

SYSTEM OF MAIZE INTENSIFICATION

FarmAll Technology Ltd. in Lahore, Pakistan has been working on the application of SRI concepts and practices to maize and other crops. FarmAll's CEO Asif Sharif is combining SRI methods and thinking with conservation agriculture (CA) and organic agriculture. He calls this convergence "paradoxical agriculture," because it can produce 'more from less.' More on this innovation is at: <https://docs.google.com/open?id=0BxKIfua619daYjFiMzU3NzYtYjdmMC00NGFjLTgxZTUtMTRiZDIyZGZiNDEz>

Sharif started by designing precision planters for establishing large-seeded crops – maize, cotton, soybeans, sunflower, etc. – with a specified plant-to-plant distance within rows, as well as wide spacing between rows.

In recent years, maize has been planted on furrows made by machine ploughing the length of large fields. This practice was started at Sharif's farm back in 1974. Later this system was adopted by most farmers in place of traditional flatbed sowing. Subsequently, when FarmAll developed effective raised-bed planting machines, corn and cotton were the first crops to be sown on raised beds.

Later, the Government of Punjab began providing a 50% subsidy to farmers for purchasing raised-bed precision planting machines, and FarmAll sold hundreds of them. At present, most progressive farmers plant their maize on raised beds. However, FarmAll has been further adapting these practices in line with the insights gained from SRI theory and methods. Probably still more and different adaptations of maize cultivation in response to SRI experience will follow. Below is the 'SMI' that has been evolved by FarmAll Technology.

Maize on Furrows & Raised-Beds a comparison – 50% water is saved in bed planting



1. Timely planting: Most of the maize is planted soon after the harvest of a potato crop in early spring. The spring season in the Punjab is very short, as the weather is cold in January, when

potato crop is harvested. At this time it is hard for any seed to germinate due to low temperatures. However, if planting is delayed, the crop will be set back by high temperatures in April/May when it is at silking and or grain is in formation stage. Therefore, high temperatures lower pollination and results in shriveled grain due to early maturity, adversely affecting yield. With raised-bed planting, it is possible to plant earlier and to plant in soil which has low moisture soon after the potato harvest, by applying water after planting/germination. With improvement in seed-to-soil contact, the maize seed can attain moisture from the vapor moisture that is trapped between soil particles to facilitate its germination.

2. Trauma to the plant during various operations is minimized: A precision weeder/soil aerator is used for mechanical weeding between plant rows on the raised beds. In spring crop one time weeding at 6 leaf stage is good enough. However, in autumn crop weeding is done twice, at 4 and 8 leaf stage. The machine slices through the upper layer of the soil crust, cutting through the roots of weeds at a depth of about 2.5cm (1"), and leaves the top layer of soil at the same place. This eliminates the soil disturbance and root-shaking of the crop that is normal with tine-type weeders. Root-shaking breaks hairline roots that absorb water-nutrition solution, resulting in crop stagnation for a week or so, allowing regrowth of hairline roots to regrow.
3. Optimally wide spacing between plants: Corn and other big seeds are planted with pneumatic precision planters to maintain plant-to-plant distance in a row. In spring maize 35,000 plants per acre are considered optimal; to achieve this maize is planted at 27 inch (69 CM) row to row distance and 6.5 inch (16.5 CM) plant to plant distance is kept. However, in autumn crop, plant population is decreased to less than 30,000 (8" or 20 CM) due to approaching low sunlight conditions at the time of maturity.
4. Weeding and active soil aeration: This occurs as explained in #2 above.
5. Water management: This is done so as to meet but not exceed the plants' and soil's needs. Raised-bed planting fundamentally avoids over-irrigation and assures moist soil for persistent plant growth.
6. Compost application to enhance the structure and functioning of soil systems: The machines can lay down a band of compost in rows where the seed is planted, and this creates a favorable micro-environment for plant roots. Some inorganic fertilizer can be laid down also as a supplement to the organic fertilization if the soil has certain nutrient deficiencies. But the aim is to move toward fully organic cultivation as fertility is built up. Raise-bed cultivation, with roots kept in the soil to discompose, can build up soil structure and functioning over time.

At present, a number of small-seeded crops such as wheat, rapeseed, carrots, reddish, onions etc., are randomly planted on (machine-made) raised beds without maintaining seed-to-seed distance. There should be productivity gains possible from more controlled planting/crop establishment, with small seeds planted at a uniform distance for what can be called 'system of crop intensification' (SCI). There is need either to develop machines which can handle and plant small seeds at a uniform distance, or to pelletize seeds so that existing machines can plant them.

In a traditional system, fertilizer is hand-broadcast at the time of seedbed preparation, furrows are made and seed is dribbled by hand. Hand-dribbling is seldom uniform in seed to seed distance and in seed depth.

In SMI, several operations are carried out in a single pass, i.e. making raised beds, placing fertilizer, compost and seed at an accurate distance and depth.

Initially, farmers were applying same amount of fertilizer as they were used to in hand-broadcasting application. However, through experience they learned that a lower amount of fertilizer application in a split doses is more beneficial.

Therefore, there is up to 70% saving in fertilizer and water, 20% in seed, 50% in machine hours, and 80% in labor compared to traditional planting system. At the same time, up to 40% yield increase is observed by progressive farmers. It is even more when comparing with flatbed planting.

Asif Sharif

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