

PN-ABS-844

**THE STATUS OF
AGRICULTURE IN MAKHRAN DIVISION
CONSTRAINTS, SOLUTIONS AND FUTURE DEVELOPMENT**

**A Consultant's Report
by
Dr. Zidan-E-Abdel-Al**

June 6, 1989

PARC . USAID . MART . WINROCK

A

TABLE OF CONTENTS

	Page
INTRODUCTION	1
MATERIALS AND METHODS	5
RESULTS AND CONCLUSION	7
The Status of Underground Water and Future Development	7
On-farm Water Management	12
Area under Crop Production	13
Vegetable	13
Fodder	14
Fruit Trees	14
Field Crops	15
The Main Crops	15
Growing Season	15
Types of Irrigation	16
Cultural Practices	16
Vegetables	16
Fodder	18
Fruit Trees	19
Cereals	21
The Status of Agricultural Inputs	21
Improved Seeds	21
Chemical Fertilizers	22
Pesticides	22
Small Farm Machinery	22
Irrigation	22
Labor Scarcity	22

Marketing	23
Mahran Cooperative Date Growers Mill Society Ltd.	24
Baluchistan Agricultural College	25
Agricultural Research Activities	25
Extension Activities	26
PROPOSED RESEARCH PROGRAMS	28
Vegetables	28
Fruit Trees	31
Fodder Crops	35
Sorghum	35
PROPOSED REGULAR TRAINING PROGRAM	36
In-country Training	36
Foreign Training	38
RECOMMENDATIONS	39
Development of Water Resources	39
Development of Agriculture	40
Coordination of Future Activities	41
Improvement of Date Palm Cultivation, Processing and Marketing	42
SUMMARY	44
APPENDICES	
Appendix A - Terms of Reference	45
Appendix B - Acknowledgement	46
Appendix C - Itinerary and Persons Visited	47
Appendix D - Glossary	52
Appendix E - Biographical Information	53
Appendix F - References	54
Appendix G - Action Taken	55

①

I - INTRODUCTION

The total area of Baluchistan Province is 347,191 square kilometer with a total population of 4,305,000 people. The population density is 12 persons per square kilometer.

The area of Makran Division is 54,646 square kilometer with a total population of 652,000 people. The population density is 12 persons per square kilometer. It borders Iran to the west, Kalat division of Baluchistan to the north and east and the Arabian Sea to the south.

Makran has three principal mountain ranges: The Coastal range, the Central Makran range, and the Siahan range. It contains parts of two river basin system. In the northern part of the division, the Rakhshan river flows from northeast to southwest, and provides water for the Panjgur oasis. South of the Rakhshan River Basin is the Kech River Basin, flowing from northeast to southeast between the Central Makran range and the Coastal range.

The river basin system is primarily confined to Makran and includes the Kech, the Nihing and the Dasht rivers. The two river basin systems contain most of Makran's Irrigated and irrigable land.

There are three administrative districts within the Division.

Gwadar district includes the south facing slopes of the Coastal range.

Turbat District follows the Kech and Nihing river valleys to the Iranian border.

Panjgur District includes the valley between the Siahan and Central Makran mountain ranges and includes all of the Rakhshan river basin system that is found within Makran division.

There are five ecological zones in Baluchistan. Three ecological zones could be distinguished in Makran division:

1. Gwadar district from sea level to 1500 feet above sea level. The mean maximum and minimum temperatures are 86.4⁰F and 67.1⁰F respectively. (30.2⁰C-19.5⁰C Pasni).
2. Turbat district from 1500-3000 feet above sea level (Turbat 1325 ft). The mean maximum and minimum temperatures are 96.9⁰F and 68.5⁰F respectively. (35.7⁰C-20.2⁰C).
3. Panjgur district from 3000-4500 feet above sea level (Panjgur 3200 ft). The mean maximum and minimum temperatures are 85.5⁰F and 57⁰F respectively. (29.6⁰C-13.8⁰C).

Two distinct precipitation levels could be identified in Makran division.

1. Panjgur District with 100 mm annual precipitation.

2. Gwadar and Turbat with 150mm annual precipitation.

The probability that annual precipitation might exceed 200 mm in Makran division is 30 percent.

Makran has limited land resources. The total area is 13.5 million acres. Of this area however, less than one percent is irrigated.

Between 35-40 percent of the total area of Makran is essentially bare, exposed rocks.

Soil classification was carried out by Water And Power Development Authority (WAPDA) in 1983 for Rakhshan River Basin and Mirian area. The most promising classes are as follows:

Class - I: Good Arable Land:

This class of land is highly suitable for producing high yields of a wide range of crops on a sustained basis and occupies 0.02 million acres or 3 percent of the total area. This land class includes moderately coarse to medium textured, deep, well drained soils. They have favorable internal drainage characteristics and good water holding capacity. The soils are free from harmful accumulations of soluble salts.

Class - II: Fairly Good Arable:

This class of land is moderately suited to a sustained irrigated agriculture, but may require some minor efforts to obtain high yields. This land class occupies about 0.06 million acres or 7 percent of the total land in the valley. The soils of this class are deep, well drained and range from moderately coarse to medium in texture. This is associated with limitations, such as uneven surface relief, slight surface salinity, thin coverage of grit gravel etc. and may require moderate leveling, leaching of excess salts or removal of grit gravel on the surface.

Class - III: Fair Arable Land:

This class of land has distinct restricted crop adoptability. It covers 0.21 million acres or 24 percent of the total area. This is associated with limits such as moderate surface salinity, uneven surface relief, moderate coverage of grit gravel and or shallow depth of soils. The soils are usually deep, well drained and moderately coarse to medium in texture.

With a total population of approximately 652,000 people, Makran has about 15% of Baluchistan's total divided up among the three districts as follows:

<u>DISTRICT</u>	<u>POPULATION</u>	<u>HOUSEHOLDS</u>	<u>% OF POPULATION</u>
Gwadar	112,385	17,177	17
Turbat	379,467	46,315	58
Panjgur	160,750	18,845	25

The population is concentrated around the irrigated area.

More than 90 percent of the irrigated acreage in Makran is irrigated by karezes which are old, long, horizontal, under-ground water carrying tunnels. Five percent of the irrigated acreage is irrigated by kaurjos which are open ditches carrying water diverted from streams. Most of the karezes are concentrated in Turbat and Panjgur.

According to an inventory prepared by Baluchistan Area Development Project (BALAD), there are 367 live karezes with total command area of about 25,414 acres of land and total annual flow of 154,039 ac-ft. The total number of dead karezes is 57.

There are an estimated 25 kaurjos in Makran irrigating about 3,000 acres of land.

The number of tubewells in Makran is 670 irrigating 4,360 hectares of land.

Since water is the main limiting factor in Makran Division, Baluchistan Area Development Project (BALAD) has undertaken four main types of activity:

- a) Watercourse improvements are undertaken where measurable seepage losses occur or where periodic destruction of the watercourse by flooding generate excessive maintenance costs and an interruption of water supply occurs.
- b) Karez boring to provide supplemental flow by gravity to existing karez from shallow artesian conditions.
- c) delay action dams to delay the flood run-off and increase the infiltration opportunity time and the ground water recharge to the shallow aquifer which feeds the karez.
- d) Karez improvements to provide perennial flow from the subsurface flow.

Furthermore, the Irrigation Department of Makran is currently constructing five delay and protection dams at the Piskol river five miles from Panjgur to recharge 15 karezes.

Infiltration gallery to recharge one kaurjo with 300 acres as command area in Panjgur.

In Turbat: Kashi Kaur to cater for 500 acres ghatti to irrigate 5,000 acres chahmandal to recharge 4 karezes with a command area of 150 acres. and a protection dam at Kaor to protect 250 acres from flood damage.

The Department is planning to construct 5 delay action dams in the future at Cina, Gurder, Buleda, Pardan and Dasht areas.

It is noteworthy to indicate that building infrastructure, while a challenge in itself, is necessary but not sufficient to achieve improvement on the farm. By far the most difficult tasks are getting water to the farm efficiently and combining increased water availability with improved farming systems to increase value added at the farm and cash income for the farm household.

Accordingly, the main objectives of the present study is to assess the present situation of agriculture in Makran Division, to identify problems confronting its development and propose the necessary solutions.

II - MATERIALS AND METHODS

To assess the situation on the ground, to identify the constraints confronting agricultural development in Makran Division and to collect the necessary data on crops, research and extension activities, irrigation facilities and soil types, several field visits to farms, research institutes, College of Agriculture and different disciplines of the Agriculture and Irrigation Departments were carried out.

Farmers, scientists, extension staff and officers in different disciplines of government line agencies and Baluchistan Area Development Project were interviewed. The relevant data were collected, summarized, analyzed, evaluated, synthesized and are presented under the appropriate headings.

Immediate problems were identified and brought to the attention of policy maker for prompt action and demonstrations to solve some of them were carried out at farmer's field. Training of extension staff, date farm laborers and contact farmers also took place during and continued after the implementation of demonstration at farmer's field from March to end of May 1989. Fig 1 and 2.

The demonstrations were carried out as follows:

LOCATION	DATE	NAME OF FARMER	SUBJECT	OBJECTIVE
Nursery	22,25/3 /89	Government Farm	Learning by doing	To train ext. staff on demonstration
Date Farm	28/3	Date Farm Laborer	" "	Train Farmers
Ginnah	28/3	Bashir Ahmed	Planting Okra, Muskmelon	" "
Pidarak	29/3	Mohammad Amin	" "	" "
Absar	1/4	Ali Mohammad	Watermelon, Muskmelon	" "
Turbat Date Laborer Farm	1/4	Bashir Ahmed	" "	"
Absar Farmers	4/4	Sardar Abdul Rehman	Watermelon Muskmelon Okra	"
Miri Farmers	17/4	Mr. Rafiq	F1 Sorghum fertilizer Okra	"

Video cassettes showing the status of agriculture and demonstrations at farmers field were recorded in English and Local Baloch for future training and technical backstopping as well. The video cassettes were handed to the Additional Chief Secretary, Secretary of Agriculture and the Principal of Baluchistan Agricultural College.

Field day was organized on May 22, 1989 to show the farmers, field assistants and extension staff the performance of watermelon, muskmelon, okra and F₁ hybrid sorghum x sudan grass demonstration plots as compared to farmer's practice. The know-how of raising these crops were explained to all the participants in Baluchi.

Workshop on date palm cultivation, processing and marketing was to be held in Sukkur, Sind on 5 June, 1989 but was postponed until the end of July, 1989. The workshop is to be attended by research scientists, extension staff, Horticulturists, processing companies, marketing specialists, exporters, progressive farmers and several high ranking government officials.

Early varieties of date palm and posters advising farmers shall be displayed. Video cassette of date palm germplasm in Pakistan shall be shown.

The problem of rain damage to dates shall be addressed. The recent development of propagating date palm using tissue culture technique shall be presented. Detail of the workshop shall be published under separate cover.



Fig. (1) Training of field assistants on demonstrations, thinning, weeding and application of fertilizers to Okra.



Fig. (2) Training of farmers on demonstrations. Spraying against white fly on okra.

III - RESULTS AND CONCLUSION

3.1 - THE STATUS OF UNDERGROUND WATER AND FUTURE DEVELOPMENT

Scarcity of water is the main problem in socio-economic development of Baluchistan Province. The surface water potential is limited due to scanty rainfall and high rate of evaporation.

3.1.1 Panjgur

The study carried out in 1983 by Water and Power Development Authority (WAPDA) indicated that recharge to ground water reservoir of Rakhshan river occurs through precipitation, which falls over the watershed area.

The principal process of ground water recharge are the direct infiltration of rainfall and percolation of flood runoff. A minor recharge also takes place from return flow of irrigation water from karezes, kurjos, tubewells and dug wells. The main areas of recharge are the mountain highlands, whereas recharge over the low land is nil.

The most recharge is commonly derived from winter rainfall which is 62 percent of total annual precipitation due to low evaporation and the maintenance of soil moisture above field capacity resulting from frequent rain.

The average rainfall data of Panjgur for the period 1940-1941 to 1969-1980 is 4.4 inches (111 mm) and it is assumed that 5-10 percent of rainfall is infiltrated to recharge the ground water on a total area of 2531 square mile. Accordingly, the amount of recharge on watershed area is estimated to be 41 cusecs and 8 cusecs due to return flow of irrigation water. Thus the total recharge to ground water reservoir is 49 cusecs out of which about 33 cusecs is in Panjgur sub-basin and 16 cusecs in Sarai-Paroom sub-basin.

However, the total discharge from the ground reservoir due to karezes, tubewells, evaporatranspiration etc. is estimated to be 49 cusecs.

On the basis of hydrogeological investigation carried out by WAPDA in 1983, it has been estimated that about 39 cusecs of ground water is available for development (23 cusecs in Panjgur sub-basin). The extraction of ground water from 23 installed tubewells after commissioning would be about 12 cusecs i.e. about 27 cusecs of ground water potential is left for future development.

In view of the hydrogeological conditions prevailing in the basin WAPDA recommended that 50 percent of 27 cusecs may be developed through installation of tubewells in the first phase.

Rakhshan river basin may be divided into two zones, zone A and B for development.

The zone A is identified as most promising for ground water development through tubewells. The Zone is Available in central part around Panjgur and south west of Panjgur in Panjgur sub-basis and in the center and south western part of Sarai-Paroom sub-basin. The total area of zone A is about 172 square miles. The expected thickness of the aquifer of zone A ranges from 50-170 feet.

The depth to water table ranges from 10-100 feet. Tubewells having depth of 120-400 feet with drawdown margin of 50-150 feet may be installed which may yield 0.5 to 1.0 cusec discharge each. Zone B is suitable for dug wells.

It would be not out of the way to point out that the network of karezes around Panjgur surely gets affected by the implementation of any extensive ground water exploitation progress in the area. This should be studied before finalizing any such scheme.

Apart from developing underground water, there is a possibility of developing flood irrigation

In Panjgur district, where Gichk river valley is rich in water and ground water as well. Gichk river itself has around 6-10 cusecs of perennial supply and flood discharge of 8000-10000 cusecs during the rainy season.

A flood diversion structure is under construction at Jauntak for flood irrigation which is near completion. The command area of the scheme still undeveloped which can be properly developed by land levelling, by BALAD to ensure even distribution of moisture, even germination and even crop stand. Apart from this scheme, there is a good chance to have more diversion structure of flood irrigation along Gichk river on upstream of existing structure to irrigate the existing agriculture basing on rain water at present on both Banks of the river. Possibility of developing the two flood irrigation schemes can be exploited and develop by BALAD (Map 1).

3.1.2 Turbat

According to 1985 studies of Dasht (Khudan) Basin by WAPDA, the average rainfall is about 5 inches. The total area of mountain highlands is 8215 square miles. Hence the total amount of recharge from direct infiltration is 151.30 cusecs out of which:

14.10	cusec	in	ROD Khan.	sub basin
19.15	"	"	Balgater	" "
38.86	"	"	Mianaz	" "
47.33	"	"	Kech	" "
31.86	"	"	Dasht	" "

The recharge from returned flow of irrigation is about 31.25 cusec. Hence the total recharge is about 182.55 cusecs. The discharge is as follows:

Utilization of perennial flow including kurjos	25 cusecs
Karezes	35 cusecs
Springs	2 cusecs
Extraction from subsoil by other means	6.75 "
Surface outflow	Nil
Evaporation	Negligible
Evapotranspiration	102

Thus the total ground water discharge is estimated to be 182.25 cusec, which just balances the estimated recharge. As such there is no possibility of exploitation of ground water for extensive agriculture purposes.

A feasibility study carried out by WAPDA in 1989 proposed a construction storage dam at Mirani, where traditional irrigation is based on flooding of the lands once in two or three years when there is favorable rainfall.

Agriculture of the area is constrained to cater to the needs of local inhabitants. The principal reason is the scarcity of irrigation water. Flood irrigation at suitable locations is practiced along the beds of nullahs and rivers.

In years of better rainfall, culturable lands are farmed under rain fed (barani) conditions but even in such years crop failure is quite common. Annual rainfall is too low. Less than 5 inches per year can not sustain the crops successfully. About 5% of the total area has been recorded as cultivated area. Sorghum, millets and pulses are raised in kharif, while wheat, bagala and alfalfa in rabi season. Annual cropping intensity is 45 percent with 19 percent kharif and 26 percent rabi. Crop yields are low not only because of scarcity of irrigation water supplies, but also because the use of farm inputs is far below the recommendations.

The utilization of Dasht river flows (1738 97 AF) after the construction of proposed Mirani Dam would help in meeting food shortage of the area. With the inception of the program to irrigate 36,000 acres of class I,II and III land (see map) a many fold increase in agricultural production is anticipated.

In Turbat, there is already a flood irrigation system in the village Dehat opposite Kalatuk on the left bank of Kech. This can be improved by constructing a proper structural intake and diversion structure at the point of off take of the flood channel already existing. In this way the area under cultivation can be increased and can develop extensive agriculture over gross area of 5,000 acres. (Map 2).

The Dasht river is flooding a wide area of land each year. The area is estimated to be the largest of all.

After the flood is over, the farmers usually plow and pulverize their land and broadcast sorghum, wheat, pulses and melons. However, there are some tubewells, in the area, especially along the eastern and western banks of the river. Where tubewells are located, crops such as alfalfa, broad bean, tomato, chilies, cabbage, carrot, onion, eggplant are grown as intercrops in date palm orchards.

Agriculture is being practiced in a primitive way and is under the mercy of water availability. The matter was discussed with Mr. Yahya Khan, Senior Irrigation Engineer of the BALAD Project, Baluchistan. He believes that the construction of two diversion dams and irrigation canals along the two banks of Dasht river would be the most suitable method to ensure water supply for the irrigation of approximately 30,000 acres.

It is noteworthy to point out that there is a similarity between Dasht Basin and Wadi Jizan project for agricultural development in Saudi Arabia where similar schemes of spate irrigation are already in operation.

The consultant and the chief of the BALAD agriculture section visited the area of Dasht and believe that early and first quality melons for future export could be produced in this area.

In view of the above mentioned facts, it might be appropriate to study the possibility of re-allocating US\$ 3.62 million allotted for the two diversion dams proposed at Kil kaur and Goburd which were resented by the people of that areas due to its detrimental effects on their karezes and construct instead another two diversion dams on the Dasht river down stream as proposed above. (Map 3 and 4).

The consultant brought the matter to the attention of Mr. Ata Jaffar Additional Chief Secretary; Mr. Naseeruddin Ahmed the Secretary of Agriculture; Mr. Muhammad Amin, Chief Irrigation Engineer; Mr. Marjan Khan, Commissioner of Makran; Mr. Masood, Director of Project Planning and Management Unit (PPMU) of Baluchistan Area Development Project, and Mr. Frank Pavich, USAID Regional Director; and all agreed in principle to the proposal provided the agreement of the local people and a feasibility study should be carried out.

The data regarding underground water of Makran division which was accumulated by WAPDA in 1983 and 1985 may be considered as the only available and reliable data at present.

However, in view of many changes and for future sound planning to develop agriculture, it is highly recommended to up-date the available data. Furthermore, observation wells are essential for the determination of the present underground water resources and for the formulation of a mathematical model for future forecasting of ground water supplies.

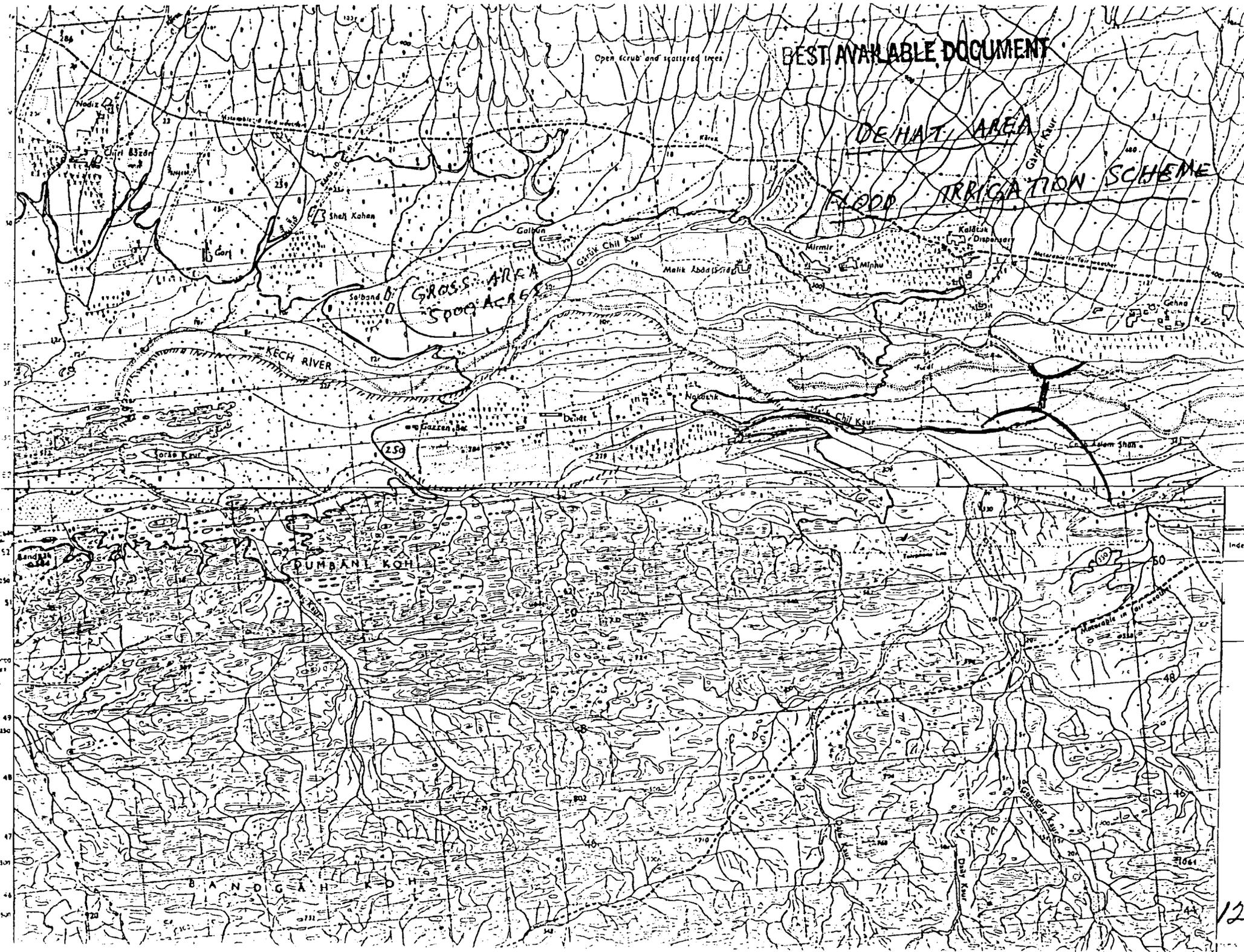
BEST AVAILABLE DOCUMENT

DEHAT AREA
FLOOD IRRIGATION SCHEME

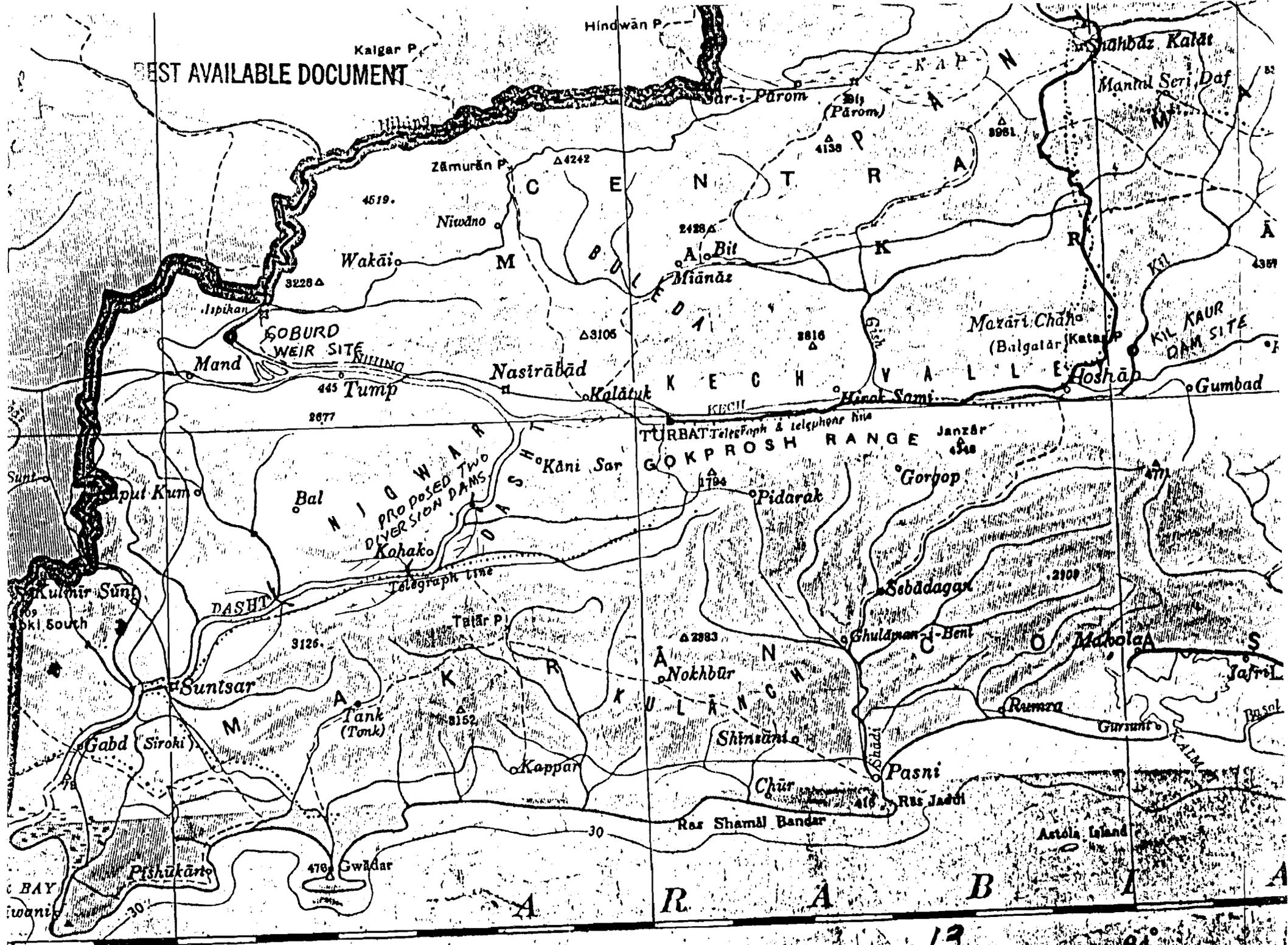
GROSS AREA
5000 ACRES

DUMBANI KOH

BANDOGAH KOH



BEST AVAILABLE DOCUMENT



60°

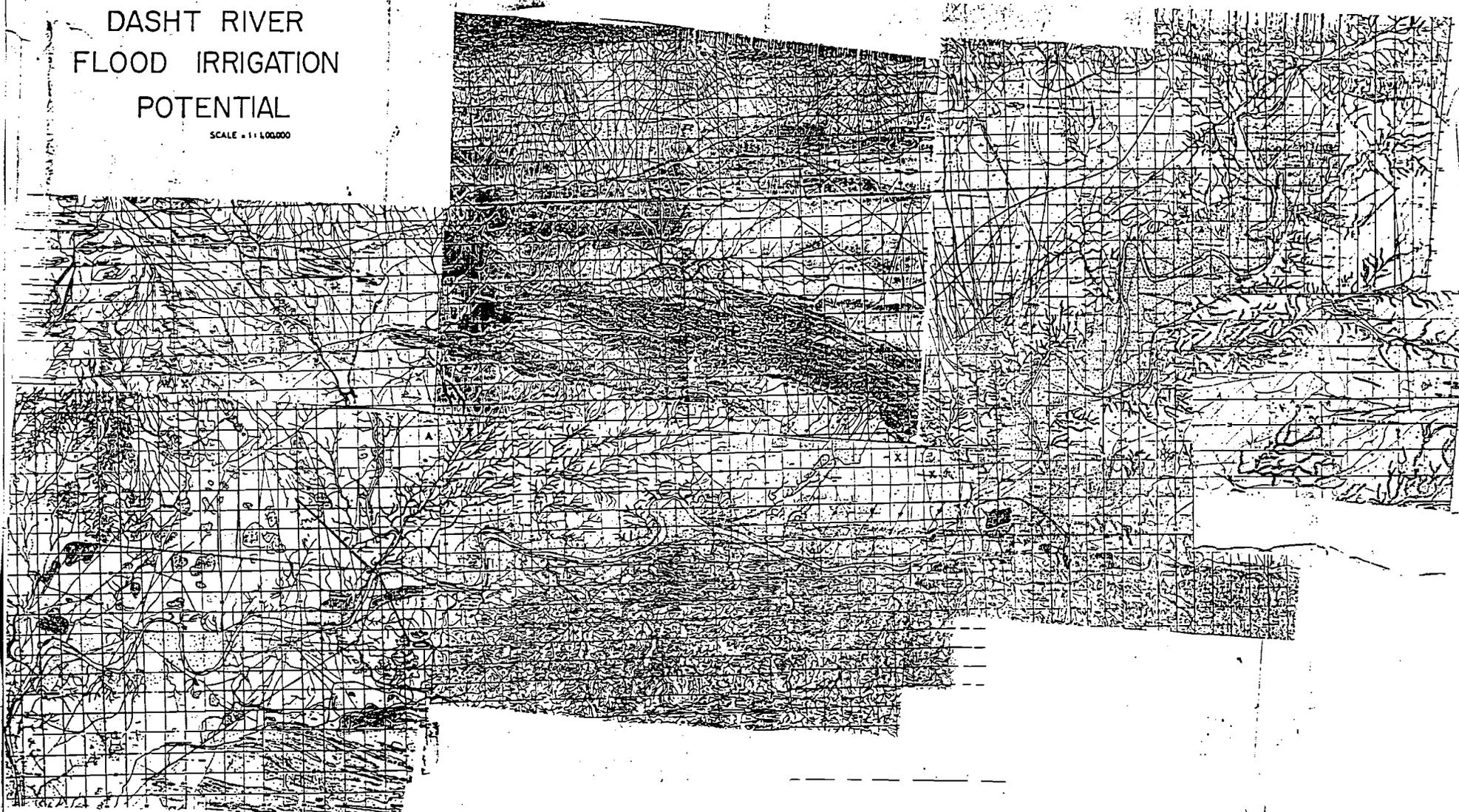
63°

D 13

64°

DASHT RIVER
FLOOD IRRIGATION
POTENTIAL

SCALE = 1 : 100,000



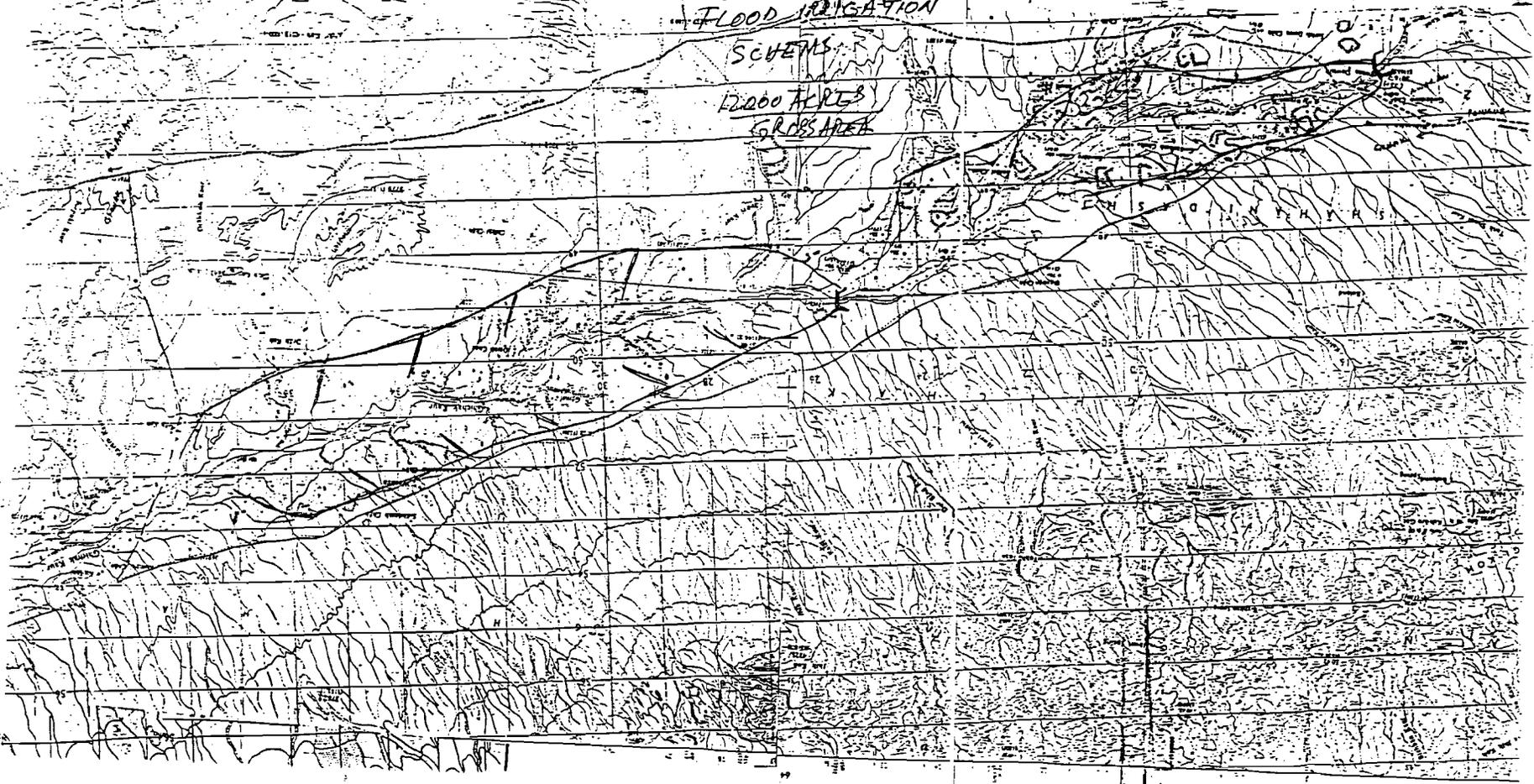
GICHAK RIVER

FLOOD IRRIGATION

SCHEMATIC

12,000 ACRES

GROSS AREA



15

The quality of water is as important as the quantity. It is the quality which determines the suitability of water for agriculture. Therefore, periodic physical and chemical analyses of water should be undertaken. The analyses should include color, odor, taste, organic matter, calcium, magnesium, sodium and chloride, sulphate, carbonate and bicarbonate. The analyses should also include pH, electrical conductivity, sodium adsorption ratio and residual sodium carbonate concentration.

In view of the primitive agriculture being practiced by farmers and the limited water resources, it is essential to utilize what is available in an efficient way. It is, therefore, highly recommended to obtain the maximum crop yield and quality for each water unit (cusec) to be discharged from the present ground water supplies. This will ultimately require the use of improved seeds, optimum plant population, suitable sowing date, fertilizer, modern irrigation system, integrated pest control, proper handling, and marketing outlets.

Accordingly, an integrated program for developing adaptive research, training, extension, roads, electricity, as well as for exploiting the deep aquifer for additional water resources are urgently needed for sound socio-economic development of Makran.

...

3.2 - ON-FARM WATER MANAGEMENT (OFWMP)

It is true that both BALAD Project and Irrigation Department are carrying out several activities to improve the recharge of karezes, and kurjos. However, the consultant has observed that there is substantial water losses from the mouth of karezes until they reach the farms. These losses could be reduced by installation of PVC pipes. Fig 3 and 4.

The objectives of the on-going on-farm water management are:

1. To increase agricultural production through effective use of irrigation water saved and improved by improved OFWM practices.
2. To improve the capability of the provincial OFWMP Directorate to plan and implement on expanding OFWMP.
3. To facilitate the coordination between the provincial OFWMP and the Agricultural Extension Directorate and strengthen the water management advisory capability of the extension service.
4. To strengthen farmer participation in Water User Associations in order to improve water and non-water input management as well as to ensure adequate maintenance of civil works.

The project has completed 22 watercourses and 10 water tanks. Apparently the project is facing problems because poor farmers are unable to contribute 25% of the total costs of civil work and the required labor force.

It is worth mentioning that in the N.W.F.P. farmers are contributing 10% of the total cost of civil work.

It is therefore, highly recommended to reconsider the percent of the total cost of civil work required to be contributed by poor farmers to enable them to participate in the project.

Under OFWM activities BALAD project proposes levelling of 4175 acres which consists of grading to eliminate slopes and high and low points.

Application of irrigation water cannot be made unless the fields are adequately levelled. This could be achieved through a tractor drawn scraper after engineering surveys of the farmer's field. Precision land levelling (PLL) will be carried out for demonstrations on government farm free of charge.

Furthermore 30 field assistants are supposed to receive training on on-farm water management in Lahore. Unfortunately, although they were scheduled in 1985, neither precision land levelling nor training of field assistants took place until now.



Fig (3) Water losses from open channels



Fig (4) Lining up channels by cement to reduce water losses

3.3 - AREA UNDER CROP PRODUCTION

According to 1986-87 statistics, the total area of all the crops grown in Makran division is 19298 hectares, which gave 254802 tonnes. Out of this area 1991 ha were unirrigated.

3.3.1 Vegetables

Vegetables including chilies (hot pepper), watermelon and muskmelon, account for 3476 hectares with total production of 34084 tonnes.

The area and the production of each vegetable is as follows:

	<u>Area/hectare</u>	<u>Production Tonnes</u>
Broad Bean (Baqla)	2,484	24,000
Okra	322	3,040
Muskmelon	145	1,490
Watermelon	140	1,340
Tomato	60	840
Tinda	42	430
Eggplant (Brinjal)	41	490
Bitter Gourd	41	370
Hot Pepper (chilies)	33	50
Spinach	19	300
Peas	19	170
Pumpkin	15	260
Bottle Gourd	13	120
Luffa	13	104
Table Beet	13	150
Radish	12	200
Carrot	8	120
Turnip	8	130

Cauliflower	3	50
Cabbage	1	10
Others	44	420

3.3.2 Fodder

Fodder accounts for 3555 hectares with a total production of 132,930 tonnes. The area and the production of each fodder crop is as follows:

<u>Crop</u>	<u>Area/hectare</u>	<u>Production tonnes</u>
Lucern (alfalfa)	2,815	140,520
Wheat	220	4,400
Jowar	185	3,160
Moth	125	1,720
Guar	61	740
Others	149	3,000

3.3.3 Fruits

Fruit trees account for 8,336 hectares with total production of 73,000 tonnes. The area and the production of each fruit tree is as follows:

<u>Crop</u>	<u>Area/hectare</u>	<u>Production tonnes</u>
Dates	7,053	63,520
Mango	515	3,430
Citrus	343	1,710
Pomegranate	174	3,085
Guava	91	270
Grapes	52	500
Coconut	11	-
Fig	10	35
Chiku	7	10
Almond	6	1.5

Plum	4	20
Peach	2	10
Others	62	350

3.3.4 Field Crops (Cereals)

Field crops account for 2,772 hectares with total production of 4,215 tonnes.

The area and the production of each crop is as follows:

<u>Crop</u>	<u>Area/hectare</u>	<u>Production tonnes</u>
Wheat	1,550	1,990
Rice	1,052	2,140
Barley	170	85

3.3.5 The Main Crops

The main crops grown in Makran are: Dates as fruit tree, broad beans as vegetable, wheat and rice as cereals and lucerne as fodder.

3.4 - THE GROWING SEASONS

There are two main growing seasons:

1. Rabi literally (spring) the same meaning in Arabic for crops to be grown from (October to March)
2. Kharif literally (autumn) in Arabic the same meaning and sometimes Nili for crops to be grown from (April to September).

The area of Rabi crops is 6,038 hectares as compared to 13,260 hectares of Kharif crops.

3.5 - TYPES OF IRRIGATION USED IN AGRICULTURE

There are two types of agriculture: (1) rainfed and (2) irrigated agriculture.

3.5.1 Rainfed Agriculture

3.5.1.1 Barani

Growing crops on direct rainfall in Hoshab/Buleda and northern Panjgur areas where barley is grown in winter and sorghum in summer.

3.5.1.2 Khushkaba

Earthen embankments, dykes or bunds are constructed to trap and store rain water. When the soil dries up, wheat, barley, mung and pulses are sown throughout Makran particularly northern Makran.

3.5.1.3 Sailaba

Diversion structures are constructed over the main and branch rivers to divert flood water to irrigate the field. Farmers usually construct small bunds and the flood waters fill each farmer's banded fields before proceeding to next field. Wheat, barley, rape, sorghum, cotton and pulses are grown under this system.

3.5.2 Irrigated Agriculture

This is the main practice throughout Makran and depend entirely on karezes, kurjos, tubewell and dugwells. All fruit trees, vegetable, fodder and cereals are grown under irrigation.

There is a substantial water losses due to seepage, evaporation and misuse of irrigation water.

3.6 - CULTURAL PRACTICES

3.6.1 Vegetables

Commercial vegetables are usually grown near town within a distance of 5-10 kilometers. Absar, Turbat, Shaitump, Kosh Kalat Dustk, Chalho and Miri are known to grow vegetables.

Tomato, eggplant and okra are usually planted on ridges. The width of the ridges are very wide 200-250 cm. Farmers are planting both sides of the ridge. The channel of the ridge is very shallow. Distance between plants on the ridges is ranging from 60-90 cm. However, okra hills seem to have regular spacing of 25 cm. Fig. 5 and 6.



Fig. (5) Field of eggplant planted on two sides of the ridge.



Fig. (6) Field of okra planted on two sides of the ridge.

Some Farmers are planting okra and eggplant on flats using irregular spacing of 90 cm.

The majority of farmers are planting hot pepper, broad beans and onion on flats. Flats are variable in size. Spacing between plants 30-40 cm. Due to lack of know-how, unsuitable plant population per unit area, yields are low. Generally speaking, farmers are applying farm yard manure as fertili-zer. The majority of farmers do not apply chemical fertilizers. Those who apply chemical fertilizers are using low rate of 25 kg/acre. Fig 8.

Tomato, eggplant and hot pepper are usually transplanted in October and November. broad beans is directly sown in November and okra in March. Harvesting of broad beans, hot pepper, tomato and eggplant begins in February-March.

Some farmers are overwintering eggplant, hot pepper and okra. Fields are full of weeds. No cultivation is carried out due to planting of both ridge sides.

White fly is infesting several crops such as eggplant, hot pepper, tomato, broad beans. Leaf curl virus was observed on tomato, eggplant and okra. Fig 7.

Broad bean is the major vegetable crop. The variety is black seeded local cultivar which is susceptible to several diseases and insects.

Some farmers are using an indeterminate, Beefsteak type tomato from Iran which seem to be tolerant to leaf curl virus. Others are using pear shaped varieties obtained from United Arab Emirates.

Onion varieties develop seed stalk rapidly. The majority of farmers are not using any pesticide to control pests. However, some farmers are spraying with Fyfanon 57% EC (Malathion) and Ekalux 25% EC against white fly.

It is note worthy to indicate that the white fly is a very serious sucking insect and has very wide host range and attacks several crops.

It is a vector of many virus diseases infecting tomato, eggplant, okra, pepper, watermelon, muskmelon etc.

The spread of leaf curl virus infecting tomato was observed in several fields. Several neighboring countries are now suffering from the outbreak of white fly infestation. It is therefore, highly recommended that attention should be given to train farmers and supply them with different insecticides to control the white fly. The matter was brought to the attention of Secretary of Agriculture for the necessary action.

An integrated control measure against the white fly should be carried out as follows:

1. Eradicate source of inoculum i.e. plant infected with virus.
2. Spray all host plants and weeds.
3. Spraying all farms at one time.

4. Use different insecticides.
5. Alternate contact and systemic insecticides
6. Spray transplants in the nursery every 10 days (twice).
7. Spray after field setting every 10 days.
8. Early sowing is subject to infestation.
9. Covering tomato plants with insects proof.

Screen until first harvest proves to be successful.

10. In Panjgur, transplanting tomato in April on one side of the ridge 120-180 cm apart and 60-90 cm between plants resulted in leaf curl virus free plants.

3.6.2 Fodder

3.6.2.1 Lucern

Lucerne or alfalfa in irrigated areas is the main fodder crop. It is a local cultivar which is highly adapted. The crop may last up to 6 years and gives 12-14 cuttings per year. It is a very profitable crop and usually sown as an intercrop in date palm orchard in October at the rate of 12 kg/acre. In Panjgur, it is sown in February, March and September. No harvesting is done for 3 months in winter.

The first cut is usually taken 5 months after sowing. The second cut is taken one month after. However, during summer, usually farmers take their cuttings after 20-25 days. Farm yard manure is the only fertilizer used by farmers and is usually applied after 2-3 cuttings.

Alfalfa is sold on flat basis i.e. an area of 25 sq. meters cost Rs.50/- for one cutting. In town, one kilogram of green alfalfa is sold for Rs. one.

The local cultivar is infected with leaf curl weevil, rats and parasitic plant in Panjgur.

3.6.2.2 Sorghum

Sorghum is sown in kharif in rain flooded areas under sailaba conditions after the soils dry up and maintain suitable moisture enough to raise the crop. The variety is local red seeded small head sorghom. Flooded areas need land levelling and strengthening of embankments to obtain even distribution of moisture which will result in even germination and eventually even stand.

It is noteworthy to point out that where sorghum is commonly grown in a given area, alfalfa is no longer a profitable crop. In Panjgur, farmers stopped growing sorghum due to stem borer infestation.

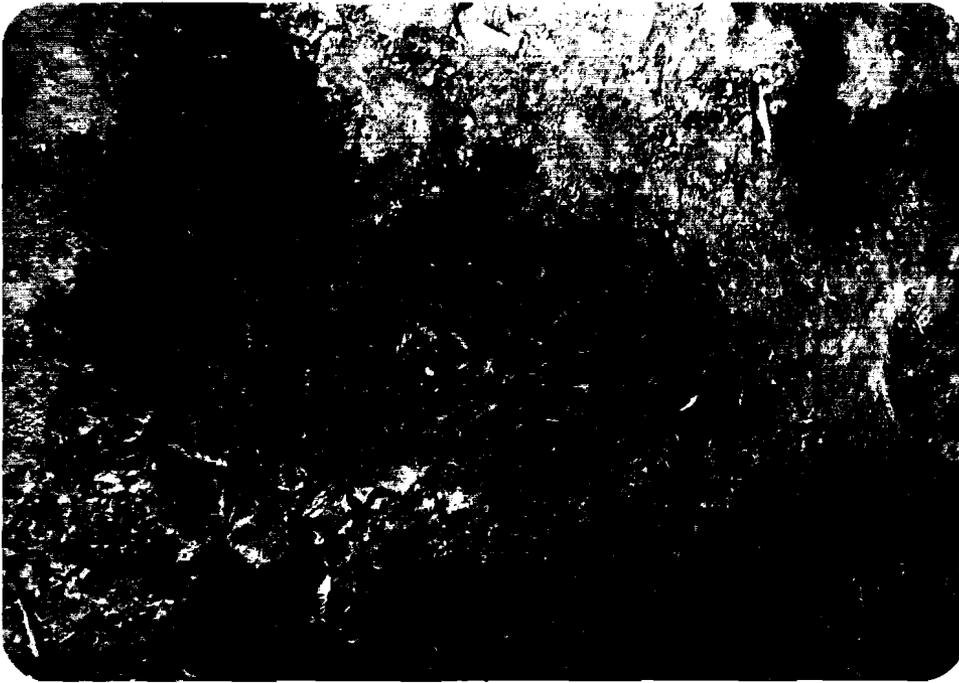


Fig. (7) Tomato infected with leaf curl virus.



Fig. (8) Onion grown in flats.

3.6.3 Fruit trees

3.6.3.1 Date Palm

The most important fruit tree product in Kech and Nihing valleys and around Panjgur, traditionally and even now is dates. The land irrigated by karezes, kurjos, tubewells and dugwells is with no exception surrounded by date palm to protect crops from sandy storms, dusty destructive winds in the winter and the strong sun of the summer. Fig 9.

As the main means of subsistence, date palms also assure relatively stable production of dates for the people where the rainfall is very scanty and uncertain with long periods of drought.

Date palm offshoots are planted around the fields as hedges at a distance 3.3-5 meters which is very close thus allowing for overlapping of the fronds and building up of high humidity particularly when intercropping with Lucern, vegetables and rice, which are commonly practiced. Fig. 11.

An important part of date palm cultivation is the artificial pollination which is carried out in January, February and March to ensure good fruit set and improved quality. The skilled labor climb the male tree just before the spathes of male inflorescence open and collect the male spathe, open them on the ground and prepare strands (branches) of the male inflorescence to pollinate the female flower when the female spathes just open. Pollination is done by climbing the tree using waist band made from the leave of wild dwarf palm (*Nannorrhops ritchieana*) which allow him to ascend and descend safely and quickly on the trunk of the date palm. Fig 12.

The number of strands of male inflorescence inserted into one female spathe varies according to the variety, i.e. Hillini requires more as compared to Begum Jangi. Four strands are called one chob and the necessary number of male inflorescence strands is expressed using this unit. The pollination is carried out whenever each female spathe matures and opens. Accordingly the skilled labor has to climb one female tree 3-4 times during the pollination season.

In view of labor scarcity and shortage of good source of male plants to collect male inflorescence for the artificial pollination and the primitive method to store the strands of male plants for one year hanging under mango trees. This operation is now becoming more difficult and expensive to be carried out. Fig. 10

At the beginning of harvesting season the skilled labor climb the trees for picking the mature dates one by one. Later on, he stretches a large cloth or basket under a fruit bunch and shakes mature fruits off the bunch. The harvested fruits are collected and brought down using basket made of dwarf palm leaf hung by a rope aided by another person on the ground. The manual harvesting operation from July to September is also adding to the rising cost of production. It is noteworthy to point out that the laborers usually take a share of 50%

of the total production (40-80% kgs/tree) to carry out pollination, irrigation and harvesting the crop. Fig. 15.

The importance of date palm is not restricted only to its use as food but the wood and fronds are also used in construction, fencing, matting, knitting and roofing.

Socially the date grove is one of the most valuable properties inherited generation to generation and is considered as an important part of the dowry in the marriages of the land owning class.

There are many constraints confronting production, processing and marketing of dates in Makran.

In date palm groves male and female plants are not in a proper ratio. Good male plants have not been identified and there is a shortage of pollen.

There is high mortality rate of offshoots after detachment from female mother tree due to lack of know-how with respect to weight, age, method of detachment, handling, time of planting and care of offshoots. Fig 18.

The majority of farmers are applying farm yard manure to their intercrops only and no chemical fertilizers are being added to their date palms.

The proper ratio of green fronds to fruit bunches is not observed and alternate bearing is evident.

There are some infestations with date palm weevil (borer), fruit fly, lesser date moth and rats. Graphiola leaf spot is the most common disease of closely spaced date palm orchards. Fig. 11.

Farmers are using primitive methods in sun ripening and curing of their dates which subject it to dust and insect infestations, and eventually result in inferior quality. Fig. 16.

Farmers are neither practicing field grading nor fumigation of their dates.

The old method of packing dates in baskets made of dwarf palm leaves are still in use. Fig 13 and 14.

Very primitive method to make chohara (boiled and sun dried dates) and extract syrup from dates are still in operation. Fig. 17.

In view of non-hygienic methods of processing, primitive packing, absence of farm to market roads, and rising cost of production, marketing of dates became the main limiting factor to be considered in future planning to build up a sound date palm industry in Makran division.

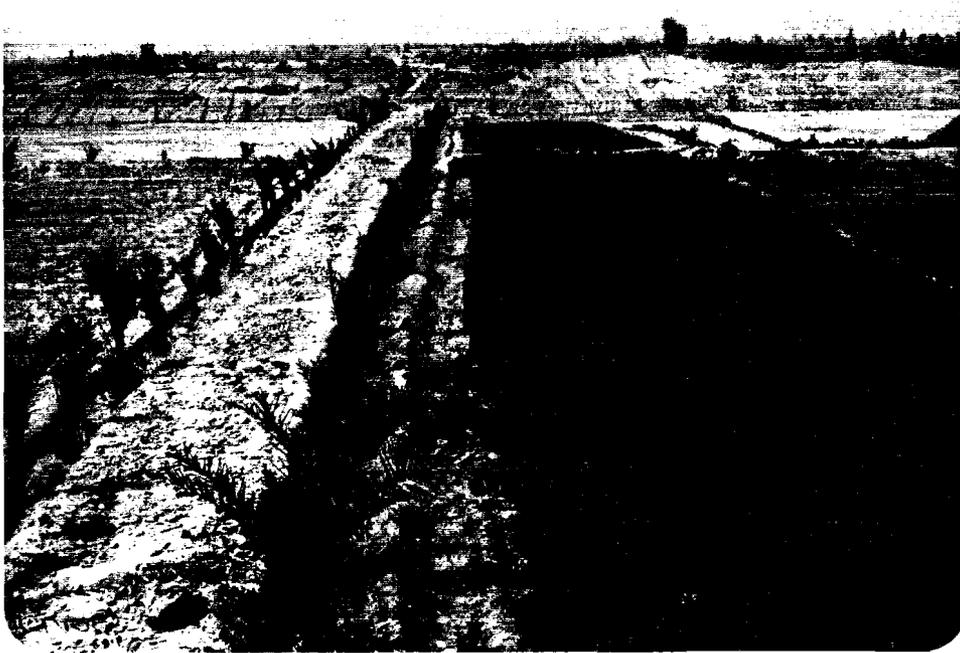


Fig. (9) Typical border planting of date palm orchard and alfalfa as intercrop.

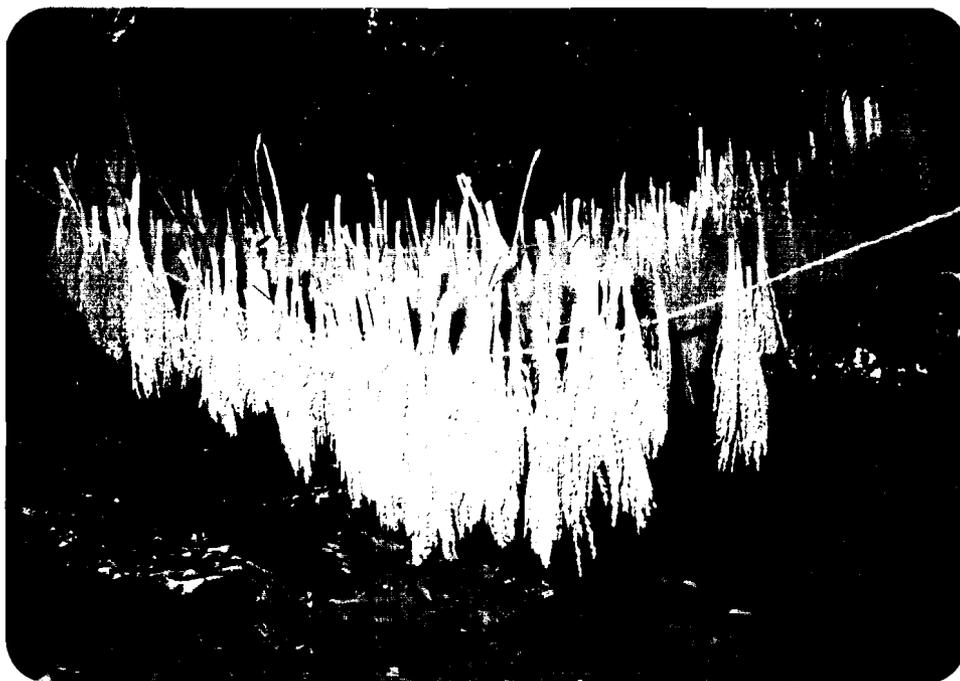


Fig. (10) Due to shortage of date palm pollen, farmers are storing the male strands under mango tree for one year. Thus reducing pollen viability.



Fig.(11) Graphiola leaf spot as a result of high humidity from close spacing.

Fig.(12) Waist band (Dar) used in climbing date palm for pollination and harvesting as well.





Fig. (13) Wild dwarf palm used in making waist bands, mats, huts and barkets for packing dates.



Fig. (14) Hut roof made of wild dwarf palm leaves.



Fig.(15) Harvesting dates using waist band to climb the tree and rope and basket or cloth to collect dates.

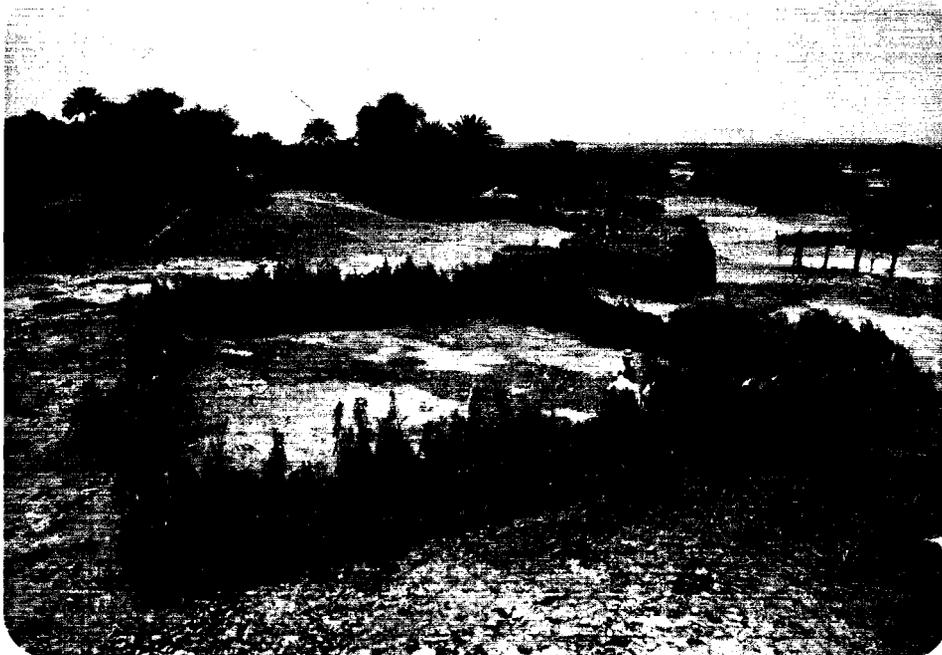


Fig.(16) Curing yard to cure dates thus exposing it to dust and insect infestation.



Fig.(17) Unhygienic method of extracting syrup from piles of dates. The big ditch.

Fig.(18) Offshoots used in propagating date palm.



3.6.3.2 Mango

Fruit drop in April and insects attacking the inflorescence are the main problems. Spraying with malathion and regular application of fertilizers might help. Fig 19 and 20.

3.6.3.3 Citrus

Lime trees are showing symptoms of micro and macro nutrient deficiency and infestation with scale insects. Application of organic and chemical fertilizers is advisable. Fig 21 and 22.

3.6.3.4 Pomegranate

Pomegranate is considered as second important fruit tree in Panjgur. However, fruit fly is damaging the crop in July.

3.6.3.5 Grapes

Grapes are considered as the third important fruit tree in Panjgur. Sabzo is susceptible to rain, whereas, Molky is tolerant to rain.

3.6.4 Cereals

3.6.4.1 Wheat

Wheat is sown from the beginning of October to the end of December, and the harvesting period runs from the beginning of April to the end of May. Wheat is one of the most staple crops and the variety grown locally is called Murki.

3.6.4.2 Rice

Rice is sown in the nursery from the middle of May until the middle of June. Seedling are transplanted from mid June to mid July. Three-six months after transplanting the crop become ready for harvest-ing. For paddy rice cultivation, a continuous supply of water for 5 months is indispensable. This should be carefully reviewed in view of water scarcity.

3.7 - STATUS OF AGRICULTURAL INPUTS

3.7.1 Improved seeds:

There is no seed store to sell improved seeds in Makran. Farmers are saving their own seeds. However, some farmers may have access to some improved seeds from neighboring countries such as Iran or United Arab Emirates. Fig 23, 24 and 25.

3.7.2 Chemical Fertilizers:

Consumption of chemical fertilizers per hectare in kgs in Makran division seems to be far below the standard average. According to 1986-89 statistics, the consumption of fertilizer was 3.33 kgs/ha as compared to 115.31 kgs/he in Quetta division.

There are only two fertilizer depots: at Turbat and at Panjgur. The annual consumption is 6,000 bags of 50 kgs each depending upon the availability of fertilizers. There is no private agency to deal with fertilizers. Supply of fertilizer is irregular. The actual demand is usually more than the supply. Smuggled fertilizer are often cheaper than local fertilizers. Accordingly, farmers are complaining, that fertilizers are not available and costly Rs.250 for 50 kgs bag. Whereas Government rate is rs.137 and 185 for Nitrophos and DAP respectively.

It is therefore, strongly recommended to draw the attention of the officials and farmers to the importance of fertilizer use to increase both yield and quality of their produce. Consequently water will be used more efficiently.

3.7.3 Pesticides and spraying equipment

There is no private agency for pesticides and spraying equipment.

3.7.4 Small farm machinery

Bullocks are the main source of draft power for farm work. Small farm machinery such as rotavators, cultivators, planters, garden tractors, pollinators etc. are not available. Primitive local implements are in use. Figs. 26 to 31.

In view of small holdings, planting date palm along the water channels around the field and labor scarcity, the use of small farm machinery seems appropriate and is therefore strongly recommended.

3.7.5 Irrigation Water

The main source of irrigation water in Makran are karezes, kurjos, tubewells, dugwells and rainfall. Several improvement to increase the recharge are underway as already mentioned elsewhere. Fig 32.

3.7.6 Labor Scarcity

A socio-economic study carried out in 1987 has shown that during the last two to three decades Makran has seen drastic changes in its socio-economic structure in general and its agricultural economy in particular. Thousands of young men, particularly from the poorer and lower classes, left Makran and headed for the neighboring Gulf states to become soldiers, unskilled laborers and domestic servants. More than anywhere else in Baluchistan, Makran was a class ridden society and the changes of the last three decades (mainly brought



Fig. (19) Mango tree infested with scale insects. Black ants may be considered as predators.



Fig. (20) Fruit drop of mango during April.



Fig. (21) Lime tree showing nutrient deficiency.



Fig. (22) Bermuda grass is common weed in date palm orchard.



Fig. (23) Due to unavailability of improved seeds, farmers are saving their own onion seeds.



Fig. (24) Farmers are saving their own spinach seeds.



Fig. (25) The only semi-seed store or seed stand in Turbat fruit and vegetable market.



Fig. (26) Bullocks are the main source of fraft power. (Smoothing, levelling, and covering sorghum seeds using board called Marzen).



Fig. (27) Local made implement (Kalamagur) used in making ridges.



Fig. (28) Local made plough called (Nargan).



Fig. (29) Locally made implements for hand weeding called (Rambi) and sickle (Das) for harvesting wheat and alfalfa.



Fig. (30) Harvesting wheat by hand using locally made implement (Das).



Fig. (31) Harvesting alfalfa by hand using locally made implement.

about by migrations but also by education and general exposure to the outside world) have upset the existing socio-economic systems.

In the karez irrigated areas of Kech valley and Panjgur even the richest landlords generally do not own more than 10 acres. "Waja" in Baluchi literally means "Master" and a 'Waja' with even one acre of land will consider it beneath his dignity to work on his land and dirty his hands. Once the lower cultivating classes found work opportunities elsewhere they no longer cared to work as tenants on small tracts of land with relatively meager to negligible income. There is therefore a current severe scarcity of agricultural labor in Makran which might have long term adverse effects on the local agricultural economy.

In Makran an agricultural laborer needs special skills. Date cultivation requires special skill in cutting, separation and planting the offshoots, climbing the tree for hand pollination and harvesting in way and at times that can be learnt only after many years of experience. Labor surplus from other areas of Baluchistan and the country are not able to fill the vacuum created by the out migration of local labor.

It is therefore, highly recommended to introduce pollinators, and harvester for dates beside small farm machinery previously mentioned in this report.

3.7.7 Marketing

Marketing constraints are directly associated with the absence of farm to market roads and the rough roads between major cities in Makran and the main road between Turbat and Karachi. As a result of rough roads, the cost of transportation is high. Three tons truck load will cost Rs.1500 for 60 miles distance between Bal and Turbat and Rs. 7,000 for 584 kilometer distance between Turbat to Karachi. Furthermore, packing boxes for fruits and vegetables are not available. Considering the above mentioned constraints some produce like limes do not have a market. Consequently, farmers are now removing their lime orchards in Bal village. Fig 33.

The main cash crop in Makran is dates. Due to the absence of date packing factory in Makran, several packing companies are now purchasing dates from Turbat, Panjgur and Mashqel. They usually come to Makran in July-August just before harvest for purchasing the crop. The companies approach farmers, fix the price and supply them with boxes. They pay the price of dates after farmers supply the finished partially graded dates. All companies assume the responsibility to transport the crop to Karachi. Some companies sometimes effect payment to growers at a later stage. However, farmers are still not getting fair prices and are at the mercy of the packing companies. Those who succeed in getting their crop to Karachi cannot escape the trouble of middle men and their huge commissions. The whole-sale price for Begum Jangi is Rs.4 whereas the retail price is Rs.16-20. The Iranian dates are sold for Rs. 20 per kg. at Turbat Market.

3.7.8 Makran Cooperative Date Growers Mill Society Ltd.

The objective of the factory is the processing, preservation and packing of dates for better marketing to ensure better price for date growers.

The factory was established in 1962. The total cost was Rs.318,430. The factory continued to operate at an annual average loss of Rs.37,459 until 1970. Fig 34 and 35.

Due to mismanagement and lack of know-how the factory has been closed since 1970.

The managing board consisted of 7 members. out of which 4 members had died. The board has not held any meeting since its initial formation, in 1962 until recently.

The closing of the date factory detrimentally affected the marketing of dates. To remedy the situation, the remaining members of the managing board should meet to find out a solution to this chronic problem. Election of a new board may take place. Furthermore, operational budget is needed for the repair of equipment and procurement of dates. A skilled director may be appointed to run the factory. The managing board held a meeting in December 1988 and a new board was elected. This was upon request from the cooperative society in order to amend the bylaws of the factory to allow for renting the factory.

Mr. Sardar Abdul Rehman became the managing director and was authorized by the general body to make any future arrangement to reactivate the factory.

Finally Mr. Mohammad Aslam Shah a prominent business man and progressive farmer as well rented the factory for Rs.50,000/year and signed a contract for 10 years. The necessary action to repair the equipment is underway and he promised to start working in the 1989 season without any further interference from the cooperative society as promised by the Commissioner.

At present, the new tenant is seeking a loan from N.D.F.C. to enable him to run the factory. This might partially solve the marketing problem of dates. Furthermore, the new Managing Director has promised to call for a meeting of all the date growers in Turbat and is planning to set up a ceiling price of Rs.300 for 40 kgs of cured date of Begum Jangi which might entirely solve the problem of marketing dates.

Upon request from the managing director and the new tenant, the consultant visited the factory several times and offered his advice with respect to know-how, quality control and marketing of dates in foreign markets.



Fig. (32) Karez, old long horizontal underground water carrying tunnel, used in irrigation.

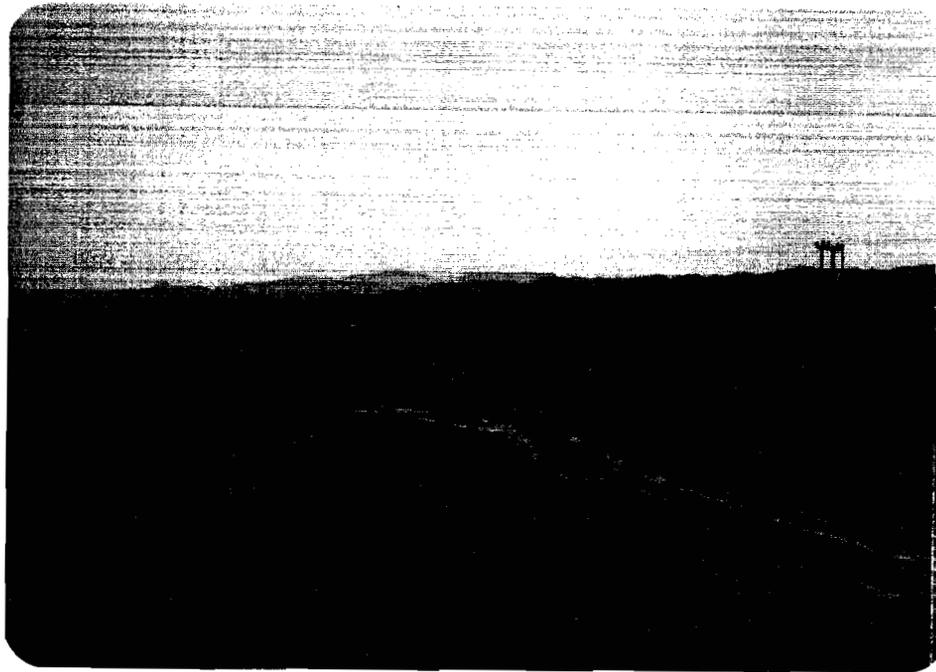
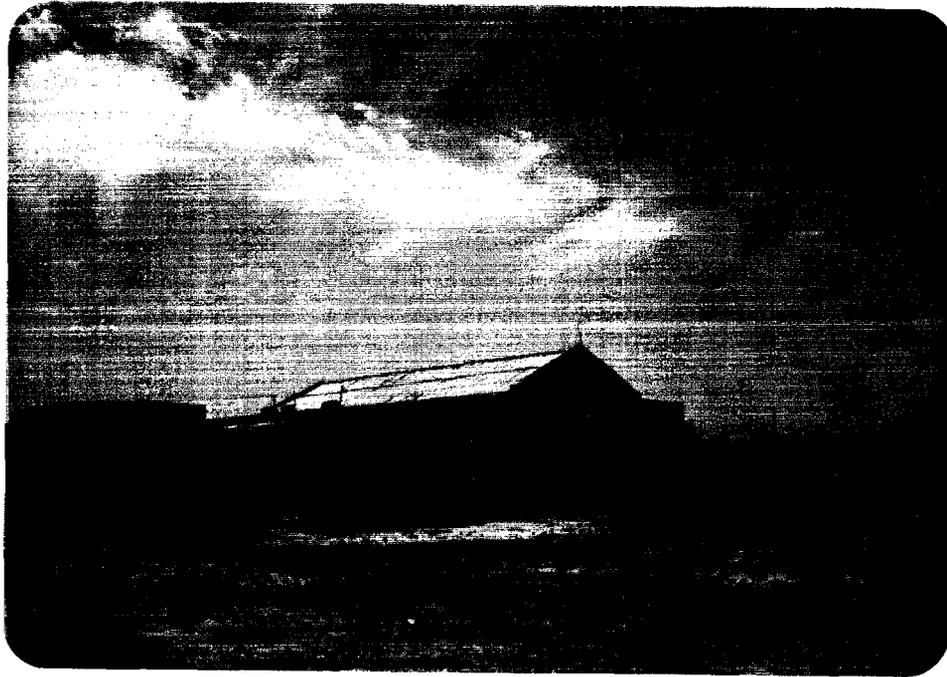


Fig. (33) All roads in Makran are rough roads. There are no farm to market roads.



(fig. (34) The Makran Cooperative Date Growers Mill Society Ltd., abandoned since 1970.

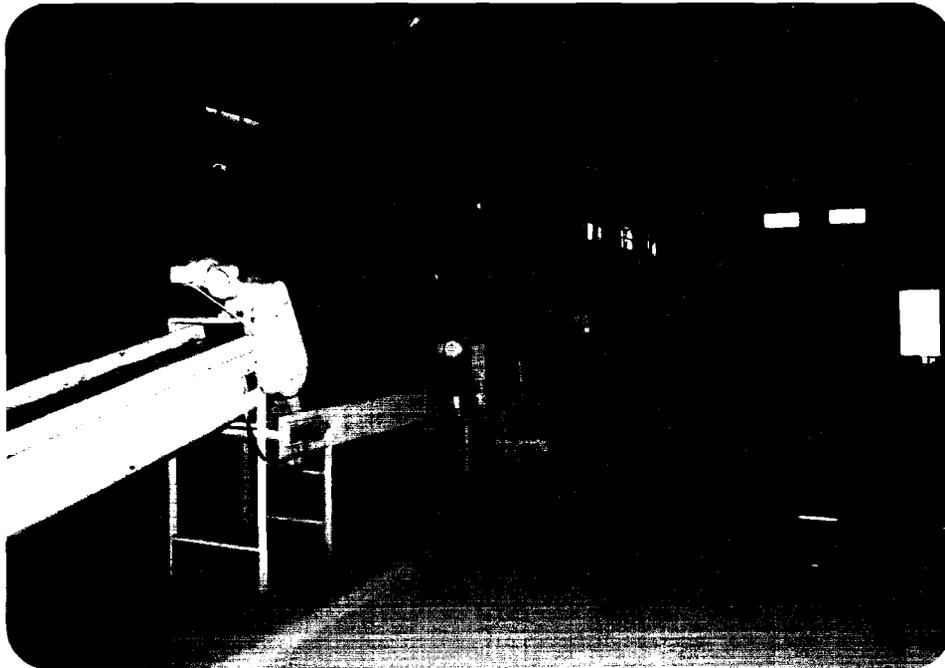


Fig. (35) Old equipment of the abandoned date factory.

3.7.9 Baluchistan Agricultural College, Quetta

The consultant visited Baluchistan Agricultural College to see its facilities, discuss the syllabus, make arrangement and coordination with respect to future in-service training for field assistants of Makran division. He also delivered lectures on the existing cultural practices and demonstrations at farmers' fields and provided the college with video cassettes.

The Principal, Mr. Mumtaz Ali Khan, offered his full cooperation and agreed to provide accommodation and training for 20 field assistants for two weeks at the beginning of Rabi and Kharif seasons.

Since date is the main cash crop an agreement was reached to include it in the syllabus as two courses, one on cultivation and the second on processing. Details of the two courses was provided by the consultant. (Appendix G).

It is noteworthy to point out that the college was originally a training institute for inservice training of field assistants, farmers and field days. Baluchistan province used to send 71 students to other Colleges of Agriculture in Punjab and Sind. However, it was learnt later that only 20 out of 71 joined the agriculture sector and the remaining preferred better job opportunities with sectors other than agriculture.

In 1986, the Government of Baluchistan decided to up grade the training institute to College of Agriculture. There are two levels of study

1. Two year Diploma which is now in the second year.
2. B.Sc. which started in May 1989 on the basis of one student for each 100,000 for each of 21 districts of the division. Furthermore, selection within each district is based on the merit of the student alone.

The existing staff consists of 26 members, twenty one M.Sc. holders and five B.Sc.

There are 9 vacant Assistant Professor posts, two vacant Associate Professor and 12 vacant Lecturer posts.

E.E.C. is now committed to establish new Agricultural College in Baluchistan for U.S. Dollars 21.1 millions to replace the existing up graded training institute. The Principal of the college is seeking an affiliation with Cranfield Agricultural University in the United Kingdom.

3.7.10 Agricultural Research activities

Agricultural research activities in Baluchistan are concentrating on high elevation research. The Management of Agricultural Research Component (MART/AZRI) was initiated at the Pakistan Agricultural Research Council's (PARC) Arid Zone Research Institute (AZRI) in

August 1985 through the financial sponsorship of United States Agency for International Development (USAID), International Center for Agricultural Research in the Dry Areas. (ICARDA) and Colorado State University are the contractors responsible for the technical implementation of the project. The principal objectives of the project are to provide support for the institutional development of AZRI and its staff; and the initiation of a research program in dryland agriculture, including livestock and rangeland management.

Five principal research groups namely: Farming systems, Agronomy, Germplasm Evaluation, Range/Livestock Management and Agricultural Extension were created.

The Agriculture Research Institute (ARI) at Sariab, Quetta is actively engaged in Introduction, testing and seed multiplication of varieties of crops such as: Oilseeds, Rice, Pulses, Chickpea, Maize, Sorghum, Millets, Sugarcane, Wheat, Barley, and Potato. However, the research activities of ARI did not include Makran Division due to the absence of infrastructure, shortage of staff and funds to cater for the implementation of any research program in Makran division. Accordingly, date palm, the major cash crop in Makran division was neglected.

The Agriculture Research Institute (ARI) recent budget is Rs. 10 millions. Out of which Rs.1.5-2 millions is actually spent on research and the remaining as wages. There are 45 vacant positions and this is taken as reasons for not including Makran in the current research program. However, there is a provision in Agriculture Research Phase II (ARP-II) financed by World Bank for the establishment of a sub-station in Turbat and a PC-1 is in the pipeline. Furthermore, Rs.500,000 were allotted in 1989 for a date research station in Turbat and will be considered as on-going project in the 1990 Fiscal year.

The consultant discussed the need for the re-organization of ARI with the Director Dr. Abdul Hameed Bajoi. Both are of the views to re-arrange it under four main divisions namely:

Crop Protection, Crop Production, Soil Fertility and Social Sciences. This arrangement will allow for efficient management of research.

3.7.11 Extension Activities

Agricultural extension in Makran division is a discipline in which little research has been undertaken. The agricultural communities are essentially under tribal organization and the communication infrastructure such as roads, telephones and transport is at present only at the beginning of the development process. Naturally these factors, beside shortage of extension personnel, substantially increased the problems of dissemination of agricultural information. These problems are further enhanced by absence of research findings and illiteracy prevailing among rural male and female population. Furthermore, the density of the rural population is very low (12 people/square kilometer) and transhumance is a common practice. This makes regular contact with farmers exceedingly difficult.

Careful examination of extension setup in Makran indicates that:

1. Several key posts such as Assistant Horticulture Officer, Assistant Statistical Officer, Assistant Plant Protection Officer, Crop Reporter, EADA of Gwadar are still vacant.
2. There is no official coordination taking place between the Deputy Director of Agriculture Extension and EADA's of both water management and date farm which is essential for effective extension work. However, there is cooperation on personal level.

At present, there is no regular foreign training program for the extension staff of Makran Division. As for in-country training, a refresher course for 2-3 days at the beginning of Rabi and Kharif Seasons is offered by the senior extension staff of Turbat District.

Accordingly, there is an urgent need for regular foreign and in-country training programs for all levels of extension staff.

...

IV - PROPOSED RESEARCH PROGRAMS

4.1 - VEGETABLES

4.1.1 Broad Beans (Baqla)

Since broad beans is the main vegetable crop in Makran division, and the existing low yield black seeded cultivar is susceptible to pests, it is therefore highly recommended to introduce several varieties which proved to be high yielding and tolerant to pests.

Introduction of varieties:

The newly introduced varieties should be planted in an observation trial in October-November in the first year of introduction. In the second year, an appropriate variety trial for the promising varieties may be carried out, varieties such as Qobrosi, Sabawi, Aquadols etc. from Egypt and varieties from ICARDA are recommended for introduction

4.1.2 Sowing dates

An experiment on sowing dates of broad beans is recommended in order to determine the suitable sowing date to obtain maximum yield and quality. Sowing dates such as September, October and November may be tried.

4.1.3 Comparison between ridge planting and flat planting

An experiment to determine the advantage of growing broad beans on ridges 70 cm apart and 25 cm between plants and broadcasting in flats may be carried out, bearing in mind using the same seed rate per unit area for ridges and flats.

4.1.4 Muskmelon (Cantaloupe)

Introduction of varieties:

Small Honey dew type is common on the market. However, introduction of varieties such as: Ananas, Gallicum, Magnum 45, Top Score, Fiesta and Gold King may be recommended to be tested in an observation variety trial in the first year.

In the second year, promising varieties may be further tried in an appropriate variety trial.

Planting may take place in March on one side of the ridge 2 meters apart and 0.5 meter spacing between plants.

4.1.5 Watermelon:

Introduction of varieties;

Several varieties such as: Charleston Gray, Charleston Sweet, Royal Sweet, Royal Charleston WR, Giza Hybrid, Royal Jubilee, Prince Charles, Royal Windsor, Sugar Baby and Crimson Sweet may be introduced for an observation variety Trial in the first year. Promising varieties may be tested in a variety trial in the second year.

Planting may take place in March on one side of ridges spaced 2 meters apart and 0.5 meter between plants. Both cantaloupe and watermelon are coming to Turbat Market from outside Makran. Fig 36 and 37

4.1.6 Okra

Introduction of Varieties:

Okra is one of the major vegetables in Makran. There is only one local cultivar. An introduction of varieties such as: Annie Oakley, Pusa Green and Clemson Spineless may be tested in an observation variety trial in the first year.

Promising varieties and the local cultivar may be tested in a variety trial in the second year.

Okra is planted in March on ridges 70 cm apart and 25 cm between plants on one side of the ridge.

4.1.7 Onion

Onion is an important vegetable in Makran consumed as green and bulb as well. It is commonly grown in flats from seeds saved by farmers. It was noticed that most onions grown by farmers developed seed stalk rapidly i.e. easy bolting. Accordingly, Introduction of slow bolting varieties are recommended for observation variety trial such as: Texas Early Grano 502PRR, Texas Grano 1025Y, Texas Grano 1015Y, Creole Red and Bombay Red.

Promising varieties may be tested in an appropriate variety trial in the second year. It is advisable to use ridges 70 cm apart and plant both ridge sides with transplants spaced 10 cm apart. Notice the day length for the newly introduced varieties.

Onion, too is coming to Turbat Market from outside Makran.

4.1.8 Eggplant (Brinjal)

Introduction of new varieties such as Black Bell, Silica, Dusky, Epic, Black Beauty, Florida Market and Long purple. To be tested in an observation variety Trial in the first year followed by variety trial in the second year.

Eggplant is transplanted on ridges 70 cm apart and spacing of 50 cm between plants using one side of the ridge.

4.1.9 Hot Pepper (Chillies)

Introduction of new varieties such as: Jalapa, Super Cayenne, Super Chili, Gold Spike, Cayenne Long Slim, Early Jalapeno, Habanero, and Serrano Chili are recommended.

4.1.10 Sweet Pepper - as new crop

California Wonder 300, Yulo Wonder A,B,L pepper may be tested in or observation trial in the first year on ridges 70 cm apart and 30 cm spacing between plants using one side of the ridge. Promising varieties may be tested in a variety trial in the second year.

4.1.11 Squash - as a new crop

Varieties: Clarita, ridges 1 meter apart spacing between plants 50 cm and using one side of the ridge.

4.1.12 Potato - as a new crop

Varieties such as: Diamant, Desiree, Spunta patrones and Cardinal may be obtained from Potato Seed Industry, Baluchistan for observation trial to be planted on one side of the ridges 70 cm apart and 25 cm spacing between plants. Use the whole tuber 35-45 mm in size (egg size) without cutting.

Planting dates may be tried in October and January. Potato is coming to Turbat Market from outside Makran

4.1.13 Tomato

Introduction of varieties such as: Roma VFN, VFN 8, Ace 55 VF, Marmande VF-PS, Manalucie, Nema 1200, Nema 1400, Nema 1401, and Zenith are recommended. Transplants should be sprayed twice against white fly in the nursery and every 10 dyas after field setting to avoid infection with leaf curl virus. An integrated control measure should be practiced against white fly.

The varieties may be tested in observation trial on ridges one meter apart and 50 cm between plants on one side of the ridge using different planting dates i.e. October, November and December.

In the second year an appropriate variety trial may be carried out for the promising varieties.

4.1.14 Carrots

Varieties such as: Chantenay Royal, Danvers 126, Chantenay Red Cored, Chantenay Long type, Nantes Scarlet Fina, Amatou, Landa, Topscore are recommended for sowing during November and December on both ridge sides spaced 70 cm. apart.



Fig. (36) Iranian dates at Turbat market. The main producing area of dates in Makran.



Fig. (37) Fruit and vegetables are coming to Turbat market from Karachi and Quetta.

4.1.15 Cucumber

Varieties such as: Beit Alpha Mr. P5, Marketmore 76, Sweet Slice, Amira 11, Dasher 11, and Tropic Cuke may be tested in observation trial on ridges 1.5 meter apart and 50 cm spacing between plants using one side of the ridge.

Planting dates may be tried in September and February.

Snake cucumber: may also be tried as mentioned above.

4.1.16 Lettuce

Varieties such as: Great Lakes 118, Great Lakes 659, Great Lakes 200, Paris Island Cos, and Paris while Cos may be tried in November on ridges 70 cm apart and 30 cm between plants.

4.1.17 Radish

White Icicle

4.1.18 Peas

Varieties such as Perfection, Little Marvel, Bolero, Spring, and Progress No. 9, may be tested in November on ridges 70 cm apart and 10 cm between plants using one side of the ridge.

It is noteworthy to indicate that sowing dates and fertilizer experiments for the above mentioned kinds of vegetables may be undertaken in the future after screening and evaluation of the varieties of each kind.

4.2 - FRUIT TREES

Date Palm

Date Palm is the main cash crop in Makran. The value of dates is about Rs.513.63 millions.

Unfortunately there is no research work being undertaken on this important crop. Furthermore, several constraints are confronting the production, processing and marketing of dates.

During 1987 and 1988, the consultant, visited all date plantations in Pakistan. He identified the problems, demonstrated immediate solutions to some of the problems and selected superior germplasm for further evaluation. With respect to Makran, the consultant recommended a progeny garden to be established for 6 commercial varieties namely: Begum Jhangi, Asseel, Abidandan, Hussaini, Hillini, and Dhaki. Fig 38 and 39.

The progeny garden was established in September 1988 as a randomized block design with four replications. Plot size is 1/2 acre and consists of 40 date palms.

The progeny garden will allow in the future to carry out statistically designed cultural practice experiments.

The following research programs may be considered as the most urgent and practical approach that might be undertaken to solve some of the problems confronting production, processing and marketing of dates.

4.2.1 Studies on Male plants and pollen grains of date palm

4.2.1.1 Screening of male plants to find out superior males that can enhance maturity and improve yield and quality of dates. It is noteworthy to indicate that 5-10 males could be tested on one female date palm.

4.2.1.2 The storage of pollen grains using low temperature and calcium chloride.

4.2.1.3 The use of pollinator on date palm to overcome pollen shortage and labor scarcity.

- A) Dilution of pollen with different amounts of flour to obtain different concentrations of pollen 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100% pollen grains
- b) Frequency of using pollinator with different pollen concentrations for commercial varieties Begum Jangi, Hillini... etc.

4.2.1.4 Improvement of Pollinator

4.2.2 Studies on the propagation of offshoots of date palm to reduce the rate of mortality.

4.2.2.1 Effect of:

- a. Age
- b. Weight
- c. Pruning and Trimming
- d. Method of Separation
- e. Time of Planting

on the percent mortality of offshoots.

4.2.2.2 The use of root promoting substances to reduce mortality rate of the offshoots

4.2.2.3 Studies on Tissue Culture techniques to propagate superior germplasm.

4.2.3 Studies on the Cultural practices of dates.

4.2.3.1 Comparison of regular orchard planting Vs border planting of dates with and without intercropping and determination of suitable population of date palms per unit area, to ensure maximum yield and quality and reduce rising production costs.

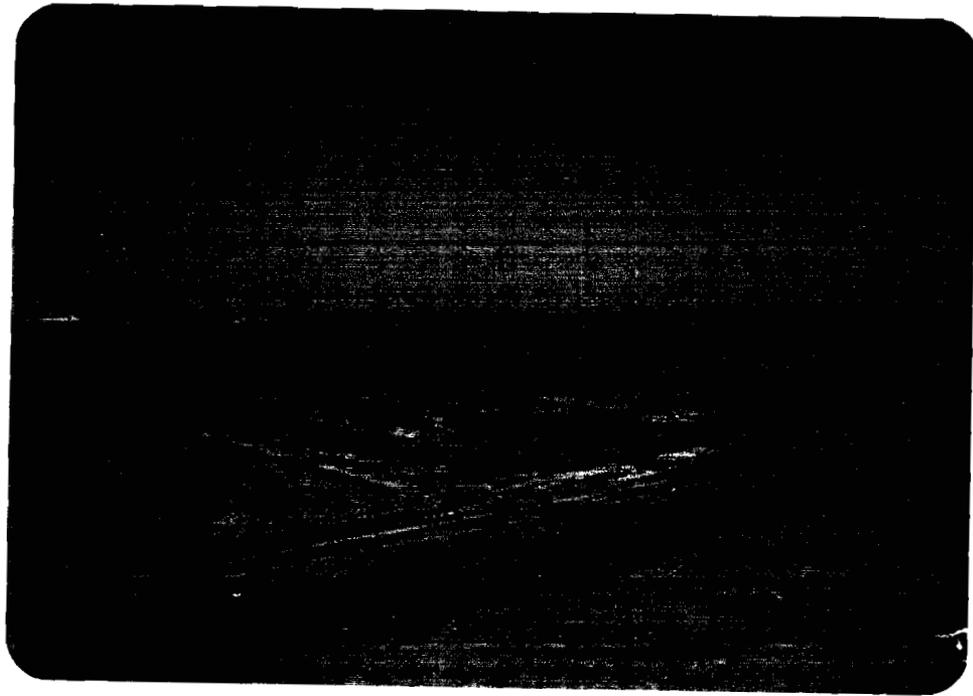


Fig. (38) Randomized block design of new date farm for future research work.



Fig. (39) Old date farm at Turbat.

- 4.2.3.2 Intercropping of date palm with Alfalfa, Broad Beans, Wheat, Tomato, Chillies, Okra, Melons... etc.
- 4.2.3.3 The application of fertilizers (NPK) to date palm to obtain maximum yield and quality and reduce rising production costs.
- a. Time
 - b. Frequency
 - c. Quantity
 - d. Kind of fertilizer
 - e. Method of application

To be carried out in regular orchards with and without intercropping.

- 4.2.3.4 The effect of different pesticides against

- a. Lesser Date Moth
- b. Mites
- c. Date Palm Weevil
- d. Graphiola Leaf Spot.

- 4.2.3.5 Evaluation of gated PVC pipes, bubbler and surface irrigation systems.

- 4.2.4 Studies on pruning of fronds of date palm

Determination of the appropriate ratio between the Number of fronds to be left on date palm in relation to the number of bunches on the tree for major varieties such as Begum Jangi, Hillini, Mozati, Kahraba etc.

- 4.2.5 Studies on Physiologic disorder of dates

To ensure maximum yield and quality. The study includes:

- a. Crosscuts (Begum Jangi)
- b. Blacknose (Dandari, Hushkinsh, Pappo)
- c. Sunburn (Dhaki)

- 4.2.6 Studies on the effect of maturity stage on the Quality of Tamur

- a. Khalal (Doka)
- b. Half Khalal (half Doka)
- c. Rutab (Dung)

- 4.2.7 Studies on the effect of

- a. Water Quality (Ph, salts)
- b. Time of boiling
- c. Degree of Khalal maturity
- d. Sodium Bicarbonate concentration

On the quality of chohara (Boiled and sun dried dates)

4.2.8 Studies on the fumigation of dates

Screening different fumigants to determine safe effective and cheap fumigants for field use and packing house as well.

The study includes:

- | | | | | | |
|----|-------------|----|---------------|----|-------|
| a. | Kind | b. | Concentration | c. | Time, |
| d. | Temperature | e. | Frequency | | |

4.2.9 Studies on the storage of fresh dates in different stages at different cold storage temperatures for local consumption and export as well.

4.2.10 Studies on date palm germplasm of Makran division. The objective of the study is aimed at collection of the superior germplasm in a progeny garden in Turbat and Panjgur for conservation, multiplication, further evaluation and future experimentation.

The study includes:

a) Varieties that might be considered as resistant to rain

Kongo, Begum Jangi, Kuroch, Sungurag, Surin Abidandan, Humbi Kalerock, Sami Kalerock, Jalagi, Zard, Bor, Arisht, Gundagurpag, Nazan Tabaqi, Sohren Begum Jangi, Miri, Shepago, Ari, Shehri, Chapshuk Kolonti, Begdag, Khassab, Mashkheli, Nazan Dazi, Kulandezaki, Unknown, Khanezi, Shakar Dandan, Jowan Zard, Kahraba, Hushkinsh, Zardan, Siah Karez, Hussani, Zard, Wash Kolont, Zard (1) Zard (2) Kuroch (1) and Kuroch (2).

b) Early varieties for fresh consumption and export from May to August:

Peshna, Shakri, Roghni, Abidandan, Kozinabad, Surin Abidandan, Zardan, Roghen Buladai, Jwanna, Dandari, Gokna, Idal Shah, Kongo, Hussani, Sabzo, Rabai, Lango, Barni, Shakar, Sharifa and Sabzaki.

c) Considering and seeking the possibility of an immediate short term tissue culture project with the private sector to obtain quick and true to type offshoots of Surin Abidandan, Zard, Kongo and Jwan Zard.

d) Initiating research program to explore the feasibility of obtaining genetically engineered rain resistance commercial strains.

4.3 Fodder Crops

4.3.1 Alfalfa

An observation variety trial to compare the local cultivar with newly introduced dormant, non-dormant and the in-between type may be desirable as already recommended by Dr. Izuno.

4.3.2 Sorghum

An introduction of Sorghum - Sudangrass hybrids, sudangrass, Dwarf Napier and multi-cut Bajra, Georgia 337 sudangrass, and pearl millet may be desirable as already recommended by Dr. Izuno.

...

V - PROPOSED REGULAR TRAINING PROGRAMS

5.1 - IN-COUNTRY TRAINING

Practical training programs on demonstrations at the beginning of each growing season Rabi and Kharif for all Agriculture Officers, Field Assistants, bulders and labors of nursery and date farm should be carried out on regular basis.

5.1.1 Location

The training programs might be carried out at the nursery farm, Turbat date farm and the committee room of Agriculture Extension where accommodation is also available.

However, the principal of Baluchistan Agricultural College at Quetta, has accepted to accommodate all the trainees if training to be carried out at Quetta.

5.1.2 Subjects

The practical training includes the following subjects.

- 5.1.2.1 The control of date palm weevil, Graphiola leaf spot and lesser date moth.
- 5.1.2.2 Separation of date palm offshoots, care of offshoots, planting of offshoots.
- 5.1.2.3 The use of pollinator to pollinate date palm, collection of pollen, storage of pollen grains, dilution of pollen grains.
- 5.1.2.4 Pruning of date palm.
- 5.1.2.5 Harvesting, curing, field grading, field fumigation.
- 5.1.2.6 Control of insects such as white fly, Aphids, Thrips, fruit fly, Cutworm, Armyworm, Beetles, Grasshopper etc.
- 5.1.2.7 The use of herbicides to control weeds particularly Bermuda grass in date palm orchards
- 5.1.2.8 Preparation of land, seed beds, ridges for Date Palm, Broad Beans, Onion, Tomato, Eggplant, Okra, Chillies, Watermelon, Muskmelon, Potato, Peanut... etc.
- 5.1.2.9 Control of major diseases of vegetables: Brown Chocolate, Alternaria Solani, Virus etc.

5.1.2.10 Know - how of growing date palm and major vegetables.

- a. Planting date
- b. Plant population per unit area
- c. Application of fertilizers - rate - method frequency
- d. Cultivation
- e. Irrigation
- f. Control of pests
- g. Harvesting and handling

5.1.2.11 On-farm water management

5.1.2.12 Small farm machinery

5.1.3 Duration

The duration of the programs would be two weeks at the beginning of each season in early March and September.

5.1.4 Officers in Charge

The program will be carried out under the supervision of the Deputy Director of Agriculture Extension in full co-operation with Chief Agriculture Section, Baluchistan Area Development project and EADA's of Turbat date farm and on Farm water management project.

5.1.5 Lecturers

- a) Entomologist
- b) Plant Pathologist
- c) Horticulturist
- d) On-Farm water management
- e) Farm machinery
- f) Expatriate on date palm

5.1.6 Contact Farmers

Each field assistant will carry out actual demonstrations at farmer's field in his area. The field assistants will each be responsible for 5-10 demonstrations and to train their farmers to become contact farmers in order to help in disseminating the information to the fullest.

5.2 - REGULAR FOREIGN TRAINING

Ten trainees are proposed for training on date palm cultivation and processing for 15 days in Egypt.

In view of the many constraints confronting the extension activities, it is strongly recommended that the programs should be initiated at once.

Furthermore, realizing the importance of training and demonstration at farmers field, the Additional Chief Secretary has agreed to include the proposals of training and modern irrigation systems in BALAD activities. (see appendix G).

VI - RECOMMENDATIONS

6.1 - DEVELOPMENT OF WATER RESOURCES

Water is the key element for all aspects of development. Makran division has an immense resource of unused fertile land. Development of water resources is, therefore, of paramount importance for utilization of land and for improving the standard of the population.

Perennial water flows in the form of rivers being extremely scarce and evaporation losses being high, economic rationality demand, that this scarce and critical resource be sparingly and wisely used. There is a definite need and scope for improvement of perennial water flows. The perennial flows cannot be brought to the fertile land on a self-help basis due to difficult terrain, or more than 50% of the water thus diverted is lost in transit due to absorption. Furthermore, the temporary diversion constructed by farmers are damaged by the floods.

The flood flows of seasonal rivers and hill torrents is another water resource which could be diverted to irrigate substantial fertile land and bring it under cultivation.

Ground water, too, constitutes a vital source for agri-culture development. The intensive and unplanned withdrawal of ground water has lowered the water table in the last 15 years by approximately two meters. The drawdown of the aquifer has outpaced the natural recharge process.

Some fragmented efforts and activities to recharge the ground water by Baluchistan Area Development Project and the Irrigation Department through damming structures, improvement of watercourses, karezes and kurjos are underway. However, these activities need coordination and integration with on-farm water management project, agriculture research and extension.

In view of all the above mentioned facts, it became most urgent to take into consideration all the necessary actions for water development, conservation, and efficient utilization as follows:

- 6.1.1 For sound planning to develop water resources, it is highly recommended to up-date the available data on water resources.
- 6.1.2 Observation wells are essential for the determination of the present situation of underground water and the formulation of a mathematical model for future forecasting as well.
- 6.1.3 The quality of water is as important as the water quantity. It is the quality which determines the suitability of water for Agriculture. Therefore, periodic physical and chemical analysis of water should be determined.
- 6.1.4 The idea of changing Mirani Dam from storage Dam to Diversion structure with approximately half the original cost might bring double the area of fertile land under cultivation. Thus an urgent feasibility study is worthwhile to be carried out.

- 6.1.5 It might be appropriate to study the possibility of re-allocating U.S. dollars 3.62 millions already allotted for the two diversion dams at Kill kaur and Goburd which were resented by the people of that area due to its detrimental effect on their karezes and construct instead another two diversion structures on Dasht river down stream.
- 6.1.6 Exploring the deep aquifer for the development of additional water resources is urgently needed.
- 6.1.7 Active steps should be taken to provide solar radiation structure, wind mills, or electricity to areas with great agricultural potential such as Dasht, Gichk, Niguar, Boleda etc.
- 6.1.8 The establishment of an irrigation research unit is essential to monitor effects of recharge structure already constructed, study water consumptive use and introduce, suitable irrigation systems may be advisable in the second phase of BALAD.

6.2 - DEVELOPMENT OF AGRICULTURE

- 6.2.1 In view of the primitive agriculture being practiced by farmers and the limited water resources. It is essential to utilize what is available in an efficient way. It is, therefore, highly recommended to obtain the maximum crop yield and quality for each water unit (cusecs) to be discharged from the present ground water. This will ultimately require the use of
- a) Improved seeds
 - b) Fertile soil
 - c) Precession land levelling
 - d) Suitable sowing date
 - e) Optimum plant population per unit area
 - f) Appropriate quantity and quality of organic and chemical fertilizers.
 - g) PVC pipes from mouth of karezes, kurjos, tubewell etc to convey water to the farms and reduce losses
 - h) Modern irrigation systems
 - i) Integrated pest control
 - j) Small farm machinery & equipment
 - k) Proper handling and processing of the produce
 - l) Sound marketing outlets
 - m) Effective extension work based on practical research, training and upgrading Baluchistan Agricultural College
- 6.2.2 Actions are urgently needed to make the necessary arrangement to supply farmers with all the agricultural inputs to ensure maximum production and eventually improve their Socio-economic conditions.

- 6.2.3 Steps should be taken to research side to develop drought resistant crops to have maximum yield with minimum yield of water. This can be helped by PARC.
- 6.2.4 Mass Media (T.V. & Radio) for agriculture and rural development purpose and working with the people at the grass root level is essential and vital tool for sound development of Makran Division.
- 6.2.5 Since there is a discrepancy between the reported command areas of karezes by BALAD, the cultivated areas reported by the Agriculture Department and the actual areas occupied by the different crops. It is therefore, highly advisable to utilize remote sensing techniques and obtain accurate statistics about the areas occupied by the different crops. Space and Upper Atmospheric Research Commission (SUPARCO) may be contacted to carry out such work.

6.3 - CO-ORDINATION OF FUTURE ACTIVITIES

- 6.3.1 To ensure effective coordination on the implementation level among Agriculture Department, PPMU of Baluchistan Area Development Project, Irrigation Department and On-Farm Water Management. It may be proposed that the Deputy Director of Agriculture extension of Makran Division may be deputised to be in charge of day to day activities. Particularly, the BALAD Project is in an interm phase and will be preparing itself to shift activities toward Agricultural Development shortly.
- 6.3.2 Previously, PPMU was not functioning properly due to shortage of staff. At present, the staff is about to be completed. It is therefore, advisable to take the necessary steps to integrate them in the on-going work plan and make their participation spelled out properly to ensure project achievement.
- 6.3.3 Actions need to be taken before carrying out any future range management scheme to ensure conservation of the desert natural green cover particularly the wild dwarf palm not only because it is a cash crop with many benefits to local community but also it conserves soil against erosion and desertification.
- 6.3.4 An integrated rural development approach to improve the socio-economic conditions of Makran division may be the main target of the second phase of BALAD Project.

6.4 - IMPROVEMENT OF DATE PALM CULTIVATION, PROCESSING AND MARKETING

- 6.4.1 A highly scientific, skilled, experienced expatriate expert may be required to coordinate and advise on the establishment and operation of the date research station at Turbat. The collection of date palm germplasm, the establishment of progeny gardens and the related research and training programs require technical assistance.
- 6.4.2 Accurate statistics on acreage number of date palm trees and varieties cultivated should be undertaken.
- 6.4.3 Screening male plants with respect to time of blooming, compatibility, amount of viable pollen, and its effect on earliness, productivity and quality is essential.
- 6.4.4 A ratio of 4 males to 100 female plants should be maintained in all date palm groves and they should receive the same care as female plants.
- 6.4.5 In order to reduce cost of production and overcome shortage of pollen and labor scarcity, pollen bank should be established to make good pollen available at critical times and the use of pollinators should be encouraged.
- 6.4.6 To reduce mortality rate of offshoots, farmers are advised to detach offshoots from mother tree when the offshoots reach a weight of 15-20 kgs and develop good root systems.
- 6.4.7 Crow bar chisel may be used for the detachment of offshoots and mother tree should be treated with coal tar after detachment to protect it against the date palm weevil (borer).
- 6.4.8 All cuts on offshoots should be treated with one percent solution of copper sulphate and planted directly.
- 6.4.9 Care after planting with respect to irrigation and protection against adverse conditions is required.
- 6.4.10 Planting new orchards in succession to ensure continuous supply of offshoots is advisable till some improved propagation techniques become available.
- 6.4.11 Since date palms usually produce 10-15 offshoots in its whole life and in order to multiply superior date palm germplasm, a tissue culture laboratory should be established.
- 6.4.12 Nitrogen fertilizer should be applied in split application at different growth stages.
- 6.4.13 Wide spacing of 9 meters between plants is advisable to reduce the detrimental effect of high humidity.

- 6.4.14 Water management and proper irrigation method to avoid direct contact of water to the trunk is essential. Gated PVC pipes or bubbler may be tried.
- 6.4.15 For higher yield a proper ratio of fronds to fruit bunch 10:1 may be maintained.
- 6.4.16 Improvement in current sun ripening and curing of dates is required.
- 6.4.17 Integrated pest control, field fumigation for controlling the insect infestation in dates in the field as well as in stores is essential.
- 6.4.18 The present baskets used for packing dates need improvement, Lining inside of the basket with food grade plastic film is advisable.
- 6.4.19 Date stores should be clean and loose fruits should be adequately protected from flies, dust and dirt by covering.
- 6.4.20 Hygienic methods for processing and extracting syrup from dates are urgently needed.
- 6.4.21 Export of fresh dates to neighboring and European countries may be explored.
- 6.4.22 Farm to market roads, re-activation of date factory and organization of date marketing are essential to build up sound date palm industry in Makran.

VII - SUMMARY

In view of water scarcity, insufficient agricultural inputs, primitive agriculture and in order to improve the socio-economic conditions of the farmers in Makran Division, several actions are urgently needed and may be summarized as follows:

7.1 - Water Development

- 7.1.1 Drilling observation wells beside up-dating data on water resources are essential to determine the present and future situation of ground water.
- 7.1.2 Exploring the deep aquifer for the development of water resources.
- 7.1.3 Constructing several diversion structures and providing wind mills, solar radiation or electricity to areas with great Agricultural potential such as Dasht, Gichk, Niguar, Boleda etc.
- 7.1.4 Carrying out periodic analysis of water quality.
- 7.1.5 Strengthening on-farm water management and introducing modern irrigation systems.
- 7.1.6 Establishing an irrigation research unit.

7.2 - Agriculture Development

- 7.2.1 All agricultural inputs including small farm machinery, pollen bank and pollinator for date palm may be made available to farmers.
- 7.2.2 Aerial spray of date palm orchards in April and May using Malathion ULV not only will control white fly, the vector of many virus diseases, but also will control the lesser date moth and mosquitos.
- 7.2.3 Know-how of raising and handling major crops may be made available through training, working with the people and mass media.
- 7.2.4 Remote sensing techniques may be utilized to obtain accurate statistics about crops.
- 7.2.5 Implementing regular training and research programs as outlined in the report. However, a date palm expatriate expert may be needed.
- 7.2.6 Utilizing video cassettes which were recorded during demonstrations at farmers fields in future training, together with mobile audio-visual aids.
- 7.2.7 Co-ordinating all activities between irrigation and agriculture departments as outlined in the report.

TERMS OF REFERENCE

- a. Identification of major constraints in the date development program.
- b. Planning of research and extension program aimed to solve the identified problems.
- c. Planning of inservice training program.
- d. Full collaboration with line ministries and other agencies operating in Makran is required. These include, *inter alia*, the BALAD Project, the ADBP, Department of Agriculture, On-farm Water Management, and P&D/PPMU.
- e. Non-date agricultural production/marketing operations found in the Makran Command areas, including fodder, vegetables and fruits will also be addressed. The consultant will identify, review, comment upon, include in training and field days and make recommendations for future extension/applied research work, priority, non-date agricultural activities.

The recommendations and action plan for extension type or applied research activities should be of modest scope and should be implementable by the line agencies. Nonetheless, recommendations can include modest support from the BALAD Project. The planning of these activities will be coordinated with the PPMU and BALAD technical staff, and the technical assistance contractor. The consultant will provide a one week training program for Makran Division agricultural staff in date culture propagation, harvesting, etc. The consultant will conduct short courses and/or field days for farmers together with agricultural staff (Department of Agriculture, BALAD Project, ADBP) at four of the larger karez command areas.

...

ACKNOWLEDGEMENT

The author wishes to express his sincere thanks and appreciation to: Mr. Ata Jaffar Additional Chief Secretary for Planning and Development. Mr. Naseeruddin Ahmed, Secretary Agriculture; Syed Saadat Hussain Naqvi, Deputy Secretary (proj) Agric.; Mr. Z. Ali Khan, the Director General Agriculture; Mr. Arif Ansari Deputy Director Planning and Mr. Mohammad Arshad, Deputy Director Project Preparation, Government of Baluchistan for their interest and support.

Special thanks to Dr. Amir Muhammad, Chairman of PARC; Mr. Manzur Ahmad, Consultant Coordination, PARC; Dr. Bill C. Wright COP, MART, Dr. Takumi Izuno, Provincial Research Operations and Support Advisor.; Mr. Frank Pavich RDD, USAID for their advice, guidance and help.

The excellent co-operation, active participation and support of Mr. Mohammad Ibrahim Azad Deputy Director of Agriculture Extension Makran Division and Dr. Ahmad Ali, Chief Agriculture Section PPMU, BALAD are highly appreciated.

Thanks are also due to Mr. Marjan Khan, Commissioner of Makran Division; Mr. James Schoof, COP, BALAD, Mr. Mirza Masood, Deputy Director PPMU, BALAD; Mr. Yahya Khan Senior Irrigation engineer, BALAD, Mr. Mohammad Elyas, EIE; Mr. Abdul Rashid, Sociologist, BALAD; Mr. Abdul Rashid, Agriculture Officer; Mr. Mohammad Amin, EADA, OFWMP; Mr. Bashir Ahmad EADA; for their encouragement.

The valuable assistance of Mr. Qamar-ul-Huda in typing the report and Mr. Mohammad Fazal, Technical Photographer is appreciated.

...

APPENDIX 'C'

ITINERARY AND PERSONS VISITED

- March 5, 1989 Left Alexandria for Cairo
- March 6 Left Cairo for Karachi
- March 7 1989 Islamabad, Meeting with Dr. Bill C. Wright, COP Winrock (MART); Dr. Amir Muhammad Chairman, PARC; Mr. Manzur Ahmad Consultant (Coord.) PARC; Mr. Richard Goldman ARD, USAID; Dr. A. D. Gopang, Dy. Director Research, Crop Production, PARC; Dr Akhtar Beg, Director Research, Crop Production, PARC; and Dr. Daud Ahmad Consultant (Hort), PARC.
- March 8 Mr. Frank Pavich, USAID; Dr. Takumi Izuno, Winrock (MART), Dr. Mohammad Saeed USAID.
- March 9 Dr. Mohammad H. Qazi Member Crop Science, PARC; Mr. Umar Balouch, Director, Crop Protection, PARC; Dr. Azra Qureshi, NARC; Mr. Hamid, NARC; H.E. Mr. Ismail Makhoulouf, Ambassador of Egypt and H.E. M. El-Mahmodi Ambassador of U.A.E.
- March 10 Dr. Raymond E. Fort FAO Representative
- March 11 Left Karachi for Lahore, Meeting with Dr. Takumi Izuno at Lahore.
- March 12 Quetta, Mr. Naseer-ud-Din Ahmed Secretary of Agriculture, Mr. Mohammad Arshad, Deputy Director, Project Preparation, Dr. Bakht Roidar, Director AZRI.
- March 13 Dr. Bajoi Director of ARI, Sariab, Mr. Ikram-ul-Haq, Economic Botanist; Mr. Mohammad Sadiq, Potato Specialist; Mr. Arif Masood Ansari, Dy. Director Planning; Dr. Fazal Ahmed, L.O., USAID, Quetta; Mr. Sardar M. Yousuf, USAID, Quetta.
Left for Karachi at 17:00 h.
- March 14 Left Karachi for Turbat (duty station) meeting with Mr. Mirza Masood, Deputy Director, PPMU BALAD; Dr. Ahmad Ali, Chief Agriculture Section BALAD; Mr. Mohammad Ibrahim Azad, Dy. Director of Agriculture Extension; Mr. Bashir Ahmed, EADA; Mr. Abdullah, EADA; and Mr. Mohammad Amin, EADA.
- March 15 Meeting with Mr. Ned B. Herring, Senior Road Engineer, Acting COP BALAD Project. Field Trip to Zinki and Miri. Interview with Mr. Taj Sabzal (farmer), Mr. Mohammad Omar (farmer), Dr. Ahmad Ali, Chief Agriculture Section BALAD.

- Visit to karez, delay action dams, infiltration gallery, siphon and aqueduct.
- March 16 Discussion with Mr. Mohammad Ibrahim Azad, Dy Director; Mr. Abdullah, EADA; Mr. Bashir Ahmad, EADA; Mr. Mohammad Amin, EADA; and Dr. Ahmad Ali, Chief Agr. BALAD to arrange for demonstration at farmer's field.
- March 18 Visit to Mohammad Ali Farm, Turbat
- March 19 Visit to Naseerabad, village Haji Ghulam Habib farm and Miri village, Mr. Mohammad Rafiq Farm.
- March 20 Visit to Pidarak village, Mr. Mohammad Amin Farm.
- March 21 Visit to Dasht, Kuddan village interview with Mr. Qadir Bakhsh, and Mr. Kuda Bakhsh and visit to Bisholi Area.
- March 22 Learning by doing - Actual demonstration of land preparation for melons and okra attended by 27 persons at the date farm nursery.
Meeting with Mr. M. Yahya Khan and Zafar Masood Irrigation Department and Crop Protection (locust control).
- March 25 Training of field assistants on demonstrations, planting okra and cantaloupe at nursery of date farm.
- March 26 Visit to Mirian, Bal villages, interview with farmers and recording video-cassette.
- March 27 Visit Department of Irrigation Mr. Muhammad Ilyas Executive Irrigation Engineer.
- March 28 Ginnah: Bashir Ahmad Farm planting okra muskmelon - date farm training laborers on planting okra.
- March 29 Visit Pidarak: Mohammad Amin Farm planting okra
- March 30 Visits to village Naseerabad and Absar to plant watermelon and muskmelon
- March 31 Compiling data
- April 1, 1989 Visit to Ali Mohammad Absar vilalge to plant watermelon and muskmelon. Interview with Sardar Abdul Rehman and Mohammad Aslam Shah
- April 2 Preparation of land of Sardar Abdul Rehman
- April 3 Continue preparation of demonstration land Sardar Abdul Rehman.
- April 4-8 Quetta: Meet Mr. Ata Jaffar, Additional Chief Secretary; Mr. Naseeruddin Ahmed, Secretary Agriculture, Dr. Bajoi,

- Director Ag. Res.; Mr. Mumtaz Ali Khan, Principal, College of Agriculture; Mr. Sadat, Deputy Secretary Agriculture; Mr. M. Amin, Chief Irrigation Engineer and Mr. Mohammad Arshad Dy. Director Project Preparation.
- April 9 Meeting with Mr. Marjan Khan, Commissioner of Makran Division, Mr. Mirza Masood Director PPMU, BALAD; Mr. M. Ibrahim Azad, Deputy Director Agr. Extension Turbat, Mohammad Amin EADA, On-Farm Water Management.
- April 10 Training of field assistants - filling gaps - control grass hopper and red beetles - calculation of seed rate.
- April 11 Visit demonstration plots
- April 12 Visit demonstration plots
- April 13 Field Trips to several fields with Mr. Arif Ansari, Dy Director Planning; Mr. Abdul Hakeem, Entomologist; Mr. Nazir Ahmad, Plant Protection and Mr. M.I. Azad Dy. Director Agric. Ext. to inspect infestation with white fly.
- April 14 Compiling data for the report
- April 15 Visit demonstration plots
- April 16 Implementation of demonstrations at Miri village on farm of M. Rafiq, on sorghum and fertilizers were applied to okra
- April 17 Visit demonstration plots at Miri.
- April 18 Visit to Turbat market, interview Mr. Ejaz, wholesale agent.
- April 19 Training field assistants
- April 20 Visit to Taghranabad to see the new karez constructed by Nasratullah. Meeting with Mr. James Schoof the new COP, BALAD.
- April 21 Projecting 2 hours video cassette for Mr. James Schoof to brief him about status of agriculture in Makran. Compiling data.
- April 22 Meeting with Mr. James Schoof, COP, BALAD to introduce him to Dy. Director of Agric. Extension, Mr. Ibrahim Azad; OFWM, Mr. M. Amin; Dr. Ahmad Ali, Chief Agric. BALAD to arrange for future cooperation.
- April 23 Follow-up demonstration plots
- April 24 Visit to Pidarak and Ginnah to follow-up demonstration plots.
- April 25 Meeting with Mr. Qayyum, Deputy Commissioner of Turbat District to brief him about mission. Visit to Ginnah, Pidarak and Absar to followup demonstration plots.

- April 26 Follow-up demonstration plots.
- April 27 Follow-up demonstration plots.
- April 28 Left for Quetta.
- April 29 Meeting with Mr. Arif Ansari, Deputy Director Planning, Mr. Mohammad Arshad Deputy Director, Project Preparation, to brief them about the status of agriculture in Makran.
- Presented a lecture on date palm cultivation to students and staff of Baluchistan Agricultural College.
- April 30 Left for Islamabad.
- May 1-7 Meeting with Dr. Bill C. Wright COP MART, Mr. Richard Goldman ARD, Mr. Frank Pavich RDD, Dr. Curtis Nissly, P.O. MART, USAID, to brief them about the status of agriculture in Makran.
- Meeting with Dr. Muhammed Hanif Qazi Member Crop Sciences, PARC; Dr. Akhtar Beg, Director Research Crop Production, PARC; Dr. A.D. Gopang, Dy. Director Research Crop Production; Dr. Takumi Izuno and Dr. Bill C. Wright to arrange for workshop on date palm to be held in Sukkur (Sind) on June 5, 1989.
- Meeting with Mr. George Metcalfe, Mr. Ahsan Tayyab, Mr. Asad Khan at RONCO Consulting Corporation to brief them about the situation of date palm in Pakistan.
- Arrangement for typing the report, slides, prints and editing video-cassettes.
- Meeting with Dr. M. Yousuf Chaudhri, Director General, NARC.
- May 8 Left For Karachi
- May 9 Meeting with Mr. Ikramullah Director Agriculture, Lever Brothers to discuss the possibility of using tissue culture to propagate rain resistant date palm germplasm.
- May 10 Meeting with Dr. M. Ishaq Mirza Director (SPARCEN), Mr. Zafar M. Khan Deputy Director SUPARCO, Mr. M. Zafrul Hassan, Head RSA-1 and Mr. Saiful Haq Deputy Head RSA-1 and Dr. M.A. Sanjra Head RSA-11 and Agricultural studies to discuss the possibility of utilizing remote sensing to obtain accurate statistics about date palm.
- May 11 Left for Turbat.
- May 12 Visit Mirani, Khudai and Dasht area with Mr. James Schoof, COP, BALAD and Mr. Abdul Rashid, Sociologist, and Dr.

- Ahmad Ali, Chief Agriculture Section, BALAD to determine agricultural potential of Dasht.
- Meeting with Mr. Anwar Shah, Chief Khudar Mr. Mohammad Akram, Speaker Baluchistan Assembly and Mr. Mohammad Iqbal to discuss future development.
- May 13 Meeting with Deputy Director of Agric. Extension.
- May 14 Visit Miri-Absar and Date Farm
- May 15 Visit Absar and Date Farm
- May 16 Meeting with Dr. H. Patrick Peterson, Chief O/ARD, USAID and Mr. Frank Pavich, RDD, USAID - visit date factory
- May 17 Left for Panjgur
- May 18 meeting with Mr. Fazal Karim EADA Panjgur - visit several farms
- May 19 Left for Turbat
- May 20 Training of Field assistants
- May 21 Training of Field assistants
- May 22 Field day
- May 23 Left for Karachi
- May 24 Left for Islamabad
- May 25 Left for Peshawar to visit North West Frontier Area Development Project.
- May 26 Left for D.I. Khan with Dr. Mohammad Hanif Qazi, Member Crop Sciences, PARC to advise on date palm research program of Gomal University.
- May 27 Left for Islamabad
- May 28-June 5 Islamabad - To arrange for workshop on date palm - Preparation of draft report.
- June 6 Left for Karachi
- June 9 Left for Cairo Egypt
- June 10 Arrival Alexandria Egypt.

...

GLOSSARY

PARC	Pakistan Agricultural Research Council
NARC	National Agricultural Research Centre
AZRI	Arid Zone Research Institute
ARI	Agricultural Research Institute
MART	Management Agricultural Research and Technology
ICARDA	International Center for Agricultural Research
WAPDA	Water and Power Development Authority
BALAD	Baluchistan Area Development Project
PPMU	Project Planning Management Unit
DAP	Di-Ammonium Phosphate
E.E.C.	European Economic Community
N.D.F.C.	National Development Finance Corporation
E.A.D.A.	Extra Assistant Director of Agriculture
SUPARCO	Space and Upper Atmospheric Research Commission
N.W.F.P.	North West Frontier Province
OFWMP	On-Farm Water Management Project.
GOB	Government of Baluchistan.
CUSEC(CFS)	Cubic feet per second.

...

BIOGRAPHICAL INFORMATION

ZIDAN E. ABDEL-AL

- Ph.D. Cornell University Ithaca N.Y. U.S.A. 1962.
- Former Professor of Horticulture, University of Alexandria
- Awarded the National Award of the Egyptian Academy of Scientific Research and Technology in 1977.
- Awarded the First Class Medal of Science and Technology by the President of Egypt for the remarkable achievements in agricultural science.
- Planned and presented 30 television programs on agricultural extension.
- Author of 7 textbooks on horticulture, 12 extension leaflets and 50 research papers on horticulture.
- Accumulated field experience of 25 years in planning, organizing, implementing, coordinating and managing institutional services, out of which 16 years of agriculture research, extension and training were spent on the international level with Food and Agriculture Organization of the United Nations in the arid zones of the world

...

REFERENCES

1. Project Paper July 1984 Pakistan Area Development BALAD 391-0479 Department of State, Agency for International Development Washington D.C. 20523.
2. Baluchistan Area Development Project BALAD GOB/USAID February 1989 Water Sector. Third Interim Report Louis Berger International Incorporated.
3. Ground Water of Rakhshan River Basin Baluchistan April 1983 Water and Power Development Authority, Pakistan
4. Ground Water of "Dasht River Basin" Baluchistan June 1985 Water and Power Development Authority, Pakistan.
Report on the Hydrometeorology of Baluchistan July 1980 UNDP-PAK/73/032.
5. Agricultural Statistics of Baluchistan 1987-1988.
6. Annual Progress Report of Economic Botany ARI, SARIAB - Quetta, 1987-1988.
7. M. Yahya Khan, Senior Irrigation Engineer BALAD Project, Personal Contacts.
8. High-Elevation Research in Pakistan the MART/AZR Project Annual Report 1987.
9. Re-activation of Date Factory at Turbat M. Ibrahim Azad, 1989.
10. Mirani Dam Project. Feasibility Report 1989. Water and Power Development Authority.
11. Muhammad Ilyas Irrigation Department of Makran Division personal Contact.
12. Takeshi Matsui 1987 Agricultural Makran Kyoto University, Japan Bulletin 89-103.
13. Abdel-Al, Zidan 1988 progress reports first and seconds, FAO, United Nations 1988 PARC, Pakistan.
14. Abdel-Al Zidan 1988 Date palm germplasm in Pakistan FAO, United Nations, PARC, Pakistan.

(ACTION TAKEN)

MOST IMMEDIATE

NO.SOA(V)17-24-85/3420-23
GOVERNMENT OF BALUCHISTAN
AGRICULTURE & COOPERATIVE
DEPARTMENT.

To,

1. The Director General,
Agriculture, Baluchistan,
Quetta.
2. The Director Agriculture,
Research, Baluchistan,
Quetta.
3. The Director Agriculture,
Extension, Baluchistan,
Quetta.
4. The Plant Protection Officer,
Agriculture, Extension,
Quetta.

SUBJECT : INFESTATION BY WHITE FLY IN TURBAT AREA.

Dr. Zaidan USAID Expert visit Turbat and pointed out that there is a serious infestation of white fly in Turbat area which is effecting nearly all the crops.

You are requested to take immediate action to overcome the problems.

(SYED SAADAT HUSSAIN NAQVI)
DEPUTY SECRETARY(PROJ.)
AGRIC.

...

(ACTION TAKEN)

April 10, 1989.

Mr. Mumtaz Ali Khan
Principal,
Baluchistan Agricultural College,
Quetta.

Dear Mr. Mumtaz,

Thank you very much for your hospitality and co-operation during my visit to Baluchistan Agricultural College in Quetta. I hope that the opportunity given to me to lecture the students and your interest to copy the video cassette regarding the existing cultural practices and demonstration at Farmer's field in Makran division will generate interest among all participants for future development of the area.

As agreed, I am enclosing outlines of two courses on dates for inclusion in the syllabus of Baluchistan Agricultural College.

I would like to take this opportunity to inform you that I will be available on 29th April to continue Lecturing to the students and discuss other matters as well.

Best personal regards

Sincerely yours,

(ZIDAN ABDEL-AL)
Consultant
Winrock International Institute for
Agricultural Development
USAID, MART, PARC

c.c. : Dr. Bill C. Wright,
COP, MART
PARC, P.O. BOX - 1031,
Islamabad.

(ACTION TAKEN)
PROPOSED COURSES FOR BALUCHISTAN
AGRICULTURAL COLLEGE QUETTA

1. CULTIVATION OF DATES

Origin and distribution - Climatic factors - Economic importance of date production - Description of the date palm - Pollination - Pollinators - Propagation - Tissue culture - Genetics - soil requirements - irrigation - Draining - Salinity - Cultural practice - Harvesting - reaching, detaching, lowering and collecting dates. Field ripening and curing, Field fumigation, Field packing Field storage - Field transport- Diseases and insects.

References:

1. Dowson, v.h.w. 1982 Date Production and Protection. Food and Agriculture Organization of the United Nations No. 35
2. Dowson, v.h.w. and A.ATCEN 1962: Dates Handling, Processing and Packig, Food and Agriculture Organization of the United Nations.

...

(ACTION TAKEN)
2. HANDLING AND PROCESSING OF DATES

Composition and ripening of dates:

Stages in ripening - sugars in dates - constituents - osmotic pressure - methods of analysis.

Preprocessing:

Preliminary packing - house operation - receipt of dates - washing and repair of lug boxes - stripping bunches - storage fumigation - fumigants - chambers - method - grading - standards - cleaning - pitting.

Processing:

Heat - dehydration - freezing - hydration - glazing - ripening agents - preservatives

Packing:

The packing house - site design - units - windows - electricity - floor - walls - air - water - fire costs

References:

Dowson, V.H.W. and A.ATEN 1962. Dates Handling, Processing and Packing, Food and Agriculture Organization of the United Nations.

...

APPENDIX 'G'

(ACTION TAKEN)
SUMMARY OF A PROPOSAL ON TRAINING

OBJECTIVES:

To train field assistants and farmers on technical know-how of cultivating and handling their crops to improve their income and strengthen the economy of Makran

1. Outside Training:

Ten trainees are proposed for training on date palm cultivation and processing for a period of 15 days

Costs

a.	Tickets	Rs. 160,000
b.	Daily allowance	Rs. 150,000
c.	Training	Rs. 60,000

		Rs. 370,000

2. In-Country Training:

Several scientists on different subjects will be requested to stay in Turbat for a period of one week during kharif and rabi seasons to train all field assistants on different aspects of crops.

Costs

Cost of lectures	Rs. 42,000
Allowances	Rs. 14,000
Trainees	Rs. 28,000
Materials for training	Rs. 20,000
Visual aids	Rs. 20,000
Refreshments	Rs. 3,000
Grand Total	----- Rs. 127,000

Details will be submitted at a later stage.

...

**(ACTION TAKEN)
SUMMARY OF A PROPOSAL**

**DEMONSTRATION OF MODERN
IRRIGATION SYSTEMS AT FARMER'S FIELD**

OBJECTIVES:

1. To demonstrate to farmers the importance of water conservation and efficient utilization to increase both yield and quality of the crops.
2. To allow for future expansion of cultivable land.

NUMBER OF DEMONSTRATIONS:

Twelve demonstrations are proposed at farmers field in different location of Makran Division.

SIZE OF DEMONSTRATION:

One acre for each demonstration.

COST OF MODERN IRRIGATION SYSTEMS:

Total cost for 12 acres about Rs.1,200,000/-

OPERATIONAL COST:

Seeds, fertilizers, pesticides, equipment
fuel, labor etc. Rs. 60,000/-

Contingency 10% Rs. 126,000/-

Grand Total **(Rs.1,386,000/-)**

Details of the proposal will be submitted at a later stage.

...

(ACTION TAKEN)
BALUCHISTAN AREA DEVELOPMENT PROJECT

GOB and USAID

OUTLINE OF TRAINING

PROGRAM ON DEMONSTRATION AT FARMER'S FIELD

Demonstrations are effective and practical way of showing and convincing farmer to adopt new technique to increase yield and quality of the crops.

1. Why demonstrations are effective?

- a. Seeing is believing
- b. Monkey sees monkey does

2. How to select Farmer for demonstration?

- a. Leader
- b. Trusted
- c. Willing to co-operate
- d. Willing to disseminate the new technique
- e. Easy access to his farm
- f. Close to other farmers and near road
- g. Willing to use his tools, equipment, land, water and farm machinery

3. What are the subject of Demonstrations:

New technique should be demonstrated side by side with old method. New techniques may be:

- a. Variety
- b. Proper plant population per unit area
- c. Application of fertilizer
- d. Control of weeds
- e. Control of insects and diseases
- f. Watering - improved method of irrigation.
- g. Cultivation
- h. Harvesting
- i. Handling.

4. What are the guarantees of success?

- a. Identification of actual problem for demonstration
- b. Accurate Implementation
- c. Accurate records of all operations
- d. Follow-up
- e. Field day
- f. Never Force farmer to adopt new technique but let him decide and choose by himself

5. Identified problems for demonstrations:

1. Control of lesser date moth on date palm
2. Control of white fly, the main vector of several virus diseases infecting:
Tomato, water melon, muskmelon, okra, eggplant and chillies.
3. Technical know-how of growing:
 - a. Okra
 - b. Muskmelon
 - c. Watermelon
 - d. Sorghum-Sudangrass Hybrid

6. Locations of Demonstration Plots:

- Turbat (Ali Mohammad)
- Turbat Date Farm
- Absar (Sar Abdul Rehman)
- Miri (Mohammad Rafiq)
- Pedark (Mohammad Amin)
- Ginnah (Bashir Ahmed)

7. Duration:

One day per week during March April and May.

8. Effective date:

March 22, 1989.

9. Participants:

- a. Field assistants (23) of Turbat District
- b. Each (FA) will contact 5-8 Farmers (CF).

10. Officers in Charge:

a. From Agriculture Department

Mr. Mohammad Ibrahim Azad, Deputy Director of Agriculture Extension; Mr. Abdullah EADA, Mr. Bashir Ahmed, EADA; and Mr. Mohammad Amin EADA.

b. From BALAD - PARC/MART/USAID

Dr. Ahmad Ali Chief Agronomy Section BALAD,
Prof. Dr. Zidan Abdel-Al, Consultant, PARC/MART/USAID.

...