system, etc. are required.

b. Annual Working Plan

Table 2-3-7 shows the estimated rate of days when work can be done which was prepared by estimating the working period for wheat, soybean and corn by referring to the following planting system table and also the monthly rainfall, and the estimated number of actual working days during each working period calculated from the above.

In the future, it is necessary to determine the suitable period for cultivation (especially for the second crop) and a reasonable estimation of days when work can be done. Although Saturdays and Sundays were not considered to be days off in Table 2-3-7, it was decided to include a day when work cannot be done at the rate of about once a week. This is based on the prerequisite that days when work cannot be done are deemed as days off and, if it is necessary from the working point of view, field work is to be carried out even if it is Sunday by paying extra wages.

c. Study on Allotted Area per Worker

If the tilling - sowing period of wheat is from November 1 to December 12 (48 days) and the rate of days when work can be done is 60%, then the working days for planting wheat will be 29 days. Now, if the tilling - sowing work is to be carried out by A System, the allotted area for one tractor (105PS, four-wheel) in this case will be 46.7ha since the time required for the work per hectare is 3.48h and actual work time per day is 5.6h from Table 2-3-2. However, two assistant workers and a transport vehicle are required for the loading work of fertilizer and seed. Twenty-five tractors alone are required, therefore, for the planting of wheat in a 1,000ha field. If the number is this large, a spare tractor would probably also be required, it seems.

2-3-2. Adaptability Tests of Crops and Varieties

The following are the cultivation tests of soybean, corn, sunflower, sesame,cotton, peanut, wheat, barley, rapeseed and Chinese milk vetch.

(1) Soybean

1) The 1991 Summer Planting Test (May - October)

a. Cultivation Test (Second Crop)

Cultivation Method:

Variety			Asgrow 3966
Sowing rate(kg/ha)			100
Fertilizer quantity(kg/ha)			DAP; 400
Field no. and area (ha)	1 (1.5)	3B (9.0)	4B (9.0)
Date of sowing	6/20	7/08	7/ 8
Date of harvest	10/01	10/16	10/16
Unit yield (ton/ha)	2.0	1.5	1.5

Table 2-3-7 Annual field farming work schedule

	April	May	June	July	August	September	October	November	December	January	February	March
Wheat		Calendar days 13 Capacity 85 % Actual days 11	□—□ 10 22					○——○ 1 18 48 60 % 29		◇—◇ 17 31 15 40 % 6	◇——◇ 15 5 19 50 % 9	
Soybean Main crop	○——○ 16 15 Calendar days 30 Capacity 70 % Actual days 21		◇——◇ 1 30 30 85 % 26	~~~~~	~~~~~	~~~~	□—□ 1 18 18 80 % 14					
Soybean Second crop		Calendar days 8 Capacity 80 % Actual days 6	○—○ 23 30	~~~~~	◇—◇~~ 1 12 12 85 % 10	~~~~	□—□ 5 31 27 80 % 22					
Corn Main crop	○——○ 16 15 Calendar days 30 Capacity 70 % Actual days 21		◇——◇~~ 1 17 47 85 % 40		~~~~~	~~~~	□—□ 1 18 18 80 % 14					
Corn Second crop			○—○ ◇——◇~~ 23 8 20 14 Calendar days 16 26 Capacity 80 % 85 % Actual days 13 22			~~~~~	~ □——□ 15 14 31 80 % 25					

Note: ○—○ : Tillage, fertilizer, sowing
◇—◇ : Cultivate, topdressing, pest control
□—□ : Harvest
~~~ : Irrigation
~~~

Table 2-3-8 Outline of cultivation method of main crops

Crop and Variety	Sowing Period Month	Sowing Period Week	Harvest Period Month	Harvest Period Week	Between Furrows cm	Between Hills cm	Sowing Rate kg/ha	Fertilizer (kg/ha) A.N.* 26%	Urea 46%	20-20-0	DAP (18-46-0)
Corn											
main crop TTM 815	4	2	10	2	70	25	30	-	200	500	-
2nd crop TUM 82/6	6	3	11	1	70	25	30	-	200	500	-
Soybean											
main crop Asgrow 3966	4	2	10	1	70	5	90	-	-	-	400
2nd crop Asgrow 3127	6	3	10	3	70	5	90	-	-	-	400
Wheat											
Seri 82	11	2	6	2	15	3	250	160	160	240	-
Doganket 1	11	2	6	2	15	3	300	160	160	240	-
Rapeseed											
Westar	10	3	5	3	15	5	10	-	150	280	-
Sunflower											
Pioneer	3	2	8	2	70	20	10	-	100	300	-
TEC 115	3	2	8	2	70	20	10	-	100	300	-
Sesame											
Sari Susam	6	3	9	4	40	20	5	-	-	-	170
Cotton											
Chukurova 1518	4	4	10	2	70	30	50	-	150+100	320	-

Note: * Ammonium Nitrate

Average unit yield(kg/ha)	1,540
Total yield(kg)	30,030

b. Variety Comparison Test (3A), Sowed in Mid-May (Main Crop)

Survey on the 1991 Soybean Harvest (Main Crop)

	Stalk Length cm	No.of Nodes	No.of Branches	No.of Pods	Stalk Dia. cm	Weight gr	Weight of 100 Grains gr
September 11							
Tsurunoko	34	10	5	65	1.3	50	42
Fukuichi	32	9	5	57	1.2	184	34
Fukura	37	12	4	41	0.9	174	41
September 24							
Asgrow 3966	113	16	0	25	0.6	25	14
Asgrow 3127	81	15	1	37	0.7	20	13
Mitchel 410	123	21	1	40	0.7	25	17
September 24							
Gunma-tsurunoko	58	15	6	61	0.9	98	39
Ryokkou	55	15	7	72	1.1	107	41
Sandoz 4240	118	17	1	38	0.8	55	18
Mitchel	102	17	1	22	0.6	56	17

Note: Average of 5 Individuals

Turkish Varieties @1,000m² Unit Yield kg/ha		Japanese Varieties @ 50m² Unit Yield kg/ha	
Mitchel 410	3,640	Fukura	2,080
Sandoz 4240	3,640	Fukuichi	2,740
Asgrow 3966	3,590	Tsurunoko	1,960
Asgrow 3127	3,500	Gokuwasefukura	1,960
Mitchel	3,290	Gunmatsurunoko	1,880

The Japanese varieties which were used in 1991 were those for green soybeans and differed from varieties which were being cultivated in Turkey for oil extraction and feed and, therefore, they were tested as novel varieties. Taking the 1991 test results into consideration, long stalk type Japanese varieties which could be harvested by machine were searched for in 1993, but without success.

As a conclusion, the Japanese varieties are the short stalk and ramified type and cannot be harvested by machine. In addition, it is not possible to introduce them into Turkey for use for oil extraction and feed because they have many disadvantages such as low yield, uneven plumping time in individual and poor bean quality. In the case when introduction as a vegetable (green soybean) is considered, it will be necessary to forecast the possibilities on the marketing end.

A comparison test between soybean varieties (second crop, sowed on June 20) was conducted in 1991 in addition to the above-mentioned tests, but the test ended unsuccessfully since the soybeans were eaten by rats at the time of emergence. The varieties used for the test were as follows.

Asgrow 3966, Asgrow 3127, SA 88, Mitchel 410, Mitchel

2) The 1992 Summer Planting Test (May - October)

a. Variety Comparison Test (2) (Main Crop)

Cultivation method:

Sowing rate(kg/ha)		100
Fertilizer quantity(kg/ha)		DAP; 400
Date of sowing		5/ 4
Date of harvest		9/28
Variety, unit yield(kg/ha)	1. Sandoz 4240	3,330
	2. Pioneer 9451	3,610
	3. Sapeksa SA 88	3,270
	4. Sapeksa MC 420	2,960
	5. Asgrow 3127	2,490

Survey on the 1992 Soybean Harvest (Main Crop)

Variety	Stalk Length cm	No.of Nodes	No.of Branches	No.of Pods	Weight of Hill gr	No.of Beans	Weight of Beans gr	Weight of 100 Grains gr
1.Sandoz 4240	84	14	0	19	16.9	221	40.0	18.0
2.Pioneer 9441	81	17	0	32	27.5	383	69.8	18.2
3.Sapeksa SA 88	65	12	0	24	16.0	289	41.3	14.3
4.Sapeksa MC 420	61	15	1	23	18.0	263	41.3	15.7
5.Pioneer 7441	75	17	0	20	21.8	308	48.9	15.8
6.Asgrow 3127	57	14	0	16	12.1	182	27.4	15.0
3C Sandoz 4240	91	17	0	39	33.8	441	70.6	16.0
4C1 Asgrow 3127	95	17	0	51	36.4	543	88.4	16.3
4C2 Asgrow 3127	91	15	0	29	18.7	283	41.5	14.5
4C3 Asgrow 3127	59	12	0	24	13.3	249	27.9	11.2

Note: Average of 5 Individuals

Each soybean variety, except Asgrow 3127, showed a large harvest of the level of 3,000kg per hectare in the variety comparison test. As to Asgrow 3127, the growth was not good because it was the first harvest after leveling. Poor yield cannot be attributed to the variety and,therefore, a difference between varieties cannot be argued.

b. Irrigation Test (2) (Main Crop)

Cultivation Method:

Variety	Sandoz 4240	
Sowing rate(kg/ha)	100	
Fertilizer quantity(kg/ha)	DAP; 400	
Field no. and area (ha)	3C (9.0)	4C (9.0)
Date of sowing	4/28	4/29
Date of harvest	9/29	9/29
Unit yield (kg/ha)	3,790	-

Unit yields in the irrigation test at 4C section are as follows.

Irrigation section of 1.80mm every 10 days	1,780 kg/ha
Irrigation section of 2.64mm every 8 days	1,830 kg/ha

Irrigation section of 3.48mm every 6 days 3,050 kg/ha

In the irrigation test, the larger the amount of water used at one time, the more the yield decreased.

In the aforementioned test at 3C section, irrigation was carried out every 10-14 days after checking the water content of the soil. For an insecticide, Treflan was spread at the early stage of soybean growth.

3) The 1993 Summer Planting Test (May - October)

a. Variety Comparison Test (Main Crop)

Cultivation Method:

Sowing rate(kg/ha)	90
Fertilizer quantity(kg/ha)	DAP; 400
Date of sowing	5/19
Field no. and area (ha)	2-2 (2.2)
Date of harvest	9/28

Variety	Date of Blooming	Unit Yield (kg/ha)
1.Asgrow 3966	6/24	3,650
2.Asgrow 3127	6/24	3,420
3.Sandoz 4240	6/24	3,420
4.Asgrow 3935	6/24	3,450
		Average: 3,485

b. Variety Comparison Test (Second Crop)

Cultivation Method:

Sowing rate(kg/ha)	90
Fertilizer quantity(kg/ha)	DAP; 400
Date of sowing	6/21
Field no. and area (ha)	3B (4.0)
Date of harvest	10/20

Variety	Date of Blooming	Unit Yield (kg/ha)
1.Asgrow 3966	8/1-2	2,830
2.Asgrow 3127	7/30	2,710
3.Sandoz 4240	8/1-2	1,380
4.Asgrow 3935	8/1-2	2,170
		Average: 2,273

As a result of the above test, it was found that Asgrow 3966 and Asgrow 3127 could obtain 80% of the yield of the main crop.

c. Variety Comparison Test (Second Crop)

Cultivation Method:

Sowing rate(kg/ha)	90
Fertilizer quantity(kg/ha)	DAP; 400
Date of sowing	7/ 5

Field no. and area (ha)	4A (1.2)
Date of harvest	10/26

Variety	Date of Blooming	Unit Yield (kg/ha)
1.Asgrow 3966	8/9-10	580
2.Asgrow 3127	8/9-10	1,000
3.Sandoz 4240	8/9-10	880
4.Asgrow 3935	8/9-10	1,170
	Average:	908

As a result of the above test, the yield of those which were seeded early in July was as low as 1 ton/ha maximum.

(2) Corn

1) The 1991 Summer Planting Test (June - November)

a. Cultivation Test (Second Crop)

Cultivation Method:

Variety			TTM 815
Sowing rate(kg/ha)			25
Fertilizer quantity(kg/ha)	Urea; 200,20-20-0; 500		
Field no. and area (ha)	2 (5)	3C (9)	4C (9)
Date of sowing	6/19	6/18	6/18
Date of harvest	10/21	11/07	11/ 7
Unit yield (kg/ha)	4,800	4,800	4,800
Total yield(ton)			120

In 4A irrigation test section, yield was 3,100kg/ha in sprinkler section, 3,260kg / ha in rain gun section and 580kg/ha in nonirrigation section.

Survey on the 1991 Corn Growth (Second Crop)

Irrigation Test section	Plant Height cm	No.of Nodes	Position of Male Flower Adhesion	Weight of Individual gr
Boom sprayer	166	15	9	1,102
Sprinkler	171	16	10	878
Nonirrigation	66	12	-	230

Note: Average of 5 Individuals, August 21

A comparison test between corn varieties (second crop, seeded on June 20) was carried out in 1991 in addition to the above-mentioned tests, but the corn was damaged when eaten by rats at the time of germination. The varieties used for the tests were as follows.

Pioneer 3379, Pioneer 3344, LG 60, Asgrow, TTM 815

2) The 1992 Summer Planting Test (May - November)

a. Variety Comparison Test (Main Crop)

Cultivation Method:

Sowing rate(kg/ha)	25
Fertilizer quantity(kg/ha)	Urea; 200,20-20-0;500
Field no. and area (ha)	2 (2)
Date of sowing	5/06
Date of harvest	9/26

Variety	Earing Time of Male Ear	Earing Time of Female Ear	Unit Yield (kg/ha)
1.TTM 815	7/11	7/15	10,280
2.Pioneer 3184	7/11	7/15	8,420
3.Pioneer 3165	7/13	7/17	8,880
4.Asgrow PX 904	7/11	7/16	7,810
5.Berchet 714	7/11	7/16	8,920
6.Sapeksa LG 2771	7/11	7/16	7,920
7.Sapeksa LG 60	7/11	7/16	7,830

The yield of each variety is around 8,000kg/ha (see Table 3-10), and, therefore, big harvests. Yield differences of this degree cannot be attributed to the ability differences of each variety since this was the first harvest after leveling, but that of TTM 815, a TIGEM variety, did exceed 10,000kg/ha.

b. Cultivation Test (Second Crop)

Cultivation Method:

Variety	TTM 827	
Sowing rate(kg/ha)	25	
Fertilizer quantity(kg/ha)	Urea; 200,20-20-0;500	
Field no. and area (ha)	3B (9)	4B (9)
Date of sowing	6/30	6/15
Date of harvest	11/03	11/04
Unit yield (kg/ha)	4,480	4,180

The unit yield of corn (second crop, after growth of rapeseed) was 4,200 - 4,500kg/ha which was about half of the main crop.

At the earing time of male ear, insecticides, Marshal (600gr/ha for a aphid) and Karate (2kg/ha for worms), were spread from an airplane.

3) The 1992 Summer Planting Test (May - November)

a. Variety Comparison Test (Main Crop)

Cultivation Method:

Sowing rate(kg/ha)	30
Fertilizer quantity(kg/ha)	Urea; 200,20-20-0;500
Field no. and area (ha)	3A (2.7)
Date of sowing	5/19
Date of harvest	10/08

Variety	Earing Time	Silking	Unit

	of Male Ear	Stage	Yield (kg/ha)
1.TTM 815	7/15	7/22	8,940
2.Sapeksa LG 60	7/15	7/22	7,400
3.TUM 82/6	7/19	7/26	4,980
4.Sapeksa LG 55	7/19	7/26	7,920
		Average:	7,310

The growth of TUM 82/6 fluctuated greatly because a part of it suffered damage from temporary stagnation of irrigation water at the time of emergence.

The 1993 Corn Variety Comparison Test; Surveyed before Harvest(Main Crop)

Variety	Weight of Kernels of 4 Ears gr	Weight of 100 Kernels gr	Water Content %	No.of Kernels in 1 Ear
1.TTM 815	898.3	30.0	16.6	748
2.Sapeksa LG 60	790.5	35.8	15.6	552
3.TUM 82/6	662.0	30.5	14.5	542
4.Sapeksa LG 55	918.3	36.3	17.6	632

b. Variety Comparison Test (Second Crop)

Cultivation Method:

Sowing rate(kg/ha)	30
Fertilizer quantity(kg/ha)	Urea; 200,20-20-0;500
Field no. and area (ha)	3B (2.7)
Date of sowing	6/29
Date of harvest	11/12

Variety	Earing Time of Male Ear	Silking Stage	Unit Yield (kg/ha)
1.TTM 815	8/19	8/26	9,610
2.Sapeksa LG 60	8/19	8/26	5,600
3.TUM 82/6	8/25	8/31	7,500
4.Sapeksa LG 55	8/25	8/31	6,940
		Average:	7,410

Germination of Sapeksa LG 60 was not good (60%).

c. Cultivation Test (Second Crop)

Cultivation Method:

Variety	TTM 815
Sowing rate(kg/ha)	25
Fertilizer quantity(kg/ha)	Urea; 200,20-20-0;500
Field no. and area (ha)	4A (2.7)

Date of sowing	7/ 6
Date of harvest	11/12
Unit Yield(kg/ha)	6,000

The 1993 Corn Variety Comparison Test; Surveyed before Harvest(2nd Crop)

Variety	Weight of Kernels of 4 Ears gr	Weight of 100 Kernels gr	Water Content %	Weight of 100 Kernels after Water Content Correction
1.TTM 815	988	35.0	20.1	29.8
2.Sapeksa LG 60	820	37.3	17.1	37.3
3.TUM 82/6	627	34.9	18.8	31.7
4.Sapeksa LG 55	632	40.6	20.9	33.2

4) Overall Conclusion of soybean and corn

In the field crop cultivation tests carried out up until 1992, the yield of soybean and corn sowed after late June, after the harvest of wheat,was only a half of the yield of main crop sowed in May. Tests were carried out in 1993 to investigate if it was possible to find varieties with less degree of reduction in yield among soybean and corn to be sowed after wheat. Four varieties of both soybean and corn were used for the test to investigate the yield of crops which were sowed late, and Asgrow 3966 and Asgrow 3127 were selected in soybean and TTM 815 and TUM 8/26 in corn. As to the two varieties of corn, the main crop marked a yield of 3,500kg/ha and the second crop 2,800kg/ha which was 80% of that of the main crop. As to corn, the yield of the main crop was 8,000 - 9,000kg/ha and TTM 815 and TUM 82/6 marked as good a yield as the main crop, 9,600kg/ha and 7,500kg/ha respectively.

(3) Sunflower

1) The 1992 Summer Planting Test (March - August)

a. Variety Comparison Test (Main Crop)

Cultivation Method:

Sowing rate(kg/ha)	10
Fertilizer quantity(kg/ha)	Urea; 100, 20-20-0; 300
Field no. and area (ha)	4A (6.3)
Date of sowing	3/14
Date of harvest	8/11

Variety	Start of Blooming	Blooming Period	Unit Yield (kg/ha)
TEC 115	6/ 8	6/10	2,550
Pioneer	6/11	6/17	2,370
Edirne	6/10	6/15	2,570
TEC 117	6/ 9	6/13	2,300

No difference was observed between varieties.

Survey on the 1992 Sunflower Growth (Average of 5 Individuals)

Variety Name	June 4 Plant Height cm	June 4 No.of Nodes	June 30 Plant Height cm	June 30 No.of Nodes	July 27 Total Weight kg	July 27 Head Weight kg
TEC 115	179	36	195	35	2.7	1.1
Pioneer	149	34	173	34	2.4	1.2
Edirne	157	33	196	33	2.3	1.3
TEC 117	127	37	164	37	2.4	1.0

2) The 1993 Summer Planting Test (April - August)

a. Irrigation Test (Main Crop)

Cultivation Method:

Sowing rate(kg/ha)		10
Fertilizer quantity(kg/ha)		Urea; 100,20-20-0; 300
Field no. and area (ha)		2 (3.4)
Date of sowing		4/ 2
Date of harvest		8/14
Unit yield(kg/ha)	Irrigated section	Nonirrigated section
	1,310	950

Date of seeding in 1992 was March 14, but it was delayed until April 2 in 1993 due to an extended rainfall in March and, therefore, growth was inferior and yield was less than half in comparison with the previous year.

(4) Sesame

1) The 1991 Summer Planting Test (May - September)

a. Cultivation Test (Main Crop)

Cultivation Method:

Variety	Sari susam
Sowing rate(kg/ha)	5
Fertilizer quantity(kg/ha)	DAP; 170
Field no. and area (ha)	3A (0.3)
Date of sowing	5/10

There was no harvest due to damage by rats.

Survey on the 1991 Sesame Growth (Average of 5 Individuals, August 15)

Plant Height cm	No.of Nodes	No.of Branches	No.of Seeds	Stalk Diameter cm	Weight g
152	50	2	133	1.1	390

2) The 1993 Summer Planting Test (May - September)

a. Cultivation Test: Difference in Sowing Time and Irrigation or Nonirrigation

Cultivation Method:

Variety		Sari susam
Sowing rate(kg/ha)		5
Fertilizer quantity(kg/ha)		DAP; 170
Field no. and area (ha)		1 (0.1)
	Irrigated section	Nonirrigated section
Date of sowing	5/27	7/11
Date of harvest	9/16	10/14
Unit yield (kg/ha)		
Main crop	1,500	1,450
Second crop	450	450

The yield of the late sowed crops decreased to a third. No irrigation effect was observed.

No difference in yield was observed between irrigation and nonirrigation.

(5) Cotton

1) The 1991 Summer Planting Test (May - September)

Cultivation Method:

Variety		Cukurova 1518
Sowing rate(kg/ha)		50
Fertilizer quantity(kg/ha)		Urea; 250,20-20-0; 320
Field no. and area (ha)		3A (1.5)
Date of sowing		5/10
Unit yield	Irrigated section	Nonirrigated section
	1,600 kg/ha	580 kg/ha

It was observed that irrigation had a large effect.

(6) Peanut

The 1991 summer planting test (May - September) was carried out (variety: North Carolina 7, field: 3A, area: 0.3a, sowing date: May 10) but suffered damage by rats.

(7) Wheat

1) The 1992 Winter Planting Test (November 1992 - June 1993)

a. Cultivation Test

Cultivation Method:

Variety					Seri 82
Sowing rate(kg/ha)					250
Fertilizer quantity(kg/ha)	NH_4NO_3; 160,Urea; 160,20-20-0, 160				
Field no. and area (ha)	3B(8.3)	3C(5.0)	4A(8.5)	4B(8.5)	4C(7.0)
Date of sowing	11/11	11/12	11/13	11/11	11/12
Date of harvest	6/22	6/22	6/22	6/23	6/23
Unit Yield(ton/ha)	499	479	449	451	468

b. Variety Comparison Test

Cultivation Method:

Sowing rate(kg/ha)	180 - 200
Fertilizer quantity(kg/ha)	Urea; 160,20-20-0, 320
Field no. and area (ha)	3C1 (1.5)
Date of sowing	11/13
Date of harvest	6/22

Variety Name	Unit Yield(ton/ha)
Gena 88	4,380
Seri 82	4,610
Panda	4,380
Doganket 1	4,610
Seri 82(Sowing on 1/1/93)	3,880

The yield of Seri 82 and Doganket 1 were excellent among the wheat varieties.

Survey on the 1992 Harvest in Wheat Variety Comparison Test
(Average of 10 Individuals, June 9)

Variety	Stalk Length cm	Ear Length cm	Ear Weight gr	No.of Grain	Grain Weight gr	Water Content %	Weight of 100 Grains gr
Gena 88	82	7	2.2	327	13.79	10	4.217
Seri 82	73	8	2.3	350	17.32	10	4.948
Panda	68	8	1.7	294	12.76	10	4.340
Doganket 1	59	5	0.9	170	6.71	10	3.947

2) The 1993 Winter Planting Test (October 1993 - June 1994)

Cultivation Method:

Variety				Seri 82
Sowing rate(kg/ha)				250
Fertilizer quantity(kg/ha)	NH_4NO_3; 160,Urea; 160,20-20-0, 240			
Field no. and area (ha)	1(1.0)	2(5.6)	3B(4.0)	3C(4.0)
Date of sowing	11/10	11/10	11/18	11/ 9
Date of harvest	6/ 6	6/ 6	6/19	6/ 6
Unit Yield(kg/ha)				3,043

(8) Barley

1) The 1992 Winter Planting Test (January - June)

a. Variety Comparison Test

Cultivation Method:

Sowing rate(kg/ha)	180
Fertilizer quantity(kg/ha)	NH_4NO_3; 160,Urea; 160,20-20-0, 240
Field no. and area (ha)	3C2 (1.2)
Date of sowing	1/ 1
Date of harvest	6/21

Variety	Unit Yield(kg/ha)
Hamidiye	2,890
Cumhuriyet 50	2,370
Zafer 160	2,620
Tokat 157/37	2,460

Average Yield 2,610

The yield of the Hamidiye and Zafer 160 varieties was more than average.

Survey on the 1992 Harvest in Barley Variety Comparison Test
(Average of 10 Individuals, June 10)

Variety	Stalk Length cm	Ear Length cm	Ear Weight gr	No.of Grain	Grain Weight gr	Water Content %	Weight of 100 Grains gr
Hamidiye	58	6	1.7	360	13.30	18	3.694
Cumhuriyet 50	84	8	2.5	410	20.51	15	5.002
Zafer 160	80	7	3.4	517	25.73	15	4.976
Tokat 157/37	69	8	2.5	418	18.67	15	4.466

Table 2-3-9 Planting area, output and unit yield per crop in Turkey and Adana Prefecture

	Turkey			Adana Prefecture		
	Planting Area (ha)	Output (ton)	Unit Yield (kg/ha)	Planting Area (ha)	Output (ton)	Unit Yield (kg/ha)
Wheat	9,600,000	19,300,000	2,040	361,487	1,434,108	3,985
Barley	3,440,000	6,900,000	2,039	13,975	38,075	2,748
Cotton	637,478	573,706	900	123,000	107,000	870
Sunflower	613,000	950,000	1,564	434	429	988
Corn	525,000	2,225,000	4,243	83,918	647,131	7,712
Soybean	46,000	95,000	2,065	39,956	81,297	2,035
Rapeseed	500	1,000	2,000	500	1,000	2,000

Source: Agricultural Structure and Production, 1992,
State Institute of Statistics, Prime Ministry, Republic of Turkey

Incidentally, the average yield of wheat in Japan is as high in Hokkaido as 3,210kg/ha and as low in Tohoku, Tokai, Kinki, Chugoku and Kyushyu as 2,200-2,600kg/ha. That of barley is around 3,000kg/ha in Chugoku and Hokkaido, but slightly lower in Kyushyu, the largest production area in Japan, at 2,760kg/ha.

(9) Common Vetch

1) The 1992 Winter Planting Test (October - May)

Cultivation Method:

Variety	Kubilay 82
Sowing rate(kg/ha)	50
Fertilizer quantity(kg.ha)	20-20-0; 170
Field no. and area (ha)	3A (1.5)
Date of sowing	10/ 9
Date of harvest	5/10

Yield of raw hayrage(ton/ha)	14.9

(10) Rapeseed

1) The 1992 Winter Cultivation Test (October - May)

Cultivation Method:

Variety	Wester
Sowing rate(kg/ha)	10
Fertilizer quantity(kg/ha)	Urea; 150,20-20-0; 280
Field no. and area (ha)	3B (8.0), 4B (8.0)
Date of sowing	10/15
Date of harvest	5/28
Unit Yield(kg/ha)	1,970

2) Winter Cultivation Test (October - May)

Cultivation Method:

Variety	Wester
Sowing rate(kg/ha)	10
Fertilizer quantity(kg/ha)	Urea; 150,20-20-0; 280
Field no. and area (ha)	1 (0.6)
Date of sowing	10/11
Date of harvest	5/16
Yield(kg) and Harvest Area(ha)	267, 0.15
Unit Yield(kg/ha)	1,780

About half of rapeseed sowed (field: 3B, area: 2.0ha) on October 26 were eaten by birds at the time of germination and there were no rapeseed standings because the seeding period was late.

(11) Chinese Milk Vetch (Rengesou)

A test was carried out using Gifuichigo (Japanese variety), (field:No.1, area: 5a, sowing date: October 11), but good results were not obtained.

Table 2-3-10 shows the types and varieties used for the tests which were carried out from the 1991 summer planting to the 1993 summer planting including winter plantings and the varieties which were selected as a result of those tests.

2-3-3. Improvement and Systematization of Production Technology

Among wheat, barley, soybean, corn, sunflower, sesame, rapeseed and Chinese milk vetch, the following crops cannot be included in the new planting system for the reasons given below.

Barley:

No harvest can be expected since it matures earlier than wheat and, therefore, is under concentrated attack by birds. It is cultivated as a feed crop in mountainous regions and profitability is low.

Table 2-3-10 Type and variety of tested field crops

Type	Variety	Tested Year						Result
		1991		1992		1993		
		main	2nd	main	2nd	main	2nd	
Soybeans	Japanese var.							
	Ichiriki	○						×
	Ryokkou	○						×
	Fukura	○						×
	Tsurunoko	○						×
	Fukuichi	○						×
	Turkish var.							
	Mitchel 410	○	○					
	Mitchel 420	○	○	○				
	Sandoz 4240	○		○		○	○	
	Asgrow 3966	○	○			○	○	◎
	Asgrow 3935					○	○	
	Asgrow 3127	○	○	○		○	○	◎
	Sapeksa 88		○	○				
	Pioneer 9451			○				
Corn	Turkish var.							
	TTM 815	○	○	○	○	○	○	◎
	TUM 82/6					○	○	◎
	Asgrow PX 904		○	○				
	Pioneer 3344		○					
	Pioneer 3379		○					
	Pioneer 3184			○				
	Pioneer 3165			○				
	Berchet 714			○				
	Sapeksa LG 277			○				
	Sapeksa LG 60		○	○		○	○	
	Sapeksa LG 55				○	○	○	
Cotton	Cukurova 1518	○						
Peanut	North Carolina	○						
Rapeseed	Westar	○				○		
Sunflower	TEC 115			○				◎
	TEC 117			○				
	Edirne 87			○		○		◎
	Pioneer			○				
Wheat	Gena 88			○				
	Seri 82	○		○		○		◎
	Panda			○				
	Doganket 1			○				◎
Barley	Hamidiye			○				◎
	Cumhuriet 50			○				
	Zafer 160			○				
	Tokak 157/37			○				
Rengesou	Japanese var.							
	Gifuichigo					○		

Note: ○ : Tested time, × : Unpromising, ◎ : Promising variety

Rapeseed:
A good harvest can be expected with sowing in mid-October,but if it is sowed in late October, it disappears during the seedling period due to the damage caused by seasonal birds. It cannot be included in the double cropping system.

Sunflower:
A good harvest is assured without irrigation as an oil crop which is sowed in March and harvested in August. However, it cannot be included in the double cropping system because of the cultivation period.

Sesame:
A good harvest is assured even without irrigation, but all of the sowing, roguing harvest, hanging and drying and threshing after one or two weeks must be carried out manually. Mechanization is difficult. It is being cultivated only on hillsides in mountainous regions.

Chinese milk vetch:
A test was carried out as a winter crop in 1993, but good results were not obtained probably because only an extremely small number of bees visited due to continued low temperatures at the time of blooming and pollination problems due to low temperatures.

Italian ryegrass:
It was listed as a crop for main testing in the original schedule, but no economical or technical advantages could be found and no appropriateness as a feed crop was seen comparing with winter planting wheat. That is to say, it is thought that to include Italian ryegrass into the crop rotation system of Turkish agriculture would not be appropriate since the agricultural system has no background of being able to use it effectively and intensively (April 1993 report of the survey team). It was excluded, therefore, from the items of the planting system.

For the above-mentioned reasons, crops which can be included into the planting system were limited to only wheat, soybean and corn.

Wheat is planted every year in 2,100ha out of approximately 3,800ha of Cukurova Farm and planting of winter crops such as rapeseed, vetch, etc. is less than a quarter of the wheat. Planting of summer crops are done in the 1,000ha which can be irrigated and the main crops among them are soybean, corn and cotton. The so-called double cropping where summer crops are cultivated after winter crops is less than 250ha or less than 30%. The yield of corn and soybean as second crops in the tests conducted in 1991 and 1992 is only a half of the main crops, and this is, it seems, because double cropping is not so advantageous.

From the above, the selection of varieties which assure a low degree of yield decrease even when planting in June and make a planting system of biennial cropping possible, in another words, varieties which have high adaptability for late seeding, was successfully conducted in the 1993 summer

planting test.

When the planting ratio of crops is compared between Adana Prefecture and the whole of Turkey, it is in the order of wheat, cotton, soybean, corn and chick-pea in Adana and in the order of wheat, barley, chick-pea, sunflower and cotton in the whole of Turkey, and it is realized that cotton, soybean and corn are weightier in Adana. It also is realized that, while the area of fields is 3% of that of the whole of Turkey, the ratio of cotton, soybean, peanut and rapeseed is unusually high at 21%, 82%, 37% and 93% respectively. Since soybean and corn are crops which are difficult to cultivate without irrigation and cotton is one which is greatly affected by irrigation (see test results), it seems that the planting system and planting ratio will, even in the southeastern region, change to become similar to Adana, if irrigation spreads. It is thought, therefore, that if soybean and corn varieties with a high adaptability for late sowing can be chosen in this kind of project and a biennial cropping system becomes possible as a business, there is a high probability that a similar business will succeed even in the southeastern region. Incidentally, since cotton is sowed in March and harvested in September and October and has the characteristic of not being possible to cultivate as a second crop after wheat, it cannot be included in a planting system of biennial cropping.

2-4. Experiments with Various Vegetable Cultivation Techniques

2-4-1.Tomatoes

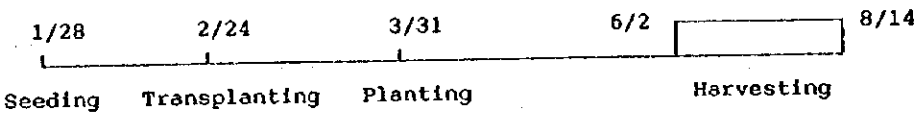
(1) Selection Test of High Quality and High Yielding Varieties

1) 1992 Testing

a. Test Methods

Selected seeds were sown in rows spaced seven or eight centimeters apart in sowing boxes. After the seeds were sown, the bed boxes were placed under controlled conditions in a small polyvinyl greenhouse, heated to the temperature of around 25℃ by panel heaters. After seedlings emerged, the seedbed boxes were moved into an unheated polyvinyl tunnel where the seedlings were transplanted into black plastic pots 12cm in diameter. Soil used in the seedbeds consisted of field soil mixed with cow manure and sand,with a chemical fertilizer (15: 15: 15) added at the rate of 5 grams per 10 liters of soil. Each variety was planted in 12 plants (2 plants for borders),without support,in two repetitions at a spacing of 160 cm x 50cm, 1,250 plants per 10 a.(on semicylindrical head ridges 80 cm wide), and mulched with black plastic film.Test plots received 2 tons of barnyard manure and chemical fertilizer (N: P: K = 10: 20: 10 kg) for every 10 a.Trimming was performed by cutting back all branches except for the three lateral branches below the top bud, leaving upper parts intact. Watering after planting was provided by spraying water from overhead boom-type sprinklers. Harvest was measured every week by the number and weight of fruits yielded from 10 plants of all fields.

Cultivation Schedule:



b. Test Results (see Table 2-4-1)

Since conditions varied significantly in different areas of the test plot, comparisons were made only with satisfactory results obtained from the repetition. In comparing the harvest yield, varieties such as "Corsaire," "H-1370," "22/74," "Kagome 89-16," "Kagome 77" and "Morioka" yielded 8 tons or more per every 10 a., expressed in weight. The highest yield was approximately 9.4 tons from "Corsaire." In comparison of early and high yielding ability (as an actual yield before 10th of June), varieties such as "Kagome 77," "VO 506," "Florida MH-1," and "Corsaire" were excellent. Of the various varieties, it was verified that "Kagome 77" was the best, with its yield of 1.68 tons per 10 a.

Table 2-4-1 Results of 1992 testing of selected varieties

Varieties	Yield kg	Quantity	Weight of Fruit g	Yield kg/10 a.	Early Harvest Before 6/10 g
Kagome 77	66.0	823	80	8,250	13,450
Kagome 89-16	68.8	927	74	8,600	5,800
Kagome 89-8	55.8	753	74	6,975	6,250
Morioka	66.0	870	75	8,250	1,370
Morioka 10	50.5	729	69	6,312	3,280
Morioka 15	37.2	564	65	4,650	810
Florida MH-1	45.5	397	115	5,687	8,210
Brehm's	52.7	634	83	6,587	3,760
Young	57.8	438	131	7,225	5,050
Falkon	48.0	199	241	6,000	850
Corsaire	75.1	579	130	9,387	7,270
BR-84	61.3	407	151	7,662	6,650
H-1370	73.2	741	99	9,150	2,380
22/74	73.0	655	111	9,125	1,660
VO 506	59.0	479	123	7,375	9,920

Note: Yield per each 10 plant, 1,250 plants (1.6 m x 50 cm) per 10 a.

2) 1993 Testing

a. Test Methods

In order to test the early harvesting capability, seeds were sown at four different times to check the effect of the seeding time on the different varieties. Seven varieties were selected, based on the results of 1992 testing. Methods used for raising and managing seedlings followed those adopted for the 1992 testing. However, commercial gardening compost, mixed with field soil, sand, and peat moss, was used as a bed soil. Fertilizer of the formulation N: P: K = 15: 20: 10 was applied per 10 a. Plants were left without trimming, and watering was performed by means of dripping water through tubing.

Cultivation Schedule:

	Seeding	Transplanting	Planting	Harvesting
No.1	12/25	X		
No.2	1/12	1/30	3/23	6/4 ~ 7/23
No.3	1/25	2/15	3/30	6/4 ~ 7/23
No.4	2/ 3	2/23	3/31	6/4 ~ 7/23

b. Test Results (see Table 2-4-2)

Since conditions varied significantly in different areas of the test plot, comparisons were made only with good results obtained from the repetition.

All plants of test plot No. 1 were withered due to continued low temperatures and high humidity after their germination. Such a condition could be caused by "rhizoctonia solani." All varieties of test plot No. 2 yielded a harvest of more than 9.0 tons per 10 a. "Kagome 77" yielded a

Table 2-4-2 1993 variety selection test results

Plot No. Date of Seeding / Varieties	Normal Yield g	No.of Normal/ Defective Fruits	Average Weight g	Yield kg/10 a.	Early Harvest, Before 6/11 g
No.2 1/12					
Kagome 77	83,050	1,466 / 134	56.7	10,381	12,220
Kagome 89-8	89,260	1,673 / 75	53.3	11,157	6,960
BR 54	74,520	911 / 110	81.8	9,315	2,670
Corsaire	72,710	901 / 71	80.7	9,088	4,310
Kagome 89-16	68,300	1,460 / 112	46.8	8,537	5,300
Kagome 91-6	84,770	1,729 / 66	49.0	10,596	4,420
No.3 1/25					
Kagome 77	81,750	1,189 / 79	68.8	10,218	6,900
Kagome 89-8	88,720	1,524 / 31	58.2	11,090	2,220
BR 54	78,050	779 / 89	100.2	9,756	1,500
Corsaire	82,300	736 / 60	111.8	10,287	3,030
Kagome 89-16	69,700	1,173 / 59	59.4	8,712	5,400
Kagome 91-6	89,830	1,615 / 51	55.6	11,229	3,630
22-74	59,080	700 / 27	84.4	7,385	580
Kagome 90-19	72,650	879 / 81	82.7	9,081	2,000
No.4 2/ 3					
Kagome 89-8	97,650	1,344 / 32	72.7	12,206	2,450
BR 54	72,200	691 / 48	104.5	9,025	1,700
Corsaire	79,030	675 / 35	117.1	9,879	2,730
Kagome 89-16	67,600	1,220 / 61	55.4	8,450	3,750
Kagome 91-6	79,700	1,244 / 33	64.1	9,963	3,500
22-74	50,050	524 / 7	95.5	6,256	0

Note: Yield per each 10 plant.
Furrow Space x Plant Space = 160 cm x 50 cm
1,250 plants per 10 a.

total harvest of 10.3 tons per 10 a. and an early harvest (before 6/11) of 1.5 tons per 10 a. However, the early harvest of all other varieties was below 0.5 ton per 10 a. All varieties of test plot No. 3 yielded more than 9.0 tons per 10 a., and the early harvest (before 6/11) of "Kagome 77" was 0.8 tons per 10 a. However, the early harvest of all other varieties was below 0.5 ton per 10 a.

Difference in the gross harvest from plants of different seeding times was not significant, but the early harvest tonnage showed a tendency to increase as the time of harvest was advanced. However, the crop type of test plot No. 1 did not succeed because this test had been seriously affected by adverse weather conditions. All the harvesting occurred after the month of June.

c. Discussion

Better results were obtained from the 1993 testing than were obtained from the '92 testing. It can be presumed that this could be mainly because of the modifications to irrigation systems. It can also be presumed that the procedure of seeding in the early or middle part of January is suitable for this type of cultivation, raising seedling in unheated greenhouse and planting in open field, in this district.It can be considered that

"Kagome 77" is the most suitable variety for this district, as both the early harvest (prior to early June) and the gross harvest of this variety were excellent. However, its small fruit may be a disadvantage in the market. (This did not come into question in the 1993 sales program.The nice taste of this fruit met with favorable public reaction.) Since it was known that early harvest (before late May) was impossible with this variety in any case, a new crop variety will be determined based on the relationship between market price and cultivation cost. The results of analyses made on the quality of tomato fruits are shown in Table 2-4-3. (Analyses were made by "TAT Konserve" Quality Control Laboratory on Test Plot No. 2 obtained in 1993)

Table 2-4-3 Results of quality analyses classified by variety

	89-8	91-6	22/74	Kagome77	90-19	BR-54	Corsaire
Brix	5.20	4.80	5.20	5.60	5.60	5.70	6.00
pH	4.37	4.41	4.32	4.20	4.12	4.38	4.27
% Acidity on dry solid	8.44	8.04	10.2	9.56	10.48	8.44	9.72
Color							
L	20.80	20.70	21.60	23.20	23.20	21.80	22.20
a	14.80	15.60	13.70	14.60	14.30	12.60	11.60
b	7.50	7.60	8.60	8.80	8.40	8.10	7.00
a/b	1.97	2.05	1.59	1.66	1.70	1.56	1.66
Lycopene	7.46	7.88	5.99	5.19	5.36	3.98	4.13

Note: All analyses other than for Brix were performed by 4.5 Bx.

(2) Test of Establishing Techniques for Mass Production of Seedlings

1) 1992 Testing

a. Test Methods

The following four methods were tried and compared. Tests were conducted in 12-plant test plots (2-plant borders) in two repetitions with the variety 22/74, which had been generally cultivated in this district. General methods of field husbandry after replanting followed that adopted for the selection tests of varieties-only the method of raising seedlings was different.

① Raising seedlings in black plastic pots, 12 cm in diameter
② Ground bed nursery (without soil on root at times of transplanting)
③ Raising seedlings in panel pots
(panel size: 49 cm x 39 cm, pot size 4 cm x 4 cm)
④ Raising seedlings in panel transparent polyvinyl bags

② and ④, above, are the local methods.

b. Test Results (see Table 2-4-4)

Since conditions varied significantly in different areas of the test plot, comparisons were made only with satisfactory results obtained from

the repetition. Comparing the gross harvest yield, the yield of method ① was excellent but that of ③ was inferior. Comparing the gross harvest yield, the yield of method ① was the highest and that of method ③ the lowest. For the early harvest yield, the method of ① was the highest and the method of ② the lowest.

Table 2-4-4 Mass production test results

	Yield kg	No. of Fruits	Average Weight g	Yield t/10 a	Early Harvest, Before 6/21 kg
Black plastic pots	73.0	655	111	9.1	9.4
Seedling in ground bed	62.1	526	118	7.7	0
Panel pots	52.0	460	113	6.5	1.1
Transparent polyvinyl bags	60.4	520	116	7.5	6.0

Note: Yield per 10 plants. Using Variety: 22/74

2) 1993 Testing

This test was not conducted because soil block machine and cell (plug) seedling production system had not been delivered to the site.

3) Discussion

Using the methods of ground seed bed and transparent polyvinyl bags, methods used locally for raising seedlings, a certain amount of yield could be obtained. It can be presumed that this was achieved because seedlings provided for testing had been properly managed. In fact, supports may be required for the small transparent polyvinyl bags to assure proper clearance between plants, because they are unstable and don1t stay in the proper place (Square strips of wood were laid out in parallel between seedlings during testing.). During watering, water does not properly get into the bag because its brim is too soft. It may be difficult to properly control in open field, because roots can be damaged when they are transplanted. In the mass production of seedlings it is difficult to raise uniform seedlings without an easy method of management. From this point of view, it is desirable that black plastic pots be used. However, precautions are necessary for transplanting because transplanting success depends largely on individual skills.If small cell seedlings or soil block seedlings are used, such problems may not occur because withdrawal and transplanting of seedlings can be accomplished uniformly. The use of large-sized cell seedlings and soil block seedlings without using pots for direct planting to open field, should be supposed. However,this method might not be suitable for this type of cultivation, because more mature seedlings (after the flowering of the first cluster in this case) had to be planted.

(3) Test of Establishing Techniques for Irrigation and Fertilizer Application

1) 1992 Testing

a. Test Methods

Tests were conducted in nine test plots of 12-plant (2-plant borders) in two repetitions with three different levels of N (10, 15 and 20 kg/10 a. each) and with three different watering cycles (3 days, 5 days and 7 days each). Watering was provided by spraying water from the overhead boom-type sprinklers, and the tomato variety selected was 22/74, which is normally cultivated in this district. General methods of field husbandry followed that adopted for the selection tests of varieties.

b. Test Results (see Table 2-4-5)

Since conditions varied significantly in different areas of the test plot, comparisons were made only with satisfactory results obtained from the repetition. Good results were obtained from the fields with higher nitrogen levels with all of the watering cycles, and the best results were obtained from the fields with the 3-day watering cycle at all levels of nitrogen. The yield from the field with the 3-day watering cycle at N level = 20 kg was 11.7 tons per 10 a., which was the largest yield of any of the fields. Withering was noted in the earlier steges in the field with a 5-day cycle at N level = 15 kg, and it can be presumed to affect the result of yield.

Table 2-4-5 Harvest yield classified by types of watering and fertilization

Treatment	Item	N-10	N-15	N-20
15 mm 3-day cycle	Yield kg	71.3	64.0	94.2
	No. of Fruits	548.	547.	784.
	Yield t/10a.	8.9	8.0	11.7
25 mm 5-day cycle	Yield kg	49.5	36.0	51.5
	No. of Fruits	503.	350.	599.
	Yield t/10a.	6.1	4.5	6.4
35 mm 7-day cycle	Yield kg	57.1	41.2	70.1
	No. of Fruits	524.	387.	641.
	Yield t/10a.	7.1	5.1	8.7

Note: Harvest yield per 10 plants. Using Variety: 22/74

2) 1993 Testing

a. Test Methods

Comparison was made between the following two test plots (watering by drip irrigation) and the test plot No. 3 field for the selection of varieties, set up for reference purposes. Three tensio-meters with lengths of 22.5 cm were buried in the furrow 40 m wide for item ②. It was

determined that watering would be provided if it was estimated that all three meters show a value in excess of 500 gf/cm². The tomato variety used was "Kagome 77," and the cultivation method (except for watering) followed that adopted for the selection test of varieties. However, a plant spacing of 180 cm x 50 cm was adopted for furrow irrigation fields.

① Furrow irrigation field
② Drip irrigation and tensio-meter control field
③ Test plot

b. Test Results (see Table 2-4-6)

A yield of 11.1 tons/10 a. was obtained from ①, 7.6 tons/10 a. from ②, and 10.2 tons/10 a. from ③. The field ① is isolated from fields ② and ③, and the largest yield was obtained from ①, although the two other fields could have been affected by disease, insect damage, or poor soil conditions. The results obtained from ②, under the tensio-meter irrigation control, was the worst. The quantity of water used per 10 a. was 664 m³ in field ① and 190 m³ in ③. Furrow irrigation needed more than three times the irrigation water needed for drip irrigation.

Table 2-4-6 Harvest yield and irrigation service record, classified by irrigation method

Test Plot	Yield per 10 Plants	No. of Fruits	Weight of Fruit	Yield kg/10 a.	Irrigation Water Quantity m³/10 a.
Variety Selection	81.75	1,189	68.8	10,218	190.5
Tensio-meter Control Field	61.55	975	63.1	7,693	-
Furrow Irrigation Field *	110.05	1,329	82.8	11,165	664.0

Note: Tomato variety: Kagome 77
Planting density: 160 cm x 50 cm per 10 a. (1,250 plants)
180 cm x 50 cm per 10 a. (1,111 plants)
Drip irrigation was used except for * .

c. Discussion

As plants are directly affected by water with overhead boom-type sprinklers as used in 1992, disease or insect damage can be accelerated and physiological damage cannot be prevented. Particularly in high temperature arid areas such as the district where this project is located, excessive wetting and drying can occur repeatedly. Since the type of crop required mulching, water would not penetrate into the ground uniformly. For this reason, drip irrigation and furrow irrigation methods were adopted for 1993 testing. Good results were obtained because plants were

not directly affected by water with these methods, but use of drip irrigation systems could increase costs, and in furrow irrigation work difficulties (work can often be interrupted by muddy ground after watering and weeds can quickly grow up) and increased quantity of water may be seen. It is difficult to provide a mechanical irrigation system using tensio-meters, because more detailed parameters to coordinate the system with growing seasons and weather conditions must be established.

(4) Test of Establishing Cultivation Techniques Including Fruition Control Including Blossom Setting

1) 1992 Testing

Test results could not be obtained because of improper management.

2) 1993 Testing

a. Test Results

In order to investigate the effects of top pinching performed during growing period of seedlings on early harvesting ability and gross yield of harvest, the following plots were established and a plot without any treatment was provided for reference purposes. Seedlings were planted with 12 plants for each field (two plants for border) in two repetitions. Cultivation method other than that for testing purposes followed the method adopted for the testing of test plot No. 3. "Kagome 77" was used for the test.

① The tops of the plants are pinched back, leaving a single true leaf at the start of the growing period.
② No treatment was performed, leaving plants as natural.

b. Test Results (see Table 2-4-7)

Table 2-4-7 Yield of harvest classified by trimming method

Plot No. Treatment Variety	Normal Yield g	No. of Normal/ Defective Fruits	Average Weight g	Yield kg/10 a.	Early Harvest Before 6/11
No.3 No Treatment Kagome 77	81,750	1,189 /79	68.8	10,218	6,900 g 862kg/10a
No.3 Trimming Kagome 77	74,850	925 /91	80.9	9,356	8,350 g 1,043kg/10a

Note: Yield per each plant.
Furrow Space x Plant Space = 160 cm x 50 cm
1,250 plants per 10 a .
The top of plants was pinched, leaving a single foliage leaf at the start of the growing period.

Comparisons were made only on satisfactory results obtained from the repetition. Better results were obtained in early yield of harvest from the treated field compared with the natural fields, but the differences were small. Average weight of fruits from the treated fields was larger by 12 grams.

(5) Sales

During 1993, tomatoes were cultivated in the fields of 50 a. in area, including those provided for various tests. The gross production was approximately 35 tons. Some of the products were turned over for sales in the local market at a low price because the amount of a single delivery was small. The price was furiously beaten down because the products were sold in field. If a large quantity of products (e.g., 10 ton cargo truck) is secured, favorable transactions may be expected as the cost of transportation to remote areas can be reduced. Actual sales prices were as shown below.

1994		Wholesale Price in Adana Central Market
June	5	7,000 TL/kg
	15	5,000
	25	1,500 TL/kg 4,500
July	5	3,000 3,000
	15	4,000
	25	4,000

2-4-2. Melons

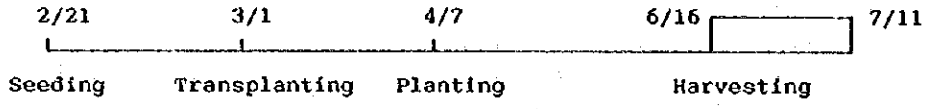
(1) Selection Test of High Quality and High Yielding Varieties

a. Test Methods

Selected seeds were sown in rows spaced seven or eight centimeters apart in sowing boxes. After the seeds were sown, the bed boxes were placed under controlled conditions in a small polyvinyl greenhouse which was heated to a temperature of 25 to 30 ℃ by panel heaters. After its germination, the seedbed boxes were moved into an unheated polyvinyl tunnel, and there the seedlings were transplanted into black plastic pots 12 cm in diameter. Soil used in the seedbeds consisted of field soil mixed with cow manure and sand, with a chemical fertilizer (15: 15: 15) added at the rate of 5 grams per 10 liters of soil. Each variety of 12 plants(2 plants for borders) were planted in two repetitions at a spacing of 270 cm x 60 cm, 1,250 plants per 10 a. (on level rows of 135 cm wide). Test plots received 2 tons of barnyard manure and chemical fertilizer (N: P: K = 10: 20: 10 kg) for every 10 a. For trimming, the tops of seedlings were pinched before planting, leaving four true leaves, and only two lateral shoots were left during the growing period. All flower buds, except from the 7th to the 13th, were removed, after that only two fruits were selected per branch. The lateral shoots after the fourteenth node were

left for natural pollination. Writing brushes were used to assure flower setting in flowering time. Watering after planting was provided by spraying water from overhead boom-type sprinklers. Harvest was measured by the weight of all fruits yielded from 10 plants and 10 fruits were selected for measuring sugar content.

Cultivation Schedule:



b. Test Results (see Table 2-4-8)

Since conditions varied significantly in different areas of the test plot, comparisons were made only with satisfactory results obtained from the repetition. Since the lateral parts of the fourteenth node were left for natural pollination, four or more fruits were yielded from a single plant. "Alice," a typical makuwa melon, "Nile" and "Tenkei," typical netted type melons with fleshy parts of their fruit a white or light green, "Sunrise" and "Bardi Red," with vermilion flesh, and "Garia" and "Makdimon," with yellow skin and a white or vermilion flesh (typical for melons in this district), were all generally excellent in yield, sugar content, eating quality, and appearance. As watering was provided by an overhead irrigation system, wet damage spots appeared on the lower skin of fruit because of the water which ponded after watering, and many of them

Table 2-4-8 Comparison of 1993 varieties

Varieties	Yield kg	No. of Fruits	Average Weight per Fruit kg	Deviation	Sugar Content Brix	Yield ton/10 a.
Alice	79.0	74	1.06	0.26	15.0～13.3	4.8
Aswan	60.1	55	1.09	0.27	13.9～10.6	3.7
Kosak	58.7	39	1.50	0.33	14.1～13.5	3.6
Sunrise	88.0	72	1.22	0.20	10.9～10.2	5.4
Andes	46.0	45	1.02	0.16	13.0～11.8	2.8
Nile	62.0	44	1.40	0.34	14.6～12.7	3.8
Tenkei	62.9	48	1.31	0.25	15.5～11.9	3.8
Bonus	59.0	53	1.11	0.17	12.8～11.7	3.6
Shinryoku	52.5	43	1.22	0.16	13.8～11.8	3.2
Anheru	54.9	33	1.27	0.19	14.3～10.6	3.3
Bardi	72.4	56	1.29	0.31	13.6～ 9.2	4.4
Bardi Red	91.9	66	1.39	0.26	12.3～ 9.3	5.6
Garia	76.9	54	1.42	0.33	11.2～ 9.2	4.7
Makdimon	78.0	41	1.90	0.46	9.4～ 7.6	4.8
Tania	54.0	37	1.46	0.23	11.0～10.8	3.3
Yokneman	46.6	24	1.94	0.38	9.6～ 7.7	2.8
Robin	48.0	32	1.50	0.30	11.0～10.2	2.9
Barada	38.4	22	1.74	0.42	11.1～10.0	2.3

Note: The above table shows the harvest of 10 plants.
Sugar content shows the average of measurements of 10 selected fruits.

started to spoil in storage. Also, cracks appeared on fruits and injury due

to disease was accelerated due to repeated wetting and drying. Because the growth of leaves was interrupted, fruits were exposed to direct sunlight and sunburned fruits developed. Chemicals were sprayed to fight against the chronic spread of downy mildew.

2) 1993 Testing

a. Test Methods

In an attempt to improve the cultivation period, seeds were sown two times to check the effect of different seeding times on different varieties. Seven varieties were selected in reference to the results of tests made in 1992. Cultivation methods followed those used in the 1992 testing. However, commercial gardening compost, mixed with field soil, sand, and peat moss, was used as a bed soil. Watering after planting was performed by means of drip irrigation.

Cultivation Schedule:

	Seeding	Transplanting	Planting	Fruit Setting	Harvesting
No. 1	2/ 3	2/22	X		
No. 2	2/25	3/10	4/12	5/11～24	

b. Test Results (see Tables 2-4-9 and 2-4-10)

Since conditions varied significantly in different areas of the test facility, comparisons were made only with results obtained from the repetition. All plants of test plot No. 1 did not grow up to be good seedlings, as expected, because of the shortage of sunshine duration. All varieties of test plot No. 2 grew vigorously with the use of drip irrigation, but damage spots appeared on the lower skin of fruits due to the water which ponded after rains, from condensed drops of moisture, and from the effects of sprayed chemicals. Straw was used attempting to solve this problem, but the conditions were little improved. The fleshy part of fruits having damage spots did not show good eating quality, and spoiled rapidly. As a result of checking the number of days required for flowering to harvest, there were no significant differences with the standard of Japan for Japanese varieties. However, it was known that Japanese varieties required 15 to 20 days more than the local varieties.

It was attempted to improve the cultivation period, but the trial failed because of adverse weather conditions. Better results were obtained to a certain extent for some varieties, but an investigation of marketability resulted in the following evaluation. Chemicals were sprayed to fight against the spread of chronic downy mildew.

Alice : The appearance is poor (looked more like a pickling melon or pumpkin rather than melon). Sweet but hard. Popular among some people.

Tenkei: The appearance is interesting. Netted skin is attractive. Eating quality is satisfactory, but the flesh is slightly hard. The skin was thick.

Nile : The appearance is not distinctive because netting does not clearly emerge. Eating quality is satisfactory but the flesh is slightly hard.

Bardi Red: The appearance is interesting. Netting is clear. Eating quality is satisfactory, but the flesh is slightly hard. The skin is thick but the color of fleshy part is very attractive.

Sunrise: Has a poor appearance. Eating quality is average and sugar content is not high. This variety has very little, if any, advantages over the local melons.

Table 2-4-9 Comparison of 1993 varieties

Varieties	Yield kg	No. of Fruits	Av. Weight per fruit kg	Deviation	Sugar content Brix
Alice	33.5	41	0.82	0.12	16.6～ 15.6
Tenkei	58.8	33	1.78	0.32	15.3～ 10.5
Nile	68.7	41	1.67	0.28	16.2～ 13.1
Bardi Red	71.1	45	1.58	0.25	15.4～ 12.2
Sunrise	58.3	47	1.24	0.15	13.8～ 12.9
Garia	53.6	41	1.31	0.21	12.9～ 9.8
Makdimon	73.0	36	2.03	0.43	12.5～ 10.3

Note: The above table shows the harvest of 10 plants. Sugar content shows the average of measurements of 10 selected fruits.

Table 2-4-10 Average number of days required for flowering to harvest

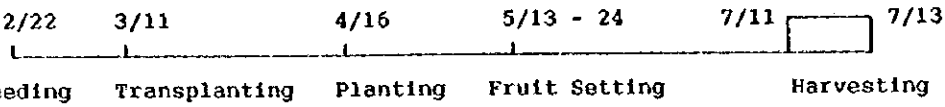
Varieties	Av.No.of Days	3-Stem Trimming	Natural Pollination
Alice	36.6	-	-
Tenkei	54.4	55.4	55.5
Nile	49.9	-	-
Bardi Red	52.2	-	-
Sunrise	43.1	-	-
Garia	34.9	41.8	50.4
Makdimon	36.0	-	-

3)1994 Testing

a. Testing Methods

Two varieties were selected for testing based on the results of 1993 testing. One additional variety, with flesh of a vermilion color was selected. Cultivation methods followed. However polyurethane melon pads (made in Japan) were laid out under fruits to protect the skin of the fruit from injury.

Cultivation Schedule:



b. Test Results (see Tables 2-4-11 and 2-4-12)

Neither the "Bardi Red" nor the "Tenkei" yielded the harvest expected when considering the yield of the previous year, and the average fruit weight was also less. It can be presumed that this was mainly because the yield was less because of poor fruit setting, and fruits did not gain flesh as expected because watering was controlled to save water during the period of cultivation. However, sugar content increased by nearly 2% and the eating quality was improved. In addition, "Rupiah Red" suffered from powdery mildew. Downy mildew spread widely but was controlled by the sprayof chemicals. For the number of days required for flowering and harvest, it was reported that approximately 48 to 49 days were necessary, but counting of this time period was started on the initial day of investigation. Since a sufficient sugar content was measured at the time when sampling was conducted, 3 to 5 days prior to the last day of investigation, it can be presumed that these fruits were ready for harvesting within 44 to 45 days. Damage spots on the lower skin of fruit were rarely found because of the use of melon pads.

Table 2-4-11 Comparison of varieties

Varieties	Yield kg	No. of Fruits	Av. Weight per Fruit kg	Deviation	Sugar Content Brix	Yield kg/10 a.
Rupiah Red	43.1 38.3	38 33	1.13 1.16	0.18 0.19	15.6～12.3 15.5～12.6	2,870 2,550
Tenkei	38.4 41.0	31 33	1.24 1.24	0.14 0.15	18.4～13.4 17.8～12.8	2,557 2,730
Bardi Red	46.0 42.3	36 34	1.27 1.24	0.17 0.17	16.8～11.7 17.4～12.7	3,063 2,817

Note: The above table shows the harvest of 10 plants.
Sugar content shows the average of measurements of 10 selected fruits.

Table 2-4-12 Average number of days required for flowering to harvest

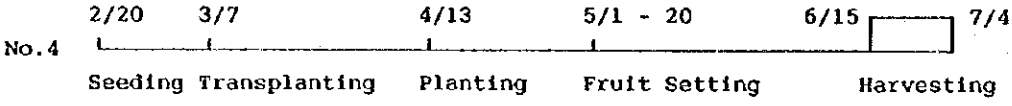
Varieties	Av. No. of Days	3-Stem Trimming	4-Stem Trimming	Natural Pollination
Rupiah Red	49.1	-	-	-
Tenkei	49.3	-	-	-
Bardi Red	48.5	48.0	Unknown but many	Unknown but many

4) 1995 Testing

a. Test Methods

Tests were conducted on the selected main two varieties, with an additional four varieties. General methods of field husbandry followed that adopted for the 1994 testing. Trimming and management work were checked together with estimated day of flowering, but flower setting using a writing brush was not performed. Sugar content was measured from the average five fruits of all harvests.

Cultivation Schedule:



b. Test Results (see Tables 2-4-13, 2-4-14 and 2-4-15)

"Bardi Red" was superior to all other varieties in fruit bearing and yield. In test plots where thinning was not sufficiently performed, the number of fruits increased by 5% and the yield of 3.8 tons per 10 a. was estimated. It was noted that sugar content decreased from that of the previous year, but this was not a serious problem because a sugar content of at least 15% was obtained. Among other netted melon varieties, "Sky Green" was superior in yield and sugar content, and the number of fruits per plant was estimated to average 3.2 pieces. Among other varieties without netting, "Honey Dream" was superior and "Eagle" was superior in sugar content. All varieties were affected by downy mildew but this was controlled by the spray of chemicals. For the number of days, a period of

Table 2-4-13 Comparison of varieties

Varieties	Yield kg	No. of Fruits	Av. Weight per Fruit kg	Deviation	Sugar Content Brix	Yield kg/10 a.
Bardi Red	58.3 74.4	42 53	1.39 1.40	0.26 0.26	15.3～13.0 15.4～12.6	3,880 4,958
Tenkei	30.2 37.6	24 28	1.25 1.34	0.19 0.29	17.4～13.3 16.4～12.6	2,011 2,508
Aruba	36.1 28.1	30 22	1.20 1.27	0.22 0.28	17.8～15.1 18.6～15.8	2,407 1,873
Sky Green	41.8 43.3	32 32	1.30 1.35	0.20 0.32	16.4～13.8 18.4～14.6	2,787 2,885
Eagle	44.9 48.0	32 31	1.40 1.55	0.24 0.34	17.2～16.5 17.7～15.9	2,992 3,243
Honey Dream	57.3 52.0	39 37	1.46 1.40	0.32 0.22	14.6～14.7 14.6～14.6	3,816 3,467

Note: The above table shows the harvest of 10 plants.

Sugar content shows the average of measurements of 5 selected fruits.

Table 2-4-14 Average number of days required for flowering to harvest

Varieties	Av. No. of Days	Start Harvesting	Middle Harvesting	Seeding
Bardi Red No.4	48.1	6/15	6/21～24	2/20
Tenkei No.4	49.0	6/21	6/21～26	2/20
Aruba No.4	49.6	6/21	6/21～26	2/20
Sky Green No.4	49.9	6/21	6/21～26	2/20
Eagle No.4	38.4	6/13	6/13	2/20
Honey Dream No.4	38.4	6/12	6/12	2/20

Table 2-4-15 Difference of blooming period in fruits

Varieties	Blooming Period				(%)
	4/11～20	4/21～30	5/ 1～10	5/11～20	Unclear
Bardi Red No.4	0.0	3.1	81.0	12.6	3.1
Tenkei No.4	0.0	0.0	100.0	0.0	0.0
Aruba No.4	0.0	0.0	90.3	9.6	0.0
Sky Green No.4	0.0	0.0	96.9	1.5	1.5
Eagle No.4	0.0	0.0	87.3	0.0	12.7
Honey Dream No.4	0.0	0.0	80.2	0.0	19.7

48 to 49 days was necessary for "Bardi Red," "Tenkei," "Aruba" and "Sky Green." However, a period of only 38.4 days was necessary for "Honey Dream" and "Eagle." Since the day of flowering, estimated from the yield of more than 80% of all six varieties, was concentrated in the period between the 1st and 10th of May, it was understood that there were no significant differences among these varieties.

5) Discussion

Although it depends on the climate of the year, it is considered that the cultivation method of sowing between the middle and the end of February is most suitable for this type of cultivation, raising of seedlings in the non-heated green house and growing in tunnel with mulch at this project site. With this method, good varieties that are easily grown, and that can resist various adverse conditions, including cold temperatures during the seedling period, high humidity inside the green house, and the high temperatures and strong direct sunlight of the harvest season, are required. Taking into account such conditions, five Japanese varieties were selected based on the results of the 1992 testing. From the results of tests conducted on these five varieties in 1993, it was determined that "Bardi Red" was the most promising variety, taking into consideration the taste and the marketability. The basis of this determination is described below.

① Netting clearly emerges on the outer skin, giving this melon an attractive appearance
② Sugar content is high.
③ As flesh color is orange, the fruit is also valuable for decorative purposes.
④ The fruit has some drawbacks such as hard fleshy parts and a thick

skin, but the flesh becomes softer after some storage time.

Except for item ③ above, "Tenkei" can also be promising. Since netting varieties having a vermilion flesh are preferred, "Rupiah Red" was selected from the same family for the 1994 testing, but many fruits were injured by disease (powdery mildew). It appeared that its flesh texture (melting) was not favored by Turks. "Bardi Red" yielded many fruits in the 1995 testing. However, "Tenkei," having a green flesh, was also expected to be a promising variety, but did not bear many fruits and the yield was small. Conversely, "Sky Green," from the same family, can be recommended as a promising variety because its fruit bearing was almost constant and it has a high sugar content. For the varieties without netting, "Honey Dream," having a light green skin, was evaluated highly at the time when samples were presented to markets, because varieties similar to "Eagle," having a yellow skin, are often seen in markets of Turkey and Europe.

(2) Test of Establishing Techniques for Mass Production of Seedlings

1) 1992 Testing

a. Test Methods

The following two methods were compared. Test plots were prepared with 12 plants (two plants for borders) planted in two repetitions. The popular local variety "Barada" was selected as a test variety. Cultivation method after transplanting followed that used for the selection test of varieties, except for the raising of seedlings.

① Raising seedlings using black plastic pots 12 cm in diameter.
② Raising seedlings using small transparent bags (local method).

b. Test Results (see Table 2-4-16)

The method of paragraph ② above was superior in gross yield but that of paragraph ① was slightly superior in weight of fruit. This resulted from the number of fruit borne, and significant differences were not noted on the growth record.

Table 2-4-16 Comparison of methods of raising seedlings

		Plot 1	Plot 2	Average
Black plastic pots	kg	68.1	66.2	67.2
	No. of Fruits	42	40	41
	kg	1.62 ± 0.30	1.65 ± 0.38	1.64
Transparent polyvinyl bags	kg	82.0	75.4	78.7
	No. of Fruits	53	53	53
	kg	1.54 ± 0.42	1.42 ± 0.32	1.48

Note: Table shows the yield of every 10 plants of Barada.
The upper row shows gross yield and the lower row shows the weight of fruit and standard deviation.

2) 1993 Testing

Tests were not conducted since soil block machines and cell (plug) seedling production systems had not been delivered on site.

3) 1994 Testing

a. Test Methods

Tests were made in the five different methods shown below, using a soil block machine, a cell (plug) seedling production system, and nursery boxes. Test plots were prepared with 12 plants (two plants for borders) of "Bardi Red," planted without repetition. The cultivation method after transplanting followed that used for the selection of varieties, except for raising seedlings. All seedlings were planted in the field after they were first replanted into black plastic pots.

① Cell Seedlings - 72-hole
72 cylindrical seedling cells of 4.0 cm dia x 4.9 cm long per each panel.
② Cell Seedlings - 144-hole
220 cylindrical seedling cells of 3.2 cm dia x 4.9 cm long per each panel.
③ Soil Block - 3.5
120 seedling blocks of 3.5 cm square per each panel.
④ Soil Block - 5.5
50 seedling blocks of 5.5 cm square per each panel.
⑤ Nursery Box: 100 seeds sown in a wooden box of 50 cm x 40 cm.

* Manufactured compost ("Yosaku 15" made in Japan) was used for the cell seedlings. Field soil mixed with manufactured peat moss at the rate of 1 : 2 was used for the soil blocks.

b. Test Results (see Table 2-4-17 and 2-4-18)

Poor seedlings were noted at a rate of one or two percent by methods ①, ② and ③ above, but these were mainly caused by poor germination of seeds. Conversely, the soil black method (method ④) had 12 poor seedlings plus eight ungerminated seeds, a failure rate of 16.7%. It can be presumed that the seed pit, with a 3.5 cm square block, was too small and soil cover

Table 2-4-17 Comparison of cultivation method for yield

Treatment	Yield kg	No. of Fruits	Av. Weight per Fruit kg	Deviation	Yield kg/10 a.
Cell Seedlings-72	41.4	33	1.25	0.19	2,757
Cell Seedlings-220	49.3	33	1.54	0.31	3,283
Soil Block - 5.5 cm	41.9	30	1.39	0.33	2,790
Soil Block - 3.5 cm	35.7	29	1.23	0.19	2,377
Nursery Box	46.0	36	1.27	0.17	3,063

Table 2-4-18 Comparison of cultivation method for germination

Treatment	No. of Seedings	No. of Poor seedlings	Ungermination Rate %
Cell Seedlings-72	144	3	1.4
Cell Seedlings-220	220	3	0.9
Soil Block - 5.5 cm	150	3	2.0
Soil Block - 3.5 cm	120	20	16.7
Nursery Box	-	-	-

was not sufficient for melon seeds. For such reasons, seeds did not germinate as expected due to repeated wetting and drying, or roots projecting after germination. Nursery box method has not been investigated, but poor seedlings were not noted regardless of the ungermination rate of 3 to 5%. Seedlings smoothly developed after germination, but after transplanting to the pot it showed severe yellowing for short periods of time using methods ① and ④. There were no significant differences in growth conditions after planting, but method ② was superior both for the yield and the average weight of fruit.

4) 1995 Testing

a. Test Methods

Tests were made with the four different methods shown below, using a soil block machine, a cell (plug) seedling production system, and nursery boxes. Test plots were prepared with 12 plants (two plants for borders) of "Bardi Red" planted without repetition. The cultivation method after transplantation followed that used for the selection of varieties, except for the raising of seedlings. All seedlings except for those of nursery boxes were directly planted in the field, but those of nursery boxes were replanted into black plastic pots 12 cm diameter.

① Cell Seedlings - 72-hole
72 cylindrical seedling cells of 4.0 cm dia x 4.9 cm long per each panel.
② Cell Seedlings - 144-hole
220 cylindrical seedling cells of 3.2 cm dia x 4.9 cm long per each panel.
③ Soil Block - 5.5
50 seedling blocks of 5.5 cm square per each panel.
④ Nursery Box: 100 seeds sown in a wooden box of 50 cm x 40 cm.

* Manufactured compost ("Yosaku 15" made in Japan) was used for the cell seedlings. Field soil mixed with manufactured peat moss at the rate of 1 : 2 was used for the soil blocks.

b. Test Results (see Table 2-4-19)

Poor seedlings were rarely seen in any of the methods. Seedlings

smoothly developed after germination and growing of roots. Except for the nursery box method, there were little differences in the yield. Seedlings of the nursery boxes also developed smoothly after planting, and the number of fruits borne resulted in the difference in the yield. The causes for poor fruit bearing could not be found.

Table 2-4-19 Comparison of cultivation method for yield

Treatment	Yield kg	No. of Fruits	Av. Weight per Fruit kg	Deviation	Yield kg/10 a.
Cell-72	56.4	44	1.28	0.30	3,760
Cell-144	56.4	36	1.56	0.35	3,762
Soil Block 5.5 cm	50.5	39	1.29	0.39	3,366
Nursery Box	37.4	23	1.62	0.40	2,495

5) Discussion

A certain yield level could be obtained even by the method of raising seedlings using transparent bags, the method normally used in this district. It can be presumed that this is because seedlings provided for the tests were properly controlled. As a matter of fact, supports may be required for the small transparent polyvinyl bags to assure proper clearance between plants, because they are unstable and don't stay in the proper place (Square strips of wood were laid out in parallel between seedlings during testing.) During watering, water does not properly get into the bag because its brim is too soft. In mass production of seedlings, it may be difficult to produce uniform seedling unless management and control can be easily performed. From this point of view, it is desirable that black plastic pots be used.

Tests were performed by using cell seedlings and soil block seedlings, because transplanting success depends largely on individual skills. As a result, significant differences cannot be seen in the growth and the yield. The selection of raising methods depends on the conditions such as the ease of control and the economy. For example, manufactured compost of Japan was used for cell seedlings, It seems very difficult to prepare proper materials in this country. Conversely, manufactured peat moss used for soil blocks can be easily obtained. For this reason, it can be determinedas the most simple method. However a large number of seedlings can be produced by this method, risks cannot be avoided because it is necessary to plant such seedlings earlier than those from plastic pot seedlings. At timeswhen fields cannot be timely prepared due to cold temperatures or continued rains, it may be necessary to consider the method of replanting soil block seedlings to plastic pots or other methods.

As a conclusion, it can be determined that the direct planting of seedlings from 5.5 cm soil blocks is the most simple and effective method. However, black plastic pots should be prepared so that seedlings can be replanted at any time. Where drainage can be a problem for clayey soil fields such as encountered at this project site, it may be desirable to adopt the method of using nursery boxes and black plastic pots from the beginning to save the cost of a soil block machine, because fields may not

be prepared on time. In such cases, it is necessary to train a sufficient number of workers.

(3) Test of Establishing Techniques for Irrigation and Fertilizer Application

1) 1992 Testing

a. Test Methods

Nine test plots were prepared with the nitrogen application set at three different rates, 10 kg, 15 kg and 20 kg, for a 10 a. plot, and with three different watering cycles, three days, five days, and seven days. Each test plot consisted of 12 plants (two plants for borders) without repetition. Watering was performed by the use of overhead boom-type sprinklers. The variety selected for the test was "Barada," which has been regularly cultivated in this district. General methods of field husbandry followed that used for the selection test of varieties.

Fertilizer		N = 10 kg	N = 15 kg	N = 20 kg
Ammonium nitrate	(33: 0: 0)	0.0	15.2	30.3 kg/10 a.
Triple superphosphate of lime	(0:45: 0)	22.2	22.2	22.2
Compound fertilizer	(15:15:15)	66.7	66.7	66.7

b. Test Results (see Table 2-4-20)

Table 2-4-20 Harvest classified by irrigation and fertilization methods

	N- 10 kg	N- 15 kg	N- 20 kg
15 mm Plot			
Total Yield kg	82.8	84.2	91.7
No.of Fruits	53	52	57
Mean± S.D.* kg	1.56± 0.36	1.62± 0.26	1.60± 0.34
ton/10 a.	5.2	5.1	5.6
25 mm Plot			
Total Yield kg	91.6	77.7	82.2
No.of Fruits	73	60	53
Mean± S.D. kg	1.25± 0.28	1.29± 0.23	1.55± 0.26
ton/10 a.	5.6	4.7	5.0
35 mm Plot			
Total Yield kg	48.9	59.6	55.6
No.of Fruits	42	47	38
Mean± S.D. kg	1.16± 0.26	1.26± 0.33	1.46± 0.25
ton/10 a.	3.0	3.6	3.4

Note: The above table shows the maximum yield of Barada per 10 plants.
* ; The average weight of fruit and standard deviation.

Good results were obtained in test plots where watering cycle was the shortest (three days), except for the plot with a low level of nitrogen. The largest yield, 5.6 tons per 10 a., was obtained from the test plot

with N = 20 kg and with watering every three days.

2) 1993 Testing

a. Test Methods

In addition to checking the performance of a drip irrigation system, a conventional variety was planted in test plots of 3 a. (row length of 40 m) to examine the practical use and feasibility of a furrow irrigation system.

b. Test Results (see Table 2-4-21)

In the furrow irrigation test the yield and other particulars were not investigated. However, normal yield data could be obtained. Some problems were found that could cause work difficulties. The drip irrigation system was used for a cultivation area of 37 a. The measured quantities of water used for drip irrigation and furrow irrigation were 22.7 m^3/10 a. and 433 m^3/10 a., respectively.

Table 2-4-21 Irrigation record

	April	May	June	July	Total
Drip irrigation	20.3m^3/2	15m^3/3	33m^3/8	16m^3/3	84.3m^3/16
Furrow irrigation	18.0m^3/1	20m^3/3	92m^3/4	0	130.0m^3/ 8

3) 1994 Testing

a. Test Methods

Upon the start of watering by the drip irrigation system, water was controlled, taking into consideration the saving of water, and the date and time of irrigation and the water quantity used were recorded. Comparisons were made with the record of the previous year.

b. Test Results (see Table 2-4-22)

Watering was performed for 60 a. of cultivated fields at the rate of 30 times/300 m^3 for the period of 88 days from April 15 to July 11 (50 m^3/10 a.). If the entire furrow (furrow width 135 cm) is considered as the effective area of watering, its area reaches 3,240 m^2 of the total area of 60 a., and watering rate totals 92 mm/m^2. If the effective area of watering is considered to have a width of 60 cm, based on catalog values (30 cm each at the both sides of tube), the area totals 1,440 m^2 and watering rate reaches 208 mm/m^2. This test produced a yield less than that of 1993. The average weight of fruit was also less. The shortage of watering during the growing period of fruits could be one of the major factors causing this. (Refer to 1994 Selection Test of Varieties.)

Table 2-4-22 Irrigation record

April	May	June	July	Total
35m³	81m³/9	133 m³/15	51m³/5	300 m³/60 a. = 50 m³/10 a.

4) 1995 Testing

a. Test Methods

Upon the start of irrigation by the drip system, the date and time of irrigation and the water quantity used were recorded and comparisons were made with the record of the previous years.

b. Test Results (see Table 2-4-23)

Watering was performed for the cultivated fields of 20 a. at the rate of 19 times/140 m³ for the period of 72 days from April 14 to June 24. Where the entire furrow (furrow width 135 cm) is considered as the effective area of watering, the area reaches 1,080 m² of the total area of 20 a. and watering rate totals 129 mm/m² Where the width of 60 cm is assumed as the effective area based on catalog values (30 cm each at the both sides of tube), its area totals 480 m² and watering rate reaches 291 mm/m² Both the yield and the average weight of fruit were greater than those of 1994 but the sugar content decreased by nearly 1.7%. The watering rate increased by 40%, to 70 m³/10 a., compared to the 50 m³/10 a. of 1994, although the watering period was reduced by 16 days.

Table 2-4-23 Irrigation record

April	May	June	Total
27.16m³/4	47.70m³/8	65.70m³/7	140.56 m³/20 a. = 70.28 m³/10 a.

5)Discussion

With the irrigation method that sprays water from overhead boom-type sprinklers, such as used in 1992, the outbreak of diseases can be accelerated and physiological damage can be significant as water is sprayed directly over the plants. Particularly in high temperature arid areas as seen at this project site, excessive wetting and drying can be repeated. Since the cultivation method requires plastic mulching, water does not easily get into the ground, and can pond on the surface of the mulching, resulting in spoiled fruits. For such reasons, drip irrigation and furrow irrigation were adopted for the 1993 testing. Since plants are not directly affected by the water with these methods, excellent results can be expected for the growth of plants. With drip irrigation it is easy to perform work around the plants, but the cost of facilities can be greater.With furrow irrigation, work difficulties and increased water quantity can cause problems (Flower setting and trimming work can often be hampered by muddy

ground after watering, and the water does not flow smoothly when melon vines grow dense. Weeds can also grow up quickly.). In the test of drip irrigation, water quantity was twice that of 1993, even though watering was controlled in 1994. The reason for this could be that weather conditions were very severe (high temperatures and dry, strong north winds) in 1994, while the amount of rainfall significantly increased between April and May in 1993. The water quantity used in 1995 was 40% greater than that of 1994. The water quantity of 70 m^3/10 a. can be the yardstick for drip irrigation.

(4) Test of Establishing Cultivation Techniques Including Fruition Control

1) 1992 Testing

a. Test Methods

Trimming after planting was performed by the following three methods and the yield of all methods were compared. Test plots were prepared with 12 plants (two plants for borders) for each plot. The cultivation method, except for trimming, followed that of the selection test of varieties. The selected variety was "Barada" which is normally grown in this district.

① One-way trimming of two-branch plant.
② Two-way trimming of four-branch plant.
③ No trimming and natural pollination.

b. Test Results (see Table 2-4-24)

Table 2-4-24 Harvest classified by trimming methods

	Plot 1	Plot 2	Average
One-way trimming Total Yield kg No. of Fruits Mean± S.D.* kg ton/10 a.	82.5 55 1.50± 0.35	76.4 51 1.49± 0.31	79.5 53 1.50 4.9
Two-way trimming Total Yield kg No. of Fruits Mean± S.D. kg ton/10 a.	86.8 66 1.31± 0.26	86.7 67 1.29± 0.30	86.8 66 1.29 5.3
No trimming Total Yield kg No. of Fruits Mean± S.D. kg ton/10 a.	129.3 108 1.19± 0.31	132.1 111 1.19± 0.26	130.7 109 1.19 8.0

Note: The above table shows the maximum yield of Barada per 10 plants.
* ; The average weight of fruit and standard deviation.

The results of the trimming method of ③, above, were the best, with 8 tons per 10 a. The average fruit weight was 1.50 kg for method ①, 1.29 kg method ② and 1.19 kg for method ③.

2) 1993 Testing

a. Test Methods

Based on the results of the selection test of varieties performed in 1992, trimming of "Tenkei," selected from Japanese varieties, and "Garia," from local varieties, was performed by the following three methods and a comparison of the yield from these varieties was made. Test plots were prepared with 12 plants (two plants for borders) without repetition. The cultivation method except for trimming followed that used for the selection test of varieties.

① One-way trimming of two-branch plant.
② Two-way trimming of four-branch plant.
③ No trimming and natural pollination.

b. Test Results (see Table 2-4-25)

As a result of comparisons made on the gross yield of "Tenkei" from all test plots, the yield of the no trimming plot was the best. Estimated flowering dates of all the three plots were checked,but many plants of the no trimming plot were not checked thoroughly. Since it was difficult to perform visual inspection of changes appearing on "Tenkei" for harvest, immature fruits were mixed in the harvest. Comparisons made between the yield of the two-branch trimmed plot and that of the three-branch trimmed plot, indicated total yields of 3.6 tons/10 a. and 4.8 tons/10 a., respectively, so it was known that the latter was better. However, the average fruit weight of two-branch trimmed plot was 350 grams more than that of three-branch trimmed plot. For "Garia," there were no significant differences in the yield nor the average fruit weight between two-branch and three-branch trimmed plots. Reason for this could be because fewer fruits were borne by the three-branch trimmed plot. The no trimming plot

Table 2-4-25 Harvest classified by trimming methods

Treatment	Yield	No. of Fruits	Av.Weight of Fruits	Deviation	Sugar Content Brix
Tenkei	kg		kg		
One-way Trimming	58.8	33	1.78	0.32	15.3～10.5
Two-way Trimming	78.8	55	1.43	0.27	16.6～11.5
No Trimming	85.4	58	1.47	0.32	14.6～11.7
Garia					
One-way Trimming	53.6	41	1.31	0.21	12.9～ 9.8
Two-way Trimming	57.9	42	1.38	0.22	10.5～ 9.1
No Trimming	83.6	64	1.31	0.28	14.0～11.1

Note: The above table shows the maximum yield of Barada per 10 plants. Sugar content shows the average of measurements of 10 selected fruits.

yielded a relatively large amount of fruit, 5.1 tons/10 a., and the average fruit weight was no less than that of the trimmed plots.

3) 1994 Testing

a. Test Methods

Based on the results of the tests for selection of varieties performed in 1993, trimming of "Bardi Red," selected from Japanese varieties, was performed by the following four methods and comparisons were made on the yield achieved from these four methods. Test plots were prepared with 12 plants (two plants for borders) in two re petitions. The cultivation method, except for trimming, followed that of the selection test of varieties.

① One-directional trimming of two-branch plant.
② Two-directional trimming of three-branch plant.
③ Two-directional trimming of four-branch plant.
④ No trimming and natural pollination.

b. Test Results (see Table 2-4-26)

In comparison of gross yield, the no trimming plot was slightly better than others, but there were no significant differences in either the average fruit weight nor the deviation. In the year of 1994, fruit bearing was poor also at other plots, and fruits did not grow as expected because irrigation was controlled. As a result, growing conditions were limited and differences between different trimming methods could possibly have been impacted by these factors.

Table 2-4-26 Harvest classified by trimming methods

Treatment	Yield kg	No. of Fruits	Av.Weight of Fruits	Deviation	Sugar Content Brix	Yield kg/10a
Two-Branch	46.0	36	1.27 kg	0.17	16.8～11.7	3,063
Three-Branch	48.3	35	1.42	0.26	15.9～11.1	3,216
Four-Branch	46.7	44	1.06	0.17	17.6～12.3	3,110
No Trimming	53.6	45	1.19	0.22	16.1～11.8	3,569

Note: The above table shows the maximum yield of Barada per 10 plants. Sugar content shows the average of measurements of 10 selected fruits.

4) Discussion

It is difficult to estimate the best time for harvesting from the appearance of "Tenkei" and "Bardi Red," both of the netted melon family. It has to be estimated by counting from the day of flowering. Since it is imperative to produce high-quality fruits, but most efforts are required to minimize variations in appearance, size, sugar content, and flesh quality. For this reason, trimming cannot be ignored. Since the relationship between the yield and the fruit weight of "Tenkei" from two-branch and three-branch plots has been clearly determined through tests conducted in

the past, the trimming method will be determined taking into consideration the marketability. For "Garia,"cultivation by no trimming is suitable because its harvest time can be easily estimated by the yellowing of its skin.

(5) Test of Early-Harvesting Cultivation Techniques

1)1995 Testing

a. Test Methods

In order to advance the time of harvesting, the seeding time was advanced and seedlings were raised in unheated greenhouses. Seeds were sown every 10 days starting January 20. Test plot Nos. 1 and 2 were planted in greenhouses and Nos. 3 and 4 were planted in open field. Also tunnel and mulch were used for them. Cultivation methods, except for test procedures, including seeding time and cultivating conditions and inspection methods, followed those adopted for the selection test of varieties. "Bardi Red" was selected for the tests.

Cultivation Schedule:

	Seeding	Transplanting	Planting	Harvesting	
No.1	1/20	2/ 9	3/14	6/ 6	Tunnel in Greenhouse
No.2	1/30	2/13	3/24	6/ 6	Tunnel in Greenhouse
No.3	2/10	2/22	4/ 1	6/20	Tunnel in Open field
No.4	2/20	3/ 7	4/13	6/21	Tunnel in Open field

b. Test Results (see Tables 2-4-27 through 2-4-29)

Since conditions in the greenhouses varied significantly, comparisons were made by the results of one side test of repeated tests. The time of harvesting was determined by sampling of plants on borders. There were no significant differences in the yield of all trials, except for No. 3 which was remarkably less from the standpoint of fruit bearing. The results of comparing the harvesting times of Nos. 1 and 2 of greenhouse planting indicated that the harvest of both of them started on the same day, June 6, and the peak of harvest continued for nearly 10 days starting June 12. Also, there were no significant differences in the average number of days from flowering to harvesting. There were slight differences in the day of flowering, but it can be seen that such differences did not affect the time of harvesting, as mentioned above. For trial Nos. 3 and 4 of open-field planting, the start of harvesting was on the same day, June 15, but the peak time of harvesting was June 15 to 21 for No. 3 and June 21 to 24 for No. 4. Reviewing the rate of flowering from the harvest, 88% of trial No. 3 flowered between April 21 and 30, while 81% of No. 4 flowered between May 1 and 10, slightly later than No. 3. However, trial No. 4 indicated a shorter period for the period from flowering to harvesting, approximately 4 days less.

c. Discussion

With the intention of advancing the time of harvesting, tests were performed taking into consideration the marketability There were little differences between the plants sown in greenhouses on January 20 and those sown on January 30. To be on the safe side,it would appear more appropriate to start plants on January 30. In open field planting, a slight time lag was seen in the peak time of harvesting between the plants sown on February 10 and those of February 20, but fruit bearing conditions were worse and the yield was seriously affected by the advanced seeding. So it is suitable seeding of February 20. In this regard,similar results were obtained from the selection test of varieties conducted in 1993. If the cultivation method that produces harvests in early June and enters into its peak in middle June (greenhouse planting end of January) is combined with the cultivation method yielding harvest that starts in the middle of June and enters into its peak at the end of June (open field planting, about February 20), approximately one month of continuous harvesting and shipping can be achieved.

Table 2-4-27 Results of early-harvesting cultivation testing

Treatment	Yield kg	No. of Fruits	Av.Weight of Fruit	Deviation	Sugar Content Brix	Yield kg/10 a.
No.1	51.7	41	1.26	0.31	14.1～12.4	3,443
No.2	58.9	36	1.63	0.33	14.4～12.6	3,925
No.3	37.4	23	1.62	0.40	13.6～10.5	2,495
No.4	58.3	42	1.39	0.26	15.3～13.0	3,880

Note: The above table shows the maximum yield per 10 plants.
Sugar content shows the average of measurements of 5 selected fruits.

Table 2-4-28 Average number of days required for flowering to harvest

Treatment	Av. No. of Days	Start Harvesting	Middle Harvesting	Seeding
No.1	50.4	6/ 6	6/12～23	1/20
No.2	51.2	6/ 6	6/12～21	1/30
No.3	52.0	6/15	6/15～21	2/10
No.4	48.1	6/15	6/21～24	2/20

Table 2-4-29 Difference of blooming period in fruits

Treatment	Blooming Period				(%)
	4/11～20	4/21～30	5/ 1～10	5/11～20	Unclear
No.1	23.0	19.7	43.9	0.0	13.3
No.2	18.9	63.7	12.0	0.0	5.1
No.3	0.0	88.9	8.9	0.0	2.2
No.4	0.0	3.1	81.0	12.6	3.1

(6) Sales

1) 1994 Testing

The products of 1993 were offered to wholesalers, high ranked hotels, and restaurants as samples to gather evaluation data. Based on this evaluation, trial sales of the products of 1994 were performed by the following methods.

a. Wholesalers (Istanbul and Adana)

Auction sale is not permitted in wholesale markets in Turkey. Therefore, producers or brokers directly deal with wholesalers. As a matter of fact, samples were offered in 1993 to introduce new varieties of melon prior to the actual transactions of the next year. Since credit of wholesalers had already been established with the sales of Japanese radish and other products, transactions were carried out smoothly. Main customers of the wholesalers included high ranked hotels and minor buyers, but the product created a sensation and additional orders could not all be filled because of the short period of harvesting. The sales prices were as follows.

Sales price: 15,000 - 20,000 TL/kg (Istanbul)
6,000 TL/kg (Adana)

Description: Sales in Istanbul on July 61, 1994 TL: Turkish Lira

No. of Case	Weight	Unit Price	Total Amount
30	221 kg	20,000 TL	4,420,000 TL
			▲ 1,137,240 (Transportation,
			3,282,760 fees and taxes)
			+ 353,600 (Taxes: 8%)
			3,636,360 TL

b. High Rank Hotels

Samples were offered to the Swiss Hotel of Istanbul in 1993 and a high evaluation of restaurant chef was obtained. Prior to the start of harvesting in 1994, sales discussions were made on the times of delivery and quantities required. An order was placed for approximately 1,000 melons. The price was determined in a manner to keep the balance with other varieties (e.g., Garia, produced in Turkey). In actual trans actions, products were sold to the hotel via the efforts of a wholesaler. Since the hotel organization is gigantic and it took time to obtain agreement of the kitchen and purchase departments, prepared products could not be shipped, and new products had to be gathered for shipment. Products were shipped immediately after harvesting so that they could used for a long time. As the buyer understood that the products delivered were ready for immediate use, the flesh part was hard and they lost their good reputation. The Turkish employees did not evaluate the product favorably. Their comment was,"Not too sweet. Turkish melon is softer and more delicious." The product was dealt at the following price. (Kitchen staff consisted of French, Japanese and English men.)

Sales price: 10,000 TL/kg

Description: Sales in Istanbul on July 7, 1994 TL: Turkish Lira

No. of Case	Weight	Unit Price	Total Amount	
119	1,520 kg	10,000 TL	15,200,000 TL	
			▲ 4,428,100	(Transportation,
			10,771,900	fees and taxes)
			833,000	(Box Fee)
			+ 1,282,640	(Taxes: 8%)
			12,887,540 TL	

c. Supermarket Chains

Direct transactions were arranged with Supermarket Miglos, having chain stores in Ankara, Mersin and other cities, with Istanbul as their core. Business negotiations started with the Istanbul main office responsible for purchase of products for all chain-linked stores in Turkey, and was introduced to the head of the store in Mersin, a location convenient to this project site. Miglos has an exclusive wholesale market in Mersin and a cargo booking office in Tarsus. Products were delivered to the cargo booking office directly from this project site and transported to stores in Mersin and Ankara for sales. Sales price was as listed below.

Sales price: 7,000 - 8,000 TL/kg

Description: Sales on July 11, 1994 TL: Turkish Lira

No. of Case	Weight	Unit Price	Total Amount	
-	950 kg	8,000 TL	7,600,000 TL	
			+ 608,000	(Taxes: 8%)
			8,208,000 TL	

d. Export

Transactions started with Serdar Gida, a wholesaler of the Central Wholesale Market in Amsterdam, Holland, after samples were offered to their local office in Antalya. Transportation between this project site and Antalya and packing materials were arranged by the buyer. (Cardboard boxes at the project site were furnished for packing some of the products.)

(a) Transportation Schedule

July 5 Leave Adana (Project Site) by covered medium-size truck
July 6 Arrive at Antalya
July 7 Leave Antalya by large refrigeration truck
July 12 Arrive at Amsterdam

Truck had been scheduled to leave Antalya on the same day of arrival, but departure delayed one day because of breakdown of the truck.

(b) Quality

The melon packages shipped from Adana arrived in Amsterdam a week later. The packages arrived with little change in quality because they had been stored in a refrigerated warehouse under good conditions. However, the bottoms of some fruits developed a white or pink mold at the rate of one per 15 and were starting to sp oil. This could have been caused by cephalocesium, as some melons stored at the project site had also been affected by the disease. This was significant at the neck of flower cluster which started to crack because of delayed harvesting. Such a disease could possibly occur because the delivered products had cracks that were not observed, or because petals had been left on. Since the time of harvesting had been delayed for the convenience of shipping arrangements that time, disease could have been accelerated. Another possible cause was that a strip of paper laid below the fruit as a cushion could have gotten wet and gathered mold. General comments of wholesalers were: "Quality is high. There are no problems if fruits are not spoiled by getting moldy. However, the price should be determined based on the price of "Garia," which has been marketed for a long time. (Garia is one of the typical Turkish varieties. The outer skin is yellow with crack-like netting. Its fleshy part is white or vermilion. Water content is high but sugar content is not very high.) It will be difficult to set the price significantly higher than Garia. Not only the melon, but fruit selection and packing are very important. Care should be taken."

(c) Other Varieties of Melon

The following varieties of melon were been dealt with the wholesalers in Amsterdam. (Sugar content was measured from a single melon on July 14, and prices shown are rough because fruits are being sold in packages or by weight in kilograms.)

	Varieties	Sugar Content Brix	Sugar Content Brix	Wholesale Price Dfl/kg
a.	Dark green,no net-type (Spanish origin)			
b.	Yellow no net,Spanish-type (Spanish origin)	12.5		
c.	Garia	12.0		1.30
d.	Altownbash (Turkish origin)	10.8	(12.5)*	1.75
e.	Light green no net,Charentain-type (French and Dutch origin)	11.0		
f.	Bardi Red (this project)	16.5	(17.5)*	1.80

Note: * ; Measured in Antalya.
Dfl; Dutch Florin

Sales Price = 10.69 Dfl/case (Final Sales Price =about 14 Dfl/case)

Description: Sales on August 9, 1994

No. of Case	Weight	Unit Price	Total Amount
400	3,200 kg	10.69 Dfl/case	1,996.00 Dfl
		± 5.70 (Transportation,	
		4.99 fees and custom)	= US$1,188
			US$0.371/kg

Note: Dfl; Dutch Florin
1 US$ ≒ 1.68 Dfl

(d) Discussion

There were no special problems for the export of Japanese-variety melons to Amsterdam. However, sales price estimated at present is the same level with Garia or slightly higher. It is very doubtful that a farm business can be maintained with this price level. The cost of seeds and materials required for production is higher than that for other varieties of melon. For this reason, being competitive is doubtful. As melons are produced also in Spain, not only in Turkey, exporting may be difficult when transportation cost is considered. Prices can vary when linked with such conditions. In order to maintain the high price peculiar to melons with netting, there are no other ways to make utmost efforts of advertising this product as a type completely different from existing melons. Since this variety is not acknowledged as a special melon at this point of time, it will be necessary to continue shipment for a certain period until its taste is approved by the public. It may be an idea to prevent the break of prices by limiting the production of this melon, even if the price of other melons is reduced. In such cases, it will be necessary to further study the preferences of Europeans. For continuous shipping, it will be necessary to consider the cultivation in districts warmer than at this project site. It will be also necessary to plan advancement of the time of harvesting by introduction of cultivation under structure.

2) 1995 Testing

Test sales were conducted on four domestic sales routes in 1994. Products were shipped to a new wholesaler in Ankara, in addition to the wholesaler in Istanbul, whoever offered the highest price. Products were also shipped two times to Rotterdam, Holland, for export to Europe, and two times to Munich, Germany. In addition, market research was conducted in Germany.

a. Shipment to Domestic Markets in Turkey (see Tables 2-4-30 and 2-4-31)

Products were shipped to wholesalers of the Central Wholesale Market in Ankara four times between June 22 and July 11. Gross volume of transactions was 2,799 kg in weight and 36,748,110 TL in gross sales. Net revenue after fees and taxes deducted was 33,044,261 TL. Thus, net revenue per kilogram was 11,805 TL. Wholesale prices were approximately 20,000 TL/kg. Main customers were supermarkets and greengroceries where the products were not considered high-grade goods. In Istanbul, transactions

were made with wholesalers of the Central Wholesale Market as same as the previous year, and products were shipped eight times between June 15 and July 12. Gross volume of transactions was 4,899 kg in weight and net revenue after fees and taxes deducted was 142,619,789 TL, at unit price of 29,112 TL per kilogram. Wholesale price was 40,000 TL/kg in most cases, sold mainly to high ranking hotels and restaurants. Since conversion rate of Turkish Lira to US dollars was 44,477 TL/$ on July 12, the unit price in Ankara was $ 0.265/kg. In Istanbul, the average unit price was $ 0.665/kg, but this increased to $ 0.730/kg if a second grade shipment was deducted.

Table 2-4-30 Sales in Ankara

Date	Weight	Unit Price	Description	Profit, Weight, Unit Profit
Jun.27	46	25,000 TL	9,199,000 TL	6,816,689 TL
	252	20,000	+ 2,382,311	471 kg
	138	18,000	- 735,920	14,472 TL/kg
	35	15,000	7,552,609	
Total	2,799 kg		36,748,110 TL	33,044,261 TL
				11,805 TL/kg

Note: Minus symbol = transportation and fees, plus symbol = taxes

Table 2-4-31 Sales in Istanbul

Date	Weight	Unit Price	Description	Profit, Weight, Unit Profit
Jun.28	826 kg	40,000 TL	33,040,000 TL	26,675,770 TL
			− 6,364,230	826 kg
			+ 2,643,200	32,295 TL/kg
			29,318,970	
Total	4,899 kg		156,696,509 TL	142,619,789 TL
				29,112 TL/kg

Note: Minus symbol = transportation and fees, plus symbol = taxes

b. Export

Transactions were made with Serdar Gida, a wholesaler of Amsterdam Central Wholesale Market, Holland, in 1994. Since the shipping agent of Turkey changed their customers this year, test shipment was made to Martiser Groothandel, a wholesaler in Rotterdam, Holland. For Germany, test shipment was made to Baqir, a wholesaler in the Central Wholesale Market in Munich via Bagir, an export trader in Mersin.

(a) Holland

Product of 2.8 tons was shipped on June 20 and 3.6 tons on June 30 to Holland via Antalya. Melons harvested at the project site were shipped in wood boxes to Adana where packages were repacked for export via Antalya at the packing yard of export agent. The packages were delivered to another export agent in Antalya and finally shipped to the wholesaler in Rotterdam, Holland. Transportation to Antalya was borne by the project. It was said

that some of the melons (mainly "Tenkei" of small size) were purchased by a Belgian buyer. Regardless of their high evaluation, payment has not been made by the buyer.

(b) Germany (see Table 2-4-32)

Approximately 5 tons of melons were shipped on June 22 and on July 5. Seven days were necessary to complete export transportation from shipping to arrival. Field investigations were conducted for the first export, but information about the melons limited to that provided by the employees of Baqir because the goods arrived two days behind schedule. Evaluations were generally favorable. It was agreed that the first shipment be delivered to Germany as a sample to determine if this new variety was acceptable, and that additional shipments would be made if the product was acceptable. The product was highly evaluated and additional orders were placed for 2 tons (there were no more harvests). Wholesale price was DM 9.7/case and total sales of 363 cases was DM 3,521. Assuming that each case contains three or five melons with a weight of 5 or 6 kg, 5.5 kg/case on the average, the wholesale price becomes DM 1.76/kg. Net revenue after transportation, custom tax, and insurance premium deducted was DM 7.5/case. Where each case is assumed to be 5.5 kg, the average price is DM 1.36/kg. Where each case is assumed to be 6.0 kg, the average price is DM 1.25/kg. If these are converted into US dollars at the rate on July 12 (US$ = DM 1.404), $ 5.342/case equals to $ 0.969/kg and $ 0.89/kg, respectively.

Transportation Schedule

June 22 Leave Adana (Project Site) by medium-size truck, packed in wooden boxes
June 22 Arrive at Mersin (to be packed in plastic boxes)
June 22 Leave Mersin by large refrigeration truck
June 28 Arrive at Munich (Central Wholesale Market)

Table 2-4-32 Record of exports to Germany

Quantity	Sales Price	Expenditures	Total Amount
363 cases	DM 9.70		DM 3,521.10
		DM 450.00 (Transportation)	
		191.67 (Custom tax)	
		58.64 (Custody)	
		39.10 (Insurance premium)	
		56.88 (Custom clearance)	∔ DM 796.29
			DM 2,724.81
			7.50 DM/case

c. Discussion

Since the relationship between Japanese melons from this project site and existing local melons can be verified by the results of test sales of

1994, comparisons are made here clarify the relationship between the shipments for domestic markets and those for exports, based on the sales records of 1995. Domestic sales routes can be classified into the high-grade limited merchandise route via the wholesalers in Istanbul, and the general merchandise route via the wholesalers in Ankara who normally deal with local melons. The transactions made in 1994 include the sales routes of the latter. Through the limited route, a profit of $ 0.736/kg could be obtained, but more shipments cannot be expected with the total shipment volume of 5 tons. If shipments increase, prices can break. The sales revenue through general routes was $ 0.265/kg with shipment of only 3 tons. Since a larger demand can be expected in cities other than Ankara in addition to the supermarket chains, explained earlier, it will be possible to increase shipments. However, the differences in sales revenue between the limited routes and the general routes amount to three or more times. From the standpoint of farm management, local melons that are easy to raise at lower costs can be more advantageous. Conversely, sales revenue from exports to Germany was $ 0.969/kg which was higher than that of the limited domestic routes. Continuous shipments can be expected to increase in volume. Therefore, cultivation type, farm areas, and the time of harvest should be determined depend on the required shipment through export routes, and also the required shipments through the limited domestic routes.

2-4-3.Lettuce

(1) Selection Test of High Quality and High Yielding Varieties

a. Test Methods

Seeds were sown in rows spaced five or six centimeters apart in sowing boxes, placed under controlled conditions in a room cooled to the temperature of 25 to 30 ℃. After seedlings emerged, the seedbed boxes were moved into a greenhouse covered by cheesecloth. Then the seedlings were transplanted into small pots (5 x 6 cm) as transparent polyvinyl bags. Soil used in the seedbeds consisted of field soil mixed with cow manure and sand, with a chemical fertilizer (15: 15: 15) added at a rate of 5 grams per 10 liters of soil. Each variety was planted in 14 plants (four plants for borders) with two lines of zigzag planting. Lines of plants were spaced 30 cm on the top of the 60 cm wide row and spaced at 35 cm intervals along the line. Furrow width was 40 cm. Mulching was not provided. The test plot received fertilizer at the rate of 2 tons of barnyard manure and chemical fertilizer (N: P: K = 15:20:10 kg) for every 10 a. Watering after planting was provided by spraying water from overhead boom-type sprinklers. Harvest

Cultivation Schedule:

	Seeding	Transplanting	Planting	Harvesting
No.1	9/ 5	9/17	10/14	12/25 ～ 1/ 6
No.2	9/10	9/24	10/22	1/ 6 ～ 2/16
No.3	9/17	9/26	10/31	×

was measured by the weight of 10 plants (not counting roots, with outer

leaves removed) from all test plots .

b. Test Results (see Table 2-4-33)

Since the field conditions varied significantly within the test area, comparisons were made only with satisfactory results obtained in each test cycle. In the test plot No.1, "Maggie," "Kimitsu-1," "Alpen" and "Karmar-MR" attained good results, but the products were slightly damaged by frost. In the test plot No.2, a small harvest was gathered from "Penn Lake," "Kimitsu-1" and "Alpen," but the yield was smaller than that of test plot No.1. In the No.3 test plot, no harvest was gathered because of cold weather and frost damage. During the growing period, seedlings were placed under 50% shading control, but good seedlings could not be obtained because of hot weather and dry air. In early December after completion of planting, plants were seriously damaged by frost and freezing.

Table 2-4-33 Comparison of 1993 varieties

	No. 1		No. 2	
Varieties	Av. Weight	Deviation	Av. Weight	Deviation
Step	660 g	180	270 g	50
Maggie	770 ☆	120	-	-
Penn Lake	590	190	430 ☆	80
Kimitsu-1	790 ☆	240	470 ☆	70
Alpen	810 ☆	150	480 ☆	70
Summer Onward	620	180	390	90
Karmar-MR	720 ☆	140	250	40
Salinas	690	140	260	40
Yedikule	950	260	490	60
Das	930	250	-	-
Romulus	770	130	360	80

Note: Weight of outer leaves and roots is not included in measured weight.
Symbol ☆ indicates the varieties that were evaluated highly.

2) 1992 Testing

a. Test Methods

In order to examine the feasibility of improving the early harvest yield of crop types based on the results of tests conducted in 1991, seeds were sown at five different times to determine the different harvest times of the various varieties. Sixteen varieties were selected in reference to

Cultivation Schedule:

	Seeding	Transplanting	Planting	Harvesting
No.1	8/ 5	8/20	9/ 4	10/20
No.2	8/15	8/26	9/ 8	10/22～10/27
No.3	8/25	9/ 1	9/18	11/ 9～11/19
No.4	9/ 5	9/12	10/ 1	11/26～12/ 4.
No.5	9/15	9/22	10/13	×

the results of 1991 testing. General method of field husbandry followed that adopted for the 1991 testing. However, commercial gardening compost

was used as a bed soil.

b. Test Results (see Tables 2-4-34 and 2-4-35)

Considering the crisphead types of the Test plot No.1, good harvest could be obtained with three varieties: "Summer Onward," "Sunny Boy," and "Exceed" to a certain level. Although flower stalk developments were not found in these varieties, stem growth due to differentiation of flow buds was seen on the inside of heads and some deformed heads were yielded. In other varieties, flower stalk development, uneven growth, and poor head formation occurred. Particularly, flower stalk development was found on all plants of "Kamogawa." The crisphead types in test plot No.2 turned out to be nearly the same as seen in test plot No.1. Among the local cos-type varieties, "Das" and "Hazera" were excellent. Of the crisphead types of test plot No.3, "Summer Onward," "Great Lakes," "Karmar-MR," "Sunny Boy," "Sacramento" and "Exceed" were excellent. In comparison of fleshiness, "Sacramento" and "Great Lakes" were superior to all others and averaged more than 900 grams. In general evaluation, "Great Lakes" was excellent. Among the cos-type varieties, "Hazera" was excellent. Among crisphead type varieties of test plot No.4, "Summer Onward," "Sunny Boy," "Step," "Sacramento," "Maggie,""Winter Cisco" and "Exceed" were excellent. Among local cos-type varieties, "Das," "Hazera" and "Yedikule" were excellent. In test plot No.5, harvest of headed lettuce could not be gathered because crisphead and growing conditions were poor and scald of leaves occurred due to cold weather and frost cover which was continuous from the latter half of November. However, cos-type varieties yielded some harvest for shipment, even under the poor growing conditions.

c. Discussion

Seeding seasons varied depending on the type of variety but seeding could be performed during the period from August 5 to September 5. As good results were obtained with seeding on September 10, in the test of 1991, and the seeding period may be extended to this date. In this test planting, hot weather and dry air during the period of raising seedlings became a special problem. An attempt was made to control this problem by the use of shades (50% shading) but good seedlings could not be obtained. Especially for the seeding of August 5 and 15, raising of seedlings was difficult and uncertain factors such as stem growth on the insides of bulbs were seen. In order assure safe planting, it may be best to plant seeds between the period of August 5 to September 5. For the test plot, it can be presumed that the three varieties of "Sunny Boy," "Summer Onward" and "Exceed" will be excellent through all seasons and can be introduced without conditions. All these three varieties are small in size. As "Summer Onward" is specially firm in head formation and is small, it is necessary to investigate its marketability. Among the many large size varieties, good results were obtained from "Sacramento," "Great Lakes" and "Karmar-MR." However, the seeding season is limited for these varieties and the effect of variable weather conditions could cause problems.

Table 2-4-34 Comparison of 1992 varieties

Varieties	No. 1		No. 2		No. 3		No. 4	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Sacramento	549 g 83.0	549 g 45.3	448 g 119.7	452 g 100.7	987 g 207.8	928 g 196.4	636 g 76.0	615 g 146.4
Step	525 g 86.5	518 g 52.2	409 g 100.8	384 g 85.7	759 g 211.2	777 g 127.6	540 g 58.1	566 g 113.8
Maggie Lettuce	515 g 79.8	470 g 86.5	- -	- -	755 g 147.4	755 g 180.6	677 g 128.0	626 g 104.0
Karmar-MR	568 g 144.5	552 g 62.1	576 g 141.9	548 g 133.4	854 g 176.4	885 g 241.5	820 g 199.2	819 g 218.9
Sunny Boy	639 g 86.3	517 g 97.4	625 g 112.5	533 g 89.6	763 g 134.1	618 g 176.9	706 g 154.2	541 g 91.2
Winter Cisco	433 g 90.6	565 g 108.7	429 g 113.4	531 g 104.5	729 g 145.4	860 g 232.2	684 g 95.2	638 g 142.8
Exceed	619 g 99.6	578 g 82.3	720 g 143.1	710 g 152.9	704 g 51.6	613 g 77.3	558 g 79.2	538 g 85.4
Great Lakes	631 g 164.4	679 g 86.3	386 g 129.2	453 g 99.2	921 g 186.8	942 g 163.3	605 g 194.2	698 g 220.8
Cisco	614 g 80.1	570 g 75.1	456 g 98.4	512 g 79.6	846 g 214.3	814 g 178.5	689 g 157.1	619 g 148.5
Summer Onward	514 g 52.7	437 g 71.5	669 g 70.9	596 g 61.6	548 g 71.6	577 g 110.0	574 g 90.9	600 g 88.6
My Lettuce	543 g 60.7	605 g 116.1	656 g 92.8	724 g 205.5	887 g 211.9	878 g 288.5	559 g 71.0	- -
Kamogawa	- -	- -	- -	- -	- -	- -	633 160.3	625 109.2
Das	1044 g 155.4	749 g 82.2	786 g 179.2	751 g 152.4	- -	- -	857 g 214.8	735 g 163.4
Hazera	689 g 70.6	700 g 39.4	849 g 139.5	1106 g 157.3	751 g 221.1	867 g 256.3	733 g 74.2	760 g 148.0
Yedikule	- -	- -	- -	- -	602 g 133.7	621 g 97.0	903 g 273.6	843 g 222.0
Romulus	823 g 95.6	750 g 102.9	620 g 71.4	594 g 99.5	711 g 105.6	751 g 135.6	910 g 175.7	779 g 173.6

Note: The above table shows the harvests of 2,850 plants per 10 a.
The upper row shows the average weight of 10 plants and lower row shows standard deviation.

Table 2-4-35 Comparison of 1992 varieties (No.3)

Varieties	Harvest Date	Uniformity	Growing Condition	Bolting /28	Malformation /20	overall
Sacramento	11/19	very good	good	0	1	good
Step	11/19	normal	normal	0	3	bad
Maggie	11/19	very good	good	0	1	good
Karmar-MR	11/19	very good	good	0	1	good+
Sunny Boy	11/14	normal	normal	0	4	normal+
Fuyu Cisco	11/19	bad	vigorous	0	8	bad
Exceed	11/14	very good	good	0	0	good+
Great lakes	11/26	very good	good	0	0	excellent
Cisco	11/19	bad	good	0	7	bad
Summer Onward	11/12	normal	normal	0	0	good+
My Lettuce	11/19	normal	good	0	3	good
Kamogawa	-	-	-	14	20	bad
Das	11/14	-	-	-	-	-
Hazera	11/14	good	good	0	0	excellent
Yedikule	11/ 9	bad	good	5	0	normal+
Romulus	11/ 9	good	good	0	0	normal

3) 1993 Testing

a. Test Methods

Based on the results of 1992 testing, four varieties were selected. Seeds were sown after the study on the best period of seeding. General methods of field husbandry followed that used for 1992 testing. A mixture of commercial peat moss, leaf mold, soil, and sand was used as a bed soil. Each variety was planted in 36 plants (six plants for borders) without repetition. Seedlings were planted at an interrow spacing of 30 cm and interrow spacing of 35 cm, intervals along the line also with zigzag planting (on a raised level row 90 cm wide with a furrow width of 30 cm). The yield of all 30 plants from each field was measured by weight.

Cultivation Schedule:

	Seeding	Transplanting	Planting	Harvesting
No.1	8/ 9	8/21	9/ 6	10/ 3～10/26
No.2	8/15	8/26	9/11	10/26～11/ 9
No.3	8/25	9/ 5	9/21	11/ 6～11/16
No.4	9/ 6	9/17	10/ 1	12/ 6～12/16
No.5	9/12	9/23	10/ 8	12/16

b. Test Results (see Table 2-4-36)

Test plot No.1: Satisfactory results were obtained from two varieties, "Summer Onward" and "Sunny Boy." Flower stalk development was not seen in these varieties but partial stem growth due to differentiation of flow buds was seen inside the bulbs. However, little deformation was seen in head formation.

Table 2-4-36 Comparison of varieties

	No.1	No.2	No.3	No.4	No.5
Summer Onward	525g± 111 Excelent	597g± 126 Good	594g± 79 Excellent	675g± 157 Excellent	- -
Exceed	620g± 235 -	832g± 296 Good	617g± 194 -	747g± 236 -	714g± 175 -
Sunny Boy	652g± 143 Good	709g± 239 Good	568g± 221 Good	647g± 228 -	- -
Sacramento	- -	- -	584g± 227 -	748g± 311 Excellent	697g± 242 -

Note: Upper row indicates the average weight (with outer leaves removed) and standard deviation. Lower row indicates the time of harvesting and general ranking.

Test plot No.2: Satisfactory results, similar to results seen in No.1 were obtained. Good results were also obtained from "Exceed."

Test plot No.3: Satisfactory results, similar to results seen in No.1 were obtained. Improved quality was seen in "Summer Onward."

Test plot No.4: Good results were obtained from "Summer Onward" and "Sacramento."

During this testing, plants were grown on three-row ridges constructed by rotary ridging machines brought in from Japan. As a result, plants did not develop uniformly on the center rows of some test plots.

c. Discussion

Seeding periods and the harvest yields of 1992 were nearly equal to those of 1993. That is, good results, especially from "Summer Onward" were obtained with seeding between August 25 and September 6. Good results were also obtained from "Summer Onward" and "Sunny Boy" with seeding between August 5 and 15, although the yield was slightly lower than the former. "Although "Summer Onward" and "Sacramento" yielded good harvests in 1992, similar to results that were obtained in 1993, it appeared that these varieties lack stability. Reviewing the relationship between the seeding period and time of harvesting of "Summer Onward," harvest can be gathered between the middle and the latter half of October with a seeding of August 5, and between the latter half of November and the early December with a seeding of September 5. It can be seen from the above that the time of harvesting can be extended one or one and a half months by delaying the time of seeding.

(2) Test of Establishing Techniques for Mass Production of Seedlings

1) 1992 Testing

a. Test Methods

The following three methods were compared. Tests were performed on 14 plants of each test plot (four plants are borders) in two repetitions. The local cos-lettuce variety "Yedikule," which is regularly grown in this district, was used for testing. General methods of field husbandry followed that used for the selection test of varieties No.3, except for the methods of raising seedlings.

① Raising seedlings by the use of panel pots (panel size: 49 cm x 39 cm: inner pot size 4 cm x 4 cm).
② Open-field nursery requiring of no transplantation (Seeding boxes were used for the convenience of management. This is the local method of raising seedlings.)
③ Raising seedlings by the use of pots and transparent polyvinyl bags.

* Seedlings raised by the method of items ① and ③ above were replanted later from sowing boxes.

b. Test Results (see Table 2-4-37)

The yield of plants from seedling propagation method ③ was the largest, but not significantly different from the yield of method ①, however the general ranking of those from method ① was lower. For plants produced by the method ② the time of harvest was delayed about 10 days, flower stalks developed, and the yield was poor.

Table 2-4-37 Yield comparison by different methods of raising seedlings

	No. 1	No. 2	Remarks
Shield Pot	730 g ± 135 11/14 Excellent	802 g ± 217 11/14 Excellent	
Ground Bed (Seeding Box)	697 g ± 169 11/26 Good	621 g ± 188 11/26 Good	2 flower stalk plants
Polyvinyl Pot	830 g ± 224 11/14 Excellent	933 g ± 252 11/14 Excellent	

Note: Upper row indicates the average weight (with outer leaves removed) and standard deviation. Lower row indicates the time of harvesting and general ranking.

2) 1993 Testing

These comparative tests were not conducted because soil block machines and cell (plug) seedling production system had not been delivered on site.

3) Discussion

In 1993 testing, better results were obtained by the method of raising seedlings of using shield pots and transparent polyvinyl bags, a method that requires the transplanting of seedlings. However, these methods are not suitable for mass production of seedlings because of the labor force required for transplanting. For this reason, it is considered that the use

of soil block machines and a cell seedling (plug seedling) production system is essential. Since this method of raising seedlings has been established as a technology, the importation of these systems are considered feasible if compost and sizes are adaptable for the raising of seedling at the project. However, the use of small size cell seedlings as are normally used in Japan may be difficult for this project site because the site is often affected by hot weather and dry air during the growing period of seedlings.

(3) Test of Establishing Techniques for Irrigation and Fertilizer Application

1) 1992 Testing

a. Test Methods

Six test plots were prepared with fertilizer applied at three different levels of nitrogen, 10, 15, and 20 kg per 10 a., and irrigation set at two different levels (normal watering and low level watering). Each test plot consisted of 14 plants (four plants for borders) planted in two repetitions. Watering was performed by the use of overhead boom-type sprinklers. The variety selected for the test was "Yedikule," which has been regularly cultivated in this district. General methods of field husbandry followed that used for the tests for selection of varieties.

b. Test Results

Good results were not obtained because of a spell of rainy weather after planting, during the watering season.

2) 1993 Testing

Tests were performed in methods similar to those of 1992 but results were not obtained because of a spell of rainy weather.

3) Discussion

In this district, it often rains beginning in the latter half of September. Therefore, watering is performed depending on the weather. With the irrigation method that sprays water from overhead boom-type sprinklers, the outbreak of diseases can be accelerated and physical damage can be significant as water is sprayed directly over the plants. However, plants were not damaged so badly in these tests. Therefore, there is no objection to the employment of boom-type irrigation systems, except for funding limitations.

2-4-4. Daikon (Japanese Radish)

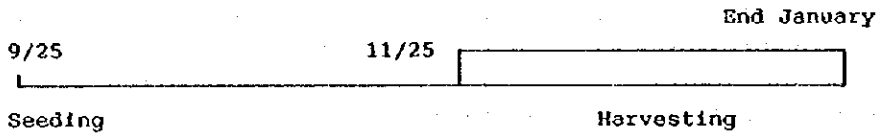
(1) Trial Cultivation

1) 1991 Fall Crop Testing

a. Objectives and Methods

Japanese radish was not included in the scope of the initial test plan. However, the trial cultivation was performed to inolude long-root varieties of Japanese radish for the following reasons: the hot and dry summer weather turns cool in November, and rains can be expected; the crop is considered suitable for the upland areas; and short root, bulb-type radishes grown locally are not tasty, even though Turks eat them raw. The varieties "Hiroko" and "Nerima" were planted at a spacing of 30 cm x 65 cm. Since the growth of roots could not be expected in level low because of the heavy clayey soil of the project site, test plots were modified to triangular high ridges (about 25 cm high), taking into consideration the drainage of rainwater. The test plots received an initial fertilization of chemicals (N: P: K = 10: 10: 10 kg) and side-dressing of (N: P: K = 5: 5: 5 kg) for every 10 a. Watering before the rainy season was provided by spraying water from overhead boom-type sprinklers.

Cultivation Schedule:



b. Test Results

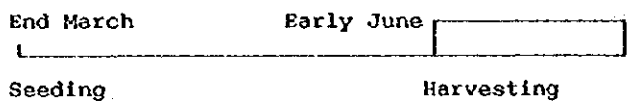
Many plants were missed and the yield was small from "Nerima," but "Hiroko" showed little disease, insect damage or missing plants and an excellent yield was obtained without disinfection. The yield of 11 rows x 5 m x 0.65 = 35.75 m^2 was 240 kg/182 plants, with an average weight of 1.3 kg/piece. The projected yield from 10 a. was 6.7 tons. Eating quality of products was excellent with little sharp taste, and they were very juicy. The products obtained favorable comments from Turkish interests.

2) 1992 Spring Crop Testing

a. Objectives and Methods

With the objectives and methods similar to those of 1991 (fall crop) testing, tests were conducted to study the feasibility of planting a spring crop. However, different varieties, "Narumi," "Fukumi" and "Aohomare," were used for this testing.

Cultivation Schedule:



b. Test Results

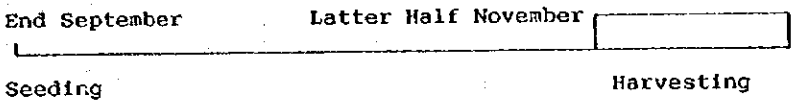
Good results were obtained from "Narumi" with little disease and insect damage. However, flow stalks developed and good results could not be obtained from the other varieties. Eating quality of the product was not favorably evaluated by Turkish interests because its sharp taste.

3) 1992 Fall Crop Testing

a. Objectives and Methods

With the objectives and methods similar to those of 1991 (fall crop) testing, tests were conducted to study the feasibility of planting a fall crop. However, different varieties, "Narumi," "Fukumi" and "Aohomare," were used for this testing ting.

Cultivation Schedule:



b. Test Results

Good results were obtained from all three varieties with little disease and insect damage. Eating quality was highly evaluated by Turkish interests. A part of the harvest was sold to a restaurant in Istanbul.

(2) Selection Test of High Quality and High Yielding Varieties

1) 1993 Fall Crop Testing

a. Test Methods

Based on the results of the trial cultivation of 1991 and 1992, six varieties were introduced. The varieties were sown at eight different times. General methods of field husbandry followed those used in 1992. However, ammonium sulfate was used as a fertilizer at a rate of 25 kg/10 a. Selected

Cultivation Schedule:

	Seeding	Harvesting	Growing Period
No.1	8/16	10/ 4～10/18	49～ 63
No.2	8/24	11/ 3～11/ 9	71～ 77
No.3	8/31	11/ 9～11/21	70～ 82
No.4	9/6	11/16～12/ 6	71～ 91
No.5	9/16	11/24～12/15	69～ 90
No.6	9/25	12/14～12/30	80～ 96
No.7	10/11	1/19～ 2/ 4	100～116
No.8	10/19	-	

varieties were seeded in test plot s having more than ten 40 meter long

rows, without repetition, for all different periods of seeding, in order to turn the harvest over for trial sale.

b. Test Results (see Tables 2-4-38 and 2-4-39)

Tests were performed at randomly selected locations of typical growth within an area of 5 rows x 3.2 m of each test plot to check the root length, size (maximum body length), and weight (at a stage ready for

Table 2-4-38 Selection of varieties and period to harvesting

Varieties	No.of Plants	Vacant Plants	Unqualified	Weight g	Deviation	Shippable %	Yield t/10a.	Harveting Date
Kensei								
3-2	64	3	10	2,078	586	79	8.4	11/20
4-1	57	3	1	1,569	278	92	7.4	11/26
4-2	57	5	8	1,693	439	77	6.6	12/ 6
Osen								
4-1	59	6	2	1,352	372	86	5.9	11/16
4-2	51	-	6	1,512	426	-	-	11/24
4-3	59	3	0	1,423	422	94	6.8	12/ 6
5-1	58	2	2	1,520	317	93	7.2	12/14
6-1	62	2	3	1,191	365	91	5.5	12/14
6-2	64	1	3	2,102	591	93	9.5	12/30
7-1	60	0	2	1,218	312	96	5.9	1/19
7-2	60	0	3	1,650	452	95	8.0	2/ 2
Fukumi								
5-1	68	2	2	2,141	470	94	10.3	12/15
6-1	61	2	0	1,223	242	96	6.0	12/15
6-2	57	1	2	1,928	529	94	9.2	12/30
7-1	60	3	0	1,642	341	95	7.9	1/19
7-2	60	1	0	2,186	425	98	10.9	2/ 2
Aohomare								
4-1	69	10	4	1,673	549	79	6.7	11/20
4-2	60	-	6	1,827	570	-	-	11/24
5-1	62	6	4	1,065	241	83	4.5	11/24
5-2	66	9	3	1,294	319	81	5.3	12/ 7
6-1	57	6	3	1,368	293	84	5.8	12/14
6-2	61	5	4	2,353	535	85	10.2	12/30
Narumi								
5-1	63	1	8	1,985	548	85	8.6	12/14
6-1	61	1	2	1,196	295	95	5.8	12/14
6-2	61	2	1	1,876	430	95	9.1	12/30
7-1	60	0	4	1,131	258	93	5.3	1/19
7-2	30	0	0	1,490	326	100	7.6	2/ 4
Mnikon								
5-1	59	1	31	1,403	475	45	3.2	11/16
5-2	57	8	1	941	256	84	4.0	11/20
6-1	58	2	0	804	322	96	3.9	12/15
6-2	57	2	4	1,498	434	89	6.8	12/30
7-1	60	4	3	1,254	233	88	5.6	1/19

shipment) of individual products. Since the test plots were provided within fields used for general crops, and seeds were planted in a zigzag layout, the number of plants in each test plot was different. "The expected 10 a. yield " is defined as the total yield from the test plot (subtracting out the defective products) divided by the yield planted, and then multiplied by 5,128 (the proposed number of plants in 10 a.)

In test plots No.1 and No.2, yield was limited because of poor growth or the spread of virus. The poor growth could be recognized by etiolated lower leaves and a significant magnesium deficiency. Analytical results of tests on leaves ar e shown in Table 2-4-39 (analyses were made by Alata Horticulture Research Institute). Poor growth was not seen in test plots No.3 through No.7, and good products were gathered from all varieties. Eating quality was also satisfactory. From the above, it can be presumed that normal growth can be hampered by hot and dry weather with early seeding. The yield varied depending on the variety and the time of harvesting, but ranged from 5 to 10 tons per 10 a. Since the time of harvesting in the above table is indicated by the date of inspection, this period is actually longer than that indicated. Particularly for test plots No.1 and No.2, actual growing period is shorter than that indicated because the time of harvesting was delayed. In test plot No.8, seedlings were all wiped out by birds. A part of test plot No.7 was also damaged by birds.

Table 2-4-39 Analytical results of tests on leaves

N	P	K	Ca	Mg	Zn	Fe	Cu	Mn
3.10	0.26	4.46	2.8	0.27 (%)	21.6	57.0	7.5	49.3 (ppm)

2) 1994 Spring Crop Testing

a. Test Methods

Based on the results of trial cultivation of 1991 and 1992, eight varieties were introduced. The varieties were sown at three different times ("Narumi" only at the first time). General methods of field husbandry followed those used in 1992.

Cultivation Schedule:

	Seeding	Harvesting	Growing Period
No.1	4/ 9	6/16	68
No.2	4/16	6/16	61
No.3	4/26	6/18～6/25	53～60

b. Test Results (see Table 2-4-40)

Tests were performed at randomly selected points showing typical growth of plants within the area of 5 rows x 12 plants of each test plot to check the root length, size (maximum body length), and weight (at a stage ready for shipment) of individual products. As soil conditions were poor because

of continued rains,soil was not sufficiently tilled. Accordingly, field preparation was delayed and seeding was not performed as scheduled. Many immature plants (branched roots, small fruits, etc.) were found in all varieties, and the yield of shippable radish was significantly reduced because of this. Products were not welcomed by the markets because of their sharp taste. Some of the products did not have the sharp taste but were not yielded at a high rate. The expected 10 a. yield was about 2 tons, altogether.

Table 2-4-40 Selection of varieties

Varieties No.	Av. of Root Length and Deviation cm	Average of Weight and Deviation g	Total Yield g	Yield for Shipment g	Expected Yield kg/10 a.
Narumi					
No.1	34.0 ± 5.3	998 ± 241	47,920	23,690	1,872
No.2	31.5 ± 5.7	893 ± 256	50,050	38,110	3,023
No.3	28.4 ± 4.2	562 ± 168	33,720	29,420	2,332
Fifuku					
No.2	27.5 ± 5.7	683 ± 226	40,980	31,760	2,515
No.3	24.5 ± 4.1	483 ± 126	29,010	22,060	1,745
Osin					
No.2	29.0 ± 9.4	632 ± 373	36,050	25,100	1,991
No.3	34.1 ± 6.9	579 ± 157	34,750	32,460	2,570
Osen					
No.2	28.6 ± 9.6	663 ± 399	36,500	25,150	1,991
No.3	28.7 ± 6.3	592 ± 192	35,520	31,140	2,467
Aohomare					
No.2	30.4 ± 7.0	656 ± 272	31,510	18,490	1,460
No.3	26.8 ± 6.6	509 ± 210	26,480	18,020	1,428
Fukumi					
No.2	28.3 ± 7.0	571 ± 234	34,310	28,550	2,261
No.3	30.5 ± 8.6	612 ± 307	36,770	25,300	2,007
Aomi					
No.2	23.2 ± 3.8	509 ± 197	30,070	11,300	896
Harunari					
No.3	26.7 ± 5.7	497 ± 169	25,880	20,830	1,650

Note: Planting Distance = 0.3 m × 0.7 m (4,761 plants/10 a.)
One Plot = 60 plants (without repetition)
Expected Yield = Yield for Shipment × 4,761 ÷ 60

3) 1994 Fall Crop Testing

a. Test Methods

The seeds of 20 varieties, with new varieties added to those selected based on the results of the past testing, were sown at seven different times. Seedlings were planted on triangular high ridges (about 25 cm high), spaced by 30 cm x 65 cm, at the rate of 5,128 plantings per 10 a.

The test plots received ammonium sulfate fertilizer at the rate of 25 kg per 10 a. and watering was provided by spraying water from overhead boom-type sprinklers. Selected varieties were seeded in fields having more than 10 rows, 40 m long, for all different periods of seeding, in order to turn the harvest over for trial sale. The test plot was constructed of 12 plants x 5 rows, and was selected out of the average growth of plants, without repetition.

Cultivation Schedule:

	Seeding	Harvesting Period	Growing Period
No.1	8/25	10/30～12/14	67～
No.2	9/ 5	11/ 5～11/24	61～
No.3	9/15	11/12～11/24	58～
No.4	9/23	11/30～12/28	68～
No.5	10/ 3	12/28～ 2/17	86～
No.6	10/13	2/ 1～ 3/ 6	11～
No.7	10/24	3/ 6～	33～

b. Test Results (see Table 2-4-41)

Tests were performed at randomly selected points showing typical growth of plants within the area of 5 rows x 12 plants, or 60 plants from each test plot, to check the root length, size (maximum body length), and weight (at a stage ready for shipment) of individual products. Investigations were performed on the produce in a condition ready for shipment. (Total yield÷ 60) x 5,128 plants was assumed as an expected 10 a. yield. The total yield after unqualified plants were deducted was assumed as the "shippable yield," and shown as a percentage, with the expected 10 a. yield as 100. Since the report of the soil analysis, commissioned to a testing laboratory, was delayed, fertilization was performed based on the analytical data of the previous year. As a result, expected growth was not be achieved because of a shortage of fertilization. Markets wanted a smaller radish than those shipped the previous year, so immature small products were gathered and shipped as they were. Fields were flooded and seriously damaged by rains exceeding 200 mm, which continued for three days starting November 18. Therefore, the harvest gathered after November 22 was damaged due to root-rot and from other causes, and the shippable yield was reduced to 50% or less, which resulted in an affect on further growth. For such reasons, it can be presumed that a comparison can be made between the results of test harvesting of all varieties gathered before November 22 for test plots No.1 through No.3. For test plots Nos.1 and 2, good results were obtained from "Fukumi," "Osen" and "Kampaku," although hot weather resistance was required in severe summer conditions. However, "Kampaku No.1" showed a tendency to split lengthwise. Initial growth of "Aomi" was very slow and the time of harvesting of "Aomi" No.1 delayed significantly. The yield of other varieties was not as expected and vacant plants and variations in size were significant. Many of the long-root varieties, to be used for pickles, were affected by groundwater during the long growing period, since their roots extended deep in the ground.

Table 2-4-41 Comparison of varieties and periods of seeding

Varieties	Missing Plant	Av. Root Length cm	Dia. cm	Av. Weight g	Deviation	Yield kg/10a	Shippable %	Harvesting Date
Fukumi								
No.1	6	24.1	4.7	523		2,402	90.8	10/31
No.2	2	27.2	5.4	536		2,468	92.5	11/10
No.3	1	31.6	5.8	748		3,443	99.5	11/12
No.3-2	3	34.9	6.3	922		4,244	34.6	11/17
No.4	1	27.4	5.3	441		2,032	39.7	11/30
No.4-2	1	27.7	5.4	462		2,585	47.4	11/30
No.5	2	23.9	5.6	430		1,980	50.6	1/ 4
No.5-2	3	25.7	6.1	532		2,447	83.8	1/ 4
No.6	1	26.3	6.6	582		2,677	94.4	2/ 1
Osen								
No.1	6	26.0	4.7	568	326	2,614	88.3	10/31
No.2	0	28.5	6.1	670	243	3,084	88.7	11/ 8
No.3	3	30.2	5.8	650	292	2,994	92.0	11/22
No.4	1	28.2	5.2	451	144	2,078	44.0	11/30
No.5	0	30.5	6.2	590	120	2,714	80.6	12/28
No.6	0	23.9	5.7	385	115	1,771	78.2	2/28
No.7	0	18.1	5.0	345	50	1,129	39.6	3/ 6
Oshin								
No.3	0	30.0	6.1	577	219	2,656	93.4	11/22
No.4	0	25.5	5.3	400	113	1,843	69.2	11/30
No.5	3	24.4	5.9	395	167	1,820	76.7	1/16
Kensei								
No.1	7	20.7	5.2	482	344	2,219	85.3	10/31
No.2	1	26.8	5.7	546	170	2,515	35.0	11/10
No.3	2	28.0	6.3	672	187	3,059	95.2	11/22
No.4	2	25.0	5.6	447	98	2,057	33.1	11/30
No.5	6	22.0	5.7	410	131	1,886	69.5	12/28
No.6	0	24.5	5.7	739	262	3,402	90.2	2/28
Kanpaku								
No.1	8	21.7	5.5	676	487	3,112	78.0	10/30
No.2	0	22.6	6.6	735	322	3,381	94.8	11/ 5
No.3	1	30.6	7.0	912	306	4,198	80.3	11/22
No.4	4	25.6	5.9	509	156	2,345	42.0	11/30
No.5	2	24.9	6.3	520	159	2,394	80.6	12/28
No.6	3	19.8	5.8	333	122	1,534	73.4	2/28

Note: In the above table, "per 10 a." shows the expected yield per 10 a. calculated from 60 plants per plot and "Shippable" indicates the weight of the yield after small or damaged products are deducted.

4) 1995 Fall Crop Testing

a. Test Methods

The seeds of 12 varieties, with promising varieties added to those selected based on the results of the past testing, were sown at five different times. Seedlings were planted on triangular high ridges (about 25 cm high), spaced 30 cm x 80 cm, at the rate of 4,166 plants per 10 a. The test plots received chemical fertilizer (N: P: K = 15: 20: 15 kg) for

every 10 a. Watering was provided by spraying water from overhead boom-type sprinklers. Selected varieties were seeded in fields having more than 5 rows, 40 m long, for all different periods of seeding. Test plots for demonstrating the average growth of plants consisted of 10 plants x 3 rows, without repetition.

Cultivation Schedule:

	Seeding	Harvesting Period	Growing Period
No.1	8/25	10/11～11/ 2	55
No.2	9/ 5	10/25～11/ 3	59
No.3	9/15	11/14～11/27	74
No.4	9/27	12/ 4～12/13	78
No.5	10/ 6	12/26～ 1/19	106

b. Test Results (see Table 2-4-42)

Tests were performed at randomly selected locations to determine the typical growth of plants within the area of 3 rows x 10 plants, to check the root length, size (maximum body length), and weight (with a few cm of leaves retained) of individual products. (Total yield ÷ 30) x 4,166 plants was assumed as an expected 10 a. yield. The total yield after unqualified produce was deducted was assumed as the "shippable yield" shown by percentage with the expected 10 a. yield as 100. Fields were flooded and seriously damaged by rains exceeding 140 mm, from the latter part of October to the early November. Especially, end of November it was rain amount to 54 mm. Therefore, test plot No.4, the harvesting was to start in December, was damaged due to root-rot and other causes, and the shippable yield was reduced significantly when fields were flooded. However, test plot No.5 was not damaged as the plants had not matured. However, good results were not obtained from No.5 because of poor control (all harvests were gathered for shipment). In test plot No.1, "Kampaku" was excellent, as it was the previous year. For test plots No.2 through No.4, good results were obtained from "Fukumi," that demonstrated a high yield and good taste. In test plot No.4, "Fukumi," little root-rot was found and the product demonstrated a tendency to be resistant to the high groundwater. Results of No.1 and No.5 are not available, but good results are expected, as seen in the previous year. The yields of "Keitoku" and "Kensei" were excellent and their eating qualities were highly evaluated. Some harvest was gathered from other varieties, but their evaluation was low because of poor taste and water content. Since radish is eaten raw in Turkey, factors such as water content, sugar content, and a texture agreeable to the teeth will be required in the future. Significant disease and insect damage were not noted, but small projections were noted on the outer skins of radishes after flooding. These were noted on most varieties, although there were slight variations depending on the variety. The cause of this was not found but few products were damaged to a degree requiring rejection for shipment. Varieties such as "Hoshiriso," to be used for pickles, were not highly evaluated for their eating quality, and were easily damaged by groundwater because of their long roots. Frost cover in

early November did not bring serious damage.

Table 2-4-42 Comparison of varieties and periods of seeding

Varieties	Missing plant	Av. Root Length cm	Dia. cm	Av. Weight g	Deviation	Yield kg/10a	Shippable %	Harvesting Date
Fukumi								
No.2-2	1	35.2	7.0	1,093	213	4,403	75.0	11/ 3
No.3-1	0	31.9	6.2	770	142	3,210	79.3	11/14
No.3-2	0	33.5	6.9	1,160	284	4,835	88.8	11/27
No.4-1	0	28.7	6.5	825	144	3,439	96.5	12/ 5
No.4-2	1/20	29.8	7.0	991	212	3,920	97.6	12/13
No.5-1	0	23.4	5.3	436	125	1,818	80.1	12/26
Keitoku								
No.2-2	1	34.0	6.7	973	200	3,921	77.4	11/ 3
No.3-1	2	31.3	6.2	874	151	3,050	85.4	11/14
No.3-2	2	32.7	7.0	1,152	295	4,479	79.6	11/27
No.4-1	2	29.7	6.0	841	171	3,272	72.2	12/ 5
No.4-2	0/20	33.8	7.0	1,125	195	4,687	79.0	12/13
No.5-1	2	24.4	5.4	459	137	1,785	92.6	12/26
No.5-2	2	28.8	7.2	1,000	213	3,890	85.7	1/19
Kensei								
No.2-2	1	32.7	6.8	998	271	4,020	88.3	11/ 3
No.3-1	2	31.9	6.4	864	198	3,232	81.6	11/14
No.3-2	1	32.3	7.1	1,192	335	4,801	69.9	11/27
No.4-1	0	31.6	6.0	924	182	3,850	90.7	12/ 5
No.4-2	1/20	35.2	7.1	1,225	201	4,848	48.5	12/13
No.5-1	2	23.7	5.5	499	185	1,939	88.5	12/26
No.5-2	0	30.8	7.3	1,109	257	4,620	85.4	1/19
Kanpaku								
No.1-1	0	30.9	8.0	1,276	487	4,310	78.2	10/24
No.1-2	0/20	38.3	9.7	2,145	597	6,384	72.7	11/ 2
Mikura Cross								
No.1-1	3/60	40.2	7.0	1,474	455	5,835	76.0	10/24
No.1-2	0	44.5	7.8	2,152	672	5,934	32.2	11/ 2
No.2-1	5/60	33.3	4.3	742	187	3,188	82.7	10/26
No.2-2	0	41.4	6.2	1,296	263	5,061	77.4	11/ 2
No.3-1	0/60	35.7	7.2	1,362	307	5,674	85.7	11/24
No.3-2	0/60	42.0	6.7	1,466	277	6,107	5.5	11/30
No.4-1	0	29.3	5.2	583	139	2,429	0.0	12/ 5
No.4-2	1/20	35.5	6.6	1,067	262	4,038	22.0	12/13
No.5-1	0	31.0	5.1	594	169	2,476	89.0	12/26

Note: In the above table, "per 10 a." shows the expected yield per 10 a. calculated from 60 plants per plot and "Shippable" indicates the weight of the yield after small or damaged products are deducted.

5) Discussion

Through open-field farming of fall crop radish in the project site, it has been determined that varieties sown for the period from the end of August to early October can be harvested during the period from the latter half of October to the latter half of January. As varieties sown in August are often damaged by hot weather, it is desirable that seeding be performed in September. During the months of October and November many other vegetables are shipped, and the price of radishes can remain low. For this reason, early seeding may not be necessary. Reviewing the harvest after the latter half of January, it is considered that the time of seeding cannot be delayed any more as there are risks of damage from birds or rain. Thus, the employment of slow growing and late maturing varieties can be considered, but it is not clear how far the time of harvesting can be delayed because temperatures can vary widely every year. According to the results of 1993 testing, a certain level of yield was gathered from late

maturing varieties of "Narumi" and "Osen" among those sown on October 11 and harvested in early February, but the product appeared excessively matured. Good products without pithy tissues were gathered, but it is difficult to select the final varieties because markets tend to prefer smaller radishes, 1 kg or less in weight.

Of the various varieties, "Fukumi" is the most reliable in yield and quality, and this variety may be used through all seasons. "Kensei" and "Keitoku" can also be recommended as suitable varieties. "Kampaku" is suitable for early seeding.

For spring crops, the first concern is that field preparation can be delayed because of rainy weather (the time of seeding can be delayed accordingly). Secondly, it is difficult to gather good products because the growing period can be affected by hot weather. Thirdly, almost all products can have a sharp taste which is not liked by the consumers. Finally, shipping time is too short. When all these conditions are taken into consideration, it can be seen that farm business of cultivation of spring crops is difficult in this district.

In 1994 fall crop testing, cultivation was performed applying fertilization based on the soil analyses of the previous year. As a result, a shortage of fertilization was found. Reason for this can be because the place of cultivation was relocated to field crop test fields from the old fields where vegetables had been test cultivated. This fact was verified with fertilization design based on soil analyses obtained later. Care must be taken when field crops are rotated.

(3) Test for Comparison of Methods of Tilling and Seeding (1994 Spring Crop)

1) Test Methods

Soil could not be fully crushed and ridges could not constructed uniformly with conventional methods of tilling and ridging using of rotovator and lister. Field husbandry had been performed by hand sowing in three steps (digging, sowing and covering with soil) and work efficiency had been extremely low. In order to improve such deficiencies, tests were performed with the assistance of short-term experts on mechanized farming. The following four operations were performed by the use of an upcut rotary with ridging machine and hand-operated sowers, made in Japan. Upcut rotary turn round in the opposite direction of tractor operation. General methods of field husbandry other than tilling, ridging and sowing followed the methods adopted for the selection of test varieties.

① Rotovator, lister + hand sowing
② Rotovator, lister + hand-operated sower
③ Upcut rotary with ridging machine + hand sowing
④ Upcut rotary with ridging machine + hand-operated sower

2) Test Results (see Table 2-4-43)

Soil conditions were seriously affected by rains and soil was not sufficiently crushed after tilling. Soil crushing efficiency was higher when the upcut rotary ridging machine was used for ridging, and fine soil

was deposited on the surface, which resulted in a smoother sowing operation. When methods ① and ④ were compared, sowing efficiency achieved with method ① was 819.7 m²/hr by nine workers and with method ④ was 1,358.9 m²/hr by one worker. (For more details, refer to the Short-Term Expert Report of Mechanized Vegetable Cultivation, April 1994.)

For the yield of harvest, the yield of shippable products with methods ① and ② was two times, or more, of that obtained with methods ③ and ④. Most of products that could not be shipped had branched roots that could have been caused by physical properties of the soil. The branches were similar to those caused by nematoda, but this could not be a main reason because rootlets were mostly clean. Soil crushing efficiency was higher when the upcut rotary machine was used, but this method could produce more branched roots because the soil mass mainly is deposited in the middle to bottom parts of the ridge. More branched roots were produced in all four test plots than were seen in the variety test plots (tilling, ridging and sowing were performed after soil conditions had improved) seeded later. Such phenomena could have been caused by water conditions of soil at the time when test plots were constructed.

Table 2-4-43 Comparison of methods of tilling and field husbandry

Treatment	Av.Length of Root cm	Deviation	Av.Weight of Plant g	Deviation	Shippable %	Yield kg/10 a.
①	34.0	5.3	998	241	41	1,872
②	30.7	4.9	918	257	40	1,840
③	23.0	5.3	624	318	18	745
④	24.5	4.6	532	197	25	849

3) Discussion

During tests performed this year, adverse moisture conditions in the soil affected the results of all test plots. Therefore, it can be said that tests on the harvest were not successful but significant differences in sowing efficiency could be verified. Namely, a work efficiency improvement of nearly 15 times was achieved with the use of a ridging machine and hand-operated sowing machines brought from Japan. These demonstrated an efficiency of 1,358.9 m²/man-hour, compared with 91.0 m²/man-hour by the conventional method. At the stage of preparing of ridge, the upcut rotary ridging machine was not as efficient as the lister, but the shape of ridges made by the former was significantly better. There were little differences between the two methods in management operation after completion of sowing, but it was determined that cultivation with the use of rotary machine is more suitable (higher level skills are required for the rotary machine in thinning operations.).

Severe comparisons were not made, but a larger area of a fall crop was cultivated by upcut rotary with ridging machine in 1994 and in 1995. Since good products were gathered, this method would be suitable for farm business

cultivation.

(4) Sales

In Turkey, the long-root variety of radish has rarely been sold. A small variety of a carrot-sized radish has been sold by chance. Since Japanese-origin white long-root varieties were not known by all the public, sales promotion advertising was performed.

1) 1993 Fall Crop Testing

a. Istanbul

Products were sold through wholesalers in the Central Wholesale Market in Istanbul. In the beginning, the products were mainly sold to green-grocery shops where foreigners shop, but after awhile sales slowly started to be made to general retail shops. Wholesale price was around 5,000 TL/kg. Products were later delivered to other wholesalers through a broker in Adana, but the wholesale price was broken because the same products were sold at low prices by wholesalers who participated later. Payment by the broker has not been made because of his large debt incurred earlier.

Price control by negotiations between wholesalers is prohibited. Unless the lowest price is offered by producers, there is no way to control prices. Therefore, it is very important to set up a proper minimum price for the sale of new products, and to select proper wholesalers. (Auction sales are not customary in Turkey, and face-to-face transactions are normally made.)

b. Ankara

Through the director of the Central Wholesale Market in Ankara, business negotiations were made with 9 or 10 wholesalers dealing with red radish. But they rejected to transact Japanese radish.So we sold wholesale to retailers directly through TIGEM Ankara. An advertisement campaign was carried out for two weeks for the new products. Wholesale price was set in the range of 1,500 to 3,000 TL/kg in reference to the price of red radish in Ankara.

c. Adana

Transaction Example — December 16, 1993

No. of Case	Weight (kg)	Unit Price	Proceeds
84	1,557	2,000 TL	3,154,000 TL
12	261	1,500	391,000
			△678,000 (Fees and taxes)
96	1,838		2,867,000

* Conversion rate of Turkish Lira vs 1 US$ changed in 1993 as follows: 11/15 = 13,343 TL, 12/15 = 14,034 TL, 1/14 17,723 TL, 2/15 17,723 TL

Transactions were made with a selected wholesaler in the Adana Central Wholesale Market. Price was set between 1,000 and 2,000 TL/kg. The total transaction was 40,189,000 TL (net) for 25,827 kg.

d. Advertisement Campaign (1993 Fall Crop)

Since the variety was not known to the public in Turkey, a suggestion was made by TIGEM for the necessity of an advertisement campaign. While a study was being made on advertisement program, a transaction was rejected by the wholesaler of Ankara. Campaign was carried out in Ankara immediately after this event. The campaign was conducted by an advertising agent as described below.

Period of Campaign: December 3 to December 18, 1993

Places of Campaign: 10 stores, including green-grocery stores, supermarkets,and restaurants in Ankara. 4 places will be selected in a day.

Method of Campaign: Offer sample chips of radish at a stand. Post posters. Mini-calendars in the shape of a Japanese radish. Cooking leaflets in the shape of radishes. Questionnaire.

Cost of Campaign: US $10,000 plus tax (20%): This cost includes naming, design, four stands, 1,000 sheets of posters (50 x 70 cm), 250 small flags, 3,000 sheets of leaflets, 10,000 sets of mini-calendars, 20,000 sheets of stickers.

Results of Campaign

The project radish was named "Bigo," and this trade name was registered by the name of TIGEM. The sample offer met with public approval and it was noted that many people made purchases immediately after tasting sample chips. As orders placed by retail stores appeared to be continuous, it was understood that the campaign was very effective. However, the expensive cost of transportation from the project site to retail stores in Ankara had to be borne by the project.

Since Japanese radish has been approved by the public through the campaign, it is presumed that Japanese radish can be introduced to general distribution channels in the future. Questionnaire was made only to 128 persons (73.4% were adults 21 to 60 years old) because the sample offer attracted the public attention. Answers were: favorable = 90.6%, better than red radish = 78.9%, price is reasonable = 91.4%.

2) Eating Quality Investigation of 1994 Spring Crop

A good harvest was gathered in the spring of 1992, but the Turks did not like this product because of its sharp taste. Since it was uncertain if this product could be sold in the markets, eating quality investigation was carried out in July 1994. Samples were distributed and Questionnaire

was done in Ankara for the spring Japanese radish . (Campaign was carried out for three days in Bagendic, the largest supermarket in Ankara. The product was advertised without the trade name of "Bigo.")

Number of Persons Questioned: 643

Items Questioned: Personal data ([1] age, [2] sex,[3] education,[4] occupation), [5] Do you like this product?, [6] Reason for Yes or No, [7] Do you like this better than red radish?, [8] Have you ever eaten "Bigo"?, [9] Do you like this better than "Bigo"?, [10] Is this product necessary for this season?, [11] Would you like to have this produced in Turkey?, [12] Is this product cheap?, [13] What would you name this product?

Prevailing answers were: [1] 21 - 60 years old = 76.9%, [2] male = 53.2%, [3] university graduate = 51.9%, [4] company employee = 33.6%, [5] yes = 90.8%, [6] yes, tasty = 23.3, no, bitter = 67.8%, [7] better = 61.3%, same = 26.9%,[8] Yes = 26.7%, [9] better = 40.7%, same = 32.4%, [10] yes = 92.1%, [11] yes = 94.9%, [12] yes = 87.7%, [13] GAP = 14.5%.

Although the product had a sharp taste, 90% of the people answered "yes," and it appeared the product was highly evaluated. Meanwhile, wholesalers and the buyers of supermarkets commented that the sharp taste was troublesome. For these reasons, it is not certain whether this product can be introduced to general distribution channels.

3) 1994 Fall Crop (see Table 2-4-44, Transaction Example)

Products were shipped to various cities, such as Konya, Izmit, Bursa, and Izmir, in addition to Istanbul, Ankara, and Adana. Business negotiations were made with the heads of wholesale markets prior to actual transactions. The results of sales activities are shown in Table 2-3-43. Total shipments were approximately 43 tons and the profit was 440,923,745 TL. The profit in US dollars exchanged at the rate of 15th of December (US$ = 37,384 TL) was $ 11,794 in total, or $ 0.275/kg. The highest price was offered in Ankara, followed by Izmit and Istanbul in that order. The highest rate of return was obtained in Ankara and Izmir, 2% lower in Istanbul, but there were no significant differences. Second class products, products affected by floods, were shipped to Adana at lower prices, but a rate of return of 80% or more was obtained here because the transportation cost was less. Wholesalers had advised that products would not be bought in the conservative city of Konya, even if the prices were lower, but orders were placed continuously and all products were sold out. For products shipped to Izmir and Bursa, general cargo trucks were hired because there were no trucks available for shuttle service. For this reason, sales unit price exceeded 10,000 TL but the rate of return was cut down by 50% because of the high transportation cost. From the example of transactions made in Istanbul, it can be seen that 23% was deducted for miscellaneous expenditures. Such expenditures included: commission 8%, total taxes (tax rate of 15%) 9%, transportation cost and its tax (tax rate of 15%) 10.8%, market charges and other expenses 3%. The above transportation cost did

not include the transportation from the project site to Tarsus (shipping base for the Midwest cities).

Table 2-4-44 Sales of Japanese radish

Name of City	Sales by Weight kg	Av.Unit Price TL	Sales Revenue TL	Revenue Profit TL	Profit TL/kg	Rate of Return
Istanbul	18,723	13,195	247,051,000	188,289,323	10,056	76.2
Ankara	3,483	15,904	133,534,000	104,805,935	13,696	78.4
Adana	14,505	7,793	113,051,200	94,203,936	6,494	83.3
Izmit	2,647	13,796	36,520,000	28,529,100	10,777	78.1
Konya	2,222	8,591	19,089,500	16,182,410	7,282	84.8
Izmir	829	10,780	8,937,000	4,445,461	5,362	49.7
Bursa	413	14,794	6,110,000	4,467,580	10,817	73.1
Total	42,822		564,292,700 TL	440,923,745 TL		

Transaction Example (Istanbul) November 25, 1994

No. of Case	Weight(kg)	Unit Price(TL)	Proceeds
8	191	15,000	23,572,000 TL
2	47	14,000	
31	741	13,000	▲ 5,435,680(Fees and taxes)
33	793	12,000	
4	90	10,000	
Total 78	Av. 1,862	Av. 12,660	18,136,320 (Sales Profit)

4) 1995 Fall Crop (see Table 2-4-45, Transaction Example)

In Istanbul, Ankara, and Adana, farm products from private farms were arriving at markets at first from the previous season. Shipment for sales began this year in the eastern parts of Turkey to extend the market throughout the country. Shipment to various cities was made as shown in Table 2-4-44. For the eastern area markets, shipments were made to Osmaniye, located in an area 50 km east of the project site, from where products were transported to the prefectures of Van, Mardin, and Batman. At least 70% of the total shipments were sold through this route. Products were favorably accepted and the rush of orders could not all be filled. Prices of vegetables, not limited only to radish, were low during the year and the sales profit per kg fell below 10,000 TL. Sales profit from the shipment to Osmaniye was only 7,501 TL/kg. This is equivalent to US$ 0.133 at the exchange rate of December 15. Rate of return from shipments to Istanbul and Ankara decreased by 10% from those of the previous year. Reason for this could be because the lowered price increased the proportion of costs for transportation. One of the buyers in Ankara became bankrupt while products were being shipped, and has not made payment. The rate of return for the shipments to Bursa, in a remote area, was the high rate of 88.8%. This could be because the transportation cost was borne by the project. If the normal procedures were followed, the rate of return should have been equal to that of Istanbul. Since the costs of transportation to the three cities of Iskenderun, Ceyhan and Osmaniye were also borne by the project,

the rate of return was high. The total shipment of this year exceeded 120 tons in weight,gross profit was approximately 907,000,000 TL, or US$ 16,117 at the exchange rate of December 15.

Table 4-4-45 Sales of Japanese radish

Name of City	Sales by Weight kg	Av.Unit Price TL	Sales Revenue TL	Revenue Profit TL	Profit TL/kg	Rate of Return
Istanbul	7,330	13,365	97,967,000	67,242,113	9,173	68.6
Ankara	858	15,175	13,020,000	9,258,400	10,790	71.1
	(2,352)		Not Paid (became bankrupt)			
Adana	4,245	-	-	18,927,780	4,459	-
Bursa	598	13,988	8,365,000	7,427,880	12,421	88.8
Izmit	649	16,521	10,722,000	4,934,736	7,603	46.0
Izmir	963	11,899	11,459,000	▲ 1,518,957	-	0.0
Iskenderun	6,700	9,921	66,471,500	59,075,500	8,817	88.8
Ceyhan	8,836	7,294	64,447,000	54,362,850	6,152	84.4
Osmaniye	87,547	8,886	777,931,000	656,727,996	7,501	84.4
TIGEM	3,050	-	-	30,500,000	10,000	-
	120,776kg	without bankruptcy		906,938,298TL	7,509TL	

Transaction Example (Osmaniye) December 15, 1995

No. of Case	Weight(kg)	Unit Price(TL)	Proceeds
210	4,554	6,000	146,666,000 TL
480	9,830	7,000	
125	2,078	8,000	▲ 23,060,000(Fees and taxes)
19	312	9,000	
30	500	9,500	
153	2,635	10,000	
Total 1,017	Av. 19,909	Av. 7,367	123,606,000 (Sales Profit)

5) Discussion

It can be seen that the sales tests which began in 1993 have progressed smoothly. In 1993, sales tests were performed in Istanbul, Ankara and Adana, and an advertisement campaign was carried out in the capital. In 1994, sales routes were extended to four major cities in addition to the three cities of the previous year. In 1995, efforts were made to strengthen markets in the major cities and to extend markets to the eastern parts of the country. In 1994, radish cultivation started in private farms, and it is said that in 1995 a large amount of radish was shipped to major cities in the Midwest district. However, it is said that the quality of products from private farms was questionable. Conversely, products shipped from the project site were favorably received. Because local producers have not attained a thorough knowledge on field husbandry of radish and quality control. The number of seeds of long-root radish available in Turkey is very limited, and a combination of optimum location, optimum crop type, and optimum variety has not been established. It can be expected that better

varieties will be introduced and technical guidance will be provided for sales methods and field husbandry by private seed company in the future.

Sales profit of $ 0.275/kg in 1994 decreased by nearly a half, to $ 0.133/kg in 1995. Variations in prices of vegetables are difficult to control, but it can be seen that current level of sales profit ranges from $ 0.15/kg to $ 0.25/kg.

2-4-5. Broccoli

(1) Trial Cultivation

1) 1992 Spring Crop Testing

a. Objectives and Methods

Broccoli was the item which was not included in the initial test plan. It is not generally consumed by the Turkish people, however, it has a high demand as a high-class product. There is already a potential demand and expansion to the general public can be expected. A good crop can be expected as the spring crop if it can be harvested before the period of high temperature in Summer. As the fall crop, its cultivation during the seedling of raising period in summer is difficult, but since it becomes cooler from November, a certain climate for broccoli can be expected. It is produced as a frozen product in the factory of agricultural product processing in Bursa. In consideration of these conditions, it was decided to test introduction of a Japanese variety. Variety of Ryokutei was used. It was planted in rows in sowing box. After its germination, the seedlings were transplanted to the small transparent polyvinyl pots. The cultivating distance was 65 cm x 45 cm. The irrigation method was the overhead boom-type sprinkler.

Cultivating Schedule:

b. Results

Good products were obtained without much damages due to disease and insects. However, harvesting time was not uniform, and the products in the later stage had disorders in flower buds. When the broccoli was boiled for tasting, it was favorably received by the Turkish people.

2) 1993 Spring Crop Testing

a. Objectives and Methods

The broccoli was cultivated in the same manner as that of the 1992

spring crop. However, the species used were "Haitsu," "Green Comet," "Syastar" and "Ryokutei."

Cultivating Schedule:

b. Results

The disorder in flower buds and variation in the harvesting time which seemingly occurred due to the delay seeding and high temperature during the harvesting period were remarkably noticed. In some products a part of flower buds had been rotten and after they were dried became to yellow.

(2) Selection Test of High Quality and High Yielding Varieties

1) 1993 Fall Crop Testing

a. Test Methods

Four varieties were planted at four different times based on the results of the trial cultivation of 1992 and 1993 spring crop. Selected seeds were planted in rows spaced 6 - 7 cm apart in the wooden sowing boxes, and were transplanted to the pots using small transparent vinyl bags. The seedlings were grown under the shading net. Setting was made with the distance between the plants of 45 cm and the distance between the rows of 65 cm. Two tons/10 a. of manure and fertilizers in the ratio of N:P:K = 17:12:15 kg/10 a. were used for cultivation.

Cultivation schedule:

	Seeding	Setting	Harvesting	No.of Days for harvest
No.1	7/24	8/31	10/18～12/ 6	86～105
No.2	8/ 5	9/ 3	10/18～11/23	74～110
No.3	8/15	9/11	11/ 6～12/ 1	83～108
No.4	8/25	9/18	11/ 9～12/30	76～127

b. Test Results (see Table 2-4-46)

Test plot was made without repetition. However, due to obstacles in the raising of seedling period, the constant number of seedlings was not obtained. Therefore, comparison of the harvest of all plants in the test plot except those in the border was made. "Green Comet" No.3, "Haitsu" No.1, No.2 and No.3 had good yield and good products in high rate. And, the expected yield per 10 a. exceeded one ton. Uneven flower buds and occurrence of rotten were conspicuous with "Syastar." "Ryokutei" was planted in only No.4, but good products were obtained. However, the yield was comparatively fewer (The expected harvest per 10 a.: 860 kg). In this

cultivation, the damage by birds during the raising of seedling and the damage of rotten during the flower bud forming period were the problems. The powdery mildew and flower bud rotten occurred and were treated with chemical spraying.

Table 2-4-46 Result of selection test of variety and seeding time

Varieties	No.of Total Plants	Vacant Plants	Average Weight g	Dev.	Period of Harvesting	Expected Harvest kg/10 a.
Green Comet						
No.1	6		295	100	10/18～10/26	1,000
No.2	13		201	78	10/18～10/26	687
No.3	34		407	138	11/ 6～11/19	1,390
No.4	33	3	204	89	11/19～12/16	630
Haitsu						
No.1	35		294	186	11/ 9～12/ 6	1,000
No.2	38		315	85	11/ 6～11/23	1,070
No.3	36		310	119	11/ 6～12/ 1	1,050
No.4	33		228	82	12/ 1～12/30	770
Syastar						
No.1	55		301	152	10/26 ～11/19	1,020
No.2	41		391	113	10/26 ～11/23	1,330
No.3	33	1	351	114	11/19 ～12/ 1	1,160
No.4	36		191	55	11/19 ～12/16	650
Ryokutei						
No.4	32	1	260	118	12/16 ～12/30	860

Note: Seeding dates; 1 - July 24, 2 - August 5,
3 - August 15, 4 - August 25

2) 1994 Spring Crop Testing

a. Test Method

Six varieties were planted at seven different times based on results of the selection test of varieties in 1992 and 1993 spring crop. The cultivation method was the same as that of 1993 fall crop.

Cultivation Schedule:

No. 1 - 7 1/31 - 3/18
└──────────
Seeding

b. Test Result

Due to the rain, the field could not be prepared until the middle of April and the time of setting was missed. As the powdery mildew diseases occurred during the raising of seedling, good seedlings were not obtained. To get good products is difficult in spring crop compared with fall crop. Since it was confirmed that this type of cultivation is unsuitable in terms of the field preparation due to the local climatic conditions, it would be

expected the economical cultivation was difficult, and cultivation was stopped.

3) 1994 Fall Crop Testing

a. Test Method

Six varieties were planted at five different times based on the past testing results. Seeds were sown to the soil block with the size of 4.5 cm square made of the peat moss and field soil mixed in the ratio of 2:1. The cultivation method was the same as that of 1993 fall crop. Except fertilization of that two tons/10 a. of manure and 25 kg/10 a. of ammonium sulfate were given.

Cultivation Schedule:

	Seeding	Setting	Harvesting	No.of Days for harvest
No.1	8/ 3	8/29	10/28～11/ 8	86～ 97
No.2	8/12	9/ 6	10/28～11/ 8	77～ 88
No.3	8/22	9/12	11/ 1～11/15	71～ 85
No.4	9/ 6	9/28	12/ 7～12/21	92～106
No.5	9/16	10/ 6	12/21～ 1/16	96～122

b. Test Results (see Table 2-4-47)

Since the analysis of soil consigned to the Agricultural experiment station was delayed, fertilizers were given on the basis of the analysis result of the previous year, but it seemed that its amount was insufficient. Reason for this can be because the place of cultivation was relocated to field crops test areas from the old fields where vegetables had been tested. The result of soil analysis obtained later showed similar result. Therefore, the initial growth after setting was poor, and the thickening growth of flower bud was also poor. Therefore, good testing result was not obtained. Coupled with much rain, the effect of additional fertilization was not seen. To dare to mention, however, a small amount of good crop were obtained in the "Green Comet" No.1 - No.4 and "Haitsu" No.1 and No.2. A considerable amount of harvest was obtained in "Syastar" No.1. However, in the same manner as in the previous year, the disorder in flower buds were conspicuous and much damage of rotten occurred. With the other three varieties, thickening of flower bud was poor, and good crop was not obtained. During the raising of seedling, the damage by birds was treated with a net, and after setting the damage by field mouse was treated with rodenticides. The occurrence of the powdery mildew and rotten was treated with chemical spraying.

Table 2-4-47 Selection of variety and seeding time

Varieties	Missing Plant	Av. Weight g	Deviation	Average Diameter cm	Harvesting Period	Expected Harvest kg/10 a.
Green Comet						
No.1	1	198	147	13.4	10/28～11/ 3	676
No.2	0	139	70	12.5	10/28～11/ 5	475
No.3	1	88	62	9.4	11/ 1～11/ 8	300
No.4	0	116	67	10.5	12/ 7～12/21	396
No.5	0	25	13	5.7	12/28～ 1/16	85
Haitsu						
No.1	0	109	63	10.6	11/ 1～11/ 8	369
No.2	0	116	56	10.1	11/ 3～11/ 8	396
No.3	0	30	13	5.4	11/ 5～11/10	102
No.4	0	37	13	6.4	12/ 7～ 1/16	126
No.5	0	65	23	10.2	1/ 5～ 1/16	222
Syastar						
No.1	3	300	88	17.6	11/ 1～11/ 5	1,025
No.2	1	197	80	14.0	11/ 5～11/10	673
No.3	0	142	44	11.6	11/ 5～11/10	485
No.4	0	131	69	11.4	12/ 7	447
No.5	5	24	9	5.3	12/21～ 1/16	82
Ryokurei						
No.1	0	66	43	7.6	11/ 5～11/15	225
No.2	1	37	29	5.5	11/ 8～11/15	126
No.3	0	49	26	6.4	11/10～11/15	167
No.4	0	51	11	6.7	12/21～12/28	174
No.5	0	96	35	11.2	1/ 5～ 1/16	328
Ryokutei						
No.1	0	59	49	7.5	11/ 8～11/15	201
No.2	0	67	39	7.5	11/10～12/ 7	229
No.3	1	53	29	6.6	11/15～12/ 7	181
No.4	0	42	11	6.2	12/21～ 1/ 5	143
No.5	2	78	44	9.1	1/16	266
Gurieer						
No.1	4	60	46	7.0	11/ 8～11/15	205
No.2	0	88	38	8.2	11/ 8	300
No.3	3	52	36	6.5	11/ 8～12/ 7	177
No.4	0	29	10	4.7	12/ 7	99
No.5	2	63	22	8.1	1/ 5～ 1/16	215

4) 1995 Fall Crop Testing

a. Test Methods

Ten varieties were planted at five different times based on the past testing results. Seeds were sown to the soil block with the size of 4.5 cm square made of the peat moss and field soil mixed in the ratio of 2:1. The cultivation method was the same as that of 1994 fall crop, except fertilization of that two tons/10 a. of manure and chemical fertilizer in the ratio of N:P:K = 15:16:22 kg/10 a.

Cultivation Schedule:

	Seeding	Setting	Harvesting	No.of Days for Harvest
No.1	7/26	8/21	10/17～11/25	83～122
No.2	8/ 3	8/29	10/17～11/25	75～114
No.3	8/14	9/ 4	10/31～11/25	77～103
No.4	8/24	9/14	10/31～12/14	68～122
No.5	9/ 4	9/28	11/25～ 1/ 8	82～126
No.6	9/14	10/ 6	12/25～ 1/ 8	102～115

b. Test results (see Table 2-4-48)

In No.1 through No.4, a vigorous growth was obtained on the whole, but thickening growth of flower bud was not so good. In the "Green Comet" No.1 and No.2 and the "Haitsu" No.1, a certain level of good crop was obtained. Although the harvest survey was not conducted, growth of the lateral flower bud was vigorous on the whole, and some of them showed the same level of main flower bud. While in the No.5 and No.6, growth of plants were poor, good flower bud were obtained in the No.6 of "Haitsu," "Ryokutei," "Senshi" and "Green Variant." Looking at the "Green Comet" of the extremely early maturing type, the harvesting periods of No.1 - No.3 were almost the same. It seems that differentiation of flower bud took place at the same time, and the difference of thickening growth of flower bud took place in accordance with growing status of the plants. There is a possibility that the periods of differentiation of flower bud deviated, and thickening growth was suppressed due to the high temperature during the flower bud thickening period.

3) Discussion

As for the seeding period, the later part of July through the later part of August seems viable, but depending on the varieties. However, the result concerning the appropriate variety and appropriate seeding period for the whole period could not be obtained. Concerning the extremely early maturing type of "Green Comet," it seems that seeding in the later part of July was most stable, and that cultivation is viable. However, in the case of the 1993 fall crop, good harvest was obtained with the seeding in the beginning and middle of August, and the possibility cannot be abandoned. Concerning other varieties and seeding periods, stable result was not

Table 2-4-48 Selection of species and seed planting period

Varieties	Lack-ing Stocks	Av. Weight g	Deviation	Average Diameter cm	Harvesting Period	Expected Harvest kg/10 a.
Green Comet						
No.1	0	221	110	14.1	10/17 ～10/27	817
No.2	0	103	56	10.5	10/17 ～10/23	381
No.3	4	51	29	7.2	10/17 ～10/27	152
No.4	1	45	30	6.0	10/31 ～11/ 6	160
No.5	1	32	13	5.0	11/25 ～12/ 4	114
No.6	2	44	29	5.2	12/25 ～12/25	151
Haitsu						
No.1	0	100	51	9.9	10/17 ～11/ 6	370
No.2	1	80	50	6.1	10/23 ～11/ 6	286
No.3	1	72	36	7.0	10/27 ～11/ 6	257
No.4	3	73	33	6.7	11/14 ～11/25	243
No.5	1	52	23	6.1	12/ 4 ～12/25	185
No.6	0	131	74	9.2	1/ 8 ～ 1/ 8	484
Ryokutei						
No.1	0	44	18	5.2	10/27 ～11/25	162
No.2	0	59	32	5.8	10/31 ～11/14	218
No.3	1	50	24	5.5	10/27 ～11/ 6	178
No.4	1	52	19	5.8	11/25 12/ 4	185
No.5	0	31	11	4.1	12/ 4 ～12/25	114
No.6	0	72	26	6.5	1/ 8 ～ 1/ 8	266
Maraton						
No.1	1	75	50	6.6	10/31 ～11/25	268
No.2	0	70	21	6.2	11/ 6 ～11/25	277
No.3	1	85	36	7.3	11/ 6 ～11/14	304
No.4	0	114	58	6.9	12/14 ～12/14	421
No.5	0	118	70	7.9	12/14 ～ 1/ 8	436
No.6	0	73	36	6.2	1/ 8	270
Sultan						
No.1	1	62	43	7.4	10/17 ～11/14	221
No.2	2	39	29	5.1	10/23 ～11/25	134
No.3	1	39	21	5.4	10/27 ～11/25	139
No.4	1	55	36	5.9	11/25 ～12/ 4	196
No.5	0	77	41	6.5	12/ 4 ～12/14	284
No.6	2	50	37	5.3	12/25 ～ 1/ 4	172
Senshi						
No.1	0	91	46	7.4	10/27 ～11/25	336
No.2	0	54	24	5.9	10/27 ～11/ 6	199
No.3	1	77	32	6.7	11/ 6 ～11/25	275
No.4	0	93	38	7.4	11/25 ～12/ 4	344
No.5	0	43	13	5.0	12/ 4 ～12/25	159
No.6	0	114	66	8.7	1/ 8	421
Green Valiant No.1	0	45	20	5.2	10/27 ～11/25	166
No.2	0	64	27	6.4	10/27 ～11/ 6	236
No.3	1	55	15	5.8	11/ 6 ～11/14	196
No.4	1	85	34	7.1	11/25 ～12/ 4	304
No.5	0	42	18	4.9	12/ 4 ～12/25	155
No.6	1	105	41	7.8	1/ 8	375

obtained, and conclusion was not obtained. For example, in the case of the medium early maturing type of the "Haitsu," good result was obtained

in the planting in the later part of July through the later part of August in the 1993 testing, but in the 1995 testing, the harvest was poor. It would be necessary to carry out a repetition testing in the future.

(3) Test of Establishing Techniques for Mass Production of Seedlings

1) Test for the Raising Seedling of Method in 1994 Fall Crop

a. Test Methods

The following six types of processing were carried out, using the soil block machine and the cell (plug) seedling production system. With the 30 stocks in each testing lot without repetition, the "Haitsu," was used as the variety. The cultivation method except the raising of seedling method after seeding was the same as the selection test of variety. In all the processing, the seedlings were directly planted in the testing field without transplanting.

① Cell seedlings - 72 holes: 72 cylindrical seedling cells with the diameter of 4.0 cm x 4.9 cm per each panel
② Cell seedlings - 144 holes: 144 cylindrical seedling cells with the diameter of 3.2 cm x 4.9 cm per each panel
③ Cell seedlings - 220 holes: 220 cylindrical seedling cells diameter of 2.6 cm x 4.9 cm per each panel
④ Soil block - 3.5: 120 seedling blocks with 4.5 cm square per each panel
⑤ Soil block - 4.5: 72 seedling blocks with 4.5 cm square per each panel
⑥ Soil block - 5.5: 50 seedling blocks with 5.5 cm square per each panel

* Manufactured compost (made in Japan: Yosaku-15) was used for the cell seedlings. As the soil block, the field soil and manufactured peat moss were mixed in the ratio of 1:2.

b. Test Results (see Table 2-4-49)

Table 2-4-49 Comparison of the raising seedling method

Type of processing	Lack -ing Stocks	Av. Weight g	Devia -tion	Average Diameter cm	Harvesting Period	Expected Harvest kg/10 a.
Soil Block						
3.5	6	38	5.6	5.6	10/28 ～11/ 3	129
4.5	1	51	7.3	7.3	10/28 ～11/ 5	174
5.5	0	57	7.2	7.2	11/ 1 ～11/ 8	194
Cell Seedlings						
220	3	90	7.8	7.8	12/ 7 ～12/21	307
144	0	48	8.0	8.0	12/28 ～ 1/16	164
72	1	84	8.5	8.5	12/28 ～ 1/16	287

There was almost no occurrence of poor seedling in the six types of processing, and showing good result. After germination, the seedlings showed good growth. On the whole, growth was poor, and thickening of flower

buds were not good. (Refer to the item of selection test of variety in 1994.) To dare to compare the results, the processing of the 220 holes were excellent in terms of both yield and average weight.

2) Mechanical Planting Test in 1994 Fall Crop

a. Test Methods

By using the tractor attachment for Mechanical planting of the vegetable seedling with two-rows (made by MAS, Italy), the seedlings were planted in the field by the following raising of seedling method and their conditions were checked. For each processing, the length of 40 meters was planted, and the number of planted seedlings and their conditions within five meters of one row were surveyed at two places. In order to improve the soil crushing condition in the field preparing, harrowing and irrigation were repeatedly carried out by using a Japan-made rotary. While the mechanical planting machine was for the two-row planting, it was operated with three persons on board (One person is an assistant for panel replacement and seedling remove.)

① Cell seedlings - 72 holes: 72 cylindrical cell seedlings with the diameter of 4.0 cm x 4.9 cm per each panel
② Cell seedlings - 144 holes: 144 cylindrical cell seedlings with the diameter of 3.2 cm x 4.9 cm per each panel
③ Cell seedlings - 220 holes: 220 cylindrical cell seedlings with the diameter of 4.0 cm x 4.9 cm per each panel
④ Soil block - 3.5: 120 soil block seedlings with 3.5 cm square per each panel

b. Testing Result (see Table 2-4-50)

Table 2-4-50 Result of mechanical planting

Processing	No. of Seedlings/5 m	Good	Poor	Lacking Stock
Cell seedling - 72 holes	17	16	1	0
Cell seedling - 144 holes	16	15.5	0.5	0
Cell seedling - 220 holes	16.5	16.5	0	0
Soil block - 3.5 cm	15	11.5	2.5	1

The testing result is indicated as an average of two places. The tractor run at the slowest gear of 40 m/3 minutes 32 seconds (approximately 680 m/hr) on the average, and they were generally transplanted in a good condition. The number of seedlings fallen within 5 meters was 15 -. 17, at

the interval of 30 cm which is almost as per the standard. While approximately 95% of each processing of the cell seedlings was transplanted in good conditions, it lowered to 70% with the soil block. This seems to be due to the shape of the roots part of the seedling. In other words, as the root part of the cell seedling is cylindrical, it is difficult to be hooked up within the cup for planting the seedling. On the other hand, the soil block is cubic, and the corner can be easily hooked up within the cup, and in addition, since it is a small size, it seemed to be susceptible to the effect.

c. Discussion

As a result, good result was obtained with the cell seedlings. This was because the preparation of the field was adequately made. In other words, even if the field solidified in the dried condition during the setting period is cultivated by the disk hallow or rotary, the soil crushing is not sufficient. With the mechanical planting test carried out under such a condition, many poor plants were occurred. Therefore, harrowing was carried out again by waiting until adequate water level is achieved after irrigation. Since mechanical planting cannot be made unless the field is evenly flat, the leveling work is also required. Thus, since the land preparation takes much trouble and is inefficient in the field with such a clay soil as in the current project site, the mechanical planting can not be suitable for it. However, it was found out that the mechanical planting is practical if the field preparation is made sufficiently. In other words, if the soil conditions are good, the work can be carried out efficiently, and the technology can be introduced to the cultivation system in a larger area. In such a case, the irrigation work after planting must be carried out speedily. Because the dryness and high temperature are severe during this planting period of this cultivation type, delayed or uneven irrigation may cause poor growth or lacking plants. The boom-type sprinkler adopted by this project can sufficiently respond, but, if the normal sprinkler is to be used, there should be to install a large number of pipes and nozzles. In order to establish the cultivation system by introducing this technology, it is necessary to survey the work efficiency in the field with good soil condition and carry out the cost comparison with the manual case.

(4) Sales

The product in 1993 autumn crop was sample shipped to Istanbul and was favorably received. The shipment and sales were tried in order to study a possibility of sales when a large-scale production is implemented.

1) 1994 Fall Crop (see Table 2-4-51)

While shipment and sales were made mainly in Istanbul, the volume was less than 1 ton. Broccoli is not yet common in Turkey and consumers are limited. The sales results in the respective cities are as shown in Table 2-4-51. Both the unit price and sales volume were good in Istanbul with

the shipment of approximately 600 kg during the period from November 10 through February 4. The sales profit per kg was approximately TL 44,000, 3.2 times as much as that of radish which was shipped and sold at the same time. In other cities, both shipment and sales were less and they did not serve as the appropriate shipping destinations. In Ankara, as the radish dealer did not handle the broccoli, which were not marketed there, but they were sold in some high-class supermarkets, and it was confirmed that there is a demand for broccoli. Although it is not described in the statement of sales, direct wholesaling was made to the Chinese restaurant and supermarket in Adana. Although the quantity and the number of sales were small, the unit price was TL 80,000 per 1 kg, and showed that there was a potential demand.

Table 2-4-51 Sales statement of broccoli

City	Sales Volume	Average Unit Price	Sales Income	Sales Profit	Profit/kg	Profit-ability
Istanbul	595 kg	TL 54,280	32,335,000	26,180,590	43,949	80.9
Adana	79	22,873	1,807,000	1,528,985	19,354	84.6
Izmit	25	20,000	500,000	401,010	16,040	80.2

Example of transaction (Istanbul) November 10, 1994

No. of Boxes	kg	Unit Price	Sales Amount
9	48	TL 60,000	TL 3,080,000
1	5	40,000	- 812,160 (handling charge, tax, etc.)
Total 10	53	Av. 58,113	2,267,840 (sales profit)

2) 1995 Fall Crop

In the same manner as the previous year, shipment and sales were tried in Istanbul. Due to the fact that the volume of vegetables handled in the market decreased and that the prices of vegetables as a whole were stagnant, the transactions were limited to an extremely small amount. The total sales volume including the direct transactions in Adana (Chinese restaurant and supermarket) was slightly over 100 kg. The transacting unit price in Istanbul was TL 72,314/kg on the average and TL 120,000/kg at the highest. The transacting cases were as shown below table. While approximately 90 kg was shipped to Germany, they were unfavorably received as the size was small. Since they might not have been pre-cooled, when the broccoli arrived in Germany, they already started yellowing, and were not offered for sales. Thus, the testing result was not obtained in both of domestic and export.

Sales Cases (Istanbul) November 6, 1995

No. of Boxes	Kg	Unit Price	Sales Amount
8	17	TL 40,000	Tl 980,000
1	5	60,000	- 293,584 (handling charge, tax, etc.)
Total 9	22	Av. 44,545	686,416 (sales profit)

3) Discussion

In the 1994 sales testing, approximately 700 kg was shipped and sold, and a certain data was obtained. However, in the 1995 sales testing, the shipping volume to the Istanbul wholesale market decreased to less than 100 kg. According to a wholesaler, as a black market has been formed, purchase by the retailers decreased remarkably. However,as in the supermarkets in Istanbul, Ankara, Izmir, etc. The broccolis are actually marketed, it does not mean that there is no sales channel. Concerning export, the agents say it is possible to handle broccoli. If sufficient negotiation is made before cultivation (concerning shipping period, volume, standard and method), sales are possible. If the testing is to be continued in the future, securing not only the wholesale market, but such domestic sales routes as leading supermarket chains would be required.

2-5. Study and Verification of Fruit Growing Technologies

2-5-1. Verification Tests on the Growing of Kiwi Fruit, Peaches and Plums

(1) Purpose

Regarding kiwi fruit, peaches and plums, irrigated growing was conducted on an experimental basis, for the purpose of verifying the feasibility of large-scale production of these fruits.

(2) Test Method

1) Fruits for Experiment

Fruit varieties tested were as follows.

Kiwi fruit: Hayward, Tomuri
Peaches : Dixi Red, Early Red
Plums : Can, Papaz, Formosa

Kiwi fruit seedlings were those produced in Japan, and seedlings of peaches and plums were those produced in Turkey.

2) Experiment Farm

a. Experiment Field

The experiment field comprised the following sizes of rectangular lots extending north and south.

Kiwi fruit: 275 a (313 m x 88 m)
Peaches : 200 a (313 m x 64 m)
Plums : 200 a (313 m x 64 m)
Total 675 a (67.5 da)

b. Planting Intervals

Each of the lots was divided into two sections for providing a sparse planting section and a dense planting section. In both areas, rows were provided at intervals of 6 m east and west, and seedlings were planted at intervals of 6 m in the sparse planting section and at intervals of 3 m in the dense planting section.

c. Arrangement of Varieties

① Regarding kiwi fruit, Hayward seedlings were first planted at the above-mentioned intervals, and then Tomuri seedlings were planted in every fifth row, in which Hayward seedlings had been already planted, with every two Hayward seedlings apart.
The number of Hayward seedlings planted was 898, while 85 Tomuri seedlings were planted.

② Regarding peaches, both the sparse planting section and the dense

planting section were divided into two, where about the same numbers of Early Red seedlings and Dixi Red seedlings were planted. Specifically, as the first 26 rows of the total of 51 rows belonged to the dense planting section, with the remaining rows belonging to the sparse planting section, Early Red seedlings were planted from the first to the thirteenth rows and from the twenty-seventh to the thirty- eighth rows, totaling to 25 rows. Dixi Red seedlings were planted from the fourteenth to the twenty-sixth rows and from the thirty-ninth to the fifty-first rows, totaling to 26 rows. The number of Early Red seedlings planted was 329, while that of Dixi Red seedlings was 338.

③ Regarding plums, Formosa seedlings were planted every fifth row from the third row of the total of 51 rows, and Can seedlings and Papaz seedlings were planted separately in the other rows. As a matter of fact, however, Can and Papaz seedlings proved to be planted promiscuously, with Papaz seedlings being planted irregularly from place to place in the rows of Can seedlings. As a result, 130 Formosa seedlings, 460 Can seedlings and 77 Papaz seedlings were grown.

The arrangement of the seedlings at the time of planting is shown in Fig. 2-5-1 for kiwi fruit, Fig. 2-5-2 for peaches, and Fig. 2-5-3 for plums.

3) Irrigation System

The drip irrigation system was adopted. In this system, a vinyl hose was laid under the seedlings along a row, and emitters were provided near the seedlings, for causing water to drip over the roots. This system needs a considerably smaller amount of water and less labor than the conventional row-spacing irrigation system. An emitter was capable of causing nine liters of water to drip in an hour. For three years from 1990 through 1992, one emitter was provided for each seedling for irrigation. In 1993, two emitters were provided for each seedling, to meet its growth. Regarding the quantity of irrigation water, five hours was regarded as one unit (45 liters per emitter), and intervals of irrigation days were varied according to conditions of rainfall and evaporation. In 1995, with the spread of crowns, two vinyl hoses were laid along the rows which had comparatively large trees, and three emitters were provided for each tree.

4) Cultivation Method

Seedlings were planted, in the middle of February 1990, in holes about 60 cm deep with a diameter of 50 cm to 60 cm. As initial fertilizer, 30 kg of compost and 500 g of phosphatic fertilizer were administered. For kiwi fruit, "T-bar" shelf culture was employed. "T-bars" were arranged along rows at intervals of 6 m, in both the sparse planting section and the

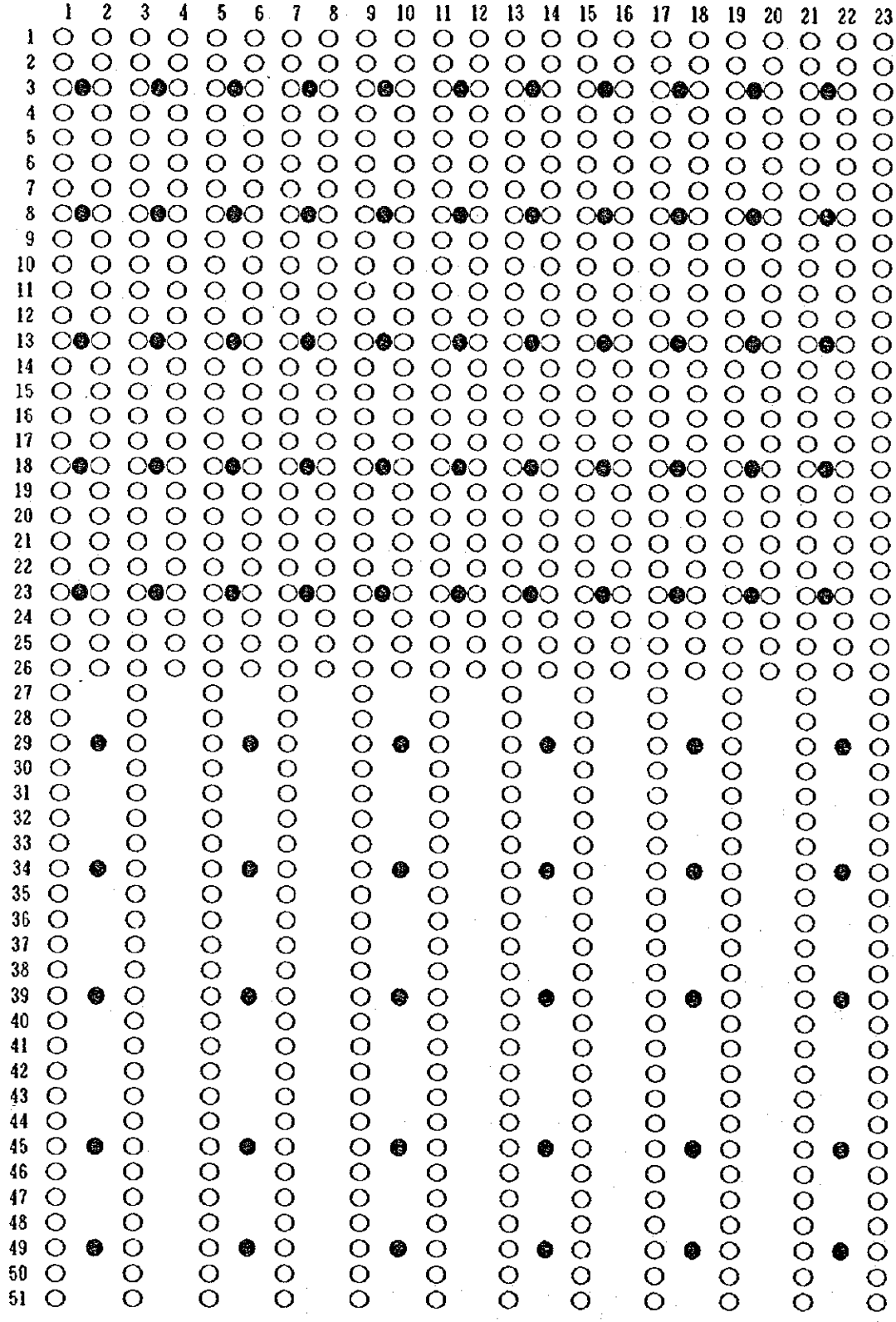


Fig.2-5-1 Arrangement of kiwi fruit trees

Note: ○: Hayward, ●: Tomuri

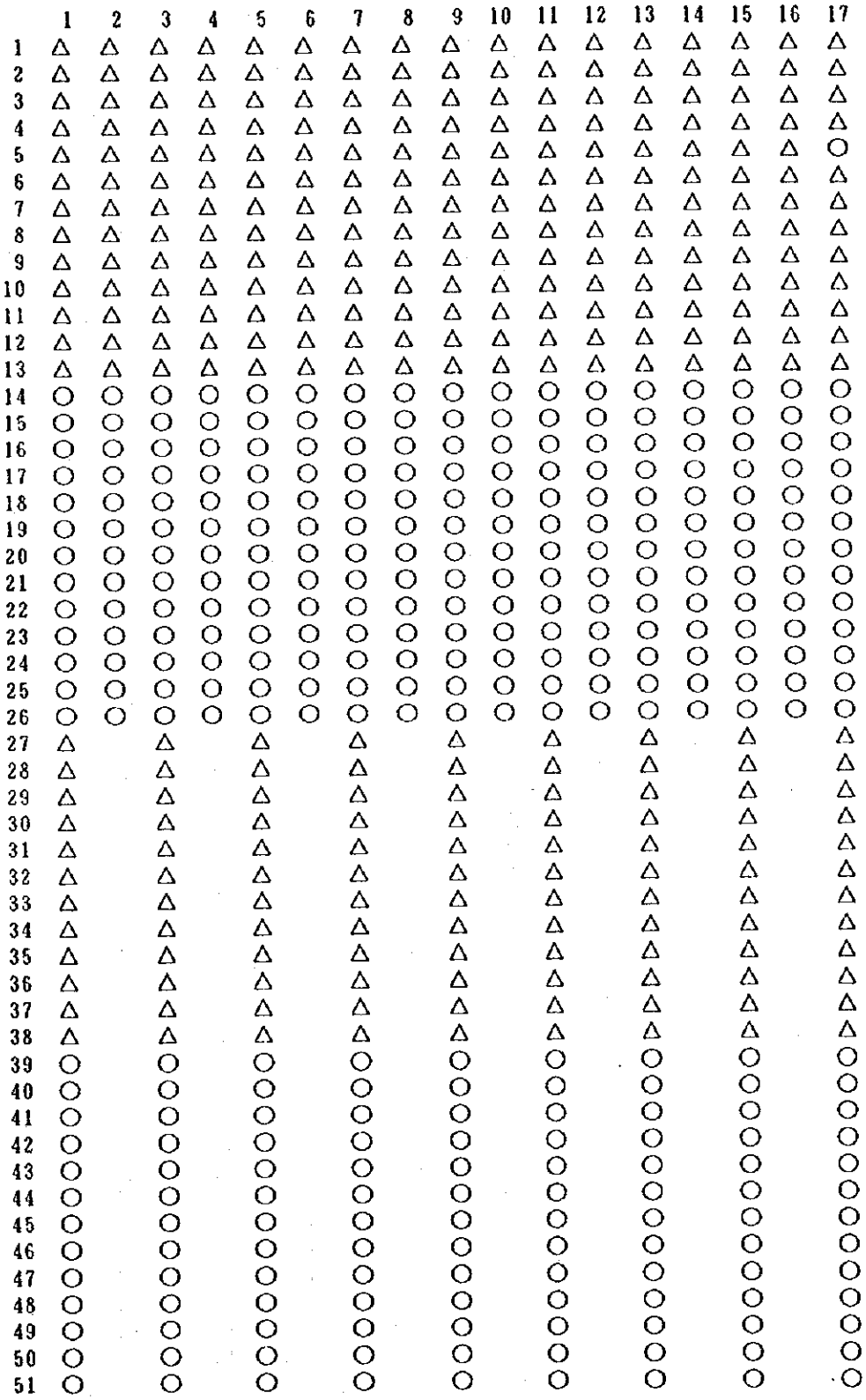


Fig.2-5-2 Arrangement of peach trees

Note: △: Early Red, ○: Dixi Red

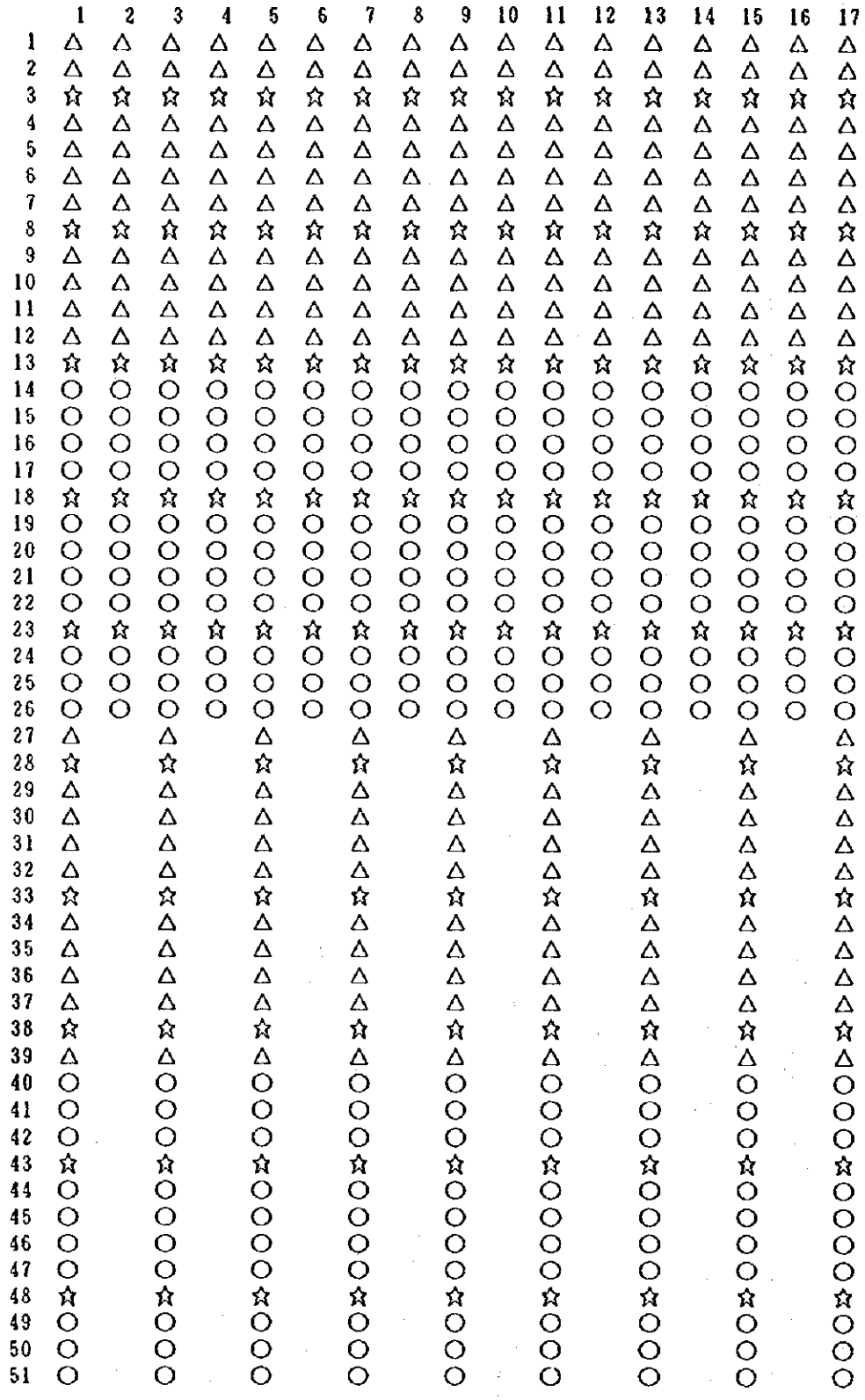


Fig.2-5-3 Arrangement of plum trees

Note: △; Papaz, ○; Can, ☆; Formosa