

***Impact of principles of System of Root  
Intensification method of Crop  
cultivation in Paddy crop grown in  
Gaya, Bihar***

***by***

***Preservation and Proliferation of Rural  
Resources and Nature (PRAN) with  
Livolink-Foundation***

# Growing Population and reducing per capita average land in India

Year	Cropped area	Total Population	Overall average land in hec/capita
1951	131.89	361.1	0.37
1971	165.79	548.2	0.30
1991	185.74	846.3	0.22
2001	190.76	1027	0.19
2051	200	1600	0.13

# Studies on three aspects

- **Influence of Age of seedlings (AOS) X No of plants per hill on Paddy cultivation**
- **Influence of Age of Seedling (AOS) X Spacing on Paddy cultivation**
- **Percentage contribution of different SRI principles towards Crop yield in Paddy cultivation**

# Organic manure and fertilizer

<b>Input of INM for 50m<sup>2</sup> plot (Organic 50% + Chemical 50%)</b>	<b>Chemical fertilizer</b>			<b>Organic manure(FYM-75%+VC-25%)</b>	
	<b>Urea</b>	<b>DAP</b>	<b>MOP</b>	<b>FYM</b>	<b>Vermi-compost</b>
Basal dose at field preparation (25% N+100% P+50% K+100% FYM)	100g	250g	100g	30kg	-
Immediately after 1 <sup>st</sup> weeding (50% N+100% vermicompost)	250g	-	-	-	3.5kg
PI Stage (25% N+50%K)	100g	-	100g		

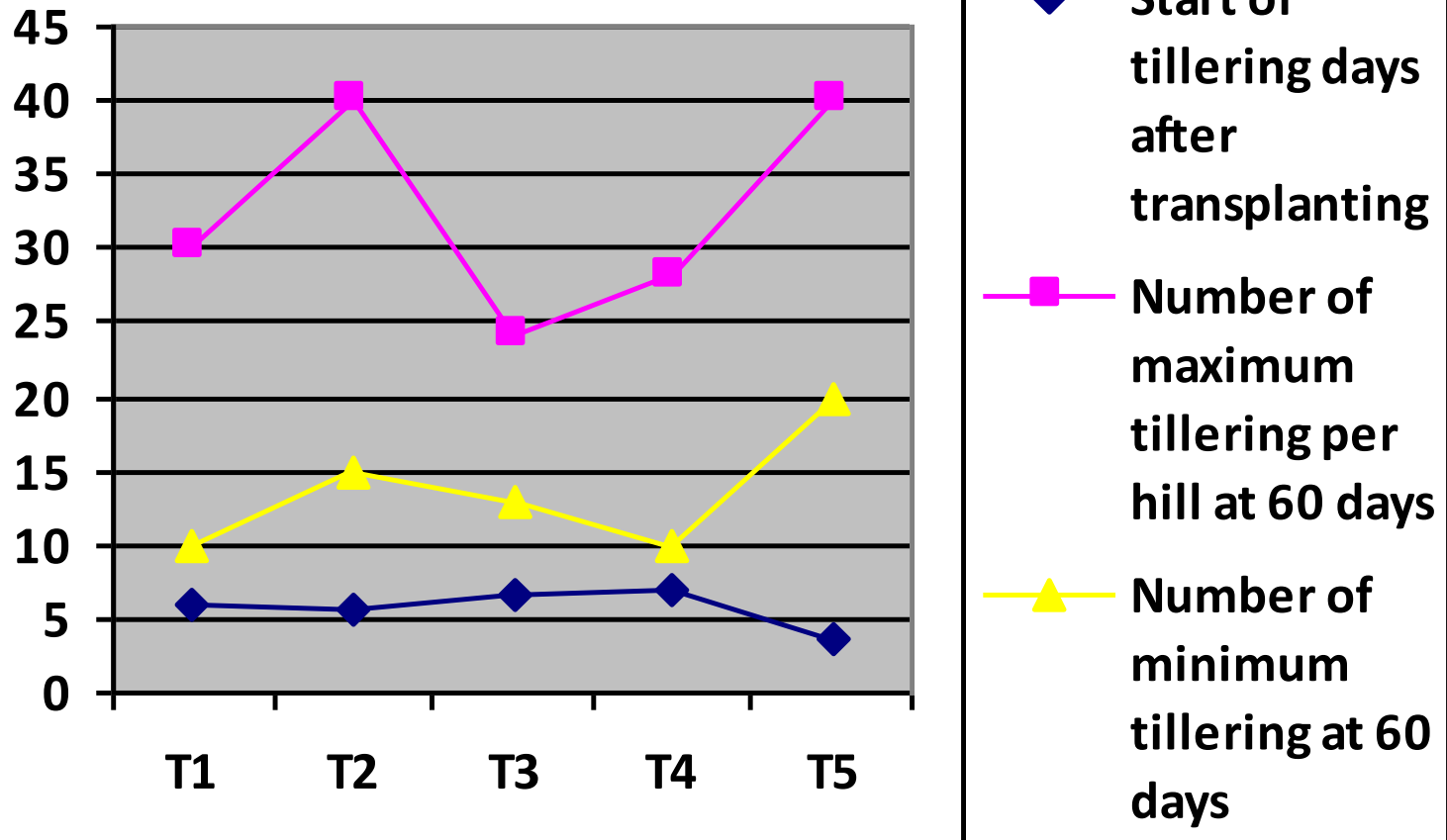
# Influence of Age of seedlings (AoS) X No of plants per hill on Paddy cultivation

<b>R1</b>	<b>T1</b> AoS-16days Seedling-1No	<b>T2</b> AoS-16days Seedling-2Nos	<b>T3</b> AoS-22days Seedling-1No	<b>T4</b> AoS-22days Seedling-2Nos	<b>T5</b> AoS-10days Seedling-1No
<b>R2</b>	<b>T4</b> AoS-22days Seedling-2Nos	<b>T5</b> AoS-10days Seedling-1No	<b>T1</b> AoS-16days Seedling-1No	<b>T2</b> AoS-16days Seedling-2Nos	<b>T3</b> AoS-22days Seedling-1No
<b>R3</b>	<b>T2</b> AoS-16days Seedling-2Nos	<b>T3</b> AoS-22days Seedling-1No	<b>T5</b> AoS-10days Seedling-1No	<b>T1</b> AoS-16days Seedling-1No	<b>T4</b> AoS-22days Seedling-2Nos
<b>R4</b>	<b>T5</b> AoS-10days Seedling-1No	<b>T4</b> AoS-22days Seedling-2Nos	<b>T2</b> AoS-16days Seedling-2Nos	<b>T3</b> AoS-22days Seedling-1No	<b>T1</b> AoS-16days Seedling-1No

# Observations

Parameters	T1	T2	T3	T4	T5
Start of tillering days after transplanting	6	5.5	6.5	7	3.5
Number of maximum tillering per hill at 60 days	30	40	24	28	40
Number of minimum tillering at 60 days	10	15	13	10	20
Average plant height in cm	107	102	96.5	97	106.5
Average Length of the panicle(cm)	21	20	21	20	25.5
Average number of grains per panicle	255	237.5	224	218.5	297.5
Average number of maximum productive tillers per hill	25	30	16	16	40
Average number of minimum productive tillers per hill	22	26	14	13	20
Average grain weight in kg in 25 sqmetre	10.6	11.75	8.7	10.5	13
Average Straw weight in kg in 25 sq metres	10.25	12.05	9	10.5	12.5

# Initiation of tillers/No of tillers



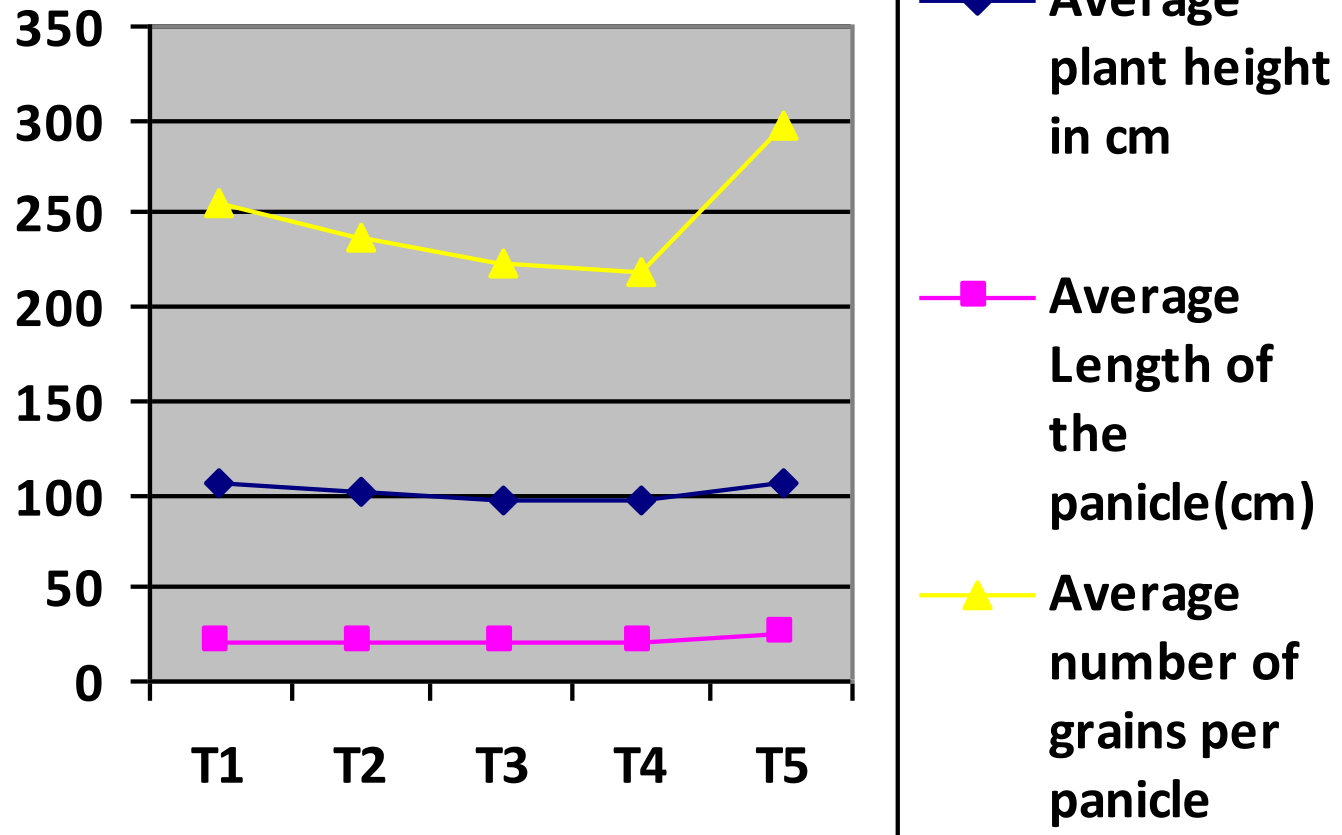
# The learnings

The graphs shows that

- The tillering started early in treatment T5 (10 days ,single seedling) while it delayed in T4(22days ,2 seedlings)
- The minimum tillering happened in T1(16days, single seedling) while the maximum tillering took place in T5(10days,single seedling)
- When transplanted early the T2(16days,2 seedlings) and T5(10days, single seedlings) produced high tillers reaffirming belief that younger seedlings perform better.



# Height and Length

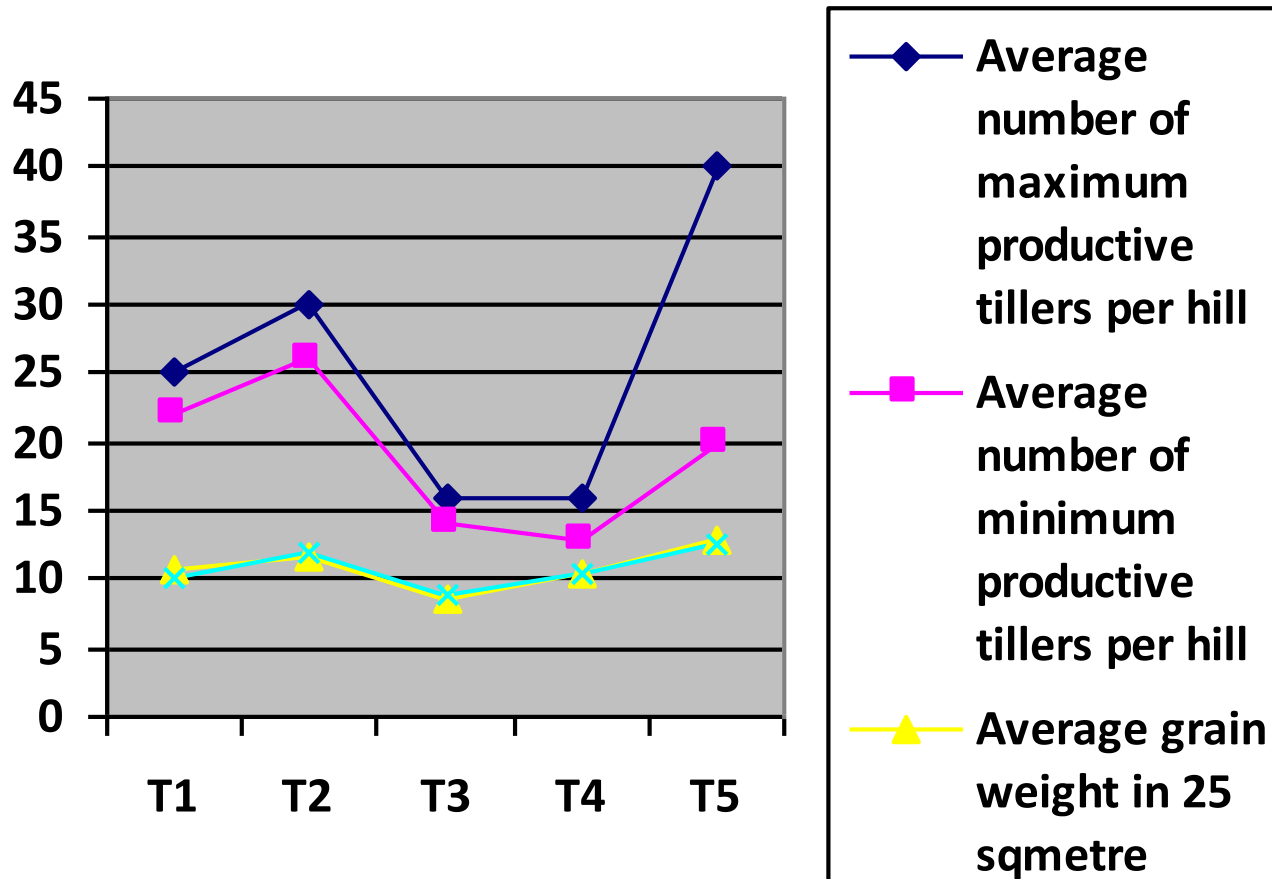


# Learnings

The graphs shows that

- The average plant height is similar in almost all treatments.
- The average length of panicle is slightly better in T1(16 days, single seedling) and T5(10days, single seedling) than T2(16days, 2 seedlings), T3(22 days, single seedling) and T4(22days, 2 seedlings).
- The average number of grains per panicle is highest in T5(10days, single seedling).

# Productive tillers and average grain weight



# Learnings

The graph shows that

- The productive tillers per hill is highest in T5(10days,single seedling).
- The straw and grain weight per unit area is in similar ratio in all the treatments.

# Conclusion

In all the yield attributing characters the T-5(10 days old seedlings and single seedling transplantation) performed better than others and the yield was higher 5.2t/hect when compared with other treatments. Thus 10 days old seedlings transplanted singly at one place provided maximum yield when compared with 16 days old two seedlings transplantation(T-2), 16 days old single transplantation(T-1), 22 days old single transplantation (T-3) and 22 days old two seedlings transplantation(T-4). After 10 days old single seedling the yield of 16 days old double seedling is better as compared to 22 days single and double seedlings. Tillering started earlier in 10 days old seedling and 16 days old seedlings as compared to 22 days older seedlings.

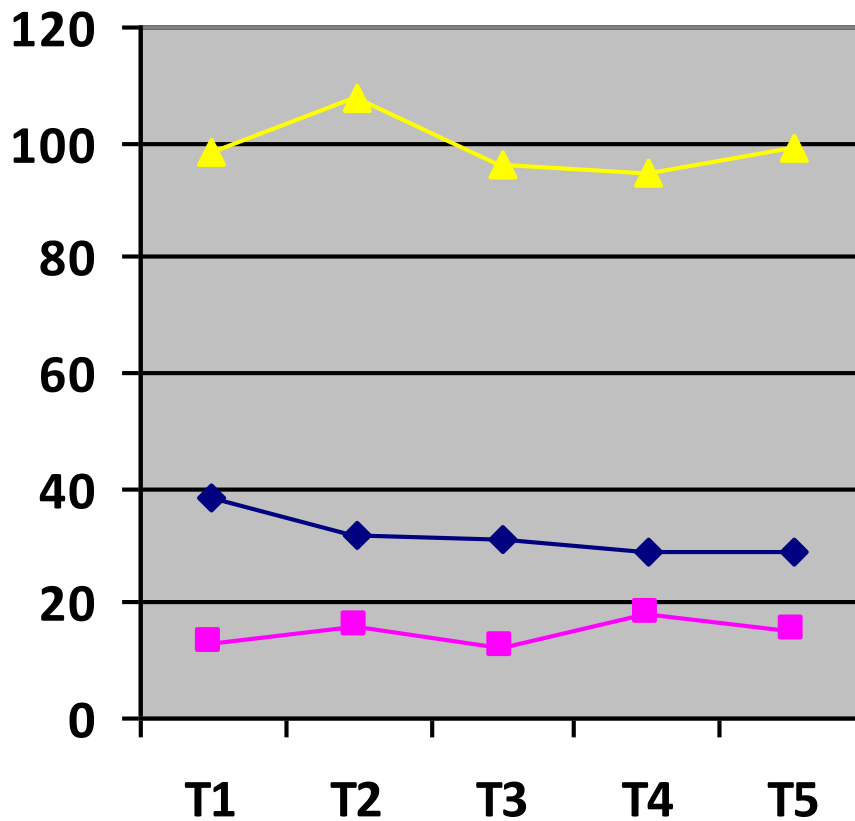
# Influence of Age of Seedling (AOS) X Spacing on Paddy cultivation

<b>R1</b>	<b>T1</b> AoS – 16 days Spacing- 25cm X 25cm	<b>T2</b> AoS-16days Spacing- 20cm X 20cm	<b>T3</b> AoS-22days Spacing- 25cm X 25cm	<b>T4</b> AoS-22days Spacing- 20cm X 20cm	<b>T5</b> AoS-10days Spacing- 25cm X 25cm
<b>R2</b>	<b>T4</b> AoS-22days Spacing- 20cm X 20cm	<b>T5</b> AoS-10days Spacing- 25cm X 25cm	<b>T1</b> AoS – 16 days Spacing- 25cm X 25cm	<b>T2</b> AoS-16days Spacing- 20cm X 20cm	<b>T3</b> AoS-22days Spacing- 25cm X 25cm
<b>R3</b>	<b>T2</b> AoS-16days Spacing- 20cm X 20cm	<b>T3</b> AoS-22days Spacing- 25cm X 25cm	<b>T5</b> AoS-10days Spacing- 25cm X 25cm	<b>T1</b> AoS – 16 days Spacing- 25cm X 25cm	<b>T4</b> AoS-22days Spacing- 20cm X 20cm
<b>R4</b>	<b>T5</b> AoS-10days Spacing- 25cm X 25cm	<b>T4</b> AoS-22days Spacing- 20cm X 20cm	<b>T2</b> AoS-16days Spacing- 20cm X 20cm	<b>T3</b> AoS-22days Spacing- 25cm X 25cm	<b>T1</b> AoS – 16 days Spacing- 25cm X 25cm

# Observation of the data pertaining to Age of seedlings X spacing aspect of trial.

Parameters	T1	T2	T3	T4	T5
Number of maximum tillering per hill at 60 days	38	32	31	29	29
Number of minimum tillering at 60 days	13	16	12	18	15
Average plant height in cm	98	107.5	96.5	95	99
Average Length of the panicle(cm)	19	17.5	17.5	19	22.5
Average number of grains per panicle	155	146	149	149	162
Average number of maximum productive tillers per hill	21	16	22	17	19
Average number of minimum productive tillers per hill	18	13	15	60	13
Average grain weight in 25 sqmetre	9.5	10.75	11.8	12.5	13
Average Straw weight in 25 sq metres	10	10	12	13	13.5

# Tillering and Plant height



- ◆ Number of maximum tillering per hill at 60 days
- Number of minimum tillering at 60 days
- ▲ Average plant height in cm

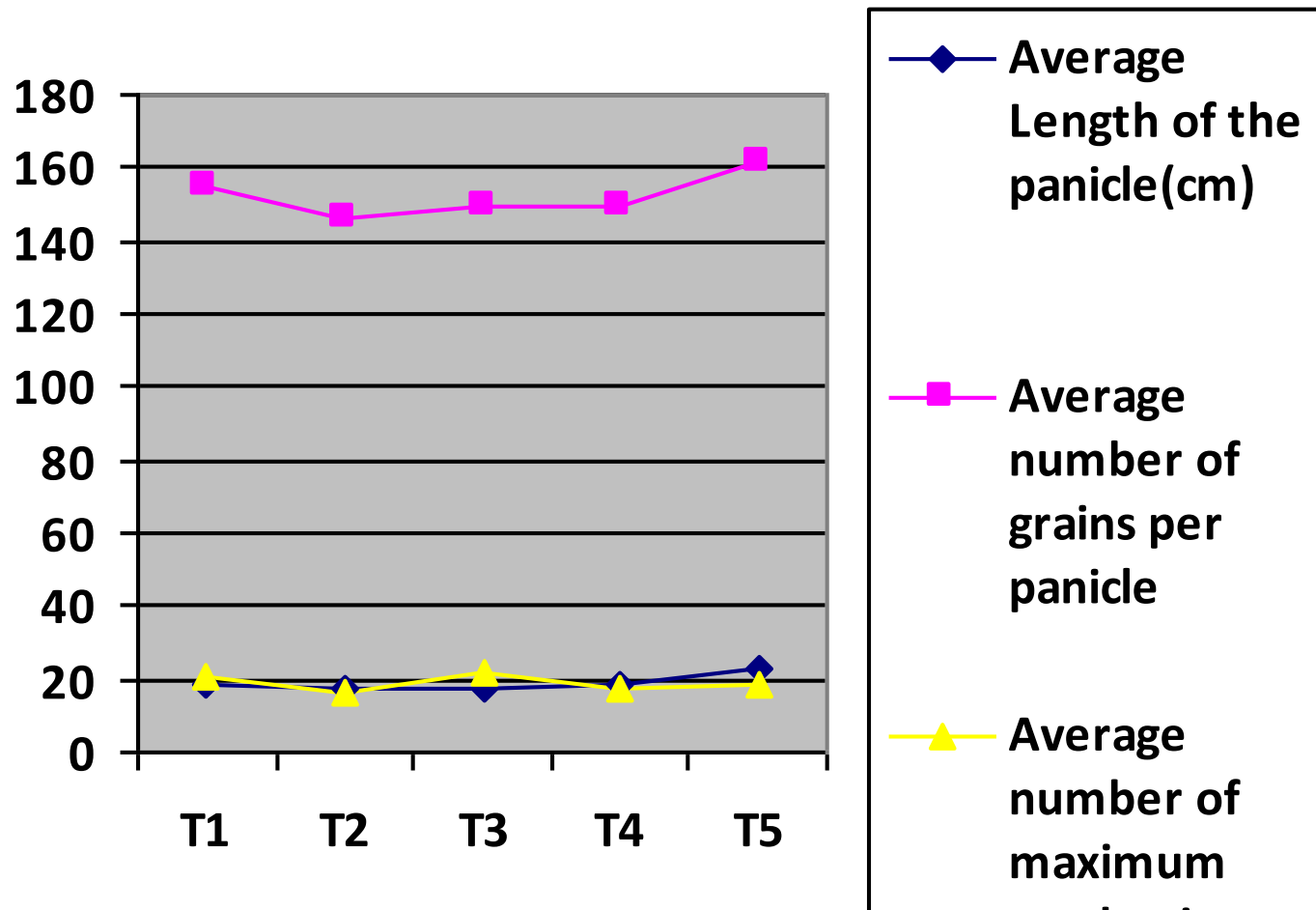


# learnings

The graph shows that

- T1(16days,25cmX25cm) provided maximum tillering at 60 days of transplanting.
- The average plant height is maximum in T2(16days,20cmX20cm).

# Length of panicle and number of grains per panicle

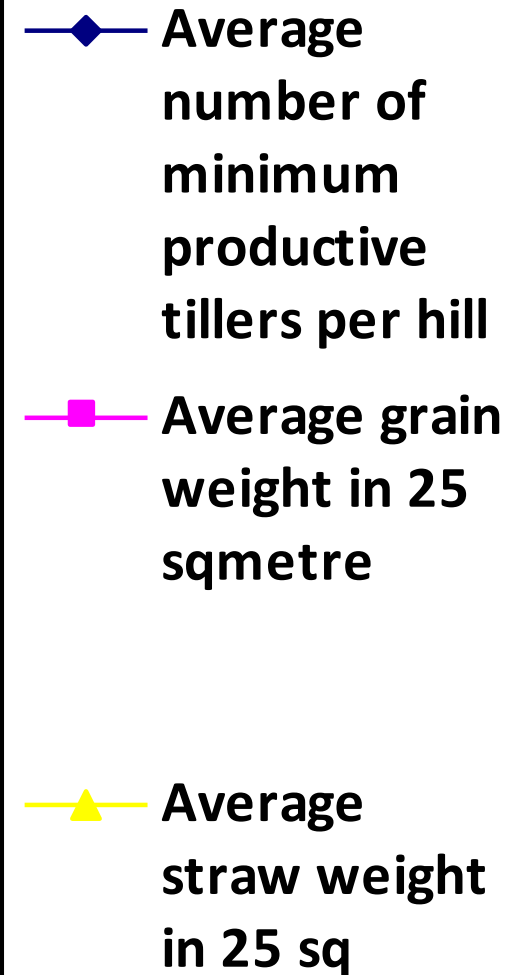
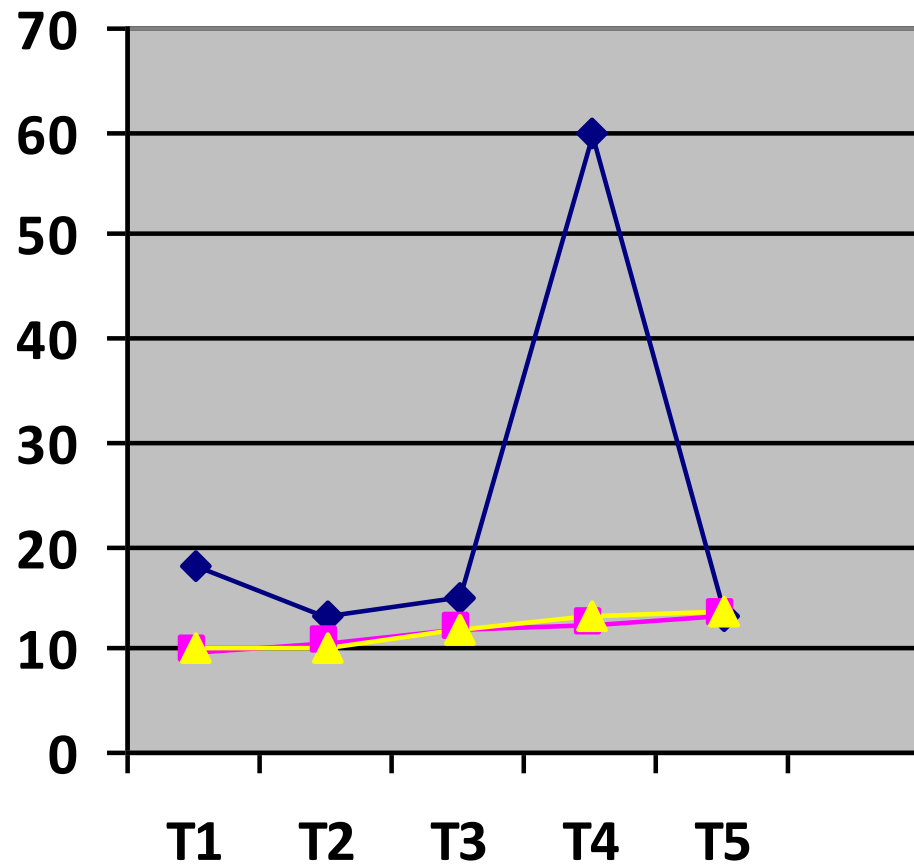


# Learnings

The graph shows that

- The number of grains per panicle is maximum in T5(10days,25cmX25cm)
- The number of productive tillers were high in T1(16days,25cmx25cm) and T5(10days,25cmX25cm)

# Productive tillers, grain and straw weight



# Learnings

The graph shows

- The average weight of grain in 25 sqm is maximum in T5(10days,25cmX25cm).
- The average weight of straw in 25 sqm is maximum in T5(10days,25cmX25cm).

# Conclusion

T5(10 days old seedling and single transplantation) provided highest grain and straw yield as compared to T1(16 days, 2 seedlings at one place transplanted at 25cm X 25cm), T2(16 days, two seedlings at one place transplanted at 20 cm X 20 cm),T3(22 days, two seedlings at one place transplanted at 25 cm X 25 cm and T4(22 days, two seedlings transplanted at 20 cm X 20 cm). Double seedlings aged 22 days transplanted at 20 cm x 20 cm produced higher yield than other treatments except 10 days old single seedlings. The research plot faced dry conditions.

# Percentage contribution of different SRI principles towards Crop yield in Paddy cultivation

The following principles were practiced by farmers at the time of SRI adoption in rain fed conditions. Although water management is supposed to be an important principle, farmers could not adopt it in the rainfed condition during Kharif. Regarding application of organics, in all the treatments the Nutrient management was done in an integrated manner ensured taking 50% from organic source and 50% from inorganic source.

- A. Younger seedling (12DAS)
- B. No. of seedling (single seedling)
- C. Spacing (25x25cm<sup>2</sup>)
- D. Weeding (3 times mechanical weeding)

# Layout

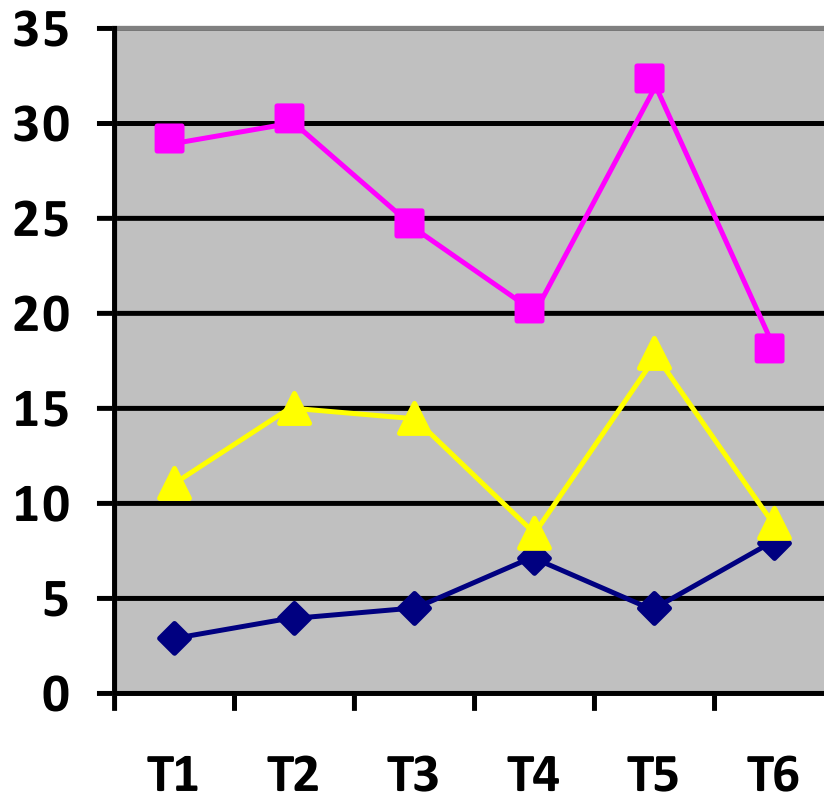
<b>Replication-1</b>	<p><b>T1</b></p> <p>12 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 2 manual weeding</p>	<p><b>T2</b></p> <p>12 DAS 3seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T3</b></p> <p>12 DAS 1seedling/hill Sp- 15X20cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T4</b></p> <p>25 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T5</b></p> <p>12 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T6</b></p> <p>25 DAS 3seedling/hill Sp- 15X20cm<sup>2</sup> 2 manual weeding</p>
<b>Replication-2</b>	<p><b>T4</b></p> <p>25 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T5</b></p> <p>12 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T1</b></p> <p>12 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 2 manual weeding</p>	<p><b>T6</b></p> <p>25 DAS 3seedling/hill Sp- 15X20cm<sup>2</sup> 2 manual weeding</p>	<p><b>T3</b></p> <p>12 DAS 1seedling/hill Sp- 15X20cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T2</b></p> <p>12 DAS 3seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>
<b>Replication-3</b>	<p><b>T6</b></p> <p>25 DAS 3seedling/hill Sp- 15X20cm<sup>2</sup> 2 manual weeding</p>	<p><b>T3</b></p> <p>12 DAS 1seedling/hill Sp- 15X20cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T5</b></p> <p>12 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T2</b></p> <p>12 DAS 3seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T1</b></p> <p>12 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 2 manual weeding</p>	<p><b>T4</b></p> <p>25 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>
<b>Replication-4</b>	<p><b>T2</b></p> <p>12 DAS 3seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T1</b></p> <p>12 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 2 manual weeding</p>	<p><b>T4</b></p> <p>25 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T5</b></p> <p>12 DAS 1seedling/hill Sp- 25X25cm<sup>2</sup> 3 mechanical weeding</p>	<p><b>T6</b></p> <p>25 DAS 3seedling/hill Sp- 15X20cm<sup>2</sup> 2 manual weeding</p>	<p><b>T3</b></p> <p>12 DAS 1seedling/hill Sp- 15X20cm<sup>2</sup> 3 mechanical weeding</p>



# Observations

Parameters	T1	T2	T3	T4	T5	T6
Start of tillering after days of transplanting	3	4	4.5	7	4.5	8
Number of maximum tillering per hill at 60 days	29	30	24.5	20	32	18
Number of minimum tillering at 60 days	11	15	14.5	8.5	18	9
Average plant height in cm	101	100	97	99.5	102	99
Average Length of the panicle(cm)	21	22	18.5	11.5	20.5	12
Average number of grains per panicle	256	250	286	237	202	222
Average number of productive tillers per hill	21	22	18.5	11.5	20.5	12
Average grain weight in kg in 25 sqmetre	9.47	8.77	9.86	8.39	7.72	9.49
Average Straw weight in kg in 25 sq metres	10.07	9.57	11.32	8.61	10.78	11.01

# Tillering



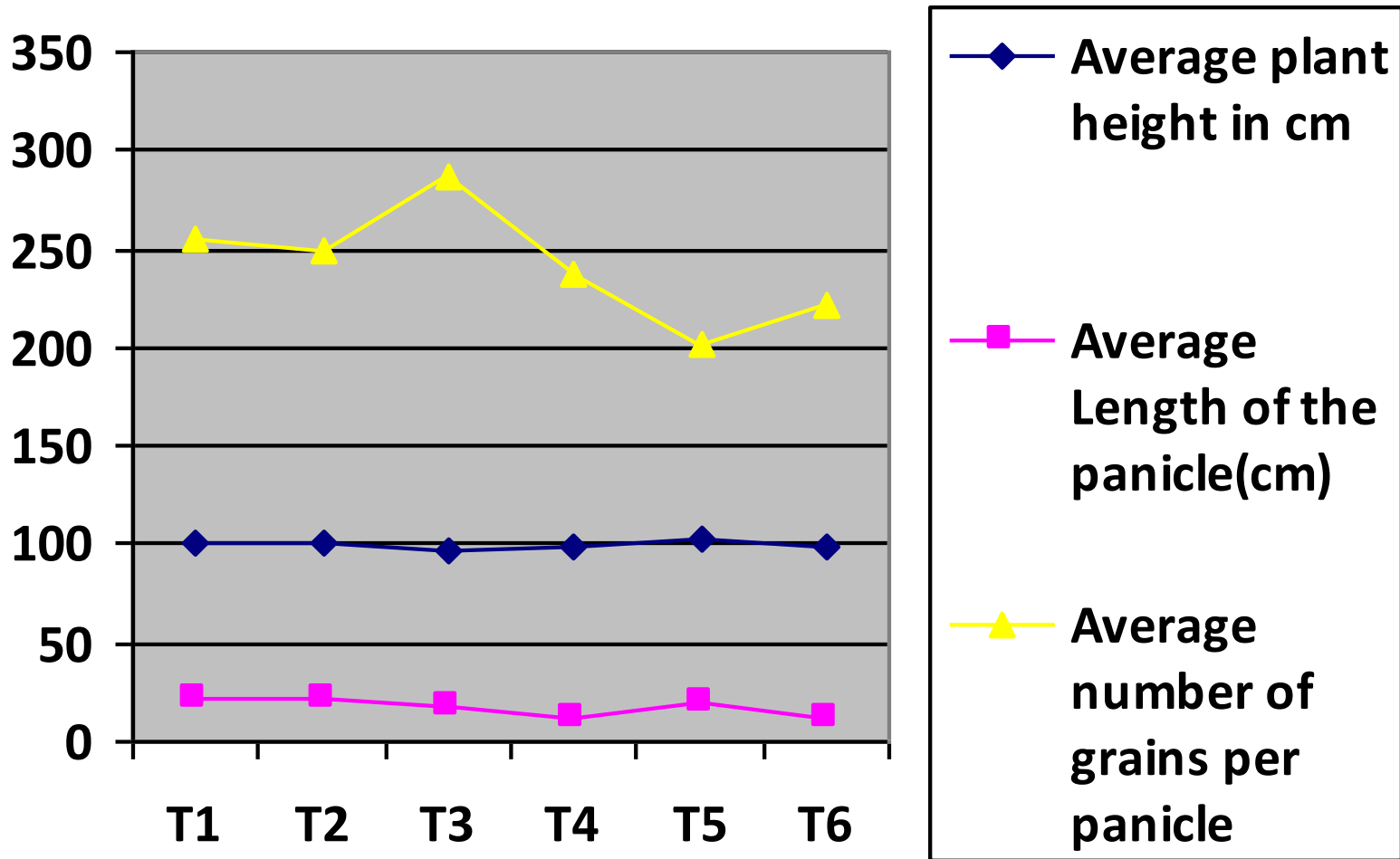
- Start of tillering after days of transplanting
- Number of maximum tillering per hill at 60 days
- Number of minimum tillering at 60 days

# Learnings

The figure shows that

- T1(12 DAS 1seedling/hill Sp-25X25cm<sup>2</sup> 2 manual weeding )starts tillering earlier as compared to all other treatments.
- T5 (12 DAS 1seedling/hill Sp-25X25cm<sup>2</sup> 3 mechanical weeding )provided maximum tillering at 60 days after transplanting.
- T5(12 DAS 1seedling/hill Sp-25X25cm<sup>2</sup> 3 mechanical weeding) has maximum number of tillering among minimum tillering recorded in other treatments.

# Plant height, length of Panicle and grains per panicle

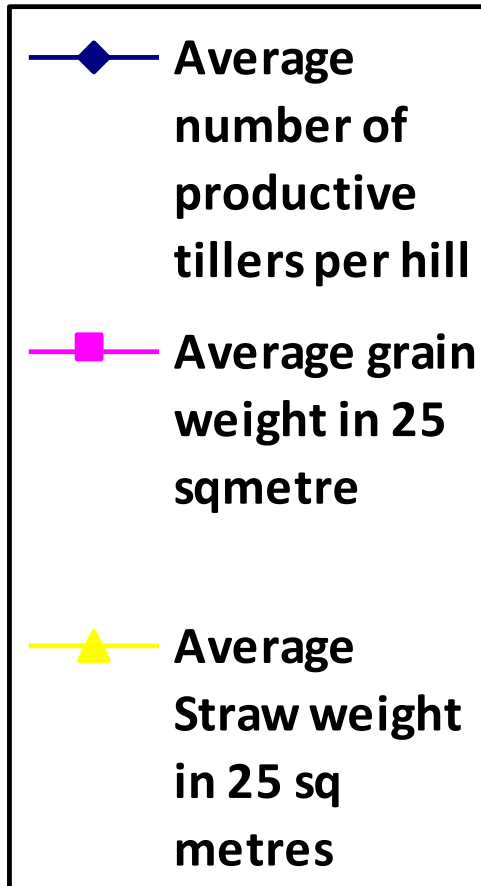
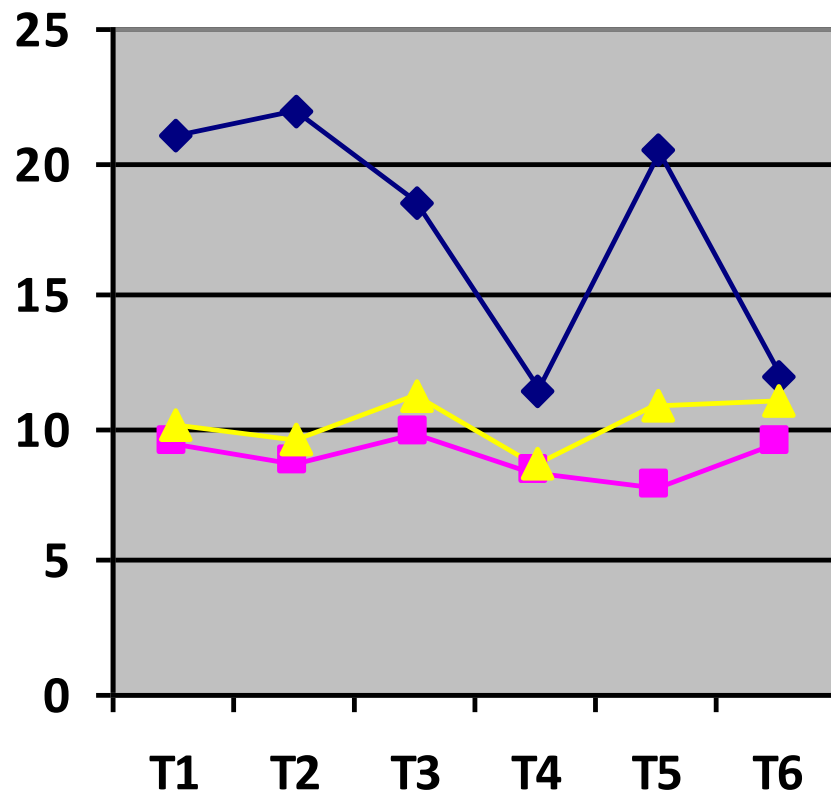


# Learnings

The figure shows that

- T3(12 DAS 1seedling/hill Sp-15X20cm<sup>2</sup> 3 mechanical weeding) has maximum number of grains per panicle as compared to T1, T2, T4 and T5.
- T1(12 DAS 1seedling/hill Sp-25X25cm<sup>2</sup> 2 manual weeding) T2 (12 DAS 3seedling/hill Sp-25X25cm<sup>2</sup> 3 mechanical weeding) and T5 produced high panicle length as compared to T3, T4 and T6.
- T5(12 DAS 1seedling/hill Sp-25X25cm<sup>2</sup> 3 mechanical weeding) has slightly better plant height as compared to T1, T2, T3 and T4.

# Productive tillers, grain and straw weight



# Learning

The figure shows that

- T2(12 DAS 3seedling/hill Sp-25X25cm<sup>2</sup> 3 mechanical weeding) produced maximum productive tillers as compared to other treatments T1, T3, T4 and T5
- T3(12 DAS 1seedling/hill Sp-15X20cm<sup>2</sup> 3 mechanical weeding) and T5(12 DAS 1seedling/hill Sp-25X25cm<sup>2</sup> 3 mechanical weeding) produced high grain weight as compared to T1, T2 .
- T3, T5 and T6 produced high straw weight as compared to T1 and T2.

# Conclusion

- The young age seedlings of 12 days transplanted single seedling at 25 cm x 25 cm integrated with 3 mechanical weeding in most of the treatments produced higher grain and straw yield. 3 mechanical weeding performed better than 2 manual weeding. Mechanical weeding has better impact over manual weeding in various parameters such as more number of productive tillers, grain weight and straw weight per unit area. 25 days old seedling single transplantation even with three mechanical weeding produced less yield of grain and straw. Young age seedlings produced high productive tillers, panicle length and plant height irrespective of other factors. Also irrespective of other factors the starting of tillering is earlier when seedlings transplanted at 12 days old.