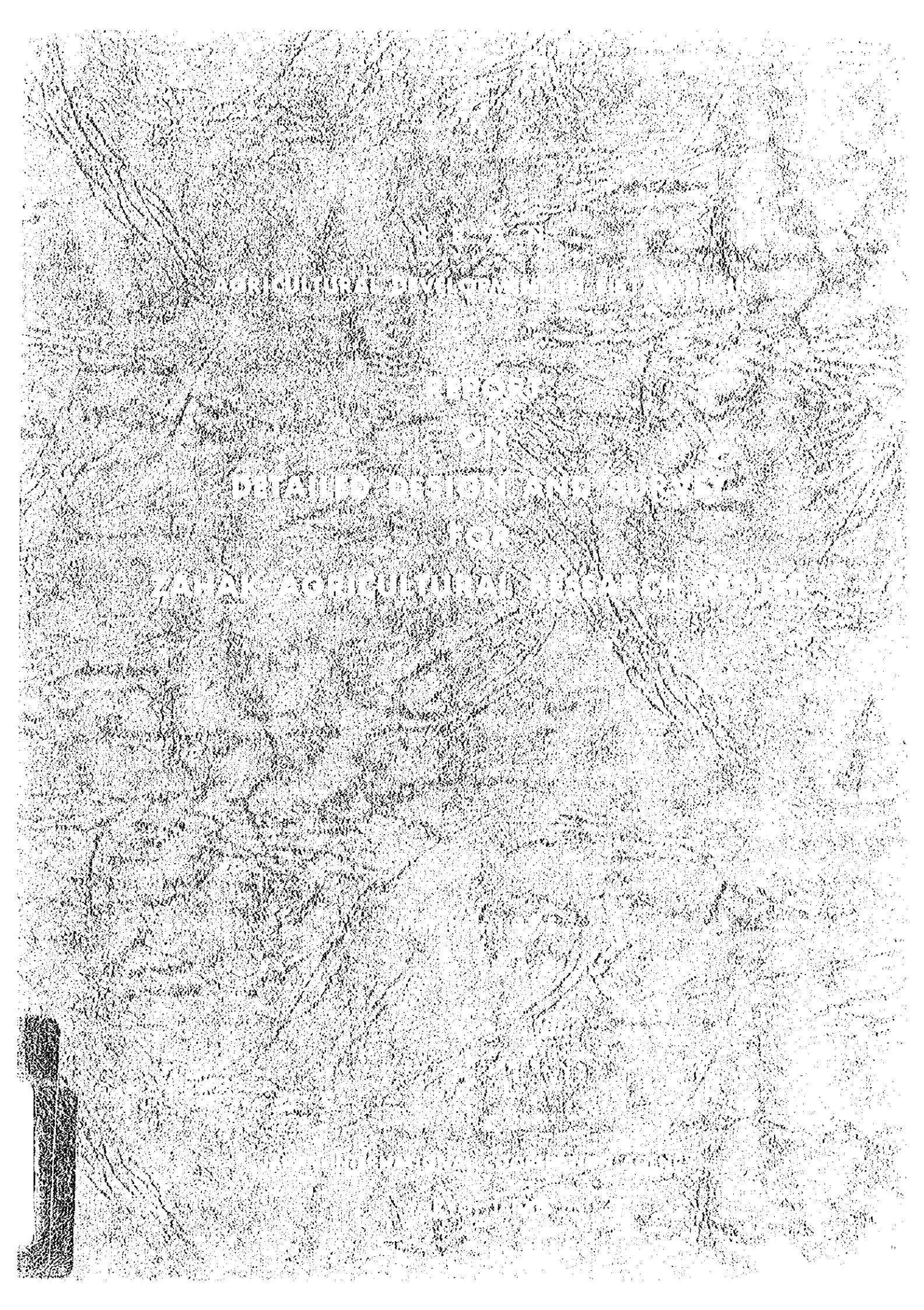


I R A N

AGRICULTURAL DEVELOPMENT IN SISTAN PLAIN

REPORT
ON
DETAILED DESIGN AND SURVEY
FOR
ZAHAK AGRICULTURAL RESEARCH CENTER

March, 1975

JAPAN INTERNATIONAL COOPERATION AGENCY

TOKYO, JAPAN

ACKNOWLEDGEMENT

The Imperial Government of Iran requested Japan, in 1972, for a technical assistance on the pilot farm project intended as a part of the agricultural development program of Sistan plain. In compliance with the request, Overseas Technical Cooperation Agency conducted the first preliminary survey in December, 1972, the second in August, 1973, and sent three experts in March, 1974, who made necessary invesigations for the establishment of a pilot farm. Based on the findings of these surveys the parties concerned of both countries came to a common opinion that in order to encourage the agricultural development of Sistan plain it is necessary to establish an Agricultural Research Center which aims at the improvement of agricultural productivity.

In line with the above, the Imperial Government of Iran selected several locations as proposed sites of the agricultural research center. After having surveyed them, a site in the suburbs of Zahak village which the Japanese Survey Team recommended as a suitable one was accepted finally, and the necessary land was expropriated.

The present Survey Team was sent to prepare the detailed design of the agricultural Research Center which should be regarded as a key to the agricultural development program of Sistan plain, and the Survey Team intended that it is fundamental policy to conduct the preparation of the detailed design by mutual agreement reached by thorough consultation in advance with the Imperial Government of Iran. Thus, the results of the past two preliminary surveys and the report of experts presented in 1974 was examined in detail, and the subjects of research, organization, facilities planning and machinery and equipment planning as well as rough designs of buildings (such as office, experiment and research house and guest house) for the Research Center were discussed by the whole members of the Survey Team to prepare original plans before their departure from Japan. The original plans, after having been presented to the Government

of Iran, were discussed and examined further by the engineers concerned of both countries. As regards organization, in particular, the change of name, establishment of new departments and other modifications of original plans were made in order to coordinate with the existing research institutions of the Imperial Government of Iran and the results of which are contained in the report presented here.

The report is composed of six chapters and appendix: (1) Background information, (2) Agricultural Research Center Project, (3) Functions of Research Center, (4) Plans of Facilities, (5) Project cost, (6) Construction Schedule, and Appendix. The Government of Iran has desired to start the construction works immediately in accordance with the report; however, the report is to be considered as a master plan rather than a final design and can not be utilized straightway as a construction of the works. Nevertheless, the plans of facilities are prepared considerably in detail and as it is believed not to be very difficult to prepare a construction design based on these plans we sincerely hope to draw up such design promptly so that the works can be started.

As clarified by the past investigations, the agriculture in Sistan plain at present is placed under very adverse conditions including severe weather, soil of low productivity, shortage of irrigation water. The role of the Research Center burdened with the duties to improve the agricultural productivity and switch over to modern agriculture is very important. In this are involved many important matters such as experiments and researches extending over fairly long period, efforts to guide the propagation of those results, investment in terminal land preparation and reorganization of land use. The solutions of these matters are not easy, and, nevertheless, we heartily hope the Government of Iran to seek a comprehensive and positive operation of the Research Center based on this report and to exert its utmost effort for the development of Sistan agriculture.

In conclusion, I express my profound gratitude, for the members of the Survey Team, to the officials in charge of Japanese Ministries of

Foreign Affairs and of Agriculture and Forestry and those of Japan International Cooperation Agency for their prudent consideration and, in the field, to the Japanese Embassy who cooperated with us in many ways, to Kage-Sanyu Group of Consulting Engineers who provided the engineer for the field works, and to the persons concerned of the Imperial Government of Iran.

March, 1975

Tamotsu Seino

Dr. Tamotsu Seino
Team Leader

Detailed Design and Survey
for
Zahak Agricultural Research Center
Agricultural Development in Sistan Plain
Japan International Cooperation Agency

Note:-

(1) The Pilot Farm was redesignated as the Agricultural Research Center at the wish of the Imperial Government of Iran and the Survey Team judged this name to be suitable for an organization which undertakes experiments and researches as its present objects.

(2) The Overseas Technical Cooperation Agency was reorganized into Japan International Cooperation Agency on Aug. 1, 1974, as a part of the reform of administrative structure effected by the Japanese Government.

LIST OF MISSION MEMBERS AND SURVEY SCHEDULE

(1) List of Mission Members

Name		
Tamotsu Seino	Team Leader	Dr. Agr., Pre-Vice Director General Aichi Irrigation Public Corporation
Sadamitsu Ichinohe	Upland crops	Dr. Agr., Chief of Farm Mechanization Division, Northeast Regional Agricultural Experiment Station, Ministry of Agriculture and Forestry
Tadakatsu Okubo	Forage crops	Head of Ecological System Laboratory, Ecology Division, National Grassland Research Institute, Ministry of Agriculture and Forestry
Shozo Onishi	Designing of facilities	1st class Registered Architect, Facilities Planning Room, Secretariat of Agriculture, Forestry and Fisheries Research Council, Ministry of Agriculture and Forestry
Chikaichi Takahashi	Designing of facilities	Sanyu Consultants Inc. (Joined to the Team on the site)
Fujio Matsumoto	Designing of Canal	Engineer Registered, Sanyu Consultants Inc. (Joined to the Team on the site)
Takashi Kakizaki	Agricultural economics	Sanyu Consultants Inc. (Joined to the Team on the site)
Kosaku Chichibu	Land Preparation	Sanyu Consultants Inc. (joined to the Team on the site)
Masahiro Isomura	Designing of farm road	Sanyu Consultants Inc.
Jiro Nakajima	Planning and coordination	Agricultural Technical Cooperation Section, Agricultural Development Cooperation Division, Japan International Cooperation Agency

(2) Survey Schedule

Jan. Six members, Okubo, Onishi, Matsumoto, Isomura and Nakajima, departed from Tokyo on IR801 flight.

16 Early in the morning, arrived in Teheran.
P.M. Made a visit of courtesy to the Japanese Embassy. Explained the contents of survey to Ambassador Ikawa, Counselor Omura and Mr. Nagasawa, Head of JICA Office; prearranged the schedule with them.

17 (Holiday) P.M. Prearranged the works; in the evening, explained the schedule to Dr. Karbasi, the counterpart.

18 A.M. Made a visit of courtesy to Mr. Mirheydar, Vice-Minister of Agriculture; Mr. Rezania, Director of Research and Coordination Bureau, Mr. Sheybani, Director of Seed and Plant Improvement Institute, and Mr. Nagasawa, Head of JICA Office, sitted with us.

P.M. Exchanged opinions with Mr. Madavi, Chief of Soil Institute, and Mr. Pazilia, the counterpart.

19 A.M. Visited Karaji center of Seed and Plant Improvement Institute, and exchanged opinions with Dr. Kaveh and Dr. Rezvani.

P.M. Exchanged opinions with Director Rezania and the Advisors attached to Research and Coordination Bureau.

20 A.M. Left Teheran and arrived in Zabol in the evening; member Kakizaki remained in Teheran to collect data.

21 Inspected the proposed site of Zahak Agricultural Research Center, Zahak barrage, the camp site of Sistan Project under the construction of Ministry of Water and Power, Miankangi Project and Ademi Farms.

Jan. 22 A.M. Inspected again the proposed site of Zahak Agricultural Research Center; Dr. Karbasi and Mr. Pazila accompanied us to explain on the site.

P.M. Consulted with both counterparts about setting a guesthouse and engineer's houses in the premise of Zabol Agricultural office.

23 A.M. Engaged in designing works.

P.M. Member Okubo and Dr. Karbasi inspected Windbreak and Sand Shelter Plants Experiment Station.

24 (Holiday) A.M. Inspected Sistan barrage and Chahnime dam and intake, heard from Mr. Pazila about the investigation data of land classification for the proposed site of Zahak Agricultural Research Center, held a lunche on party under the auspices of Survey Team at the guesthouse of the Ministry of Water and Power and invited about thirty guests including Chief of Zabol Agricultural Office and chief of Zabol Office of Ministry of Water and Power.

P.M. Left Zabol and arrived at Zahedan in the evening, except member Chichibu who stayed at Zabol for surveying works.

25 A.M. Left Zahedan and arrived in Teheran at noon.

26 A.M. Dr. Hamidi, chief of Research Room, Department of Animal Husbandry, and member Okubo exchanged their views at the Ministry of Agriculture, after which visited Karaji Center of Soil Institute.

P.M. Engaged in designing works.

27 A.M. Members Ichinohe, Okubo, Kakizaki and Nakajima exchanged opinions with Dr. Mehdizadeh of Forest and

Grassland Institute and Dr. Shaidaee of Forest Department, other members engaged in designing works.

P.M. Members Okubo and Kakizaki exchanged opinions with the officer in charge of cattle and sheep of Department of Animal Husbandry, other members engaged in designing works.

28. A.M. Members Ichinohe and Nakajima made an interim report to Ambassador Ikawa, Counselor Omura and Head Nagasawa sitted with them. Other members engaged in designing works.

29. A.M. Made an interim report of designing works to Mr. Mirheydar, Vice-Minister of Agriculture, and members Ichinohe, Okubo and Onishi said good-bye to him for their returning to Japan.

P.M. Members Ichinohe, Okubo, Onishi and Nakajima made an interim report to Ambassador Ikawa and Counselor Omura and said good-bye for their returning to Japan; Head Nagasawa sitted with them.
In the evening, made previous arrangements of works.

30. Early in the morning, left Teheran for Shiraz
A.M. Visited Zalgon Agricultural Experiment Station; exchanged opinions with Dr. Yused, Chief of the Station.

31. P.M. Arrived in Teheran.
(Holiday)

Feb. 1. Members Ichinohe, Okubo and Onishi prepared for returning home.

2. Early in the morning, members Ichinohe, Okubo and Onishi left Teheran on PA002 flight for Japan.

3. Engaged in designing works; after which made previous arrangements for about a half day.

4. Early in the morning, members Matsumoto, Isomura and Nakajima left Teheran for Zabol, where they arrived in the evening due to extremely bad conditions of the road between Zahedan and Zabol caused by the heaviest rain in tens of years.
Member Kakizaki stayed at Teheran for the adjustment of data, member Takahashi Joined to the Survey Team.

5. Engaged in designing works.

6. Engaged in designing works.

7. Engaged in designing works.

8. Engaged in designing works.
(Holiday)

9. Engaged in designing works.

10. Members Takahashi and Chichibu engaged in drawing the plans.

P.M. Members Matsumoto, Isomura and Nakajima left Zabol and passed the night at Zahedan.

11. Flight service between Zahedan and Teheran was suspended due to sandstorm; stayed at Zahedan.

12. A.M. Left Zahedan and arrived in Teheran around noon.

13. Team leader Seino arrived in Teheran early in the morning, members Takahashi and Chichibu arrived in Teheran around noon.

P.M. The progress of works was reported to Team leader Seino.

Feb. 14. The progress report to Team leader was continued and previous arrangements were made.

15. A.M. Team leader Seino and member Nakajima made a courtesy visit to Ambassador Ikawa and counselor Omura, Head Nagasawa sitted with them. After which, they made a visit of courtesy to Mr. Mirheydar, Vice-Minister of Agriculture, who told Team leader Seino that, due to the official tour abroad, he could not be present at the explanation meeting of a draft report which will be presented later by the Survey Team before their returning to Japan. He said that Director Rezania would be present at that meeting on behalf of him. Other members engaged in designing works.

16. Engaged in designing works.

17. Engaged in designing works.

18. Engaged in designing works.

P.M. Team leader Seino consulted with Mr. Sheybani, Chief of Seed and Plant Improvement Institute, on the draft report.

19. A.M. The members made arrangements on the draft report.
P.M. Presented the draft report and explained it to Mr. Sheybani, Chief of Seed and Plant Improvement Institute.

20. A.M. Presented the draft report to Mr. Mirheydar representing Ministry of Agriculture and Director Rezania, Team leader Seino and member Matsumoto explained it. On that occasion, the Director wished to present, at an earliest moment, the plan for sending the experts as an implementation of the cooperation policy on the part of the Japanese Government and required to present the report on datailed design hastily.

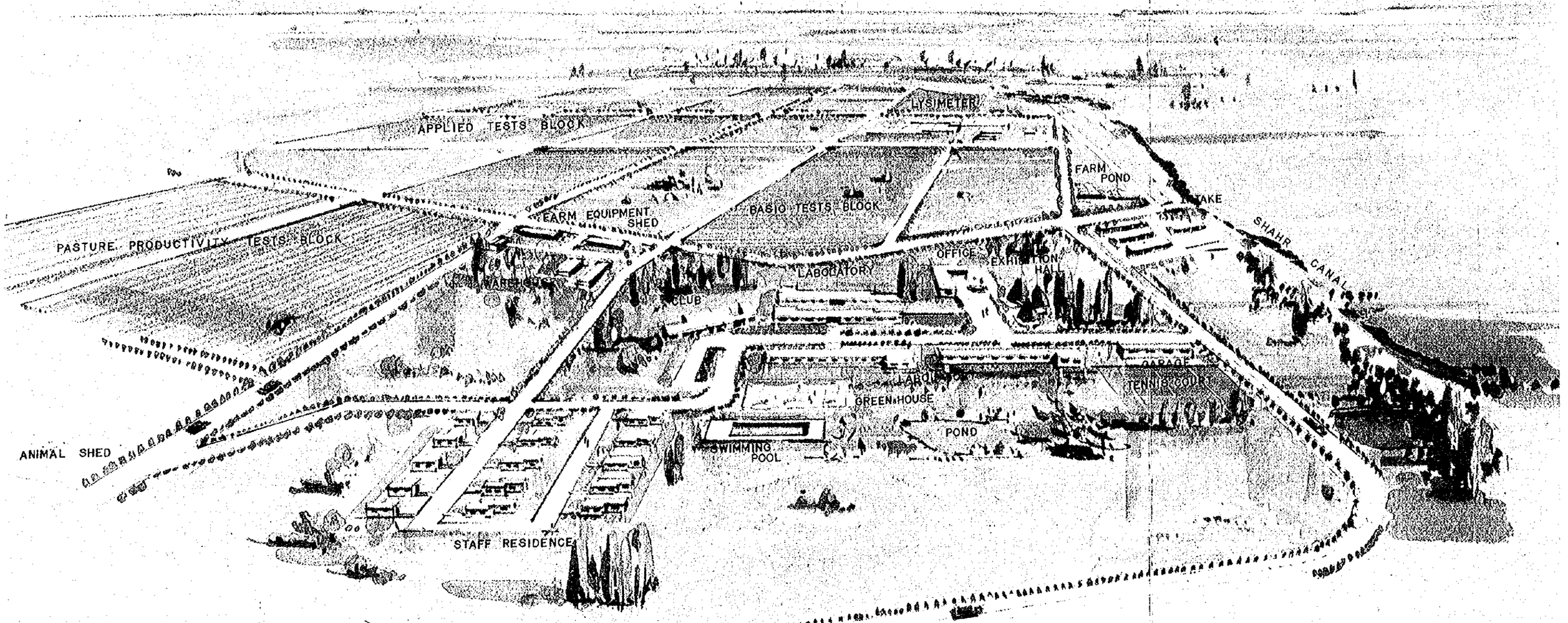
P.M. Visited the Embassy to say good-bye for returning to Japan.

21. (Holiday) Prepared for returning home.

22. A.M. Members Seino, Matsumoto, Isomura and Nakajima left Teheran on AF186 flight. Members Kakizaki, Takahashi and Chichibu returned to their regular posts.

23. Arrived in Japan in night.

ZAHAK AGRICULTURAL RESEARCH CENTER



CONTENTS

1. BACK GROUND INFORMATION

1-1. SISTAN PLAIN

Sistan Plain is situated in the South - Eastern area of Iran and lies between lat. 30°31' - 31°31' N and between long. 61°30'and 62°E with an acreage of about 250,000 ha. The northern and eastern ends of this plain adjoin Afghanistan and the western part is surrounded by Hamun-e-Hirmand Swampy area. This plain is a deltaic area formed by the Hilmand River which has its origin at the Hindu Kush mountains of Afghanistan. Its altitude is 400 - 500 m above the sea level with a moderate gradient of 1/4,000 - 1/5,000 from east to west. In the central area of the Plain, the Sistan River, a tributary of the Hilmand River, flows north-east into the Hamun-e-Hirmand.

This Plain has the continental dry climate which is characteristic in the Near East, with high temparature (35° - 40°C) in summer and com paratively low temperature (0° - 10°C) in winter. Scarce rainfalls concent-trating in the winter season average only 45 mm per year. On the other hand, the amount of evaporation reaches about 5,000 mm per year. Furthermore, severe wind which is also characteristic in this Plain (velocity; 10 - 20 m/sec.) blows in the northern or the north-eastern direc-tion for about 120 days in summer and causes wind erosion and sand dune formation as well as considerable increase of evaporation in summer.

Total population in the Sistan Plain is about 150,000 of which 20.000 people live in the city of Zabol, administrative and economic center of the Plain, and the remaining 130,000 people are farmers living in local villages. These farmers utilize water from the Sistan River for irrigation of wheat and barely cultivation in winter season. However, the River of irrigation water is used for cultivation of pulse, alfalfa, fruits trees and vegetables. The farm land area of the Plain consists of 3 blocks as follows:

Sistan River system: Posht-Ab (84,000 ha), Shib-Ab (86,000 ha)

Paran River system: Miankangi (80,000 ha)

The above in a general description of the present agricultural status of Sistan Plain. Owing to the unfavourable climatic condition and poor irrigation facilities, salt accumulation of soil increases with resultant hindrance to the crop growing. Generally speaking, agriculture of this Plain is low in productivity and consists of petty farmers with an average operational holding of only 2 - 6 ha.

1-2. IRRIGATION AND DRAINAGE PLAN

Both Sistan River and Parian River, which divert from the Hirmand River in Afghanistan, have contributed to the irrigation of Sistan Plain as its important water resources. The Imperial Government of Iran constructed Kohak and Zahak barrages on the Sistan River as the counter-measure to the dam construction undertaken in 1953 by Afghanistan on an up-stram site of the Hirmand River. However, construction of Kohak barrage reduced the water quantity diverted from Hirmand River to the Sistan River with resultant instability of water supply.

The Government of Iran, with the intention of not only solving this problem but also promoting more effective water utilization of the Sistan River, established the development Project of the Sistan Plain. The irrigation plan envisaged by the project is as briefed below. For Miankangi area in the northern part of the plain, it is planned that water will be drawn from the Parian River and partly by pumps. For Sistan Plain, partial improvement of the existing Zahak barrage is planned to make use of the flow of the Sistan for irrigation of upstream Posht-Ab and Shibt-Ab. Water supply to downstream Posht-Ab and Shib-Ab is planned to resort to Sistan barrage which will be newly constructed to draw residual water from the Kahak barrage as well as to Chahnime resevoir which will also be newly created in the depression on the left bank side of the Sistan River to make up for the shortage irrigation water. Flood water of the Hirmand River stored in Chahnime reservoir in spring is planned to be discharged to the Sistan River upstream of Sistan barrage to cover the water shortage in the dry summer season.

Outline of major construction work to be executed under the project is shown as Table - 1.

Table-1: Outline of the major Construction Works

Description	Scale
A. Sistan River System	
(1) Chahnime Reservoir	Dam Type: Uniform type earth Fill Dam
(a) Chahnime Dam	Dam length: 168.5 m Dam height: 16.0 m Available water: 340 MCM Full water area: 47 km^2
(b) Chahnime Feeder Canal	Extension: 4.3 km Maximum discharge: 160.0 m^3/s
(c) Chahnime Diversion Canal	Extension: 3.5 km Maximum discharge: 50.0 m^3/s
(2) Sistan Barrage	Type: Floating Type Crest length: 154.0 m Crest height: 3.2 m Number of gate: 6 sets Maximum flood discharge: 1,600 m^3/s Maximum intake: 30 m^3/s on both banks
(3) Sistan Irrigation & Drainage Canals	
(a) Irrigation Canal	Extension: 1,800 km
(b) Drainage Canal	Extension: 2,000 km
B. Parian River System	
Miankangi Irrigation & Drainage Canals	
(a) Irrigation Canal	Extension: 630 km
(b) Drainage Canal	Extension: 840 km

1-3. AGRICULTURAL DEVELOPMENT PLAN

On account of the increases of population and food consumption per capita in Iran, the government has imported a large amount of vegetable oil, cereals, tea, dairy products and livestock products, then its amount had reached about 10% of the annual total import amount. Therefore, accroding to the Fifth Five-Year Plan an annual growth rate of agricultural production has been made a plan to raise to the extent of 5.8%, and it is especially expected that the greater part of the needs of Iranian nation's protein intake will be met by the domestic production. On the other hand, recently, farm lands in the farm village near cities and towns have been converted into residential districts and factory areas, owing to the industrilization and the increase of population into cities and towns, thus the shortage of food production in Iran has extended more and more.

Sistan plain will play an important role in the sector of agricultural production of the Iranian Five-Year Plan with the advance of water resourses development, because this plain is vast and is blessed with abundant sunshine. Its final targets of the development are shown in Table - 2.

Table-2. River systems and Development areas proposed

River	Developing Site	Regional area (ha)	Irrigable area (ha)
Sistan	Posht-Ab°	84,000	50,000
	Shib-Ab	86,000	30,000
Parian	Miankangi	80,000	40,000
Total		250,000	120,000

According to the above-mentioned development plan, wheat, barley and Cumin will be cultivated in winter, and pulses, melons, sugar-beet, oil crops and forage crops such as Alfalfa, Perusian clover and Sudan grass in summer also. The amount of gross agricultural production in the plan is estimated to come up to 2,500,000,000 Rials.

2. AGRICULTURAL RESEARCH CENTER PROJECT

2-1. GENERAL DESCRIPTION

(1) Significance to establish Research Center

At the request of the Imperial Government of Iran for cooperation for the agricultural development program of Sistan plain, Japan International Cooperation Agency conducted the first preliminary survey in December, 1972, the second in August, 1973, and sent three experts in March, 1974, who performed necessary investigations. As a result of these surveys the parties concerned of both country came to a common opinion that in order to further the agricultural development of Sistan plain it is necessary to establish an Agricultural Research Center.

At present, the agricultural experiment and research institutions in Sistan plain include Zabol Agricultural Office and its subsidiary Ademi Farm. As to the former, its facilities have become obsolete and its site is narrow (18 ha), as for the latter, apart from the land area, the quality of groundwater is poor and is not suitable to use as irrigation water source. Thus, referring to the opinion of Japanese Survey Team, the Government of Iran expropriated about 100 ha of land in the neighborhood of Zahak village situated at the southeastern end of Sistan plain for the site of the Research Center.

The agriculture in Sistan plain is subjected to a very adverse conditions including severe weather, soil of low productivity, shortage of water and poor social and economic conditions. In order to overcome these natural and social economic conditions to lead to agricultural development program to a success, it will need experiments and researches, extending over long period, on the basis of the full knowledge of traditional technique of agriculture in Sistan plain, the establishment of guidance and popularization system based on them, and the policy and investment to support such system.

The Sistan Agricultural Development Program expects the completion of terminal canals (covered area up to 100 - 150 ha) by 1985 or so. The land preparation is to be done in parallel with the above. Judging from the present state of Sistan agriculture, it is not easy to carry out the transition to modern mechanized farming by crop rotation programs from the present extensive farm management simultaneously with the completion of the canal networks, in view of technology and accumulation of capital. Therefore, up to the completion of the canal construction during about 10 years which should be considered the preparation of the period to make up the modern agriculture.

Taking into account these circumstances, the Research Center is to be set up with the object of establishing the agricultural technique including its transition process to carry out smoothly the modernization of Sistan agriculture.

As it is clear from the object of its establishment, therefore, the experiments and researches at the Research Center will be mainly focussed on practical studies connecting directly to the farm management of Sistan farm households and at the same time fundamental researches will be conducted to develop the practical studies.

(2) Purpose of Research

As a result of the first and second preliminary surveys, several points have been arranged on the development of Sistan agriculture. Among them, those related to the technology are as follows.

(a) For most Sistan farm households, the farm land area per household is 2 - 6 ha and the greater part of their farming depends on winter crop only which is harvested once two years; the yield of winter wheat being only 200 - 1,000 kg per ha in most cases.

(b) According to the data the area under cultivation of summer crops is about 15% of the farm land area. However, the survey has

revealed that a small quantity of vegetables, watermelon, melon and alfalfa was being grown and that practically no summer crop was cultivat

(c) At present about 800 million m^3/year of water are diverted from Sistan River to Shahr and Taheri canals, but due to inadequate irrigation and drainage canal network the water is not utilized effectively and the accumulation of salt in the soil is increasing.

(d) Strong wind in summer of Sistan plain is the restrictive factor for the cultivation of field crops on the Plain as the saline soil is so. On the problem of salinization of soil, the investigator Ikeda has reported as follows; "The accumulation of salt in dryland farming is caused by the irrigation water of high salinity, high evapo-transpiration and high groundwater level. The same applies to the problem of alkalization, which occurs salt leaching with repeat of irrigation water supply and it is worsened, otherwise, checked mainly by the quality of water, what is necessary for us how to leach salt so that its accumulation will not take place again in a root zone, and how to prevent alkalization from occurring in the process of salinity correction."

The above indication may be construed that the three conditions; (1) low rainfall and shortage of irrigation water, (2) high saline soil and (3) raving of strong wind in summer which are considered as demerits among the natural conditions of Sistan plain, an efficient use should be made positively of three conditions; (1) abundant insolation, (2) low humidity and (3) high air temperature which are regarded as merits.

In developing the agriculture of Sistan plain having such conditions as its background, the irrigation water necessary for cultivating the field crops should be secured in sufficient quantity and, at the same time, an adequate consideration must be given to the perfection of drainage facilities needed for removing the leached soil. Then, experiments and researches based on the concrete methods must be considered first of all.

The second important problem is to secure a profitable yield by cultivating wheat and forage legumes in the fields for which irrigation facilities are perfected. In order to improve further the yield level of these main crops it is necessary to plan the improvement of physical properties of soil and the soil fertilization by introducing forage legumes. This is also an important problem for establishing a basic pattern of the rotation cropping of "wheat - forage legumes".

The third important problem is to introduce summer crops other than forage legume to develop further the basic pattern of rotation cropping mentioned above. In order to stabilize the production of summer crops introduced, it is necessary to conduct researches on windbreaks, windbreak fence, soil conservation, growing method and working method for protecting the land from strong wind and changing into a desert.

When the researches described above have been progressed, it is possible to cultivate continuously crops in most farm land of planned area and this means that the first stage object of the Research Center has been by and large attained.

If it is taken into account that the farm land area per household is 2 - 6 ha for most farm households in this plain, it becomes necessary to introduce cash crops and livestock on the assumption that they will be shipped out of the plain. In introducing the cash crops, researches are needed into the conditions which permit to create special production localities in the plain and the choice of crops which enables to make the most of climatic advantage of the plain. In introducing livestock, it is necessary to make the studies of animal and forage to secure meat and dairy products. However, as the study of livestock requires many heads of animal and vast area it is difficult to organize such study satisfactorily in this Research Center. Therefore, the researches on these subjects will be inevitably centered around the development of forage crops including grasses and other

forage resource. Also it is important to study the use of machines which enable to save labor and expand the planted area of main field crops including wheat and forage crops. Mechanization is essential to the positive improvement and conservation of the soil and it constitutes an important problem together with the study of technology assessment for the technicalization of results of researches in various fields.

As aforesaid, the immediate object of Sistan agriculture is to establish an irrigation farming based on the rotation cropping of "wheat-forage legume" as the basic pattern. Therefore, this basic pattern must not be neglected, in the choice of summer crops which is an important problem and also in the selection of barley, forage turnip, beet, gramineae grasses, oil crops and other crops. Moreover, in introducing fruit trees and vegetables, it is important to make the study of land use plan and of the methods of irrigation and drainage after having taken into full account of this basic pattern. Considering that the researches adapted to the above objects and character can be carried out continuously in future, the experiment farm (of about 70 ha) of the Research Center has been divided into three sections precise experiment, applied experiment and grass field productivity experiment farms.

2-2. SUBJECTS OF RESEARCH

(1) Meteorological observation

The meteorological conditions in Sistan plain is especially severe among other districts of Iran. High air temperature, strong wind and small rainfall in summer and high evaporation throughout the year are the natural conditions which impede the development of agriculture in this plain. On the other hand, rich sunshine, high air temperature and low humidity can be mentioned as favorable natural conditions for the cultivation of crops.

The clarification of these natural conditions holds the key to the development of Sistan Agriculture in future and any theoretical explication of crop cultivation and irrigation and drainage cannot be expected without the observation data about these conditions. Also the meteorological observation data are indispensable to the studies of irrigation system and water management.

(a) For this, general observations of natural conditions are made about the following items.

(i) Air temperature
(ii) Humidity
(iii) Soil temperature
(iv) Water temperature
(v) Amount of insolation
(vi) Duration of sunshine
(vii) Evaporation loss (measured by evaporimeter and that from water surface)
(viii) Precipitation
(ix) Wind velocity and Direction

(b) Influence of wind

As the effects of windbreaks, one can mention the prevention of reduction of soil productivity due to eroded top soil by wind and the protection of crops from mechanical damage caused by deposit of blown sand. However, in view of the intensity of wind in this plain, the study of windbreaks in respect of the kind and height of trees, planting, width (density) and spacing is expected to extend over a considerably long period. As it is difficult to make the experiments in these items in a short period they will be postponed until when Adimi Farm where the windbreaks is existing will be use as a branch farm. Thus, as an immediate measure, windbreak fence or wall (or windbreak net, if circumstances require) will be set up to make the following experiments.

(i) Influence on evaporation losses of various types of windbreak wall.

(ii) Experiments in the windbreaks effects of and obstruction with windbreak wall.

(c) Others

Evapo-transpiration for various crops is measured with Lysimeter. In the field of meteorological observation, the trial computations are made by the Penmann, Blaney-Criddle and Thornthwaite methods applying the data of metorological observations and a study of modification of coefficients is conducted taking into account the climatic characteristics of this plain. Further, based on these researches, evapo-transpiration ratios by month are examined.

(2) Soil and Water

The water of Sistan river is of such quality that its salinity is as much as 400 ppm and is slightly rich in sodium with S.A.R. (sodium absorption ratio) being 2. When such river water of high salinity is use continuously for irrigation, salt is leached into groundwater by permeability; while the evapo-transpiration is promoted by the climatic conditions such as high air temperature, low humidy and strong wind in summer so that salt accumulates in the upper part of soil layer by capillarity. The more the groundwater level is shallow the more this phenomenon is accelerated, and also the more the soil texture is of finegrained and soil structure is poor the more it is so. This phenomenon is repeated every year. Unless the desalinization by drainage, about 2 tons of salt per ha is accumulated during one cropping of wheat. The present situation of Sistan plain is that the accumulation of salts has been aggravated rapidly and the arable land has gone on being devastated because no drainage canal was provided when the irrigation canals were completed about twenty years ago.

A method to correct such saline soil is to effect drainage whenever the irrigation is applied so that the groundwater level is lowered and that at the same time the salinity is removed from the soil layer.

A factor which has a most influence on the efficiency of correcting saline soil by irrigation water is soil texture. Sistan plain is an area of alluvial soil and silty loam accounts for about one-third of the whole area. Further, a zone containing heavy-textured clay soil in any layer of stratum of 1.5 meters accounts for about one-third of the whole area and, in particular, the cases where such soil is distributed in all layers are found most frequently. The salt leaching is very difficult in the case of heavy-textured clay soil and it requires a great quantity of water. Therefore, the improvement for heavy-textured clay soil is also an important problem.

Moreover, in the salt leaching by irrigation water, it needs to take a measure to prevent the soil from alkalization in view of somewhat high S.A.R. Fertilization can not be practiced until when the above-mentioned correction has been made. After the said correction, the method of rational fertilization and the measure to preserve soil productivity will become the subjects to be solved.

In order to improve the situation mentioned above, it is necessary to make researches into the following subjects and take measures to meet them.

(a) Soil survey

In order to apply the principles as certained by the Research Center it needs to make clear the soil, quality of water and movement of groundwater level in Sistan plain.

(b) Water analysis

As the study of quality of irrigation water is an essential factor for improving saline soil, the samples of surface water are collected

at Zahak barrage and other necessary points along Sistan River to conduct water analysis (to find pH, electric conductivity, total dissolved solid, sodium absorption ratio, estimated exchangeable sodium percentage and chemical constituents).

(c) Correction of saline soil by irrigation and drainage

It is necessary to determine the methods of irrigation and effective drainage by soil texture and by groundwater level.

The determination of these correction methods is restricted by the quantity of irrigation water, the method of drainage, and the system of cropping and working, as a matter of course, and also by the plans for water resource and arable and utilizations, the regional development plan with manufacturing and other industries included and the investment to these plans, all those for Sistan plain as a whole. Therefore, considerations should be given also to the period of correction and the management of arable land (that of fallow ground included) during the process of correction.

(d) Prevention for alkalization of soil

In leaching salt a special attention should be paid to the alkalization and whether it needs to apply gypsum and lime be examined because the irrigation water is somewhat rich in sodium as aforesaid.

(e) Fertilization and preservation of soil fertility

The process of salinity correction and the method of fertilizing after correction should be established for each kind of crops and at the same time it in necessary to make clear the measure to preserve the soil fertility by the application of organic fertilizer.

(f) Improvement of heavy-textured clay soil and effective salt leaching

Along with the improvement of heavy-textured clay soil, such as the promotion of crumbling by the application of sand dressing, compost and lime, it is necessary to improve the drainage efficiency using mole drain which aims at to drain the root zone only as a supplementary measure, and at the same time to cut capillaries and increase permeability by causing fissure in the soil layer. The latter subject will be treated principally at the Branch Farm.

(3) Irrigation and Drainage

Sistan plain is irrigated by gravity irrigation with the water conveyed by Azar canal through Kohak barrage and Taheri canal on the left bank and Shahr canal on the right bank through Zahak barrage, with Sistan River being the water source for the both. The amount of intake water by these canals is about 33% of annual average discharge of Sistan River, i.e., 2,540 million cub.m (1659 - 1969) and remaining 67% is flowing into vast Hamun-e-Hirmand. Among them, Azar canal is buried due to sandstorm and suspended sand in the river water and the quantity of intake water through it is only 4%, with the greater part being taken through Zahak barrage. On the other hand, Shahr and Taheri canals to which water is taken through Zahak barrage are earth canals of which sections and slopes are irregular and their waterways meander and are divided naturally, and because of much leakage the water is not utilized effectively. Due to poor drainage, in addition, such leakage causes water logging and constitutes a cause of salt injury.

Sistan River flow, most of the quantity of intake water is utilized to irrigate for wheat and barley in winter and only a small part is used for alfalfa and melon growing in summer.

As for irrigating method, pre-irrigation is applied by means of basin irrigation of 10 cm in water depth before seeding period with the

purpose to leach salts accumulated on the ground surface; after seeding, about three times of irrigation will be done with the water depth of 10 cm. The irrigation times are restricted by water, which is not distributed at optimum times and this coupled with the lack of drainage facilities causes very low productivity. Therefore, the basic problems in the development of Sistan agriculture is to perfect the irrigation and drainage facilities and supply water necessary for the culture of crops at optimum and to solve them the researches should be made into the following subjects and the use of irrigation water be rationalized.

(a) Water consumption

In Sistan plain, the irrigation is based on a habitual practice and is not conducted theoretically. Basically, the water consumption for any crop differs according to the growing stages and the climatic, soil and cultivating conditions; it is the fundamentals of irrigation technique to make these conditions clear and adjust the daily water consumption by a crop. The daily fluctiation in such consumption can be measured by Lysimeter or by tracting method of change of water-holding capacity, and the experiments will be done on these measuring methods.

(b) Irrigation Method

In Sistan plain, basin method and follow irrigation will be done, the former for summer and winter crops, and the latter for summer crops such as melon, etc.

As it is essential for Sistan plain where water is the valuable resource to make the rational use of irrigation water, a comprehensive examination of the following conditions is needed for the surface irrigation system; (1) natural conditions (directions and velocities of wind, slope of ground and physical properties of soil), (2) farm managing conditions (kind of field crops, method of cultivation and scale of management), and (3) economic conditions (fixed charges,

labor expenses and motive power expenses).

In view of the above conditions (1) and (2), the irrigation system to be covered by research and study in Sistan plain is the surface irrigation (Fallow and basin methods) as principal system, and the spinkler system will be limited to particular crops due to the conditions (3).

The irrigation method to be employed to the heavy-textured-clay-soil zone which is occupied one-third of Sistan plain, an area around Ademi Farm, should be investigated and studied in conjunction with soil improvement at the Branch Farm to be set up separately.

(c) Irrigation network

It was not impossible to identify and fixed form of irrigation network in Sistan plain. The seeding period of winter wheat which is the main crop of the Plain extends over a long time, or from September to December or partially to February, and the productivity lowers as the seeding period is delayed. In order to improve the productivity of crop, a suitable variety adaptable to the natural conditions of Sistan plain should be selected as a matter of course. While, from the standpoint of irrigation, it is required to secure the water quantity for one application of irrigation needed for the suitable variety to be grown at suitable period by consuming optimum amount of water and it is necessary to take measures to satisfy these requirements. These measures, which are called irrigation system in general, include the design of irrigation water facilities for terminal farms and the setting up of rotation block which is calculated from the water quantity for one application of irrigation. The irrigation system is composed of several farms and irrigation and drainage canals and farm pond annexed to them, but in many cases it consists of several tens ha of land for the sake of water management. Thus, in setting up the irrigation system, the scale of facilities and the

functions of terminal farms are to be examined and it is desirable that the reorganization of land use in Sistan plain is also considered at the time together with irrigation technique.

(d) Drainage

The irrigation canals in Sistan plain are earth canals which produce much leakage loss and the groundwater level is shallow due to lack of drainage facilities, forming a swamp in some area. In addition, the meteorological conditions peculiar to Sistan such as high air temperatures, strong wind and low humidy in summer cause to increase evapo-transpiration and accelerate the accumulation of salts in the surface layer of soil, therefore the productivity of arable land is extremely low.

Thus, the improvement of the soil with accumulated salts is an important subject of study for Sistan region and it is not too much to say that any development of Sistan agriculture can not be conceivable without the solution of this problem. For this, an experiment should be made on the salts leaching by means of tile-drain; for usual drainage by subdrainage, experiments be made on the rationalization of bore, depth of burying and width of subdrain, by establishing controlled water level necessitated by the culture of crops based on the soil texture and groundwater level.

(4) Cultivation of Crops

At one time Sistan plain was a granary and it was possible to grow wheat which was main grain as well as various crops such as grasses, cumin, vegetables and fruit trees. Whereas, at present, due to increasing salinity accumulation in the soil and insufficient irrigation water, only alfalfa, wheat, a winter crop and a few kind of vegetables as summer crops are cultivated. The yield of wheat is very low ranging 200 - 1,000 kg/ha in most areas; however, it amounts to about 3 tons/ha in some areas along Sistan River where natural drainage is possible and

irrigation water is comparatively abundant.

The low yield of crops is caused by the shortage of irrigation water and, as an another reason, salts in the soil obstruct germination and growing. That the application of fertilizers is impossible due to high salinity accumulation is also a cause of low yield. Because of the lack of drainage facilities the groundwater level of cultivated land rises to cause injury by moisture in the low land. Further, the heavy-textured clay soil occupying one-third of whole arable land is one cause of such low yield.

In order to take measures to improve the present situation as described above and increase the production of crops it is required to make researches into the following subjects.

(a) Crops and selection of variety

The resistant against the obstacles of crops for low yield differs according to the kind and variety of crops and also the cultivating season has an influence on it in relation to growing process. Therefore, in selecting the crops for Sistan plain it is necessary to make clear the characteristics of the kind and variety of crops for each soil texture as to salinity-, humidity-, high temperature- and wind-resistants so that reactions to various obstacles by cultivating season and by growing process can be ascertained. The proposed crops include wheat, barley, oil crops (sunflower), pulse, sugar crops (sugar beet) and arable land grasses; however, for the time being, it will need to haste the studies of wheat and barley and forage legumes such as alfalfa.

(b) Method of cultivating crops

The cultivating methods are to be clarified for both aspects, that is, during the period of salinity correction and after the correction in the soil. Though, at present, hire plowing by tructor is

popular for the ground plowing and leveling it is desired to mechanize most process (from seeding to harvesting) in the future through the organization such as agricultural cooperative association. Therefore, methods of cultivating crops must be established assuming mechanization. Assuming shifts of growing period and planting system for each crop, various principles based on physiological and ecological studies are to be applied to the methods of irrigation and drainage, ground tilling and leveling, seeding, nursing seedlings, applying fertilizers, prevention and extermination of weed and of plant pests, and harvesting and preparation.

(c) Cropping Rotation System

Taking into consideration the prevensition of obstacle due to continue cultivation, damage by diseases and vermin and soil injury by pests, and the preservation and improvement of soil fertility, a cropping rotation system is established on the basis of elements studies referred in above paragraph (b), by combining ordinary upland crops with vegetables, grasses and forage crops. This needs a planting system along the line of development plan, which assumes the socio- economic preconditions of Sistan plain, and it is necessary to determine the cropping rotation system extending over a long time including the period for correction of salinity in the soil. In particular, an important subject is to include forage legumes or mixed seeding grasses in the system. Whether the harvest of grasses should be made using machine or through grazing must be examined by comparison in relation to the management as a whole.

(5) Horticulture

The present situation being as described in paragraph (4), the studies of following subjects are needed to improve and take measures for them.

(a) Vegetables

The choice and variety of vegetables, the method of culture and the cropping rotation system by combining vegetables with ordinary upland crops and grasses are clarified in the same manner as in the case of the ordinary upland crops.

(b) Fruit trees

The variety of fruit trees are selected and the method of cultivation is established. The subjects requiring immediate research are variety of fruit trees and the method of irrigation, and it is necessary to try to restore such as grapes, pomegranate and pistachio which were grown until a recent date.

(6) Plant Protection

The subjects of researches include; (a) prevention and extermination of injurious insects, (b) prevention and extermination of damages by diseases and (c) prevention and extermination of weed. The present situation about the damages by plant pests and weed is not necessarily so severe as to require an immediate solution. According to the result of investigation the aphides (wheat) appeared in many places to become a big problem and no more experience. However, the problems of damages by plant pests and weed are expected to occur with the introduction of many kinds of crops and the improvement of productivity after the correction of salinity in the soil having been completed. In this sense it becomes necessary to study the protection of crops in the course of research of crop cultivation being progressed.

In prevention and extermination, an attention should be paid to the environmental preservation as far as possible and it is desirable to employ ecological or mechanical means avoiding the use of chemicals. Because the irrigation water is nothing but the water for daily living for the inhabitants of this plain a special care must be taken about

water pollution. Therefore, when chemicals are to be used the attention should be paid to the above fact in particular.

(7) Pasture and Forests

Grasslands are divided into the native and the cultivated. The latter is further divided into the grassland where perennial grasses are cultivated for grazing use and the short-lived forage where annual or biennial grasses are grown and reaped for stored roughages. In the case of Sistan agriculture, the natural grassland (native grass field) is the main source of forage supply for sheep and the pasture will be developed with the aim to improve the productivity of beef cattle. The grasses to be grown in the pasture for short rotation cropping are treated under the subject of the sector (4), the cultivation of crops. Pasture as referred to herein, however, includes both the native grassland utilized for grazing and the pasture for stored roughages. The main subjects of the research cover the following three research lines.

(a) Establishment and management of pasture

(i) Establishment of pasture to be irrigated

In the establishment of pasture, it should be noted that, since many of the seeds of herbage plants are small sized, the influences of the degree of ground leveling and the desalinization of seed bed as well as moisture and bases in the soil are apt to appear strongly at the time of germination. Particularly in the case of a pasture which is utilized over many years, it is desired to employ safe and reliable techniques of pasture establishment taking into account the various conditions of irrigation and drainage, the sowing method of pasture plants and time of seeding adapted to such conditions and the choice of species of grasses.

(ii) Methods of scientific management and utilization of pasture to be irrigated and comparison of productivities

When the species of grasses which enable ths safe and reliable establishment of pasture in Sistan plain have been found, the comparison of productivities is made between these species under grazing conditions. Experiments in the relation between irrigation and the time and frequency of grazing and cutting and the fertilizer application are carried out for particular species of grasses.

(b) Improvement and conservation of range land

(i) Improvement of vegetation in range land

The native vegetation in range land is to be changed gradually (increase in plant density, changes in species) without applying much artificial operation such as tilling, sowing and fertilizing so as to improve feeding value and grazing capacity.

(ii) Conservation of range land

The quantity of herbage resource in the native grasslands is measured over the entire Sistan plain; based upon which the density and frequency of grazing are controlled and the lands is prevented from becoming devastated and desert to find how to maintain the grazing capacity.

(c) Forest trees and windbreaks

(i) Search for windbreaks and sand defence plants

A study is to be made to find the plants with salinity resistance and availability of using for windbreaks and sand defence. The search for plants is not restricted to the trees but is extended to herbs and shrubs.

(ii) Silviculture of windbreaks and sand defence plants

Experiments on the method of silviculture and the effect of

sand defence are to be made for the main trees available.

(8) Grassland Utilization and Animal Production

In the preceeding paragraph (7) the problem of grassland farming is approached from the plant side. The subject of this paragraph is an approach to the problem from the animal side. For research items (c) and (d) among those in this area, it is difficult to make various experiments on large scale in the premise of Zahak Research Center; the studies specialized in livestock area should be intensified at the separate site and facilities to be provided in the vicinity of the Center.

(a) Utilization of grassland

(i) Comparison of the types of grassland utilization and their efficiency for animal raising

In the case of pasture, the efficiencies of utilizations respectively by feeding animals on grazing, on soilage rations in barn yard, or on processed grass materials harvested by machines differ considerably according to the natural and social conditions. The types of grass field utilization under respective conditions are appraised in terms of the response of animal production.

(ii) Utilization of products from ley

Herbage plants grown in ley as a part of rotation cropping system will be stored as the roughages for off pasturing season, and the storing and processing methods and evaluation of these roughage materials through the chemical analysis for feeding values and feeding experiment.

(b) Feed resources

(i) Storage and processing of grains and fodder root crops

Where feed barley and fodder beet are cultivated as a part of rotation cropping system, the methods of their storing and

processing and the feeding experiment with them are carried out.

(ii) Crop-residual-products utilization for feed stuffs

The residual-products from wheat and barley, oil crops and vegetables are utilized at present; the chemical analysis for feeding value and feeding experiment with them are conducted to include them in the annual feed plan and also to find a new resource.

(iii) Feeding value analysis of resources from natural grassland and forest

Investigations are made of the feed characteristics of probable feed resources such as herbage plants and shrubs growing in the natural grass land (the periphery of marshy land and semi-arid land included) and forest land.

(c) Animal feeding system

(i) Establishment of feeding systems for various animals

The plans of feed supply are formed as adapted to the nutritional requirements by kind of livestock and to efficient use of various feed resources.

(d) Animal nutrition

(i) Measurement of energy and protein requirements by kind of livestock

Although there are great fluctuations in measured values between individuals and also between raising groups of animals in Sistan plain - for example, cattle are Sistan species and sheep are Balti species - it will be possible to set the standards of average requirements of energy and protein. It will need to make a study with special regard to the lowest limit of the requirement at the shortage of feeds.

(ii) Measurement of mineral requirements by kind of livestock and by area

The remarkable salts accumulation in the soil and the plants makes an important subject to study mineral requirement and mineral balance of animals.

(iii) Animal nutrition and disease

The relation between adverse conditions (energy and vitamin deficient, and mineral unbalance) and the diseases of animals are clarified.

(9) Technical Service and Farm Management

Land use, mechanization and technology assessment are to be taken up as the subjects of studies on farm management and the research operations about seed production and facilities management are included in the technical services. Though they are by no means showy, they play an important role in administrating and operating the Center and in extension of the results of various studies.

(a) Land use

It needs to develop the researches from time to time in cooperation with other specialized sectors concerned at a suitable site outside of the Center in order to master the necessary technology for land use planning, taking into account the direction of agriculture in Sistan plain, and to establish the technique for planning land use which is adaptable widely under various conditions of climate, topography and soil.

(b) Mechanization of farm work

The researches of agricultural machineries include the study of trial manufacture and improvement with the object to develop new-type machineries and working implements and that of working methods

with the object to establish the means to utilize machineries and working implements. Here the main emphasis may be placed on the latter. That is, the immediate aim may be the technicalization which envisages the popularization of the basic pattern of "wheat-forage legumes," and related summer crops for which the methods of cultivation and utilization have been established. When the choice of suitable crops is advanced with the progress of studies, the establishment of mechanized cultivation of these crops will become to be a subject. Also, in parallel with the said subject, it needs to attach importance to the study of mechanized techniques required for the improvement and conservation of the soil and the role of this Department is important in carrying out the uniform cultivation on a vast land. The present subjects of researches are as follows.

(i) Mechanized cultivation of wheat and barley

A labor-saving and stabilized method of cultivation is to be established hastely with the cooperation of the Depertments concerning researches of crop and soil sectors.

(ii) Harvest and preparation work system of grasses

Covering the suitable species of grasses selected the method of preparation is to be examined relating it to the method of harvesting work to feed the animals with such grasses.

(iii) Soil improvement by the use of machines

A method to improve the soil which makes full use of mechanical power is to be studied with the cooperation of the Departments concerning researches of crop and soil sectors.

(iv) Mechanization of techniques on soil conservation

The mechanization of techniques on soil conservation involves fairly difficult problems. However, it is an important subject as an extensive popularization of techniques is not possible without its solution.

(c) Technology assessment

The results of researches attained in the basic test area by respective specialized sectors are not directly diffused among the managements of farm households. The result of individual research is subjected once to the assessment as a technology and to the managerial evaluation through the process of technicalization study at the applied test area, then after which it is popularized. In short, it needs to make a comprehensive study for establishing the technological system which assumes certain management type and a demonstration study under different soil conditions. They have a close relationship particularly with the researches of mechanization and management.

(d) Seed and seeding production procedure

Breeding is not conducted at the Research Center. The task here is to produce the seeds of crops to be used for the experiments and investigations at the Center and increase the varieties which have been breeded or selected. These operations are conducted sometimes combined with the uniform cultivation on the reserved land.

(e) Management of facilities

The main task is to manage the buildings and facilities annexed to the farm and to prepare and store the harvests from the farm. The selling and forwarding of products and the storage of forage for livestock are also included. The control of roads in the farm and the management of the farm as a whole are included and they play an important role in the operation of Research Center.

3. FUNCTION OF THE RESEARCH CENTER

3-1. ORGANIZATION

In order to perform all the aforesaid projects, organization and system of the Agricultural Research Center in Zahak must be prepared of large scale. However, it is limited in such the organization and the system as could be imagined of the settled scale of 100 ha, and the experimental farm of a little less than 70 ha. Besides, there are also allotments between the existing research organizations at Teheran and in the other areas, the following organization in view of the importance of the role to be carried out by the Center.

The organization consists of 7 departments. And their name, field of research and posting of the staff are shown on Table - 3 "Organization of the Research Center."

In order to arrange the subjects of each research department and the important matters relating to the management of the Research Center, and to realize an organic action of the Center, a planning committee, organized with the Director general of the Center and the cheif of each department, etc., is to be established.

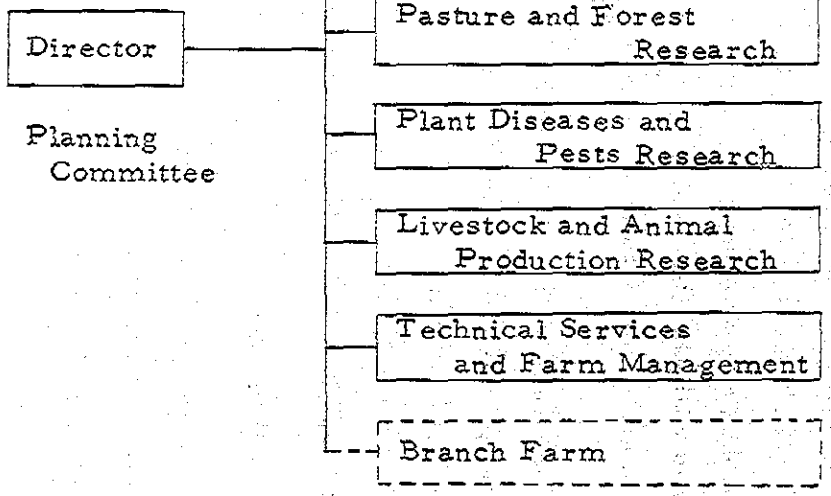
The branch farm will also be founded in the area of special soil such as of heavy textured soil and in the other areas as are required according to the necessity of the research.

3-2. FUNCTION OF THE RESEARCH DEPARTMENTS

(1) Administration

In order to carry out the business of the Research Center smoothly and efficiently, general affair, accounting and supplies divisions are to be set up in the administration department.

Table - 3 Organization of ZAHAK Agricultural Research Center



Department	Division	Staff: Engineer	Staff: Technician
Administration	General Affair	1	2
	Accounting		1
Soil and Water Research	Climatic Environment		2
	Soil and Water	1	4
	Irrigation and Drainage	1	4
Seed and Plant Research	Crop Cultivation	1	6
	Horticulture	1	2
Pasture and Forest Research	Pasture and Forest	2	5
Plant Diseases and Pests Research	Plant Protection	2	2
Livestock and Animal Production Research	Grassland Utilization	1	2
	and Animal Production	1	4
Technical Services and Farm Management	Technical Services	1	6
	Farm Management	1	0
Branch Farm			
	Total	13 + 1 (Director)	40

General affair division takes charge of the personel affairs, the welfare, the filing of documents and other general affairs; accounting division of estimate, settlement and expenditure; supplies division of management of the facilities in the Research Center, inspection and repair of the machinery as well as purchase and management of the commodities.

(2) Soil and Water

Aim of the study in this department can be roughly classified into, (1) efficient utilization of irrigation, (2) efficient correction of soil salts by irrigation and drainage, and (3) soil improvement.

These are studies on the relation between irrigation-drainage and soil, and have close relationship to each other, so the promotion of the studies must be done in the closest connection to, as well as together with, the crops cultivation which will be described in the following paragraph. Therefore, it is of course necessary to exchange information each other in the organizations of the Center. And also the basic principle obtained in each division must be practised in the same block as far as possible by every technical group, and be observed in cooperation with all the technical groups. Thus the sectionalism among every technical group will be eliminated, and the result of every technical group will be put together, and then the efficiency of the project of the Research Center itself will be elevated.

(a) Meteorological Observation

The meteorological and micro-meteorological findings in all over the Sistan area serve as basic data for every field of irrigation, soil improvement and crop cultivation. So, (1) the measurement at the meteorological observation facilities in the Center as well as micrometeorological measurement at the block are to be carried out, and the weather, irrigation and drainage in the experimental field as well as the correction of soil salts and the relationship to the

crop cultivation are to be clarified. (2) The relationship between the strong wind in summer time and the crops are to be made clear, and also the basic data on the effect of wind breaker are to be obtained. (3) The findings relating to the irrigation and the evaporating quantities concerning deposit of salt etc. are to be obtained, and the data to establish and the efficient irrigation method are to be obtained.

(b) Study on Irrigation and Drainage

(i) Measurement of Water Consumption

There are a lysimeter method and a tracing method of water holding capacity variation as for the measurement of daily variation of consumptive use of water by the crops. The former has a weighing method and a water balance method. The weighing method is applied to such the crop that is simple and has not so large crop. However, it has problems in arranging soil water and weighing, so the water balance method is mainly utilized. This method is a large quantity of water above field capacity pouring freely out of the bottom of the soil tank, wherein the difference between irrigation and drainage is regarded as the consumptive use of water. But, the growth of the rooting zone of the crops not being free, it is necessary to control the cultivation as to ensure the equal growth as in the block.

The tracing method of water holding capacity variation traces a reducing process of soil water in the block, calculates the reducing quantity and regards it as the consumptive use of water. This method can simultaneously carry out a survey necessary for deciding irrigation quantities at one time.

There are direct soil sampling method, tensionmeter method and electric resistance soil moisture meter method for the measurement of the soil water. Each method is to be carried out principally in every 10 cm depth and its results are to be indicated by volume.

Measurement of soil sampling is to be done every 4 - 6 days in the depth of 10, 20, 30, 40, 60, 80 and 100 cm, and indeed at more than two spots between levees. These measurements will prove the water holding capacity variation at the block in each soil layer and in every period, allowing a calculation of water consumption as a whole and also per day. Moreover, through the measurement of soil moisture tension in each soil layer, the condition of water supply for the crops being clarified, the available depths and conditional soil layers for each crop can be known. The irrigation quantity at one time will also be known therefrom. The experiment plot consists of a standard, a little and no irrigation area, and the crop cultivation therein will be done in cooperation with the crop cultivation division.

(ii) Test of the Irrigation Method

As for the irrigation method, the Surface irrigation (Border, Furrow and Basin) and Spray irrigation (sprinkler, perforted Pipe or Trickle method) are considered, but generally speaking it is necessary to examine and decide comprehensively; (1) natural conditions (wind direction, wind velocity, inclination of land and physical properties of soil), (2) farming conditions (planted variety, cultivation method and scale of management) and (3) economic conditions (fixed costs, labor costs and power expenses).

In view of the small scale of management and economic conditions as well as the experience of basin method having been traditionally applied to the winter crops, surface irrigation is the common method. Sprinkler method has problems under the severe weather conditions such as a strong wind in summer time, and perforated pipe or trickle method seems to be confined to the special crops owing to its economic conditions such as facilities expenses.

As for the surface irrigation method, furrow and basin methods are considered, but in case of application it needs studying how to decide the water demand for the block, the length of ridge, the time of water supply and the design of block (the degree of inclination and fold). Planing of these factors requires the experiments on (1) intake rate of water, (2) flowing velocity of water, (3) irrigation efficiency, etc., although it is possible to design the facilities for arranging of the block necessary for the surface irrigation, provided the acceptable length of ridge, the quantity of water supply and the slope of land being decided.

However water is a valuable existence in Sistan plain, so the sprinkler irrigation is difficult to be abandoned because of its efficiency. Therefore, with regard to such the crops as affected little by the strong wind or such the crops having a short summer cultivation period, the test by the sprinkler method will be applied; and with regard to the fruit tree, the transpirating test by lysimeter being inapplicable, the trickle method will be applied in view of the economy.

By the way, reporter Ide estimates, in his report, the basic intake rate in Ademi Farm at 5 - 3 mm/hr. The infiltration capacity in the heavy textured soil zone, which is said to cover 1/3 of the Sistan plain and in the center of which located the testing block, being comparatively low, it looks difficult to avail this zone as a farm land without elevating permeability by soil improvement, e.g. subsoil breaking, sand soil dressing, auxiliary drain, etc. This investigation is an important subject of study at the Branch farm, which is expected to be installed separately and orienting the heavy textured soil zone.

(iii) Study on the Irrigation System

In order to control water supply between the main and

the branch canals smoothly, it is indeed essential to classify the Sistan plain into several regions having similar elements and to compose an irrigation system.

The irrigation projects are desirable to be allotted to managing squad covering the unit of several hundreds ha., and to managing section covering the unit of several tens ha., so as the systematic irrigation can be carried out. The managing section, in case of crop rotation, forms at the same time a rotation block.

In case of composing the above-mentioned organization, administratively the village and its terminal administrative organization, and as for the natural conditions the lie of the land and the physical property of soil etc., will be considered as the elements.

In other words, these elements are to be investigated and studied in conformity to the actual state of Sistan plain, and to be examined and decided in order that the irrigation organizations are piled up from the terminal managing section to the managing section to the managing squad of upper organization.

By the way, the terminal managing section often forms a rotation block, yet a certain cooperative examination with the crop groups will be necessary, because the peak consumptive use of water should be satisfied for such the crops as having been interwoven into a crop rotation system on account of the design at the block in the managing section.

The difference of irrigation time between the designed flow in the terminal branch channel and the peak flow used to the canal for the block, is to be dealt with the capacity thereof should be examined in consideration of special weather condition in Sistan plain.

(iv) Drainage System

As for the important subject of study in Sistan plain, experiments on desalinization depickling test by under-draining is to be considered. The drainage at the testing blocks has been designed tentatively as follows: habitual limit of water level as 1.2 m, depth of underdraining as 1.5 m, and its intervals as 50 m. In any case, soil texture, salinity, moisture content and groundwater level must be investigated before the desalinization. For desalinization, the basin method by pre-irrigation is to be adopted at the time before seeding. Leaching water depth at one time may be 10, 15, 20, 25 cm, and it will be operated so as to reserve water for a suitable time, to let soil saturated and then to drain off until field capacity be reached. Aim of leaching is to be tentatively set up on 4 mmho/cm and draining is to be continued till the said value be attained. Amount of drainage is weighed at the outlet opened to the drainage canal, and also salt contents are inspected. Further, the variation of salinity of soil will be measured by direct soil collection to the depth of the available soil layer. The testing block is to be examined by the combination of leaching water depth and leaching frequency, although as a control section a section having no tile drain is to be set up.

As a result of the said examination it will be necessary to set up a new testing section by changing the interval of the tile drain and the depth of laying. Moreover, a similar experiment is to be carried out, setting up a drain section (depth 80 cm, interval 25 m) with mole drain in a part of the testing section instead of the tile drain.

The experiments on the habitual drainage will be carried in parallel with the irrigation experiments, and weighing of drainage from the over irrigation and inspection of the water quality will be done simultaneously with a measurement of the

change in water level at the observating well, and then the process of deposit of salts will be proved.

(c) Scientific Study on Soil Fertilizer

(i) Soil Survey

A more detailed investigation on soil is to be carried out in Sistan plain, in cooperation with Soil Institute. As for the investigation items, soil texure, salt contents and alkalinity, soil group, soil phase, chemical structure, water quality, groundwater level, etc. are taken into consideration.

(ii) Study on correcting method of salinity soil by irrigation and drainage

In correction plan of salinity soil, it is necessary to know leaching water required to reduce salt content in the expected soil layer to a desirous level. Relation between leaching water and concentration of salts - comprehensively EC: electric conductivity (leaching curve) - is to be clarified on every soil texture. Therefore, many examples concerning lysimeter, block for basic examination and its attached facilities, experiments block and spot block of every soil group, etc. are needed. These studies are also to be done in cooperation with the said meteorological study, study on irrigation and drainage, study on crops cultivation, etc. Measuring is carried out on quantitative and qualitative grasp of percolating of physical and chemical properties of soil, etc. Each item requires measuring instruments respectively.

(iii) Study for Preventing Soil Alkalization

Repeated desalinization by irrigation for certain kind of water quality makes its EC lower. However, it is feared that sodium remains in soil layer and has soil alkalized, so the activity of Na^+ in the process of correcting soil chlorides is to be measured

from the investigation of water quality of Sistan River, and if it be feared of alkalization, a measure for preventing alkalization, e.g. use of gypsum or lime has to be studied. This experiment is to be also carried out in relation to (ii).

(iv) Study on Fertilization and Maintainance-Promotion of Soil Fertility

Fertilization for crops in the process of and after salts correction is to be established, besides application of crude oraganic matter and soil conditioner such as compost, barnyard manure, residue, etc. and its effect are to be clarified. Furthermore, elevation of soil fertility by rotation cropping system (through introduction of pulse family crops) will be studied. In every case promotion of research is needed in connection with the crop cultivation.

(3) Seed and Plant

This test aims at knowing such a rotation cropping system that is capable to select the optimum crop and its variety in the process of and after correcting soil salinity, and also to avoid growth retardation by continuous cropping or damages by insect pest, thus to elevate soil fertility. This test is being in a close connection with that of the afore-said soil and water research department, and is to be carried out both insides and outsides. Further, the crop selection and rotation cropping system are to satisfy the development plot in Sistan plain and to premise social and economical conditions in Sistan plain, e.g. available irrigation quantity and its utilizarion system, investment estimated in development plot, correspondence to the market (relation between demand and supply), transport conditions (distance, traffic situation, etc.), organization utilising farm machinery (such as a cooperative association), farmer's level of technology and management, etc. On the basis of these pre-mises, technological possiblities and to be investigated.

For these purposes, productivity of the plant of every species and of every variety, irrigation and drainage, correlation with soil, etc. are to be basically tested in the basic test block. However, before starting comparison test, it is necessary to carry out uniform cultivation continuously and to confirm the uniformity of soil fertility at the block according to the result of plant cultivation. And also at the applied testing block, such a cultivation plan as capable of surveying soil fertility level in all over the block will be needed to first, with the similar purpose as in the uniform cultivation. As mentioned later, this will be a first job of the technical services and farming department.

(a) Selection of Suitable Varieties of Crops

Salts tolerance of the crops corresponding to the concentration of salinity is to be investigated in the process of soil correction. Also wet hardiness at the block of the different groundwater level is to be clarified. As for the summer crops, high temperature tolerance and wind tolerance are also selected, objective crops are grains (wheat, barley), grasses, forage plants, oil plants, vegetables and fruit trees. Positive synthesis of varieties by mating is to be carried out in the future, so at present the optimum seedling will be investigated by collection and selection of species and varieties.

Out of the said studies, what is especially to be taken into consideration is to promote a necessary research in order to establish a basic type of rotation cropping "wheat-forage legumes", that is expected to be introduced at present into the agricultural development in Sistan plain. This is necessary to promote investigation in every research department, such as irrigation and drainage, soil improvement, instrumentation and livestock, on the basis of common understanding.

Further, the study on introduction and selection of cash crop, e.g. sugar beet, requiring tens of thousands ha of the harvest scale

(including rotation plant) in case of extension, will be of secondary importance.

(b) Crop Cultivation Method

Cultivation method carried out by farmer for wheat, alfalfa, etc. is very crude, namely it constitutes a planning system to saw when moisture being given, to saw much for diversification of risks and to saw by broadcasting. Therefore, cultivation for stable and rich harvest requires a close joint study with the soil and water research department.

In these investigations it is necessary to carry out detailed factorial experiments on the plants, having been judged to have applicability in Sistan plain, and to clarify a combination of factors of highly productivity. And it will be efficient to adopt cultural factors economically, leaving space from the broadcasting to the harvest, and to carry out trials by multiple design. What is especially important is to fix the optimum sowing time according to each variety, and for that purpose to promote studies, such as humidity reaction of the plant, the number of days before or after irrigation, determination of the plowing or sowing day.

(c) Crop Rotation

What is prevalent for the farmer in this plain is the system "wheatfallow," however, under the bad condition of water management the use of chemical fertilizer is naturally restricted and the level of yield becomes very low. As mentioned over and over again, wheat is a staple food and elevation of its yield is the primary subject in crop cultivation. And as well know, the combination of pulses or root vegetables is the best method of maintaining high yield of wheat. Which plant is the suitable one will be studied as a problem pertaining to (a), however, here will be clarified the crops rotation system in the process of and after soil correction, on the basis of findings studied in (a) and

(b). In this case, it will be important to carry out observation and measuring on soil fertility, insect pest damage, trouble of continuous cropping, etc., and to decide an efficient cropping system with regard to water supply.

Since in Sistan plain, having a restriction on the total amount of irrigation water, it seems rational to set up fallow land zone, the management of fallow land is also an important subject of investigation.

Problem of crop rotation system being primarily a subject of technical side as well as of executive one, it will not be easy to carry out in this Department only, but will require much cooperation from other Departments.

(4) Plant Protection

Contents of study in this Department are as follows:

(a) research on the actual condition with regard to decease damages, insect pest damages, weeds damages

(b) research on damage control technique

(i) control by agricultural chemicals
(ii) ecological control
(iii) mechanical control

Further, this research field, having problems closely connected with crop cultivation department, is at present to be investigated among researches on crop cultivation as a department of cultivation control.

(5) Pasture and Forests

In the Sistan agricultural development plan, future promotion of animal husbandry is being laid on stress, and maintenance of forage resources is forming the most important subject. Also in case of crops

rotation, having placed wheat in the main and incorporated barley or beet for the forage, it seems essential to incorporate short-term grassland, wherein forage legumes such as alfalfa, Persian clover, etc., or forage legumes and forage grasses having been mix-sewn. Since, in case of large scale of irrigation being carried out for desalinization, leaching of nutritive salts will simultaneously occur, it is necessary to supplement soil organic matters always by banryard manures and grasses. Study, practising characters of grassland, such as ability of collecting nutritive salts from deep layers of soil to an available layer, ability of nitrogen fixation of forage legumes, etc., and comparison test on grass species under condition of pasturage, will be of especial importance.

In Iranian Research Institute of Forestry and Rangeland, only the improvement and conservation of wild grassland are on the agenda, and no organization taking charge of management (pasturage, utilization) of artificial grassland seems to be existing. Grassland research field, being marginal area between special research fields on livestocks and crops, is easily coverable in the advanced nations as for livestocks through access from both sides. However, in such countries as having had less importance on the livestocks in farming, this research field has all the more importance because it being apt to be neglected. In this sense it is desirable that Research Institute of Forestry and Rangeland also adopts artificial grassland of large scale for irrigation as a subject of research, and on the other hand, that Seed and Plant Improvement Institute as well as the livestocks experiment station promote studies including this field. By the way, the research from the view point of production-ecology will be especially important.

(a) Establishment and Management of Pasture

In this Department, establishment and management of pasture with irrigation are studied. The first stage of study is an experiments on selecting grassland formation and the optimum grass species

under such a condition of soil as having undergone a certain grade of desatinization irrigation. Grass species growing wild in Sistan plain or in the area of similar condition, i.e. forage legumes, such as *medicago sativa, medicago rhizoma, trifolium fragiferum, prosopis stephaniana*, etc. and proper forage grasses, such as *imperata cylindrica, cynodon dactylon*, etc. will desirably be tried first. Thus the surest method of grassing will be found from combination of broadcasting or transplanting and irrigation. At the second stage in the grassland formed by these grass species, test of grassland management such as time and frequency of pasturage or reaping is to be done. At the same time it is desired to collect data on subtropical grasses such as *panicum* species or *cenchrus* species from all over the world, and to carry out a comparison test on salt resistance, drought resistance and biennial. If any of these be annual and prove high productivity in summer, experiment on incorporation into rotation cropping is carried out in the crop cultivation department. If desalting at the germination time be optimal, herbs belonging to *panicum spp., chloris spp.* look like promissing.

For the study in this Department beef cows are to be held constantly here within the site of Research Center. It is important to study grassland management, comparing productivity of each grassland, salt-drought resistance etc. under the condition of pasturage. In this case, about 30 to 50 head of beef cows are reared, and these livestocks are considered, so to say, as reapers. As mentioned later, a study, having direct relation to coarse feeder production out of the studies on livestocks field, is only to be carried out in the site of Zahak Research Center, and for the other most part it will be desired to establish separately new facilities in the neighbouring site.

(b) Improvement and Conservation of Rangeland

This Department makes wild grassland, being used mainly as

pasturage, an object of study. It would be an effective method to practise methodology, such as computer simulation or statistical forecasting of ecological system, observing at first the productivity in this pasture-wild grassland (actual and potential present production quantities) with botanic -ecological and productive-ecological measures, checking up pasturing frequency and investigation of pasturing head, scientifically controling the use of grassland, and considering drought which will occur every several years.

(c) Forest Trees and Windbreaks

This kind of study seems to be handled rather at the forestry experiment station, however, wind-sandbreaks must be established in parallel with the foundation of Zahak Research Center, and also in case of constructing irrigation cannels in the whole Sistan plain, it will require such a department as leading a planned afforestation business in the green-belt from the view point of water canal protection or peripheral farm-land protection. Therefore, not a basic experiment, but an applied-on-the-spot-test and the like will play the leading role. However, this role seems better to be curbed to a secondary one in the Pasture and Forest Department.

(6) Grassland Utilization and Animal Production

Iranian group of research organization corresponding to this field is said to be Livestock and Animal Production Dept. The extent of the proposed Research Center is too narrow to carry out all of the studies on livestock field, so the studies on Animal Feeding System (8-3) and on Animal Nutrition (8-d), described in the paragraph of Research Subject, are necessary to be carried out at the branch, being founded separately.

Thus, as mentioned in the preceding paragraph 8-a, 8-b, only the subject on grassland utilization and on livestock rearing by coarse feeds will be handled within Zahak Research Center.

(a) Utilization of Grassland

Utilization, mentioned here, means a process such as managing grassland, producing feeds (grasses) thereby and having them utilized efficiently by livestock. It involves the time and frequency of rotation pasturage, growth and sanitation of livestock at that time, treatment and storage of grasses gathered from grassland, etc. Grassland utilization system or evaluation of grassland products is estimated by reaction of livestock side, using beef cows reared for experiment. Pasturing test in optimum time, and comparison test of storage feeds by domestic feeding in non-optimal time, are carried out. Experiments in this Department are desirable to be promoted in close connection and cooperation with the Department of animal feeding system or pasture management.

(b) Feeds Resources

According to the instance of agriculture in Denmark, where rotation farming and animal feeding be rationally connected and so a fuel time farmer having comparatively stable unit of family be reared up, most part of animal feeds is supplied with barley or beet for feeding, being produced by self cultivation or domestic production, or with grass cultivation. Also in case of agriculture in Sistan plain, would such the feed supplying system not be desirable as self-cultivating the concentrated feeds and utilizing the by-products, the cultivated grasses, the wild grasses, etc. allotedly for more than two species of livestock. For, from the view point of ecology, high diversity of energy-flow- canal from plant to livestock, animal products, etc. is a condition of stability, and this stability is essential for animal products development.

Concerning the research for feed resources, an emphasis is to be placed on studies for storing-processing method of grain and fooder root crops, and for utilization of agricultural products' residual for feed stuffs. Then, these feed resources are to be evaluate in terms of the feeding values through chemical analysis in a point of view of animal nutrition. Furthermore the Department concerned feeding-system research is to make actual feeding experiments on feed resources having feeding values judged

(7) Technical Services and Farm Management

If the proposed Center would be established as a research institute or its branch laboratory for research work on a certain specialized field, such a specific institute might not be necessary. However, in the understanding that this Center will play an important role in regional development of Sistan plain, research works on various subjects should be mutually related and analysis of problems should not be limited merely within a specific field. The results of research would not be sufficient for regional development unless those would be utilized for other specific fields, put into technical practice for farm management.

As for the research on wheat which will be a main crop, even when a method for stable high yield is established with good results from research on improvement of varieties, manuring method and planting density, the developed method should not be directly applied to farm management; it must be available for mechanization with good character about falling down and off of crops, and also it must be evaluated to see whether it can be applied to crop rotation, in the relation between the preceding crop and the following crop. Furthermore, it may sometimes be necessary to make some change in varieties and cultivating method according to different characteristics of soil.

As for research on grass, it is necessary to carry on research not only on its high yield but also on its taste to cattle, method of storage, adaptability to crop rotation and method of its irrigation etc.

As for soil improvement, if special project and specific type of machinery are required for soil improvement, it is necessary to study and determine expenses required and its effectiveness to the whole crop rotation.

In advanced countries, the above-mentioned problems were put into technical practice with trial and error at farmers' farms for a long period. However, in order to promote the agriculture in a relatively short period with farmers who have no intensive farming technique, it is necessary to integrate always results of research in various specialized fields, make them reflected on farm management plan and extend among farmers by means of elaborate guidance. Research works for the purpose of the integration are research works on land use, on mechanization and also on technical application for the use of evaluation. These must be major research items at blocks for applied test in the Research Center, and also be experimental research at a branch with different soil characteristics.

Results of technical research at blocks for applied test and experimental research at a branch shall be extended to farmers, however, new unexpected problems may be brought forth at farmers' farms which have different conditions. Those problems must be at all times studied for technical research and experimental research works, and also as research subjects in various fields those must be examined for causes and countermeasures and be fed back to farmers for their farm management.

(a) Plan of Land Use

The reason why results of research on technical application and experimental research are not well extended to farm management is, for one thing, poor planning and unskilled technique of land use. This will happen especially in a case of poor land and soil conditions. As wind and water conditions are very severe in Sistan plain, it is a very important problem how to incorporate technique

of soil conservation against erosion by wind and water and arrangement of windbreaks and windbreak-fences into plan of land use. In research works of this type, however, it is very difficult to carry out efficient tests and experiments in a limited area, and it is necessary to repeat experimental works with trial and error at a certain place where it is easier to carry out this type of research.

By repeating elaborately this type of research, it will be possible to establish proper locational arrangement for forest, fruit trees, grassland and cultivated area. This makes also suitable measures for irrigation and drainage. Accordingly, this type of research will not be conducted efficiently without cooperation by many research divisions.

Main research works at the Research Center shall be management of auxiliary areas, uniform cultivation for the purpose of regular experimental works and maintenance and management of irrigation and drainage canals, windbreaks, and windbreak-fences.

(b) Mechanization of Farm Management

Research works for mechanization division on the way of research on suitable crops are, for the time being, (i) mechanized production of feeds by cultivation of wheat and grass, (ii) uniform cultivation by mechanization at a testing block, (iii) construction, maintenance and management of glazing pasture, (iv) utilization of machinery to assist the experimental works in such fields as crop cultivation, soil improvement and conservation, and (v) study and training in operating technique of machinery, etc. Though these works are not gallant as research works, for the whole research activity these have a very important role to actively assist the experimental works which must precede others.

In the future when selection of suitable crops is promoted and some advancement is made in the research on soil improvement and conservation technique, there must be specific research subjects on mechanical application. Especially at the beginning of research works on technical application and experimental works, results of the abovementioned research works will be very useful and play the leading role in the research activity.

(c) Technology Assessment

It is technology assesment thet evaluates the techniques established and, controls poor influences before the extension to farmers, and then, plans a smooth introduction of technology to farmers and sound development.

Subjects concerned the said researches are devided into researches on techniques, actual experiment studies and evaluation for techniques.

The importance in the research on technical application was already discussed, however, it can be explained in more details as follows:

At the Block for Applied Test which is divided into three sections with different irrigation and draninage systems, results of research by various divisions are integrated, suitable technical systems are established and tests for technical application are conducted by mechanized method.

At the initial stage, experimental works on the basic pattern for "Wheat-forage lugumes" are conducted with results of research on soil improvement, irrigation and drainage methods are evaluated,

meanwhile cultivating method is improved, also irrigation and drainage methods are improved and integrated technical system is improved and established. Later when selection of suitable crops is promoted, the basic pattern is added with summer crops and vegetables, and thus the crop rotation is gradually improved with better technique. In short, in a close cooperation among divisions of irrigation, drainage, soil improvement, cultivating methods and mechanization, the major target of the research on technical application is to improve low-grade technique and establish integrated technical system with advanced technique.

As for the experimental research, it is expected that it is necessary to made experimental works with heavy-textured soil, and on the way of research on technical application it can be separately studied. Its research method will be almost the same as that of the research on technical application.

As for the research on evaluation of farm management, not only the research on technical application but also the actual condition of farmers' farm management must be surveyed, and data and materials for evaluation standard by using Central Processor Unit must be always prepared.

(d) Seed and Seeding Production Procedure

In Iran it seems that production and distribution of crop seeds is one of major works of agricultural research institutes, however, the proposed Center has not a sufficient area of land to carry out such services. Therefore, it is necessary to consider separately such an organization for production and distribution of crop seeds. For the Center it will be possible to produce seeds required only for the Center and field experimental works.

(e) Facilities Management

This is a very important work for operation of the Center.

It includes not only buildings and facilities of the Center but also maintenance and management of related machinery and equipment. It is necessary to secure a great number of personnel for handling and storage of harvested crops of large volumes, and personnel management is one of major important works.

(8) Branch Farm

There are three problems being considered difficult to carry out in the proposed Zahak Research Center. The first is clarification of problems on the soils of different textures than Zahak. Especially in Sistan plain more than 30% is covered with heavy-clay-textured soil, so the attainments of Zahak Agricultural Research Center cannot instantly be applied to micro-meteorological problem, salinity correction of soil, irrigation and drainage, crop cultivation, etc. Thus, these problems peculiar to heavy-clay-textured soil are desirable, from the view point of elevating research efficiency, to be investigated at the branch farm having been established. For these purposes, along the main water canals, being capable of earlier water conveyance, the most devastated area of heavy-clay-textured soil is to be secured. For the time of securing the site, when the water conveyance be made capable tens ha will be applied there.

As for the subjects of study here, the followings are considered:

(a) Efficient Salinity Correction Heavy-Textured Soil

This study aims mainly to find an efficient draining. Method of study will be the same as that of irrigation and drainage as well as of salinity correction, being used in Zahak Research Center. However, it is also necessary to investigate a mole drain as supplementary means.

(b) Soil Improvement

Sand and soil dressing, promotion of soil aggregation by applicating compost or lime, etc. are to be examined.

(c) Establishment of Mechanized Operation System

Improvements of mechanized operation in heavy-textured soil, such as mechanised operation of irrigation and drainage, mechanization of soil dressing, mechanization of crop cultivation, etc. are to be sought.

The second problem is a study that makes livestock an object. As mentioned in the paragraph "Study on Livestock Rearing," studies on animal feeding system and animal nutrition are difficult to practise within Zahak Research Center because of its dimensions, so the other area must be prepared for its realization. However, in this study there is no severe restriction for soil condition etc., the site may be put side by side within the aforesaid branch farm, so long as the condition to seek feeds be satisfied. The necessary dimensions will be decided according to the species and head of livestock.

The third problem is the study on land utilization and soil conservation. The study will be promoted mainly by repetition of research and operation. However, if the proper site be available, efficient study on execution, maintenance, management, etc. can be carried out. Moreover, it may be probable to study the second problem including the item of grassland utilization at the same site, And also concerning study on pasture and forest, various experiments may be planned as a task from livestock research side.

In any case it becomes necessary to establish a branch farm, it will be desirable to carry out full examination in the process of establishment of Zahak Research Center, and to make a choice of the optimum site.

3-3. RESEARCH PROGRAMME

Since the Research Centre is to be newly constructed in a new area, creation and utilization of testing blocks and construction of research facilities should nationaly be undertaken in stages. In addition, construction of buildings should be followed by installation of the equipment and instrument indispensable for actual research activities. Since such equipment and instrument also need to be installed in stages according to the research programme, it is not feasible to initiate all research and experimental activities simultaneously.

It is generally known that research equipment and instrument with higher accuracy are developed year after year. Research equipment and instrument are prone to become useless if they are kept in stock for two or three years after procured, and this tendency becomes more pronounced as the accuracy of equipment increases. Installation of the equipment and instrument should therefore planned and carried out in strict conformity to the research programe.

As regards the creation and utilization of testing blocks, it must be noted that in order for all testing blocks to be divided for simultaneous implementation of a diversity of basic experiments, any one block used for a basic experiment must be left for a period of about three years before it recovers the original soil fertility and be used for another kind of basic experiment. Therefore, strict control must be exercised in order to assure most effective utilization of testing blocks and in addition, it is an imperative to secoure a surplus testing area which is at least three times as large in acreage as the planned testing block area so as to meet the future additional requirement of testing blocks.

If the Research Center is to serve as the basis for agricultural development of Sistan plain, it should not be planned in such a way that all the divisions required for future progress of research activities are incorporated from the outset. If, again, the research activities are to be conducted with emphasis placed on the agricultural development of Sistan

plain, it is of prime importance to give consideration to the establishment of research divisions, installation of research facilities, equipment and instrument, as well as to the effective utilization of testing blocks in full conformity to the research programme to be executed in the immediate future.

This calls for careful selection of the kinds and types of initial stage research activities. In other words, it is of utmost importance to work out a research programme which is most likely to provide solutions for the most essential and fundamental problems facing the planned regional development and to attain full mutual understanding and coordination between respective divisions to that end.

Table-4 shows the research programm as mapped out on the basis of the above concept.

The activities of the Research Center should begin with collection of data which are required for formulation of the research implementation plan.

Data collection has two aspects. One is the collection and consolidation of data, and the other is the observation and survey. The former need not be conducted at site because it is preferable that respective specialized Departments collect the necessary data in any place where such data are most accessible. The latter, however, involves activities that must be done at site such as meteorological observation, soil survey and farm household survey. Divisions related to such observation and survey, i.e., 1-a, 1-c, 2-a, 2-b, 3-b, 4-a, 4-b and 7-a, are therefore required to make themselves ready for research activities and engage in the relevant surveys and observations from the outset.

Availability of data relating to agriculture in Sistan plain is extremely limited. Since it is probable that a great portion of the necessary data will not be produced by the surveys conducted in Sistan plain alone, all the pertinent Departments will be required to conduct surveys and observations

in other areas of Iran or foreign countries resembling Sistan plain in natural as well as socio-economic conditions.

This should naturally be followed by the formulation of a research implementation plan by each Department. It must be noted here that priority should be given to the research activities of those Departments which are responsible for the most important and fundamental problem, i.e., land preparation for improving the soil productivity to attain accelerated agricultural production centering upon wheat (improvement of irrigation and drainage facilities and soil improvement) and selection of crops suited to rotation (forage legumes for some time to come). For this reason, initial stage effort should be directed towards establishment of a system under which the Departments responsible for irrigation and drainage, soil improvement, crop selection and cultivation, and grass and animal husbandry will be given priority over other Departments in their research activities. These Departments are required to tackle the above-mentioned problem before anything else, and this is the indispensable prerequisite to early initiation of research activities of other Departments. Conversly speaking, these Departments are not required to expedite the initiation of individual research works which are not closely related to the functions of other Departments. For this reason, early establishment of research system is desired for Departments 3-a, 3-b, 3-c, 3-d, 2-c, 2-d, 2-e, 4-c and 7-b as well as 4-a, 4-b and 7-a.

Needless to say, Departments like 9-b, 9-d and 9-3 which will provide the above-mentioned Departments with necessary assistance and services must be fully equipped and ready in the initial stage. Further, division 9-c which is responsible for technology assessment must make preparations necessary for this purpose in the initial stage.

It is planned that the initial stage will witness the completion of the research implementation plan to be executed to bring "solution for the fundamental problem" which will be the common objective of all the aforementioned Departments. It follows, therefore, that the conditions under

which the second stage research activities can be filled when uniform culture is almost completed by some farm experiments conducted by mutual cooperation between these Departments.

When the aforementioned fundamental problem (selection of optimum crops and land preparation) is brought to light in a substantial degree, conditions for starting research activities relating to vegetables (5-a) and forage crops (8-b) will be satisified. Accordingly, need arises in the second stage to establish the research system for studying the effect of wind on these crops (1-b) and for drawing up wind-protective measures (7-c) and land use plan (9-a).

Researches in the fruit tress (5-6) call for many years of preparations including supply of seedlings before planting. Although establishment of fruit tree research system must be taken into account from the beginning it may be safely said that actual research activities will not be started until the third stage because fruit trees call for no consideration of crop rotation.

As regards plant protection (6-a, 6-b and 6-c), subjects of research activities cannot be determined until production is set fairly afoot so that surveys will be continued for a considerably long time in future. However, it is of course necessary to plan the research system from the outset and put it in operation in the third stage.

In the aspect of livestock farming, the research system of the sector relating to grass and grassland (8-a) must be established in the initial stage after the prospect of livestock introduction and feed supply is made clear.

As for other sectors (8-c and 8-d), final determination will have to be made in the third stage after studying whether branch farms should be created to prompt research activities.

As discussed earlier, researches for improvement of heavy-textured clay soil (2-t) calls for additional branch farms. Creation of

such additional branch farms should be reviewed together with that of branch farms for livestock farming.

Table - 4 Research Program

Research Subjects	Research Program I	II	III stage	Department
1. Climatic Environment				Soil and Water Research
a. Meteorological	O	O	O	
b. Influence of wind on plants		O	O	
c. Evaporation loss	O	O	O	
2. Soil and Water				
a. Soil survey	O	O	O	
b. Water analysis	O	O	O	
c. Saline soil amendment by leaching	O	O	O	
d. Improvement of alkalization	O	O	O	
e. Soil fertility build-up	O	O	O	
f. Improvement of hevy textured soil			O	
3. Irrigation and Drainage				
a. Consumptive use of water	O	O	O	
b. Irrigation method	O	O	O	
c. Irrigation system	O	O	O	
d. Drainage	O	O	O	
4. Crop Cultivation				Seed and Plant Research
a. Selection of suitable varieties of crops	O	O	O	
b. Crop cultivation method	O	O	O	
c. Crop rotation	O	O	O	
5. Horticulture				
a. Vegetables		O	O	
b. Fruits			O	
6. Plant Protection				Plant Diseases and Peste Research
a. Insect and insecticides			O	
b. Disease and fungicides			O	
c. Weed control			O	
7. Pasture and Forests				Pasture and Forest Research
a. Establishment and management of pasture	O	O	O	
b. Improvement and conservation of range land	O	O	O	
c. Forests trees and windbreaks		O	O	
8. Grassland utilization and Animal production				Livestock and Animal Production Research
a. Utilization of grassland	O	O	O	
b. Feeds resources		O	O	
c. Animal feeding system			O	
d. Animal nutrition			O	
9. Technical Services and Farm Management				Technical Service and Farm Management
a. Planning of land use		O	O	
b. Mechanization of farm management	O	O	O	
c. Technology assessment	O	O	O	
d. Seed and seeding production procedure	O	O	O	
e. Facilities management	O	O	O	

4. PLAN OF FACILITIES

Main facilities to be constructed for the Research Center will include such items as experimental farms, office, research laboratories, engineer's houses, staff's houses, guest house, club house and welfare facilities etc.

Among these facilities the experimental farms, office, research laboratories, staff's houses, club house and welfare facilities are to be constructed at the site of about 100 ha, which the Government of Iran expropriated for Zahak Agricultural Research Center near Zahak village in the upstream area of Sistan River. On the other hand, the guest house, engineer's houses and some welfare facilities will be constructed at the site of about 10 ha of Zabol Agricultural Office in Zabol City.

Land areas of the main planned facilities are as follows:

(1) Zahak Agricultural Research Center

(a)	Areas of experimental farms	: 63 ha
	(i) Block for basic tests	: 16 ha
	(ii) Block for applied tests	: 32 ha
	(iii) Block for pasture productivity tests	: 15 ha
(b)	Areas of Office, research laboratories, staff's houses, club house and welfare facilities	: 12 ha
(c)	Roads, Ditchs, green zone	: 19 ha
(d)	Others	: about 6 ha
	Total	: about 100 ha

(2) Zabol Agricultural Office

(a)	Engineer's houses, guest house and welfare facilities	: 7 ha

(b) Others : about 3 ha

Total : about 10 ha

4-1. EXPERIMENTAL FIELD

The present condition of the site for the Research Center is that about 80% (about 80 ha) of the total area is flat, part of which is cultivated area and for the most area is wasteland. The other area of about 20% (about 20 ha) includes a small hill at the southeastern corner, and some farmhouses were scattered partly in this area.

The experimental farm is arranged extensively over the flat land. The small hilly area will be used for building of office, research laboratories, staff's houses and welfare facilities.

The standard unit area of experimental farm is to be 2.0 ha (100 m x 200 m) and the total area is 63 ha.

The experimental farm consists of 5 blocks; one of them is basic tests, three are applied tests and the other one is pasture productivity tests.

Along the long side of the standerd unit area of experimental farm, roads, irrigation and drainage canals and incidental facilities are to be constructed. The incidental facilities include irrigation water supply valves and gates installing at the outlet of tile-drain etc, which can be done respectively control of the irrigation and drainage water.

(1) Block for Basic Tests

The block for basic test is located at the southeastern part of the site for the experimental farm. The site for basic test is selected at the place which is near farm ponds, research laboratories and the office in order to performed the basic tests at this site, and as a matter of convenience water use, immediately responded for the activity at the

site. This block of 16 ha is arranged by basic tests area, the lysimeter, experimental framed lot and meteorological facilities which are to be provided in the area of about 4.0 ha.

(2) Block for Applied Tests

This farm is located at northern and western parts of the site for the experimental farm, occupying an area of about 50% of the total area of the experimental farm and situated along the existing irrigation canal diverted from the Shahr Canal along the northern edge of the Research Center.

(3) Block for Pasture Productivity Tests

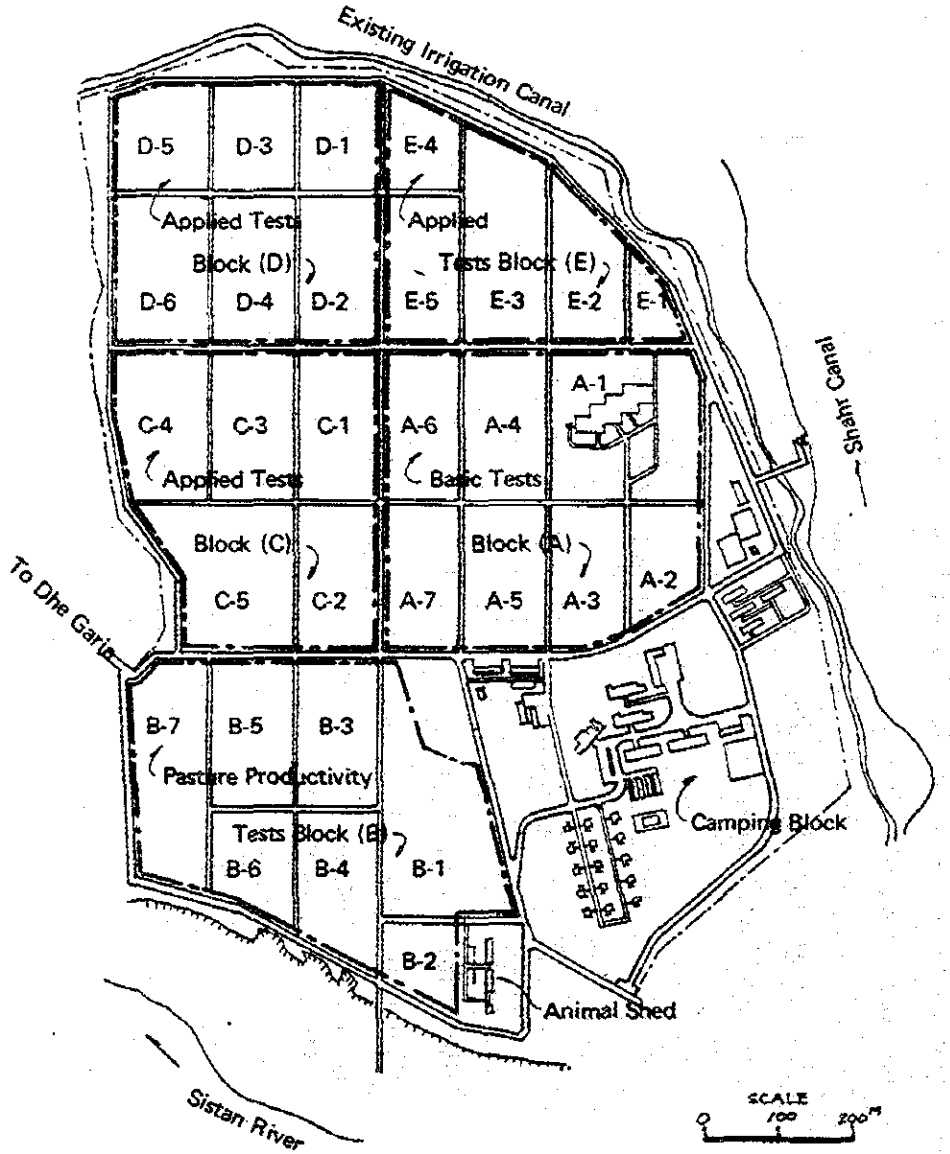
This farm is located at the southern part of the site for the experimental farms, part of which is located along the right bank of Sistan River. The existing local road situated along the central part from east to west in the site will be replaced outside of the Research Center along Sistan River.

Number of lots, basic test area, applied tests area, and pasture productivity test area are shown as Table-5;

Table- Scale of Experimental Farm

Name of Experimental Farm	No. of Block	No. of Lot	Total Area ha	Remarks
Block for Basic Tests	1	7	16	A
Block for Applied Tests	3	16	32	C.D.E
Block for Pasture Productivity Tests	1	7	15	B
Total	5	30	63	

Fig. -1 Plan of Experimental Farm



Block for Basic Tests (A) 16 ha

A-1	4.4 ha	A-5	2.2 ha
A-2	1.3	A-6	2.0
A-3	1.9	A-7	2.0
A-4	2.0		

Block for Applied Tests (C) 12 ha

C-1	2.0	C-4	2.6
C-2	2.0	C-5	3.4
C-3	2.0		

Block for Applied Tests (D) 11 ha

D-1	1.5	D-4	2.0
D-2	2.0	D-5	1.8
D-3	1.5	D-6	2.6

Block for Applied Tests (E) 9 ha

E-1	0.7	E-4	1.3
E-2	2.0	E-5	2.0

Block for Pasture Productivity Tests (B) 15 ha

B-1	3.8	B-5	2.2
B-2	1.0	B-6	1.4
B-3	2.0	B-7	3.0
B-4	2.0		

4-2. CAMPING FACILITIES

4-2-1. Zahak Agricultural Research Center

Facilities to be constructed at the Research Center includes buildings such as office, research laboratories, staff's houses and club house etc. as well as experimental field mentioned in 4-1, and also related facilities such as water supply system, sewerage system, power supply system, telephone facilities and such welfare facilities as tennis court, volley ball court, swimming pool and green zones.

Main description of these buildings and facilities is given in the following paragraphs:

(1) Buildings

In consideration of the special weather conditions of Sistan plain, buildings such as office, research laboratories, staff's houses and club house are to be built by all of the single-storey houses according to architecture in Iran.

Foundation of buildings is to be constructed of reinforced concrete, and pillars and ceiling beams shall be of H-steel beam. The ceiling and side walls are to be made of H-steel beams covered with bricks, of which surfaces be finished with mortar and paint.

The size of windows is to be made as small as possible to prevent high temperature wind blowing into rooms in summer. Especially windows of office, research laboratories and staff's houses shall be fixed about 60 cm inside from the outside wall of the buildings to prevent the direct sunshine and sand and dusts blowing into rooms. Frames for these windows are to be made angle steel and flat steel specially processed at the site.

Buildings in the Research Center are listed in Table-6. Detailed design of buildings are shown on drawings, Appendix.

Table-6 Plan of Building in ZAHAK Agricultural Research Center

Name of Building	Structure	Number	Floor area m^2	Remarks
Office	S. B	1	740	Director's R.(1), Administration(1) Conference R.(1) and Engineer's R.(6) etc.
Laboratory	S. B	4	3,400	Research R., Laboratory, Weight R., Draft R. and Chemical Storage R. etc.
Club House	S. B	1	560	Dining R., Kitchen, Sports R. and Bed R. etc.
Staff Residence	S. B	15	1,800	2 Bed Rooms, Living R. and Kitchen etc.
Exhibition Hall	S. B	1	430	Exhibited Data and Panels etc.
Green House	S. G	3	630	
Garage	S. A	1	210	
Farm Equipment Shed and Repair Shop	S. A	2	590	
Ware-house	S. A	3	900	
Farm worker's Assembly House	S. B	1	250	
Labour's Quater	S. B	4	1,300	
Generator House and Pumping Station	S. A and S. B	3	460	
Animal Shed and Store House for Hay	S. A	4	1,040	
Gate Keeper's House	S. B	2	40	
Silo	S. B	7		
Total		52	12,350 m^2	

Note: S. B; Steel Frame with Brick
S. G; Steel Frame with Glass
S. A; Steel Frame with Corgated Asbestos Cement Boad and Brick
R; Room

(2) Water Supply

(a) Water Intake Facilities

The source of water supply to the Research Center is to be dependent upon the Shahr Canal beside the eastern edge of the Research Center area.

The Shahr Canal is diverted from a existing Zahak barrage in Sistan River, to supply irrigation water to Posht-Ab area in Sistan Plain and also drinking water to Zabol City in a comparatively stable condition. Therefore, the location of water intake is selected at a place about 1 km downstream of the beginning point of Shahar Canal.

Two pumps are to be used for water intake from the canal; a pumping station and its related facilities are to be installed for this purpose.

Water pumped up at the pumping station is to be once reserved at the farm ponds which are to be also as water discharge tanks. Two farm ponds are to be constructed; effective reservoir capacity of each pond is to be 1,000 m^3, and both ponds are to be mutually connected.

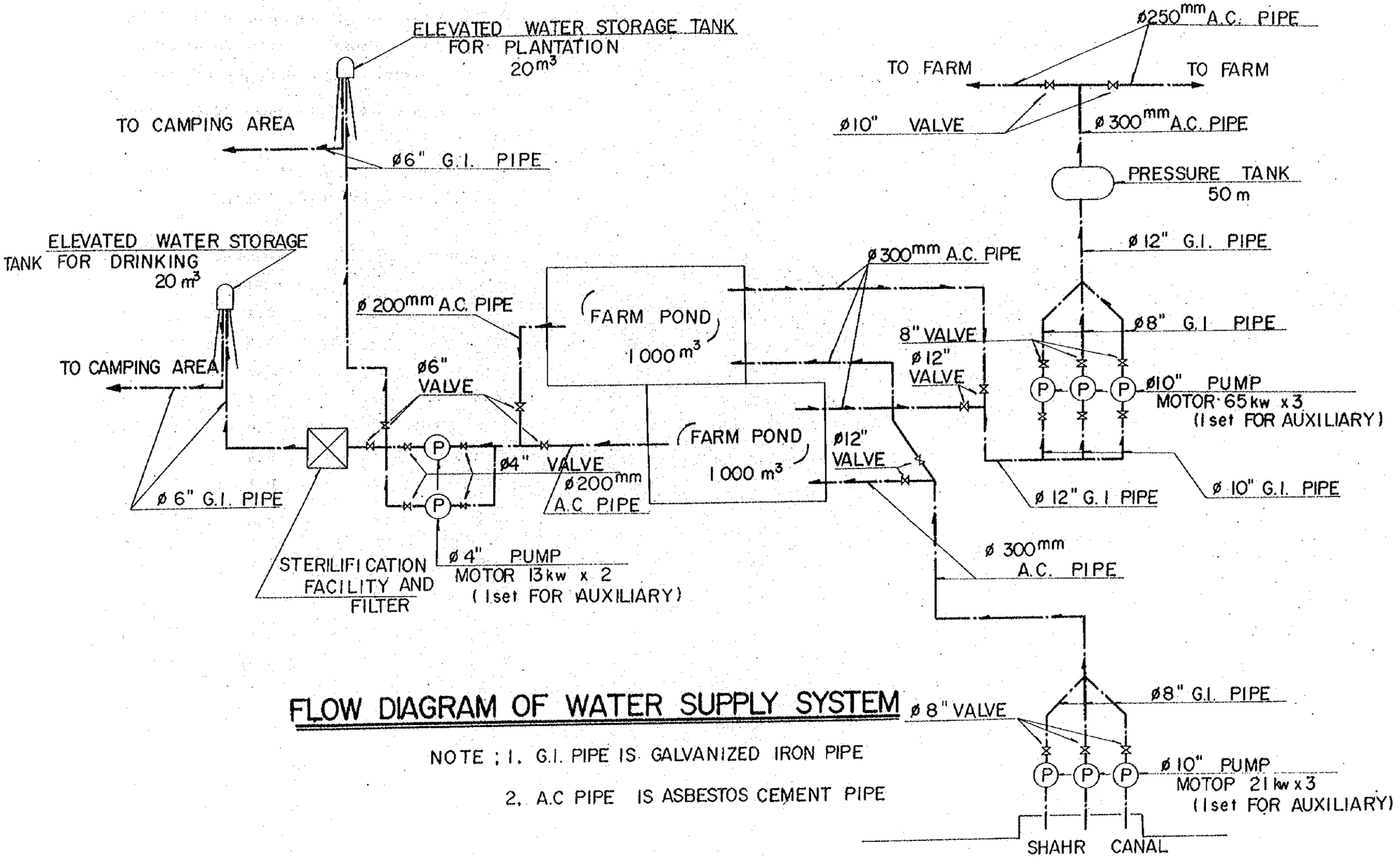
Required capacities of pumps of this water intake facilities are mentioned in the irrigation facilities of the experimental farm, Paragraph 4-3, (1).

(b) Water Supply System

Water supply system of the Research Center consists of two systems; one for irrigation water to be supplied to experimental farms and the other for drinking water to be supplied to office, research laboratories and staff's houses etc. and water to be supplied to green zones. Water for these purposes to be pumped up and pressurized from the farm ponds.

Plan of water supply system is shown as Fig. -2

Fig. - 2 Water Supply System



FLOW DIAGRAM OF WATER SUPPLY SYSTEM

NOTE ; 1. G.I. PIPE IS GALVANIZED IRON PIPE

2. A.C PIPE IS ASBESTOS CEMENT PIPE

(c) Drinking Water and Related Facilities

Drinking water is to be pumped up with pressure from farm ponds, purified and pumped up to the elevated water tank at a higher place in this Research Center. Water to be supplied to the buildings through the pipe lines by gravity flow system.

Available drinking water is shown as Table - 7:

Table - 7 Plan of Water Supply for Drinking in ZAHAK Agricultural Research Center

	Quantity m^3/day	Number of Building	Amount m^3/day	Remarks
Office	1.0	1	1.0	
Laboratory	2.0	4	8.0	
Club house	5.0	1	5.0	
Staff Residence	1.0	15	15.0	
Exhibition Hall	0.2	1	0.2	
Green House	2.0	3	6.0	
Garage	1.0	1	1.0	
Farm Equipment Shed and Repair Shop	0.2	2	0.4	
Ware-house	0.1	3	0.3	
Farm Worker's Assembly House	0.1	1	0.1	
Labour's Quater	2.0	4	8.0	
Animal Shed	10.0		10.0	
Miscellaneous			5.0	
Total			60.0	

For the purpose of water supply to the buildings, it is planned to construct such main facilities between farm ponds and the buildings as pumping facilities to supply water from farm ponds to water tanks, filter facilities, water supply tanks and supply pipe lines; outline of these facilities is as follows:

(i) Pumping Facilities

Suction water level	: EL 94.0 m
Delivery water level	: EL 120.0 m
Discharge	: 1.34 m^3/min. /per pump
Actual head	: 26.0 m
Total head	: 32.0 m
Type	: centrifugal pump
Diameter	: 100 mm
No. of pump	: 2 (one is for stand-by use)
Motor output	: 13 kw/pump
No. of motor	: 2 (one is for stand-by use)

(ii) Elevated Water Storage Tank and Pipe Line

The capacity of the elevated water storage tank for drinking water is 20 m^3, which is to be used three times a day for the total supply amount of 60 m^3/day for the buildings. The tank is of sylindrical steel construction, and installed 20 meters higher the ground. The supporters of the tank are of steel truss construction. Pipes for water supply system are galvanized steel pipes, and its total extension is of 2,540 meters.

(iii) Operation of Pumps

Pumps for water supply to water tanks are to be operated by the motor with power supplied constantly by the private generator. In operation of pumps, values of the upper limit and the lower limit of water level in the tanks are detected, given to the motor of the

supply pump, and the pump is stopped at the upper limit water level and started at the lower limit water level. Therefore, the motor to automatically start or stop with signals "ON" or "OFF" to be given by the fluctuation of the water level in the water tanks.

(d) Water for Green Zone and Related Facilities

Water for green zones is to be used for irrigation of plants on both sides of roads and also plants arranged around the buildings and other area in the Research Center.

System of irrigation is the same as the drinking water supply system; water is pumped up from farm ponds and supplied to the tank (capacity of 20 m^3) for irrigation of plant, however this water is not purified. Irrigation water is to be supplied to plants through pipe lines by gravity flow system. The pipe line is to be made of asbestos cement with its total extension of 3,840 meters.

If the total area of irrigation is 10 ha and the peak irrigation water depth is 5mm/day, the maximum water amount required for irrigation is, 10ha x 5mm/day = 500 m^3/day. Where, if irrigation is continued for 5 days and the duration of irrigation is 8 hours, then water is to be supplied for 2 ha per day with 19.4 litre/sec. (500 m^2/day/8 hr x 0.9 x 3,600 = 19.3 litre/sec.) A hydrant is provided for every area of 0.2 ha (sprinkling radius is about 25 m), and diameter of valve is 50 mm. Feed water capacity of hydrant is about 7.0 litres/sec. with the terminal pressure of 0.6 kg/cm^2.

(3) Sewerage

Sewage disposal system at the Research Center is to be the natural septic system generally adopted in Iran. In this system, sewage is collected into a decomposition tank and disposed of by natural septic process together with application of chemicals.

The septic tank has a capacity of 200 m^3, with reinforced concrete construction, and is to be installed in the edge of the animal shed.

Sewage from office, research laboratories, staff's houses and other sections is to be conveyed through the pipe culvert of asbestos cement pipe (extension of 3,400 m) to the septic tank, and to be drawn into Sistan River. However, special sewage including heavy metals exhausted by research laboratories is to be disposed of a special tank of reinforced concrete constructed somewhere near the laboratories.

(4) Power Supply

The Research Center provides with private power generating facilities for its own exclusive use.

The facilities include four units of 125 kVA Diesel generators to supply power to the area of the Research Center for 24 hours a day.

A special apparatus to control the voltage fluctuation within the allowable range is to be equipped to measuring instruments at the research laboratories etc.

Power supply capacity is estimated as follows:

(i) Power Supply for Lighting

Name of Building	Floor area of Building m^3	Lighting kw	Number of Telephone
Office	740	5.0	10
Laboratory	3,400	48.0	40
Club house	560	5.0	5
Staff Residence	1,800	37.5	15
Exhibition Hall	430	1.0	3
Green House	630	3.5	3
Garage	210	0.8	-

Name of Building	Floor area of Building m^3	Lighting kw	Number of Telephone
Farm Equipment Shed and Repair Shop	590	3.5	3
Ware-House	900	5.0	3
Farm Worker's Assembly House	250	1.0	1
Labour's Quater	1,300	20.0	1
Generator House and Pumping Station	460	1.3	1
Animal Shed and Store House for Hay	1,040	7.0	8
Street Lamp	130 lamps	36.5	-
Miscellaneous		4.9	7
Sub-total		180.0	100

(ii) for Water Intake Pumps

for two motors	:	42 kW
for auxiliary units & others	:	3
Sub-total	:	45 kW

(iii) for Farm Irrigation Pump

for two motors	:	130 kW
for auxiliary units & others	:	5
Sub-total	:	135 kW

(iv) for Water Supply & Plant Irrigation Pumps

for one motor	:	13 kW
for auxiliary units & others	:	2
Sub-total	:	15 kW

(v) for Others

Sub-total : 25 kW

Grand Total : 400 kW

Accordingly, the power supply system makes four-split system with consideration of differences in power demand during daytime, night and at the peak demand in the evening. Such related facilities as fuel tank, control panel and auxiliary units are to be provided.

All of outdoor power distribution lines is provided underground cable system in consideration of preventing troubles caused by strong wind, sand and dusts, and the total extension is of 3,850 meters.

(5) Telephone

For the telephone communication within the Research Center, automatic dialing system is adopted among office, research laboratories, staff's houses and meteorological station. Meanwhile, as for the communication with Zabol Agricultural Office, overhead telephone line (2 circuits) is to be installed for the distance of about 20 km between the Research Center and Zabol Agricultural Office. Official telephone communication from the Research Center connects with Zabol City and other areas through the switch board to be installed at Zabol Agricultural Office.

It is planned to provide 100 telephone circuits including stand-by lines at the Research Center, and the details of number and location of telephone sets are shown in (i) Power Supply for Lighting in (4) Power Supply. Outdoor telephone lines to be provided in the Research Center area is all underground . cable system the same as the power distribution line, and its extension is of 2,300 meters.

(6) Welfare Facilities

As welfare facilities for the staff members and their families of the Resear Center, it is planned to construct 2 tennis courts, a volley ball court, a swiming pool (25m x 7 courses) and green zones.

. As for the swimming pool, its side walls and the invert section are to be constructed of reinforced concrete with feed water facilities, underwater lighting facilities and drainage facilities. The drainage facilities is to be connected to the main sewage pipe line.

4-2-2. Zabol Agricultural Office

As part of the facilities for Zahak Agricultural Research Center, it is planned to construct in Zabol Agricultural Office; guest house, engineer's houses, welfare facilities and related facilities such as water supply facilities and sewage disposal facilities.

The main reason why these facilities are to be arranged within the area of Zabol Agricultural Office is that the Government of Iran requested such a plan and also due to located Zabol Agricultural Office in the Zabol City it would be convenient for the staff concerned for education and medical care of their children and be easier for them to communicate with organizations concerned. The these facilities are described as follows:

(1) Building

Buildings to be constructed in the area of this Agricultural Office are the same as architecture of the buildings at Zahak Agricultural Research Center, to be single-storey house.

Buildings in the Zabol Agricultural Office are listed in Table - 8 . Detailed design of buildings are shown on drawings, Appendix.

Table - 8 Plan of Building in
ZABOL Agricultural Office

Name of Building	Structure	Number	Flow area m^3	Number of Telephone	Remarks
Guest House	S.B	1	1,190	15	Dining R., Bar, Sports R. and Guest R. etc.
Engineer's house	S.B	20	3,300	20	Three Bed Rooms (10) Two Bed Rooms (10)
Gate Keeper's House	S.B	1	20	1	
Pumping Station	S.B	1	7	-	
Cabin with Shower	S.B	1	150	1	Shower R., Dressing R. Pump R. and Sterilization Facility etc.
Miscellaneous				3	
Total		24	4,667	40	

Note: S.B; Steel Frame with Brick
R; Room

(2) Water Supply

At present, drinking water at the Agricultural Office is supplied by the municipal water supply system in Zabol. However, the water pressure is very low, and it is afraid that water supply cannot be made satisfactorily to the buildings by more connection of new pipes to the existing water pipes. Therefore, in order to supply enough amount of water to new buildings, city water is reserved in the water tank to be installed in the area of the Agricultural Office is pumped up to the eleveted water storage tank distributed to the buildings.

The capacity of the water tank is 20 m^3, and the tank is of reinforced concrete construction. The water tank is installed at a level of 20 meters above the ground, and its type is the same as the elevated waterstoragetank to be installed at Zahak Agriand is distributed to the buildings.

(3) Sewerage

Sewage disposal system at this Office is the same as that of Zahak Agricultural Research Centre.

Disposed sewage is to be exhausted to the drainage canal, which is constructed around the site with the following reason.

At present, drainage system is not satisfactory in the site of Zabol Agricultural Office and it is poor drainage especially at the site for Proposed engineer's houses. Therefore, as there are some problems about pipe culvert and fundation of building, the ground surface of the site to be filled by soil of one meter, and a drainage canal is open type. This drainage canal is used for also drainage from inside the site as well as prevention of inflow of underground water from outside of area. This water is to be drained to the

drainage canal which will be constructed for Sistan irrigation and drainage project.

(4) Power Supply

The power supply conditions for the Agricultural office building are unlike Zahak Agricultural Research Center, this Agricultural Office can be received power supply from a public power supply source of Zabol City.

Although a private generating equipment is to be installed at Zahak Agricultural Research Center, this Agricultural Office to not be provided with any private generating facilities, and only a sub-station to receive power from the above-mentioned public utility to be provided.

(5) Telephone

The telephone communication system inside the Agricultural Office to be the same as that of Zahak Research Center, and communication to be available among rooms of the guest house, engineer's houses and other facilities. Meanwhile communication system between this Office and Zahak Agricultural Research Center to be automatic dialling telephone system. On the other hand, telephone communication among the outside (Zabol City area and other areas), Zahak Research Center and Zabol Agricultural Office to be available through the exchange is installed in the club house (an operator is required).

(6) Welfare Facilities

As for welfare facilities, like those of Zahak Agricultural Research Center it is planned to construct such main facilities as 2 tennis courts, a volley ball court, a swiming pool (25m x 7 courses) and a children's recreation ground. This recreation

ground. This recreation ground to be provided with swings, see-saws and slides etc.

As a green park is under construction near this site, it is expected to be benefitted with a better living environment.

4-3. FARM FACILITIES

As formerly mentioned objectives and subjects on the research, some indoor-scale experiments and studies are to be carried out in connection with various farm experiments in the field.

Therefore, a careful consideration is given to the facilities of experimental farm to carry out the experiments easily and exactly. The major facilities in experimental farm are of irrigation and drainage, lysimeters, testing framed lots, meteorological observating equipments and ground-water level observating wells.

The facilities and their layout in a standard farm are shown in Fig.-3.

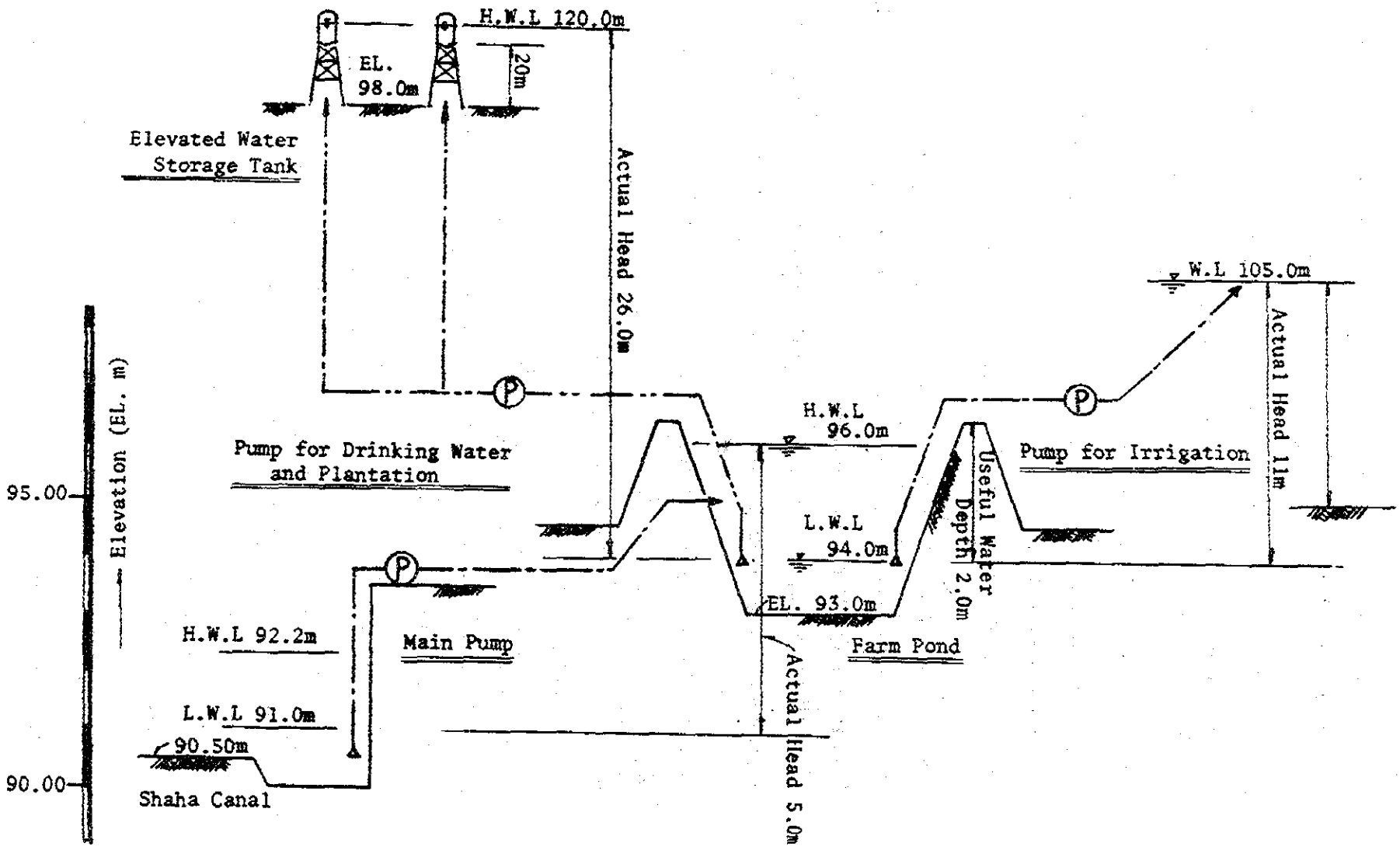
(1) Irrigation

As a result of study on two drafts which has an open-canal system and a pipe-line system, a pipe-line system has been adopted because of both easier water management and less water-conveyance loss.

The pipe-line system consists of two main pipe-lines, branch pipe-lines and a pressure pump. The branch pipe-lines branch out with a interval of 200 meters along the main pipe line, and is to be provided along the long side of the standard unit area of experiment farm.

Water to the experimental farm is to be supplied by four hydrants equipped every 50 meters along on the blanch pipe-line,

Fig. 3 Profile of Water Supply Facilities



and the water pressure is to be 1 kg/cm^2 at terminal point. The hydrant has an angle valve with an inside diameter of 75 mm and available supply capacity of about 10 liters per second.

Then, stop valves and accumulating current meters are to be equipped at the branching point of main pipe-line. At the lowest part of pipe line and lower sites of longitudinal profile, sand-and-mud removal devices are to be provided, and air valves are to be equipped at the higher part in pipe-lines. Sand-and-mud removal water are to be available to irrigate the wind breaks which are planted along the circumferences of standard unit area of experimental farm.

The layout and attached equipments of pipe-lines are shown in the attached drawings.

In case of selection of pipe-line's materials, asbestos-cement pipes are to be desirable as a result of study on reinforced-concrete pipes, polyvinyl-chloride pipes and asbestos-cement pipes. The diameter and extention of asbestos-cement pipes are shown in the following table.

Table -9 Pipe-lines for Irrigation

Inside diameter of pipe (mm)	Extension of pipe (m)
100	3,300
150	1,400
200	600
250	1,300
300	100

In case of sprinkler irrigation, portable pressure pumps are to be installed in the applied testing blocks and the grass productivity testing blocks.

Water using for irrigation is to be measured by the accumulating current meter equipped on the pipe-line, but as for detail measurements of water flow on irrigation tests, it is to be measured by portable metering sets fixed at hydrants. The portable measuring equipment is available used, in case of surface irrigation test is a parshall flume and triangulation weir, and surface irrigation test is an accumulating current meter.

(a) Water-intake pump

A method of water-intake from Shahr Canal is mentioned in the paragraph (2)-(a) of 4-2-1.

The outline of pumping facilities is as follows;

(i) Water-intake pumps

Suction water level	;	EL 91.0 m
Delivery water level	;	EL 96.0 m
Discharge	;	8.4 cub.m/min/unit
Actual head	;	5.0 m
Total head	;	9.0 m
Type	;	Centrifugal pump
Inside diameter	;	250 mm
Number of pumps	;	3 units including 1 unit for emergency
Capacity of electric motor	;	21 kw per unit
Number of motors	;	3 units including 1 unit for emergency

The above-mentioned suction water level of EL 91.0 m is estimated on the basis of EL 91.40 m of the proposed water intake site on Shahr canel water level surveyed in February 1975, and be basis of the data of the pumping station (the same as location in above pumping station) at the higher part of upper Posht-Ab area which was reported in "Sistan Water Utilization Project Feasibility

Report, Appendix II, Feb., 1971.

According to the above Report, the suction water levels of Pumping Station were HWL 488.19 m (92.23 m converted with BM of the land surveying map in this Research Center) and LWL 487.39 m (91.43 m converted) in the higher part of Upper Posht-Ab area, and the level of river bed was 486.50 m (90.54 m converted).

(ii) Supply pumps for irrigation

The outline of pumping facilities which convey irrigation water from a farm pond to experimental farm through pipe-line system are as follows;

Suction water level	;	EL 94.0 m
Delivery water level	;	EL 105.0 m
Discharge water volume	;	7.8 cub.m/min/unit
Actual head	;	11.0 m
Total head	;	35.0 m
Type	;	Centrifugal pump
Inside diameter of pump	;	250 mm
Number of pumps	;	3 units including 1 unit for emergency
Capacity of electric motor	;	65 kw per unit
Number of motors	;	3 units including 1 unit for emergency

Water levels on Shahr Canal concerning to the water-intake facilities, the available range of water levels at a farm pond and the relation between these main structures are shown in Fig.-4.

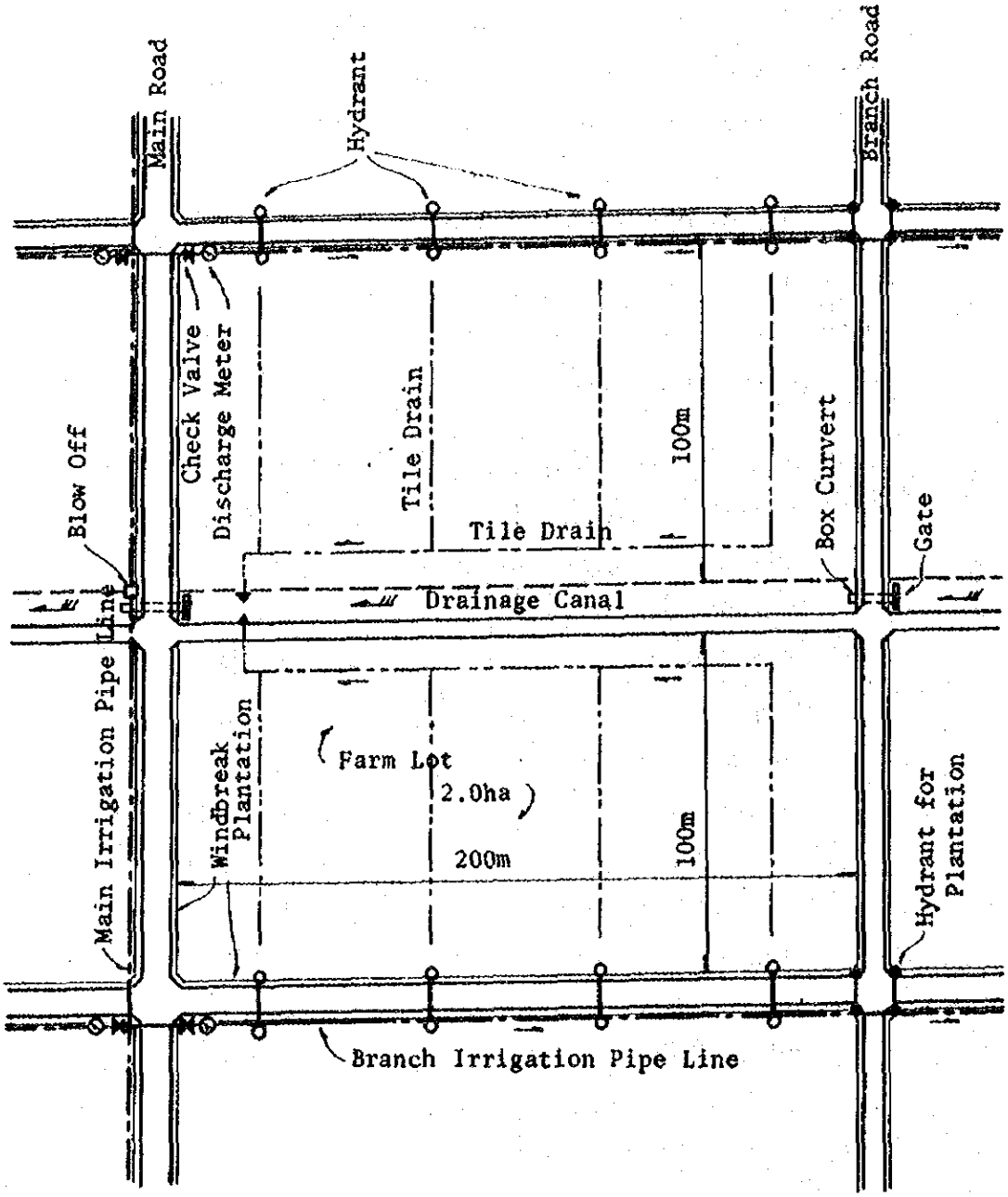


Fig. 4 Plan of Farm Facilities

(2) Drainage

The drainage system in the standard unit are of experimental form has an open canal and a tile-drain: the former is to be constructed along the long side of the farm with 200 m space, and the latter is to be established underground with interval of 50 m in parallel, and collecting underdrain is established with one place per a standard unit area of experimental farm in the farm for drainage of ground-water into the open canal. And portable water flow-meter equipment is to be set up to measure drain water volume at the exit of collecting drain. Poly-Vinyl-Chloride multi-hole pipe of 100 mm is desirable to use as drain's materials. The pipe construction criterion is shown on drawing, Appendix.

Drainage open canals are confluent successively and are formed finally one canal at the Pasture productivity testing block, then drainage water flows into Sistan river.

The open canals having the cross-section of side-slope of 1 : 1 are earth channels. As for prevention of weeds, stabilization of the canal structure and measurement of drain water from the experimental farm, concrete lining is to be placed at some part of 60 cm the sides of canal section.

At the crossings of open canals and roads, pipe-drains are to be installed underground, and the gates are to be set up for control of drain water at the upper reach sides of crossing.

Regulation of groundwater-levels in the experimental farm with man-made control of the open-canal water-levels will be convenient for various tests and experiments. Open canals will have the total extension of 3,200 meters.

(3) Meteorological observation

The site of meteorological station at the middle of the

experimental farm is to have the area of 0.2 ha. and the site will be established in the block for basic test.

To prevent radiant-heat reflection from the ground surface, the site of 0.2 ha is to be grassed.

The measuring items on meteorological observation are air temperatures, humidity, ground temperatures, wind velocities, wind directions, sunshine duration, radiation, evaporation and precipitation.

As regards methods for the measurements and selection of observation equipments, if possible, it is desirable that automatic measuring equipments and automatic data-processing control device will be installed.

Otherwise, data measuring instruments, detector, receiving device and data-processing apparatus with many kinds of electronics products will be somewhat reformed, on account of the severe climatic conditions in Sistan plain. Therefore, the equipments which actual results of use in Iran should be selected in the initial operating stage of the Research Center, then, new-improved equipments will be successively introduced to this Center for perfect automaticity of data-recording-processing system in future.

(4) Lysimeter and Experimental Framed Lot

(a) Lysimeter

A purpose of installation of Lysimeters in the testing block is to carry out fundamental researches and studies such as water balance and salinity balance including transpiration for soils and crops under Sistan's severe climatical conditions.

The size and dimensions of one block of Lysimeter are 3.0 meters length x 3.0 meters width x 2.0 meters depth x 6 frames,

and one set of Lysimeter consists of two blocks. According to the program, Lysimeters of four sets with reinforced concrete are to be constructed.

(b) Experimental Framed Lot

The main purpose of the concrete testing frame is to carry out fundamental researches and studies on nutrition balance of field crops under various soil conditions. The size and dimensions of one set of testing frame are 10.0 meters length x 5.0 meters with x 2.0 meters depth x 6 frames, and 4 sets of the testing frames having reinforced concrete are to be constructed. Two sets are with the bottom, but other two sets bottomless.

(5) Observating well

A purpose for the establishment of observating well is to measure variations of groundwater level in the experimental fram.

It is taken into account that variations of groundwater level in the farm depends upon the following three factors; the first factor is the water levels on Sistan river, the second factor is the water levels on Shahr Canal and the third factor is irrigation water amount in the farm. Therefore, the above-mentioned three variations should be measured together with the observation of groundwater levels at the same time.

The observating wells have the two kinds of wells to look for the ground-water levels in the whole experimental farm and the influence of tile-drain prepared every 50 meters space in the farm.

The former wells are to be arranged as one well per 4.0 ha in the farm, and 4.0 meters depth, the latter wells will be provided at three sites under different soil conditions in the whole farm, and one set of the latter well consist of nine tubes.

This arrangement is shown on the drawing, Appendix.

4-4. MISCELLANEOUS

(1) Road

In order to secure traffic and convenience in the site of the Agricultural Research Center, two different road systems are to be adopted. One of them is for road in experimental farms; the surface is to be paved with gravel for the convenience of traffic of agricultural machinery. On the other hand, road around the office, research laboratories and staff's houses are to be paved with asphalt concrete for the safety and comfortableness of automobile traffic. In this road system, the center of road is a driveway, with promenade of 2.0 meters on both sides and also green zones of 2.0 meters on both outsides.

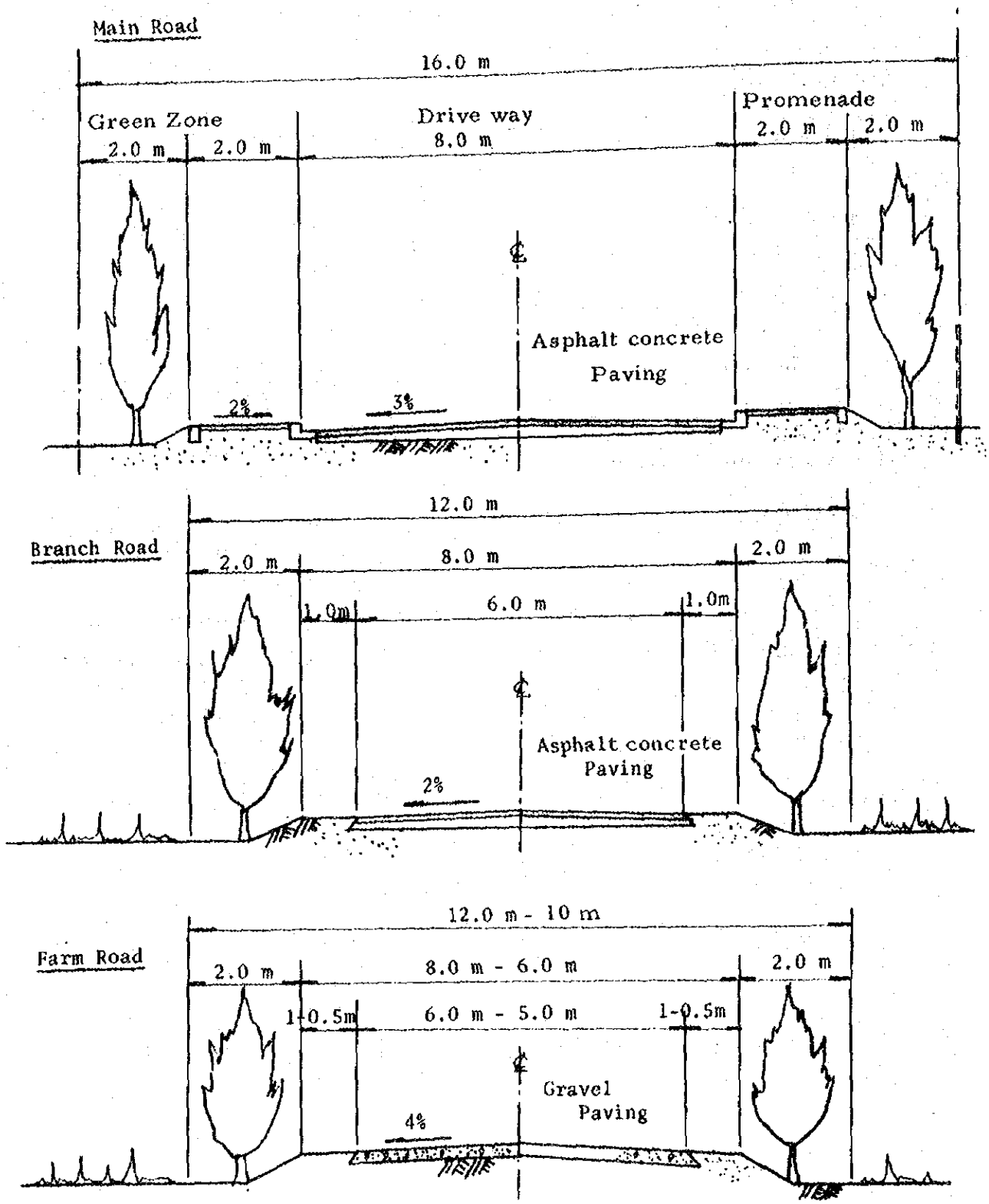
Outline of the roads is shown in Table-10 and Fig.-5.

Table 10 Outline of Road

Description	Road Width m	Structure	Length m	Remarks
(Farm Road)				
Main Road	6	Gravel Paving	2,000	with plantation
"	6	"	320	
Branch Road	5	"	8,000	with plantation
"	5	"	360	
"	4	Earth	2,350	
Sub-total			13,030	
(Road on Camping Area)				
Main Road	8	Asphalt Paving	1,000	with promenade road and plantation
"	8	"	1,180	with plantation
Branch Road	6	"	200	with promenade road and plantation
"	6	"	240	
"	4	"	480	
Sub-total			3,100	
Total			16,130 m	

The detailed design of the roads are shown on the drawings, Appendix.

Fig. 5 Typical Section of Road



(2) Windbreak

As for the windbreak inside the experimental farms, it is planned to plant tamarisk around the farms.

Other kinds of tree are to be selected and planted according to the results of research by the Research Center and other research institutes.

In addition, the green zones with plants around the Office, research laboratories and staff's houses will be planned to be available also for windbreak.

(3) Fence

Fences are to be arranged around the site for the Research Center, the cattle shed, tennis courts, volley ball court and swimming pool.

As for construction of fences, steel pipe supporters of 2 meters are to be fixed to concrete foundation, wire net be put up to the height of 1.25 m and three lines of barbwire be fixed over the wire net. The total extension of fence is about 4,200 meters.

A fence of 1.2-meter bigh is to be fixed around the pasture productivity test block, and movable electric stockades are to be arranged in the test block for experimental grazing.

5. PROJECT COST

The Project cost of the agricultural research center consists of three components; Construction cost of the Zahak agricultural research center and Zabol agricultural office, cost estimation of the farm equipments and testing equipments, and operation and maintenance expenses. The Project cost is summarized as follows:

5-1.	CONSTRUCTION COST:	670,000
		(Unit: 1,000 Rials)
5-1-1.	Zahak Agricultural Research Center:	520,000
(1)	Land preparation of Expenimental Farm:	78,000
(2)	Camping Facilities	339,000
(a)	Land preparation	41,000
(b)	Building	217,000
(c)	Water supply	13,000
(d)	Sewage	6,000
(e)	Power supply	27,000
(f)	Telephone	18,000
(g)	Miscellaneous	17,000
(3)	Farm Facilities	55,000
(a)	Water supply	15,000
(b)	Drainage	24,000
(c)	Meteorological station	1,000
(d)	Lysimeter	14,000
(e)	Miscellaneous	1,000
(4)	Contingency	48,000

5-1-2.	Zabol Agricultural Office	150,000
(1)	Camping Facilities	138,000
(a)	Land preparation	8,000
(b)	Building	97,000
(c)	Water supply	9,000
(d)	Sewage	4,000
(e)	Power supply	7,000
(f)	Telephone	3,000
(g)	Miscellaneous	10,000
(2)	Contingency	12,000

Above-mentioned construction cost estimation is prepared by using the rate of January in 1975. The land expropriation cost of 100 ha area in the Zahak agricultural research center is not estimated because the land compensation to the land owner was paid by the Imperial Government of Iran. The detailed construction cost estimation refers to Appendix.

5-2. COST ESTIMATION OF EQUIPMENTS

Required expenses to the equipments of the Zahak agricultural research center are divided to the farm equipment using at the experimental field and testing equipment of the laboratory.

The estimated cost of the equipments are summarized as belows:

(1)	Farm Equipments	39,000
		(Unit: 1,000 Rials)
(a)	Primary tillage equipment	600
(b)	Secondary tillage equipment	1,200
(c)	Broadcaster and fertilizer spraying equipment	1,100
(d)	Cultivating and ridging equipment	400
(e)	Forage and hay harvesting equipment	22,900

(f)	Transporting equipment	3,400
(g)	Tractor	1,200
(h)	Combine	5,000
(i)	Contingency	3,200

The detailed cost of the above equipments refers to Appendix.

(2) Testing Equipments

The testing equipments using at the laboratory are prepared by the each division of the study on the research subjects. The cost estimation of the testing equipments is summarized as belows:

Testing Equipment Cost	(Unit: 1,000 Rials) 167,000
1. Meteorological observation, Soil and Water, Irrigation and Drainage	24,000
2. Crop Cultivation, Horticulture	25,000
3. Plant Protection	22,000
4. Pasture and Forests	20,000
5. Pasture Productivity and Animal Production	32,000
6. Pasture Productivity and Animal Production	29,000
7. Contingency	15,000

The list of names and quantities of above-mentioned testing equipments refers to Appendix.

5-3. OPERATION AND MAINTENANCE EXPENSES

The Annually Operation and Maintenance expenses are divided as the personnel fee, executive testing cost and the maintenance expenses for the facilities, the entire cost is estimated according to the following

conditions:

Operation and Maintenance Expenses	150,000 (Unit: 1,000 Rials)
Personnel expenses	110,000
Executive testing cost	30,000
Maintenance expenses	10,000

The above mentioned personnel expenses of 110,000,000 Rials annually are estimated based on personnel composition in the organization of the Zahak agricultural research center mentioned Part 3-1, in which are cooperated by the engineers of 14 persons including a director, technician of 40 persons and workers (operator of plants and equipment, driver and labors) of 100 persons approximately. And the grand total is to be about 150 persons in near future.

The rates of personnel expenses per month are proposed the engineer of 200,000 Rials, technician of 100,000 Rials and worker of 20,000 Rials. However, these rates were as of January 1975.

On the other hand, the executive testing cost and maintenance expenses of the facilities are based on similar scale of the agricultural research center in Japan.

6. CONSTRUCTION SCHEDULE

The total period of construction of the Agricultural Research Center shall be two years; the first one year shall be spent to complete all the facilities to be constructed in the site of Zabol Agricultural Office, (guest house, club house, engineer's houses) and related facilities and welfare facilities etc. Meanwhile, at the site for Zahak Agricultural Research Center sites for experimental farms and the buildings shall be prepared; and as for special materials to be manufactured by factories (various kinds of pipes for water supply system and experimental farm facilities, pumps and their parts, apparatuses and instruments for power supply system and telephone facilities and equipment) the period required for manufacture of these items by factories must be considered and orders for these items must be placed in this year.

In the second year, at the site for Zahak Agricultural Research Center the whole shedule shall be completed about buildings (club house, research laboratories, staff's quarters and welfare facilities etc.), water supply system, sewage system, irrigation facilities for farms, power supply and telephone facilities with materials manufactured by factories.

The proposed construction schedule is shown Table - 11.

Table 11 Construction Schedule

Description	Year	1st. Year												2nd. Year												Remarks
	Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
1. Zahak agricultural research center																										
Preparation of works																										
(1) Land preparation of experimental farm																										
(2) Camping facilities																										
(a) Land preparation																										
(b) Building																										
(c) Water supply																										
(d) Sewerage																										
(e) Power supply																										
(f) Telephone																										
(g) Miscellaneous																										
(3) Farm facilities																										
(a) Water supply																										
(b) Drainage																										
(c) Meteorological station																										
(d) Lysimeter																										
2. Zabol agricultural office																										
Preparation of works																										
(1) Camping facilities																										
(a) Land prparation																										
(b) Building																										
(c) Water supply																										
(d) Sewerage																										
(e) Electricity																										
(f) Telephone																										
(g) Miscellaneous																										

: Period of preparation for the materials

: Period for the site works

APPENDIX

Appendix

1. Construction Cost Estimation of Agricultural Research Center

Description		Amount (Unit: 1,000 Rials)
1-1.	Zahak Agricultural Research Center	
(1)	Land preparation of experimental farm	78,000
(2)	Camping facilities	339,000
(3)	Farm facilities	55,000
(4)	Contingency	48,000
	Total	520,000
1-2.	Zabol Agricultural Office	
(1)	Camping facilities	138,000
(2)	Contingency	12,000
	Total	150,000
	Grand Total	670,000

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
1-1.	Zahak Agricultural Research Center				
(1)	Land preparation of experimental farm				
101	Land leveling for basic testing block	sq.m	158,000	120	18,960
102	Land leveling for applied testing block	sq.m	321,000	90	28,890
103	Land leveling for grassland	sq.m	154,000	70	10,780
104	Farm road	sq.m	75,000	100	7,500
105	Gravel paving (15cm)	sq.m	63,000	90	5,670
106	Wind break	m	17,700	150	2,655
107	Miscellaneous				3,545
	Sub-Total				78,000
(2)	Camping facilities				
(a)	Land Preparation				41,000
201	Earth excavation	cu.m	63,000	80	5,040
202	Fill	cu.m	32,000	100	3,200
203	Road (Including crossing structure)	sq.m	35,000	280	9,800
204	Asphalt paving with curb concrete	sq.m	26,000	800	20,800
205	Gravel paving	sq.m	2,400	90	216
206	Miscellaneous				1,944

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
(b)	Building				217,000
207	Main office and club house	sq.m	1,300	20,000	26,000
208	Laboratory	sq.m	3,400	15,000	51,000
209	Staff residence	sq.m	1,800	20,000	36,000
210	Exhibition Quater	sq.m	430	30,000	12,900
211	Labour's house	sq.m	1,300	10,000	13,000
212	Green house	sq.m	630	50,000	31,500
213	Garage	sq.m	210	8,000	1,680
214	Farm equipment shed and repair shop	sq.m	590	8,000	4,720
215	Ware house of crops and grass	sq.m	900	8,000	7,200
216	Farm worker's Assembly House	sq.m	250	10,000	2,500
217	Generator and pumping house	sq.m	460	12,000	5,520
218	Animal shed and store house for hay	sq.m	1,040	8,000	8,320
219	Silo (5m x 10m height)	No	1	1,200,000	1,200
220	Silo (3m x 4m height)	No	6	500,000	3,000
221	Gate keeper's house	sg.m	40	10,000	400
222	Miscellaneous				

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
(c)	Water supply				13,000
223	Pump 4"2 sets (with motor and automatical control apparatus)	L.S			500
224	Filtration facility	L.S			1,200
225	Elevated water storage tank 20 m^3	Set	2	2,000,000	4,000
226	Galvanized iron pipe ϕ 6"	m	140	2,300	322
227	Galvanized iron pipe ϕ 4"	m	210	1,800	378
228	Galvanized iron pipe ϕ 3"	m	350	1,550	543
229	Galvanized iron pipe ϕ 2"	m	620	1,350	837
230	Galvanized iron pipe ϕ 3/2"	m	490	1,100	539
231	Galvanized steel pipe ϕ 1"	m	730	1,000	730
232	Asbestos cement pipe ϕ 150 mm	m	270	1,300	351
233	Asbestos cement pipe ϕ 100 mm	m	770	900	693
234	Asbestos cement pipe ϕ 75 mm	m	2,800	800	2,240
235	Miscellaneous				667
(d)	Sewerage				6,000
236	Septic tank 200 cu.m	L.S			600
237	Asbestos cement pipe 300 mm	m	275	1,800	495
238	Asbestos cement pipe 250 mm	m	180	1,500	270
239	Asbestos cement pipe 200 mm	m	1,800	1,300	2,340
240	Asbestos cement pipe 150 mm	m	1,150	1,100	1,265
241	Miscellaneous				1,030

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
(e)	Power supply				27,000
242	Diesel generator and accessary (125 K.V.A)	Set	4	4,000,000	16,000
243	Cabling of electricity	m	3,850	1,500	5,775
244	Street Lamp	No	130	30,000	3,900
245	Mixcellaneous				1,325
(f)	Telephone				18,000
246	Telephone equipment (Exchanger with 100 extension)	L.S			2,000
247	Cabling of telephone	m	2,300	800	1,840
248	Telephone line	km	20	650,000	13,000
249	Miscellaneous				1,160
(g)	Miscellaneous				17,000
250	Tennis court	L.S			220
251	Valley ball court	L.S			150
252	Swimming pool	L.S			6,000
253	Fence	m	4,200	2,000	8,400
254	Plantation with irrigation ditch	m	4,800	100	480
255	Gardening	sq.m	35,000	50	1,750
	Sub-Total				339,000

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
(3)	Farm Facilities				
(a)	Water supply				15,000
301	Intake facility	L.S			1,200
302	Farm ponds (1,000 cu.m x 2)	L.S			500
303	Pumping facility ϕ 10" (with motor and apparatus)	Set	6	600,000	3,600
304	Asbestos cement pipe ϕ 300 mm with apparatus instrument	m	50	2,500	125
305	Asbestos cement pipe ϕ 250 mm with apparatus instrument	m	1,300	2,000	2,600
306	Asbestos cement pipe ϕ 200 mm with apparatus instrument	m	600	1,500	900
307	Asbestos cement pipe ϕ 150 mm with apparatus	m	1,400	1,300	1,820
308	Asbestos cement pipe ϕ 100 mm with apparatus	m	3,300	900	2,970
309	Miscellaneous				1,285
(b)	Drainage				24,000
311	Drainage canal	m	3,200	4,500	14,400
312	Tile draine ϕ 4" (P.V.C)	m	12,000	700	8,400
313	Miscellaneous				1,200

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
(c)	Meteorological station				1,000
314	Arrangement of land and lawn	sq.m	4,000	100	400
315	Fence and Framed Lot without bottom	m	240	2,000	480
316	Miscellaneous				120
(d)	Lysimeter				14,000
317	Lysimeter	set	4	2,500,000	10,000
318	Experimental Framed Lot with bottom	set	2	1,100,000	2,200
319	Experimental	set	2	650,000	1,300
320	Miscellaneous				500
(e)	Miscellaneous and Experimental Framed Lot				1,000
321	Observation well (2m)	No	27	2,500	68
322	Observation well (4m)	No	26	7,000	182
323	Sign post	No	100	5,000	500
324	Miscellaneous				250
	Sub-Total				55,000
(4)	Contingency				48,000
	Total				520,000

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
1-2. Zabol Agricultural Office					
(1) Camping facilities					
(a) Land preparation					8,000
401	Fill up in camping area	cu.m	4,400	150	660
402	Asphalt paving	sq.m	14,000	400	5,600
403	Drainage ditch	m	3,000	400	1,200
404	Miscellaneous				540
(b) Building					97,000
405	Guest house	sq.m	1,190	20,000	23,800
406	Staff residence	sq.m	3,300	20,000	66,000
407	Gate keeper's house	sq.m	20	10,000	200
408	Pumping station	sq.m	7	12,000	84
409	Miscellaneous	sq.m	150	15,000	2,250
410	Miscellaneous	sq.m			4,666

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
(c)	Water supply				9,000
411	Water storage tank 20 cu.m	L.S			1,200
412	Elevated water storage tank 20 cu.m	Set	1	2,000,000	2,000
413	Pump ϕ 2"	L.S			300
414	Galvanized iron pipe ϕ 3"	m	600	1,550	930
415	Galvanized iron pipe ϕ 3/2	m	2,000	1,000	2,000
416	Asbestos cement pipe ϕ 150 mm	m	900	1,300	1,170
417	Irrigation Canal for plantation	m	4,000	400	800
418	Miscellaneous	m	4,000		600
(d)	Sewerage				4,000
419	Septic tank 200 cu.m	L.S			600
420	Pump ϕ 2"	L.S			150
421	Asbestos cement pipe ϕ 200 mm	m	700	1,300	910
422	Asbestos cement pipe ϕ 150 mm	m	1,500	1,100	1,650
423	Miscellaneous				690
(e)	Electricity				7,000
424	Cabling of electricity	m	2,700	1,500	4,050
425	Street Lamp	No	70	30,000	2,100
426	Miscellaneous				850

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
(f)	Telephone				
427	Telephone equipment (Exchanger with 40 extension)	L.S			3,000
(g)	Miscellaneous				10,000
428	Tennis court	L.S			300
429	Valley ball court	L.S			100
430	Basket ball court	L.S			200
431	Swimming pool	L.S			6,000
432	Fence	m	800	2, 2,000	1,600
433	Plantation	m	3,500	100	350
434	Gardening	sq.m	12,000	50	600
435	Miscellaneous				850
	Sub-Total				138,000
(2)	Contingency				12,000
	Total				150,000

2. Cost Estimation of Farm Equipment

	Description	Amount Unit: 1,000 Rials
(1)	Primary tillage equipment	600
(2)	Secondary tillage equipment	1,200
(3)	Broadcaster and Fertilizer Spraying equipment	1,100
(4)	Cultivating and Redging equipment	400
(5)	Forage and Hay harvesting equipment	22,900
(6)	Transporting equipment	3,400
(7)	Tractor	1,200
(8)	Combine	3,200
(9)	Contingency	1,200
	Total	39,000

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
(1)	Primary tillage equipment				600
101	Bottom plow	No	3	100,000	300
102	Disk plow	"	3	80,000	240
103	Subsoiler	"	2	30,000	60
(2)	Secondary tillage equipment				1,200
201	Disk harrow	"	2	115,000	230
202	Spike tooth harrow	"	3	70,000	210
203	Rotary harrow	"	2	150,000	300
204	K-Roller	"	2	230,000	400
(3)	Broad caster and Fertilizer spraying equipment				1,100
301	Broad caster	"	3	50,000	150
302	Grain drill	"	2	175,000	350
303	Manure spreader	"	2	300,000	600
(4)	Cultivating and Ridging equipment				400
401	Cultivator	"	3	80,000	240
402	Ridger	"	2	80,000	160

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
(5)	Forage and Hay harvesting equipment				22,900
501	Rear mower	No	2	100,000	200
502	Forage chopper	"	2	200,000	400
503	Gyro hay maker	"	2	150,000	300
504	Side rake	"	2	80,000	160
505	Hay baler	"	2	600,000	1,200
506	Forage blower	"	2	320,000	640
507	Hay Cuber	"	2	10,000,000	20,000
(6)	Transporting equipment				3,400
601	Truck and Jeep	"	5	500,000	2,500
602	Farm wagon	"	3	300,000	900
(7)	Tractor	"	2	600,000	1,200
(8)	Combine	"	1	5,000,000	5,000
(9)	Contingency				3,200
	Total				39,900

3. Cost Estimation of Testing Equipment

	Description	Amount (Unit: 1,000 Rials)
(1)	Meteological environment, Soil and water, Irrigation and Drainage	24,000
(2)	CCrop Cultivation, Horticulture	25,000
(3)	Plant Protection	22,000
(4)	Pasture and Forests	20,000
(5)	Grassland Utilization & Animal Production (Chemical analysis of Roughage)	32,000
(6)	Grassland Utilization & Animal Production (Animal Production & Reproduction)	29,000
(7)	Contingency	15,000
	Total	167,000

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
(1)	Meteological environment, Soil and Water, Irrigation and Drainage				
101	Automatic Weather Data Recording System for Station	Set	1	8,800	8,800
102	Automatic Weather Data Recording System for Mobile Device	"	1	4,760	4,760
103	Soil Aregation Analysis Apparatus	"	1	190	190
104	Universal Washer	"	1	950	950
105	Electric Incubator (Low Temperature)	"	1	1,400	1,400
106	Drying Oven	"	1	40	40
107	Direct Reading Balance	"	1	200	200
108	Apparatus for Measuring	"	1	240	240
109	Apparatus for Measuring Soil Suction by using pressure membrane	"	1	240	240
110	Volmenometer including of Soil Soil sampling kit	"	1	100	100
111	Soil moisturemeter in site	"	1	370	370
112	Tensiometer of various length	"	1	10	10

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
113	Suction Plate apparatus	Set	1	160	160
114	Pressure menblane apparatus	"	1	210	210
115	Centrifuging apparatus	"	1	450	450
116	Soil hardmeter	"	1	60	60
117	Measuring apparatus of field permiability	"	1	110	110
118	P.H. Meter	"	1	90	90
119	Electric conductivity meter	"	1	270	270
120		"	1	50	50
121	Auto-Analyzer	"	1	5,300	5,300
	Sub-Total				24,000

Item	Description	Unit	Quantity	Rate(Rials)	Amount (Unit: 1,000 Rials)
(2)	Crop Cultivation, Horticulture				
201	Desiccator	Set	1	10	10
202	Hot Air Rapid Drying Oven	"	2	240	480
203	Automatic Balance	"	1	610	610
204	Direct Reading Balance Type-A	"	1	160	160
205	Direct Reading Balance Type-B	"	1	160	160
206	Stalk Gauge	"	1	10	10
207	Numbering	"	1	10	10
208	Automatic Area Meter	"	1	320	320
209	Root System Soil Sampler	"	1	40	40
210	Water Potential Measurement	"	1	1,100	1,100
211	Stalk Gauge	"	1	10	10
212	Hand Refractometer	"	1	10	10
213	Thrashing Machine	"	1	60	60
214	Winnower	"	1	100	100
215	Grain Sieve Set	"	1	130	130
216	Awn Remover	"	1	80	80
217	Germonation Dish	"	1	10	10
218	Grain Balance	"	1	20	20
219	Granometer	"	1	10	10

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
220	Calculator	Set	1	120	120
221	Crusher (Willy's Pulverrer for Laboratory)	"	1	20	20
222	Ion Exchange Resin Demineralizer	"	1	60	60
223	Wagner Pots	"	1	10	10
224	Agricultural Photometer	"	1	70	70
225	Browth Cabinet	"	1	940	940
226	Grain Rigidity Tester	"	1	30	30
227	Vegetable Cleaner	"	1	60	60
228	Electric Germinator	"	1	120	120
229	Thermo-Hygrograph	"	1	20	20
230	Photosynthesis Measurement Apparatus	"	1	1,200	1,200
231	Plant Micro-Thermometer	"	1	560	560
232	Apparatus for Measuring Erupo-Ranspiration	"	1	1,270	1,300
233	Interval Measured Temperature	"	1	600	600
234	Camera Set for Plant Ecology	"	1	110	110
235	Apparatus for Measuring Permeability	"	1	100	100
236	Viscosity Meter	"	1	30	30
237	Soil Penetro-Meter	"	1	20	20

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
238	Warburg Manometer	Set	1	560	560
239	Automatic Titration Apparatus	"	1	670	670
240	Infrared Spectrophotometer	"	1	1,500	1,500
241	Ultraviolet Spectrophotometer	"	1	2,330	2,330
242	Automatic Analyzer	"	1	6,000	6,000
243	Element Analyzer	"	1	2,600	2,600
244	NP Matic Printer	"	1	900	900
245	Electronics Portable Calculator	"	1	560	560
246	Fertility Counter	"	1	250	250
247	Indoor Seeding Cabinet	"	1	60	60
248	Refrigerator	"	1	140	140
249	Tripod Supported Centrifuge	"	1	50	50
250	Thermo-Hygrograph	"	1	20	20
251	Drying Oven	"	1	500	500
252	Evaporation Pan	"	1	20	20
253	Chemical Laboratory Table	"	1	140	140
	Sub-Total				25,000

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
(3)	Plant Protection				
301	High Sensitive Water Bath	Set	1	80	80
302	Autoclabe	"	1	130	130
303	Aseptic Box	"	1	30	30
304	Inoculating Thermostsat	"	1	60	60
305	Vaporizer	"	1	20	20
306	Sprayer	"	1	30	30
307	Auto Sprayer	"	1	130	130
308	Growth Chamber for Insects	"	1	80	80
309	Tube Sets	"	1	20	20
310	"LUPE" Set for Insects	"	1	10	10
311	Insect Net	"	1	10	10
312	Insect Collecting Box	"	1	10	10
313	Nematode Handling Sets	"	1	10	10
314	Animal Dissecting Sets	"	1	50	50
315	Automatic Indect Sampler Clooector	"	1	30	30
316	Binocular Stereoscopic Microscope	"	1	60	60
317	Binocular Microscope	"	1	60	60
318	Specimen Adjusting Box	"	1	40	40
319	Punch for Sisease Germ Inoculating	"	1	20	20

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
320	Automatic Dialy Allurement Inseceicide Collector	Set	1	170	170
321	Refrigerator	"	1	140	140
322	Cultire Dish	"	1	10	10
323	Hot Air Rapid Drying Oven	"	1	440	440
324	Testmill	"	1	50	50
325	Water Bath Incubator	"	1	80	80
326	Rotary Evaporator	"	1	50	50
327	Hot Air Sterilizer	"	1	140	140
328	Incubator	"	1	140	140
329	Water Bath with Thermostat	"	1	80	80
	Sub-Total	"	1	80	22,000

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
(4)	Pasture and Forests				
401	Grass Meter	Set	1	170	170
402	Protect Case (Grazing Experiment Use)	"	20	6	120
403	Quadrate for Vegitation Survey	"	6	20	20
404	Electric Fence for Grazing Area	"	1	10	10
405	Electric Drying Oven	"	1	60	60
406	Refrigerator	"	1	130	130
407	Grain Sieve Set	"	1	10	10
408	Hand Tractor	"	1	230	230
409	Combine	"	1	400	400
410	Desiccator	"	1	10	10
411	Hot Air Rapid Drying Oven	"	1	440	440
412	Drying Oven	"	1	40	40
413	Automatic Balance	"	1	610	610
414	Direct Reading Balance	"	1	610	610
415	Direct Reading Balance	"	1	610	610
416	Automatic Area Meter	"	1	320	320
417	Root System Soil Sampler	"	1	40	40
418	Neutron Water Potential Measurement	"	1	1,100	1,100
419	Germination Dish	"	1	4	4
420	Calculator	"	1	120	120

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
421	Crusher	Set	1	20	20
422	Ion Exchange Resin Demineralizer	"	1	60	60
423	Wagner Pot	"	1	10	10
424	Agricultural Photometer	"	1	70	70
425	Thermo-Hygrograph	"	1	20	20
426	Photosybthesis Measurement	"	1	1,300	1,300
427	Plant Micro-Thermometer	"	1	560	560
428	Apparatus for Measuring Evapo-transpiration	"	1	1,300	1,300
429	Thermometer for Interval Measured Temperature	"	1	600	600
430	Indoor Seeding Cabinet	"	1	60	60
431	Refrigerator	"	1	140	140
432	Thermo-Hygrograph	"	1	20	20
433	Srying Oven	"	1	440	440
434	Evaporation Pan	"	1	20	20
435	Chemical Laboratory Table	"	1	140	140
436	Protein Analyzer	"	1	30	30
437	Thermostatic Chamber	"	1	440	440
438	Portable Electronics Culculator	"	1	120	120
439	Chemical Laboratory Table (Large Size	"	1	140	140

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
440	Spare Chemical Laboratory Table	Set	1	30	30
441	Ion Exchange Resin Demineralizer	"	1	60	60
442	PH Meter	"	1	100	100
443	Crusher	"	1	20	20
444	Sort of Glass-Made Apparatus	"	1	560	560
445	Sort of Reagent	"	1	560	560
446	Direct Reading Balance	"	1	170	170
447	Refrigerator	"	2	130	130
448	Photoelectric Colorimeter	"	1	120	120
449	Hot Rapid Drying Oven	"	1	440	440
450	Portable Recorder	"	1	120	120
451	Carorie Meter	"	1	3,540	3,540
452	Carbon & Nitrogen Analyzer	"	1	2,300	2,300
453	Plat Form Scale 1,000 kg	"	1	170	170
454	Plat Form Scale 250 kg	"	1	140	140
455	Plat Form Scale 150 kg	"	1	110	110
456	Plat Form Dial Scale	"	1	20	20
457	Scale 5 kg	"	1	30	30
458	Hot Rapid Drying Oven	"	1	440	440
	Sub-Total				20,000

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
(5)	Grassland Utilization & Animal Production (Chemical analysis of Roughage)				
501	Protein Analyzer	Set	2	25	50
502	Thermostatic Chamber	"	2	440	880
503	Chemical Balance	"	2	115	230
504	Portable Electronics Culcurator	"	2	560	1,120
505	Chemical Laboratory Table (Large Size)	"	2	150	300
506	Spare Chemical Laboratory	"	4	30	120
507	Muffle Eurnance	"	1	800	800
508	Extraction Apparatus	"	1	80	80
509	Crade Fibre Measuring Apparatus	"	2	75	150
510	Ion Exchange Resin Demineralizer	"	1	60	60
511	PH Meter	"	1	100	100
512	Crusher	"	1	20	20
513	Sort of Glass-Made Apparatus	"	1	600	600
514	Sort of Reagent	"	1	560	560
515	Direct Reading Balance	"	2	610	1,200
516	Refrigerator (Large Size)	"	1	140	140
	Refrigerator (Ordinary Size)	"	1	120	120
517	Slidac for A.C. Power	"	1	10	10
518	Photoelectric Colorimeter	"	1	120	120

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
519	Electric Heater	Set	5	20	100
520	Mantle Heater	"	5	20	100
521	Fleek Analyzer	"	4	80	320
522	Toluene Distilling Apparatus	"	4	90	360
523	Micro Photography Device	"	1	90	90
524	Electric Centrifuge Gerber's	"	1	50	50
525	Microscope	"	1	190	190
526	Milk Cooler	"	1	70	70
527	Chemical Laboratory Table (Large Size)	"	1	140	140
528	Hot Air Rapid Drying Oven	"	1	440	440
529	Stereocopic Microscope	"	1	50	50
530	Water Still	"	1	520	520
531	Pipette Washer	"	1	50	50
532	Speed Pipette Dryer	"	1	80	80
533	Autoclave	"	1	130	130
534	Muffle Furnance	"	1	810	810
535	Flask Shaker	"	1	70	70
536	Vacuum Pump	"	1	50	50
537	Portable Recorder	"	1	120	120
538	High Pressure Steam Sterilizer	"	1	180	180
539	Gas Chromatograph	"	1	700	700

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
540	Carolie Meter	Set	1	3,000	3,000
541	Aminoacid Analyzer	"	1	2,700	2,700
542	Carbon & Nitrogen Analyzer	"	1	2,300	2,300
543	Liquid Column Chromatograph	"	1	1,500	1,500
544	Freeze Vacuum Drying Oven	"	1	1,900	1,900
545	Absorption Spectrophotometer	"	1	2,000	2,000
546	Colour Analyzer	"	1	2,600	2,600
547	Energy Metabolism Experimental Apparatus	"	1	1 120	120
548	Plat Form Scale, 1000 kg	"	1	170	170
549	Plat Form Scale, 250 kg	"	1	140	140
550	Plat Form Scale, 150 kg	"	1	110	110
551	Plat Form Dial Scale	"	1	20	20
552	Sample Cutter	"	1	70	70
553	Deep Freezer	"	1	50	50
554	Experimental Silo	"	1	600	600
555	Scale (5 kg)	"	1	30	30
556	Plat form Scale (100 kg)	"	1	20	20
557	Cutter	"	1	90	90
558	Hot Air Rapid Drying Oven	"	1	1,300	1,300
559	Thermostatic Chamber	"	1	1,780	1,780
	Sub-Total				32,000

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
(6)	Grassland Utilization & Animal Production (Animal Production & Reproduction)				
601	Artificiel Insemination Equipment	"	1	370	370
602	Hot Air Sterilizer	"	1	40	40
603	HI-Speed Autoclave	"	1	170	170
604	Instrument Sterilizer	"	1	20	20
605	Scale (50 kg)	"	1	70	70
606	Plat Form Scale (150 kg)	"	1	110	110
607	Bal-Zal Bloodless Castrator	"	1	20	20
608	Dissecting Instrument	"	1	30	30
609	Operating Set	"	1	30	30
610	Electric Cautery	"	1	30	30
611	Automatic Multidoese Syringe	"	1	10	10
612	Refrigerator	"	1	140	140
613	Freezer	"	1	50	50
614	Drying Oven	"	1	40	40
615	Thermostatic Chamber	"	1	440	440
616	High Sensitive Water Bath	"	1	90	90
617	Centrifugal Separator	"	1	510	510
618	Direct Reading Balance	"	1	170	170
619	Ion Exchange Resin Demineralizer	"	1	60	60

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
620	Universal Washer	Set	1	1,000	1,000
621	Haematocrit Centrifuge	"	1	60	60
622	Tissue Samples Framer	"	1	1,500	1,500
623	Liquid Scintillation System	"	1	4,200	4,200
624	Automatic Feeder	"	1	520	520
625	Energy Metabolism Experiment Apparatus	"	1	110	110
626	Steam Cleaner	"	1	130	130
627	TV Monitor System	"	1	500	500
628	Livestock Scale (750 kg)	"	1	100	100
629	Ditto (100 kg)	"	1	80	80
630	Animal Cage	"	1	20	20
631	Operation Table for Medium-Sized Animal	"	1	220	220
632	Ear Tags Applicating Instruments	"	1	20	20
633	Tattooing Forceps	"	1	30	30
634	Bull Service Steel Frame	"	1	50	50
635	Artificiel Insemination Equipment	"	1	380	380
636	Energy Metabolism Experimental Apparatus	"	1	110	110
637	Telemetric Apparatus	"	1	4,500	4,500

Item	Description	Unit	Quantity	Rate (1,000 Rials)	Amount (Unit: 1,000 Rials)
638	PH Meter	"	1	100	100
639	Spectrophotometer	"	1	1,000	1,000
640	Flame Photometer	"	1	940	940
641	Electrophoresis Apparatus	"	1	700	700
642	Liquid Chromatograph	"	1	1,500	1,500
643	Gas Chromatograph	"	1	1,200	1,200
644	Absorption Spectrophotometer	"	1	1,200	1,200
645	Discrete Sample Analyzer	"	1	6,960	6,960
	Sub-Total				29,000
(7)	Contingency				15,000
	Total				167,000

4. Data of Soil

Table (1)-1 (1) Chemical Analysis Data of Soil Sample

Profile No.	Depth	SP	ECx10^3	PH	Clay	Silt	Sand	$CaCO_3$	E.S.P	Ex.Na	Org.C	Drg.C	Av.k	Av.p
	cm	%	mmhos/cm		%	%	%	%	%	meg/100g	meg/100g	%	ppm	ppm
0 - 4	0- 25	33	2.31	8.6	4.2	14.0	81.8	21.7	40	1.0	2.5	-	145	2.5
"	25- 35	47	1.29	7.7	6.2	62.0	31.8	13.5	7	0.35	4.8	0.18	60	4.0
"	35- 50	41	0.66	7.8	4.2	10.0	85.8	17.7	12	0.37	2.9	-	-	-
"	50- 55	41	0.94	7.7	6.2	54.0	39.8	16.0	8	0.3	4.0	-	-	-
"	55-150	20	0.56	8.1	2.2	6.0	91.8	13.5	16	0.3	1.8	-	-	-
0 - 6	0- 17	41	3.97	8.0	28.2	42.0	29.8	18.5	23	1.9	8.1	0.19	175	14.0
"	17- 35	36	1.09	8.4	28.2	42.0	29.8	20.0	13	1.07	7.8	0.18	165	11.0
"	35- 65	60	2.78	8.6	38.2	50.0	11.8	19.7	34	3.7	10.7	-	-	-
"	65-130	52	4.14	8.6	40.2	54.0	5.8	20.5	42	4.6	10.7	-	-	-
N - 3	0- 20	43	1.18	7.9	20.2	46.0	33.8	17.7	9	0.7	7.4	0.24	105	6.0
"	20- 70	43	1.58	7.5	48.2	18.0	33.8	11.7	8	1.04	12.0	0.66	230	8.5
"	70-150	58	2.27	7.4	34.2	48.0	17.8	16.0	2	0.25	11.0	-	-	-
M - 4	0- 17	29	2.52	7.8	14.2	32.0	53.8	17.2	8	0.50	5.9	0.32	105	10.0
"	17- 40	26	0.78	8.3	14.2	24.0	61.8	13.0	7	0.45	5.7	0.16	90	6.0
"	40-100	31	0.34	8.5	4.2	8.0	87.8	11.7	9	0.27	2.9	-	-	-
"	100-150	44	0.76	8.1	16.2	48.0	35.8	19.5	6	0.58	8.7	-	-	-
L - 5	0- 23	29	1.73	7.7	8.2	30.0	61.8	17.0	8	0.39	4.4	0.18	70	6.0
"	23- 55	31	2.92	8.3	2.2	4.0	93.8	12.7	8	0.2	2.3	0.02	55	4.0
"	55- 95	25	0.39	8.3	4.2	24.0	71.8	17.2	11	0.43	3.8	-	-	-
"	95-150	29	0.40	8.2	2.2	14.0	83.8	19.2	13	0.31	2.3	-	-	-

Note: E.S.P - Exchangeable sodium percentage

C.E.C - Cation exchange capacity

Table (1)-2 Chemical Analysis Data of Soil Sample

Profile No.	Depth	SP	ECx10^3	PH	Clay	Silt	Sand	$CaCO_3$	E.S.P	Ex.Na	Org.C	Drg.C	Av.k	Av.k
		%	mmhos/cm		%	%	%	%	%	meg/100g	meg/100g	%	ppm	ppm
I - 10	0- 25	32	1.52	8.2	6.2	44.0	49.8	17.7	11	0.45	3.8	0.08	55	4.0
"	25- 55	36	3.70	8.6	3.0	20.0	77.0	15.2	10	0.32	3.2	0.09	45	4.0
"	55- 70	39	1.13	8.5	7.0	38.0	55.0	17.0	9	0.45	4.8	-	-	-
"	70-140	29	0.55	8.6	5.0	10.0	85.0	11.5	13	0.34	2.5	-	-	-
H - 7	0- 22	31	3.0	7.5	13.0	36.0	51.0	17.0	9	0.54	5.9	0.50	125	6.0
"	22- 52	45	1.54	8.7	7.0	86.0	7.0	18.0	17	1.13	6.3	0.15	55	4.0
"	52- 90	41	2.0	8.7	7.0	88.0	5.0	18.5	38	2.33	6.1	-	-	-
"	90-130	34	4.0	8.2	19.0	72.0	9.0	20.5	51	4.14	8.0	-	-	-
F - 3	0- 20	29	1.15	8.0	7.0	6.0	87.0	18.0	4	0.2	4.4	0.15	90	7.0
"	20- 50	35	1.26	8.4	23.0	46.0	31.0	19.7	13	1.03	7.8	0.18	150	6.0
"	50-100	44	2.69	8.8	35.0	28.0	37.0	19.0	56	5.04	9.0	-	-	-
"	100-120	32	2.46	8.8	11.0	42.0	47.0	18.0	58	3.08	5.3	-	-	-
D - 9	0- 25	28	11.3	9.9	17.0	46.0	37.0	19.5	70	5.1	7.2	0.13	230	15.5
"	25- 50	41	1.98	9.4	7.0	68.0	25.0	18.7	41	2.13	5.1	0.13	95	6.0
"	50- 70	41	3.61	9.4	15.0	44.0	41.0	20.5	42	3.2	7.6	-	-	-
"	70-140	36	1.95	9.2	7.0	52.0	41.0	21.5	26	1.37	5.1	-	-	-
C - 2	0- 18	34	18	8.9	7.0	60.0	33.0	22.2	41	2.1	5.1	0.11	170	8.5
"	18- 45	47	4.8	9.2	9.0	86.0	5.0	19.2	71	4.8	6.7	0.60	70	7.0
"	45-105	37	3.47	9.0	5.0	64.0	31.0	16.0	-	-	-	-	-	-
"	105-150	38	2.22	8.7	11.0	70.0	19.0	25.5	-	-	-	-	-	-

Note: E.S.P - Exchangeable sodium percentage

C.E.C - Cation exchange capacity

Table (2) (2) Data of Physical Properties of Soil Sample

Profile No.	Depth	Bulk Density	Moisture (%)		
			Wilting Point W.P.	Filed Capacity F.C. 1/3 Bar	Sample Moisture
	cm		%	%	%
L - 5	0 - 23	1.54	8.0	17.0	10.0
"	23 - 55	1.53	8.0	18.0	10.0
"	55 - 95	1.4	15.0	33.0	9.0
"	95 - 150	1.4	16.0	37.0	12.0
O - 4	0 - 25	1.32	8.0	17.0	17.0
"	25 - 35	1.69	5.0	14.0	12.0
"	35 - 50	1.87	14.0	29.0	10.0
"	50 - 150	1.82	5.0	11.0	8.0
O - 6	0 - 17	1.59	5.0	14.0	12.0
"	17 - 35	1.37	9.0	19.0	10.0
"	35 - 65	1.4	9.0	20.0	18.0
"	65 - 130	1.4	12.0	26.0	12.0
I - 10	0 - 25	1.53	3.0	8.0	3.0
"	25 - 55	1.44	6.0	15.0	5.0
"	55 - 70	1.35	3.0	9.0	17.0
"	70 - 140	1.58	5.0	10.0	3.0
H - 7	0 - 22	1.52	5.0	10.0	8.0
"	22 - 52	1.47	7.0	16.0	9.0
"	52 - 90	1.4	12.0	24.0	11.0
"	90 - 130	1.43	12.0	25.0	18.0
C - 2	0 - 18	1.3	7.0	17.0	16.0
"	18 - 45	1.47	10.0	21.0	18.0
"	45 - 105	1.45	8.0	18.0	11.0
"	105 - 150	1.4	13.0	26.0	15.0
D - 9	0 - 25	1.64	11.0	21.0	11.0
"	25 - 50	1.43	1.0	20.0	15.0
"	50 - 70	1.37	13.0	28.0	19.0
"	70 - 140	1.54	4.0	8.0	11.0
F - 3	0 - 32	1.6	3.0	8.0	10.0
"	32 - 50	1.07	13.0	27.0	20.0
"	50 - 100	1.45	12.0	27.0	20.0
"	100 - 120	1.2	9.0	18.0	10.0
M - 4	0 - 17	1.45	6.0	14.0	13.0
"	17 - 40	1.56	10.0	21.0	10.0
"	40 - 100	1.58	13.0	29.0	5.0
"	100 - 150	1.37	14.0	-	21.0

Table (3)-1

(3) Electric Conductivity and PH

Profile No.	Depth (cm)	E.C x10^3	PH
P - 3	0 - 25	1.61	8.2
"	25 - 30	1.29	7.7
"	30 - 60	0.66	7.8
"	60 - 80	1.11	7.5
P - 5	0 - 20	4.48	8.5
P - 7	0 - 14	8.68	9.2
"	14 - 35	8.17	9.3
"	35 - 60	3.19	9.2
"	60 - 150	3.97	8.8
O - 2	0 - 22	1.18	7.2
"	22 - 65	1.04	7.9
"	65 - 85	0.63	7.8
O - 4	0 - 25	23.10	8.6
"	25 - 35	1.29	7.7
"	35 - 50	0.66	7.8
"	50 - 55	0.94	7.7
"	55 - 150	0.56	8.1
O - 5	0 - 20	2.22	8.0
"	20 - 70	1.85	8.9
"	70 - 140	1.14	8.7
O - 6	0 - 17	3.97	8.0
"	17 - 35	1.09	8.4
"	35 - 65	2.78	8.6
"	65 - 130	4.14	8.6
O - 7	0 - 25	8.68	9.1
"	25 - 50	1.73	9.3
"	50 - 120	2.35	8.7
"	120 - 150	1.37	8.8
N - 3	0 - 20	1.18	7.9
"	20 - 70	1.58	7.5
"	70 - 150	2.27	7.4
N - 2	0 - 20	4.27	7.3
"	20 - 50	8.17	7.9
"	50 - 80	6.54	7.8
N - 5	0 - 18	16.80	8.2
"	18 - 60	1.12	8.6
"	60 - 130	0.37	8.2
N - 6	0 - 20	7.66	9.5
"	20 - 60	2.57	9.5
"	60 - 110	2.28	9.0
"	110 - 150	0.66	8.9
N - 7	0 - 5	2.13	7.7
"	5 - 25	0.44	8.6
"	25 - 32	0.74	8.3
"	32 - 140	0.24	8.5
M - 2	0 - 10	2.40	8.0
"	10 - 25	3.27	7.9
"	25 - 70	3.27	8.3
M - 3	70 - 20	13.20	7.8
"	20 - 50	4.58	8.3
"	50 - 150	2.22	8.2
M - 4	0 - 17	2.52	7.8
"	17 - 40	0.78	8.3
"	40 - 100	0.34	8.5
"	100 - 150	0.76	8.1
M - 5	0 - 20	3.27	7.6
"	20 - 50	0.63	8.3
"	50 - 150	0.35	8.3
M - 6	0 - 13	18.50	10.0
"	13 - 24	4.70	9.8
"	24 - 55	2.40	9.8
"	55 - 100	5.10	9.6
"	100 - 150	2.70	9.3

Table (3)-2

Electric Conductivity and PH

Profile No.	Depth (cm)	E.C x10^3	PH
M - 7	10 - 20	16.8	7.8
"	20 - 40	11.1	8.0
"	40 - 60	13.9	8.0
"	60 - 120	3.7	9.2
M - 9	0 - 18	15.0	8.4
"	18 - 40	12.3	8.7
"	40 - 70	16.7	8.4
"	70 - 90	10.4	8.7
"	90 - 120	6.4	8.6
M - 12	0 - 25	2.22	8.3
"	25 - 110	1.11	7.9
"	110 - 150	0.95	7.3
L - 2	0 - 20	5.56	7.6
"	20 - 80	1.39	8.0
L - 3	0 - 25	3.17	7.6
"	25 - 35	0.66	8.1
"	35 - 70	0.63	8.0
"	70 - 85	4.63	8.1
"	85 - 110	0.82	8.1
L - 4	0 - 20	1.44	7.8
"	20 - 50	1.15	8.1
"	50 - 120	1.85	8.2
L - 5	0 - 23	1.73	7.7
"	23 - 55	2.92	8.3
"	55 - 95	0.39	8.3
"	95 - 150	0.40	8.2
L - 6	0 - 20	0.40	9.1
"	20 - 60	22.2	8.3
"	60 - 90	7.94	8.5
L - 12	0 - 19	5.14	7.6
"	19 - 60	2.64	8.2
"	60 - 85	1.91	7.9
"	85 - 140	0.72	7.9
K - 2	0 - 20	7.9	7.5
"	20 - 44	3.36	8.6
"	44 - 100	3.78	7.7
K - 3	0 - 25	2.29	7.8
"	25 - 80	0.42	7.9
"	80 - 150	0.66	8.1
K - 4	0 - 20	2.52	7.8
"	20 - 50	0.61	8.3
"	50 - 120	1.98	8.1
K - 5	0 - 20	0.73	8.2
"	20 - 60	0.95	7.9
"	60 - 150	1.26	8.0
K - 7	0 - 20	34.1	7.4
"	20 - 60	13.9	7.8
"	60 - 100	5.24	8.7
K - 11	0 - 14	4.71	8.0
"	14 - 35	7.7	8.2
"	35 - 55	4.27	9.1
J - 2	0 - 20	15.0	7.5
"	20 - 60	12.0	7.8
"	60 - 150	7.0	7.3
J - 3	0 - 23	14.6	7.8
"	23 - 48	0.50	8.1
"	48 - 80	14.0	8.0
"	80 - 150	4.20	8.4
J - 4	0 - 20	0.80	8.0
"	20 - 50	0.84	8.2
"	50 - 150	3.00	8.0
J - 5	0 - 18	5.14	7.6
"	18 - 50	1.85	8.2
"	50 - 65	0.92	8.3
"	65 - 150	0.57	8.4
J - 6	0 - 20	2.70	8.2
"	20 - 50	3.48	8.1
"	50 - 150	3.34	8.2

Table (3)-3

Electric Conductivity and PH

Profile No.	Depth (cm)	E.C x10^3	PH
J - 7	0 - 18	16.5	8.0
"	18 - 40	10.0	8.0
"	40 - 58	7.0	7.6
"	58 - 90	5.0	8.5
"	90 - 140	1.85	8.6
J - 8	0 - 30	2.30	8.4
"	30 - 70	4.27	8.1
"	70 - 150	4.63	8.1
J - 9	0 - 13	1.20	7.9
"	13 - 30	2.05	8.0
"	30 - 60	2.92	8.4
"	60 - 130	3.48	8.4
J - 10	10 - 15	1.30	7.8
"	15 - 100	0.57	8.0
"	100 - 150	0.80	8.3
I - 3	0 - 20	1.83	8.0
"	20 - 55	1.85	8.6
"	55 - 110	3.70	9.0
"	110 - 150	1.87	9.0
I - 4	0 - 25	10.0	7.8
"	25 - 50	6.70	8.4
"	50 - 110	7.40	8.5
	110 - 130	0.92	8.4
I - 5	0 - 25	1.32	7.9
"	25 - 150	3.56	8.6
I - 6	0 - 13	2.85	7.6
"	13 - 47	4.83	8.6
"	47 - 72	3.70	8.9
"	72 - 150	3.36	8.3
I - 7	0 - 25	2.78	7.8
"	25 - 60	0.60	8.0
"	60 - 150	1.43	8.2
I - 8	0 - 16	1.35	8.2
"	16 - 45	0.65	8.4
"	45 - 85	2.05	8.7
"	85 - 130	2.64	8.8
I - 9	0 - 15	4.63	8.2
"	15 - 60	3.0	8.3
"	60 - 150	1.61	8.5
I - 10	0 - 25	1.52	8.2
"	25 - 55	3.70	8.6
"	55 - 70	1.13	8.5
"	70 - 140	0.55	8.6
I - 11	0 - 20	3.08	7.9
"	20 - 80	3.08	8.8
	80 - 150	11.00	8.8
H - 2	0 - 30	3.36	8.4
"	30 - 75	4.92	9.0
"	75 - 150	5.56	9.0
H - 3	0 - 20	2.78	8.2
"	20 - 70	0.60	9.2
"	70 - 100	1.61	9.1
"	100 - 120	0.70	9.3
H - 4	0 - 20	3.36	8.4
"	20 - 50	1.91	8.5
"	50 - 140	4.75	8.5
H - 5	0 - 12	1.61	8.0
"	12 - 45	0.56	8.2
"	45 - 65	0.44	8.6
"	65 - 150	0.30	8.4
H - 6	0 - 20	1.35	8.3
"	20 - 150	0.56	8.6
H - 7	0 - 22	3.0	7.5
"	22 - 52	1.54	8.7
"	52 - 90	2.0	8.7
		4.0	8.2
H - 8	0 - 25	1.39	8.0
"	25 - 70	1.54	9.0
"	70 - 150	0.82	8.4

Table (3)-4

Electric Conductivity and PH

Profile No.	Depth (cm)	E.C x10^3	PH
H - 9	0 - 16	2.22	8.0
"	16 - 100	0.52	8.4
"	100 - 150	0.30	8.5
H - 10	0 - 20	0.88	8.9
"	20 - 60	1.32	8.6
"	60 - 140	0.63	8.5
H - 11	0 - 13	11.80	8.4
"	13 - 42	4.80	8.8
"	42 - 62	3.56	8.8
"	62 - 92	2.0	8.6
"	92 - 140	2.78	8.6
G - 2	0 - 20	0.92	8.1
"	20 - 45	0.44	8.5
"	45 - 150	0.36	8.5
G - 3	0 - 15	20.0	8.9
"	15 - 40	6.90	9.2
"	40 - 80	5.60	8.8
"	80 - 140	4.27	8.6
G - 4	0 - 15	0.88	8.0
"	15 - 30	0.72	8.4
"	30 - 85	1.85	8.4
"	85 - 140	0.44	8.2
G - 5	0 - 30	10.0	8.3
"	30 - 70	7.9	8.6
"	70 - 100	10.0	8.4
"	100 - 150	2.0	8.5
G - 6	0 - 13	2.5	8.2
"	13 - 35	5.3	8.4
"	35 - 60	0.95	9.0
"	60 - 130	1.4	8.9
G - 7	0 - 20	18.0	8.3
"	20 - 80	9.7	8.4
"	80 - 110	12.6	7.8
"	110 - 150	9.2	7.9
G - 8	0 - 20	1.04	8.2
"	20 - 85	0.8	8.5
"	85 - 120	1.1	8.2
G - 9	0 - 20	1.02	8.3
"	20 - 50	0.92	8.4
"	50 - 150	2.64	8.4
G - 10	0 - 18	8.10	8.3
"	18 - 38	0.60	9.2
"	38 - 85	2.64	8.5
"	85 - 150	1.85	8.4
G - 11	0 - 25	1.63	8.0
"	25 - 100	0.77	8.2
"	100 - 150	0.50	8.2
F - 2	0 - 20	1.50	7.9
"	20 - 80	0.80	8.3
"	80 - 140	2.78	8.7
F - 3	0 - 20	1.15	8.0
"	20 - 50	1.26	8.4
"	50 - 100	2.69	8.8
"	100 - 120	2.49	8.8
F - 4	0 - 20	2.78	8.0
"	20 - 60	2.78	8.9
"	60 - 150	2.22	9.0
F - 5	0 - 15	2.78	7.9
"	15 - 40	2.22	8.1
"	40 - 60	13.90	9.3
"	60 - 90	12.10	9.1
"	90 - 140	11.10	8.9
F - 6	0 - 20	2.83	8.0
"	20 - 70	4.71	8.1
"	70 - 110	2.46	8.1
"	110 - 150	0.89	8.7

Table (3)-5

Electric Conductivity and PH

Profile No.	Depth (cm)	E.C x10^3	PH
F - 7	0 - 14	1.58	7.9
"	14 - 40	1.57	8.2
"	40 - 70	4.27	8.3
"	70 - 140	2.31	8.4
F - 8	0 - 20	0.84	8.2
"	20 - 60	0.68	8.3
"	60 - 150	0.95	8.4
F - 9	0 - 20	0.66	8.1
"	20 - 48	2.00	8.2
"	48 - 80	5.05	8.6
"	80 - 130	3.08	8.8
F - 10	0 - 20	1.02	8.0
"	20 - 60	1.43	8.0
F - 11	0 - 25	0.66	8.1
"	25 - 50	0.44	8.5
"	50 - 80	0.35	8.4
"	80 - 150	1.80	8.6
E - 2	0 - 23	1.23	8.0
"	23 - 37	1.80	8.3
"	37 - 65	1.60	8.5
"	65 - 90	2.64	8.9
"	90 - 110	4.71	9.1
"	110 - 130	2.90	9.2
E - 3	0 - 20	1.80	8.2
"	20 - 100	0.66	8.3
"	100 - 150	1.82	8.2
E - 4	0 - 20	1.11	8.0
"	20 - 50	1.68	8.3
"	50 - 70	3.47	8.0
"	70 - 120	3.70	8.5
E - 5	0 - 20	1.04	8.0
"	20 - 65	0.92	8.2
"	65 - 120	3.34	9.0
E - 6	0 - 20	1.32	7.8
"	20 - 38	2.92	8.0
"	38 - 70	3.40	8.5
"	70 - 90	3.15	8.4
"	90 - 140	4.27	8.5
E - 7	0 - 20	3.80	7.9
"	20 - 70	4.55	8.4
"	70 - 150	6.60	8.7
E - 8	0 - 42	12.00	8.4
"	42 - 75	9.40	9.1
"	75 - 140	7.70	9.1
C - 2	0 - 18	4.27	9.4
"	18 - 45	18.00	8.9
"	45 - 105	4.80	9.2
"	105 - 150	3.47	9.0
C - 3	0 - 20	2.22	8.7
"	20 - 90	15.00	9.8
"	90 - 150	4.80	9.2
C - 4	0 - 20	11.80	9.6
"	20 - 90	3.86	9.2
"	90 - 140	2.69	9.2
C - 5	0 - 20	20.50	8.4
"	20 - 60	20.60	8.3
"	60 - 100	13.51	8.8
"	100 - 150	16.80	9.3
C - 6	0 - 18	32.70	8.4
"	18 - 55	11.00	8.5
"	55 - 140	8.00	9.2
C - 7	0 - 20	1.98	8.0
"	20 - 60	1.80	9.2
"	60 - 150	1.00	9.0

Table (3)-6

Electric Conductivity and PH

Profile No.	Depth (cm)	E.C x10^3	PH
C - 8	0 - 15	2.06	8.3
"	15 - 77	0.51	8.4
"	77 - 95	1.04	8.7
"	95 - 120	1.04	8.7
B - 2	0 - 20	1.54	8.4
"	20 - 70	3.08	9.6
"	70 - 150	2.06	9.3
B - 3	0 - 19	1.13	8.0
"	19 - 70	1.00	8.0
"	70 - 130	0.80	8.2
B - 4	0 - 15	4.80	9.4
"	15 - 40	1.30	8.0
"	40 - 75	3.40	8.1
"	75 - 150	2.41	8.3
B - 5	0 - 18	11.80	9.4
"	18 - 50	1.72	8.6
"	50 - 90	0.66	9.4
"	90 - 140	0.37	8.8
B - 6	0 - 30	22.20	8.7
"	30 - 80	10.20	8.5
"	80 - 150	10.20	8.8
E - 9	0 - 15	6.20	8.5
"	15 - 50	3.70	9.2
"	50 - 100	3.54	9.2
"	100 - 150	2.22	8.8
E - 10	0 - 28	14.60	8.4
"	28 - 88	2.05	9.2
"	88 - 140	3.08	9.0
E - 11	0 - 20	27.80	9.8
"	20 - 90	8.70	9.5
"	90 - 150	2.13	8.8
D - 2	0 - 30	1.54	8.1
"	30 - 60	6.30	8.5
"	60 - 140	6.90	9.0
D - 3	0 - 16	5.05	7.9
"	16 - 40	4.71	8.8
"	40 - 80	4.14	9.2
"	80 - 140	4.63	9.0
D - 4	0 - 20	3.21	7.7
"	20 - 40	2.22	8.5
"	40 - 70	2.78	8.8
"	70 - 150	1.68	9.2
D - 5	0 - 20	1.35	7.8
"	20 - 80	3.02	8.5
"	80 - 150	2.17	9.3
D - 6	0 - 20	3.70	7.9
"	20 - 50	3.75	7.8
"	50 - 150	0.69	8.2
D - 7	0 - 14	2.00	7.8
"	14 - 40	0.73	8.2
"	40 - 80	0.48	8.2
"	80 - 150	0.43	8.3
D - 8	0 - 15	1.30	8.0
"	15 - 50	6.90	8.2
"	50 - 150	6.90	8.2
D - 9	0 - 25	0.41	8.5
"	25 - 50	11.30	9.9
"	50 - 70	1.98	9.4
"	70 - 140	3.61	9.4
D - 10	0 - 25	1.95	9.2
"	25 - 62	1.63	8.1
"	62 - 80	4.00	9.2
"	80 - 140	2.41	9.4

Table (4)-1

(4) Permeability

Profile No.	Depth	Bulk Density	Permeability at First	Permeability after-4 days	Permiability
	cm		mm/hr	mm/hr	
I - 10	70 - 140	-	247	104	Rapid
H - 7	0 - 22	-	31	27	Medium
"	22 - 52	-	6	5	Slow
"	52 - 90	-	2	2	Slow
"	90 - 130	-	0.75	0	Slow
C - 2	0 - 18	-	3	2	Slow
"	18 - 45	-	4	3	Slow
"	45 - 105	-	6	5	Slow
"	105 - 150	-	3	3	Slow
D - 9	0 - 25	-	0	0	Slow
"	25 - 50	-	4	3	Slow
"	50 - 70	-	2	2	Slow
"	70 - 140	-	22	20	Medium
F - 3	0 - 32	-	26	22	Medium
"	32 - 50	-	1	1	Slow
"	50 - 100	-	0	0	Slow
"	100 - 120	-	2	0.75	Slow

Table (4)-2

Permeability

Profile No.	Depth	Bulk Density	Permeability at First	Permeability After-4 days	Permeability Class of Soil
	cm		mm/hr	mm/hr	
M - 4	0 - 17	-	2	2	Slow
"	17 - 40	-	4	4	Slow
"	40 - 100	-	112	67	Rapid
"	100 - 150	-	1	1	Slow
L - 5	0 - 23	-	3	3	Slow
"	23 - 55	-	61	63	Medium
"	55 - 95	-	5	34	Medium
"	95 - 150	-	82	63	Rapid
O - 4	0 - 25	-	37	46	Medium
"	25 - 35	-	3	6	Slow
"	35 - 50	-	133	62	Medium
"	50 - 150	-	127	96	Rapid
O - 6	0 - 17	-	125	0	Slow
"	17 - 35	-	3	3	Slow
"	35 - 65	-	0*	0*	Slow
"	65 - 130	-	0*	0*	Slow
I - 10	0 - 25	-	25	17	Medium
"	25 - 55	-	37	25	Medium
"	55 - 70	-	4	4	Slow

Note: * No water pass through sample in 4 days

Table (5)

(5) Water quality of Sistan river and Ground water of Zahak Agricultural research Center

T.D.S.	EC x 10^6	pH	In Milliequivalent/Liter									Na	S.A.R.
			CO_3^-	HCO_3^-	CL^-	SO_4^{--}	Sum Anion	$Ca^{++}+Mg^{++}$	$^+$	K^+	Sum Cations		
Water Sample of Sistan River													
582	910	7.3	-	4.25	3.0	3.1	10.35	6.2	5.25	-	11.45	46	3.0
Ground Water of Profile No: (O-4)													
768	1,200	7.5	-	5.0	5.6	4.2	14.85	8.8	5.75	-	14.55	40	2.7
Ground Water of Profile No: (N-3)													
1,952	3,050	7.4	3	7.9	22.1	8.1	38.1	18.7	18.87	-	37.5	50	6.2

(6) Guide for Soil Map and Soil Classification

A. Soil Map

(a) Mapping Unit "A"

(i) Major features:

Deep, gray brownish to dark brown, stratified, silt loam to fine sand, occasionally platy structure on sub stratum, some area moderate to severe salinity and alkalinity - (alluvial plane)

(ii) Physiography:

River alluvial plane

(iii) Soil classification symbol:

symbol A

(b) Mapping Unit "B"

(i) Major features

Very deep, brown to light olive brownish, silt loam over brown to light olive massive to platy structure, usually with moderate salinity and alkalinity - (Alluvial soil)

(ii) Physiography:

River alluvial plane

(iii) Soil classification symbol:

symbol B

(c) Mapping Unit "C"

(i) Major features:

Deep, brown to olive dark gray, silt loam to loam, structureless with mottled spots, shallow ground water table - (50 cm depth) some part severe salinity and alkalinity 0 (Alluvial soil).

(ii) Physiography:

Lower terrace of Sistan river

(iii) Soil classification symbol:

symbol C

(d) Mapping Unit "D"

(i) Major features:

Deep, brown to dark yellowish brown, fine sandy clay to coarse sandy clay over brown to blive brown silty clay and massive or coarse platy structure with mottled spots, slight to moderate alkalinity - (Alluvial soil)

(ii) Physiography:

River alluvial plane

(iii) Soil classification symbol:

See symbol D

(e) Mapping Unit "E"

(i) Major features

Very deep, brown to dark yellowish to olive brownish sandy to coarse sandy clay, structureless severely wind eroded - (Alluvial soils).

(ii) Physiography:

River alluvial plane

(iii) Soil classification symbol:

symbol E

(f) Mapping Unit "T"

(i) Physiography:

Hills

(ii) Soil classification symbol:

symbol T

B. Soil Classification and salinity

(1) Soil limitations

(a) Figures 2, 3, 4; sub-soil permeability

Tentative subsoil permeability rating is indicated as the approximation in regard with sub-soil heaviest horizon;

2 : Texture class of the subsoil heaviest horizon is light

3 : Texture class of the subsoil heaviest horizon is medium or heavy

4 : Texture class of the subsoil heaviest horizon is very heavy

(b) Symbols M, H: surface soil texture

The texture os surface soil layers is indicated as belows:

M : Loam - fine sand, loam - silt loam, silt

H : Clay loam, silty clay loam, sandy clay loam.

(2) Topography and erosion limitations

(a) Symbols A_1, A_2, B_1, B_2, : Overall slope

For preparation of below LEGEND - The publication No.205 under the heading of "MANUAL OF LAND CLASSIFICATION FOR IRRIGATION" - Soil Institute of Iran had been used.

Symbol	Overall slope	Transversal slope	M:
A_1	0 - 2	-	Slight
A_2	0 - 2	-	Moderate
B_1	2 - 5	-	Slight
B_2	2 - 5	-	Moderate

(b) Symbols E_0, E_1, E_2, (E_1), (E_2), (E_3): Present erosion status Present status of the water and wind erosion is indicated as follows:

E : No apparent erosion by water

(E_2) : Slight erosion by wind

(E_3) : Severe erosion by wind

(3) Drainage limitation

(a) Symbols VW : Sub classes with shallow ground water table.

(4) Salinity limitations

(a) Symbols S_0, S_1, S_2, S_3 : Soil salinity

S_0 : Less than 4 mmhos/cm no or very slight salinity limitation

S_1 : 4 to 8 mmhos/cm no or very slight salinity limitation

S_2 : 8 to 16 mmhos/cm Moderate salinity limitation

S_3 : 16 to 32 mmhos/cm Severe salinity limitation

(b) Symbols A_0, A_1, A_2, A_3, : Soil alkalinity

The above symbols are indicated the rating tentatively made on the basis of maximum (PH) found within the first 75cm of soil as follows:

A_0 : no alkalinity problem, PH below 8.5

A_1 : Slight alkalinity problem, PH above 8.5

A_2 : Moderate alkalinity problem, PH between 8.5 - 9.0

A_3 : Severe alkalinity problem, PH between 9.0 - 9.5

(c) Symbols I, II, III, IV, V, VI : Land classes

(d) Symbols IIT, IIIT, IVT :

Sub classes in respect to topography limitation

(e) Symbols IIIA, VA :

Sub classes in respect to soil alkalinity

(f) Symbol IIIAT :

Sub-classes in respect to soil alkalinity and tophography

(g) Symbol IIST :

Sub-classes in respect to soil and topography limitation

C. Soil Classification Symbols

Mapping Unit

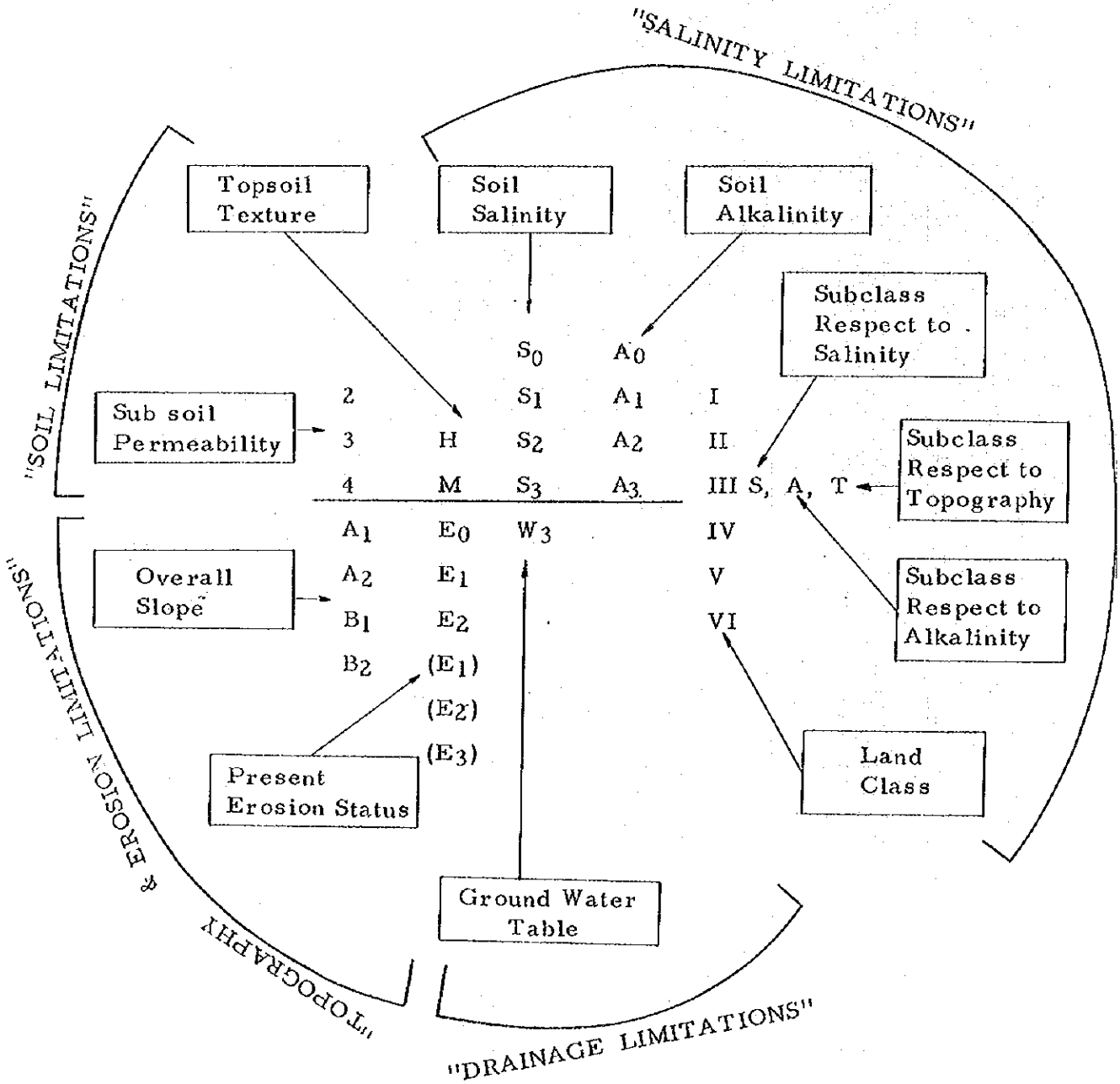
A	B	C	D	E	T
$\frac{3NS_0A_0}{A_2-E_0}$ IIIT	$\frac{3MS_2A_2}{A_1-E_1}$ IIIA	$\frac{3MS_3A_3}{A_1-E_0}$ VA	$\frac{4M}{A_1-E_0}$ IIST	$\frac{2MS_0A_0}{A_1-E_0}$ IIST	$\frac{IV}{T}$
$\frac{3MS_3A_3}{A_2-E_0}$ VA	$\frac{3M}{A_1-E_0}$ IIT	$\frac{3MS_0A_0}{A_1-E_0-W_3}$ VW	$\frac{4M}{A_1-E_0}$ IIST	$\frac{2MS\ A}{A_2-(E_3)}$ IVT	
$\frac{3M}{A_1-E_0}$	$\frac{3MS_0}{A_1-E_0}$ IIT		$\frac{4MS_2A_2}{A_1-E_0}$ IIIA	$\frac{2M}{A_2-(E_2)}$ IIIT	
$\frac{3M}{A\ -E_0}$ IIT	$\frac{3M}{A-E_0}$ I		$\frac{4HS_0A_0}{A_1-E_0}$ IIST	$\frac{2MS_1A_1}{A_1-E_0}$ IIST	
$\frac{3MS_3A_3}{A_1-E_0}$			$\frac{4HS_1A_1}{A_2-E_0}$ IIIT		
$\frac{3MS_2A_2}{A_1-E_0}$ IIIA					
$\frac{3MS_2A_2}{A_1-E_0}$ IIIAT					
$\frac{3M}{B_1-E_0}$ IIT					
$\frac{3MS_0A_0}{A_1-E_0}$ IIT					

D. Electric Conductivity of Saturated extracts for Soil (ECx10^3/cm)

General Symbole

14.90	"	0 - 50 cm
10.4	"	50 - 100 cm
6.40	"	100 - 150 cm

E. Limitation-Rating Formula



5. Drawings

Dwg. No.	Title
R - 1001	General Plan
R - 1002	Plan of Camping Facilities in Zahak
R - 1003	Plan of Camping Facilities in Zabol
R - 1004	Plan of Basic Test Block and Applied Test Block
R - 1005	Plan of Water Supply System
R - 1006	Plan of Water Supply Facilities and Generator Pumping Station, Generator House, Farm Pond and Elevated Water Storage Tank
R - 1007	Irrigation Facilities and Lysimeter Hydrant, Hydrant Box for Plantation, Check Valve Box, Air Valve Box, Blow-off, Discharge Meter Box and Lysimeter
R - 1008	Site Plan for Farm Drainage, Sanitary Sewerage, Electric Distrbution and Telephone Systems
R - 1009	Camping Facilities Office and Exhibition Hall
R - 1010	Camping Facilities Club and Guest House
R - 1011	Camping Facilities Laboratory (Seed and Plant Research, Plant Diseases and Pests Research) (Livestock and Animal Production Research, Pasture and Forest Research)

R - 1012 Camping Facilities

Laboratory
(Soil and Water Research)
(Irrigation and Drainage, Technical Service and Farm Management)

R - 1013 Camping Facilities

Staff Residence
Three Bed Room, Two Bed Room

R - 1014 Camping Facilities

Warehouse, Farm Worker's Assembly House and Garage

R - 1015 Camping Facilities

Farm Equipment Shed, Farm Equipment Shed with Repair Shop, Gate Keeper's House and Main Gate

R - 1016 Camping Facilities

Labour's Quarter, Irrigation Ditch for Plantation, Silo and Green House

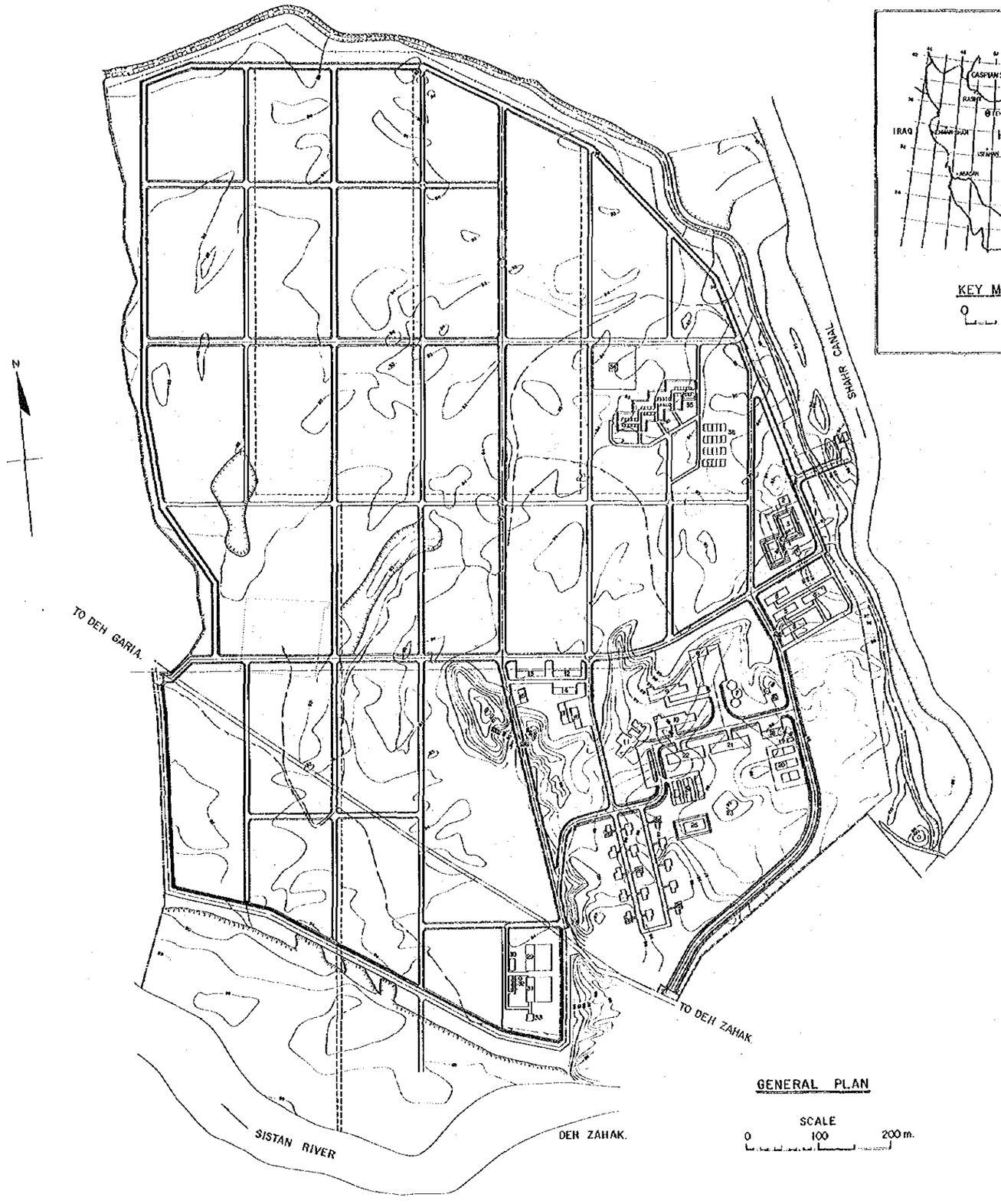
R - 1017 Camping Facilities

Animal Shed for Feeding Experiment and Animal Shed for Breeding

R - 1018 Camping Facilities

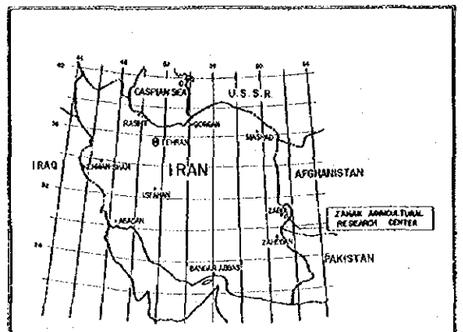
Swimming Pool, Fence, Street Lamp, Septic Tank and Water Storage Tank

R - 1019 Soil Map



GENERAL PLAN

SCALE 0 100 200 m.



KEY MAP

0 500 1000 km.

LEGEND

- BOUNDARY
- CLIFF
- EXISTING CANAL
- FLOW DIRECTION
- EXISTING ROAD
- GARDEN
- CONTOUR - LINE
- BENCH - MARK
- BUILDING
  - 1 MAIN PUMPING STATION
  - 2 GENERATOR AND PUMPING STATION FOR IRRIGATION
  - 3 FARM POND
  - 4 PUMPING STATION FOR DRINKING WATER AND PLANTATION
  - 5 LABOUR'S QUARTER
  - 6 ELEVATED WATER STORAGE TANK
  - 7 EXHIBITION HALL
  - 8 OFFICE
  - 9.10.21.22 LABORATORY
  - 11 CLUB
  - 12.13 FARM EQUIPMENT SHED
  - 14.16.17 WAREHOUSE
  - 15 FARM WORKER'S ASSEMBLY HOUSE
  - 18 GARAGE
  - 19 CABIN
  - 20 TENNIS AND VALLEY-BALL COURT
  - 23 POND
  - 24 GREEN HOUSE
  - 25 SWIMMING POOL
  - 26 STAFF RESIDENCE
  - 27 MAIN GATE
  - 28 GATE
  - 29.31.33 ANIMAL SHED
  - 30 STORE HOUSE FOR HAY
  - 32 SILO
  - 34 METEOROLOGICAL STATION
  - 35 LYSIMETER
  - 36 EXPERIMENTAL FRAMED LOT

PLAN OF FACILITIES

A. EXPERIMENTATON FIELD	63 ha
BLOCK FOR BASIC TESTS (A)	16 '
BLOCK FOR APPLIED TESTS (C)	12 '
' (D)	11 '
' (E)	9 '
BLOCK FOR PASTURE PRODUCTIVITY TESTS (B)	15 '
B. CAMPING FACILITIES	
1. BUILDING	12.350 m²
2. ROAD	
ASPHALT PAVING WITH SIDE WALK	1200 m
ASPHALT PAVING	1900 m
3. POTABLE WATER SUPPLY FOR DRINKING	
PUMP #3" (WITH AUTMATICAL CONTROL SYSTEM)	1 Set
ELEVATED WATER STORAGE TANK 20 m³	1 Set
GALVANIZED IRON PIPE (# 6" ~ 1")	2540 m
4. POTABLE WATER SUPPLY FOR PLANTATION	
ASBESTOS CEMENT PIPE (#150mm~ 75mm)	3840 m
5. SEWERAGE	
SEPTIC TANK 200 m³	1 Set
ASBESTOS CEMENT PIPE (#300mm~ 150mm)	3400 m
6. ELECTRIC DISTRIBUTION FACILITIES	
DIESEL GENERATOR AND ACCESSARY 125 K.V.A	4 Set
ELECTRICAL CABLE	3.700 m
STREET LAMP	130
7. TELEPHONE FACILITIES	
TELEPHONE EQUIPMENTS (EXCHANGER WITH 100 EXTENSION)	1 Set
TELEPHONE CABLE	2300 m
8. MISCELLANEOUS	
TENNIS COURT AND VALLEY-BALL COURT	3
SWIMMING POOL	1 Set
FENCE	4.200 m
GATE	5
C. FARM FACILITIES	
1. IRRIGATION	
INTAKE FACILITY	2 Set
FARM POND (1000 m³)	2
PUMPING FACILITY # 10"	6 Set
PRESSURE TANK (50 m³)	1 Set
ASBESTOS CEMENT PIPE (#300mm~100mm)	6.700 m
2. DRAINAGE	
DRAINAGE CANAL	3200 m
TILE DRAIN (#4" P.V.C)	12000 m
3. FARM ROAD	
GRAVEL PAVING WITH WINDBREAK	10000 m
GRAVEL PAVING	680 m
EARTH ROAD	2350 m
4. METEOROLOGICAL STATION	1 Set
5. LYSIMETER	
6. EXPERIMENTAL FRAMED LOT	4 set
7. MISCELLANEOUS	
OBSERVATION WELL (2 m)	27
OBSERVATION WELL (4 m)	26
SIGN POST	100

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

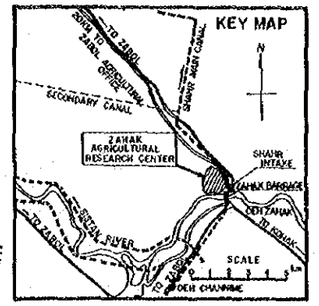
ZAHAK AGRICULTURAL RESEARCH CENTER

GENERAL PLAN

DATE	MAR. 1975	DWG. No.	R-1001

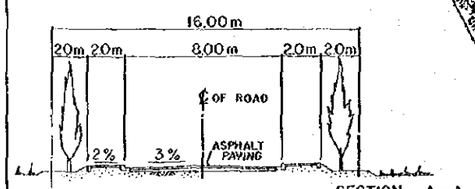
JAPAN INTERNATIONAL COOPERATION AGENCY

SISTAN RIVER



BUILDING & CAMPING FACILITIES

①	MAIN PUMPING STATION	40 m²
②	GENERATOR AND PUMPING STATION FOR IRRIGATION	80 m²
③	FARM POND	1,000m²x 2
④	PUMPING STATION FOR DRINKING WATER AND PLANTATION	100 m²
⑤	LABOUR'S QUARTER	1300 m²
⑥	ELEVATED WATER STORAGE TANK	20m²x 2
⑦	EXHIBITION HALL	430 m²
⑧	OFFICE	740 m²
⑨	LABORAORY (IRRIGATION AND DRAINAGE, TECHNICAL SERVICES)	830 m²
⑩	LABORATORY (SOIL AND WATER RESEARCH)	800 m²
⑪	CLUB	560 m²
⑫	FARM EQUIPMENT SHED WITH REPAIR SHOP	290 m²
⑬	FARM EQUIPMENT SHED	300 m²
⑭	WAREHOUSE FOR FARM IMPLEMENTS	300 m²
⑮	FARM WORKER'S ASSEMBLY HOUSE	250 m²
⑯	WAREHOUSE FOR CROPS	300 m²
⑰	WAREHOUSE FOR GRASS	300 m²
⑱	GARAGE	210 m²
⑲	CABIN	40 m²
⑳	TENNIS AND VALLEY-BALL COURT	3
㉑	LABORATORY (SEED AND PLANT RESEARCH)	885 m²
㉒	LABORATORY (LIVESTOCK AND ANIMAL PRODUCTION RESEARCH)	885 m²
㉓	POND	L.S
㉔	GREEN HOUSE	210m²x 3
㉕	SWIMMING POOL (25m x 7LANES)	1
㉖	STAFF RESIDENCE	120m²x 15
㉗	MAIN GATE	1
㉘	GATE	3
㉙	ANIMAL SHED	320 m²
㉚	STORE HOUSE FOR HAY	160 m²
㉛	ANIMAL SHED	410 m²
㉜	SILO	7
㉝	ANIMAL SHED	150 m²



PLAN OF CAMPING FACILITIES IN ZAHAK

SCALE 0 50 100m

SHAHR CANAL

LEGEND

- FLOW DIRECTION
- CLIFF
- CENTER LINE OF ROAD
- BOUNDARY
- FENCE
- PLANTATION ALONG THE ROAD
- PLANTATION FOR YARD
- PIPELINE FOR POTABLE WATER SUPPLY
- CURVE SETTING FOR ROAD
- ASPHALT PAVING ROAD
- GRAVEL PAVING ROAD
- PATH

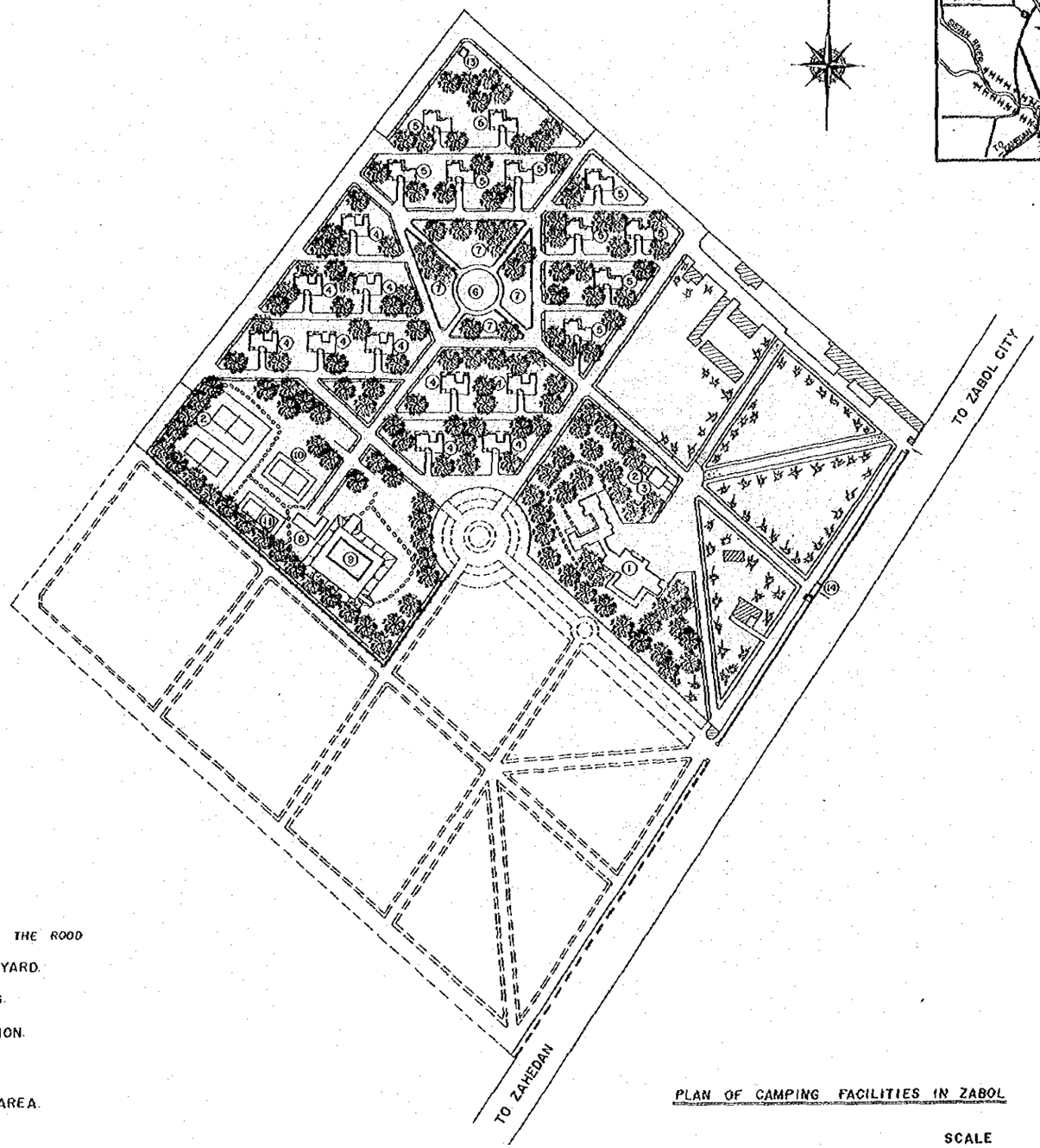
AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

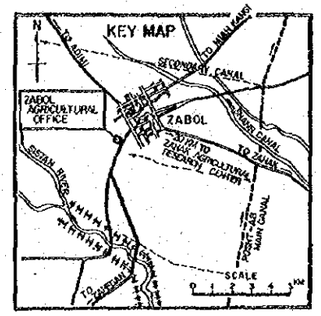
ZAHAK AGRICULTURAL RESEARCH CENTER

PLAN OF CAMPING FACILITIES IN ZAHAK

DATE	MAR 1975	DWG. No.	R-1002

JAPAN INTERNATIONAL COOPERATION AGENCY





PLAN OF FACILITIES

A. CAMPING FACILITIES

1. BUILDING	
CLUB AND GUEST HOUSE	1,190m²
PUMPING STATION FOR POTABLE WATER SUPPLY	7m²
STAFF RESIDENCE (3 BED ROOM)	180m²x10
STAFF RESIDENCE (2 BED ROOM)	150m²x10
GATE KEEPER'S HOUSE	20m²
CABIN WITH SHOWER	150m²
2. POTABLE WATER SUPPLY FOR DRINKING	
WATER STORAGE TANK 20m³	1
ELEVATED WATER STORAGE TANK 30m³	1 set.
PUMP ϕ2"	1 set.
GALVANIZED IRON PIPE (ϕ3"~3/2")	2,600m
3. POTABLE WATER SUPPLY FOR PLANTATION	
PUMP ϕ 2"	1 set.
ASBESTOS CEMENT PIPE (ϕ150mm)	900m
IRRIGATION DITCH	4,000m
4. SEWAGE	
SEPTIC TANK 200m³	1
PUMP ϕ 2"	1 set.
ASBESTOS CEMENT PIPE (ϕ200-150mm)	2,200m
5. ELECTRIC DISTRIBUTION FACILITIES	
ELECTRICAL CABLE	2,700m
STREET LAMP	70
6 COMMUNICATION FACILITIES	
TELEPHONE EQUIPMENTS	1 set.
7. ROAD	
ASPHALT PAVING	14,000m²
DRAINAGE DITCH	3,000m
8. MISCELLANEOUS	
TENNIS COURT	2
VALLEY-BALL COURT	1
BASKET-BALL COURT	1
SWIMMING POOL (25m x 7 LANES)	1
FENCE	800m

BUILDING & FACILITIES LIST

① CLUB AND GUEST HOUSE
② ELEVATED WATER STORAGE TANK
③ PUMPING STATION FOR POTABLE WATER SUPPLY
④ STAFF RESIDENCE (3 BED ROOM)
⑤ STAFF RESIDENCE (2 BED ROOM)
⑥ CHILDREN'S PARK
⑦ GREEN SPACE
⑧ CABIN AND SHOWER
⑨ SWIMMING POOL
⑩ BASKET-BALL COURT
⑪ VALLEY-BALL COURT
⑫ TENNIS COURT
⑬ SEPTIC TANK
⑭ MAIN GATE

LEGEND

- PLANTATION ALONG THE ROAD
- PLANTATION FOR YARD.
- EXISTING BUILDING.
- EXISTING PLANTAION.
- PATH.
- OUT OF PROJECT AREA.

PLAN OF CAMPING FACILITIES IN ZABOL

SCALE 0 50 100m

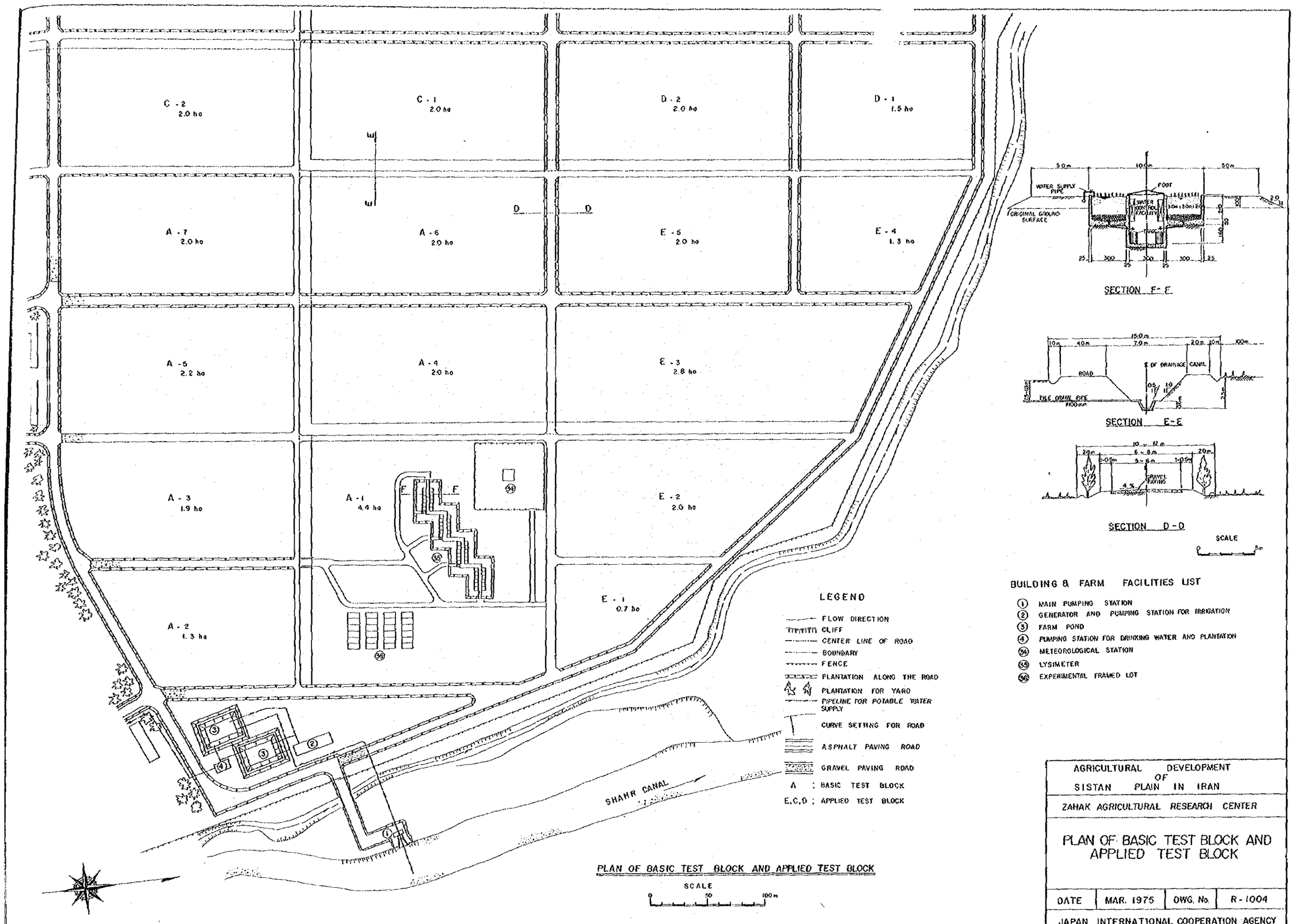
AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

ZAHAK AGRICULTURAL RESEARCH CENTER

PLAN OF CAMPING FACILITIES IN ZABOL

DATE	MAR. 1975	DWG. No.	R-1003

JAPAN INTERNATIONAL COOPERATION AGENCY



SCALE
0 5m

BUILDING & FARM FACILITIES LIST

1. MAIN PUMPING STATION
2. GENERATOR AND PUMPING STATION FOR IRRIGATION
3. FARM POND
4. PUMPING STATION FOR DRINKING WATER AND PLANTATION
54. METEOROLOGICAL STATION
55. LYSIMETER
56. EXPERIMENTAL FRAMED LOT

LEGEND

- FLOW DIRECTION
- CLIFF
- CENTER LINE OF ROAD
- BOUNDARY
- FENCE
- PLANTATION ALONG THE ROAD
- PLANTATION FOR YARD
- PIPELINE FOR POTABLE WATER SUPPLY
- CURVE SETTING FOR ROAD
- ASPHALT PAVING ROAD
- GRAVEL PAVING ROAD
- A : BASIC TEST BLOCK
- E,C,D : APPLIED TEST BLOCK

PLAN OF BASIC TEST BLOCK AND APPLIED TEST BLOCK

SCALE
0 50 100m

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

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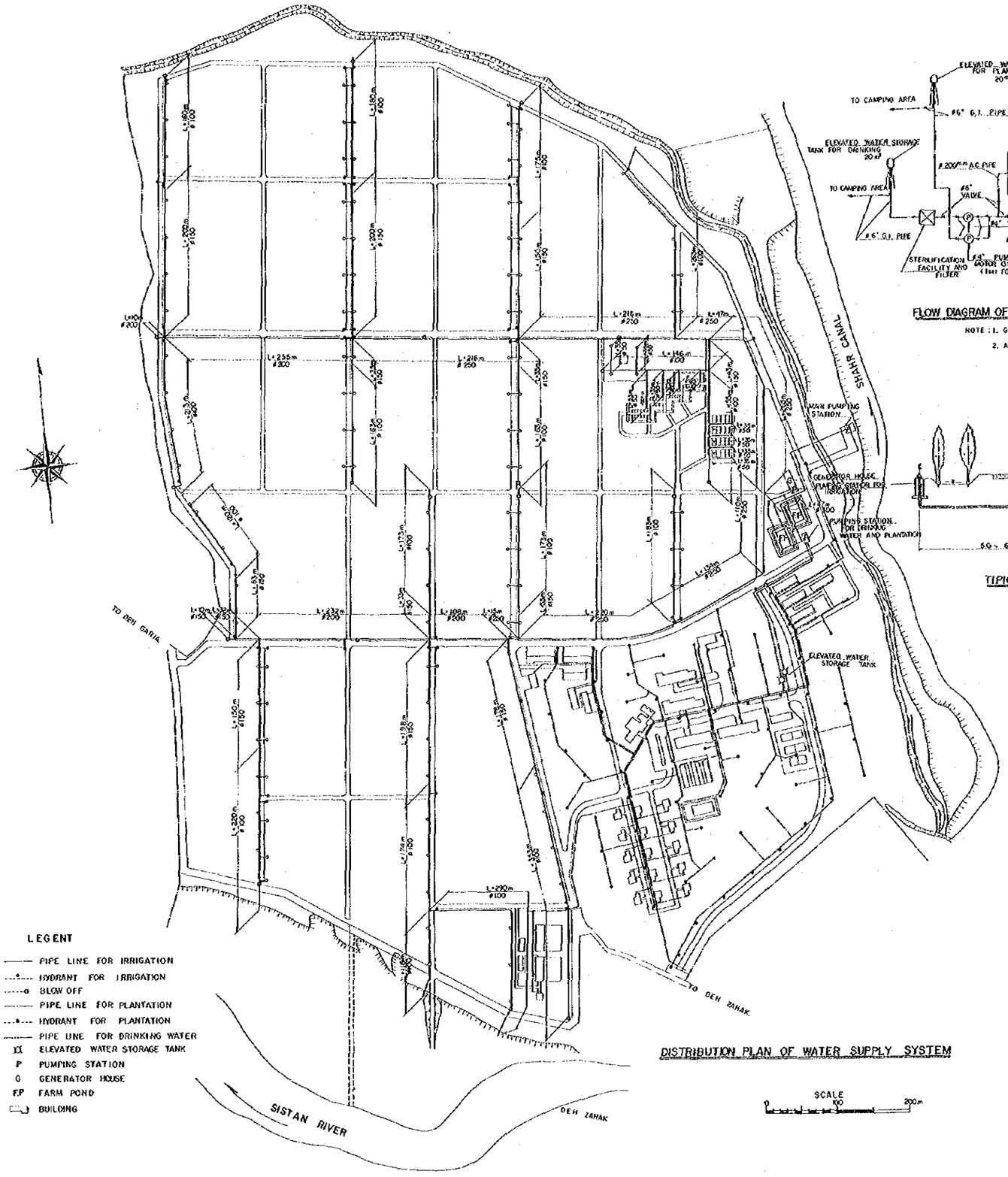
PLAN OF BASIC TEST BLOCK AND APPLIED TEST BLOCK

DATE	MAR. 1975	DWG. No.	R-1004

JAPAN INTERNATIONAL COOPERATION AGENCY

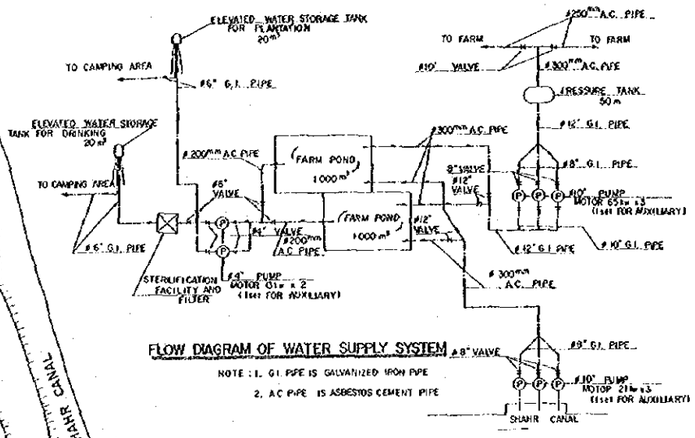


LEGEND

- PIPE LINE FOR IRRIGATION
- HYDRANT FOR IRRIGATION
- BLOW OFF
- PIPE LINE FOR PLANTATION
- HYDRANT FOR PLANTATION
- PIPE LINE FOR DRINKING WATER
- ELEVATED WATER STORAGE TANK
- P PUMPING STATION
- G GENERATOR HOUSE
- FP FARM POND
- BUILDING

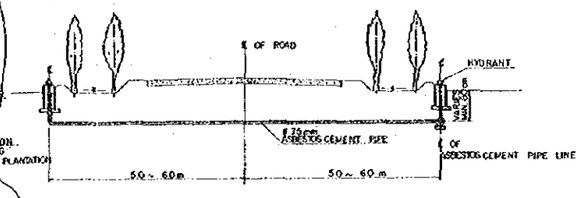
DISTRIBUTION PLAN OF WATER SUPPLY SYSTEM

SCALE 0 100 200m



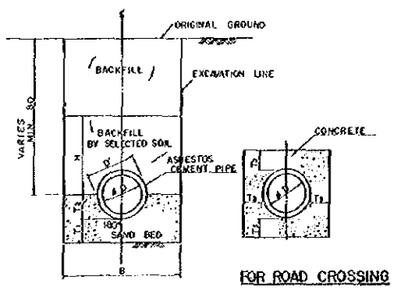
FLOW DIAGRAM OF WATER SUPPLY SYSTEM

NOTE : 1. GI PIPE IS GALVANIZED IRON PIPE
2. AC PIPE IS ASBESTOS CEMENT PIPE



TYPICAL SECTION OF DISTRIBUTION FACILITY

SCALE 0 1 2 3m



FOR ROAD CROSSING

TYPICAL SECTION OF ASBESTOS CEMENT PIPE

DIMENSIONS OF ASBESTOS CEMENT PIPE LINE						
VARK / φ D	75	100	150	200	250	300
B	60	60	60	60	60	60
H	30	30	30	30	40	45
T1	10	10	10	10	15	15
T2	0/2	0/2	0/2	0/2	0/2	0/2
T3	10	10	10	10	15	15

LIST OF WATER SUPPLY FACILITIES

A. MAIN PUMPING STATION
- 1. BUILDING 40 m²
- 2. PUMP φ 10" 3 set (1 set FOR AUXILIARY)
  - POWER 21 kw x 2
  - ACTUAL HEAD 5 m
  - DISCHARGE 8.4 m³/min

B. IRRIGATION FACILITIES
- 1. BUILDING 80 m²
- 2. PUMP φ 10" 3 set (1 set FOR AUXILIARY)
  - POWER 65 kw x 2
  - ACTUAL HEAD 11 m
  - DISCHARGE 7.8 m³/min
- 3. PIPE LINE
  - ASBESTOS CEMEN PIPE φ 100mm 3 300 m
  - " φ 150mm 1 380 m
  - " φ 200mm 600 m
  - " φ 250mm 1 230 m
  - " φ 300mm 50 m
- 4. PRESSURE TANK 50m³ 1 set

C. DRINKING WATER FACILITIES
- 1. BUILDING 100 m²
- 2. PUMP φ 4" 2 set (1 set FOR AUXILIARY)
  - POWER 13 kw x 1
  - ACTUAL HEAD 26 m
  - DISCHARGE 1.34 m³/min
- 3. PIPE LINE
  - GALVANIZED IRON PIPE φ 6" 140 m
  - " φ 4" 210 m
  - " φ 3" 350 m
  - " φ 2" 620 m
  - " φ ½" 490 m
  - " φ 1" 730 m
- 4. STERILIFICATION FACILITY 1 set
- 5. ELEVATED WATER STORAGE TANK 20m³ 1

D. WATER SUPPLY FACILITIES FOR PLANTATION
- 1. PIPE LINE
  - ASBESTOS CEMENT PIPE φ 75mm 2 800 m
  - " φ100mm 770 m
  - " φ150mm 270 m
- 2. ELEVATED WATER STORAGE TANK 20m³ 1

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

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PLAN OF WATER SUPPLY SYSTEM

DATE	MAR 1975	DWG. No.	R-1005

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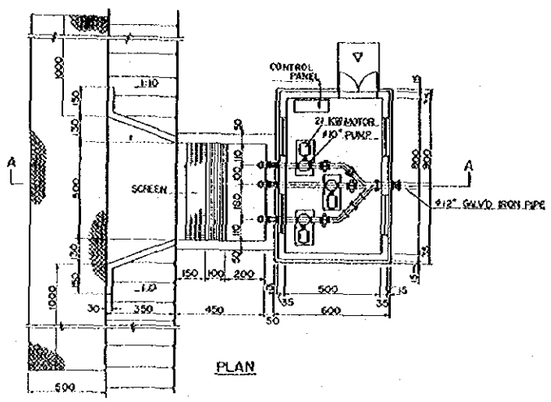
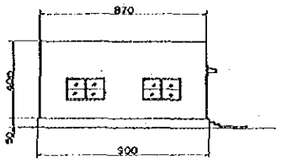
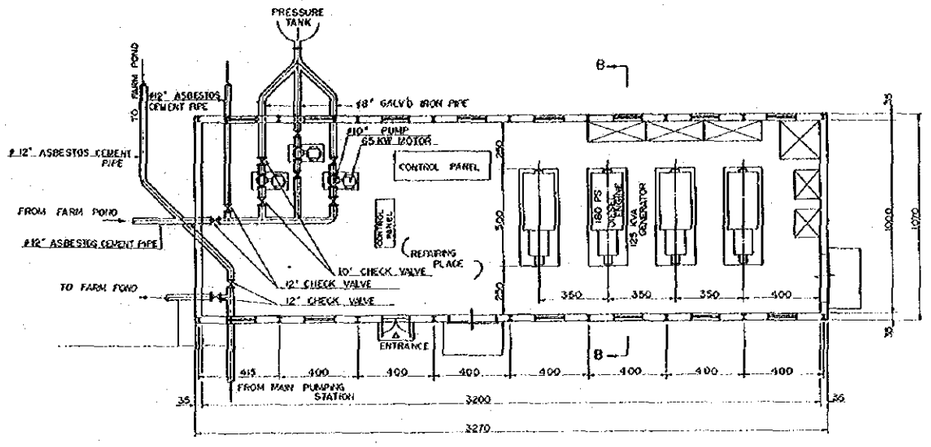


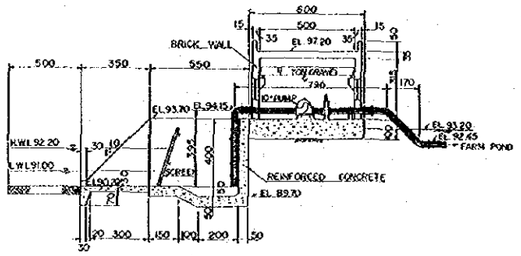
PLAN



WEST ELEVATION



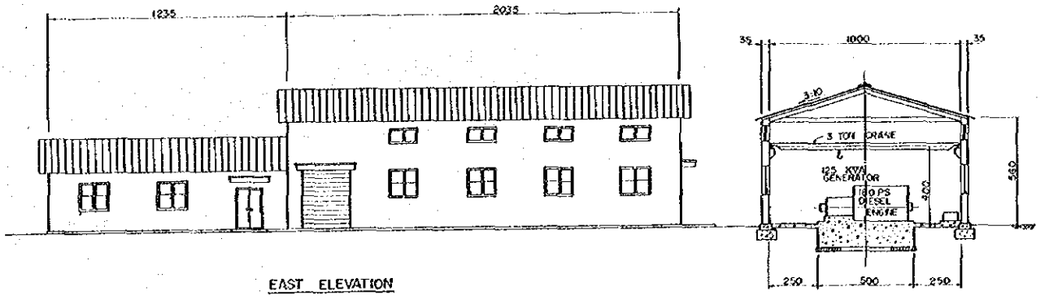
PLAN



SECTION A-A

MAIN PUMPING STATION

SCALE 0 5m

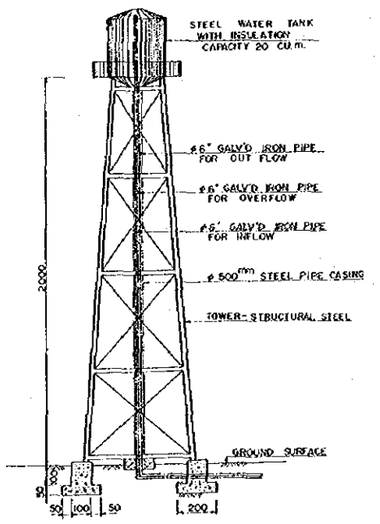


EAST ELEVATION

SECTION B-B

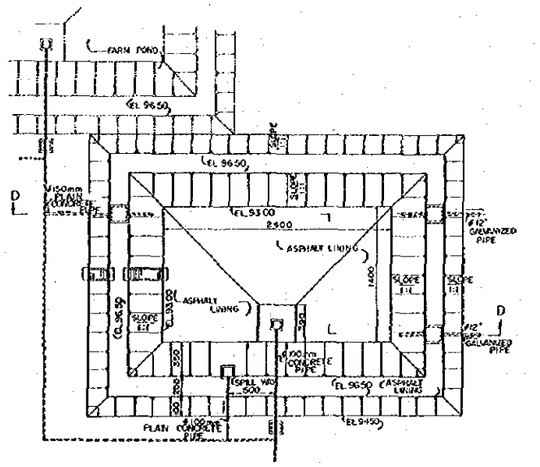
PUMPING STATION FOR IRRIGATION AND GENERATOR HOUSE

SCALE 0 500cm

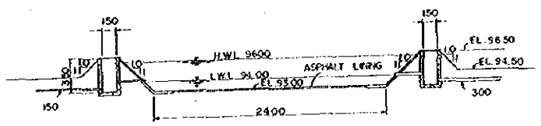


ELEVATED WATER STORAGE TANK

SCALE 0 5m

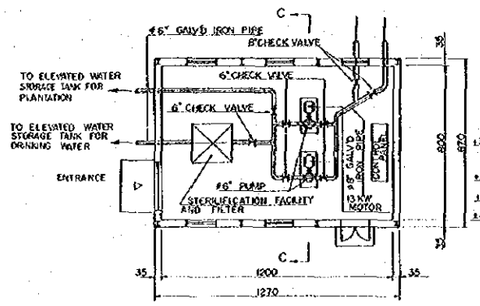


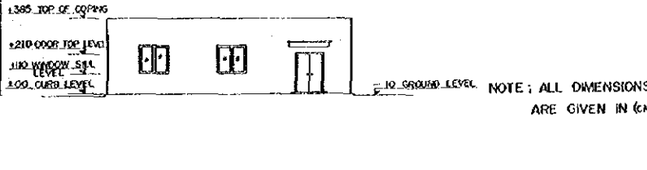
PLAN



SECTION D-D

FARM POND SCALE 0 5 10m

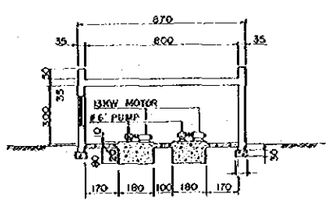




EAST ELEVATION

NOTE ; ALL DIMENSIONS ARE GIVEN IN (cm)

PLAN



SECTION C-C

PUMPING STATION FOR DRINKING WATER AND PLANTATION

SCALE 0 500cm

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

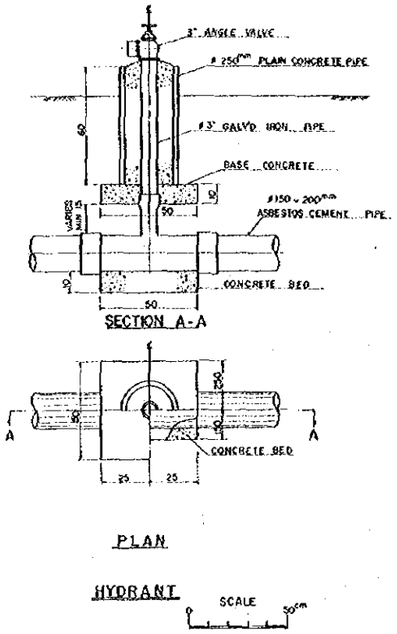
ZAHAK AGRICULTURAL RESEARCH CENTER

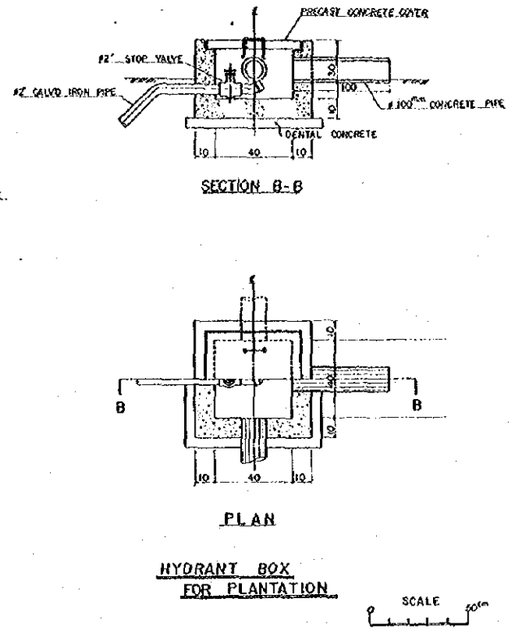
PLAN OF WATER SUPPLY FACILITIES AND GENERATOR

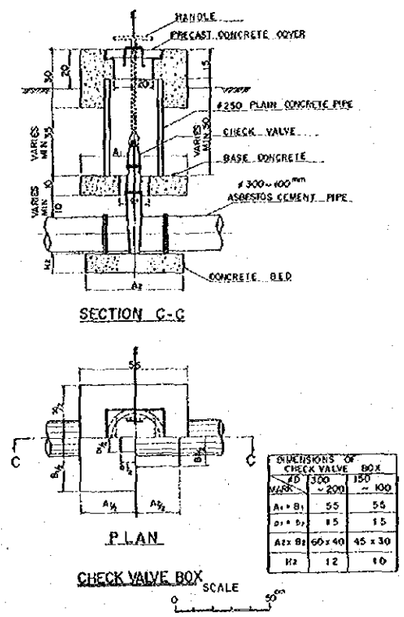
PUMPING STATION, GENERATOR HOUSE, FARM POND AND ELEVATED WATER STORAGE TANK

DATE	MAR 1975	DWG. No.	R-1006

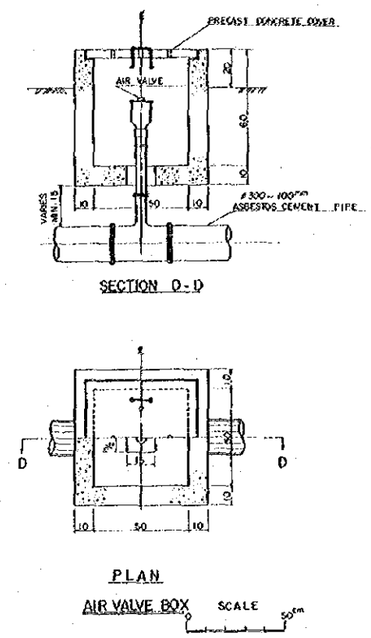
JAPAN INTERNATIONAL COOPERATION AGENCY

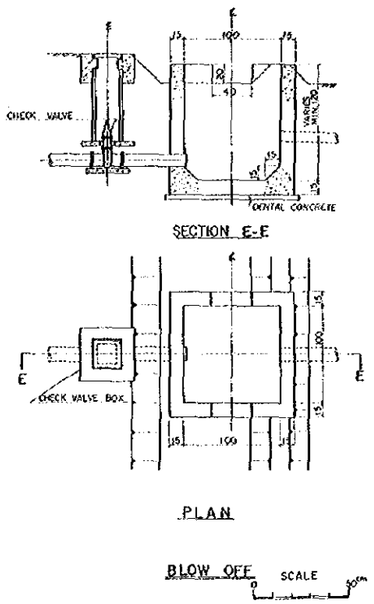


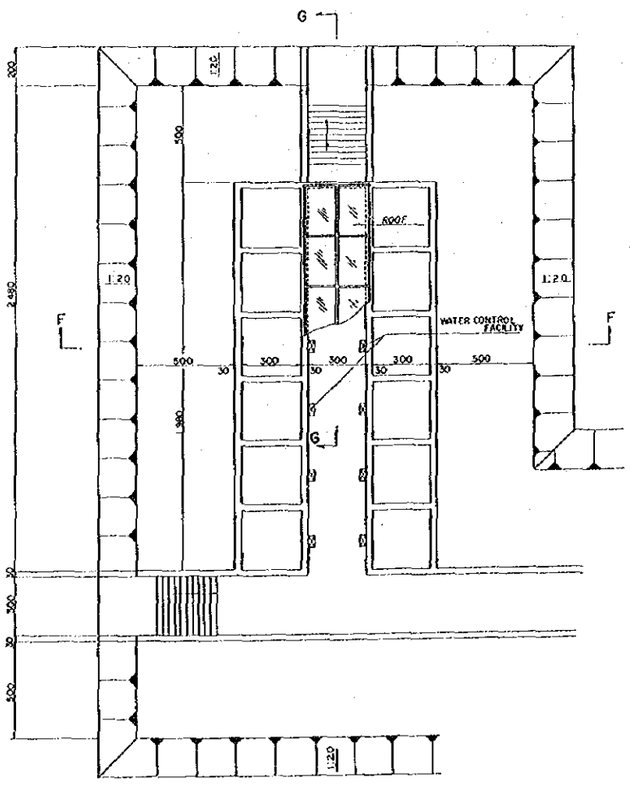


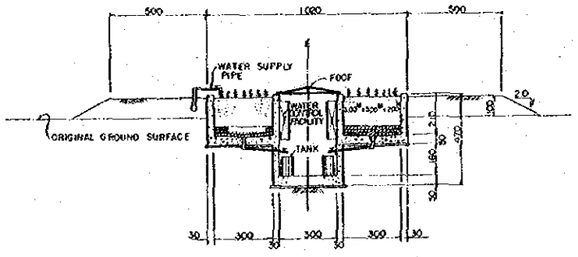


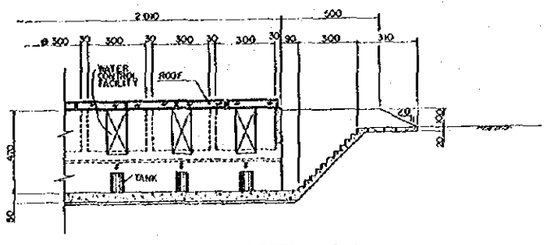
DIMENSIONS OF CHECK VALVE ϕD	300 ~ 200	150 ~ 100
A1 × B1	55	55
a1 × b1	15	15
A2 × B2	60 × 40	45 × 30
H2	12	10



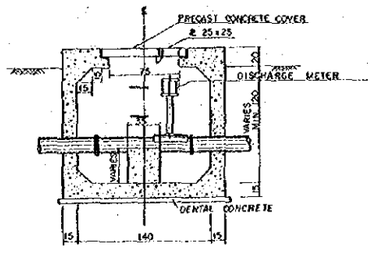


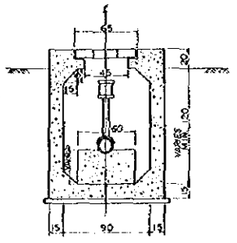


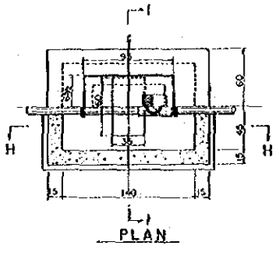




LYSIMETER SCALE







DISCHARGE METER BOX SCALE

NOTE : ALL DIMENSIONS ARE GIVEN IN (CM)

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

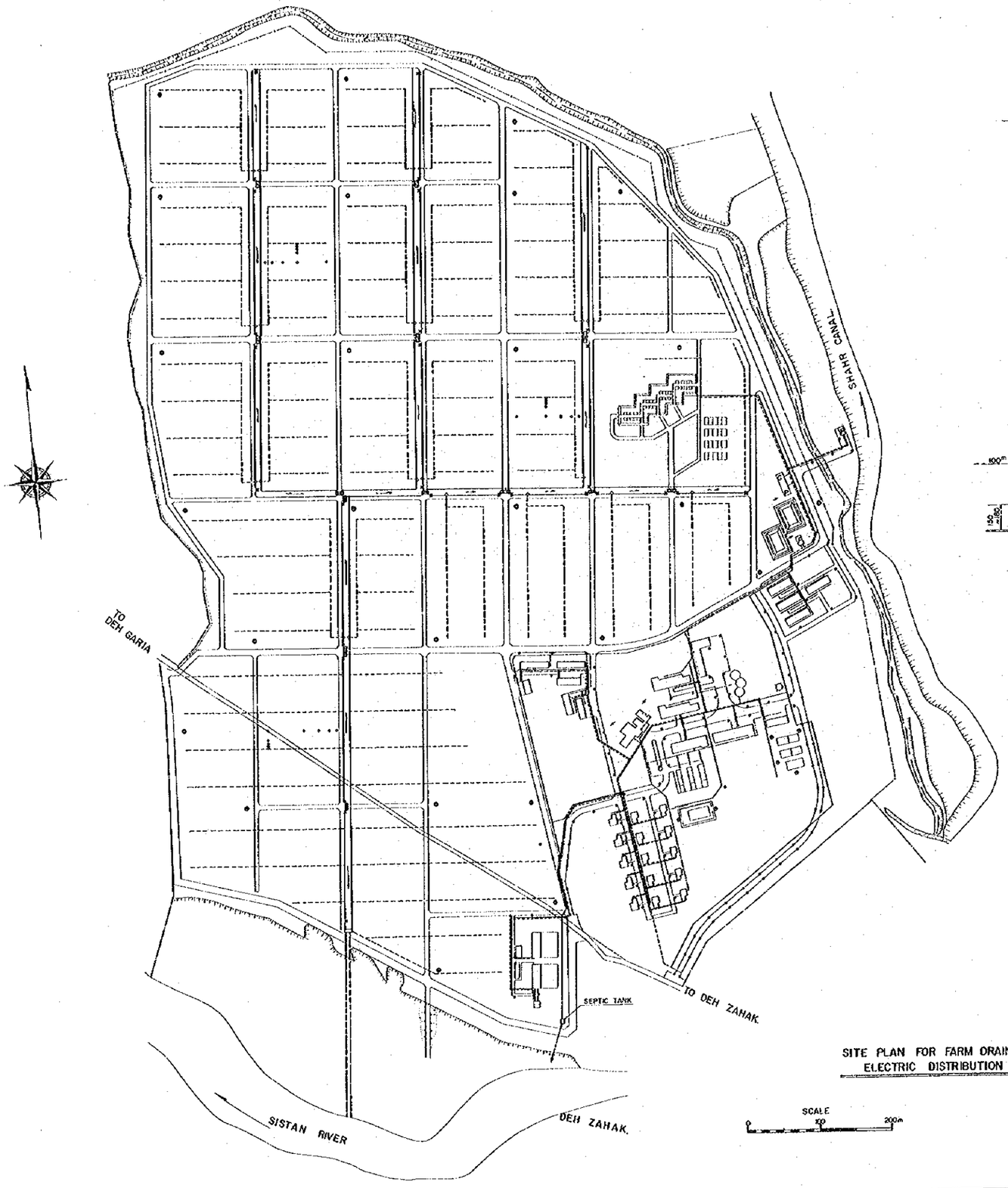
ZAHAK AGRICULTURAL RESEARCH CENTER

IRRIGATION FACILITIES AND LYSIMETER

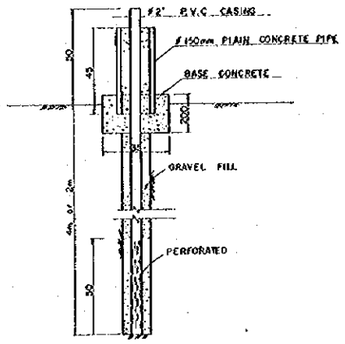
HYDRANT, HYDRANT BOX FOR PLANTATION
CHECK VALVE BOX, AIR VALVE BOX, BLOW OFF, DISCHARGE METER BOX AND LYSIMETER

DATE	MAR. 1975	DWG No.	R-1007

JAPAN INTERNATIONAL COOPERATION AGENCY

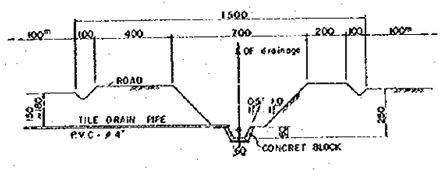


SITE PLAN FOR FARM DRAINAGE, SANITARY SEWERAGE, ELECTRIC DISTRIBUTION AND TELEPHONE SYSTEMS



OBSERVATION WELL

SCALE
0
50cm



TYPICAL SECTION OF DRAINAGE CANAL

SCALE
0
5m

LIST OF FACILITIES

A. DRAINAGE FACILITIES		
1. DRAINAGE CANAL		3 200 m
BOX CULVERT		14
STEP FOR OBSERVATION AND MAINTENANCE		30
2. TILE DRAIN P.V.C. - ø 4"		12 000 m
3. OBSERVATION WELL		
TYPE A (2 m DEPTH)		27
TYPE B (4 m DEPTH)		26
B. SANITARY SEWERAGE FACILITIES		
1. SEWAGE PIPE		
ASBESTOS CEMENT PIPE	ø 150mm	1 150 m
"	ø 200mm	1 000 m
"	ø 250mm	180 m
"	ø 300mm	275 m
MANHOLE		60
2. SEPTIC TANK 200 m³		1
C. ELECTRIC DISTRIBUTION FACILITIES		
1. GENERATOR		
BUILDING		240 m²
GENERATOR 125 kva		4 set (1set FOR AUXILIARY)
DIESEL ENGINE 180 PS		4 set (1set FOR AUXILIARY)
FUEL STORAGE TANK 40 m³		4
2. ELECTRICAL CABLE		3 700 m
3. STREET LAMP		130
D. TELEPHONE FACILITIES		
1. TELEPHONE EQUIPMENTS		1 set
2. TELEPHONE CABLE		2300 m

LEGEND

- DRAINAGE CANAL
- TILE DRAIN PIPE LINE
- BOX CULVERT
- STEP FOR OBSERVATION AND MAINTENANCE
- OBSERVATION WELL TYPE A (2M DEPTH)
- OBSERVATION WELL TYPE B (4M DEPTH)
- SEWAGE PIPE LINE
- ELECTRICAL CABLE
- TELEPHONE CABLE
- LIGHTING POST - ONE LAMP
- LIGHTING POST - TWO LAMPS
- LIGHTING POST - COCKTAIL LAMPS
- G GENERATOR HOUSE
- P PUMPING STATION

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

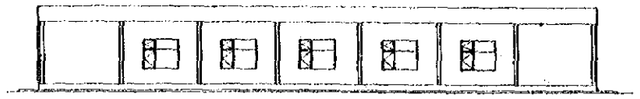
ZAHAK AGRICULTURAL RESEARCH CENTER

SITE PLAN FOR FARM DRAINAGE, SANITARY SEWERAGE, ELECTRIC DISTRIBUTION AND TELEPHONE SYSTEMS

DATE	MAR. 1975	DWG. No.	R-1008

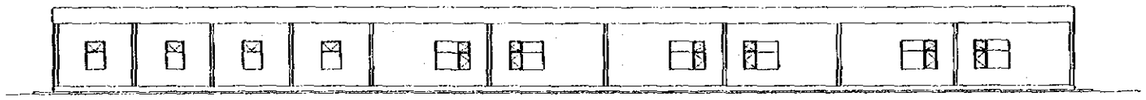
JAPAN INTERNATIONAL COOPERATION AGENCY

OFFICE

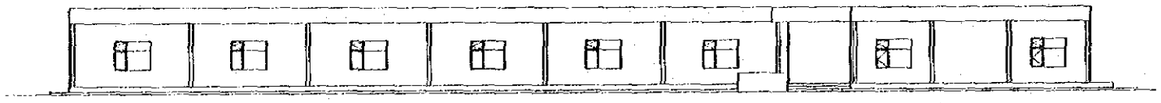


NORTH ELEVATION

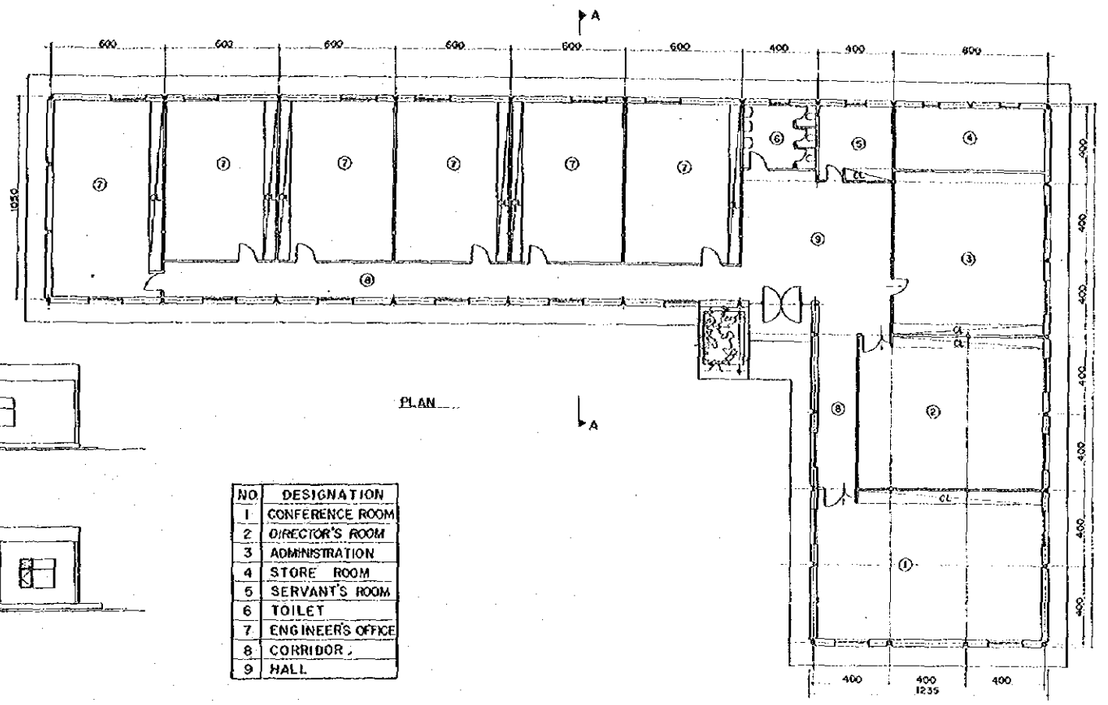
SECTION A-A



WEST ELEVATION



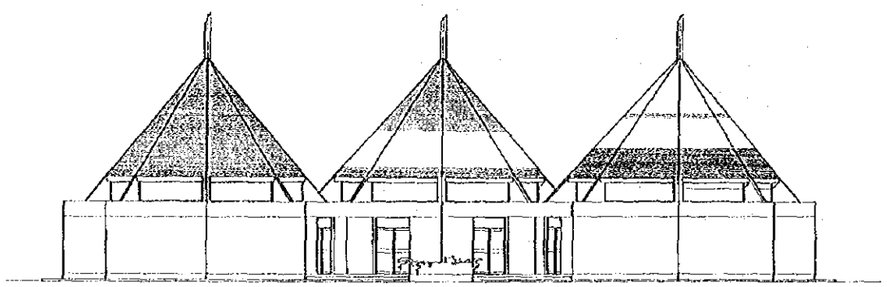
EAST ELEVATION



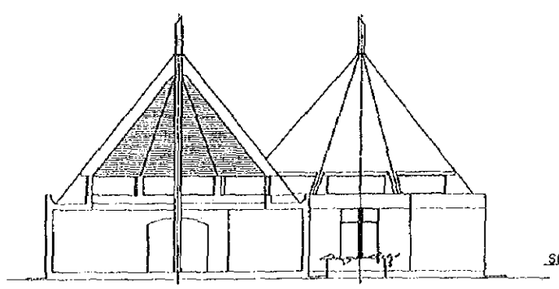
PLAN

NO.	DESIGNATION
1	CONFERENCE ROOM
2	DIRECTOR'S ROOM
3	ADMINISTRATION
4	STORE ROOM
5	SERVANT'S ROOM
6	TOILET
7	ENGINEER'S OFFICE
8	CORRIDOR,
9	HALL

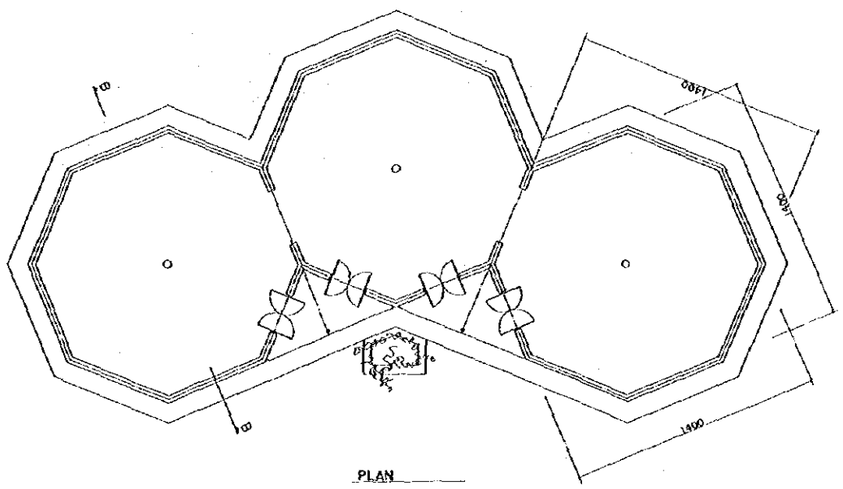
EXHIBITION HALL



SOUTH ELEVATION



SECTION B-B



PLAN

SCALE

0 5M

NOTE: ALL DIMENSIONS ARE GIVEN IN (CM)

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

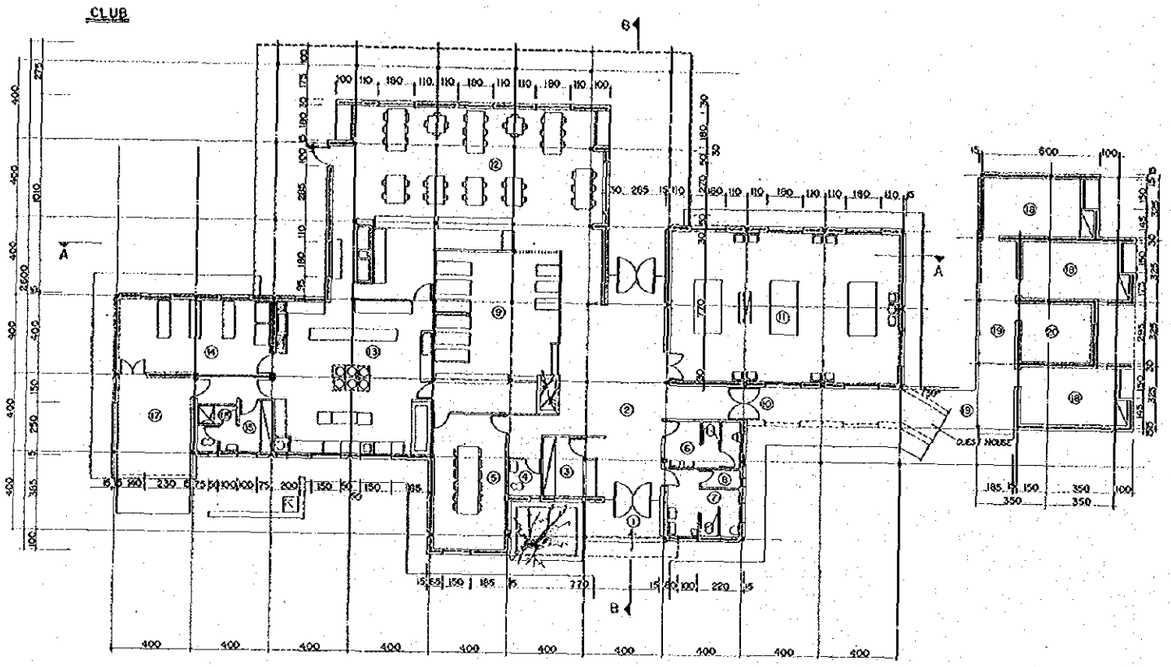
ZAHAK AGRICULTURAL RESEARCH CENTER

CAMPING FACILITIES
OFFICE AND EXHIBITION HALL

DATE	MAR. 1975	DWG. No.	R-1009

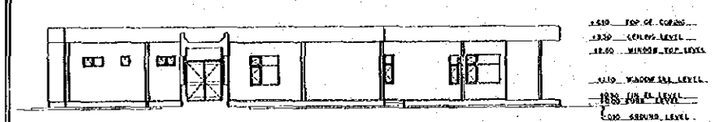
JAPAN INTERNATIONAL COOPERATION AGENCY

CLUB

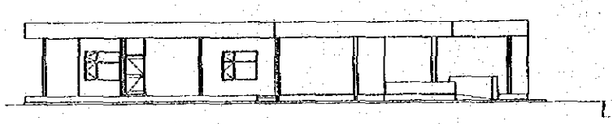


PLAN

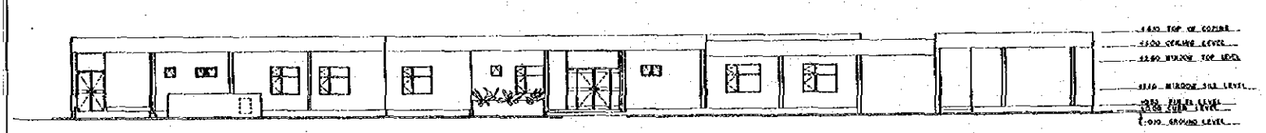
SCALE 0 500 CM



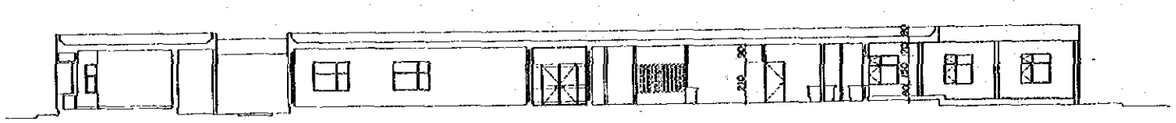
EAST ELEVATION



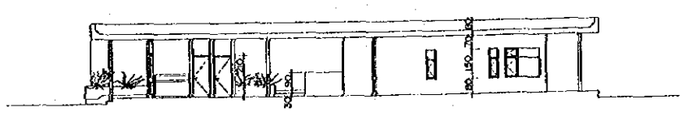
WEST ELEVATION



SOUTH ELEVATION

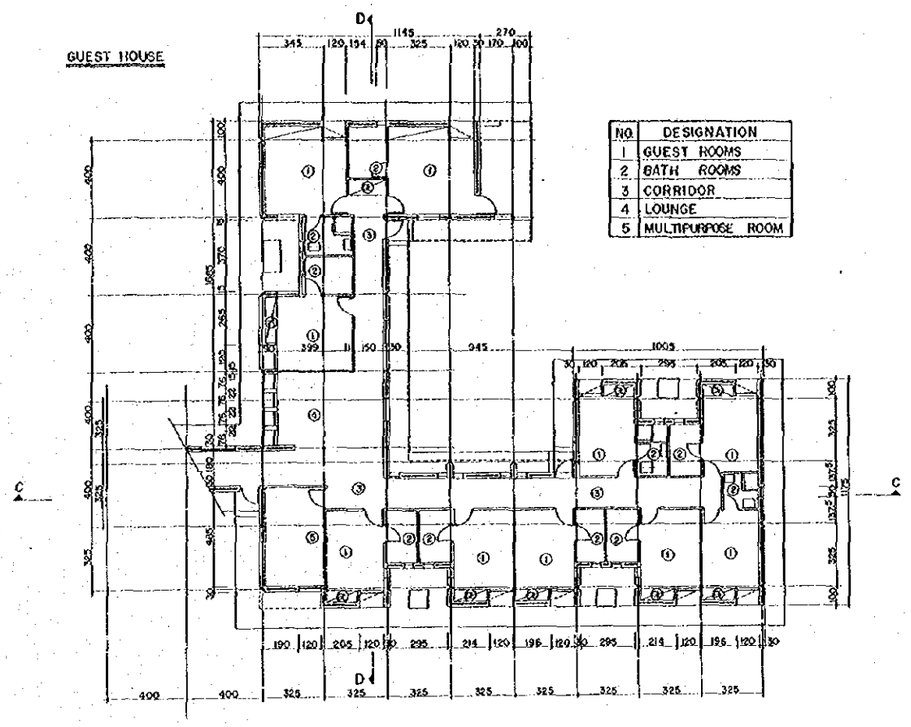


SECTION A-A



SECTION B-B

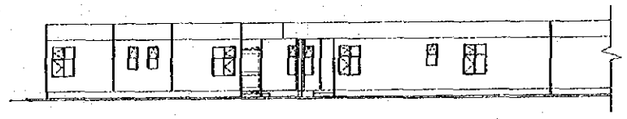
GUEST HOUSE



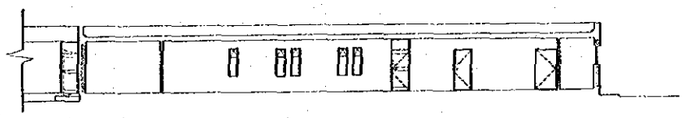
NO.	DESIGNATION
1	GUEST ROOMS
2	BATH ROOMS
3	CORRIDOR
4	LOUNGE
5	MULTIPURPOSE ROOM

PLAN

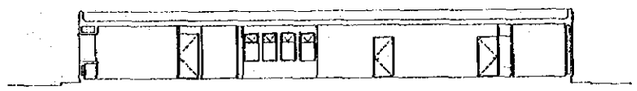
SCALE 0 500 CM



SOUTH ELEVATION



SECTION C-C



SECTION D-D

NO.	DESIGNATION	NO.	DESIGNATION
1	ENTRANCE	11	SPORT ROOM
2	ENTRANCE HALL	12	DINING ROOM
3	RECEPTION	13	KITCHEN
4	TOILET	14	STORE ROOM
5	GUESTS' DINING ROOM	15	DRESSING ROOM
6	LADIES' REST ROOM	16	SHOWER ROOM
7	GENTLEMEN'S REST ROOM	17	SERVICE YARD
8	JANITOR'S ROOM	18	BED ROOM
9	SNACK BAR	19	SIDE WALK
10	CORRIDOR	20	SHOWER AND REST ROOM

NOTE: ALL DIMENSIONS ARE GIVEN IN (CM)

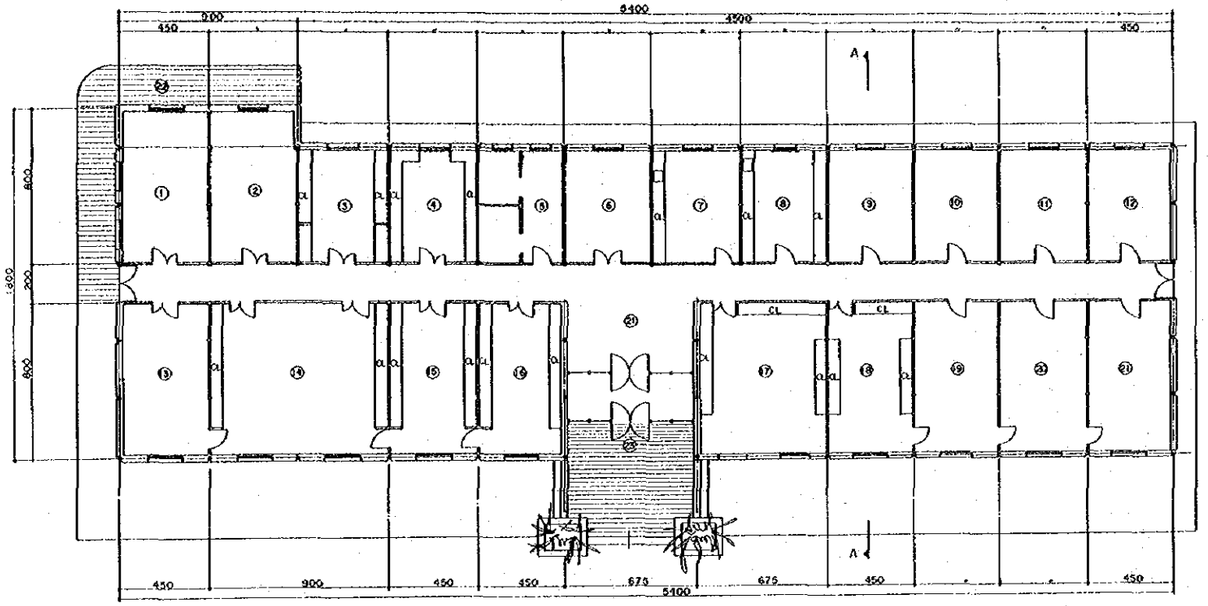
AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

ZAHAK AGRICULTURAL RESEARCH CENTER

CAMPING FACILITIES
CLUB AND GUEST HOUSE

DATE	MAR 1975	DWG. No.	R-1010

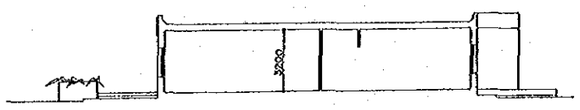
JAPAN INTERNATIONAL COOPERATION AGENCY



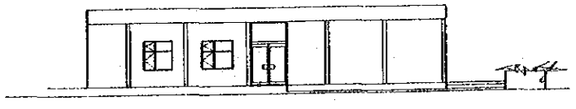
PLAN
(SEED AND PLANT RESEARCH
PLANT DISEASES AND PESTS RESEARCH)

NO.	DESIGNATION SEED AND PLANT RESEARCH
1	SEMINAR
2	SAMPLE AND DATA LIBRARY
3	DISTILLER ROOM
4	CHEMICALS STORE R
5	TOILET
6	STORE ROOM
7	SERVANT ROOM
8	O.P.E. ROOM
9	CALCULATION ROOM
10	DRYING ROOM
11	LABORATORY
12	COLD STORAGE ROOM
13	DRAFT ROOM
14	LABORATORY
15	PRECIOUS INSTRUMENT R
16	WEIGHT ROOM
17	RESEARCH ROOM
18	MICRO SCOPE ROOM
19	ASEPTIC BOX
20	THERMOSTATIC CHAMBER
21	HALL
22	SIDE WALK
23	ENTRANCE

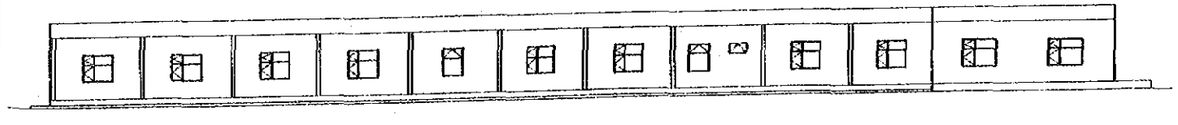
NO.	DESIGNATION LIVE STOCK AND PRODUCTION RESEARCH
1	SEMINAR
2	SAMPLE AND DATA LIBRARY
3	SEED STORE ROOM
4	CHEMICALS STORE R.
5	TOILET
6	STORE ROOM
7	SERVANT ROOM
8	O.P.E. ROOM
9	DISTILLER ROOM
10	DRYING ROOM
11	LABORATORY
12	COLD STORAGE ROOM
13	MICROSCOPE ROOM
14	LABORATORY
15	WEIGHT ROOM
16	RESEARCH ROOM
17	RESEARCH ROOM
18	PRECIOUS INSTRUMENT R.
19	LABORATORY
20	DRAFT ROOM
21	HALL
22	SIDE WALK
23	ENTRANCE



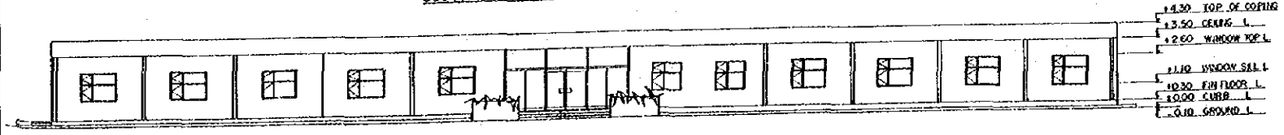
SECTION A--A



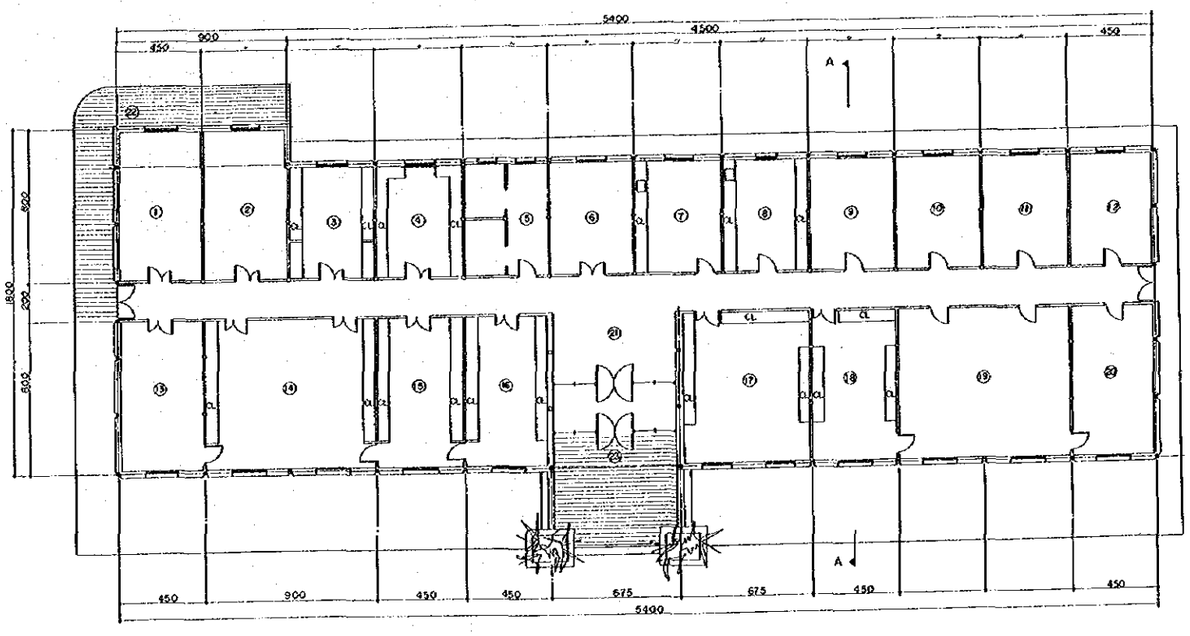
EAST ELEVATION



SOUTH ELEVATON



NORTH ELEVATON



PLAN
(LIVESTOCK AND ANIMAL PRODUCTION RESEARCH, PASTURE AND FOREST RESEARCH)

NOTE; ALL DIMENSIONS ARE GIVEN IN (CM)

SCALE
0 5M

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

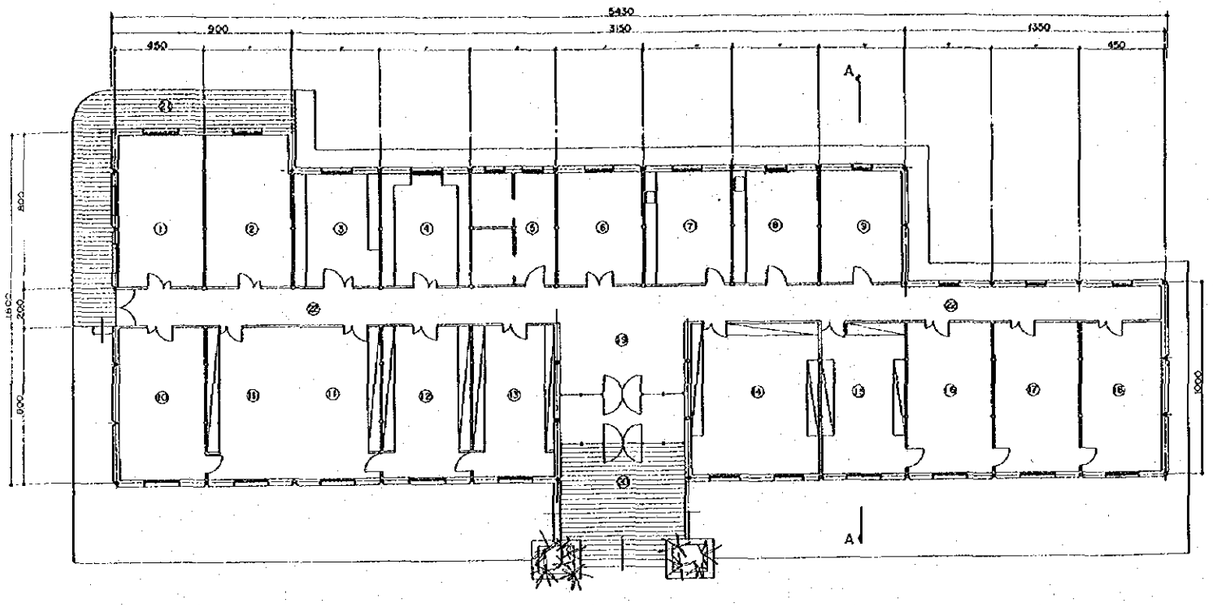
ZAHAK AGRICULTURAL RESEARCH CENTER

CAMPING FACILITIES LABORATORY

(SEED AND PLANT RESEARCH, PLANT DISEASES AND PESTS RESEARCH) (LIVESTOCK AND ANIMAL PRODUCTION RESEARCH, PASTURE AND FOREST RESEARCH)

DATE	MAR. 1975	DWG. No..	R-1011

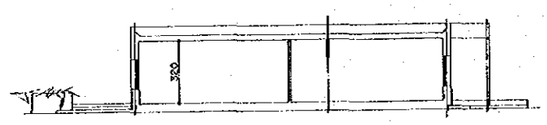
JAPAN INTERNATIONAL COOPERATION AGENCY



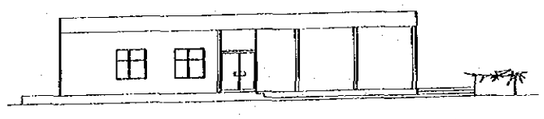
PLAN
(SOIL AND WATER RESEARCH)

NO.	DESIGNATION SOIL AND WATER RESEARCH
1	SEMINAR
2	SAMPLE AND DATA LIBRARY
3	DISTILLER ROOM
4	CHEMICALS STORE ROOM
5	TOILET
6	STORE ROOM
7	SERVANT ROOM
8	O. P. E ROOM
9	STORE ROOM
10	DRAFT ROOM
11	LABORATORY
12	SPECTRUM ANALYSIS
13	WEIGHT ROOM
14	RESEARCH ROOM
15	RESEARCH ROOM
16	LABORATORY
17	LABORATORY
18	LABORATORY
19	HALL
20	ENTRANCE
21	SIDE WALK
22	CORRIDOR

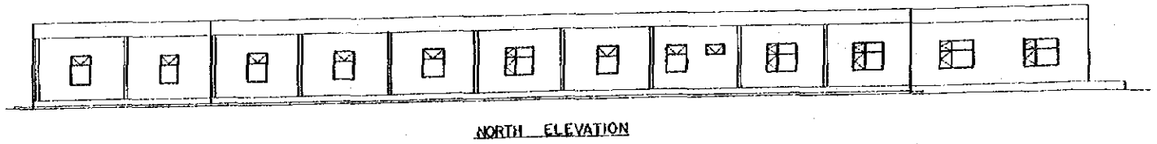
NO.	DESIGNATION IRRIGATION AND DRAINAGE TECHNICAL SERVICE
1	MACHINE TOOL ROOM
2	STORE ROOM
3	O. P. E. ROOM
4	CHEMICALS STORE ROOM
5	TOILET
6	STORE ROOM
7	SERVANT ROOM
8	CALCULATION ROOM
9	DRYING ROOM
10	COLD STORAGE ROOM
11	LABORATORY
12	SAMPLE AND DATA LIBRARY
13	SEMINAR
14	RESEARCH ROOM
15	RESEARCH ROOM
16	LABORATORY
17	LABORATORY
18	LABORATORY
19	HALL
20	ENTRANCE
21	SIDE WALK
22	CORRIDOR



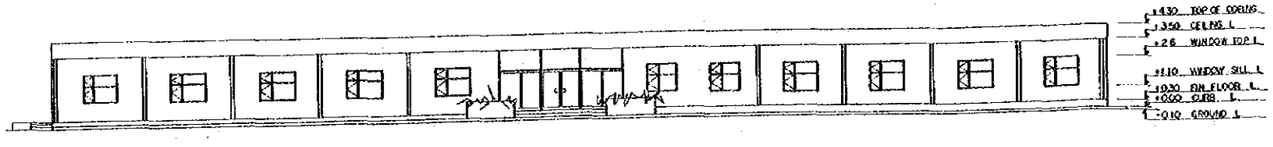
SECTION A-A



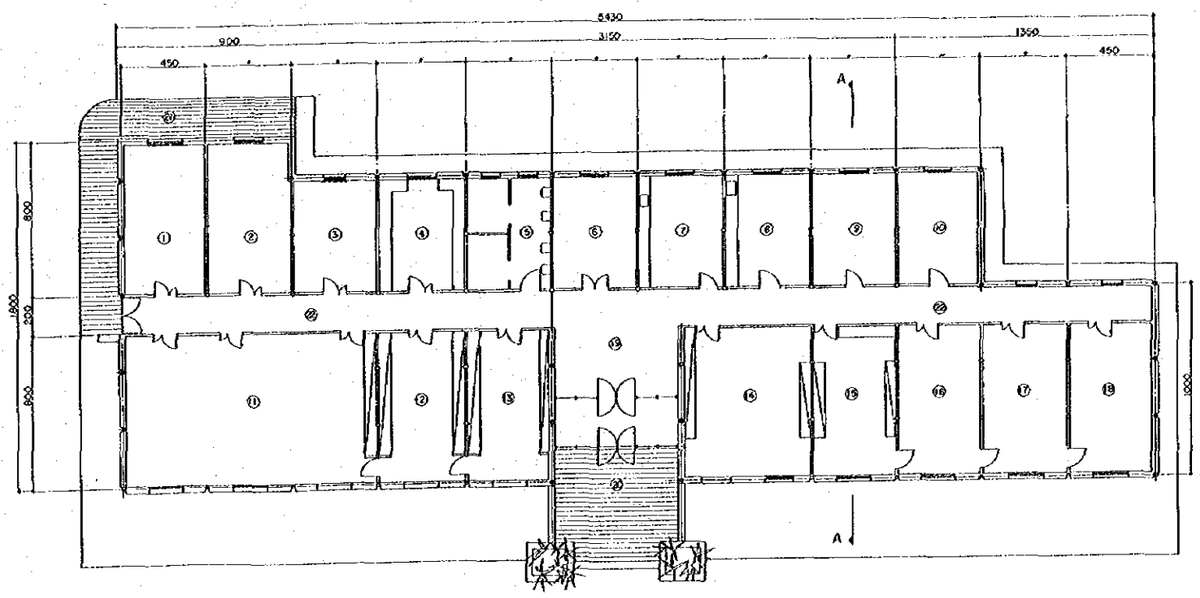
WEST ELEVATION



NORTH ELEVATION



SOUTH ELEVATION



PLAN
(IRRIGATION AND DRAINAGE, TECHNICAL SERVICE, AND FARM MANAGEMENT)

NOTE; ALL DIMENSIONS ARE GIVEN IN (cm)

SCALE
0 5M

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

ZAHAK AGRICULTURAL RESEARCH CENTER

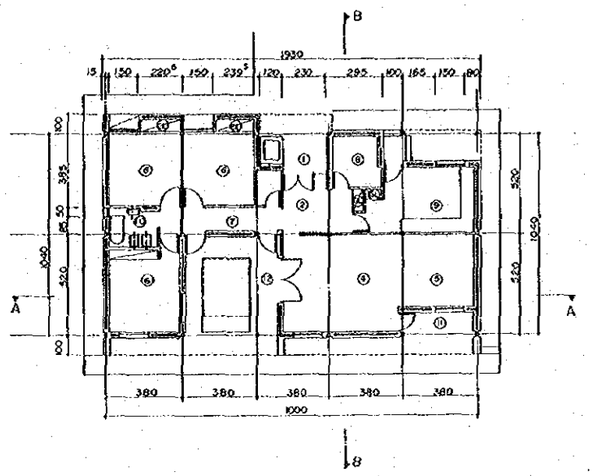
CAMPING FACILITIES LABORATORY

(SOIL AND WATER RESEARCH)
(IRRIGATION AND DRAINAGE, TECHNICAL SERVICE AND FARM MANAGEMENT)

DATE	MAR. 1975	DWG. No.	R-1012

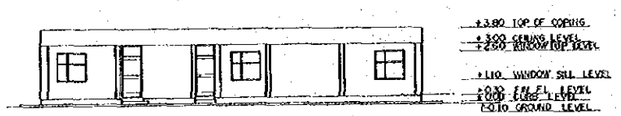
JAPAN INTERNATIONAL COOPERATION AGENCY

THREE BED ROOM RESIDENCE

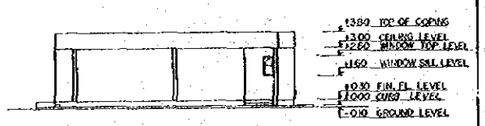


PLAN

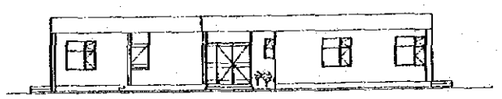
SCALE 0 5M



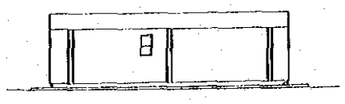
SOUTH ELEVATION



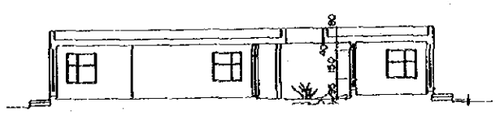
EAST ELEVATION



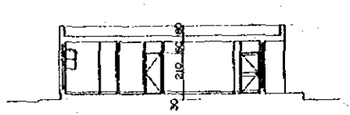
NORTH ELEVATION



WEST ELEVATION

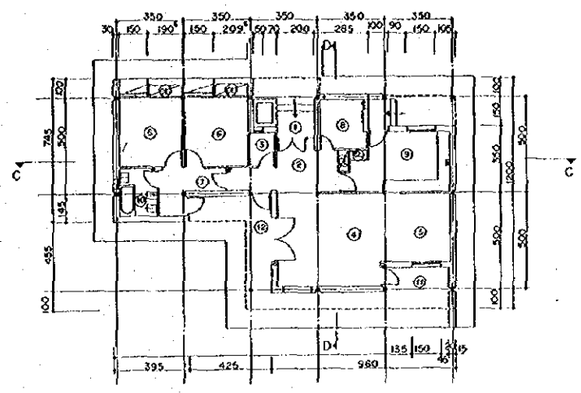


SECTION A-A



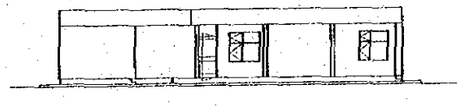
SECTION B-B

TOW BED ROOM RESIDENCE

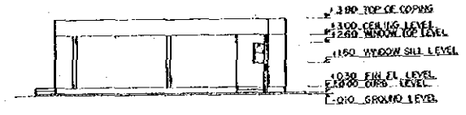


PLAN

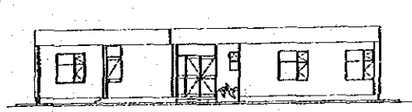
SCALE 0 5M



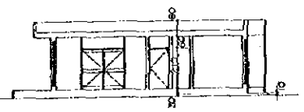
SOUTH ELEVATION



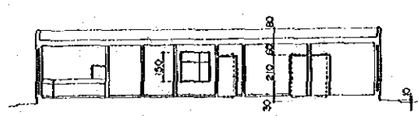
EAST ELEVATION



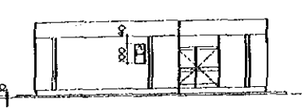
NORTH ELEVATION



SECTION D-D



SECTION C-C



WEST ELEVATION

NO.	DESIGNATION
1	ENTRANCE PORCH
2	ENTRANCE HALL
3	TOILET
4	LIVING ROOM
5	DINING ROOM
6	BED ROOM
7	CORRIDOR
8	STORE ROOM
9	KITCHEN
10	BATH
11,12	BACK PORCH

NOTE; ALL DIMENSIONS ARE GIVEN IN (cm)

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

ZAHAK AGRICULTURAL RESEARCH CENTER

CAMPING FACILITIES

STAFF RESIDENCE

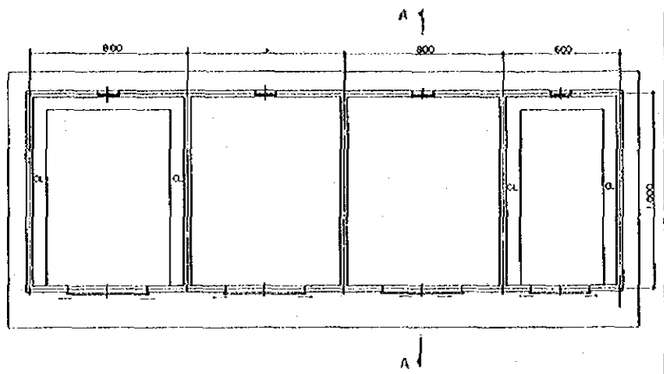
THREE BED ROOM

TWO BED ROOM

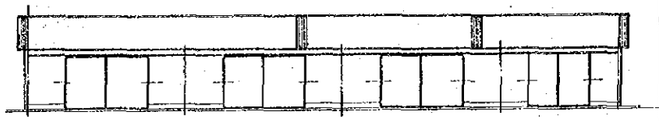
DATE	MAR. 1975	DWG. No.	R-1013

JAPAN INTERNATIONAL COOPERATION AGENCY

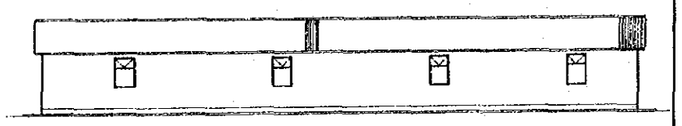
WAREHOUSE



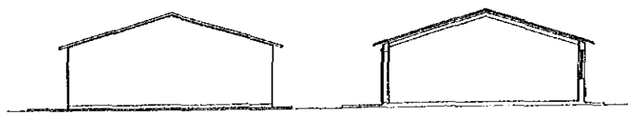
PLAN



EAST ELEVATION



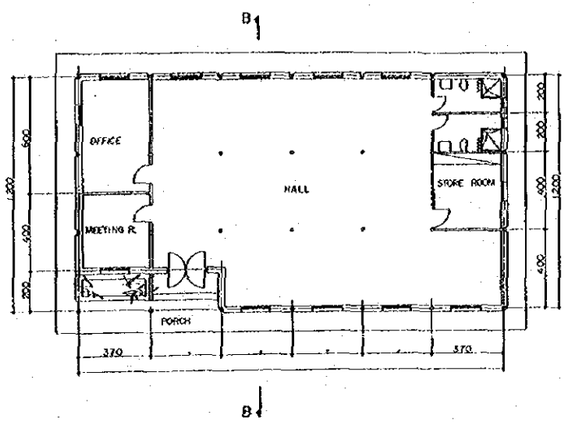
WEST ELEVATION



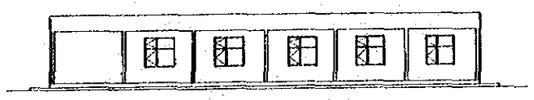
SOUTH ELEVATION

SECTION A – A

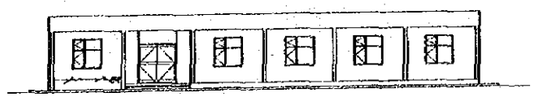
FARM WORKER'S ASSEMBLY HOUSE



PLAN

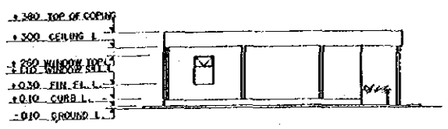


EAST ELEVATION



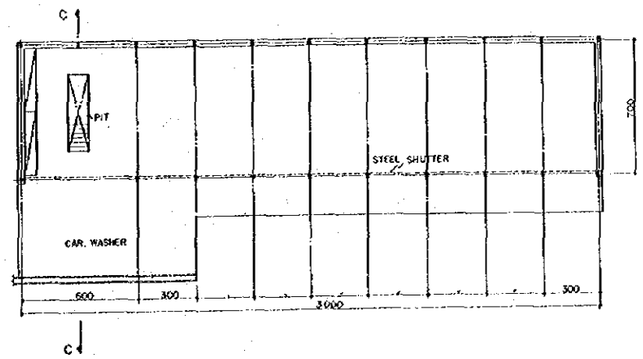
WEST ELEVATION

SECTION B – B

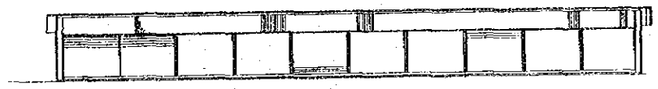


NOUTH ELEVATION

GARAGE

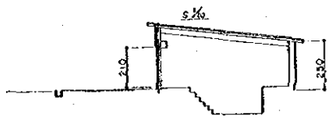


PLAN



NOUTH ELEVATION

WEST ELEVATION



SECTION C – C

NOTE , ALL DIMENSIONS ARE GIVEN IN (CM)

SCALE 0 5M

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

ZAHAK AGRICULTURAL RESEARCH CENTER

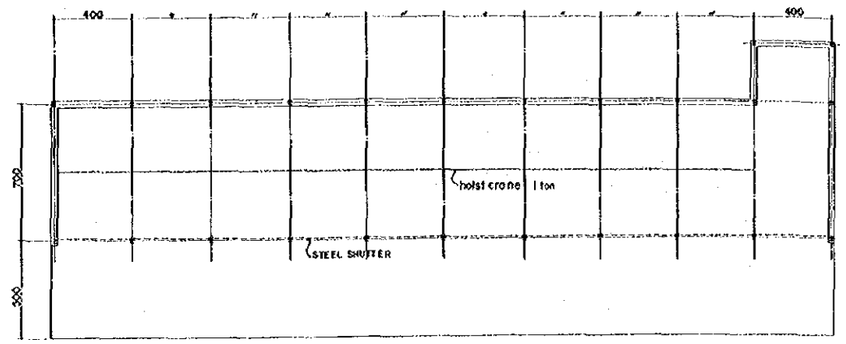
CAMPING FACILITIES

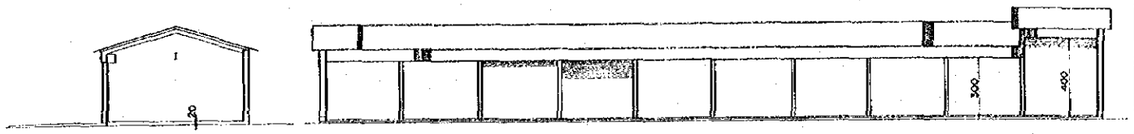
WAREHOUSE FARM WORKER'S ASSEMBLY HOUSE AND GARAGE

DATE	MAR 1975	DWG No.	R-1014

JAPAN INTERNATIONAL COOPERATION AGENCY

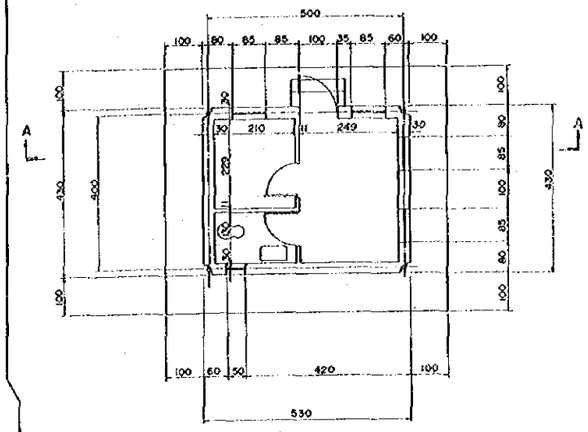
FARM EQUIPMENT SHED





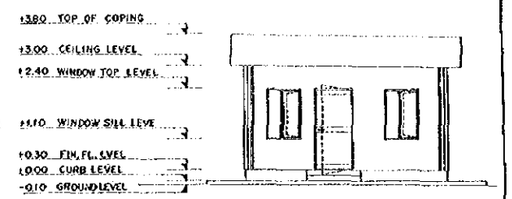
NORTH ELEVATION

GATE KEEPER'S HOUSE

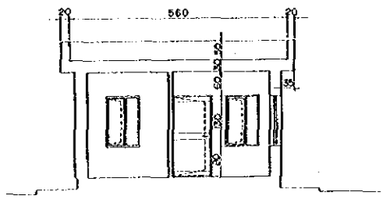


PLAN

SCALE 0 3m

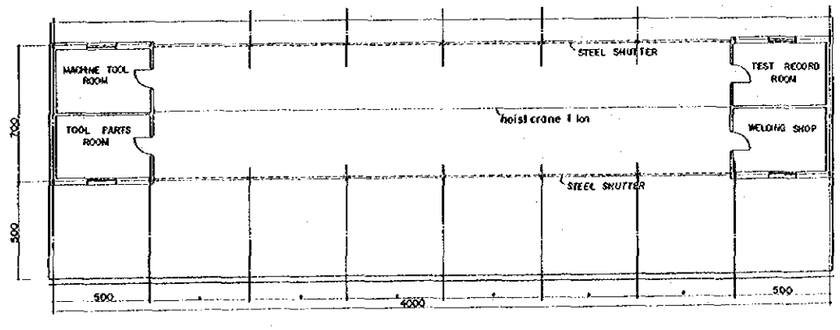


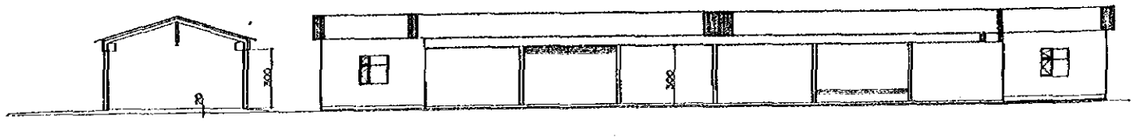
SOUTH ELEVATION



SECTION A-A

FARM EQUIPMENT SHED WITH REPAIR SHOP

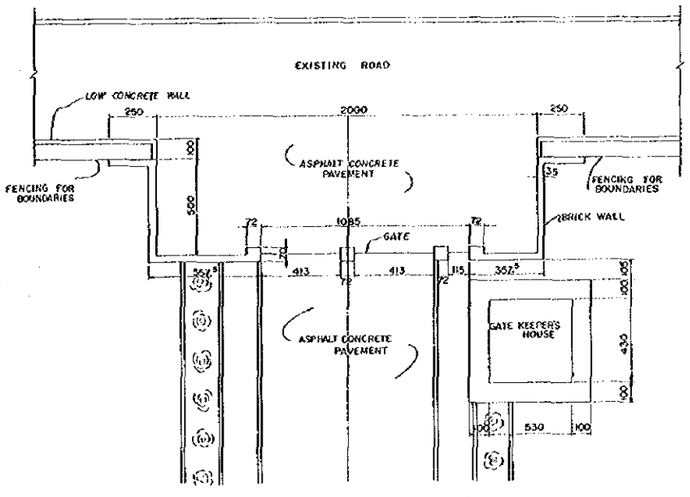




NORTH ELEVATION

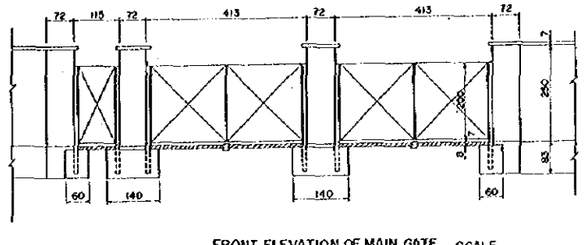
SCALE 0 5m

MAIN GATE



PLAN SCALE 0 5m

NOTE : ALL DIMENSIONS ARE GIVEN IN (cm)



FRONT ELEVATION OF MAIN GATE SCALE 0 3m

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

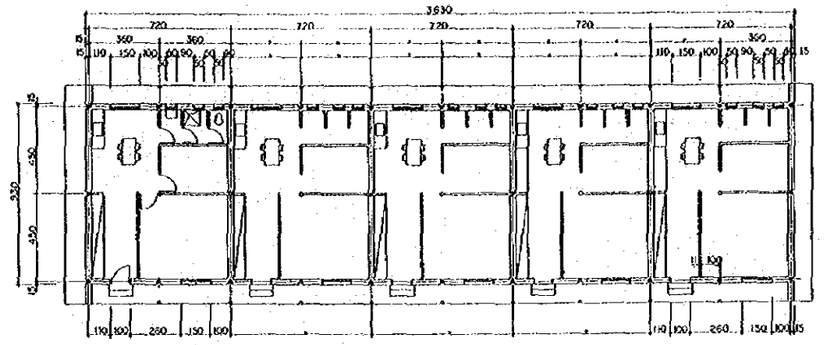
ZAHAK AGRICULTURAL RESEARCH CENTER

CAMPING FACILITIES

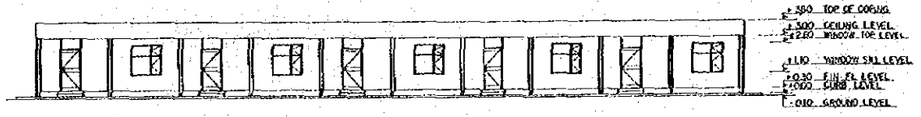
FARM EQUIPMENT SHED, FARM EQUIPMENT SHED WITH PERAIR SHOP, GATE KEEPER'S HOUSE AND MAIN GATE

DATE	MAR. 1975	DWG. No.	R-1015

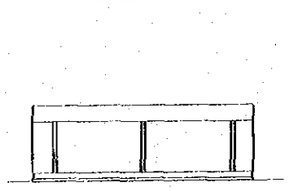
JAPAN INTERNATIONAL COOPERATION AGENCY



PLAN

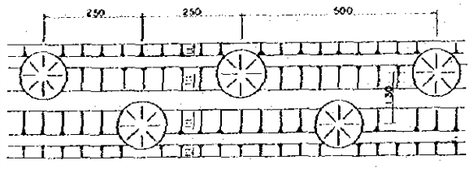


SOUTH ELEVATION

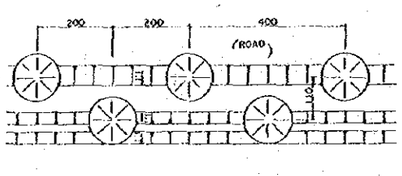


EAST ELEVATION

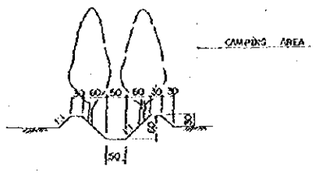
LABOUR'S QUARTER SCALE 0 5m



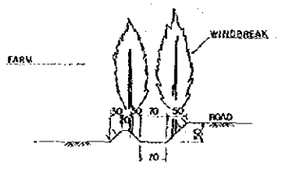
PLAN



PLAN



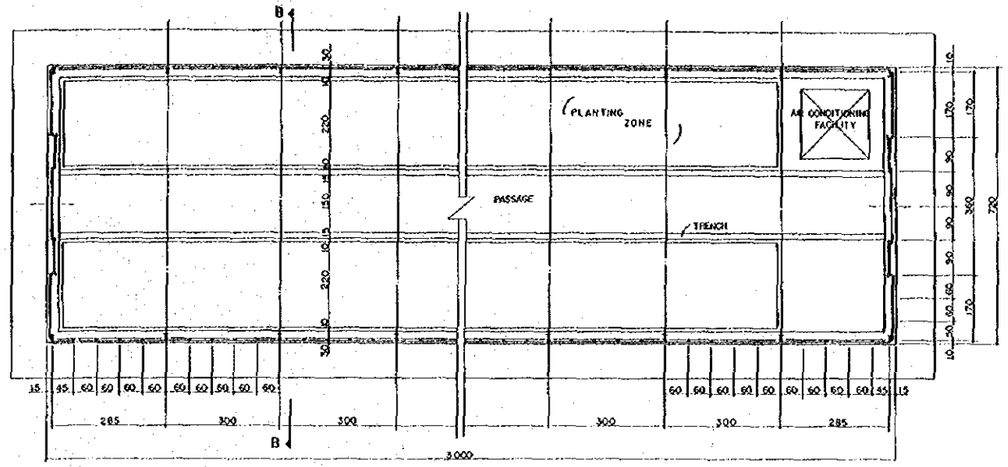
CROSS SECTION



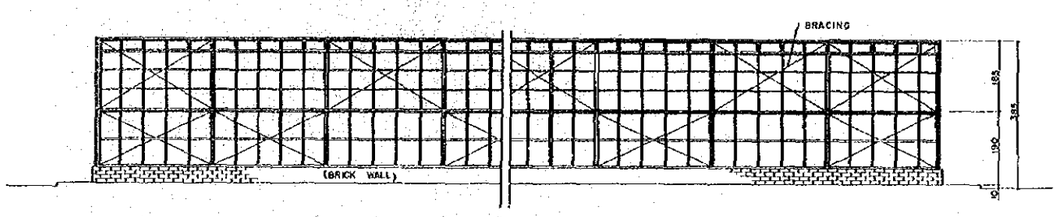
CROSS SECTION

SCALE 0 5m

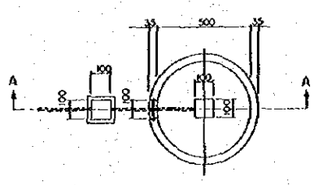
IRRIGATION DITCH FOR PLANTATION



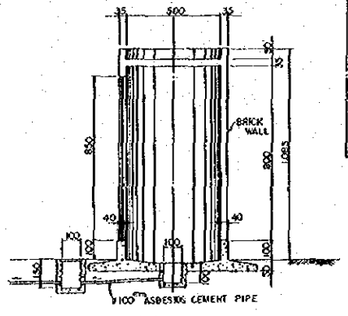
PLAN



EAST ELEVATION

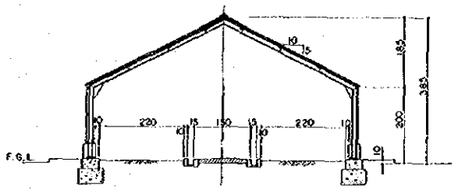


PLAN

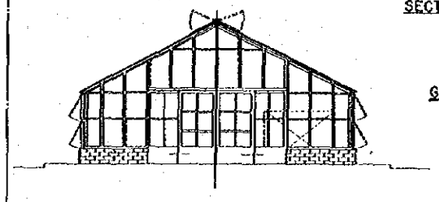


SECTION A-A

SILO SCALE 0 5m



SECTION B-B



SOUTH ELEVATION

GREEN HOUSE SCALE 0 5m

NOTE : ALL DIMENSIONS ARE GIVEN IN (CM)

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

ZAHAK AGRICULTURAL RESEARCH CENTER

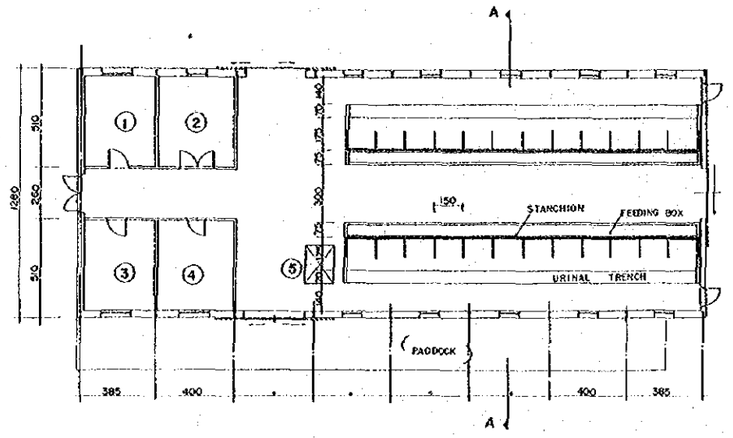
CAMPING FACILITIES

LABOUR'S QUARTER, IRRIGATION DITCH FOR PLANTATION, SILO AND GREEN HOUSE

DATE	MAR. 1975	DWG. No.	R-1016

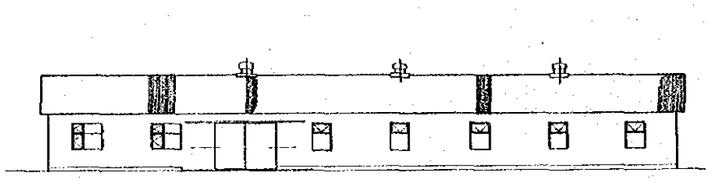
JAPAN INTERNATIONAL COOPERATION AGENCY

ANIMAL SHED FOR FEEDING EXPERIMENT

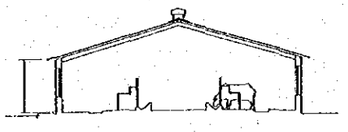


No.	DESIGNATION
1	COLD STORAGE FOR SAMPLES
2	FODDER STORAGE ROOM
3	EXPERIMENTAL INSTRUMENT STORE ROOM
4	LABORATORY
5	WEIGHT

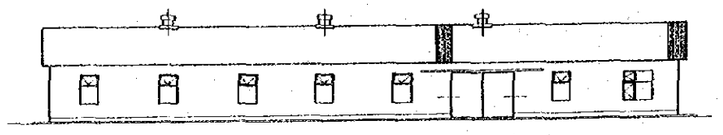
PLAN



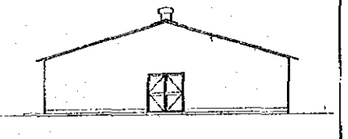
SOUTH ELEVATION



SECTION A-A

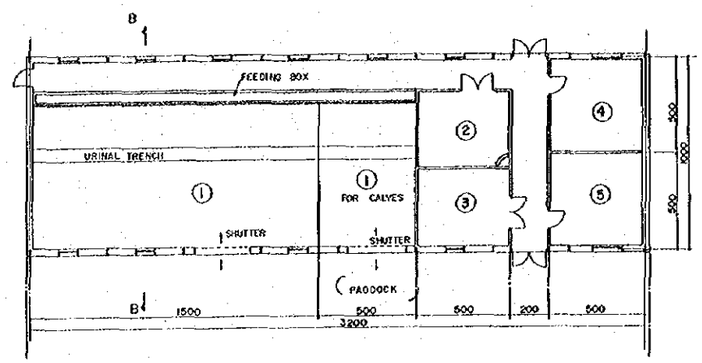


NORTH ELEVATION



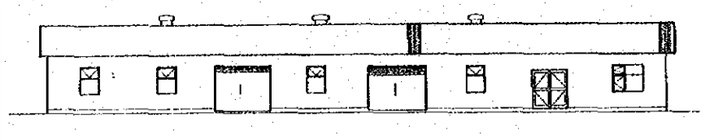
WEST ELEVATION

ANIMAL SHED FOR BREEDING

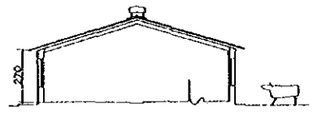


No.	DESIGNATION
1	BARNYARD
2	DELIVERY ROOM
3	FODDER STORAGE ROOM
4	LABORATORY
5	OFFICE

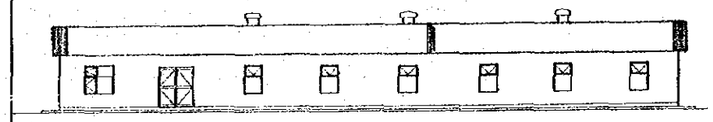
PLAN



SOUTH ELEVATION



SECTION B-B



NORTH ELEVATION

WEST ELEVATION

NOTE: ALL DIMENSIONS ARE GIVEN IN (CM)

SCALE 0 5m

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

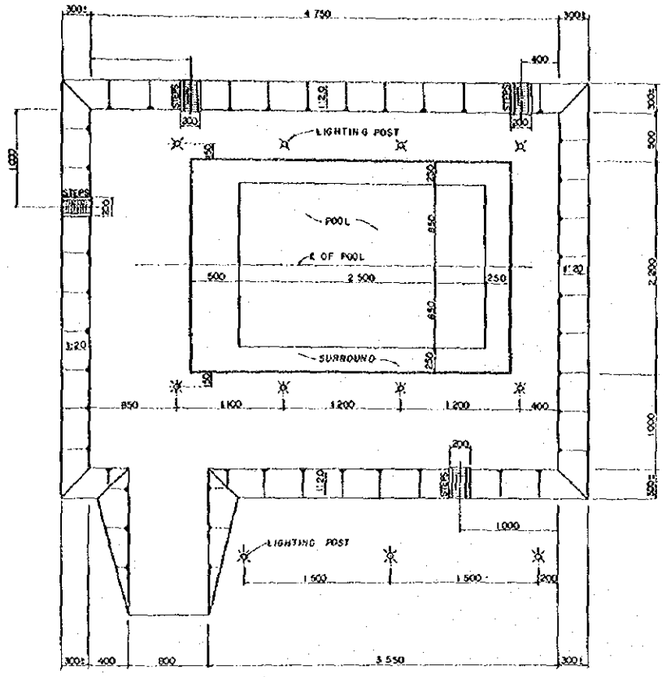
ZAHAK AGRICULTURAL RESEARCH CENTER

CAMPING FACILITIES

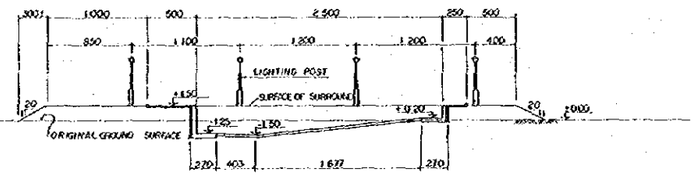
ANIMAL SHED FOR FEEDING EXPERIMENT AND ANIMAL SHED FOR BREEDING

DATE	MAR. 1975	DWG. No.	R-1017

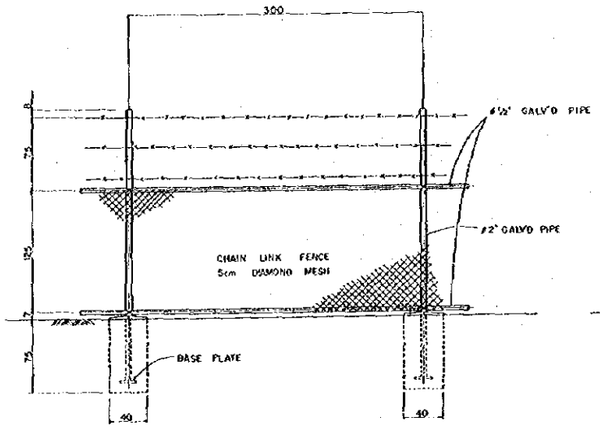
JAPAN INTERNATIONAL COOPERATION AGENCY



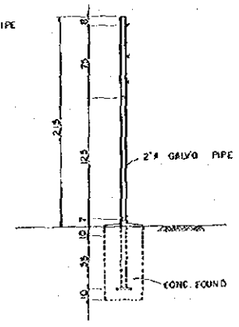
PLAN



PROFILE



FRONT ELEVATION OF FENCE



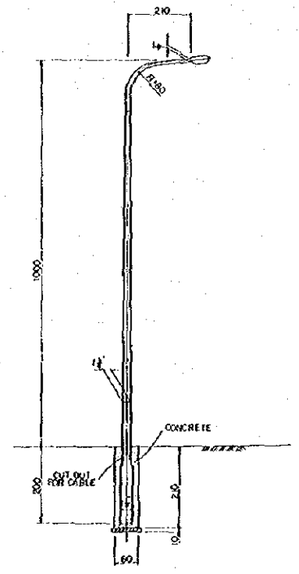
SECTION OF FENCE

FENCE

SCALE

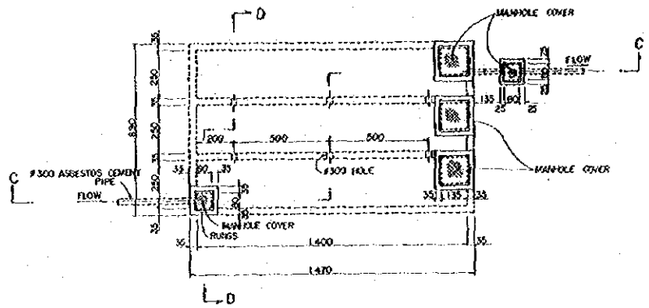
SWIMMING POOL

SCALE

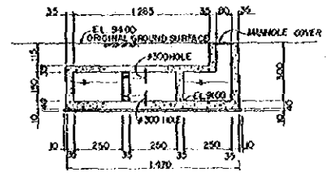


STREET LAMP

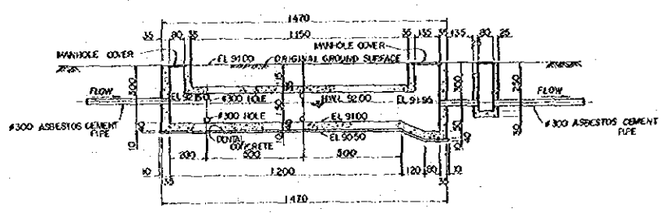
SCALE



PLAN



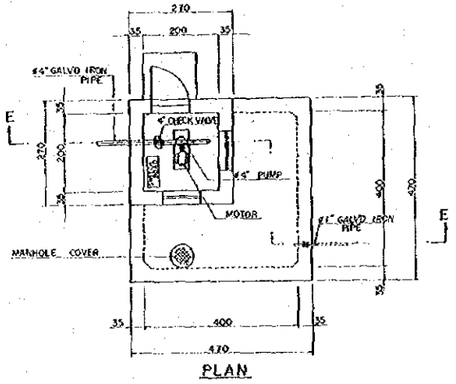
SECTION D-D



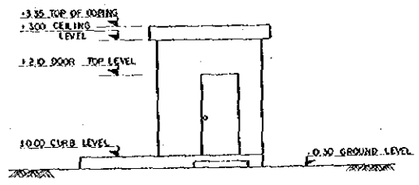
SECTION C-C

SEPTIC TANK

SCALE



PLAN

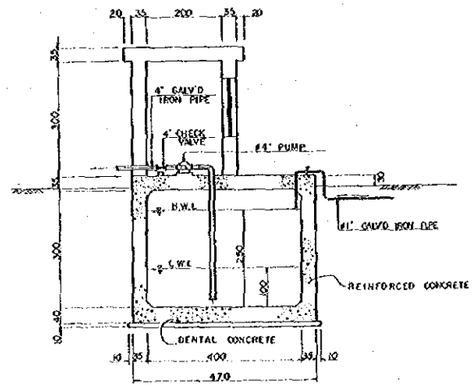


NORTH ELEVATION

NOTE ; ALL DIMENSIONS ARE GIVEN IN (CM)

WATER STORAGE TANK

SCALE



SECTION E-E

AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

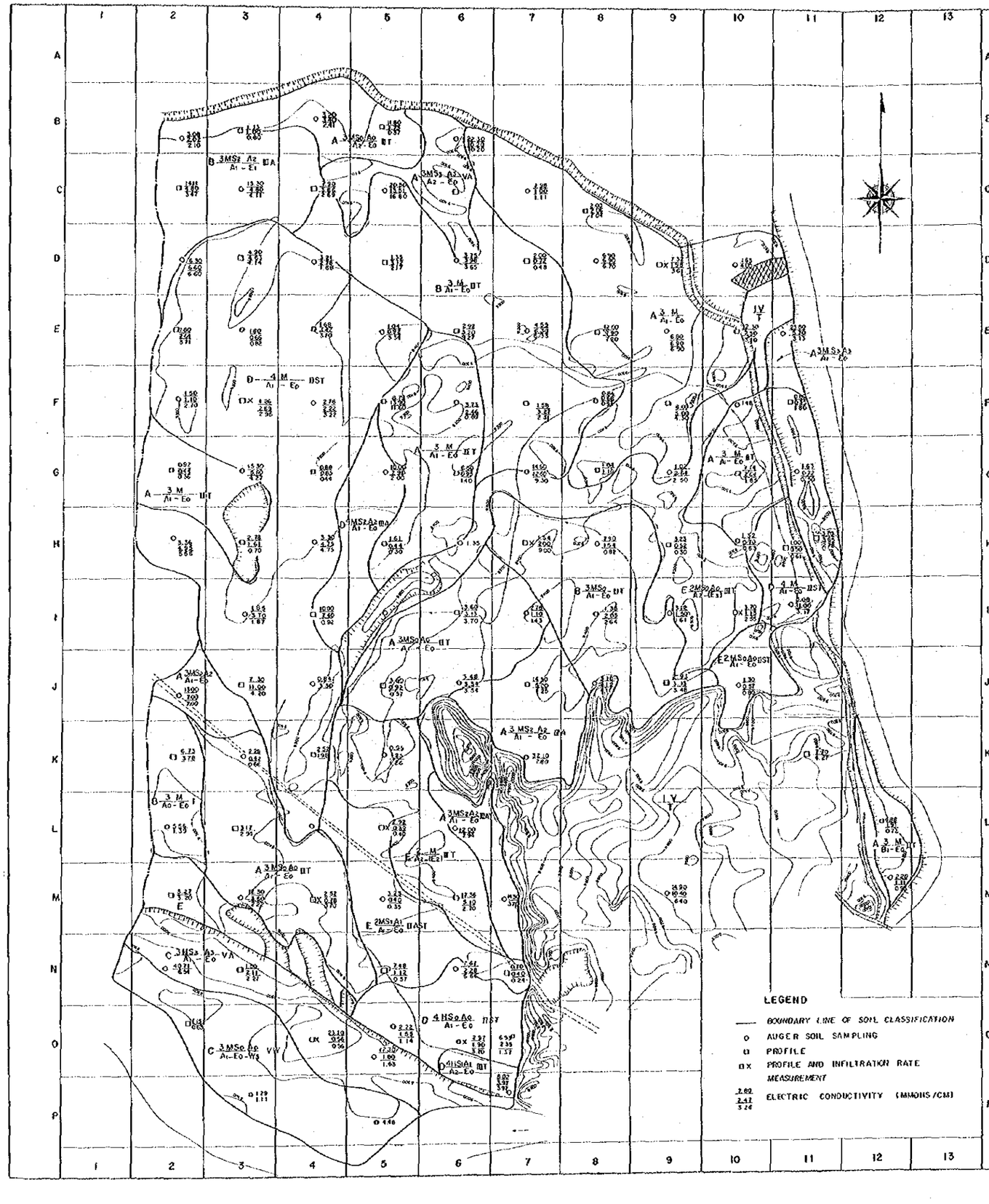
ZAHAK AGRICULTURAL RESEARCH CENTER

CAMPING FACILITIES

SWIMMING POOL, FENCE, STREET RAMP
SEPTIC TANK AND WATER STORAGE TANK

DATE	MAR 1975	DWG. No.	R-1018

JAPAN INTERNATIONAL COOPERATION AGENCY

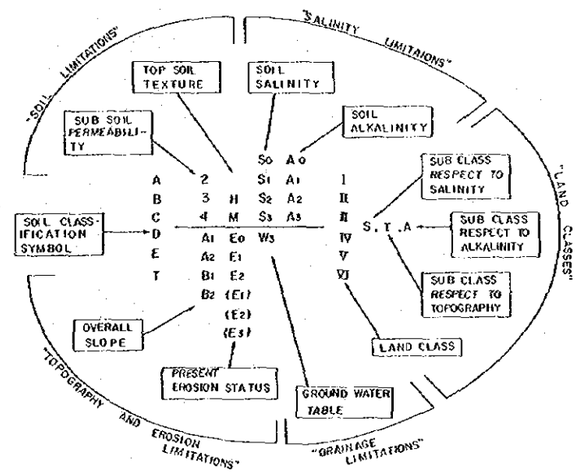


GUIDE FOR SOIL MAP

1. SOIL CLASSIFICATION SYMBOLS

SYMBOL	MAJOR FEATURES	PHYSIOGRAPHY
A	DEEP, GRAY BROWNISH TO DARK BROWN, STRATIFIED, SILT LOAM TO FINE SAND, OCCASIONALLY PLATY STRUCTURE ON SUB STRATUM. SOME AREA MODERATE TO SEVERE SALINITY AND ALKALINITY -(ALLUVIAL PLANE)	RIVER ALLUVIAL PLANE
B	VERY DEEP BROWN TO LIGHT OLIVE BROWNISH, SILT LOAM OVER BROWN TO LIGHT OLIVE, MASSIVE TO PLATY STRUCTURE USUALLY WITH MODERATE SALINITY AND ALKALINITY -(ALLUVIAL SOIL)	RIVER ALLUVIAL PLANE
C	DEEP, BROWN TO OLIVE DARK GRAY, SILT LOAM TO LOAM, STRUCTURE LESS WITH MOTTLED SPOTS, SHALLOW GROUND WATER TABLE - 150 CM DEEP) SOME PART SEVERE SALINITY AND ALKALINITY - (ALLUVIAL SOIL)	LOWER TERRACE OF SISTAN RIVER
D	DEEP, BROWN TO DARK YELLOWISH BROWN, FINE SANDY CLAY TO COARSE SANDY CLAY OVER BROWN TO OLIVE BROWN SILTY CLAY AND MASSIVE OR COARSE PLATY STRUCTURE WITH MOTTLED SPOTS. SLIGHT TO MODERATE ALKALINITY - (ALLUVIAL SOIL)	RIVER ALLUVIAL PLANE
E	VERY DEEP, BROWN TO DARK YELLOWISH TO OLIVE BROWNISH SANDY TO COARSE SANDY CLAY, STRUCTURE LESS SEVERELY WIND ERODED -(ALLUVIAL SOIL)	RIVER ALLUVIAL PLANE
T		HILLS

2. LIMITATION - RATING FORMULA



AGRICULTURAL DEVELOPMENT OF SISTAN PLAIN IN IRAN

ZAHAK AGRICULTURAL RESEARCH CENTER

SOIL MAP

DATE	MAR 1975	DWG. No.	R-1019

JAPAN INTERNATIONAL COOPERATION AGENCY