A Micro-climatic Observation in the Extremely Hot and Dry Climate in Iraq*

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Abstract

Natural conditions in Iraq are not unsuitable for rice growing, except for the extremely high temperature and low humidity during the rice growing season. The extremely high temperature and low humidity may, however, be modified well suitable for rice production by concentrating rice fields in large, well irrigated areas protected by windbreaks.

1. Introduction

To consider the agriculture or rice culture in any country, it is better to analyse the environment under the heading of i) climate, ii) soil and iii) biological environment of the fields. The main difference between Iraq and other rice growing countries exists in climate. Rice originated in South-East Asia where the rice growing season is very hot and highly humid, but in Iraq the climate during the rice growing season is extremely hot and very dry. Therefore, it is necessary to give special attention to the climate. In particular, the local climate in the rice growing areas and the micro-climate in the rice field or the rice plant itself are especially important. The record of the Government of Iraq indicates that the monthly average of the daily maximum air temperature at meteorological observatories are about 42°C and that the monthly average of the daily minimum relative humidity are about 20%. It has been found that in such a dry condition the development of rice grain is impossible. In spite of these facts, however, in Iraq the average annual yield of rice grains attains to 100,000 tons. This is one of the greatest miracles in modern agriculture, and can only be explained by the fact that the temperature of the rice plants themselves is not necessarily as high as the air temperature recorded at the Meteorological Observatories, the Government of Iraq.

2. Materials and methods

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A. Local climatic observation in the rice field areas.

The local climate in the rice field areas with the high and low yields were selected and observed, respectively. A high yield area was selected in the surroundings of Shamiah Town located about 200 km apart to the south from Baghdad City. In this area, 69 km trip from the desert near Najaf City to the desert near Diwaniya City including 25 km distance of paddy field, marsh and other aquatic area surrounding Shamiah Town was done. The first observation was made between 2 and 5 p.m. on 3rd August and the second between 11 a.m. and 2 p.m. on 7th September, 1963. At the time of the first observation, the predominant rice variety named "Ambar" was at the most effective tillering stage and the others, named "Nayima" was at the heading and named "Hauezawi" was at the maturity stages. And at the time of the second observation, "Ambar" was just at the heading and "Nayima" was already harvested. The temperature and relative humidity 1 m above the surface at the side of road at each observation point were measured with Asman's psychrometer of 1°C graduation. In August, one observation point was selected in each typical condition by the road, i.e. desert, town, canal, paddy field, marsh etc., so the results obtained were discontinuous and it was inevitable to show the result as bars. In September, at point 5 km apart in the desert and grass land, and at point 2 km apart in the rice field area and marsh, observations were undertaken, so the results obtained were given as a broken line.

A low yield area is scattered along the international road from Iraq to Kuwait via Amara City. Among this road, the same kind of observation between 6 a.m. and 4 p.m. on 24th August, 1963, at points 10 km apart for 400 km from Baghdad to Amara was done. The method of observation was almost same as the one mentioned above.

B. Micro-climatic observations in a high yield paddy field and a typical desert for comparison.

Micro-climatic observations in a high yield paddy field and in a typical desert were carried out as a comparison. A paddy field located at Om-Arda, Al-Mishkhab, was selected as it has been said to produce about 4 tons/ha of rice in every year. It is 18 km apart from Abi-Sekhair Town to the south and is facilitated well with beautiful date palm grove as a windbreak in each 500 metres distance against north-west wind in summer. And a part of desert 1 km apart from Najaf City to the north east was selected. It is a typical desert and there is no meteorological obstacle surrounding this place, and the desert spreads in the windward direction as far as Syria. The observations were made on 5th and 6th August 1963 in the paddy field and 7th and 8th in the desert, respectively. The weather conditions during these four days were all fine but slightly dusty with wind, and we could consider the weather was the typical in summer.

The temperature and the relative humidity at heights of 2, 50, 100 and 150 cm above the soil, and the temperature of the soil surfaces with and without irrigation water and rice plants were recorded hourly, with Asman's psychrometer used for the observation of local climate for 24 hours. The wind velocity was also recorded by Beaufort scale with eye measurement. As it was an eye measurement, the wind record of the Diwaniya Meteorological Observatory was cited as a reference.

Temperature of water at the bottom was regarded as the soil surface temperature with water. The depth of water was 3 cm. For the measurement of rice plant temperature, standing rice plants in the field grasped by hand and in the center of plants a cylinder shape thermometer was inserted for about 30 seconds then another groups of plants were grasped and the thermometer was transferred in this bundle. After three times of insertion mentioned above, the temperature of rice plant was determined.

Out of the above, observations of same kind were given on 9th and 10th September 1963 in the paddy field at Al-Mishkhab and on 11th and 12th September in the experimental paddy field at the Diwaniya Experimental Farm, additionally for a check of the results in August.

3. Results

A. Local climatic observation in the rice field areas.

Results obtained during two occasions of observation surrounding Shamiah, a high yield area, are illustrated in Figure 1.

In August, there was a temperature of 46°C with only 10% of humidity in the air 1 metre above the soil surface and 61°C of soil surface temperature in the desert area, from Najaf to Abi-Sekhair and there was almost no grass until the western limit of the Abi-Sekhair Town. This town is located at the western bank of a branch of the River Euphratis and there are so many date palm trees planted in the town. The temperature was 44°C with 18% of

humidity on the road in this town. Beyond this town across the river about 25 km distance there are rice field area, marsh and brooks and the surface of this area is covered with water, rice plant, aquatic plants and date palm groves. In this area there was a temperature of 41°C with 49% of humidity and the temperature of water was 35°C in an average. But there is a town named Shamiah, where is the biggest rice market in Iraq, there was of 45°C with 22% of humidity even it is located in the center of aquatic area. The eastern,

Fig. 1. Influence of collective rice field area on the desert climate.

limit of this rice field area is a big drainage canal. At the bank of this canal there was a temperature of 43°C with 26% of humidity but the soil temperature was still 55°C and the temperature of running water in the canal was 33°C. From this canal the grass land continues to Diwaniya Town, but the species of grass gradually changed from cereals to fleshy plants in the desert. This is the big difference between the western and eastern sides of this aquatic area as the predominant summer wind is north-west direction in this area. At the distance of 18 km from the canal there grew only a fleshy plant with thorns and there was a temperature of 45°C with 14% of humidity. The body temperature of this fleshy plant was 43°C. It was already 5 p.m. but the temperature at the Diwaniya Meteorological Observatory was 44.5°C with 16% of humidity.

In September, the same tendency was observed but this time the observation was more continuous than in August, and the results is shown as a broken line in Table 1.

Results obtained on 24th August 1963 from Baghdad City to Amara City, where many low yield rice fields are scattered, are illustrated in Figure 2.

Fig. 2. Influence of scattered rice field area on the desert climate.

To make 400 km trip by car, it was necessary to leave Baghdad in the early morning, so the record of this time was much influenced by the daily variation of temperature and humidity. Moreover, the day for observation was already the late August and the temperature was not so high as that of the observation in early August. The departure from Baghdad City was at 5:55 a.m.. The temperature

was 29°C and the humidity was 28%. The car passed through the forest in the suburbs at 6:15 a.m., where the temperature was 29°C and the humidity 38%. Later on, the temperature rised slowly up to 43°C and the humidity decreased down to 9%. En route from Azizia Town to Kut City between about 8:00 to 8:45 a.m., there were many rice fields scattered along the road. No influence of rice field to the temperature on the road was observed. Same observation was made from 1:00 p.m. to 3:00 p.m. and there was also no influence, but the temperature in the rice field 1 metre above the soil surface was 40°C and the humidity 20%. The water temperature was 36°C even though the temperature on the road was 43°C and the humidity 12%. There is a small village on the road and the temperature was 44°C with the humidity of 13% on the street and inside a shop in this village the temperature was 43°C with the humidity of 17%. It means that a small village gives no influence to the climate even though there was a big influence in the town of Shamiah. At 4:00 p.m. by the marsh, the temperature was 42°C and the humidity was 25%. In the desert after

passing this marsh, the temperature was 43°C and the humidity was 14%. These results indicate that there was little climatic influence of rice fields to the weather on the road, since the size of rice fields scattered along the road were not so large compared to that surrounding Shamiah Town.

B. Micro-climatic observations in a high yield paddy field and in a typical desert for comparison.

Results obtained in a high yield on 5th and 6th August 1963 at Al-Mishkhab are given in Table 1.

The growth of rice plant was very vigorous and the height and

the length were 60 cm and 74.4 cm, respectively. The density of tillers was 730 per square metre. At 150 cm height the temperature was from 23°C to 39°C and the humidity was from 70% to 39%. There was a bimodal curve in humidity. Under the cover of rice plants, bimodal curve in humidity was more obvious. At 50 cm height the temperature was from 22°C to 38°C and the humidity from 92%

Table 1. Micro-climate in the paddy field at Al-Mishkhab.

Obs. time	Temperature and (Relative humidity)						Wind velocity	Diwaniya Met. Obs.					
	Height of observation (cm)				Bottom of water	Rice plants		Wind direction	Wind velocity				
	150	100	50	2									
	°C	%	°C	%	°C	%	°C	°C	Beaufort		Beaufort		
10	35	(64)	34	(69)	33	(80)	32	(86)	30	30	0	N	4
11	35	(54)	35	(64)	34	(64)	32	(86)	33	33	1	N	4
12	36	(55)	36	(65)	35	(75)	34	(87)	35	33	1	N	4
13	37	(55)	37	(60)	36	(65)	34	(81)	36	<u>34</u>	2	WNW	4
14	39	(56)	39	(56)	37	(76)	36	(81)	39	<u>34</u>	1	NNW	2
15	<u>39</u>	(56)	<u>39</u>	(61)	<u>38</u>	(71)	<u>36</u>	(70)	<u>38</u>	<u>34</u>	0	N	1
16	38	(61)	38	(61)	37	(71)	35	(87)	36	<u>34</u>	0	N	4
17	36	(60)	36	(65)	35	(70)	34	(87)	35	<u>34</u>	1	NNW	3
18	35	(54)	34	(69)	32	(86)	32	(93)	34	<u>31</u>	0	NNW	3
19	32	(52)	31	(67)	30	(73)	29	(100)	32	29	1	NNW	3
20	32	(41)	31	(45)	28	(59)	27	(92)	30	27	0	N	2
21	31	(40)	31	(40)	29	(54)	27	(92)	30	25	0	N	3
22	29	(43)	29	(49)	28	(53)	25	(92)	29	25	1	—	—
23	30	(39)	30	(39)	29	(43)	25	(84)	28	24	1	—	—
24	27	(65)	27	(65)	25	(84)	25	(92)	28	25	1	N	3
1	26	(58)	26	(58)	25	(76)	23	(92)	27	<u>22</u>	2	—	—
2	26	(51)	26	(51)	24	(62)	21	(92)	27	<u>22</u>	2	—	—
3	26	(51)	26	(51)	25	(63)	<u>22</u>	(84)	26	<u>22</u>	2	N	3
4	25	(57)	24	(70)	23	(84)	22	(100)	25	<u>23</u>	0	—	—
5	23	(76)	23	(84)	22	(92)	23	(100)	25	23	0	—	—
6	24	(70)	<u>23</u>	(76)	<u>23</u>	(84)	22	(100)	<u>23</u>	<u>23</u>	0	N	3
7	27	(52)	26	(58)	26	(71)	24	(92)	26	24	1	NNW	4
8	32	(46)	31	(51)	30	(61)	27	(92)	26	27	2	N	4
9	34	(48)	33	(52)	32	(68)	31	(80)	27	29	2	N	4
10	34	(48)	33	(52)	23	(63)	31	(86)	30	30	2	NW	4

Remarks: 1. Date of observation: 5~6 August 1963.

Location: Om-Arda, Al-mishkhab, Abi-Sekhair, Diwaniya, IRAQ

2. Obs. time means time for observation.

3. Bottom of water means the soil surface with irrigated water in the paddy field.

4. Beaufort means Beaufort Scale of wind velocity.

5. Diwaniya Met. Obs. means the Diwaniya Meteorological Observatory. at the Air Port.

to 43%. At 2 cm height above the water surface the temperature was from 21°C to 36°C and the humidity from 100% to 70%, and there was abundant dew both in the morning and in the evening. These dews were considered mainly come from the guttation of rice plants. One of the remarkable features of observations was the temperature of rice plant itself, which did not exceed 34°C even at the time of the maximum temperature of the day and did go down with the air temperature as low as the minimum air temperature. This observation shows that rice plants have the ability to protect themselves against rises in temperature but can not protect themselves against falls in temperature.

While making this observation, it was notable

that the effect of the windbreaks surrounding the rice fields was to decrease considerably the force of the wind. Despite of the strong wind of Beaufort Scale 3 to 4 recorded at the Diwaniya Meteorological Observatory, the simultaneous wind over the paddy fields at Al-Mishkhab was fairly weak only of the scale of a dead calm as given in Table 1.

Results obtained in the desert on 7th and 8th August 1963 near Najaf City are given in Table 2.

The soil surface of the desert selected for observation was hard enough to drive an ordinary pick-up car, but there was almost no grass surrounding the observation point.

The daily variations of temperature and humidity were going withtogether and no bimodal curve was observed. When the temperature of the surface of

Table 2. Micro-climate in the desert near Najaf City.

Obs. time	Temperature and (Relative humidity)					Wind velocity	Diwaniya Met. Obs	
	Height of observation (cm)				Soil surface		Wind	Wind
	150	100	50	2			direction	velocity
	°C %	°C %	°C %	°C %	°C	Beaufort		Beaufort
6	29 (38)	29 (38)	29 (33)	29 (33)	28	3	WNW	3
7	32 (24)	32 (24)	32 (28)	32 (28)	32	3	NW	3
8	36 (21)	36 (25)	36 (25)	37 (34)	38	3	NNW	3
9	38 (17)	38 (20)	38 (20)	39 (21)	44	4	NNW	3
10	39 (15)	39 (18)	40 (14)	42 (22)	48	4	NW	4
11	41 (12)	41 (15)	41 (15)	44 (18)	53	4	NW	4
12	42 (13)	42 (11)	42 (16)	44 (18)	56	4	WNW	4
13	42 (11)	43 (14)	44 (9)	47 (11)	57	4	NNW	4
14	43 (12)	44 (10)	44 (12)	47 (7)	56	4	NNW	4
15	44 (10)	44 (10)	44 (8)	46 (10)	55	4	WWN	4
16	43 (12)	44 (13)	44 (13)	45 (7)	52	4	NNW	4
17	43 (17)	43 (20)	43 (14)	44 (18)	49	4	WNW	4
18	42 (16)	42 (13)	42 (13)	42 (16)	44	4	WNW	4
19	40 (14)	39 (18)	39 (18)	39 (12)	39	4	WNW	4
20	37 (16)	36 (21)	36 (11)	36 (11)	36	3	WNW	3
21	35 (13)	35 (13)	35 (16)	33 (21)	34	3	WNW	2
22	34 (15)	34 (19)	34 (15)	33 (14)	33	3	—	—
23	34 (15)	33 (17)	33 (17)	35 (7)	32	3	—	—
24	33 (14)	33 (10)	33 (10)	32 (8)	31	3	NW	4
1	33 (14)	32 (16)	32 (16)	32 (16)	31	3	—	—
2	32 (16)	32 (16)	32 (20)	32 (20)	30	3	—	—
3	32 (16)	32 (16)	31 (18)	30 (21)	30	3	WNW	4
4	31 (26)	31 (22)	30 (12)	30 (16)	29	3	—	—
5	29 (24)	29 (19)	29 (19)	28 (27)	27	3	—	—
6	29 (38)	29 (38)	29 (38)	29 (33)	28	3	W	3

Remarks : 1. Date of observation : 7~8 August 1963.

Location : Najaf City, Karbala, IRAQ

2. Obs. time means time for observation.

3. Beaufort means Beaufort Scale of wind velocity.

4. Diwaniya Met. Obs. means the Diwaniya Meteorological Observatory. at the Air Port.

the soil varied from 28°C to 57°C, the air temperature and the humidity at 2 cm height varied from 28°C to 47°C and from 34% to 7%, respectively, and those at 150 cm height did from 29°C to 44°C and from 38°C to 10%. Dew and other meteorological phenomena were not observed.

It was notable that the wind velocity observed here was almost same as that recorded at the Diwaniya Air Port, and it is possible to expect that in spite of a rather strong wind over the desert the wind over the high yield paddy fields was not strong by the effect of windbreak. Through the comparison of wind velocity observations at the Diwaniya Meteorological Observatory and at the Diwaniya Experimental Farm, where windbreak was not facilitated well, it was certified that the wind

velocity in this experiment farm was just between the Meteorological Observatory and the paddy field.

An effective distance of windbreak was assessed by the observation of temperature and humidity at Amara. The temperature under the date palm grove was 39°C with a relative humidity of 27% and the influence of the date palm grove extended, with gradually decreasing power, for 400 metres to the leeward, where the normal desert temperature of 45°C with 14% humidity was reached. Therefore it is estimated that with the aid of a 1,000 metre length windbreak against the predominant wind in Al-Mishkhab, it would be reasonable to have paddy fields extending for 500 metres away from it along the line of the predominant wind.

Besides the meteorological observation, some

observations from the view point of crop science were given. Number of panicles per square metre was more than 300, if the weeds were controlled well, and this is at the same level of number of panicles in Japan of 312 ± 43 . Number of grains per panicle was more than 90 and this is at the higher level than that in Japan of 78.4 ± 7.0 . But the fertility of grain was about 50%, even though the fertility in Japan is $87.6 \pm 2.7\%$. Weight of 1,000 grains (husked) was below 20 grams and it is smaller than that in Japan of 20.8 ± 0.8 grams. These data mentioned above show the importance of promoting the fertility of grains and weight of 1,000 grains for the increase of rice production in Iraq. Data in Japan are cited from the author's report in 1962.

4. Discussion and conclusion

The final object of this report is to find ways of increasing rice production in Iraq. It is first of all necessary to find out what the limiting factors are, and then to find out ways of overcoming them. The extremely hot and dry summer climate in Iraq observed here should be very important limiting factor to rice production, and the results obtained here also show that insufficiency of water is equally important, because water is not only important as a physiological factor for the rice plants, before and after heading, but for its strongly moderating effect of the local and micro-climate of the rice field areas. The moderating effect of water on the climate is far less when the rice fields are scattered over a large area, as they are observed from Baghdad to Amara, than when many rice fields are collected together in one area, such as those surrounding Shamiah Town.

To concentrate all the rice fields in a few selected areas along the rivers and main canals would be the immediately feasible means of conserving valuable water in Iraq and would have the added advantage of modifying the micro- and local-climate of the fields making them more favourable for the growth of rice. To obtain sufficient modification of climate for the production of high yields, the rice fields area must be large, and the more rice fields are collected together in one area, the better.

The effect of surrounding the rice fields with windbreaks would be to lessen considerably the force of the desert wind over them and thus to help the normal growth of rice plant and to save water consumption. The longest effective distance of a

windbreak, even of adult date palm grove, is 500 metres. So the rice field area, greater than 50 hectares should be divided into sections, and each section should be surrounded by windbreaks. No section should stretch for more than 500 metres along the line of the predominating north-west wind in summer, and if temporary windbreaks are used the distance should be less. The size of each section should depend upon the effective distance of its windbreaks.

It is possible to say, taking the experience of the desert in United Arab Republic into account, that the provision of windbreaks to protect the fields against the hot and dry desert wind is vitally necessary if any significant modification of micro-climate is to be achieved. For the main windbreaks dividing the rice fields from the desert, casuarina (*Casuarina Equisitifolia*), or eucalyptus trees (*Eucalyptus spp.*) are the most useful, but for windbreaks among the units of the rice fields, date palms are useful. To provide temporary windbreaks while the trees are growing sufficiently large to serve their purpose, such quick growing bushes as *Sesbania spp.* are very effective.

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References

- BURINGH, PIETER (1960): Soils and Conditions in Iraq. D. G. of Agricultural Research and Projects, Ministry of Agriculture, Iraq.
- CHAO, LIEN-FANG (1959): Report to the Government of Iraq on Rice FAO No. 1081
- ITO, HIROSHI (1962): Tashu-sei Ine Ikushu-zairyo no Seitai-kei. (Characteristics of Genetic Stocks of Rice for Higher Yield) -in Japanese Recent Advance in Breeding III.
- (1963): The Necessity, the Possibility and the Means of Rapidly Increasing Rice Production in Iraq. D.G. of Agricultural Research and Projects, Ministry of Agriculture, Iraq.
- Ministry of Communications, Iraq (1960): Climatological Means for Iraq.
- WALLEN, C.C. and G. PERRIN de BRICHAMBAUT (1962): A Study of Agro-climatology in Semi-arid and Arid Zones of the Near East. FAO.

極高温乾燥地、イラク国における水田微気象観測の一例

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イラク国における稲の出穂前の気候は、日中は月平均でも 42℃、湿度 20% 以下で、稲の正常な発育を期待することは出来ない。しかし、全国平均の収量は低いが高位収獲田もあり、年々 10 万トンの米の生産があるので、その理由を明らかにし、逆に増産の方策をたてるために、水田微気象の観測を行なった。

水田や湿地が径 25km にも及ぶ大集団を作っているシャミヤ地方では、気温 46℃、湿度 10% の砂漠気象が、気温 41℃、湿度 49% に温和化され、収量も高い。径 1km 程度の水田が散在している場合には、このよう

にはつきりした気候の温和化は認められない。さらに高位収獲田と砂漠とで 24 時間の微気象観測を行なうと、水田とくに植被内での微気象と砂漠との差が著しく、とくに防風林による乾風の防止が気候改良に大きな効果があつた。稲の収量構成要素の調査結果をも吟味した結果、水田を集団化し、湛水状態に保ち、さらに防風林で保護することによつて、水田微気象を稲の生育に適するように改造することも可能で、これにより増産を期待することができる。

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株式会社 小笠原計器製作所	東京都目黒区唐ヶ崎町 618 Tel (713) 1141	気象測器の製作研究	小糸工業 株式会社	東京都杉並区大宮前 1 の 30 Tel (398) 2286	人工気象室の設計製作
中浅測器 株式会社	東京都中央区日本橋通 3 の 4 Tel (271) 6925~8	気象測器の製作販売			