PRE-DISSERTATION REPORT

(AGR- 596)

Evaluation and analysis of rice intensification system in central plain zone of Punjab

Synopsis Submitted To

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In Partial Fulfilment of the Requirements for the

Degree of

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In

Agronomy

By

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CERTIFICATE

I certified that this synopsis Shifali Verma with registration number 11718627, **"EVALUATION AND ANALYSIS OF RICE INTENSIFICATION SYSTEM IN CENTRAL PLAIN ZONE OF PUNJAB"** has been formulated and finalized by the student on the subject.

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DECLARATION

I hereby declare that the project work entitled **" EVALUATION AND ANALYSIS OF RICE INTENSIFICATION SYSTEM IN CENTRAL PLAIN ZONE OF PUNJAB"** is an authentic record of my work carried out at lovely professional university as requirements of project work for the award of degree of Master of Science in Agronomy, under the guidance of Vandna Chabbra, School of Agriculture, Lovely Professional University, Jalandhar, Punjab, India.

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CHAPTER 1. INTRODUCTION

Rice (Oryza sativa), the most important cereal crop is the staple food for more than 60% of the world's population. About 90% of rice grown in the world is produced and consumed in Asia (FAO,2009). Rice mostly grown by flooding method in Asia (PRASAD,2011). Punjab is known as the granary of India. It occupies only 1.5% of the total geographical area of the country. It is the topmost producer of food grains in India. Punjab is the largest producer of Wheat and second largest producer of Rice. Over 97% of the cultivated area is irrigated in Punjab but 75% of the area is irrigated by using groundwater resources (tube wells) while only 25% is through the canals. Rice covers an area of about 29-30 lakh hectares in the state, out of which Basmati Rice was grown on an area of 8.62 lakh hectares in 2014-15, but this area was reduced to 7.60 lakh hectares in 2015-16. Globally rice is cultivated on total area of about 159.2 Million Hectares in 2015-16. During 2017-18 area increased to 161.1 Million Hectares.

Whether rice requires more water for its growth but now these days, groundwater level is decreasing at higher rate in Punjab due to cultivation of rice crop which needs huge amount of water and is grown mainly in summer season when the temperature is too high and hence the rate of evaporation is also very high. Lack of enforceable laws, technology in pumping, lack of incentives to save water, electrical subsidy contributed to the decline of ground water. Water level is very low in districts like Barnala, Patiala, Sangrur and Fatehgarh Sahib and high in Firozpur and Muktsar districts. So, there is an urgent need to improve the water productivity of rice in Punjab. Therefore, farmers need to produce more rice with less water. The System of Rice Intensification (SRI) is better option which is very cost effective and used by farmers in Punjab.

System of Rice Intensification (SRI) is a new method or technology of rice cultivation which aims at increasing the productivity of rice with less external inputs. Father Henri de Laulanie developed SRI in Madgascar in 1980s. It is practised in many countries like China, Indonesia, Cambodia, Thailand, Veitnam, Nepal, Myanmar, Bangladesh and India. SRI includes transplanting of young seedlings between 8-12 days old (2-3 leaf stage), careful planting of single seedling per hill in square pattern at wider spacing of 25*25cm, use of mechanical or cono-weeder for controlling the weeds in the field, use of organic manures and compost and alternate wetting and drying. SRI gives higher grain yield (7-20%), reduce the seed rate by 80%, water requirement by29%, growth duration by 8-12 days (Kumar *et al*., (2012). SRI requires low cost for raising nursery, higher cost of cultivation and gives higher total cost as compared to conventional method (Halder *et al*., 2012).

Nitrogen is an essential constituent of proteins and amino-acids. Nitrogen is an essential and yield limiting nutrient required by the rice crop for its production around the world (Samonte *et al*.,2006). High doses of nitrogen results in serious nitrogen losses and low nitrogen use efficiency (Wang *et al*.,2001; Peng *et al*.,2006). In irrigated rice, Nitrogen use efficiency is low because of nitrogen losses through surface runoff, denitrification, leaching and ammonia volatilization (AV).

Seed priming is defined as a method which involves soaking of seeds in water (hydropriming) or in an organic solvent (osmo-priming) which improves seed vigour due to increasing α amylase, catalase activities and decreasing lipid peroxidation activities and in rice flooded soils seedling establishment is improved by seed bed management(Ella *et al*.,2011). Various approaches of seed priming have been practised in rice crop. Seed priming showed good results, both under stressed and non-stressed conditions and improves crop performances and better effects are obtained in adverse climatic conditions like chilling stress, drought(Farooq *et al*.,2009; Sun *et al*.,2010). Plants raised from primed seeds results in good crop stand and proper germination than non-primed seeds in many upland crops.

Vermicomposting results in sustainable agriculture and good environment. The use of various organic manures like farm wastes, human wastes, sewage sludge, animal manures and composts maintains the fertility of soil which results in better plant growth and yield. Application of vermicompost (organic manure) increases stem height, seed germination, leaf area, number of leaves, root length, leaf dry weight, total yield, root number and chlorophyll content(Joshi *et al*.,2014).

CHAPTER 2. REVIEW OF LITERATURE

2.1 Effect of Seed priming

Khalid *et al*., (2015) conducted a field experiment on rice with seed priming on different sown rice nurseries and found that the leaf area index is improved by applying seed priming, seedling age and rice cultivator.

Basra *et al*., (2004) observed that seed treatment with different methods including traditional method, osmoconditioning (-1.1 MPa KNO3) for 24 or 48 hours and seed hardening for 18 to 24 hours. Among all these methods, traditional method and seed hardening results in higher germination energy, germination index and germination percentage and lower mean emergence time and mean germination time.

Mgaya *et al*., (2016) conducted an experiment on field on rice by using three priming materials namely PEG (Polyethylene glycol) and KNO3 (Potassium nitrate) for 48 hours and hydropriming (deionized water) for 24 hours and concluded that hydropriming was the best method followed by other two.

Ranjithaa *et al*., (2013) observed that in SRI method, well decomposed compost improves soil structure and nutrient supply which resulted in crop growth and biomass production and increased rate of nitrogen improves photosynthetic activity and leaf area index.

Illangakoon *et al*., (2016) concluded that seed priming ensures vigorous crop stand and seed vigour**.**

Farooq *et al*., (2009) evaluated that seeds of basmati were subjected to hardening, hydropriming for 48 hours and osmohardening with CaCl2 and KCl for 24 hours and concluded that osmohardening with CaCl2 was the best method and seed priming improves the root and shoot length, soluble sugars and dehydrogenase activity and dry weight of seedling.

2.2 Effect of nitrogen on rice yield:

Mannan1 *et al*., (2010) conducted an experiment at BRRI with different Basmati varieties and with increased dose of nitrogen, plant height, panicle length, tiller number, spikelet sterility and straw yield also increase.

Thakur *et al*., (2013) investigated that with different doses of nitrogen SRI grain yield was 49% higher as compared to TFR.

Zhao1 *et al*., (2010) conducted field experiments to determine the Impacts of varying nitrogen doses on rice yield and nitrogen utilization and concluded that SRI (System of Rice Intensification) increased rice yield and nitrogen uptake as compared to TF (Traditional flooding).

Indira chaturvedi.,(2005) conducted field experiment at Agricultural Research Station, Chattisgarh, India with sulphur containing nitrogen fertilizer (Super-Net) and non-sulphur containing nitrogen fertilizer (Urea) and found that Super-Net gives higher grain nitrogen (N), growth and yield as compared to Urea.

2.3 Effects of SRI on yield:

Nyamai M. *et al*., evaluated that SRI gives better productivity and crop yield as compared to conventional flooded system and SRI saves 21% water and increases the water productivity (WP) by 90% and land productivity (LP) by 71% over conventional flooded system.

Kumar *et al*., (2012) investigated that SRI gives higher grain yield (7-20%), reduce the seed rate by 80%, water requirement by29%, growth duration by 8-12 days.

Haldar *et al*., (2012) found that SRI requires low cost for raising nursery, higher cost of cultivation and gives higher total cost as compared to conventional method.

Pandian *et al*.,(2006) analysed that SRI results in increase in yield about 40-50%, requirement of water is less (885mm), and gives higher water use efficiency (7.31 kg ha-1 mm-1) and yield (6,406 kg ha-1) over the conventional method of transplanting.

Tsujimoto *et al*.,(2009) conducted field survey and field experiment on rice to assess the yield and claimed that SRI plots gives higher yield due to great nitrogen-supplying ability and soil fertility.

2.4 Effects of Organic manure rice yield;

S. S *et al*., (2011) concluded that nitrogen applied through vermicompost gives higher growth and yield attributes.

Joshi *et al*.,(2014) found that application of vermicompost (organic manure) increases stem height, seed germination, leaf area, number of leaves, root length, leaf dry weight, total yield, root number and chlorophyll content.

Zahedifard *et al*.,(2014)conducted an experiment with RCBD design and concluded that combination of nitrogen and vermicompost altered seed oil percentage, seed protein percentage, grain yield and oil yield of rapeseed.

Younis *et al*., carried out study at Agriculture Research Centre, Egypt on cabbage (with Brassica oleraceae var. capitata L.) split plot design and evaluated that with increasing doses of nitrogen and vermicompost, NPK content, vegetative growth, head quality and dry weight of cabbage increases.

CHAPTER 3. OBJECTIVE

The objectives of the proposed study are:

1. To study the growth and yield of Paddy under SRI.
2. To find out the effect of Seed Priming and varying Nitrogen doses on crop growth and yield.
3. To evaluate the relationship between organic sources of nutrients and crop yield.
4. To calculate the Benefit Cost Ratio.

CHAPTER 4. TECHNICAL PROGRAM OF THE WORK:

4.1 Experimental designs

The proposed study will be carried out in Agriculture farm of Lovely Professional University, Phagwara, Punjab (31.2536° N, 75.7037° E) at altitude of 252 amsl which falls under Trans-Gangetic plain region of agro climatic zone of Punjab. Evaluation and analysis of rice intensification system in central plain zone of Punjab.

4.2 Brief information of the work:

Crop Used : Rice

Period of work : 2018

Design of Experiment : RCBD

Topic under discussion : **Evaluation and analysis of rice intensification system in central plain zone of Punjab**

CHAPTER 5. METHODOLOGY OF PROPOSED WORK:

5.1 Soil Parameters

- **pH**
  Soil pH determined by the glass electrode digital pH meter (Jackson,1973)
- **Electric conductivity (EC)**
  EC was determined by Conductivity meter (Spark,1996)
- **Organic Carbon**
  The determination of soil organic carbon by wet oxidation method (Walkey and black, 1935).
- **Available Nitrogen**
  Available nitrogen was determined by Alkaline potassium permanganate method by Subbiah and Asija (1956).
- **Available Phosphorus**
  Available phosphorus was determined after Olsen et al. (1954) and Jackson (1973).
- **Available Potasssium**
  (Jackson, 1973)
- **Organic Carbon** (Walkley and Black, 1935)

5.2 Growth and Yield Parameter

- Plant height
- Number of leaves
- Number of tillers per metre square
- Number of effective tillers per metre square
- Number of panicles
- Panicle height
- Straw yield (quintals per hectare)
- Grain yield (quintals per hectare)
- Biomass content
- Benefit cost ratio

CHAPTER 6. PLAN OF WORK

The present experiment will conduct in winter season 2017 at agricultural farm of Lovely Professional University, Jalandhar, Punjab. Materials and methods used during this experiment are described below.

6.1 EXPERIMENT SITE

The experiment will conduct at college farm at Lovely Professional University which is located in Punjab state in India at about 252meters above from sea level and this region falls under Trans-Gangetic plain region of agro climatic zone on Punjab India.

DESIGN AND LAYOUT OF THE EXPERIMENT FOR RICE:

Randomized Block Design with seven levels of treatment and three levels of replication. The plan is depicted in the figure.

6.1 TECHANICAL PROGRAMME:

S. No.	EXPERIMENTAL DETAILS	Description
1.	Year of the experiment	2018
2.	Experimental design	RBD
3.	Number of treatments	7
4.	Number of replications	3
5.	Total no. of plots	7 x 3 = 21
6.	Plot size	5m x 4m (20 sq. m)
7.	Total Cultivated Area	20sq. m x 21 = 420 sq. m
8.	Sub Irrigation channel	(1m x 29)2 = 58m
9.	Main Irrigation Channel	1m x 17m = 17 m
10.	Total area	420+58+17 = 495 sq. m.

6.2 Collection of soil samples:

Soil samples will be taken before crop sowing to check the soil pH, organic carbon, electric conductivity, N, P, K ratio present in soil.

6.3 Seed Rate

Crop	Kg/acre
Basmati Rice	6-8 kg/acre

6.4 RECOMMENDED DOSE OF FERTILIZERS:

Fertilizer Quantity (**kg/ac**)	Basmati Rice
Nitrogen (N)	25 kg/acre
Phosphorus (P2O5)	On soil test basis
Potassium (K2O)	On soil test basis

1. NITROGEN (N) is given by using

- UREA
- VERMICOMPOST

2. **PHOSPHOURUS (P)** is given by using SINGLE SUPER PHOSPHATE
3. **POTASSIUM (K)** is given by using MURATE OF POTASH

6.5 Design and layout of the experiment

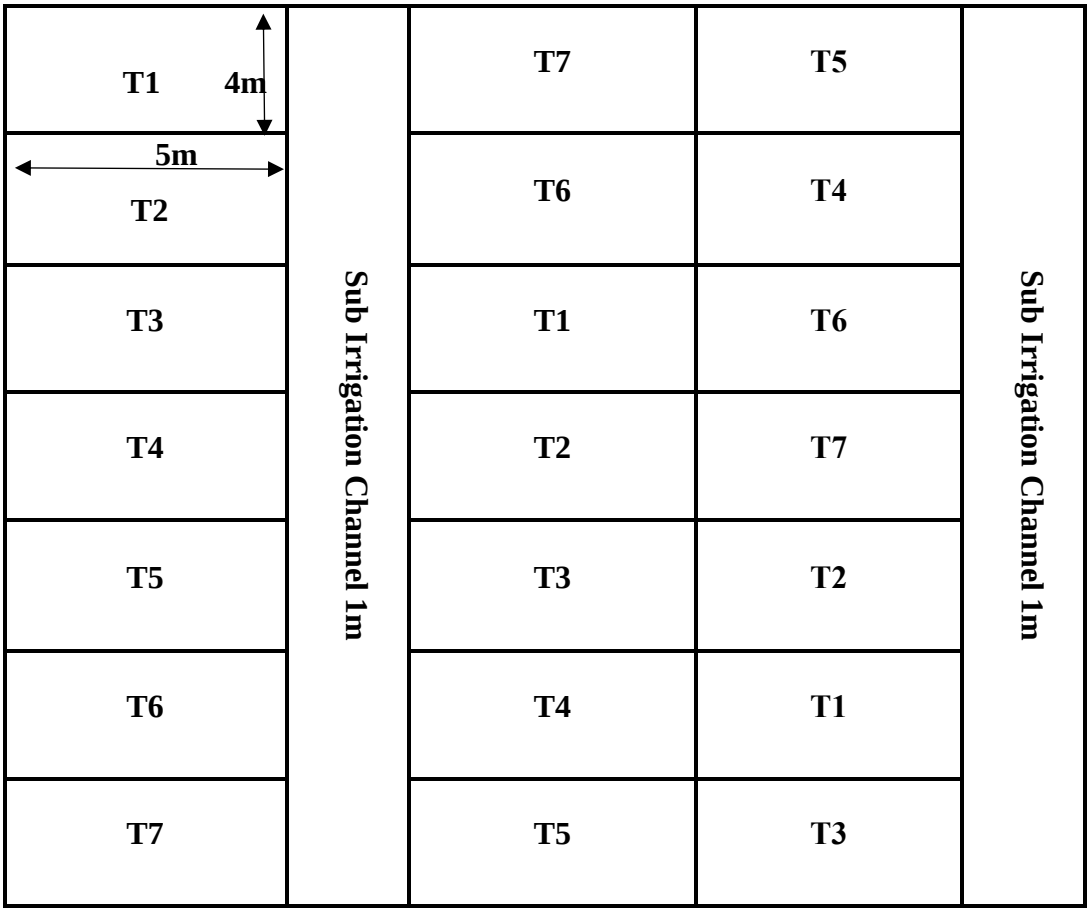
The experiment laid out in Randomized Block Design with eight levels of treatment and three levels of replication. The plan is depicted in the figure:

S. No.	TREATMENTS
T-1	Control
T-2	RDF NPK (100%) + with Seed Priming
T-3	RDF NPK (100%) + without Seed Priming
T-4	75% NPK + 25% Organic manure + Seed Priming
T-5	50% NPK + 50%Organic manure + with Seed Priming
T-6	75 % NPK + 25% Organic manure +without Seed Priming
T-7	50 % NPK + 50% Organic manure + without Seed Priming

6.6 FIELD LAYOUT

R1 R2 R3

17m



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