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System of Wheat Intensification. An Innovative Approach for Sustainable Agriculture

Mehraj-Sofi[1], Shayista Fayaz[2], Tanveer Ahngar[2] and Bhat Shabir[3]
[1]M.Sc. Student, Department of Agronomy, Agriculture University Jodhpur, Rajasthan
[2]Ph.D. Research Scholar, Agronomy, Faculty of Agriculture, SKUAST-K, Wadura, Sopore, Jammu and Kashmir
[3]M.Sc Student, Agronomy, Faculty of Agriculture, SKUAST-K, Wadura Sopore, Jammu and Kashmir

SUMMARY

System of wheat intensification (SWI) is a novel wheat production technique with management of seed treatment, seed rate, spacing, weeding, irrigation, and use of nutrient. These management techniques improve the growing conditions for the wheat crop in compared to those plants cultivated using traditional wheat farming methods, at the root zone. Indirectly increasing farmers' income and lowering food insecurity for small and marginal farmers, SWI provides a new possibility for increasing wheat output. In the current environment, it might help the crop tolerate biotic and abiotic pressures that are getting worse. Through the use of SWI, resource-constrained farmers can boost productivity and profit by using fewer agricultural inputs.

INTRODUCTION

In India Wheat is one of the most imperative crops, and stands second in grain production in the world next to rice (Meena, 2013). 55% of overall world's population depends on Wheat for the intake of about 20% of the food calories. Wheat plays an important role in country's economical and nutritional security. In India, wheat stands second with respect to area and production, but first in productivity amongst all the cereals and occupied on 31.45 million hectare with a production of 107.59 million tonnes along with productivity of 3421 kg/ha (DES, 2020) .It can be grown in the areas where rainfall ranges from 300-1130mm System of Wheat Intensification (SWI) is an innovative wheat cultivation technique which modifies traditional practices of inputs and other agronomic practices for favorable growth of both root and shoot, resulting in improved production of wheat. The green revolution transformed the industrial processes in the 1960s and 1970s, mostly because of its improved production features, increased responsiveness to water and fertiliser, shatter and disease resistance, and lodging resistance hastened the adoption of Mexican types across the globe. The persistently poor and deteriorating productivity of wheat is a significant problem as the performance boom of input-intensive technologies fades away. This method of farming might not be able to sustainably supply the ever-increasing population with food. In this context, the principles of system of crop intensification (SCI)-an innovation in rice production is suitable for wheat cultivation, which demonstrates better potentiality of production enhancement. The Principles of System of Crop Intensification (SCI), an innovation that provides opportunity for higher production per unit of agricultural inputs like fertilizer, seed, etc. Encouraging results obtained by adopting system of wheat intensification (SWI) or adopting SCI principles in wheat cultivation.

Concept of the System of Wheat Intensification (SWI)

SWI is an innovative wheat establishment technique involving components of wheat cultivation practices such as sowing, weeding, irrigation, and nutrient management. These management practices provide better condition of growth for wheat crop in the root zone than those plants grown under conventional wheat cultivation practices. Approaches such as SRI,SWI may serve the important needs of resource-poor farmers in areas with poor soils, but are likely to have little potential for improving rice production in intensive irrigated systems on more favorable soils, where high yields can be achieved through implementation of more cost-efficient management practices.

Principle of SWI

SWI is primarily based on following two principles of crop production:

1. Principle of root development
2. Principle of intensive care

Principle of root development

For the proper development of crop plant, it must be well established from rooting system. Root development is the first step of healthy growth and development of any plant. It requires proper nourishment and sufficient space around the plant. Distance between plants is crucial for proper growth and development of crop plants.

Principle of intensive care

Intensification does not mean high number of plant density per unit space; rather it is proper space maintenance and taking care of plants very closely. To enhance productivity requires intensive care in every stage of plant growth specially management of weed, insect, disease, organic manure and irrigation.

Package of practices for SWI

In SWI, the fundamental practices of wheat cultivation more or lessre main same; however it creates conducive environment for crop through changes in sowing geometry weed management and a stressing on organic manuring. It aims to increase the crop production while enhancing the intrinsic productivity of land, with minimum use of external inputs. SWI requires a number of steps for successful increase in grain and straw yield; land preparation, seed selection, seed treatment, field preparation, sowing, weeding, manure application and proper use of irrigation which are presented in brief below.

Land selection and preparation:

Well drained, loamy fertile soil withpH ranging from 6.0 to 8.5 isconsidered ideal for cultivation ofwheat. Avoid water logged soils andselect land with which is havingadequate drainage facility forremoving of excess water.The three ploughings are requiredfor obtaining good tilth for wheatsowing in SWI. The first ploughing is done to remove roots of precedingcrops cultivated on the land. After 1to 1½ month compost is applied and land is ploughed for the second time.Last ploughing is carried out beforesowing of wheat seeds.

Manure application

A good wheat crop requires adequate amount of N, P2O5 and K2Oproper proportion, 80-125:40-60:30-40kg/ha. Soil test based nutrient has been recommended followed by the application of organic manures such as farm yard manure, vermicompost ,NADEP compost, liquid manure like panchagavya, amritghol and matkakhad (PAM) and other manures(including crop residue and animal dung are commonly used for this purpose to maintain the balance of essential nutrients. Seed selection and treatment: 20–25 kg/ha bold and healthy Wheat seeds are taken by putting seeds in solution of 20% salt in water and removal of floating seeds. Thus, for seed treatment a mixture of 10 LWarm water (600C), 2 kg well-decomposed compost or vermicompost, 3 litres of cow urine and 2 kg of jaggery prepared in anear then pot. After mixing it properly, 5 kg seeds dipped in the mixture and left for 6-8 hours. With the sameratio of the above ingredient, the mixture for may be prepared for more amount of seed for treatment. The next step is to separate seeds from mixture by filter and washing with clean water. Treated seeds is kept in shade for 10–12 hours and by this time seeds fully sprout.

Sowing

The sprouted seeds will be used for sowing in the field by dibbling using two seeds per hill. Different row to row and plant to plant spacing (15 cm × 15 cm or 20cm × 20 cm) can be used depending on the moisture content. A manually driven or motorized seed drill can be used for sowing. If seed drill is not available then the fields are marked by using rope or a string tagged at15/20cm intervals. Seeds will be sown at a depth of 2.5–3.0 cm using a dibbler or pegs. Sufficient moisture should be provided in the soil while sowing germinated seed. Wherever the seed failed to germinate or destroyed, the gaps were filled with germinated seeds within 10 days of sowing. Extra seeds germinated in a hill have removed to reduce competition.

Particulars	Conventional method	SWI	Particulars	Conventional method	SWI
Seed rate	100-125 kg/ha	20-25 kg/ha	Panicle length	10-11 cm	15 cm
Seed treatment	Not necessary	Mandatory	No. of Grains/panicle	18-50	60-120
Method of sowing	Broadcasting or continuous	Dibbling in line	No. of panicles/hill	1-2 (for good stand: 2-4)	20-45
Spacing	No proper spacing regulation	20 cm × 20 cm	Stem	Thin	Thick
Weeding	Not done	2-3 times	Root	Shallow	Deep
Seed germination	After a week of sowing	Within 2-3 days of sowing	leaf	Narrow (Less LAI)	Broad (More LAI)
Irrigation	2-4 times	3-6 times	Yield	1-2 t/ha	3-4 t/ha

Source: ATMA (2008); PRADAN (2012)

Weed management

Hoeing is essential component of SWI since it ruins the weeds that compete with crop for space, light, water and nutrients. Weeding through hoeing loosens the soils and effectively aerates the roots, allowing exploration of soil that leads to better water and nutrients absorption from deeper soil depth. The weeds are incorporated into the soils which helps in increasing water holding capacity and nutrients status of the soil. In SWI normally weeding is done 2-3 times, first weeding at 20-25 days after sowing (DAS).Subsequent weeding's are carried out at an interval of 10 days.

Water management

In SWI, the soil is kept alternately wet and dry, and 3-5 irrigations may be given as per soil moisture status. First irrigation is given at 15 DAS, before the crown root initiation (CRI). A second irrigation will be given after40 DAS as the soil develop hairline cracks. Irrigations are given before weeding in the early stages of crop growth. A third irrigation was given at 75 DAS. Fourth irrigation was given at flowering and fifth irrigation at grain-filling stage.

Pest and disease management:

Varieties, which are resistant to pest and disease are selected, and seed treatment can be done before sowing of the seed to prevent crop damage caused by various biotic stresses. The use of biological pest control tactics like biological agents and organic insecticides is advocated in SWI.

Harvesting

Adequate availability of sun light, water and proper aeration leads to effective tillers/hill. The proper adoption of the SWI package and practices, the crop matures in time and subsequently harvested when the moisture content of wheat grain is around 20-25%.

Adoption of SWI in India

• In India, SWI first tested in 2006by PSI (People Science Institute) in northern India with 40 farmers in25 villages, obtaining a 66% yield increase over their traditional practices.
• Within three years the number of farmers using the new methods was over 12,000 in Himachal Pradesh and Uttarakhand.

The most rapid growth is in Bihar, where 415 farmers, mostly women, tried SWI methods in 2008-09, with yields averaging 3.6 t/ha, compared with 1.6 t/ha using usual practices.

Benefits of SWI

• More number of effective tillers.
• No lodging of crop and increased production.
• Early anthesis and crop maturity (4-5 days).
• Long and shining grain is obtained-good grain quality.
• More fodder available for cattle.
• No/ lesser disease incidence and insect infestation.
• Less seed requirement 75-80% seed saving (Only 20-25 kg/ha).
• Weeding facilitated good aeration to roots.
• Less water requirement (20-30%).
• High seed germination rate and better plant stand.
• Suitable for organic farming, fertility of soil is also improved.

Constraints in SWI

• Need to design and develop suitable sowing implement.
• Availability of suitable weeder to the farmers.
• Capacity building of farmers in adoption of SWI.
• To ensure irrigation at critical stages of crop growth.
• Intensive scientific study need to be done at research station.

CONCLUSION

In conclusion, System of Wheat Intensification Method of wheat cultivation has shown positively response on all measured growth parameters, yield characters and yield production compared to conventional method. It shows positive response for seed treatment and wider space sowing. The SWI technology has already established its strength in terms of multiple benefits like enhanced productivity per unit land, water and other inputs with higher economic gain. However, more detail study is needed on various agronomic and other bio-physical changes in the plants under SWI method. Finally, more skill oriented training for the SWI farmers is required to build

REFERENCES

Raghavendra, M., Singh, Y.V., Verma, R.K., Halli, H.M. and Goud, B.R., System of wheat intensification An innovative approach. *Indian Farming*, *69*(4).

Dobermann, A. (2004). A critical assessment of the system of rice intensification (SRI). *Agric*. *Sys*., 79: 261-281.

Meena, B.L. and Singh,R.K.(2013). Response of wheat (Triticum aestivum) to rice (Oryza sativa) residueand weed management practices. *Indian J. Argon*., 58: 521-524.