total	5	2,500	330
Grand Total	10	11,500	1,530

Source : Field Survey

TABLE A-3.2.3 Industrial Establishment

Type of Establishment	Quetta		Kalat	
	No of Est.	Employee	No of Est.	Employee
Pharmaceutical	1	601	-	-
Chemical	1	-	-	-
Vegetable Ghee	1	200	-	-
Cold Storage	1	5	-	-
Coal Briquetting	1	12	-	-
Wollen Mills	1	-	-	-
Lubricating Oil	1	30	-	-
Aluminium	8	20	-	-
Food	7	59	-	-
Ice Factory	5	17	-	-
Tobacco Crusing	3	15	-	-
Wood Work/Furniture	4	92	-	-
Marble Products	1	4	-	-
Printing Press	6	31	-	-
Flour Mill	10	37	60	120
Soap Factory	7	28	-	-
RCC Pipe Factory	3	10	-	-
Stone Crushing	5	-	-	-
Hotel, Bakery, Restaurant	19	109	8	18
Brick Mills	21	340	-	-
Engineering Workshop	4	15	13	25
Foot Wear	-	-	4	21
Furniture	-	-	3	6
Dairy Farm	-	-	1	16
Poultry (GOV'T)	-	-	1	-
Total	103	1,645	90	206

Source : Department of Industry, Baluchistan

TABLE A-3.2.4 Labor Force Statistics

Item	Quetta			Kalat		
	Male	Female	Total	Male	Female	Total
1. Population	213,044	168,522	381,566	171,575	169,618	341,193
2. Labor Force	83,546	2,981	86,527	95,782	1,307	97,089
3. Labor Force Participation Rate (2/1, %)	39.2	1.8	22.6	55.8	0.8	28.5
4. Working Population	79,817	2,832	82,649	94,229	1,056	95,285
5. Unemployed Population (2-4)	3,729	149	3,878	1,553	251	1,804
6. Unemployment Rate (5/2, %)	4.5	4.5	4.5	1.6	19.2	1.9
7. Self-Employed (%)	28.6	18.2	28.2	73.9	49.7	73.6
8. Employee (%)	60.1	79.3	60.8	12.2	16.6	12.4
9. Distribution of Occupation						
Agriculture	14.1	4.1	13.7	87.4	75.2	87.2
Manufacturing	6.4	7.9	6.5	0.2	3.5	0.2
Services	79.5	88.0	79.8	12.4	21.3	12.6
Total	100.0	100.0	100.0	10.0	100.0	100.0

Source : 1981 District Census Report, Quetta and Kalat.

TABLE A-3.2.5 Education Institutions

Item	Quetta		Kalat		Total	
	Male	Female	Male	Female	Male	Female
Primary School (Grade 1-5)						
No. of Schools	134	88	184	32	318	120
Enrollment	23,155	18,304	7,197	1,392	30,352	19,696
No. of Staffs	671	557	520	43	1,191	600
Mosque School						
No. of Schools	92	-	120	-	212	-
Enrollment	3,151	-	4,395	-	7,546	-
No. of Staffs	92	-	120	-	212	-
Middle School (Grade 6-8)						
No. of Schools	21	20	30	7	51	27
Enrollment	22,011	19,871	6,041	1,928	28,052	21,799
High Schools (Grade 9-10)						
No. of Schools	20	13	8	4	28	17
Enrollment	4,295	2,104	315	64	4,610	2,168

Source : Directorate of Education, Baluchistan

TABLE A-3.2.6 Health Institutions

Item	Quetta		Kalat	
	No.	Bed	No.	Bed
Hospital	11	1,777	3	68
Dispensaries	17	8	24	4
Rural Health Clinic	-	-	1	10
Basic Health Units	21	-	14	-
T.B. Clinic	1	-	1	-
Maternity & Child Health	15	-	2	-
Total	65	1,785	45	82

Source : Health Department, Baluchistan

TABLE A-3.2.7 Health Personnel

Item	Quetta		Kalat		Total	
	No.	Population/ Officer	No.	Population/ Officer	No.	Population/ Officer
Medical Officers	168	2,271	29	11,765	197	3,669
Para-Medical Staff	218	1,750	42	8,124	260	2,780

Source : Health Department, Baluchistan

TABLE A-3.2.8 Planted Area, Harvested Area and Production of Sample Households (Crop Year 1986/87)

Crop and Area	Planted Area (ha)	Harvested Area (ha)	Production (t)	Yield (t/ha)
Wheat				
Quetta	60	55	99.9	1.8
Kalat	57	46	57.1	1.2
Total/Ave.	117	101	157.0	1.6
Cumin				
Quetta	1	1	0.1	0.1
Kalat	28	27	4.8	0.2
Total/Ave.	29	28	4.9	0.2
Sorghum				
Quetta	6	3	6.6	2.2
Kalat	4	-	-	-
Total/Ave.	10	3	-	-
Potato				
Quetta	1	-	-	-
Kalat	14	13	107.8	8.3
Total/Ave.	15	13	-	-
Onion				
Quetta	4	4	43.0	10.8
Kalat	6	6	79.6	13.3
Total/Ave.	10	10	122.6	12.3
Alfalfa				
Quetta	24	24	216.0	9.0
Apple				
Quetta	18	18	98.7	5.5
Others	16	7	-	-

Source : Farm Economic Survey

TABLE A-3.2.9 Average Area of Landholding among Sample Households

	Quetta Area (11)	Kalat Area (12)	Total/Average (23)
Sample Size			
Wheat Area (ha)	5.4	5.4	5.4
Field Crop Area (ha)	2.3	2.9	2.6
Permanent Crop Area (ha)	2.7	1.5	2.1
Pasture, Fallow Area (ha)	41.3	43.3	42.4
Total (ha)	51.7	53.1	52.5

Note : Pasture land includes common tribal land.

TABLE A-3.2.10 Source of Irrigation Water for Planted Area

Crop	Rain(Flood)	River	Pond	Canal	Well	Others	Total
Wheat	82	0	0	0	18	0	100
Cumin	47	0	0	0	53	0	100
Sorghum	100	0	0	0	0	0	100
Potato	6	0	0	0	94	0	100
Onion	0	0	0	0	100	0	100
Alfalfa	0	0	0	0	100	0	100
Apple	0	0	0	0	100	0	100
Melon	100	0	0	0	0	0	100
Vegetable	0	0	0	0	100	0	100
Others	92	0	0	0	8	0	100
Weighted Average	55	0	0	0	45	0	100

Source : Farm Economic Survey

TABLE A-3.2.11 Disposition of Crops

Crop	Sold	Consumed	Seed	Feed	Payment	Stock	Others
Wheat	44	45	5	-	4	-	2
Cumin	91	-	2	-	7	-	-
Potato	78	2	-	-	20	-	-
Onion	82	-	-	-	18	-	-
Alfalfa	92	4	-	-	4	-	-
Sorghum	-	100	-	-	-	-	-
Vegetable	71	1	-	-	28	-	-
Melon	100	-	-	-	-	-	-
Apple	99	1	-	-	-	-	-

Source : Farm Economic Survey

TABLE A-3.2.12 Inventory of Livestock and Polutry

Livestock	Cattle	Baffalo	Sheep	Goat	Camel	Donkey	Chicken
% of Owners	48	4	87	83	65	26	26
Ave. No. of Livestock	2	2	39	17	2	1	2
Value of Livestock	9,100	13,000	19,000	6,000	8,300	820	60

Source : Farm Economic Survey

TABLE A-3.2.13 Inventory of Household Equipment

	House	Warehouse	Animal Shed	Tractor	Pump
% of Owners	100	52	61	9	22
Ave. No. of Livestock	2	1.5	1.6	1	1.3
Value of Livestock	22,00	5,200	4,500	57,500	235,000
	Sprayer	Animal Plow	Cart	Pick Up & Truck	
% of Owners	9	30	4	17	
Ave. No. of Livestock	1	2.1	1	1.3	
Value of Livestock	10,000	300	1,500	246,000	

Source : Farm Economic Survey

TABLE A-3.2.14 Source of Domestic Water

	Spring	Open Well	Tubewell
% Distribution	13	43	44
Ave. Distance (m)	1,050	280	580
Labor Requirement (man hrs/day)	2	4	9

Source : Farm Economic Survey

TABLE A-3.2.15 Debt Status

Purpose	Livestock	Machinery	Land	Household Facility	Others
% Concerned	9	17	9	35	3
Source of Loan(%)					
Relative	100	25	100	75	-
Bank	-	75	-	12	67
Others	-	-	-	12	33
Ave. Remaining Debt	4,000	57,500	12,600	17,000	25,400

Source : Farm Economic Survey

TABLE A-3.2.16 Annual Household Farm Income by Crop

Crop	H.H. Concerned (%)	Cash Income (%)
Wheat	39	6,586 (7)
Cumin	5	3,963 (4)
Potato	17	8,999 (10)
Onion	22	22,219 (25)
Alfalfa	9	8,804 (11)
Vegetable	13	2,094 (2)
Apple	13	36,585 (40)
Total	65	89,250 (100)

Source : Farm Economic Survey

TABLE A-3.2.17 Annual Household Income from Non-farm Work

Farm Type(No.)	H.H. Concerned	H.H Members Concerned	Days Worked	Ave. H.H. Income (Rs)
Non-Irrigated(17)	13/17	1.8	435	12,904
Irrigated (6)	2/6	1.0	363	5,933
Average (23)	15/23	1.7	425	11,085

Source : Farm Economic Survey

TABLE A-3.2.18 Annual Household Income

Farm Type(No.)	On-Farm		Off-Farm		Total	Family Size	Per Capita Income	
	Cash	Non-Cash ^{1/}	Agri.	Non-Agri.			Rs	US\$
Non-Irrigated(17)	12,643	7,100	1,706		12,904	34,353	14.3	2,402
Irrigated(6)	306,304	6,100	50,000 ^{2/}		5,933	368,337	19.2	19,184
Average(23)	89,250	6,800	14,319		11,085	121,454	15.6	7,786

Source : Farm Economic Survey

Note : ^{1/} Estimated value of household consumption of wheat.

^{2/} Rent from the land leased

TABLE A-3.2.19 Average Annual Household Expenditure

Item	Expenditure (Rs.)
Food	8,545
Wheat, rice and other grains	(4,300)
Beans	(400)
Eggs	(-)
Meat (Sheep, goat, beef, poultry)	(3,200)
Fish	(45)
Vegetables	(600)
Tea	1,600
Tobacco	66
Housing	28
Light Fuel	800
Clothes	600
Medical Care	300
Transportation/Communication	1,200
Education	35
Total	13,174

Source : Farm Economic Survey

TABLE A-3.2.20 Dimension of Sample Households

Item	Quetta Area	Kalat Area	Total/Average
No. of Households(Exended Family)	11	12	23
No. of Household Members	143	215	358
Size of Household	13.0	17.9	15.6
Size of Labor Force Per Household ^{1/}	9.0	10.5	9.8
Sex Ratio (males per 100 females)	107	111	109
Age Dependency Ratio (%) ^{2/}	59	119	90
Average Family Age	24.2	20.8	22.2
No. of Days Worked Per Labor Force in			
- Own Farm Work	29	90	68 (61)(%)
- Other Farm Work	-	-	-
- Non-Farm Work	40	46	43 (39)
Total	69	136	111(100)
Working Place for Non-Farm Work (Cases)			
- Quetta District	7	-	7 (41)(%)
- Kalat District	-	5	5 (29)
- Sibi District	-	1	1 (6)
- Sind Province	-	4	4 (24)
Total	7	10	17(100)

Note : 1/ Size of Labor Force per Household is estimated by imputing the following value ;
0-9 years - 0.2; 10-14 years - 0.4, 15-19-years - 0.7
20-59 years - 1.0, 60 years and above - 0.5
2/ Percentage ratio of population below 15 years and above 60 years to population of 15 to 59 years

Source : Farm Economic Survey

3.3 LANDUSE

TABLE A-3.3.1 Land Utilization in Pakistan and Baluchistan Province

(Unit : x 1,000 ha)

Year	Total Area	Area Reported	Forest Area	Not Available For Cultivation	Culturable Area	Cultivated Area
* 1980/81	79,610	53,920	2,850	19,910	10,860	20,300
1981/82	79,610	56,660	2,990	22,380	10,950	20,340
1982/83	79,610	56,710	3,050	22,340	11,040	20,280
1983/84	77,610	56,770	3,070	22,410	10,950	20,340
** 1980/81	34,720	19,050	1,070	11,160	5,410	1,410
1981/82	34,720	19,050	1,070	11,160	5,410	1,410
1982/83	34,720	19,090	1,070	11,160	5,380	1,470
1983/84	34,720	19,090	1,080	11,160	5,390	1,450

SOURCE : * Pakistan Statistical Yearbook 1986

** Baluchistan Development Statistics 1983 - 84

TABLE A-3.3.2 Land Utilization in Related Tehsils 1984-85.

		(Unit : ha)		
Category	Tehsil	Quetta	Mastung	Kalat
1.	Total Area	184,999	56,331	98,040
2.	Uncultivated Area	115,666	24,714	42,088
2.1	Forest	65	-	
2.2	Impossible	76,906	11,817	19,398
2.3	Pasture	177	-	
2.4	Cultivable	34,633	-	
2.5	Waste	3,885	12,897	22,690
3.	Cultivated Area			
3.1	Total	69,333	31,617	55,952
	1 by Karazes & Spring	20,562	6,305	
	2 by Tube Wells	13,432	6,652	2,093
	3 by Flood	11,964	11,011	47,955
	4 by Rainfed	23,375	7,649	5,904
3.2	Fruiting Crop	3,403	1,185	118
	1 by Karazes & Spring	2,159	709	
	2 by Tube Wells	1,244	476	118
	3 by Flood	-	-	-
	4 by Rainfed	-	-	-
3.3	Non-fruiting Crop	1,042		
	1 by Karazes & Spring	623		
	2 by Tube Wells	419	(incl'd)	(incl'd)
	3 by Flood	-	(in 3.2)	(in 3.2)
	4 by Rainfed	-		
3.4	Other Crop	10,985	20,071	55,834
	1 by Karazes & Spring	5,190	3,814	1,768
	2 by Tube Wells	3,381	3,821	207
	3 by Flood	181	8,858	47,955
	4 by Rainfed	2,233	3,578	5,904
3.5	Fallow	53,903	10,361	
	1 by Karazes & Spring	12,590	1,782	
	2 by Tube Wells	8,388	2,355	
	3 by Flood	11,783	2,153	incl'd
	4 by Rainfed	21,142	4,071	in 3.4

SOURCES : Quetta, Mastung and Kalat Tehsil Office

3.4 AGRICULTURE

TABLE A-3.4.1 Present Farming Practice

	Plowing	Sowing	Fertilizing	Weeding	Spraying	Harvesting	Threshing
Sorghum	Animal Machine	Animal	-	-	-	Man	Animal
Green Sorghum	-do-	-do-	-	-	-	-do-	-
Maize	-do-	-do-	-	-	-	-do-	Man
Green Maize	-do-	-do-	-	-	-	-do-	-
Onion	-do-	Man	Man	Man	-	-do-	-
Melons	-do-	Man	Man	Man	-	-do-	-
Wheat	-do-	Animal	-	-	-	-do-	Animal
Cumin	-do-	Man	Man	Man	-	-do-	Man
Potato	-do-	-do-	-do-	-do-	Sometimes	-do-	-
Vegetables	Animal	-do-	-do-	-do-	Sprayer	-do-	-
Alfalfa	-	-	-	-	-	-do-	-
Orchard	-	-	Man	Man	Sprayer	-do-	-

Source: Field Survey Results, 1982

TABLE A-3.4.2 Number of Machinery and Area Reclaimed

ITEM	TRACTORS			THRESHERS			BULLDOZERS			Reclaimed Area (ha)
	Gov.	Pri.	Total	Gov.	Pri.	Total	Gov.	Pri.	Total	
Baluchistan	198	2,952	3,141	19	137	156	261	0	261	12,478
Quetta Div.	39	1,202	1,241	9	21	30	81	0	81	4,381
Quetta Dis.	8	112	120	1	2	3	10	0	10	645
Kalat Div.	60	503	563	6	4	10	71	0	71	3,006
Kalat Dis.	32	190	222	1	1	2	19	0	19	810

* Gov. ; Government

Pri. ; Private

Source ; Argicultural Statistics Baluchistan 1985 - 1986

TABLE A-3.4.3 Recommended Inputs for Crops
(Unit : kg/ha)

CROPS	SEED	FERTILIZER		
		N	P ₂ O ₅	K ₂ O
<u>Summer Crops</u>				
Sorghum	37	225	150	75
Maize	25	200	100	-
Chilies	5	250	125	125
Vegetables	20	250	150	60
Melons	6	75	75	-
Onion	15	300	200	200
Fodder	50	90	50	
<u>Winter Crops</u>				
Wheat	92	300	150	-
Cumin	12	125	60	
Potato	1980-2480	300	200	100
Pulses	20	45	115	-
Vegetables	20	250	150	60
<u>Perennial Crops</u>				
Alfalfa	20	125	250	-
Orchards	225-250	225	175	175

Source; Department of Agriculture, Government of Baluchistan

TABLE A-3.4.4 Agricultural Statistics (Average 1981/82)

Crops	Name of Area	Irrigation	Acreage (ha)	Production (ton)	Yield (kg/ha)
Wheat	Baluchistan	Irri.	165,326	325,268	1,967
		Non.	96,944	51,356	530
		Total	262,270	376,624	1,436
	Quetta Div.	Irri.	22,638	41,898	1,851
		Non.	26,708	19,656	736
		Total	49,346	61,554	1,247
	Quetta Dis.	Irri.	1,458	2,194	1,505
		Non.	398	220	558
		Total	1,852	2,414	1,303
	Kalat Div.	Irri.	17,182	28,398	1,653
		Non.	53,070	38,818	731
		Total	70,252	67,216	957
	Kalat Dis.	Irri.	9,948	14,108	1,418
		Non.	15,980	17,022	1,065
		Total	25,928	31,130	1,201
Rice	Baluchistan	Irri.	104,902	301,847	2,877
Barley	Baluchistan	Irri.	3,140	7,627	937
		Non.	5,187	3,112	600
		Total	13,327	10,739	805

(to be continued)

(cont'd)

Crops	Name of Area	Irrigation	Acreage (ha)	Production (ton)	Yield (kg/ha)	
Barley (con'd)	Quetta Div.	Irri.	1,372	1,342	978	
		Non.	612	340	555	
		Total	1,984	1,682	848	
	Quetta Dis.	Irri.	110	107	997	
		Non.	-	-	-	
		Total	110	107	997	
	Kalat Div.	Irri.	3,573	3,351	938	
		Non.	4,140	2,542	614	
		Total	7,713	5,893	764	
	Kalat Dis.	Irri.	165	151	915	
		Non.	170	90	529	
		Total	335	241	719	
	Cumin	Baluchistan	Irri.	2,536	1,553	612
			Non.	1,244	476	383
			Total	3,780	2,029	537
Quetta Dis.		Irri.	1,777	1,019	573	
		Non.	290	105	362	
		Total	2,067	1,114	539	
Quetta Div.		Irri.	182	102	559	
		Non.	113	41	361	
		Total	295	143	485	

(to be continued)

(cont'd)

Crops	Name of Area	Irrigation	Acreage (ha)	Production (ton)	Yield (kg/ha)	
Cumin (cont'd)	Kalat Dis.	Irri.	726	441	607	
		Non.	954	372	390	
		Total	1,680	813	484	
	Kalat Div.	Irri.	613	374	610	
		Non.	810	320	395	
		Total	1,423	694	488	
Sorghum	Baluchistan	Irri.	20,945	16,498	788	
		Non.	30,631	15,748	514	
		Total	51,576	32,246	625	
	Quetta Div.	Irri.	664	476	717	
		Non.	3,135	1,529	488	
		Total	3,799	2,005	528	
	Quetta Dis.	-	-	-	-	
	Kalat Div.	Irri.	196	165	842	
		Non.	7,086	3,457	488	
		Total	7,285	3,622	497	
	Kalat Dis.	-	-	-	-	
	Maize	Baluchistan	Irri.	1,870	1,851	990
			Non.	1,566	980	626
			Total	3,436	2,831	824

(to be continued)

(cont'd)

Crops	Name of Area	Irrigation	Acreage (ha)	Production (ton)	Yield (kg/ha)
Maize (cont'd)	Quetta Div.	Irri.	1,762	1,745	990
		Non.	1,555	974	626
		Total	3,317	2,719	820
	Quetta Dis.	-	-	-	-
	Kalat Div.	-	-	-	-
Onion	Baluchistan	Irri.	6,185	88,892	14,372
	Quetta Div.	do	1,123	15,896	14,155
	Quetta Dis.	do	254	3,382	13,315
	Kalat Div.	do	4,191	62,508	14,915
	Kalat Dis.	do	3,698	56,400	15,251
Potato	Baluchistan	Irri.	5,146	68,382	13,288
	Quetta Div.	do	1,922	24,630	12,815
	Quetta Dis.	do	37	454	12,139
	Kalat Div.	do	3,041	41,496	13,646
	Kalat Dis.	do	3,023	41,272	13,612

(to be continued)

(cont'd)

Crops	Name of Area	Irrigation	Acreage (ha)	Production (ton)	Yield (kg/ha)
Tomato	Baluchistan	Irri.	2,342	33,255	14,199
	Quetta Div.	do.	1,344	19,473	14,489
	Quetta Dis.	do.	576	8,200	14,236
	Kalat Div.	do.	782	10,830	13,849
	Kalat Dis.	do.	350	4,895	13,986
Melon	Baluchistan	Irri.	7,185	120,396	16,756
		Non.	3,742	42,673	11,404
		Total	10,927	163,066	14,923
	Quetta Div.	Irri.	4,961	86,139	17,363
		Non.	2,397	28,155	11,746
		Total	7,408	114,294	15,428
	Quetta Dis.	Irri.	649	10,690	16,471
		Non.	-	-	-
		Total	649		
	Kalat Div.	Irri.	896	15,020	16,763
		Non.	1,124	12,883	11,461
		Total	2,020	27,903	13,813

(to be continued)

(cont'd)

Crops	Name of Area	Irrigation	Acreage (ha)	Production (ton)	Yield (kg/ha)
Melon (cont'd)	Kalat Dis.	Irri.	410	7,033	17,152
		Non.	864	9,995	11,568
		Total	1,274	17,028	13,365
Vegetable Kharif ^{/1}	Baluchistan	Irri.	4,596	58,935	12,823
	Quetta Div.	do	1,980	25,540	12,900
	Quetta Dis.	do	1,138	14,148	12,421
	Kalat Div.	do	1,215	15,708	12,928
	Kalat Dis.	do	629	8,440	13,418
Rabi ^{/2}	Baluchistan	do	3,736	51,585	13,808
	Quetta Div.	do	547	8,567	15,662
	Quetta Dis.	do	198	3,098	15,646
	Kalat Div.	do	587	8,648	14,732
	Kalat Dis.	do	288	4,492	15,597

/1 Kharif : Sep/Oct - Mar

/2 Rabi : Apr - Sep

(to be continued)

(cont'd)

Crops	Name of Area	Bearing	Acreage (ha)	Production (ton)	Yield (kg/ha)	
Apple	Baluchistan	Bearing	4,735	73,262	15,472	
		Non.	3,735	-	-	
		Total	8,570	-	-	
	Quetta Div.	Bearing	2,779	41,518	14,940	
		Non.	2,427	-	-	
		Total	5,206	-	-	
	Quetta Dis.	Bearing	818	12,278	15,010	
		Non.	417	-	-	
		Total	1,235	-	-	
	Kalat Div.	Bearing	859	13,248	15,423	
		Non.	602	-	-	
		Total	1,461	-	-	
	Kalat Dis.	Bearing	714	11,286	15,807	
		Non.	362	-	-	
		Total	1,076	-	-	
	Grape	Baluchistan	Bearing	2,433	26,536	10,907
			Non.	261	-	-
			Total	2,694	-	-
Quetta Div.		Bearing	2,119	23,246	10,970	
		Non.	150	-	-	
		Total	2,269	-	-	

(to be continued)

(cont'd)

Crops	Name of Area	Bearing	Acreage (ha)	Production (ton)	Yield (kg/ha)
Grape (cont'd)	Quetta Dis.	Bearing	628	6,972	11,102
		Non.	48	-	-
		Total	676	-	-
	Kalat Div.	Bearing	209	2,596	12,421
		Non.	100	-	-
		Total	309	-	-
	Kalat Dis.	Bearing	184	1,944	10,837
		Non.	94	-	-
		Total	278	-	-

Note: Div. : Division
Dis. : District
Irri. : with irrigation
Non. : without irrigation
or non-bearing

TABLE A-3.4.5 Lectures Given to Farmers by Extension Workers in KALAT Teshil (1984-85)

Village Name	Nos. of Participant	Nos. of Lectures	Subject on which lecture was given
1. Kalat	36	35	About use of chemical fertilizer seed and levelling of land, etc.
2. Rodine	15	12	About Ch. Fertilizer and Plant Protection.
3. Isghalko	7	10	Importance of orchard farming and seed.
4. Sheikhry	5	4	Repair of bunds and barani farming.
5. Juhan	20	22	Chemical fertilizer, seed and implements.
6. Neemurgh	4	6	Seed and fertilizers use.

Source: Kalat Tehsil Agricultural Extension Office

TABLE A-3.4.6 Demonstration Plots of Kalat Teshil

Crops	Variety	Area (Acre)	Seed Used (kgs)	Sowing Date	N.Kgs Used			Nos. of Irrigation.	Total Production (kgs)	Harvesting Date
					N	P	K			
Wheat	Pon	1	50	16.11.85	46	30	-	4	1920	3.7.86
Wheat	"	1	50	19.11.85	46	30	-	4	2160	29.6.86
Wheat	"	1	50	1.12.85	46	30	-	3	1320	2.7.86
Wheat	"	2	100	11.11.85	92	60	-	4	1200	28.6.86
Wheat	"	1	50	26.11.85	46	30	-	4	1200	20.6.86
Wheat	"	2	100	23.11.85	92	60	-	4	2880	15.6.86
Wheat	"	2	100	25.11.85	92	60	-	3	2480	1.7.86
Wheat	"	1	50	27.11.84	46	30	-	4	2200	30.6.86
Wheat	"	1	50	29.11.84	46	30	-	4	2120	28.6.86
Potato	Red	1	600	25.4.86	46	30	-	5	5400	5.9.86
Cumin	White	2	6	12.12.85	23	30	-	3	280	25.6.86

Source: Kalat Tehsil Agricultural Extension Office

TABLE A-3.4.7 Farming Facilities and Equipment in Kalat Area

Equipment	H.P.	Nos.
Tractors	56	13
	45	4
	55	2
Cultivators	-	13
Mould Board Plow	-	13
Troly	-	8
Blade(for Multi- purposes).	-	19
Threshers	-	3
Local Plow Local Blade (Animal Driven) Sohaga Local Drill (Animal Driven)	Data not available	

Tubewells:	Nos.
1. <u>Electric.</u>	
a) Government	4
b) Private	93
2. <u>Diesel</u>	
a) Government	-
b) Private	62
3. P. Wheel	10
4. <u>Open Wells</u>	
a) For Irrigation	-
b) For Drinking	38

Source: Kalat Tehsil Agricultural Extension Office

TABLE A-3.4.8 Agricultural Research Institutes in Baluchistan

Sr.No.	NAME OF INSTITUTE	Area in ha
1.	Orchard Development Programme (FAO) Quetta (All Fruits)	—
2.	Nursary Demonstration Farm (FAO) Quetta	113
3.	Agriculture Research Centre Quetta	—
4.	Potato and Vegetable Seed Production Farm Quetta	18
5.	Potato Seed Farm at Pishin	3
6.	Cereal Seed Production Farm Sibi	51
7.	Cereal Seed Production Farm Gandawa	1268
8.	Agricultural Training Institute Baleli, Quetta	12
9.	Development of Floriculture in Baluchistan, Quetta	1
10.	Arid Zone Research Centre, Quetta	5
11.	Fruit Development with Highly Salined Water, Experimental Farm Mastung.	4
12.	Vegetable and Other Crop Seed Production Farm Mastung	10
13.	Development of Floriculture Shahi Bagh, Mastung	11
14.	Saffran and Fruit Experimental Farm Mastung	21
15.	Fruit Experimental Station at Khuzdar (Almond and Pomegranate)	3
16.	Fruit Experimental Research Farm Ziarat (Apple)	10
17.	Fruit Experimental Research Farm at Loralai (Apple, Pomegranate and Pistachio)	10
18.	Fruit Experimental Station at Pishin (Apricot & Grapes)	8
19.	Installation of Trickle Irrigation on 100 Acres at Uthal	41
20.	Date Farm Turbat	41
21.	Katra Farm at Kachhi	5
22.	Seed Farm Usta Mohammad	114
23.	Vegetable Seed Farm Dhadar	12
24.	Modle Farm Sibi	8
25.	Fruit Research Farm Baghbana	9
26.	Mustafa Kareze Farm Zhob	10
27.	Fruit Experimental Farm at Rani Bagh Sariab Road, Quetta	3
28.	Seed Farm Giddar District Kalat.	595

Source: Baluchistan Agricultural Office

TABLE A-3.4.9 Present Crop Budget per Hectare

ITEMS	Input Unit Price	Wheat		Cumin		Sorghum		Barley	
		QTY	Price	QTY	Price	QTY	Price	QTY	Price
1. Yield (Kg/ha)		1,050	-	284	-	472	-	632	-
2. Farm Gate Price (Rs/Kg)		-	2.0	-	19.6	-	1.5	-	2.0
3. Gross Production Value (Rs)		-	2,100	-	5,566	-	708	-	1,264
4. Production Cost									
a) Seed									
- Wheat	2.5Rs/Kg	65	163	-	-	-	-	-	-
- Cumin	30.0Rs/Kg	-	-	10	300	-	-	-	-
- Sorghum	2.5Rs/Kg	-	-	-	-	32	80	-	-
- Barley	2.5Rs/Kg	-	-	-	-	-	-	49	123
b) Fertilizer -DAP		-	-	-	-	-	-	-	-
-Urea		-	-	-	-	-	-	-	-
-Manure		-	-	-	-	-	-	-	-
c) Pesticide		-	-	-	-	-	-	-	-
d) Labor	30.0Rs/day	15	450	100	3000	5	150	10	300
e) Animal (incl'd Labor)									
-Seeding	65.0Rs/day	2.5	163	7.5	225	2.5	163	2.5	163
f) Machinery (incl'd Labor)					(Labor only)				
- plowing	65.9Rs/hr	4.2	273	4.2	273	4.2	273	4.2	273
Total Production Cost (Rs)		-	1049	-	3,798	-	666	-	859
5. Net Production Value (Rs)		-	1051	-	1,768	-	42	-	405

TABLE A-3.4.10 Existing Livestock Institutions

Institution	Number
<u>I. Quetta District</u>	
1. Hospitals, Quetta, Panjgur, Kuchlak	3
2. Dispensaries	10
3. Disease Investigation Laboratory, Quetta	1
4. Veterinary Research Institute, Quetta	1
5. Govt. Poultry Farm, Quetta	1
6. Govt. Dairy Farm, Quetta	1
7. Milk Plant, Quetta	1
8. Poultry Feed Mill, Quetta	1
9. Chiltan Feed Mill, Quetta	1
10. Kid and Lamb Fattening Center, Sariab	1
11. Artificial Insemination Center, Quetta	1
<u>II. Kalat District</u>	
1. Hospitals, Kalat, Mastung, Surab	3
2. Dispensaries	25
3. Govt. Poultry Farm, Kalat	1
4. Govt. Dairy Farm, Mastung	1
5. Govt. Dairy Farm, Kalat (under construction)	1
6. Artificial Insemination center, Kalat, Mastung, Mangocher	3

TABLE A-3.4.11 Organization of Each Livestock Office in Quetta and Kalat District

Item	Quetta	Kalat
Assistant Director	1	1
Veterinary Officer	4	2
Stock Assistant	36	13
Milk Tester	9	-
Subject Matter Specialist	-	5
Officer Assistant	1	-
Keeper	-	2
Camelman	41	8
Sweeper	-	2
Head Clerk	1	1
Driver	1	-
Peon	1	-
Total	95	34
Vehicles and Equipment	1 lot	1 lot

3.5 EXISTING INFRASTRUCTURE FACILITIES

TABLE A-3.5.1 Classification of National Highway

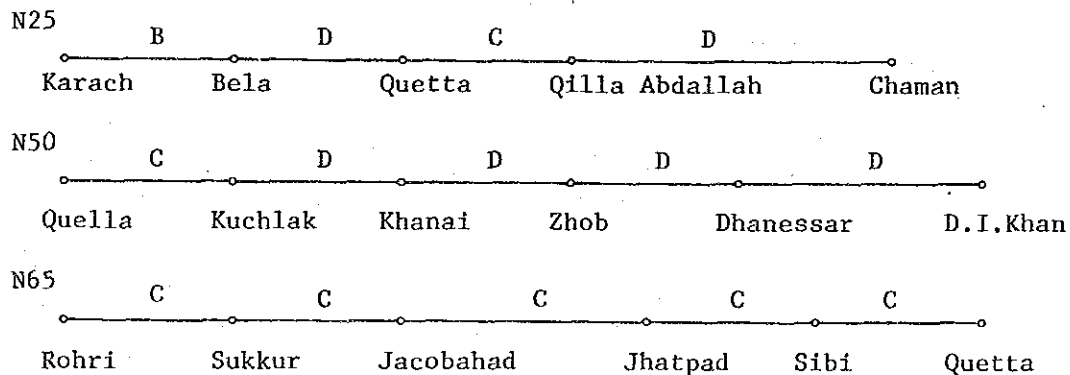
Type of Highway	Traffic vehicles/day	Type of Pavement	Formation width
A	7,000-48,000	4 lane divided asphalt concrete (2x7.3m)	11 m(36ft) median in rural area & 2 meter median in urban areas
B	3,000-7,000	2 lane - 7.3m pavement width (asphalt concrete)	12 meter (40 ft)*
C	500-3,000	2 lane - 7.3m with surface treated pavement	12 meter (40 ft)*
D	Less than 500	3.65 meters with surface treated pavement	12 meter (40 ft)*

* In hilly terrain pavement width for type B & C highway may have to be reduced from 7.3 m to 6 m and formation width from 12 m to 9.75 m.

Traffic Number(1985/86)

- Sibi - Quetta Ave. 1364 cars/day

- Kalat - Quetta Ave. 2769 cars/day



RCD : Regional Communication Development

TABLE A-3.5.2 Main Road Statistics 1986-87

(Unit : Km)

	Total Length	Black Topped	Shingled	Pavement Ratio
Baluchistan*	17,827	3,201	14,626	18.0%
Quetta Dist.*	817	344	473	42.1
Kalat Dist.**	1,068.4	410.4	658.0	38.4

Sources : * Communication & Works Dep., GOB

** Bridge & Road Dep. Kalat Executive Engr.

4. GROUNDWATER RESOURCES

4.1 Hydrogeology

TABLE A-4.1.1	Previous Test Well Results in Quetta Area
TABLE A-4.1.2	Previous Test Results In Kalat Area
TABLE A-4.1.3	Monthly Groundwater Table Fluctuation in Quetta Area
FIG A-4.1.1	Groundwater Table Fluctuation in Northern Quetta
FIG A-4.1.2	Monthly Discharge Fluctuation of Springs in Kalat Area
FIG A-4.1.3	Monthly Discharge Fluctuation of Karazes in Mastung Area

4.2 Present Groundwater Use

TABLE A-4.2.1	Inventory of Existing Wells in Quetta Area
TABLE A-4.2.2	Inventory of Existing Wells in Kalat Area
TABLE A-4.2.3	Estimation of Present Groundwater Extraction Amount
TABLE A-4.2.4	Groundwater Quality in Quetta Area
TABLE A-4.2.5	Groundwater Quality in Kalat Area
TABLE A-4.2.6	Surface Water Quality of the Sariab Iora at Berwery Bridge
FIG A-4.2.1	Fluctuation of Surface Water Discharge

4.3 Heli-borne Aerial Gamma-ray Spectro Prospecting

**** ref. to VOLUME III ****

4.4 Seismic Prospecting

4.4.1 General

4.4.2 Geological Conditions of Survey Area

4.4.3 Outline of Prospecting Method

4.4.4 Prospecting Works

4.4.5 Analysis of Observed Data

4.4.6 Results of Analysis

TABLE A-4.4.1	Seismic Wave(P-wave) Velocity in Different Type of Layers and Rocks
TABLE A-4.4.2	List of Equipment for Seismic Prospecting
TABLE A-4.4.3	Seismic Speed and Description on each Layer in Quetta A-Line
FIG A-4.4.1	Location of Seismic Lines in Quetta Area
FIG A-4.4.2	Location of Seismic Lines in Kalat Area
FIG A-4.4.3	Test Well Logs in Quetta Area
FIG A-4.4.4	Test Well Logs in Kalat Area
FIG A-4.4.5	Geological Cross-section in Kalat Area
FIG A-4.4.6	Path of Seismic Waves
FIG A-4.4.7	Travel Time Distance Curve and Velocity Section
FIG A-4.4.8	Flow Chart of Measuring Work
FIG A-4.4.9	Diagram of Seismic Prospecting
FIG A-4.4.10	Seismic Speed Graph and Seismic Water Path
TABLE A-4.4.4	Seismic Speed and Description on each Layer in Quetta B-Line
TABLE A-4.4.5	Seismic Speed and Description on each Layer in Kalat Line
FIG A-4.4.11	Seismic Speed Graph. Quetta A-line
FIG A-4.4.12	Seismic Speed Graph. Quetta B-line
FIG A-4.4.13	Seismic Speed Graph. Kalat line

4.5 Well Test

- 4.5.1 General
- 4.5.2 Drilling and Equipment
- 4.5.3 Pumping Test
- 4.5.4 Drilling Rigs and Equipment
- 4.5.5 Results

TABLE A-4.5.1	Tube Well Development of KL-JICA-2
TABLE A-4.5.2	Stepdown Pumping Test of KL-JICA-2 (Stage 1; Q=3.87 l/sec)
TABLE A-4.5.3	Stepdown Pumping Test of KL-JICA-2 (Stage 1; Q=5.36 l/sec)
TABLE A-4.5.4	Constant Discharge Pumping test of KL-JICA-2
TABLE A-4.5.5	Recovery Test Data
TABLE A-4.5.6	Tube Well Development
TABLE A-4.5.7	The First Stage Pumping Test for KL-JICA-3
TABLE A-4.5.8	The Second Stage Pumping Test for KL-JICA-3
TABLE A-4.5.9	The Third Stage Pumping Test for KL-JICA-3
TABLE A-4.5.10	Pumping Test at Constant Discharge for KL-JICA-3
TABLE A-4.5.11	Recovery Test Data
FIG A-4.5.1	Work Schedule of Test Well
FIG A-4.5.2	Procedure of Construction of Test Well
FIG A-4.5.3	Air Lift Pumping Test (example)
FIG A-4.5.4	Drilling Rate of KL-JICA-1
FIG A-4.5.5	Result of Water Sampling Test KL-JICA-1
FIG A-4.5.6	Groundwater Table Observation at KL-JICA-1
FIG A-4.5.7	Drilling Rate of KL-JICA-2
FIG A-4.5.8	S-r/t Curve in KL-JICA-2
FIG A-4.5.9	S-t/t' Curve in KL-JICA-2
FIG A-4.5.10	S-r/t Curve in KL-JICA-3
FIG A-4.5.11	S-t/t' Curve in KL-JICA-3

4.1 HYDROGEOLOGY

TABLE A-4.1.1 Previous Test Well Results in Quetta Area

Name of Well	Ground Surface EL. (m)	Drilled Depth (m)	Well Depth (m)	Aquifer Thickness (m)	Total Length of Screen (m)	Static Water Table (BGL m)	Transmissivity (m ³ /d/m ²)	Specific Capacity (m ³ /day/mdd)	Observed by	Well Area/Number
QA-9(T/W-3)	1,694.6	185.9	69.4	97.8	27.4	25.0	—	—	UNDP/WAPDA	VF4-125
QA-10(T/W-1)	1,691.6	219.4	60.4	6.7	12.1	32.6	—	—	UNDP/WAPDA	
QA-20(T/W-4)	1,688.5	339.2	74.6	315.1?	27.4	15.8	—	—	UNDP/WAPDA	
QA-24(T/W-5)	—	150.8	99.0	114.3	39.6	36.5	—	—	UNDP/WAPDA	
UN-QA-27	1,579.0	106.6	103.6	56.0	51.8	12.5	1,722.6	—	UNDP/WAPDA	
UN-QA-2	—	121.9	77.4	36.5	12.4	15.6	—	38.5	UNDP/WAPDA	
UN-QA-4	1,905.0	125.5	86.8	73.1	12.1	18.8	8.6	16.8	UNDP/WAPDA	
GSP	—	187.7	137.1	—	98.7	14.9	—	—	UNDP/WAPDA	
University-1	1,687.7	121.9	78.9	37.1	19.5	20.7	130.2	—	UNDP/WAPDA	
University-2	—	122.5	91.4	18.2	16.7	30.4	—	—	UNDP/WAPDA	
CP2-34	—	—	197.2	—	105.7	44.5	—	93.0	WAPDA	
CP2-35	—	—	195.6	—	106.0	45.7	—	55.1	WAPDA	
CP2-36	—	—	193.2	—	73.4	65.8	—	38.3	WAPDA	
CP2-37	—	—	195.3	—	107.8	54.2	—	568.0	QDA	
QWS-1	—	305.0	—	—	—	27.4	—	—	QDA	
QWS-2	—	305.0	—	—	—	49.4	—	—	QDA	
QWS-3	1,748.1	305.0	260.5	—	131.0	65.1	290	59.0	QDA	
QWS-4	1,764.6	305.0	230.9	—	119.5	70.7	160	54.5	QDA	
MP-5	—	—	—	—	—	42.0	—	—	I&P	
MP-6	—	—	95.7	—	45.7	38.1	—	55.0	BDA	
MP-34	—	—	297.4	—	51.2	38.4	—	10.5	WAPDA	
MP-35	—	—	191.4	—	39.0	66.4	—	—	WAPDA	
MG-11	—	—	112.2	—	—	65.5	—	—	I&P	
MG-25	—	—	180.4	—	34.1	55.0	—	49.0	WAPDA	

(to be cont'd)

(CONT'd)

Name of Well	Ground Surface EL. (m)	Drilled Depth (m)	Well Depth (m)	Aquifer Thickness (m)	Total Length of Screen (m)	Static Water Table (BGL m)	Transmissivity (m ³ /d/m ²)	Specific Capacity (m ³ /day/m ²)	Observed by	Well Area/ Number
QV3-1	—	—	144.4	—	67.0	21.9	—	31.0	I&P	
QV3-11	—	—	101.1	—	34.1	18.2	—	22.4	I&P	
QV3-39	—	—	88.4	—	17.0	31.1	—	6.6	I&P	
QV4-46	—	—	92.3	—	18.3	21.3	—	14.3	I&P	
QV4-69	—	—	121.9	—	—	10.5	—	—	I&P	
QV4-70	—	—	121.9	—	—	10.9	—	—	I&P	
QV4-81	—	—	94.1	—	29.8	32.3	—	—	I&P	
QV4-103	—	—	144.1	—	55.7	27.4	—	46.1	I&P	
QV4-104	—	—	95.7	—	39.3	27.4	—	17.9	I&P	
QV4-109	—	—	71.6	—	24.3	24.3	—	—	I&P	
CP2-7	—	—	103.3	—	27.4	13.1	—	65.5	WAPDA	
CP2-32	—	—	122.5	—	35.0	56.6	—	50.7	I&P	
QT-JICA-1	—	—	—	—	—	—	—	—	WAPDA/JICA	
QT-JICA-2	—	—	—	—	—	—	—	—	WAPDA/JICA	
QT-JICA-3	—	—	—	—	—	—	—	—	WAPDA/JICA	
QT-JICA-4	—	—	—	—	—	—	—	—	WAPDA/JICA	

Sources : DP/UN/PAK-73-032/4, Technical Report No.4 : Groundwater of the Pishin Lora Basin, 1982
 QDA/NESPAC, Quetta Water Supply Proposed Well Field, Oct. 1983
 WAPDA Hydrogeology Directorate, Quetta

TABLE A-4.1.2 Previous Test Well Results In Kalat Area

Name of Well	Ground Surface EL. (m)	Drilled Depth (m)	Well Depth (m)	Aquifer Thickness (m)	Total Length of Screen (m)	Static Water Table (BGL m)	Transmissivity (m ³ /d/m ²)	Specific Capacity (m ³ /day/m ²)	Observed by	Well Area/ Number
UN-KL-3	1,796.9	169.8	143.3	107.9	54.9	46.7	1,041.6	164.5	UNDP/WAPDA	
UN-KL-4	1,849.8	205.7	192.0	104.5	51.8	53.9	19.8	14.3	UNDP/WAPDA	
UN-KL-5	1,783.6	116.4	70.1	62.4	30.4	13.8	2,108.0	388.1	UNDP/WAPDA	
UN-KL-1	1,820.8	134.7	79.2	10.6	27.4	65.8	—	—	UNDP/WAPDA	
UN-KL-2	—	108.9	—	—	—	77.8	—	—	UNDP/WAPDA	
KL-1-JICA									WAPDA/JICA	
KL-2-JICA									WAPDA/JICA	
KL-3-JICA									WAPDA/JICA	

Sources : UNDP/WAPDA, Technical Report No.4 : Groundwater of Pishin Lore Basin, 1982
WAPDA/JICA, Test well results for the Study conducted in 1987-1988

TABLE A-4.1.3 Monthly Groundwater Table Fluctuation in Quetta Area

(Unit : m)

Well Data	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
NO. 56	1969	-	-	-	-	-	-	-	0.34	0.36	0.21	0.17	0.02	-
COORDINATES TOPO. SHEET NO. 34N/4	1970	0.00	0.17	0.09	0.32	-	-0.12	-0.36	-1.09	-0.46	-0.93	-0.72	-0.88	-
GROUND EL BASE W. L. G. W. T. DEPTH (JAN 1970)	1971	-	-0.85	-	-0.81	-0.56	-0.58	-0.76	-0.70	-0.82	-1.36	-1.01	-0.93	-
	1972	-1.19	-1.07	-1.08	-1.30	-	-1.53	-1.67	-	-	-	-	-	-
MEAN		-0.60	-0.58	-0.50	-0.60	-0.56	-0.74	-0.93	-0.48	-0.31	-0.69	-0.52	-0.60	-
NO. 61	1969	-	-	-	-	-	-	-	-0.13	-0.83	-0.77	-0.01	-0.89	-
COORDINATES TOPO. SHEET NO. 34J/16	1970	0.00	1.44	-0.80	0.48	0.39	-0.81	0.22	-0.74	-1.64	-1.87	-0.86	-1.40	-0.47
GROUND EL BASE W. L. G. W. T. DEPTH (JAN 1970)	1971	-0.81	-1.10	-1.82	-1.19	-1.07	0.64	-1.20	-1.06	-0.80	-1.03	-0.89	-1.26	-0.97
	1972	-1.33	-1.06	-1.56	-1.43	-	-	-	-	-	-	-	-	-
MEAN		-0.71	0.24	-1.39	-0.71	-0.34	0.09	-0.49	-0.64	-1.09	-1.22	-0.59	-1.18	-
NO. 122	1969	-	-	-	-	-	-	-	-0.30	-0.45	-0.35	-0.29	-0.25	-
COORDINATES TOPO. SHEET NO. 34J/16	1970	0.00	-1.01	-0.99	-1.68	-1.22	-1.37	-1.49	-1.83	-2.07	-1.98	-2.07	-2.07	-1.482
GROUND EL BASE W. L. G. W. T. DEPTH (JAN 1970)	1971	-1.44	-2.75	-1.98	-2.53	-3.67	-2.26	-	-2.38	-3.06	-2.30	-2.68	-2.51	-
	1972	-	-2.21	-1.83	-1.54	-	-	-3.13	-	-	-	-	-	-
MEAN		-0.72	-1.99	-1.60	-1.92	-1.63	-1.82	-2.31	-1.50	-1.86	-1.54	-1.68	-1.61	-
NO. 178	1969	-	-	-	-	-	-	-	-	-0.45	-0.68	-0.52	-0.15	-
COORDINATES TOPO. SHEET NO. 34 N/4	1970	0.00	0.21	0.20	-0.08	-0.68	-1.23	-1.18	-1.40	-1.48	-1.43	-1.42	-1.30	-0.816
GROUND EL BASE W. L. G. W. T. DEPTH (JAN 1970)	1971	-0.94	-0.86	-0.98	-1.36	-2.38	-2.12	-2.50	-2.74	-2.89	-2.76	-2.49	-2.29	-2.026
	1972	-	-	-2.01	-2.31	-	-2.90	-4.76	-	-	-	-	-	-
MEAN		-0.47	-0.33	-0.93	-1.25	-1.53	-2.08	-2.81	-2.07	-1.61	-1.62	-1.48	-1.25	-

(to be cont'd)

(Unit : m)

(cont'd)

Well	Data	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
NO. 209		1969	-	-	-	-	-	-	-	-0.31	0.72	0.38	-1.41	0.41	-
COORDINATES	896154	1970	0.00	1.04	0.93	0.15	0.86	-0.54	0.62	-1.12	-0.11	0.69	0.62	-1.48	0.14
TOPO. SHEET NO.	34J/16	1971	0.96	0.82	0.71	-0.69	-1.03	-2.19	-0.35	0.56	-0.16	-1.70	-2.08	-0.08	-0.43
GROUND EL	1,678.56	1972	-	0.84	0.40	-0.12	-	-	-	-	-	-	-	-	-
BASE W. L.	1,674.04	Mean	0.48	0.90	0.68	-0.22	-0.09	-1.37	0.14	-0.29	0.15	-0.21	-0.96	-0.38	-
G. W. T. DEPTH	4.52	(JAN 1970)													
NO. 212		1969	-	-	-	-	-	-	-	-2.92	-2.05	-0.81	-0.54	-0.29	-
COORDINATES	893141	1970	0.00	0.05	0.29	0.30	0.35	0.18	0.11	-0.44	-0.39	-0.45	-0.37	0.95	0.048
TOPO. SHEET NO.	34J/16	1971	-0.26	-0.07	-0.17	0.10	-0.14	-0.29	-0.44	-0.55	-0.48	-0.39	-0.15	-0.12	-0.247
GROUND EL	1,684.33	1972	-	-0.30	-0.13	-0.05	-	-	-	-	-	-	-	-	-
BASE W. L.	1,675.11	Mean	-0.13	-0.11	-0.00	0.12	-0.11	-0.06	-0.17	-1.30	-0.97	-0.55	-0.35	0.18	-
G. W. T. DEPTH	9.22	(JAN 1970)													
NO. 213		1969	-	-	-	-	-	-	-	-	-0.68	-3.05	-0.02	0.01	-
COORDINATES	903139	1970	0.00	0.19	-0.89	-0.87	0.21	-0.14	-0.87	-1.58	-0.80	-0.98	-0.31	-0.48	-0.543
TOPO. SHEET NO.	34J/16	1971	-0.31	-0.38	-1.00	-0.93	-1.70	-2.22	-2.06	-2.33	-	-	-	-	-
GROUND EL	1,675.40	1972	-	-	-	-	-	-	-	-	-	-	-	-	-
BASE W. L.	1,671.35	Mean	-0.16	-0.10	-0.95	-0.90	-0.75	-1.18	-1.47	-1.96	-0.74	-2.02	-0.17	-0.24	-
G. W. T. DEPTH	4.05	(JAN 1970)													
NO. 214		1969	-	-	-	-	-	-	-	-	-0.09	-0.09	-0.14	-0.14	-
COORDINATES	917137	1970	0.00	0.09	-0.11	-0.17	-0.59	-0.67	-0.61	-0.73	-1.06	-0.64	-0.46	-0.56	-0.459
TOPO. SHEET NO.	34J/16	1971	-1.12	-0.41	-0.66	-1.06	-0.96	-	-	-	-	-	-	-	-
GROUND EL	1,703.16	1972	-	-	-	-	-	-	-	-	-	-	-	-	-
BASE W. L.	1,691.26	Mean	0.56	-0.16	-0.39	-0.62	-0.77	-0.67	-0.61	-0.73	-1.06	-0.54	-0.64	-0.56	-
G. W. T. DEPTH	11.90	(JAN 1970)													

(to be cont'd)