vegetable seedlings were transplanted just by the sides of the trenches thereafter. Such application of compost was practised before sowing or transplanting of each vegetable in the plot. It was applied almost thrice in a year, which comes about 20-30 tons of compost per hectare per year.

The compos making scheme at Rapti Model Farm has been presented on page No.6 of the presenting paper.

PREPARATION OF BED SOIL FOR RAISING VEGETABLE NURSERY

For some of the vegetables, it is necessary to raise seedlings in the nursery and then transplant to the main field when they achieve a proper size. In crops having small seed, the seedling are tender, weak and grow slowly. The small seedlings can be damage very easily by the insects and diseases. For these reasons the seed lings are raised in the nursery in fertile soil under the favourable weather conditions. As half of the total performance of the crop is achieved when the seedlings are sound, healthy and well managed. So to raise good seedlings, the importance of bed soil is great. The bed soil for raising vegetable nursery must satisfy the following conditions:-

1. It should have good aeration and good water holding capacity.
2. It should be able to supply enough nourishment to the growing seedlings.
3. It should be free from dangerous insects and diseases and noxious weeds.
4. It should have suitable soil reaction i.e. pH.

Well decomposed compost of crop-residue of cereals, oilsee and pulse crop group was selected for raising vegetable nursery at the farm. Also, virgin soil from the reservoir which was free from noxious weeds, dangerous insects and diseases was taken for this purpose. Well decomposed compost and virgin soil (as mentioned earlier) were piled in alternate layers in 1:1 ratio. Enough amount of water was sprinkled in each layer and then covered by straw-mat, or plastic sheet for fermentation. The size of the heap was kept 1.5 x 1.5 x 1.2m.

After six month of piling, the heap was broken vertically downward so that the soil and compost of every layer come down and then mixed well. If the compost was well drained and easy to get dry, some more compost and soil was added to increase the water holding capacity and 130 gms of each of N,P,K were added per metric ton of such soil. This bed soil was used for raising vegetable nursery as mentioned in fig. No. 1 of page No.7 in the presenting paper.

In case of urgency, we prepared the bed soil with carbonised rice husk. The carbonised rice husk was mixed with virgin soil as mentioned above in 1:3

ratio and 320, 650 and 210 gms of N,P,K respectively were added per one metric ton of soil. This type of bed soil was used immediately after preparation. Preparation method is mentioned in the fig. 2 of page No. 7 in the presenting paper.

Raising vegetables nursery and transplanting to the main field are elaborated on page No. 8 of the presenting paper.

EFFECT OF MULCHING ON SOIL TEMPERATURE

Soil mulching in vegetable cultivation seems to be quite an important measure in conserving the top soil, checking weeds, preserving moisture in the soil and also in controlling the soil temperature. Soil temperature plays an important role in governing the root and shoot development of the plant. Very high and very low soil temperature conditions are not good for the satisfactory development of the crops plants. The temperature of the soil nearer to root zone of crops is very much influenced by the environmental temperature. If the variation in the soil temperature is checked to some extent, it may create good soil ecology for the development of the crops. Taking this into account, a study was conducted at Rapti Model Farm during the lowest temperature day of the year. In this, the environmental and soil temperatures were recorded at every hour for 24 hrs. under mulch and no-mulch conditions. Mulches were of Rice husk and Rice straw.

The temperature of the surface at 5, 10, and 20 cms depth of soil varied according to the environmental temperature. But the variation was very high in the surface soil and goes on decreasing with the increasing depth of the soil. As from table - 1, the minimum temperature of the environment was 3.1°C where as it was 25°C, 8.5°C, 11.0°C and 13.8°C of the surface, 5, 10 and 20 cms depth of soil respectively. This minimum temperature condition was recorded between 7 to 8 a.m. Likewise the maximum soil temperatures during maximum environmental temperature of 20.4°C at 3 p.m. were 30.2°C of the surface, at 1 p.m., 20.7°C of 5 cms depth, at 2 p.m., 18.2°C of 10 cms at 4 p.m. and 5.9°C of 20 cms depth at 5 p.m. The temperature at 30 cms and 1 m depths of soil were almost stabilised. The table shows the soil-temperature variation went on decreasing with the increasing depth of the soil. Also, it took more time to influence the soil temperature at the deeper place of the soil under mulch condition. The fluctuation in the soil temperature at different depth level of soil was less in mulched condition than no-mulch condition.

The maximum temperatures at different depth levels in case of straw mulch were - 18.0°C, 15.8°C, 15.5°C, 15.2°C, 14.0°C and 17.0°C at surface, 5, 10, 20,

30 cms and 1m. depths respectively where as in case husk mulching, the temperatures were 20, 18.5, 16.5, 15.5, 14.8 and 17.5°C at the same depth leve s respectively. Likewise the minimum temper atures in straw mulch were - 8.8°C, 10.5°C, 12.0°C, 13.2°C, 14.0°C and 17.0°C and in case of husk mulch - 6.8°C, 10.5°C, 9.8°C, 13.6°C, 14.2°C and 17.5°C respectively at the same depth levels of soil. There was comparatively less variation in temperature in case of straw mulch at all depth levels of soil than the husk mulch condition. By this it seems straw mulch was more effective in stabilising the soil temperature as compared to husk mulch. It did not allow the temperature to go very high and very low under very low and very temperature condition of the surface.

This study was conducted in winter season under lowest temperature condition with a purpose to increase the soil temperature to suit to the crop for growth and development. The minimum temperature difference of the environment and that of straw mulch condition, was 5.7°C (3.1°C environmental temperature and 8.8°C of the surface soil in straw mulch) which was really a significant difference. By this, it was felt, the study was very much successful. The dire need of such study to increase the soil temperature during extremely low temperature condition of the year to raise the vegetable seedlings early, was also felt. As it is clear from the above table, such mulch was also effective during summer condition also.

Moreover, the straw mulch if not well rotten at the end of the crop, it's possible to remove it from the land and prepare for other crops. But, it might be difficult to remove the rice husk from the plot. Also rice straw could be available in plenty from the farm itself, but not the husk. Rice straw, wheat straw and also some of the grasses of the farm could be used for this purpose. But the rice husk ahad to be transported from outside and it might not be feasible as mulch on large scale. For this, straw mulch found to be more effective in all those respects.

Table 8 Soil Temperature

Recording Time	Soil Surface Temperature °C			Temperature at 5cms Depth °C			Temp. at 10 cms Depth °C			Temp. at 20 cms Depth °C			Temp. at 30 cms Depth °C			Temp. at 1 m Depth °C			Environment at Temperature
	No Mulch	Husk Mulch	Straw Mulch	No Mulch	Husk Mulch	Straw Mulch	No Mulch	Husk Mulch	Straw Mulch	No Mulch	Husk Mulch	Straw Mulch	No Mulch	Husk Mulch	Straw Mulch	No Mulch	Husk Mulch	Straw Mulch	°C
PM 5	15.8	15.0	14.5	19.5	17.5	15.8	18.0	16.0	15.5	15.9	15.2	15.2	15.0	14.8	17.0	18.0	17.5	17.0	17.5
6	12.5	13.5	14.2	19.8	17.0	15.0	17.5	15.8	15.5	16.0	15.5	15.2	15.0	14.8	17.0	18.0	17.5	17.0	14.0
7	10.4	12.0	12.5	16.4	16.0	14.5	16.9	15.0	15.0	15.8	15.4	15.2	15.0	14.8	17.0	18.0	17.0	17.0	11.7
8	9.5	12.0	12.0	15.0	15.5	14.0	16.2	15.0	15.0	16.1	15.4	15.2	15.0	14.8	17.0	18.0	17.0	17.0	10.5
9	8.4	11.0	11.5	13.9	15.0	12.5	15.6	14.8	15.0	15.9	15.3	15.1	15.0	14.8	17.0	18.0	17.0	17.0	9.6
10	7.2	10.0	11.0	13.0	14.5	13.0	14.8	14.0	14.0	15.7	15.3	14.9	15.0	14.8	17.0	18.0	17.0	17.0	8.7
11	6.5	9.5	11.0	12.2	14.0	13.0	14.3	13.0	13.5	15.5	15.2	14.9	15.0	14.8	17.0	17.8	17.0	17.0	8.0
12	6.4	9.0	10.8	11.5	13.5	13.0	14.8	12.5	13.0	15.4	14.9	14.7	15.0	14.8	17.0	17.8	17.0	17.0	7.7
AM 1	6.3	8.9	10.0	11.2	13.0	12.2	13.5	11.5	12.5	15.2	14.8	14.2	15.0	14.8	17.0	17.5	17.0	17.0	6.9
2	5.0	8.9	10.0	10.7	12.5	12.1	13.1	11.0	12.5	15.0	14.6	14.2	15.0	14.8	17.0	17.5	16.5	17.0	6.6
3	4.0	8.0	9.5	10.2	12.0	11.5	12.4	11.0	12.0	14.8	14.5	13.2	15.0	14.8	17.0	17.5	16.5	17.0	6.0
4	3.8	8.0	9.0	9.5	11.8	11.0	12.4	11.0	12.0	14.7	14.4	13.2	15.0	14.8	17.0	17.5	16.5	17.0	5.0
5	3.8	7.9	9.0	9.4	11.2	10.7	12.1	10.8	12.0	14.4	14.3	13.2	15.0	14.5	17.0	18.0	17.0	17.0	4.5
6	2.7	7.0	8.9	8.9	11.0	10.5	11.5	10.5	12.0	14.2	14.1	13.2	15.0	14.5	17.0	18.0	17.0	17.0	4.4
7	2.5	6.8	8.8	8.5	10.5	10.5	11.4	10.0	12.0	14.0	14.0	13.2	15.0	14.5	17.0	18.0	17.0	17.0	3.1
8	6.2	8.0	9.0	8.5	10.5	10.5	11.0	9.8	12.0	13.8	13.8	13.2	15.0	14.5	17.0	18.0	17.0	17.0	3.8
9	12.4	10.5	10.5	9.2	11.2	11.0	11.0	10.1	12.0	13.8	13.8	13.8	14.8	14.5	17.0	18.0	17.0	17.0	7.4
10	19.5	13.5	12.8	11.3	12.8	11.8	11.6	11.0	12.2	13.8	13.6	13.8	14.8	14.2	17.0	18.0	17.2	17.0	11.6
11	25.5	16.7	15.5	14.2	14.8	12.5	12.6	12.8	13.0	13.8	13.6	13.8	14.9	14.2	17.0	18.0	17.2	17.0	14.4
12	28.8	18.5	17.0	16.9	16.0	13.5	14.1	14.0	13.5	14.0	13.7	14.0	14.9	14.2	17.0	18.2	17.3	17.0	18.4
PM 1	30.2	20.0	18.0	19.3	17.5	14.0	15.5	15.0	14.2	14.2	13.8	14.5	14.9	14.2	17.0	18.2	17.5	17.0	18.6
2	29.4	20.0	17.8	20.4	18.0	15.0	16.8	16.0	14.8	14.6	14.3	14.5	14.8	14.0	17.0	18.2	17.2	17.0	19.4
3	27.8	19.2	17.0	20.0	18.5	15.0	17.7	16.5	15.0	15.2	14.5	14.2	14.8	14.5	17.0	18.2	17.2	17.0	20.4
4	24.1	18.0	16.0	21.0	18.0	15.0	18.2	16.5	15.0	15.5	14.8	14.5	15.0	14.5	17.0	18.3	17.2	17.0	20.1
5	16.8	15.0	14.0	20.0	17.5	15.0	18.1	15.9	15.0	15.7	14.8	14.5	15.0	14.5	17.0	18.0	17.2	17.0	18.0

RAISING VEGETABLE SEEDLINGS DURING WINTER SEASON
(FUMIKOMI)

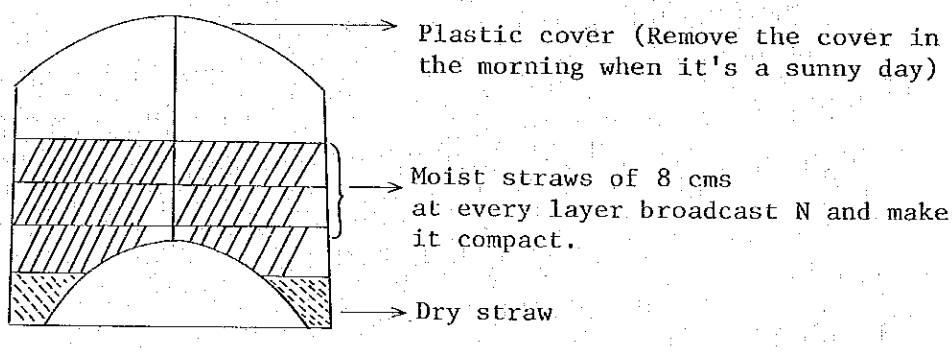
It is quite important for a vegetable grower to harvest vegetables early to fetch good price in the market. For early harvest, early seeding is quite essential. Problems usually occur during winter season when the environemental temperature is very low, the seeds does not germinate. If a vegetable grower is dependent on weather for the seeds to germinate it is rather impossible to harvest early. Some artificial means must be adopted for this, and Fumikomi seems to be an important measure in this direction. In this the fermenting temperature of the Rice straw is utilzed for the seeds to germinate.

CONDITIONS FOR FUMIKOMI:-

1. The ditch for this should be constructed near water source.
2. It should be near the residence.
3. It should be at well drained and low water table area.
4. It should be at best Sunshine area.
5. The side wall for this should be wooden preferably.
6. The moisture level of the straw should be 70%.
7. C/N of the rice straw adjusted at 30.

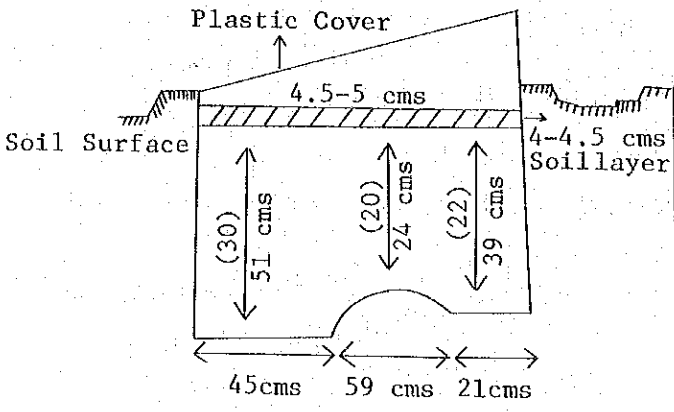
Ditch condition:-

Fig. 1



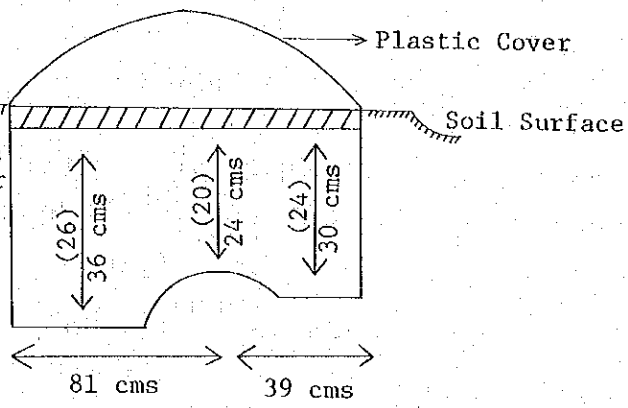
Plastic cover should be kept facing towards south to utilize the maximum Sun shine in the east to west direction of the Fumikomi ditch.

Fig. 2



Sowing bed

Fig. 3



Transplanting bed

The side wall of Fumikomi ditch should be wooden to minimise the heat loss through the sides. 70% moisture in the rice straw can be guessed as follows:-

Dip the dry rice straw in water and allow it there for about 2-3 minutes. After that take it out and transport to the Fumikomi ditch. By that time the execessive water would be drained out. After that by pressing the wet straw by hand, water will just squeeze out. At that stage it may be roughly 70% moisture in the straw.

C/N of the straw should be adjusted at 30. C/N of rice straw is 61. To adjust it to 30, about 4.5 kgs of Ammonium sulphate per 100 kgs of rice straw is necessary.

The Fumikomi ditch should be prepared as follows:-

The ditch should be dug in east to west direction to the desired length. It should be 1.2 m. wide. The bottom of the ditch should be prepared as shown in fig. 1, 2, & 3 above. The bottom of the fumikomi is raised upward in the centre towards northern part of the bottom. Moreover, the bottom should be slightly shallower towards the northern part than the southern one. Usually the temperature of such fumikomi bed is higher at the centre and lower towards the sides, if the bed is made in a level. In such condition if the seed is sown on Fumikomi bed, the seeds get damage at the centre because of high temperature where as it does not germinate by the sides due to low temperature. So in order to get uniform temperature, Fumikomi bed is made as shown in the figures above. If the Fumikomi depth is more, higher temperature can be obtained. Also, if the plastic cover is used slant facing south, maximum Sunshine is utilized by the bed. Also, due to this, the southern bottom is made slightly deeper than the northern one.

In such condition, the bottom layer should be filled with dry straw and make it compact by foot as far as possible. It will check the downward loss of temperature. After that the moist straw of 8 cms layer should be kept and the calculated quantity of Ammonium sulphate should be broadcasted over the bed and make it compact. Likewise other layers should also be kept. The top layer of the straw should be covered by the bed soil prepared for nursery, for about 4.5 - 5 cms thick where the seeds can be sown in line.

This Fumikomi was practised during winter season for germinating watermelon seeds at Rapti Model Farm as mentioned in table No. 8. On December 12 the Fumikomi was prepared and on 15th Watermelon seeds were sown in line when the temperature started rising. Uniform germination of the seeds was observed on 20th when the minimum temperature of the Fumikomi bed at 5 cms depth was 35°C - 37°C. The Watermemlon seeds show good germination unless the temperature is as high as 28°C - 30°C. So, the Fumikomi temperature seems was to be satisfactory for germination. After 21st December, the temperature decreased constantly, and was 24°C on the 27th of the same month. This condition was quite good for the germinating seeds of Watermelon, because the high temperature of Fumikomi like 35°C - 37°C might cause damage to the sprouting seeds.

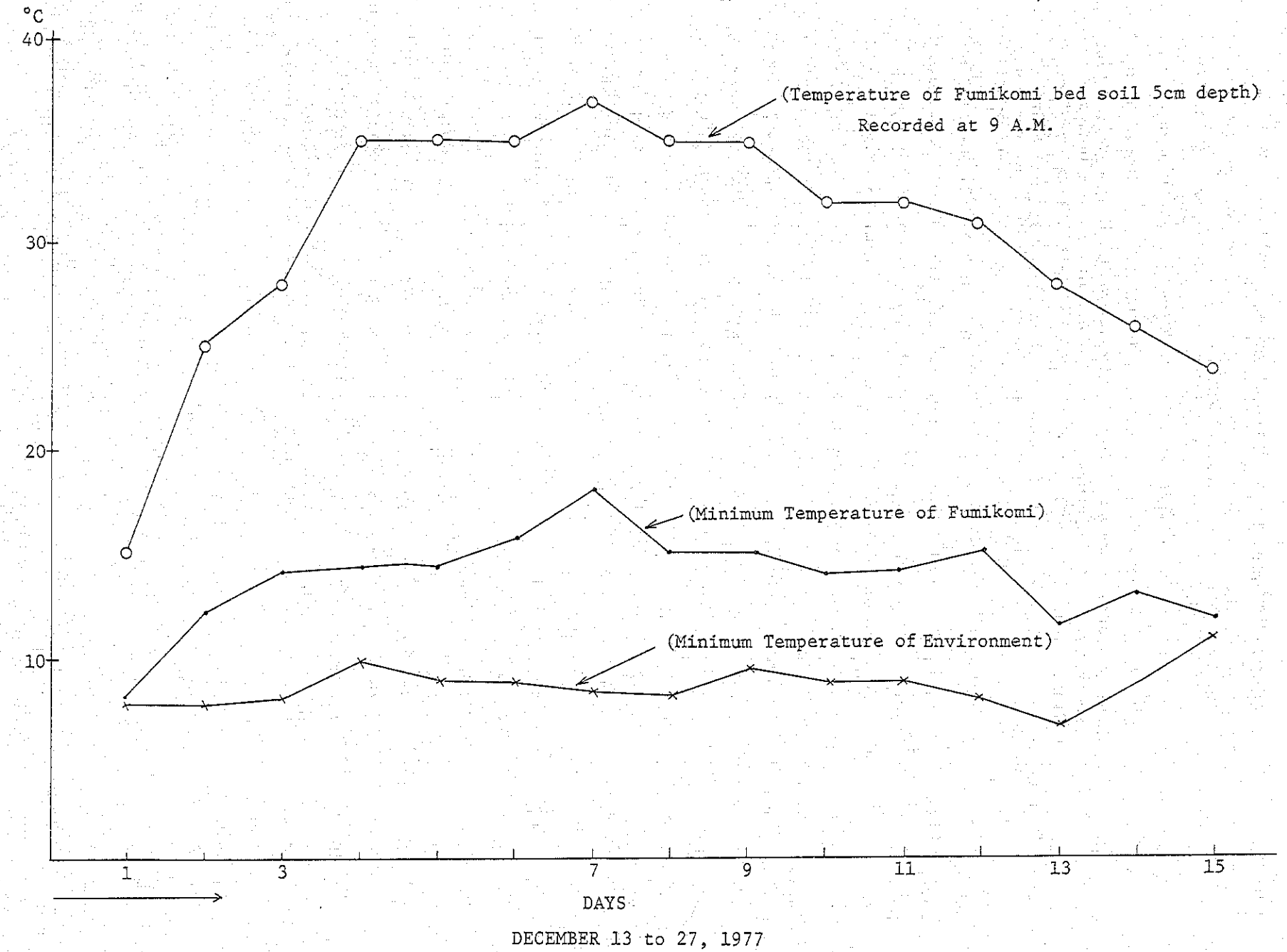
After seeding seeds in Fumikomi, the plastic cover should be kept open during Sunny day as in closed condition the maximum temperature goes as high as 40°C - 45°C which would cause damage to the sprouting seeds and the seedlings. Minimum temperature of Fumikomi (above the bed) as mentioned in table No. 8 are 15°C and 14°C till 23rd of December which is also favourable for the germinating seeds and the seedlings. When the cotyledons of the seeds are full open they are transplanted to the Fumikomi transplanting bed as mentioned in Fig. 3 which was prepared on 28th of December. At the two true leaves stage they are shifted under venyl tunnel where the temperature is slightly less than the Fumikomi. Such temperature is suitable for the vegetative growth of the seedlings. This way, it is quite possible to get at least one month early crop of Watermelon and others.

MINIMUM TEMPERATURE OF FUMIKOMI HOT BED

From December 13 - 77 to January 24 - 78.

Table 9

Date	Environmental temperature Mini.	Max.	Minimum temperature of venyl tunnel	Minimum temperature of Fumikomi	Temperature of Fumikomi bed soil at 5 cms depth (9 a.m.)
Dec. 12 Making Fumikomi	-		-	-	-
Dec. 13	7.8°C	23.2°C	-	8°C	15°C
" 14	7.4°C	23.4°C	-	12°C	25°C
" 15 Sowing Watermelon Seeds	7.8°C	23.4°C	-	14°C	28°C
Dec. 16	9.2°C	22.8°C	-	14.2°C	35°C
" 17	8.8°C	22.8°C	-	14.2°C	35°C
" 18	8.2°C	22.5°C	-	15.5°C	35°C
" 19	8.1°C	22.4°C	-	18.0°C	37°C
" 20 Germination	7.8°C	23.4*C	-	15.0°C	35°C
Dec. 21	9.3°C	23.4°C	-	15.0°C	35°C
" 22	8.6°C	24.4°C	-	14.0°C	32°C
" 23	8.8°C	24.7°C	11.5°C	14.0°C	32°C
" 24	7.8°C	22.8°C	10.8°C	12.5°C	31°C
" 25	7.0°C	23.6°C	10.0°C	11.8°C	28°C
" 26	8.8°C	24.0°C	11.9°C	13.0°C	26°C
" 27	10.4°C	20.8°C	11.5°C	12.0°C	24°C



DECEMBER 13 to 27, 1977

EXTENSION OF TECHNIQUES

The techniques adopted in vegetable cultivation and others here at the farm were extended to the farmers by holding farmers day. The farmers of the nearby villages and also from far areas were invited at the farm in peak seasons at least twice in a year through ADO and by the direct approach to the farmers. During this time, we demonstrated our techniques to them and also discussed their problems. Also, concerning documentry film show was arranged on that occassion. Whatever new vegetables like Brussels sprout, Celery, Lettuce etc. introduced at the farm were cooked and served to them on that day. Every time we emphasised on compost application to the soil in large quantities. Also we cooperated the ADO in the training ctivities to the JT, JTA and farmers. Farmers were welcomed at any time to discuss their problems and we helped them directly as far as possible. Directly or indirectly the nearby farmers were found to be motovated by the vegetable cultivation, compost application and other techniques adopted at the farm. During main season when there was enough moisture in the soil (no irrigation) much vegetables were seen in the farmers field and kitchen garden at present than before. Previously the farmers were seen exchanging the FYM to the green grasses from the farm. But now they are quite cautions and don't exchange compost in any case rather they pay money for the grasses here at Horticulture farm. Few farmers are having several pits for compost making near their livestock shed and they apply to their own field as much as possible.

Several farmers often visited the farm for good seeds and seedlings because they are convinced that the farm seeds are far supirior to the local seeds.

FARM PRODUCTION

TABLE 10

Fiscal year	Fresh production	Seed production
2029-030 (1972-73)	10,608.800 Kgs.	
2030-031 (1973-74)	7,213.380 Kgs.	5,618.330 Kgs.
2031-032 (1974-75)	12,629.730 Kgs.	7,656.290 Kgs.
2032-033 (1975-76)	15,023.925 Kgs.	8,875.135 Kgs.
2033-034 (1976-77)	10,818.905 Kgs.	10,569.370 Kgs.
2034-035 (1977-78)	32,837.619 Kgs.	14,114.573 Kgs.

FARM INCOME

TABLE 11

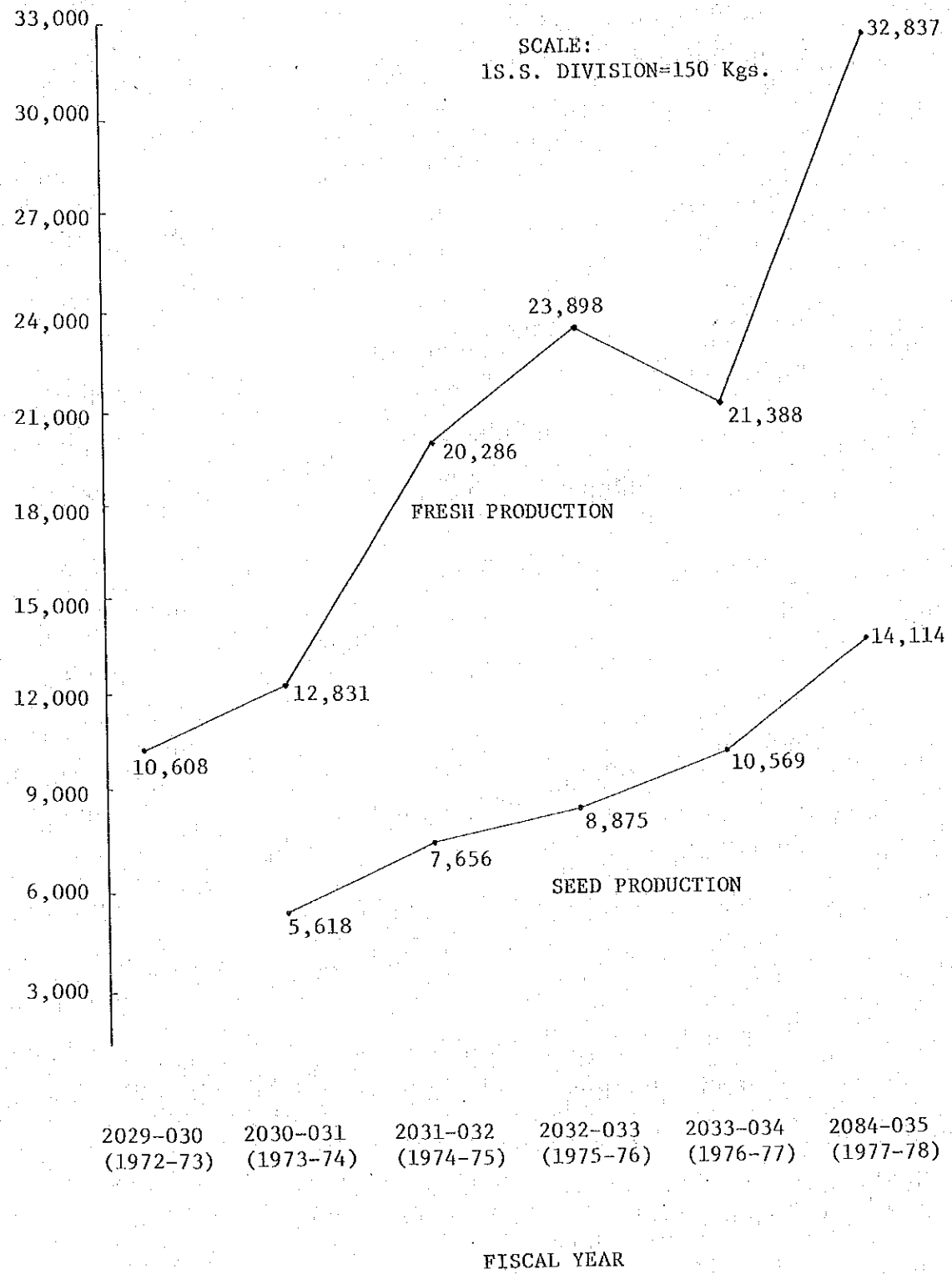
Fiscal year	Farm Income (Rs.)
2029-030 (1972-73)	Rs. 8,688.08
2030-031 (1973-74)	Rs.11,592.34
2031-032 (1974-75)	Rs.25,847.31
2032-033 (1975-76)	Rs.24,668.58
2033-034 (1976-77)	Rs.26,988.14
2034-035 (1977-78)	Rs.81,132.57

FARM EXPENDITURE

(Budget item No.7.5+7.3.2+ Coolie wage)

TABLE 12

Fiscal year	Farm Expenditure
2029-030 (1972-73)	Rs. 36,946.25
2030-031 (1973-74)	Rs. 66,615.19
2031-032 (1974-75)	Rs.104,800.66
2032-033 (1975-76)	Rs.114,362.04
2033-034 (1976-77)	Rs.102,870.35
2034-035 (1977-78)	Rs. 78,750.85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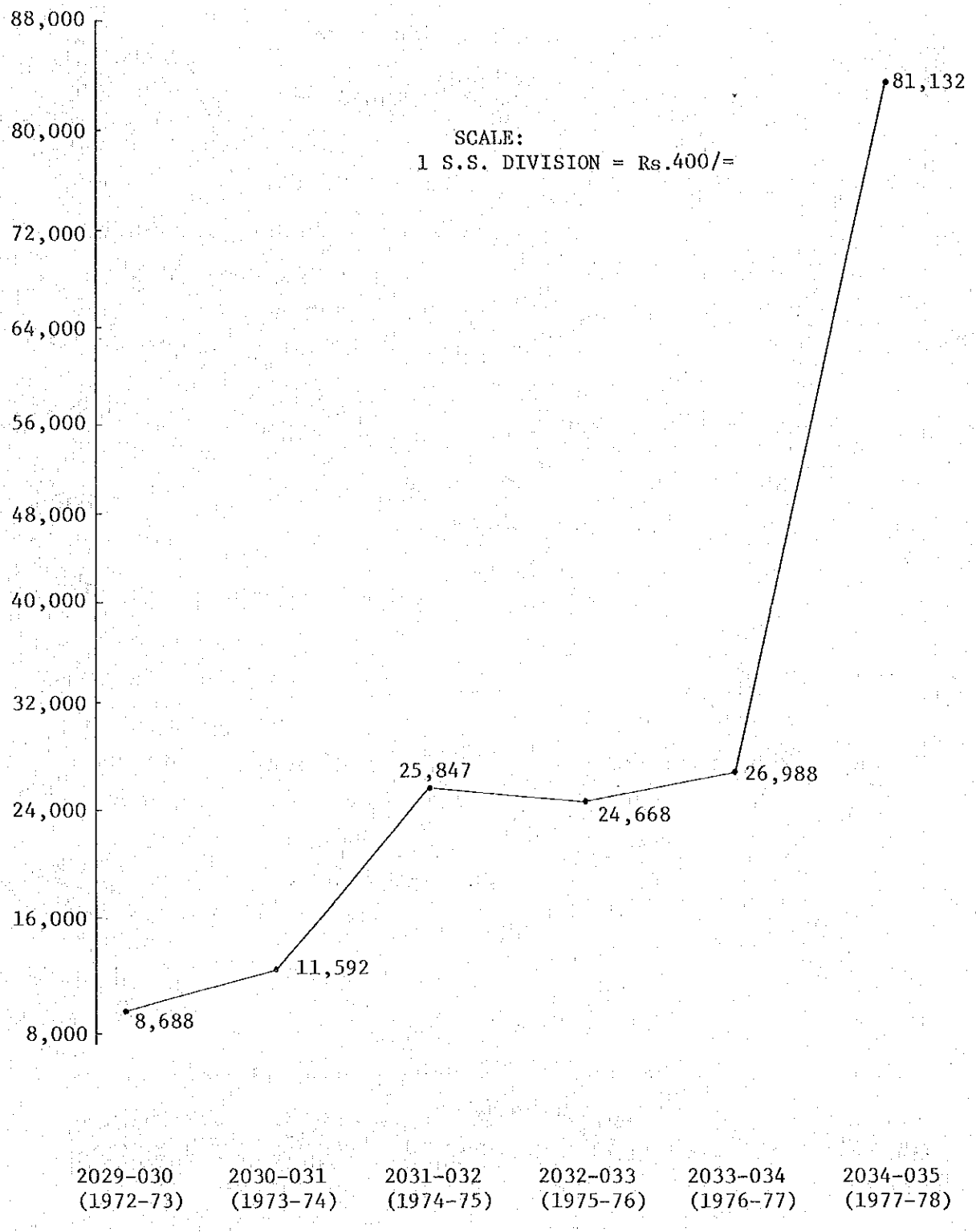
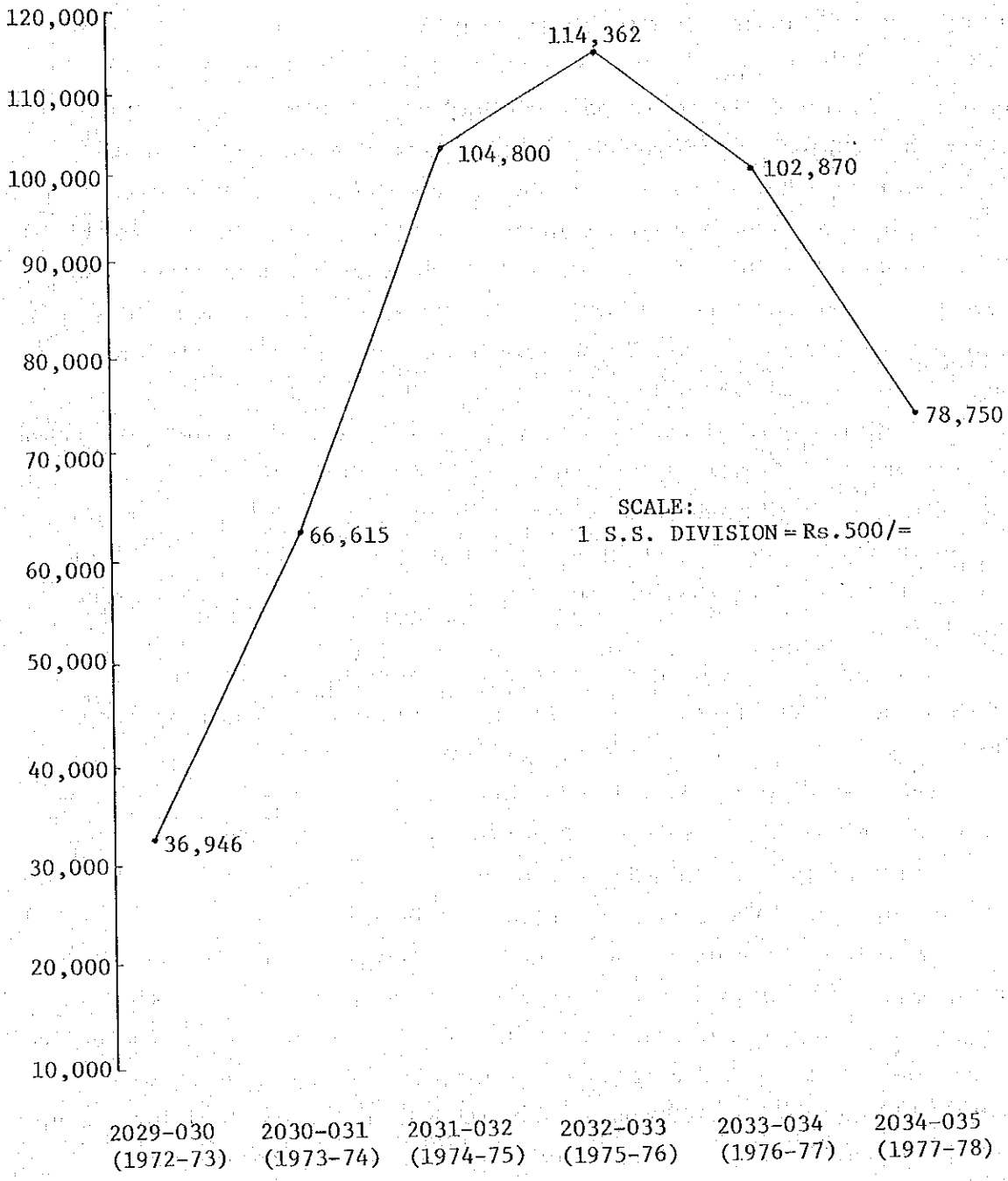
1S.S. DIVISION=150 Kgs.
33,000
30,000
27,000
24,000
21,000
18,000
15,000
12,000
9,000
6,000
3,000
32,837
23,898
21,388
20,286
FRESH PRODUCTION
14,114
12,831
10,608
10,569
8,875
7,656
SEED PRODUCTION
5,618
2029-030 (1972-73)
2030-031 (1973-74)
2031-032 (1974-75)
2032-033 (1975-76)
2033-034 (1976-77)
2084-035 (1977-78)
FISCAL YEAR


88,000
80,000
72,000
64,000
56,000
48,000
40,000
32,000
24,000
16,000
8,000
SCALE:
1 S.S. DIVISION = Rs.400/=
8,688
11,592
25,847
24,668
26,988
81,132
2029-030 (1972-73)
2030-031 (1973-74)
2031-032 (1974-75)
2032-033 (1975-76)
2033-034 (1976-77)
2034-035 (1977-78)
FISCAL YEAR


120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
36,946
66,615
104,800
114,362
102,870
78,750
SCALE:
1 S.S. DIVISION = Rs.500/=
2029-030 (1972-73)
2030-031 (1973-74)
2031-032 (1974-75)
2032-033 (1975-76)
2033-034 (1976-77)
2034-035 (1977-78)
FISCAL YEAR

ANALYSIS OF FARM PRODUCTION, INCOME AND INVESTMENT

For the analysis of the total farm production, Investment and the Income of the Farm, a graphical representation of all these have been made in the presenting paper page No. 12 to 14. To have a comparative study on all those aspects, the graph represents them right from the fiscal year 2029 - 030 (1972-73) till 2034-035 (1977-78). The production of the farm has been subdivided into Fresh production and Seed production and are represented on page 12 of the presenting paper separately. The fresh production curve shows continuous increase till 2032 - 033 (1975-76). In the year 2030 - 31 (1973-74) the seed production activities were given priority which resulted in decreased production of fresh vegetables. Likewise in the year 2033 - 034 (1976-77) the Farm Incharge was out of station which also affected the farm activities to some extent. The increase shown by the graph in the year 2034 - 035 (1977-78) is almost two to three fold of that of the previous year in Fresh as well as seed production both.

The seed production curve on the same page represents the continuous increase till the current fiscal year. The fresh as well as Seed production amount are the maximum in the running fiscal year.

Farm Income since 2029 - 30 (1972-73) till 2034 - 035 (1977-78) has been represented on page No.13 of the presenting paper. The curve shows continuous increase in the farm income till the current fiscal year except 2032 - 33 (1975-76) due to less sales of the farm product this year.

Budget expenditure (a sum of budget item No. 7.5, 7.3.2 and coolie wage) has been presented on page No. 14 of the presenting paper which shows the maximum investment in the year 2032 - 33 (1975-76) and thereafter it has declined constantly. The curve shows increased investment in the beginning which was at the establishment stage. After being established fully, the farm investment should decrease continuously till it reaches an optimum investment stage. After a maximum investment stage, the decline on the graph represents the same.

Even with the decreased investment, there is increased production and increased income which represents an ideal condition. This year i.e. 2034 - 035 (1977-78), the farm income is more than the investment which also satisfies the Planning Commission's regulations for a production farm.

Better management of the soil to maintain the fertility and increase the productivity, use of organic manure to increase the humus content of the soil, better management of the crops and farm planning, better and efficient use of the man power and facilities by the direct supervision and devotion of the responsible staffs to the field resulted in such a high production and income of

the farm. This high income are not the maximum most. By adopting the steps mentioned above these can still be maximised to a greater extent and also the investment can be minimised to the same degree.

Farm production, Income and Investment have been presented on page No. 25 in Table 9.10 and 11 respectively.

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