V. INVESTIGATIONS

1. Investigation of several afforestation places and sand dune fixation projects in UAE (Theme A)

Several places of afforestation were observed. The list and location of observation sites are shown in Table 26 and Fig. 16.

There are some of afforestation areas and sand dune fixation project in UAE, but unfortunately, no numerical or statistical data is available concerning them. So it is important to determine the effect of afforestation and some mulching treatment on sand movement statisfically. This is one of the major objectives of Theme A.

And, in most of the afforestation areas in UAE, only trees, such as *Acacia tortilis* (Samar). *Prosopis spicigera* (Ghaff) and *Salvadora persica* (Arak), have been planted. But it is also interesting and necessary to discuss the utilization of natural vegetation, such as *Haloxylon salicornicum*, *Zygophyllum sp.* and *Cyperus conglomeratus*, for sand dune fixation.

Table 26. Areas and tree species in the afforestation sites

Place	Date observed	Area(ha)	Tree species	Remarks
Bida Zayed	Sept.1985	-	Samar,Ghaff,Dates, Arak	Abu Dhabi Municipality
Buharma *1	Feb.1986	170	Markha,Alta,Samar, Ghaff,Arak	Al Ain Forestry Dep.
Qasimah *1	Apr.1986	300	↑	↑
Al Wagon	May 1986	300	Samar,Ghaff,Arak	↑
Safran *2	June 1986	2,000	Samar,Ghaff,Arak Ghwaif, Tamarix	Abu Dhabi Municipality

Notes *1: Buharma and Qasimah are similar kind of project conducted by Al Ain Forestry Department. Several kinds of trees are planted in natural sand dune area of these places. In this project, some shrubs or grasses, such as Markha (Leptadenia pyrotechica) and Alta (Colligonum commosum), are planted in first stage to prevent shifting sand. And several kinds of trees,such as Samar, Ghaff, and Arak, are planted in second stage.

Notes *2: Safran is located near Bida Zayed. This project is conducted for sand dune fixation by planting tree with asphalt mulching conducted by Iranian company. Asphalt mulching was sprayed before tree planting. It seems like that this asphalt mulching is effective to prevent sand dune movement. But no numerical data is available.

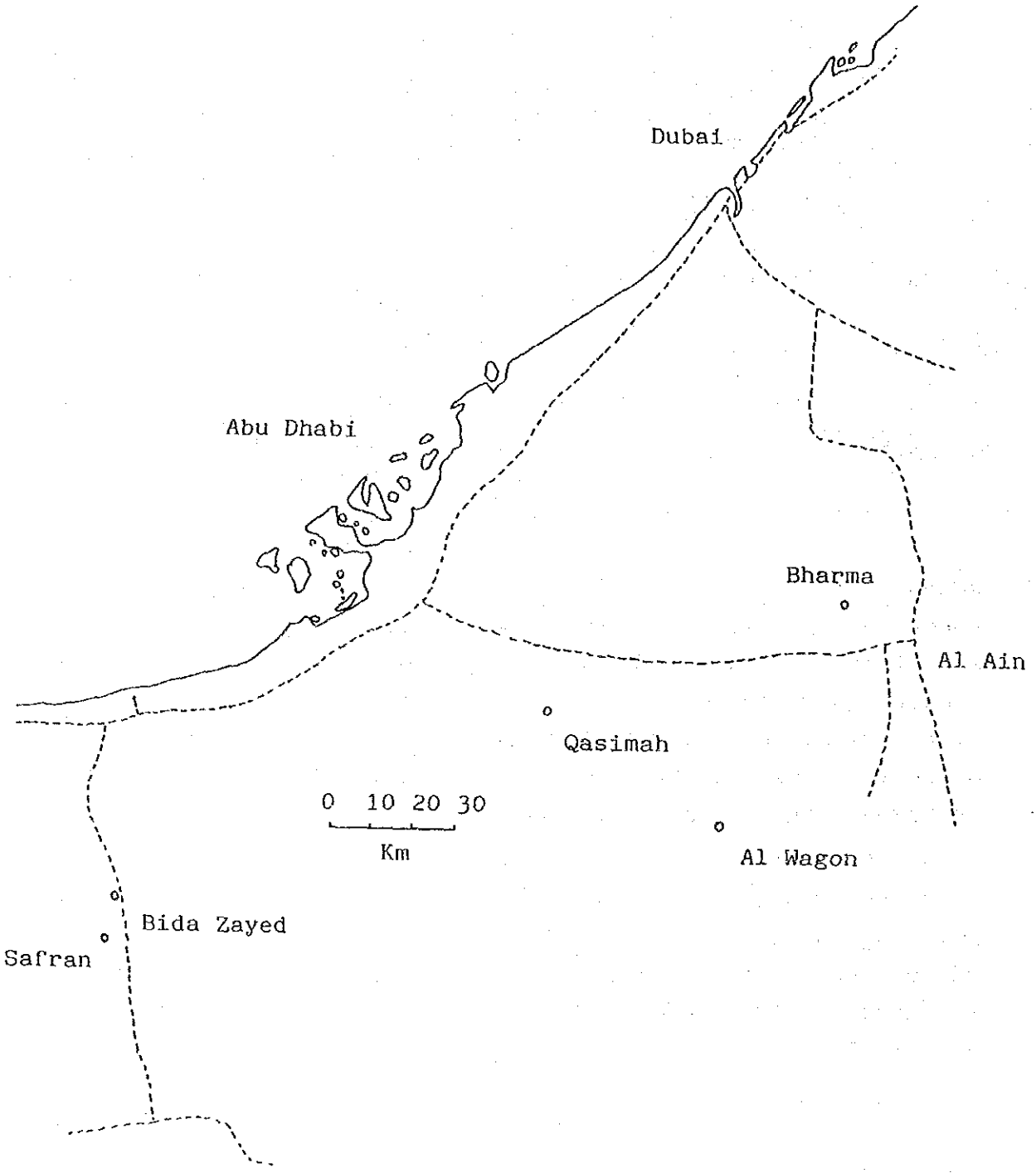


Fig. 16. Location of afforestation site observed

2. Studies on natural vegetation and soil in Al Ain area (Theme A)

Natural vegetation is largely influenced by the soil conditions such as soil moisture, soil salinity and pH and so on. It is, therefore, possible to know the soil conditions by investigation of natural vegetation, and it is also useful to clarify the relation between natural vegetation and soil conditions for deciding the afforestation method in desert area.

In the present paper, relation between *Zygophyllum sp.*, *Haloxylon salicornicum* dominant in Al Ain area and soil conditions were mainly investigated. Proportions by covered plants including the others were determined in a square of 50m x 50m.

The results obtained are shown in Table 27 and 28. *Zygophyllum sp.* and *Haloxylon salicornicum* were dominant in points of 3, 5, 7 , and in points of 4, 6, 8, respectively (Table 27). Values of moisture and EC from soil samples were relatively high in points of 3, 5, 7, and were low in points of 6, 8 (Table 28).

From these results, *Zygophyllum sp.* and *Halogylon salicornicum* tended to be dominant in soil conditions as high and low levels of both soil moisture and salinity, respectively.

Moistures, EC and pH in saturation extracts of soil samples from different layers in investigation points were measured.. Location of investigation point is shown in Fig. 17.

Table 27. Species of Natural vegetation and proportions by covered plants

Point	Species in Natural vegetation	Proportion by covered plants (%)
1.	Accasia arabica	4.0
	Haloxylon salicornicum	1.0
2.	Haloxylon salicornicum	0.4
	Cyperus conglomeratus	0.2
3.	Zygophyllum sp.	2.8
4.	Zygophyllum sp	2.9
	Haloxylon salicornicum	6.7
5.	Zygophyllum sp	4.1
6.	Zygophyllum sp	1.4
	Haloxylon salicornicum	6.8
7.	Zygophyllum sp	4.2
8.	Haloxylon salicornicum	3.0
	Zygophyllum sp	0.3

Table 28. Moisture, EC and pH in saturation extracts of soil samples from different layers in investigation points

Point	Depth(cm)	Soil Moisture(%)	ECe(mS/cm)	pH
1	0-24	1.20	4.27	7.81
	24-50	3.14	10.61	8.19
	60-	6.11	6.81	8.27
2	0-10	0.29	0.97	7.76
	10-20	0.32	0.49	7.51
	20-30	0.43	0.24	7.46
3	0-15	5.49	149.50	7.17
	20-30	10.48	25.30	7.62
	30-50	24.38	41.10	7.60
4	0-10	1.89	12.60	7.84
	20-30	4.06	32.40	7.67
	40-50	11.19	22.60	7.66
5	0-5	0.5	4.13	7.48
	5-12	3.0	5.08	7.61
	12-20	5.7	4.38	7.69
	20-35	6.9	4.16	7.68
6	0-10	0.5	0.56	7.85
	10-20	1.3	0.48	7.85
	20-35	2.5	0.58	8.03
	35-50	2.6	3.29	7.80
7	0-2	1.1	10.35	7.56
	2-14	0.8	8.91	7.80
	14-26	4.7	14.40	7.71
	26-40	7.1	19.3	7.77
	40-50	5.0	20.4	7.64
8	0-13	0.7	1.07	7.91
	13-30	2.2	0.90	7.92
	30-35	1.5	1.60	7.60
	35-45	1.2	6.87	7.76

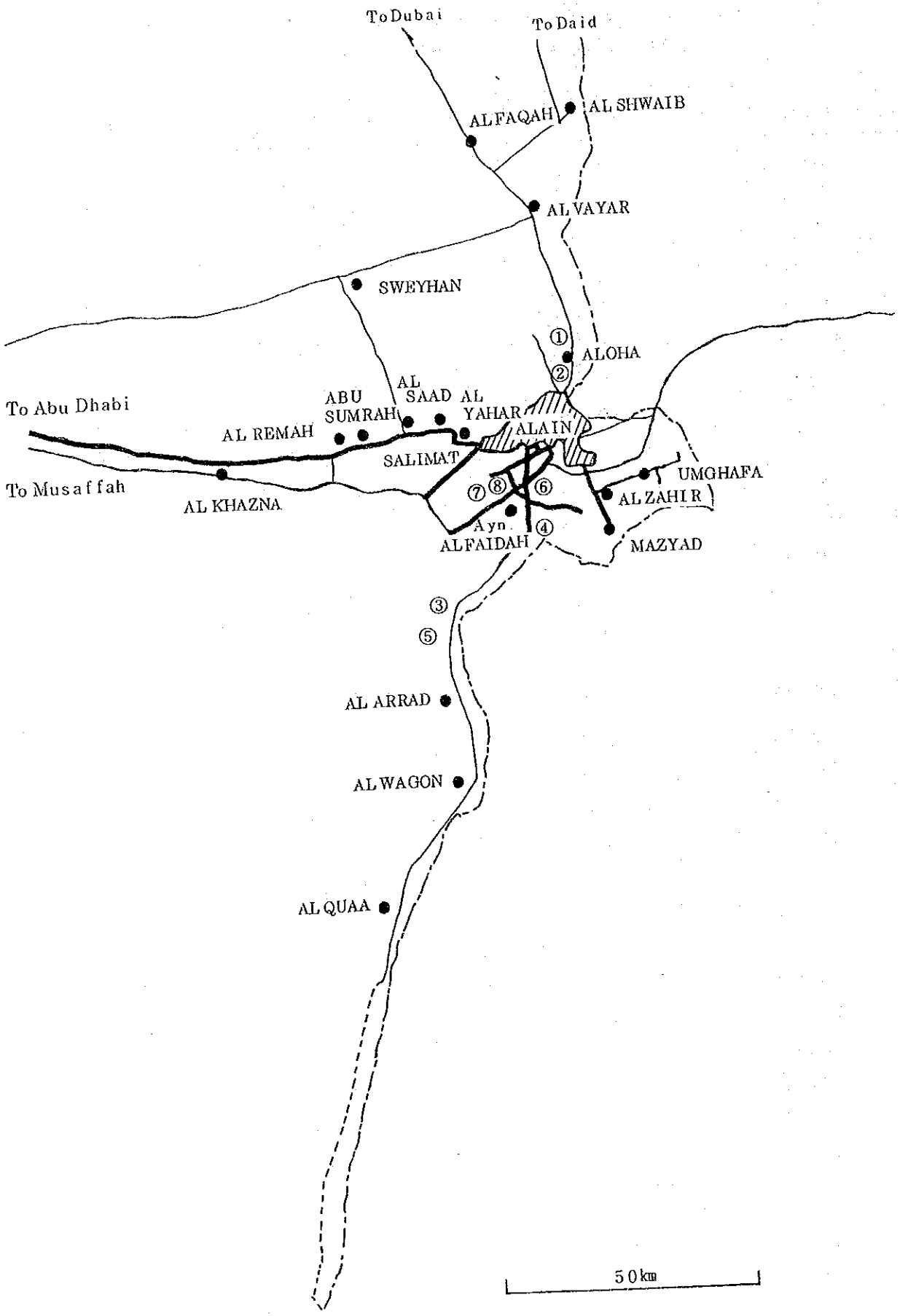


Fig. 17. Location of investigation point

3. Investigation of conventional cultivation methods of crops and vegetables (Theme B)

Coventional cultivation methods of crops in Al Ain area were investigated to determine the cultivation methods of crops on research theme of the Joint Study Project in the University Farm. Cultivation period of crops including wheat and alfalfa and conventional application amount of fertilizer are shown in Table 29 and Table 30, respectively.

Conventional cultivation methods of wheat and alfalfa as main crops in the research theme are as follows:

(1) Wheat

1) Variety: *Mexi pac*
2) Cultivation period: middle of Nov. to April
3) Amount of fertilizer applied:
   i) Before planting organic compost 10t/ ha
      (Al Ain compost)
      super triphosphate 200kg/ha
      K_2SO_4 100–150kg/ha
   ii) In sowing time chemical fertilizer 100–250kg/ha
      (N:P:K = 15:15:15)
   iii) After 3 weeks from seedling : 100kg Urea/ha
      after 10 days : 100kg Urea/ha
      after 10 days : 100kg Urea/ha
      after 10 days : 100kg Urea/ha
      after 10 days : 100kg Ammonium Nitrate/ha
4) Irrigation with sprinkler method
   Amount of irrigation water
   10mm x 45 times / one cropping season
5) Yield 2 – 2.5 ton/ha

(2) Alfalfa

1) Variety: *Omani*
2) Sowing time: end of Oct. to first half of Feb.
   (best season: Nov. and Dec.)
3) Harvesting time: First time 60 days after sowing
   Summer 25 days
   Winter 30–35 days
   Cultivation is continued for 7–10 years.
4) Amount of fertilizer applied:
   organic compost (Al Ain compost)
   Oct. – beginning of Nov.: 2 ton/donum
   or Oct.: 1 ton/donum, Feb. : 1 ton/donum
   chemical fertilizer (NPK = 18:19:5:1.5)
   i) winter 20–30 kg/donum
   ii) 7 times/year. Oct. – April (after harvesting)
5) Irrigation with sprinkler method

summer: 2 hours each 24 hours (= 20mm ?)
winter: 1 hours each 48 hours

6) Yield each harvest ----- 1 ton/donum

Table 29. Sowing periods and cultivation periods of crops and vegetables in Al Ain

species \ month	9	10	11	12	1	2	3	4	5	6	7	8	Note
wheat			-----										seeds
alfalfa													seeds (perennial)
tomato													seedling
eggplant													seedling
pepper													seedling
broad bean													seeds
peas													seeds
cabbage													seedling
cauliflower													seedling
onion													seedling
carrot													seeds
turnip													seeds
beat													seeds
radish													seeds
lettuce													seedling
spinach													seeds
egyptian mallow													seedling
garlic													bulbs
chard													seeds
parsley													seeds
celery													seeds
leek													seeds

Remarks; ----- sowing period
——— cultivation period

species	month	9	10	11	12	1	2	3	4	5	6	7	8	
water melon	spring													seeds
	autumn													seeds
sweet melon	spring													seeds
	autumn													seeds
cucumber	spring													seeds
	autumn													seeds
potato														tubers
squash														seeds
okura	spring													seeds
	autumn													seeds
bean	spring													seeds
	autumn													seeds
maize														seeds
Jew's mallow	spring													seeds
	autumn													seeds
purslane														seeds

Table 30. Conventional application amounts of fertilizers for vegetables in Al Ain

species	Organic fertilizer (t/ha)	Chemical fertilizer (Kg/ha)		
		N	P_2O_5	K_2O
tomato	10	50	40	30
eggplant	7.5	50	50	40
pepper	10	40	40	40
cabbage	15	40	30	25
cauli flower	10	35	40	30
onion	5	30	37	30
carrot	10	30	30	30
turnip	10	40	30	40
radish	10	40	40	40
lettuce	10	45	30	25
egyptian mallow	20	40	35	20
water melon	10	40-45	35	30
melon	10	40-45	35	30
squash	10	40	40	30
cucumber	10	40	40	30
potato	15	40	40	40
okura	10	40	50	40
Jewś mallow	20	40	30	20
bean	10	35	40	40

4. Meteorological data in the near the University Farm (Theme A, B and C)

In this paper, daily meteorological data were summarized as monthly meteorological tables. Contents of observation and instruments are as follows:

1)	Air temperature	Thermo-Hygrograph Maximum and minimum thermometer	set in shelter
2)	Humidity	Thermo-Hygrograph	set in shelter
3)	Wind veolocity and wind direction	Mechanical wind recorder	height of 2m
4)	Evaporation	Evaporation gauge, Piche type	set in shelter

Table 31. Meteorological data (June, 1986)

JUNE, 1986										
Date	Temperature (C)			R.H. (%)			Evapo-ration (mm)	Wind		
	Max	Min	Ave	Max	Min	Ave		Ave	Max	Direction
1	NO DATA			NO DATA			NO DATA	2.8	5.8	NNW
2								2.4	5.4	N
3								2.8	5.7	NNW
4								3.0	6.9	NW
5								3.6	7.2	S
6	41.6	28.5	34.8				13.40	4.2	8.5	S
7	42.3	28.8	33.4				8.75	3.1	6.0	S
8	42.1	21.0	32.9				13.05	3.4	10.2	E
9	42.3	23.8	34.8				15.31	3.1	5.9	S
10	40.9	23.1	32.1				15.81	2.9	5.4	NW
11	43.0	21.3	32.3				16.90	3.2	7.7	SE
12	39.4	27.5	33.5				13.60	5.0	8.1	E
13	40.7	26.9	33.9				12.60	3.7	6.6	E
14	41.9	26.9	34.1				11.02	3.2	6.5	N
15	41.8	27.0	30.7				6.95	2.8	9.4	E
16	40.8	24.5	31.8				12.00	2.5	4.9	NW
17	41.7	23.8	32.7				13.97	2.7	5.9	NNW
18	42.3	26.0	33.9				10.80	2.8	7.0	NNE
19	42.2	25.5	33.8				12.60	2.3	6.0	NW
20	41.7	23.6	31.9				11.75	3.1	6.0	WNW
21	40.0	22.5	30.8				12.88	3.2	6.5	WNW
22	38.6	23.1	29.6				9.67	3.0	5.8	WNW
23	38.6	22.4	29.4				7.60	2.3	5.3	WNW
24	41.5	22.4	31.3				9.76	3.0	5.1	WNW
25	43.2	25.2	33.5				11.01	3.0	5.0	WNW
26	42.7	24.4	-				11.77	3.2	5.9	WNW
27	41.1	22.9	-				12.65	3.1	6.3	WNW
28	41.2	22.6	30.8				10.62	3.2	6.4	WNW
29	41.4	21.9	30.9				9.34	3.3	5.8	W
30	40.8	23.2	31.0				9.00	3.3	5.7	WNW
Ave.	41.4	24.4	32.3				11.71	3.1	6.4	-

Table 32. Meteorological data (August, 1986)

AUGUST, 1986										
Date	Temperature (C)			R.H. (%)			Evapo-ration (mm)	Wind		
	Max	Min	Ave	Max	Min	Ave		Ave	Max	Direction
1	44.0	28.6	34.9	88	35	63	12.00	2.6	6.0	ENE
2	45.5	27.6	36.3	87	30	56	14.18	2.6	5.0	S
3	45.1	29.9	37.3	74	30	49	15.25	3.5	6.8	S
4	45.2	32.5	37.8	70	31	47	15.06	4.0	8.5	S
5	44.4	27.0	35.9	81	31	53	14.11	3.5	7.6	S
6	45.6	27.5	36.4	87	25	54	16.80	2.8	6.4	SSE
7	46.5	30.2	38.3	66	22	38	17.85	3.0	4.3	SE
8	43.8	27.5	35.9	66	28	45	14.37	2.7	5.5	SSW
9	42.7	28.0	34.9	60	30	48	12.34	3.4	5.4	NNW
10	45.5	27.3	36.3	93	8	42	18.78	2.9	5.0	ESE
11	43.6	25.4	35.5	40	11	21	19.20	3.4	5.6	E
12	40.8	30.8	35.4	50	27	35	12.44	3.2	5.2	NNE
13	43.5	28.1	35.9	72	16	37	14.58	2.3	5.4	E
14	42.7	22.9	33.3	68	21	37	13.62	2.6	5.6	S
15	43.1	26.3	34.4	71	25	44	13.30	3.5	5.3	ENE
16	40.2	25.2	32.9	82	28	51	12.22	4.0	6.2	S
17	39.0	24.8	32.3	75	34	53	10.16	3.8	7.1	S
18	40.7	26.9	33.9	69	29	46	11.43	3.5	6.8	S
19	41.8	25.8	34.3	70	25	44	13.41	3.2	7.3	S
20	43.5	26.0	34.9	61	23	38	16.31	3.8	7.6	S
21	43.5	31.0	36.7	40	22	31	16.47	4.5	7.9	E
22	42.2	26.3	34.9	54	23	37	12.47	3.3	6.0	S
23	41.4	26.7	34.4	60	26	43	13.52	3.1	5.3	S
24	42.6	25.2	35.4	68	23	36	16.39	3.0	5.0	S
25	43.6	25.9	36.0	55	23	35	17.75	3.8	7.6	S
26	41.2	29.3	35.2	50	28	38	17.14	5.7	8.5	S
27	41.2	27.9	35.0	52	29	37	14.26	4.9	7.3	S
28	41.5	27.0	32.8	85	30	45	8.53	3.1	5.8	ESE
29	40.7	24.2	31.5	87	23	51	10.17	3.4	7.1	S
30	40.5	25.6	33.1	73	25	43	11.79	3.4	6.8	ENE
31	40.9	25.8	34.2	62	23	40	13.25	3.1	5.4	S
Ave.	42.8	27.2	35.0	68	25	43	14.17	3.4	6.3	-

Table 33. Meteorological data (July, 1986)

JULY, 1986										
Date	Temperature (C)			R.H. (%)			Evapo-ration (mm)	Wind		
	Max	Min	Ave	Max	Min	Ave		Ave	Max	Direction
1	41.5	22.6	31.8	86	22	54	11.21	3.1	5.3	WNW
2	42.5	26.7	33.8	77	31	52	14.10	3.6	10.8	SSE
3	43.3	30.2	36.7	70	23	43	15.08	2.6	4.2	SSE
4	43.3	31.6	37.2	62	24	39	14.51	3.3	6.8	S
5	44.2	27.2	36.3	64	19	38	15.53	3.0	5.2	S
6	45.2	24.1	36.3	62	18	36	16.14	3.3	7.6	S
7	45.6	24.9	35.8	59	19	34	17.67	3.2	8.0	S
8	45.9	29.1	37.8	57	18	34	16.67	4.4	8.8	S
9	45.1	26.6	36.2	57	20	38	16.17	2.8	6.4	SSW
10	45.1	24.4	35.8	60	21	37	16.01	3.3	7.2	S
11	45.2	22.8	34.4	64	19	43	12.72	3.1	5.6	SSW
12	45.2	25.5	35.4	91	13	46	13.47	2.5	5.3	SSW
13	44.6	26.4	35.8	67	15	33	17.23	3.7	7.8	SE
14	43.5	26.7	34.9	50	17	32	14.21	3.2	9.8	ENE
15	43.0	25.8	35.1	46	22	33	13.60	3.0	6.7	SE
16	43.6	24.6	35.2	59	20	35	14.41	2.4	4.8	ESE
17	43.9	24.7	36.1	59	18	31	14.49	2.5	6.0	NNW
18	44.7	24.4	34.4	55	15	33	15.91	2.9	5.8	NNW
19	45.5	24.4	35.2	55	17	29	18.32	2.9	5.6	SSW
20	46.4	27.6	37.3	40	18	32	19.48	3.6	7.6	S
21	45.1	30.2	37.5	70	23	36	15.46	4.5	8.6	S
22	41.7	25.4	34.4	94	14	41	15.05	2.7	5.6	NW
23	45.7	22.5	34.8	55	13	31	15.20	2.3	4.5	NNW
24	46.4	25.1	36.8	84	17	35	17.36	2.8	6.2	S
25	45.2	26.1	36.1	70	23	41	14.96	2.8	5.3	WNW
26	44.3	25.5	35.6	91	23	53	15.10	3.0	5.6	NW
27	46.0	28.2	37.6	96	22	54	16.65	2.6	5.3	NNE
28	45.4	31.4	38.2	74	25	46	15.76	3.5	5.9	SSW
29	43.9	30.0	36.8	70	29	49	14.80	3.9	6.7	S
30	41.7	28.8	35.0	75	37	56	11.48	3.4	5.3	S
31	43.0	29.2	35.4	88	32	56	14.35	3.1	6.4	S
Ave.	44.4	26.5	35.8	68	21	40	15.26	3.1	6.5	-

Table 34. Wind velocity and wind direction (March to May, 1986)

Date	MARCH			APRIL			MAY		
	Ave	Max	Dir	Ave	Max	Dir	Ave	Max	Dir
1	NO DATA			4.3	9.7	S	3.5	8.4	NW
2				5.3	10.3	S	2.1	4.9	NNW
3				4.7	9.1	S	3.1	7.6	S
4				3.2	5.9	SSW	5.3	10.0	S
5				2.7	7.0	NW	5.2	9.0	S
6				2.8	6.3	NNW	2.6	5.2	NW
7	6.0	11.6	SSW	2.5	3.9	N	2.6	5.2	NNW
8	7.2	11.1	S	2.6	4.5	WNW	2.5	5.8	NW
9	3.2	6.6	NW	3.7	7.0	SW	2.8	5.7	NW
10	1.6	2.7	NNE	2.6	10.9	WSW	2.7	6.5	NW
11	4.3	6.9	WSW	2.5	4.8	NW	3.0	5.2	NNW
12	2.7	5.7	WNW	3.1	7.7	NW	3.2	6.1	SSW
13	2.9	7.5	NW	3.1	6.8	WNW	3.6	8.2	SSW
14	2.5	5.5	N	2.9	7.3	NW	3.2	6.2	S
15	4.6	8.0	SSW	2.6	5.2	NW	3.0	4.6	S
16	7.3	11.5	S	2.4	6.2	NW	3.7	7.2	SSW
17	2.6	5.0	NW	2.8	6.7	NW	2.4	5.4	NNW
18	2.3	4.6	N	3.3	8.0	NW	2.9	5.6	N
19	3.8	7.2	S	2.5	5.2	NNW	2.8	4.9	NNW
20	3.1	6.3	WNW	2.8	5.5	SW	2.2	4.0	NNW
21	3.4	8.0	NW	2.9	4.6	ENE	2.4	4.1	NNW
22	2.6	5.5	NW	2.6	6.0	W	2.6	5.2	NNW
23	2.1	4.6	NNW	4.0	8.6	WSW	3.2	6.2	SSW
24	2.3	5.8	S	2.4	5.3	NW	3.6	7.8	S
25	5.9	10.0	S	2.5	6.2	NW	3.5	7.0	S
26	8.8	14.0	S	3.0	5.6	NNW	3.2	6.4	WNW
27	2.5	4.5	NW	2.1	4.8	NW	2.7	5.6	W
28	2.8	7.1	NNW	2.5	6.2	SW	2.7	6.7	WSW
29	2.9	5.6	NNW	3.4	6.0	N	3.7	7.8	SSW
30	2.3	5.4	S	3.3	6.5	NW	3.1	6.1	SW
31	4.1	9.1	S	-	-	-	2.7	4.8	NNW
Ave.	3.8	7.2	-	3.0	6.6	-	3.1	6.2	-

Table 35. Relation between wind velocity and wind direction in March 1986

MARCH, 1986						
Wind Direction	Wind Velocity (m/sec)					Total (%)
	<1.0	1.0-4.0	4.0-8.0	8.0-12.0	12.0<	
N		4.7	1.5			6.2
NNE		3.7	0.3			4.0
NE		3.0				3.0
ENE		3.3				3.3
E		2.0				2.0
ESE		1.0				1.0
SE		0.7				0.7
SSE		2.0	0.8			2.8
S		2.3	5.8	5.3	0.7	14.1
SSW		0.3	2.0	2.0	0.2	4.5
SW		0.3	2.3	1.3		3.9
WSW		0.2	2.0	0.2		2.4
W		1.5	0.8			2.3
WNW		2.8	3.0			5.8
NW		6.0	8.8	0.2		15.0
NNW		5.5	2.5			8.0
variable	11.7	9.2				20.9
Total(%)	11.7	48.5	29.8	9.0	0.9	99.9

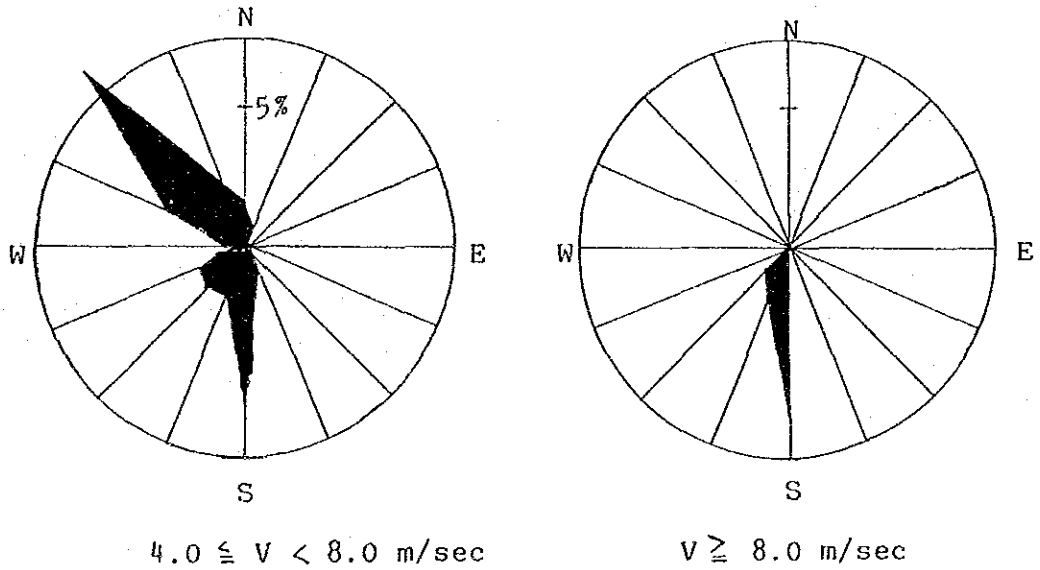
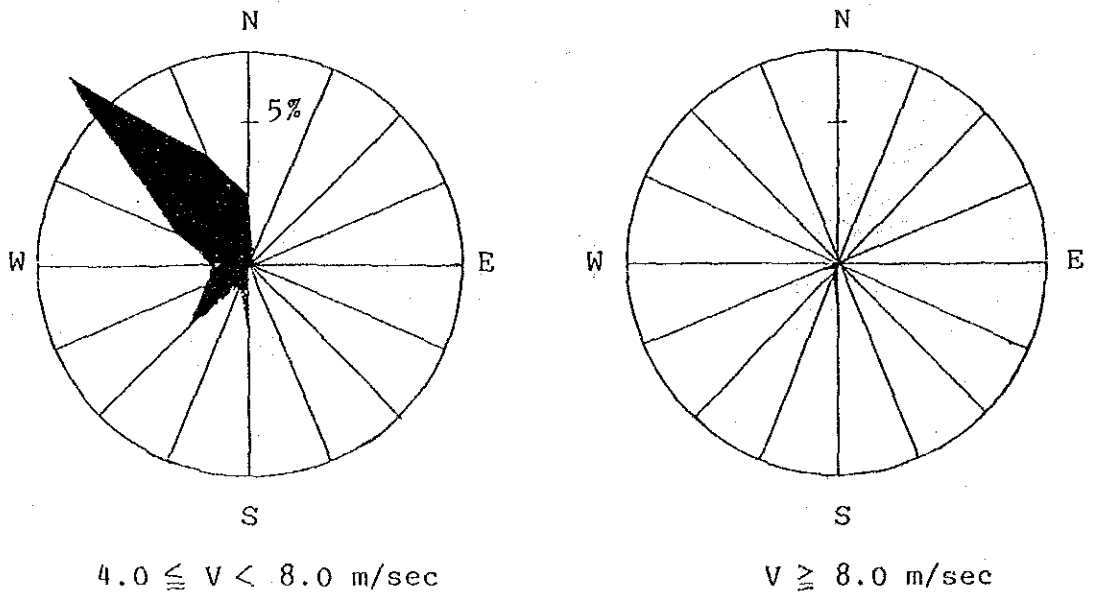


Fig. 18. Wind distribution diagram in March 1986

Table 36. Relation between wind velocity and wind direction in April 1986

APRIL, 1986						
Wind Direction	Wind Velocity (m/sec)					Total (%)
	<1.0	1.0-4.0	4.0-8.0	8.0-12.0	12.0<	
N		5.7	2.4			8.1
NNE		3.8	0.4			4.2
NE		3.5	0.6			4.1
ENE		4.6	0.1			4.7
E		1.9	0.1			2.0
ESE		0.7				0.7
SE		1.5				1.5
SSE		1.0				1.0
S		1.8	2.4	1.4		5.6
SSW		1.0	0.8	0.4		2.2
SW		0.8	3.2			4.0
WSW		1.3	1.7	0.6		3.6
W		1.7	1.3			3.0
WNW		1.5	2.6			4.1
NW		5.6	9.3			14.9
NNW		5.6	4.2	0.1		9.9
variable	5.8	20.8				26.6
Total(%)	5.8	62.8	29.1	2.5		100.2



4.0 ≦ V < 8.0 m/sec　　V ≧ 8.0 m/sec

Fig. 19. Wind distribution diagram in April 1986

Table 37. Relation between wind velocity and wind direction in May 1986

MAY. 1986						
Wind Direction	Wind Velocity (m/sec)					Total (%)
	<1.0	1.0-4.0	4.0-8.0	8.0-12.0	12.0<	
N		7.1	1.5			8.6
NNE		2.7				2.7
NE		3.9				3.9
ENE		3.9				3.9
E		1.6				1.6
ESE		0.5				0.5
SE		1.5				1.5
SSE		4.0	0.3			4.3
S		2.7	6.2	1.1		10.0
SSW		0.7	2.7	0.4		3.8
SW		2.4	5.0			7.4
WSW		0.8	1.2			2.0
W		1.1	1.5			2.6
WNW		2.6	1.2			3.8
NW		3.9	5.2	0.1		9.2
NNW		7.0	6.9			13.9
variable	5.0	15.5				20.5
Total(%)	5.0	61.9	31.7	1.6		100.2

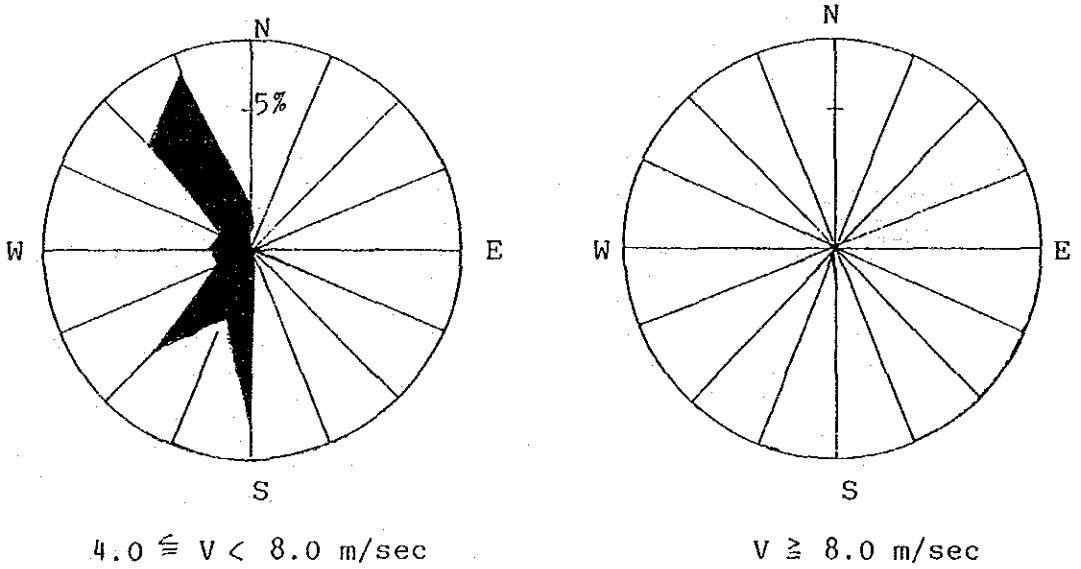
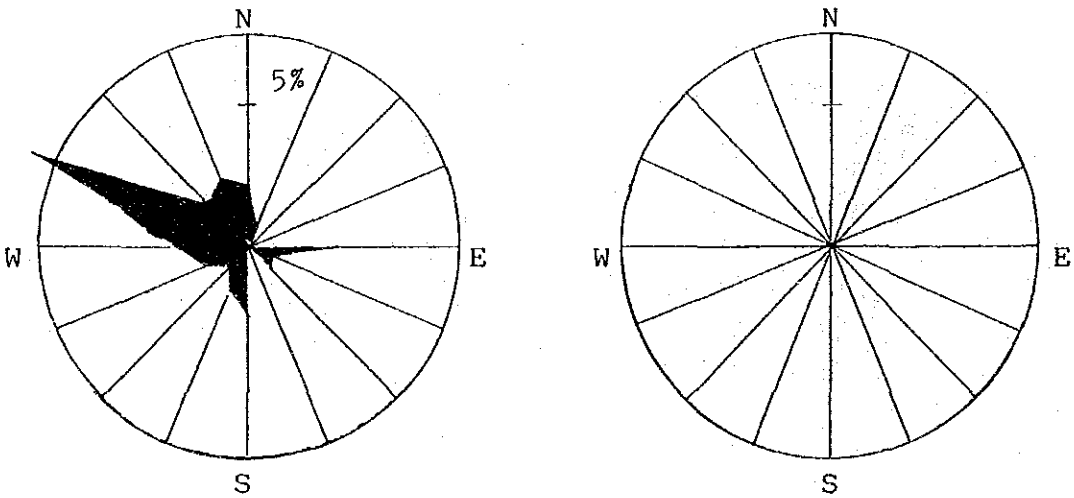


Fig. 20. Wind distribution diagram in May 1986

Table 38. Relation between wind velocity and wind direction in June 1986

JUNE, 1986						
Wind Direction	Wind Velocity (m/sec)					Total (%)
	<1.0	1.0-4.0	4.0-8.0	8.0-12.0	12.0<	
N		5.8	2.2			8.0
NNE		2.8	0.8			3.6
NE		1.7				1.7
ENE		2.4	0.1			2.5
E		1.4	3.1	0.4		4.9
ESE		1.1	1.0			2.1
SE		2.6	1.1			3.7
SSE		2.2	0.3			2.5
S		3.6	2.5	0.1		6.2
SSW		2.9	1.7			4.6
SW		4.6	1.0			5.6
WSW		3.2	1.7			4.9
W		6.4	2.5			8.9
WNW		5.8	8.5			14.3
NW		2.9	2.2			5.1
NNW		6.3	2.6			8.9
variable	6.3	6.0	0.3			12.6
Total(%)	6.3	61.7	31.7	0.5		100.2

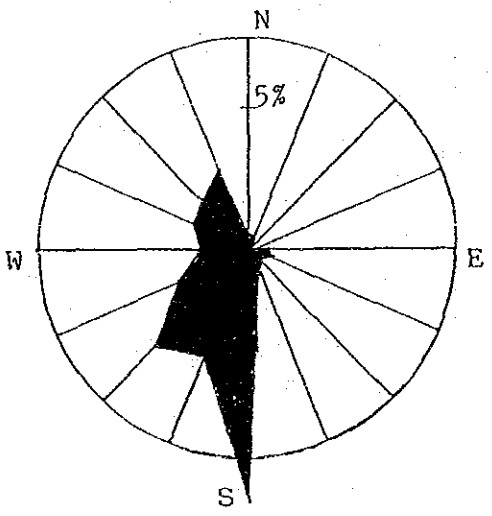


4.0≦ V < 8.0 m/sec　　V ≧ 8.0 m/sec

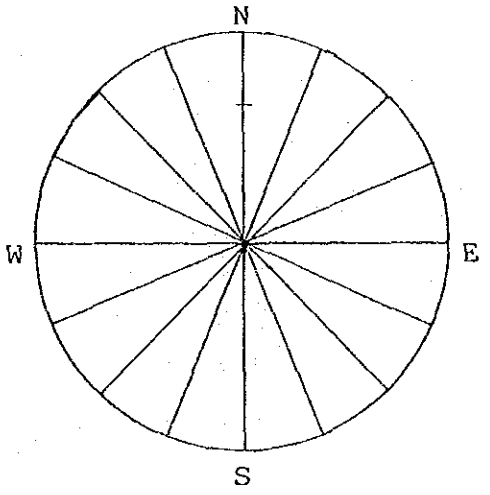
Fig. 21. Wind distribution diagram in June 1986

Table 39. Relation between wind velocity and wind direction in July 1986

JULY, 1986						
Wind Direction	Wind Velocity (m/sec)					Total (%)
	<1.0	1.0-4.0	4.0-8.0	8.0-12.0	12.0<	
N		4.8	0.5			5.3
NNE		2.7	0.4			3.1
NE		3.4	0.3			3.7
ENE		4.8	0.1	0.1		5.0
E		4.6	0.8			5.4
ESE		1.3	0.9			2.2
SE		3.4	0.7			4.1
SSE		2.3	0.7	0.1		3.1
S		6.0	9.0	0.5		15.5
SSW		2.4	4.2	0.1		6.7
SW		3.6	4.8			8.4
WSW		2.0	2.6			4.6
W		2.6	1.7			4.3
WNW		2.6	2.3			4.9
NW		3.4	2.4			5.8
NNW		4.0	3.1			7.1
variable	7.0	3.4	0.3			10.7
Total(%)	7.0	57.3	34.8	0.8		99.9



4.0 ≦ V < 8.0 m/sec



V ≧ 8.0 m/sec

Fig. 22. Wind distribution diagram in July 1986

Table 40. Relation between wind velocity and wind direction in August 1986

AUGUST. 1986						
Wind Direction	Wind Velocity (m/sec)					Total (%)
	<1.0	1.0-4.0	4.0-8.0	8.0-12.0	12.0<	
N		4.8	1.5			6.3
NNE		3.1	0.4			3.5
NE		1.7	0.4			2.1
ENE		2.2	2.0			4.2-
E		3.1	1.9			5.0
ESE		1.6	1.5			3.1
SE		3.6	0.8			4.4
SSE		6.3	2.4			8.7
S		7.5	15.3	0.3		23.1
SSW		1.7	3.1			4.8
SW		2.3	3.0			5.3
WSW		2.3	1.7			4.0
W		2.3	0.4			2.7
WNW		2.8				2.8
NW		3.5	0.8			4.3
NNW		4.6	1.3			5.9
variable	4.3	5.4				9.7
Total(%)	4.3	58.8	36.5	0.3		99.9

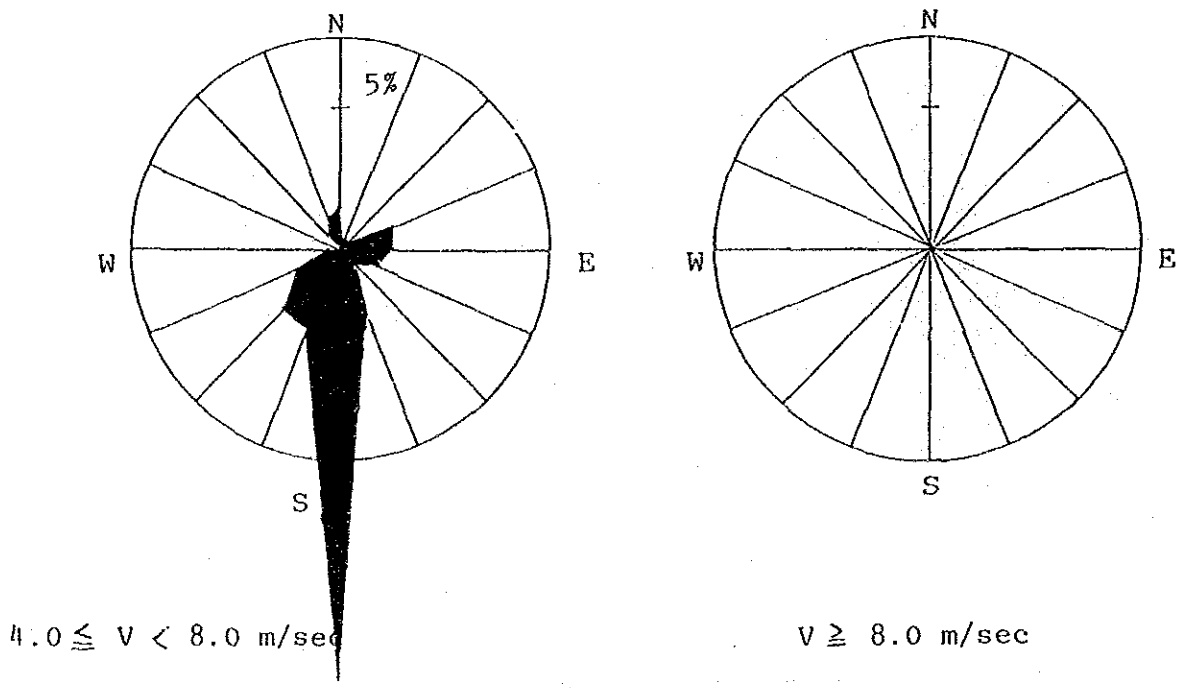


Fig. 23. Wind distribution diagram in August 1986

VI. LIST OF COLLECTED SEEDS OF CROPS AND TREES FOR THEME C

1. Crops

	Species	Number of Varieties	Remarks
1.	Sorghum	50	ICRISAT
2.	Chick pea	50	ICRISAT
3.	Pigeon pea	50	ICRISAT
4.	Pearl millet	50	ICRISAT
5.	Ground nut	50	ICRISAT
6.	White cabbage	4	Europe
7.	Cauriflower	1	Europe
8.	Leek	1	Europe
9.	Carrots	2	Europe
10.	Red garden beet	1	Europe
11.	Wheat	2	Japan
12.	Alfalfa	2	U.S.A.
13.	Spinach	3	Japan
14.	Radish	3	Japan
15.	Tomato	3	Japan
16.	Cucumber	2	Japan

2. Trees

	Species	Remarks
1.	Allepo pine	
2.	Jojoba (*Simmondsia chinensis* (Link Schneider)	U.S.A.
3.	Yamamomo (*Myrica rubra* Sieb. et Zucc.)	Japan
4.	Ubamegashi (*Quercus phillyraeoidas* A. Gray)	Japan
5.	Niseakashia (*Robinia pseudo-acacia* L.)	U.S.A.
6.	Akigumi (*Elaeagnus umbellata* Thumb.)	Japan
7.	Yamahagi (*Lespedeza bicolor* Turczf. actifolia Matsumu)	Japan
8.	Itachihagi (*Amorpha fruticosa* L.)	U.S.A.
9.	Medohagi (*Lespedeza cuneata* G. Don)	Japan
10.	(*Hedysarum mongolicum* Turcz)	China
11.	(*Hedysarum mongoricum* Fish et Mey)	China
12.	(*Haloxylon ammodendrom)*	China
13.	(*Calligonus leucocladum* (Schrenk) Bge.)	China

VII. LIST OF EQUIPMENTS PROVIDED BY JAPANESE GOVERNMENT

Equipments and materials that is needed for Theme A, B, and C were provided by Japanese government as followed:

	Item	Quantity	Price (Yen)
Sept. 1985	Camera	1 pc	70,500
	Lens 35mm F2.8	1 pc	24,500
	Lens 55mm F2.8	1 pc	41,400
	Lens 70–210mm F4	1 pc	64,000
	Camera case	1 pc	3,800
	Speed light	1 pc	18,500
	Tripod	1 pc	12,600
	Film	40 pcs	33,800
	Video camera	1 pc	273,000
	AC adaptor	1 pc	23,700
	Battery pack	5 pcs	35,500
	Video tape	10 pcs	18,000
	Portable wind vane and anemometer	2 sets	57,000
	Plastic pipe	100 pcs	34,000
	Auto level	1 set	180,000
	Aluminium staff	3 pcs	36,900
	Eslon pole	10 sets	24,700
	Measuring tape	1 pc	11,000
	Electric typewriter	1 set	190,000
	1) Typewriter stand	1 set	22,000
	2) Correction tape	1 Box	4,700
	3) Ribbon casette	1 Box	6,800
	4) Daisy wheel	3 pcs	14,400
	Assman psychrometer	1 pc	79,000
	Surveying compass	1 pc	77,000
	L-tube thermometer	2 sets	89,000
	Conductivity meter	1 pc	450,000
	Automatic recording tensio meter	1 set	1,787,000
			3,682,800
			(1 DH=56 Yen, 8,357 DH).
Dec. 1985	Leaf puncher	1 set	51,800
	Boring shovel	1 set	13,200
	Soil sampling bottle	10 sets	72,000
	Soil sampler	1 set	54,500
	Measuring pile	150 pcs	60,000
	Three phase meter	1 set	463,000
	Combination anemometer	6 sets	166,800
	Tree seed	1 Box	10,000
			891,300
		(1 DH=56 Yen,	15,916 DH)

Jan. 1986	Fly sand catch system	1 set	468,000
		(1 DH = 56 Yen,	8,357 DH)
June 1986	Float type water level meter	1 set	480,500
	Er-186 recorder	2 sets	971,400
	Single beam spectrophotometer	1 set	555,085
	Hand drive asphalt emulsion sprayer	1 set	373,000
	Insecticide	120 pcs	416,500
	Fertilizer	30 pcs	82,500
	Compost	10 pcs	10,000
	Creosote	12 cans	98,400
	Tube evaflow type A	10 pcs	75,000
			3,062,385
		(1 DH = 47 Yen,	65,157 DH)
July 1986	Automatic recording tension meter	3 sets	5,374,000
	Soil tensio meter	20 pcs	243,000
	Agricultural meterological IPC system		
	1. Computer system	1 set	3,500,000
	1) personal computer		
	2) Display		
	3) Printer		
	4) I/O unit		
	2. Sensor		
	1) Anemo Scap and Anemo meter	1 set	280,000
	2) Air temperature	1 set	20,000
	3) Soil temperature	3 sets	60,000
	4) Dew point (humidity)	1 set	120,000
	5) Solar radiation	1 set	250,000
	6) Leaf wetness	1 set	50,000
	7) Evaporation	1 set	400,000
	3. Cord	1 set	200,000
	4. Environs machine parts		
	1) Pole (6 m)	1 set	180,000
	2) Instrument shelter	1 set	170,000
	3) Battery power supply	1 set	750,000
	5. Observation house	1 set	350,000
	Persoanl computer		
	1) PC8001 MK2SR	1 pc	110,000
	2) Color display	1 pc	95,000
	3) Printer	1 pc	121,000
	4) Mini floppydisk unit	1 pc	110,000
	5) System desk	1 pc	7,000
	6) Mini floppydisk	1 pc	18,000
	7) Paper	1 pc	4,000
	8) Transformer	1 pc	150,000
	Clean bench	1 set	639,000

	Clean bench	1 set	639,000
	Auto clave	1 set	281,000
	Zoom stereo microscope	1 set	230,000
	Soil test refrigerated centrifuge	1 set	3,100,000
	Refrigerator	1 set	245,000
	Plant moisture tensio meter	1 set	760,000
	Compressor	1 set	790,000
	pF meter, suction plate method	1 set	1,600,000
	Boring stick	1 set	35,000
	Post hole auger	1 set	81,000
	Soil shaker	1 set	394,000
	Auto still with transformer	1 set	285,000
	Handy aspirator	2 sets	158,000
	Graviry convection oven	1 set	180,000
			21,340,000
		(1 DH = 44 Yen,	485,00 DH)
Aug. 1986	Tractor with spare parts	1 set	637,500
	Carriage with tent	1 set	571,100
	Asphalt emulsion	1000 L	609,000
	Synthetic emulsion	108 kg	67,500
	Compost	500 packs	1,020,000
			2,905,100
		(1 DH = 42 Yen,	69,169 DH)
	Total		31,349,585 Yen
			(699,399 DH)

VIII. DISPATCH OF EXPERTS

Some experts mentioned as below were dipatched by JICA to conduct the Joint Study Project.

Short-term Experts

Name	Speciality	Position	Duration of Dispatch
Dr. Kaiichiro Matsuda	Team Leader Soil Science and Plant Nutrition	Professor, Faculty of Agriculture Shizuoka Univ.	12 Sept. 1985–29 Sept. 1985 15 Dec. 1985–28 Dec. 1985 2 Sept. 1986–20 Sept. 1986
Dr. Mamoru Nagai	Crop Science	Professor, Faculty of Agriculture Shizuoka Univ.	12 Sept. 1985–29 Sept. 1985 15 Dec. 1985–28 Dec. 1985
Dr. Hiroshi Murai	Forest Hydrology	Professor, Faculty of Agriculture Shizuoka Univ.	12 Sept. 1985–29 Sept. 1985 15 June 1986–26 June 1986 2 Sept. 1986–20 Sept. 1986
Mr. Yasuo Yuasa	Sirviculture	Research Associate, Faculty of Agriculture Shizuoka Univ.	15 Dec. 1985–28 Dec. 1985
Dr. Hitoshi Sawada	Crop Science	Research Associate, Faculty of Agriculture Shizuoka Univ.	2 Sept. 1986–20 Sept. 1986

Long-term Experts

Name	Speciality	Position	Duration of Dispatch
Mr. Hiromi Yokota	Plant nutrition	Research Associate, Faculty of Agriculture Shizuoka Univ.	20 Aug. 1985–up to now
Mr. Akira Koto	Soil Science Soil Conservation	Agricultural Expert, JICA	20 Aug. 1985– up to now

IX. ACKNOWLEDGEMENT

The Joint Study Project Team between UAE University and Shizuoka University is indebted to Dr. Nuri Shafiq, Vice Chancellor of UAE University, Dr. Nizar Hamadmad, previous Dean of Faculty of Agriculture, and staff members of Faculty of Agriculture, UAE University during implementation of the above mentioned Project. We also would like to thank the staff members of Al Ain Agriculture Department, Al Ain Forestry Department, Abu Dhabi municipality and Central Laboratory of Ministry of Agriculture and Fishery for their kind arrangement to our studies. We also would like to thank the staff members of Embassy of Japan in Abu Dhabi, Japan International Cooperation Agency and Faculty of Agriculture, Shizuoka University for their counsel and advice during the implementation of the above mentioned Project.

JICA