

Spring maize: a water exhaustive crop

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Data of 80 farmers were collected by KVK, Kapurthala scientists on comparative performance of spring maize and summer moong. The comparative yield of spring maize and summer moong were 37.6 and 4.26 q/acre, respectively. The number of irrigation applied during crop season varied significantly as it was 19.7 irrigations for spring maize as compared to 2.4 irrigations for summer moong. Likewise, total irrigation water applied was calculated to be 3,940 and 480 m³/acre for spring maize and summer moong, respectively. The cost of irrigation water for spring maize cultivation was calculated to be ₹ 3,940/-acre, and for summer moong it was ₹ 480/-acre. There was a huge difference in the cost of production for spring maize (₹ 12,320/-) and summer moong (₹ 7,500/-), the major difference was due to the fertilizer application. On the other hand, spring maize yielded an average of 37.6 q/acre @ ₹ 958/-q which comes out to be ₹ 36,021/acre and was more by ₹ 6,201/acre. Contrary to the fact gross returns on per day basis in summer moong was ₹ 470/acre as compared to spring maize (₹ 304/acre). Considering irrigation water cost, cultivation of spring maize became less remunerative (₹ 19,768/-) than the summer moong (₹ 21,840/-).

Key words: Crop, Spring Maize, Water

PUNJAB is the major rice-wheat producing state in the country contributing 51% of paddy and 18% of wheat production. To produce 10.8 tonne/ha of rice and wheat, two natural resources i.e. water and soil have been depleted to a large extent. Out of 145 water blocks of Punjab, 110 have already been declared as dark zones. In spite of this peculiar situation, the farmers of Jalandhar and Kapurthala district were not judging the consequences of unwanted situation and therefore, opting for cultivation of spring maize between February and June every year. Moreover, due to very high temperature between April and May, the water requirement of maize was very high. With the passage of time the net profitability was declining and growing of crops is not being sustained because the level of underground water-table was

declining, as a result, farmers were further increasing depth of submersible motors. Hence, it has become essential to educate the farmers about the use of irrigation water for raising short duration crops. Summer *moong* being a leguminous crop had unique role in fixing atmospheric nitrogen through the process of biological-nitrogen fixation. The biological nitrogen-fixed by summer *moong* not only met its own requirement but also leaves nitrogen after harvest, which is beneficial to the next crop by fixing 31/85 kg N/ha.

RESEARCH WORK

To demonstrate the production potential of summer *moong* as a profitable, sustainable and viable alternative to the spring maize, front-line demonstrations on summer *moong* cv. SML 668 were conducted

on 32.32 ha at 50 farmers' field in district Kapurthala. The participating farmer had also sown spring maize and therefore, it became easy to make comparison between pulse and cereal crop. All the package of practices recommended by the Punjab Agricultural University, Ludhiana were followed. However, (KVK) *Krishi Vigyan Kendra* provided only seed of SML 668 and all other inputs were applied by the farmer himself at his own level as per the advice of the KVK scientist. The data of all the farmers were collected on regular basis at various stages of both the crops and calculations were made to draw the inference about the comparative performance of summer *moong* with spring maize. The data were analyzed using mean value

- Gross income = Yield (q/ha) × Selling price (₹/q)
- Gross returns/day (₹) = Gross



income (₹)/Crop duration (No. of days)

c. Irrigation water applied(m³/ha) = Number of irrigations×depth of irrigation)×100

d. Net returns (₹) = Gross returns– Cost of production

e. Water productivity (kg/m³/ha) = Yield (kg/ha)/Total irrigation water used (m³)

PERFORMANCE OF CROPS

The comparative yield of spring maize and summer *moong* were 37.6 and 4.26 q/acre, respectively.

Yield and water use efficiency for spring maize and summer *moong*

The cropping season of both spring maize and summer *moong* sets in between from February to June, when the ambient temperature starts rising and was found to be maximum between April and May. The duration of growing period for maize and summer *moong* is 118 days and 63 days, respectively (Table 1).

Table 1. Yield of spring maize and Summer *Moong*

Parameters	Spring maize	Summer moong
Days to maturity	118.5	63.4
Yield (q/acre)	37.6	4.26
Selling price (₹/q)	958	7,000

The data regarding number of irrigation applied during crop seasons varied significantly because spring maize required 19.7 irrigations as compared to 2.4 irrigations for summer *moong*. Likewise, total irrigation water applied was calculated to be 3,940 and 480 m³/acre for spring maize and summer *moong*, respectively (Table 2). This

indicates that cultivation of spring maize is highly unsustainable due to higher water requirement. Looking at the gravity of the situation, it is imperative to discourage cultivation of spring maize and farmers must be advised to go for short duration water efficient and sustainable crop such as summer *moong*.

Table 2. Water use efficiency in spring maize and summer *moong*

Parameter	Spring maize	Summer moong
Number of irrigations during crop season	19.7	2.4
Total irrigation water applied (Cubic m/acre)	3,940	480
Water productivity (kg/m ³ /acre)	0.95	0.89
Cost of irrigation water (₹/acre) @ 1 paisa per 10 liter	3,940	480

Although Government of Punjab is providing electricity free of cost to the farming sector, as a result of which farmers do not consider the cost of irrigation water applied for growing crops. The cost of irrigation water for spring maize cultivation was calculated to be ₹ 3,940/acre and for summer *moong* it was ₹ 480/acre, which showed that cultivation of summer *moong* is economical compared to spring maize. This fact needs to be further propagated among the farming community while calculating the gross profit or net profit earned per unit area.

Cost of inputs and net returns for spring maize and summer *moong*

The Table 3 showed that there was a huge difference in the cost of production for spring maize (₹ 12,320) and summer *moong* (₹ 7,500). The major difference was

Table 3. Cost of inputs used for growing spring maize and summer *moong* per acre (0.404 ha).

Parameters	Spring maize (₹)	Summer moong (₹)
Land preparation	1,500	1,500
Seed cost	1,600	3,000
Seed treatment	140	20
Labour cost for sowing	700	400
Watch and ward cost during germination and grain filling	930	Nil
Weedicide used	650	400
Insecticides used	400	480
Fertilizers used	2,750	Nil
Earthing up	250	Nil
Labour cost for harvesting	1,500	1,100
Labour cost for threshing	Nil	400
Labour for irrigation	1,900	200
Total cost	12,320	7,500

due to the fertilizer application because summer *moong* was grown mostly after potato harvesting which requires no fertilizer whereas, for growing spring maize there was a need for 120 kg of urea, 75 kg of DAP and 20 kg of MoP per acre, which cost ₹ 2,750 per acre. Similarly, for providing 19 irrigations to the spring maize, during the growing period starting from February to June at least 19-man-days @ ₹ 250 man day were required thus costing ₹ 1,900, which is ₹ 200 in summer *moong*.

Additionally, an amount of ₹ 930 was required to deploy a person for taking care of watch and ward especially at the germination and after filling up of grains in spring maize (Table 3). As far as, harvesting cost is concerned maize crop was harvested with the help of combine harvester @ ₹ 1,500 per acre

(0.404 ha), whereas, *moong* crop was harvested and threshed manually. No fertilizer was applied to the summer *moong* as *Rhizobium* spp. which supplies about 20 to 40 kg N/ha can be considered as a complementary source of plant nutrients as inoculation of *Rhizobium* enhances nodulation, nitrogen-fixation, and grain yield.

The average selling price of summer *moong* observed during 2016-17 was between `6,500 and `7,500/q and so the average was `7,000/q then gross income comes out to be `29,820/acre (0.404 ha) (Table 4). On the other hand, spring maize yielded an average of 37.6 q/acre (0.404 ha) @ `958/q which comes out to be `36,021/acre and was more by `6,201/acre.

This was the main reason that farmers were increasing area under spring maize day-by-day to harvest short-term gains and were not paying any attention toward cultivation of short-duration, more resource efficient crops like summer *moong* and spring groundnut etc. Contrary to the fact gross returns on per day

Table 4. Net returns in spring maize and summer moong

Parameter	Spring Maize	Summer moong
Gross income (`/acre)	36,021	29,820
Gross returns per day (`/acre/day)	304	470
Cost of production including irrigation cost (`/acre)	16,260	7,980
Net returns excluding irrigation cost (`/acre)	23,708	22,320
Net returns including irrigation cost (`/acre)	19,768	21,840

basis in summer *moong* was `470/acre as compared to spring maize (`304/acre). This indicated that farmers can earn more gross returns per unit area in per unit time but it requires an exhaustive effort to be made by the extension agencies to make the farmer understandable about this philosophy.

The study showed that the net profitability is totally dependent upon the cost of irrigation water applied, which is considered free by the

farmers and if taken into consideration, cultivation of spring maize, in any case is not at all profitable (Table 4). Cultivation of spring maize became less remunerative (`19,768) than the summer *moong* (`21,840).

SUMMARY

Little attention needs to be given by the farmers to into account the cost of irrigation water required to irrigate the crop, while calculating the total cost of production as well as the profitability of the crop to save the underground water. Hence, it is imperative to discourage cultivation of spring maize and farmers must be advised to go for short duration water efficient and sustainable crops such as summer *moong*.

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