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Additional Income Generation from Cultivation of Summer Mungbean in Rice-Wheat System of Haryana

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ABSTRACT

Background: Mungbean [*Vigna radiata* (L.) Wilczek], also known as green gram is cultivated on area of 4.75 million ha in kharif and rabi/ spring seasons as monocrop or intercrop in India. It serves as a major source of dietary protein for the vast majority of vegetarian people in the country. Mungbean contributed 10.03 per cent of total pulses production (23.40 million tonnes) in the country with productivity level of 494 kg ha^{-1} in 2018-19. The pulses cultivation in Haryana is almost eliminated in kharif season owing to deviation of area towards cotton, cluster bean and pearlmillet because of low profitability. However, the new window opens for cultivation of mungbean in rice-wheat cropping system in summer season to generate additional farm income and to improve soil health. The area under summer mungbean in state was around 64 thousand ha with the production of 50 thousand tonnes and the average productivity of 780 kg/ha during 2017-18. Although rice-wheat system provides better farm returns, but it has imposed threat to soil health, availability and contamination of ground water, weed and biotic stress management.

Methods: The data pertains to costs and returns from summer mungbean cultivation was gathered from 60 mungbean cultivators of Hisar, Kurukshetra and Panipat districts of Haryana having adequate irrigation water availability adopting personal interaction approach in 2018-19. Simple budgeting technique was employed to draw practical implications which ultimately help to take favourable policy decisions for enhancing acreage of summer mungbean.

Result: The inquiry profound that mungbean cultivation in summer season particularly in rice-wheat was established as additional income generation farm enterprise. The net benefits accrued from short duration varieties of mungbean over variable cost was Rs. 31831 ha^{-1} with time span of 60-70 days by utilizing fallow land in summer season. The B-C ratio toiled considering expenses incurred on variable resources with value of 2.99 divulges economic viability of mungbean cultivation in the study area. It is imperative from results that cultivation of short duration cultivars of mungbean is viable option to enhance farm income, restoration of diminishing soil fertility owing to adoption of continuous rice-wheat rotation by inherent characteristics of converting atmospheric nitrogen. Distinctive efforts are essential to evolve mungbean cultivars suitable to prevailing cropping system in Haryana and assure market procurement. The exploration of mungbean cultivation will reduce dependency on import and improve net availability of pulses in India.

Key words: B:C ratio, Gross returns, Mungbean, Net returns, Profitable enterprise.

INTRODUCTION

Pulses are important for nutritional security and for alleviating malnutrition among the poor masses in India. These provide energy, dietary fiber, protein, minerals and vitamins required for human health. Pulses, by contributing about 10 per cent in the daily protein intake and 5 per cent in energy intake, are of particular importance for food security in low income countries like India, where the major sources of proteins are non-animal products and large population is vegetarian. In addition, pulses also contain significant amounts of other essential nutrients like calcium, iron and lysine (Gowda *et al.,* 2013). Therefore, pulses are included in all “food baskets” and dietary guidelines. Recent research studies suggested that consumption of pulses may have potential health benefits by reducing the risk of cardiovascular diseases, cancer, diabetes, osteoporosis, hypertension and gastrointestinal disorders (Jacobs and Gallaher, 2004).

The top five states, *i.e.* Madhya Pradesh, Maharashtra, Uttar Pradesh, Rajasthan and Andhra Pradesh shared over 75 per cent of total pulses production. Madhya Pradesh is the highest pulse-producing state (3.2 million tonnes/annum) followed by Maharashtra and Uttar Pradesh. In terms of productivity, Haryana has the highest yield of 824 kg ha^{-1} followed by Madhya Pradesh, Uttar Pradesh and Bihar (Gowda *et al.,* 2013).

Per cent share of pulses to total food-grain basket in the country in terms of area and production was 19.62 and 16.55 per cent, respectively in1950-51 and continued till 1960-61 and it started declining after inception of green revolution due to no break-through in production technology of pulses in comparison to other commodities of food grains. Deceleration of contribution of pulses to total food grains

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has prompted vigorously in the country to pursue pulses as one of component of NFSM in 12th Plan to focus on cultivation of pulses in rainfed and rice fallow areas as well as adoption of improved production technologies coupled steep rise in MSP and procurement arrangement.

In Haryana, the continuous increase in area under rice and wheat due to expanded irrigation facilities has created imbalance in cropping pattern and resulted into nearly elimination of pulses from the cropping system in irrigated conditions. The area under pulses in state condensed to 0.75 lakh ha and pushed to poor fertility and rain-fed areas due to low yield and absence of adequate production/ protection technologies.

No doubt, rice-wheat system yields better farm returns, but it has imposed threat to soil health, contamination of ground water, weed infestation, occurrence of biotic stresses. At present, about 13 lakh ha area is cultivated under rice-wheat system with assured irrigation facilities. However, the area remains fallow during summer season in the state and provides space for cultivation of short duration pulses like mungbean. Keeping in view above stated facts, the present study was attempted with objective to analyse the status and economic profitability of mungbean cultivation in summer season in the state.

MATERIALS AND METHODS

The present study was confined to one district (Hisar) from western zone and two districts (Kurukshetra and Panipat) from eastern zone of Haryana state. From each district, three villages were selected randomly. Further, 20 cultivators were selected randomly from each selected district from the list of mungbean growers incentivized by State Department of Agriculture and Farmers Welfare and Krishi Vigyan Kendras (KVKs) of CCS Haryana Agricultural University. The relevant information pertaining to various resources like seed, farm machinery, human labour, farm operations etc were extracted from mungbean cultivators through personal interaction. Compound annual growth rate (CAGR), simple budgeting techniques and descriptive analysis were employed to draw valid inferences from the information collated.

RESULTS AND DISCUSSION

Area coverage under mungbean

The share of summer mungbean to total pulses in the state in terms of area and production was 30.81 and 23.99 per cent, respectively during 2013-14 (Table 1). After this, area and production of total pulses started decline and this trend continued till 2016-17. During 2017-18, contribution of area and production of summer mungbean was 83.12 and 84.99 per cent to the total pulses, respectively. The total acreage under pulses decreased during time period of 2013-14 to 2017-18. The growth rate for area and production of total pulses were estimated to be negative *i.e*. -12.63 and -11.34 per cent, respectively while in case of summer mungbean, both values were found positive. This reflects that there is good potential for cultivation of summer mungbean in rice-wheat system having area of around 13-14 lakh ha in the state. The only way to compensate decline in acreage under pulses in the state is by promoting the cultivation of pulses in summer season. It is also required special attention for brining large area under cultivation of mungbean in summer season not only to utilize fallow areas but also supplement additional quantity of pulses to meet the ever rising demand of pulses in the country.

Economics of summer mungbean cultivation

The cost and returns analysis is important for promotion and adoption of crop enterprise. The cultivators come forward for adoption of new farm enterprise after analysing its profitability and do allocation of scarce farm resources accordingly. Besides, planting time and impact on succeeding crop, potential, duration and accessibility of quality seed of improved cultivars, technologies, irrigation water availability, procurement arrangement, market price, weather conditions etc. are also considered for enchanting appropriate decision to cultivate new farm enterprise. Therefore, the economic analysis of farm enterprise play an important role for replacing/inclusion of farm enterprise in existing cropping systems adopted at the farm. The short duration (60-70 days) varieties of mungbean like SML 668 and MH-421are cultivated during summer season. The planting time of mungbean start from end of March to Last week of April and it is harvested in first fortnight of June. Its planting is mostly done residual moisture or with light irrigation.

The per hectare total cost calculated on prevailing market prices of various inputs used in cultivation of summer mungbean in Haryana during 2018 workout to be ` 43975 (Table 2). The harvesting and thrashing charges contributed 12.62 per cent of total cost in the state followed by field preparation (8.55%) and irrigation (6.35%). The cost of harvesting and threshing operation can be reduced to large extent by providing suitable machines at affordable price. The variable expenses incurred in cultivation of summer mungbean were around 36 per cent of total cost. While in case of fixed cost, highest contribution derived from rental value of land (54.96%) followed by management and risk factors (7.08%) and transportation cost (1.49%) out of total cost. These results are in agreement with the findings of Grover and Singh (2015), Sekhon *et al*. (2007), Angadi and Patil (2018) and Islam *et al*. (2011).

The share of rental value of land in total cost may be due to cultivation of crop on fertile land with assured irrigation facilities. However, there is no application of chemical fertilizers as summer mungbean fulfils the nutrient requirement having nitrogen fixation characteristic being legume crop and available unused nutrients in field. The crop was harvested by applying two light irrigations during crop season of 65-70 days. The crop is not much affected by biotic stresses due to hot conditions and uses of one/two sprays of pesticides protect the crop. Sometimes, early

Table 1: Contribution of summer mungbean to total pulses in Haryana.

Years	Summer mungbean	Total Pulses	% contribution in total	Summer mungbean	Total Pulses	% contribution in total
	Area	Area	area	Production	Production	production
2013-14	47.00	152.55	30.81	30.00	125.05	23.99
2014-15	20.00	83.20	24.04	13.00	56.10	23.17
2015-16	34.00	96.60	35.20	25.00	65.68	38.06
2016-17	20.00	84.60	23.64	17.00	75.91	22.39
2017-18	64.00	77.00	83.12	50.00	58.90	84.89
CGR (%)	**6.37**	**-12.63**		**13.77**	**-11.34**	

A= Area in '000' ha. P= Production in '000' tonnes.

Table 2: Cost of cultivation of summer mungbean in Haryana (Rs./ha).

Particulars	Study area (district)			Overall
	Kurukshetra	Hisar	Panipat	average
Field preparation	3788(8.45)	3981(9.39)	3513(7.86)	3761(8.55)
Seed	2200(4.91)	1763(4.16)	1835(4.11)	1933(4.39)
Planting	500(1.12)	450(1.06)	500(1.12)	483(1.10)
Irrigation	2500(5.58)	3000(7.08)	2875(6.43)	2792(6.35)
Plant protection	1158(2.58)	1038(2.45)	588(1.31)	928(2.11)
Harvesting and threshing	5420(12.09)	5363(12.65)	5863(13.12)	5549(12.62)
Interest on working capital	603(1.34)	606(1.43)	586(1.31)	598(1.36)
Variable cost	**16168(36.06)**	**16200(38.21)**	**15759(35.27)**	**16042(36.48)**
Management and risk charges	3134(6.99)	3150(7.43)	3052(6.83)	3112(7.08)
Rental value of land	25000(55.76)	22500(53.07)	25000(55.95)	24167(54.96)
Transportation	538(1.20)	550(1.30)	875(1.96)	654(1.49)
Total cost	**44839(100.00)**	**42399(100.00)**	**44686(100.00)**	**43975(100.00)**
Yield	11.33	10.58	11.50	11.14

*****Rental value of land for mungbean included one fifth of the total rental value of land for one year.

**Figure in parenthesis are represent to per cent of total cost.

Table 3: Returns from cultivation of summer mungbean in Haryana (Rs./ha).

Particulars	Study area (district)			Overall
	Kurukshetra	Hisar	Panipat	average
Yield (quintals ha^{-1})	11.33	10.58	11.50	11.14
Price per quintal	4298.15	4298.02	4300.00	4298.72
Gross return	48698	45473	49450	47874
Cost of production (Rs $quintal^{-1}$)	3915	3967	3842	3908
Returns over variable cost	32530	29273	33691	31831
Net return	3859	3073	4764	3899
B:C ratio (over variable cost)	3.01	2.81	3.14	2.99
B:C ratio (over total cost)	1.09	1.07	1.11	1.09

precipitation at maturity stage of crop resulted into sharp reduction in the yield and farmers ploughed the crop in the field for green manuring.

Returns from cultivation of summer mungbean

The income generated from cultivation of farm enterprise is strong yardstick to take decision for its cultivation. The income accrued from cultivation of mungbean is considered as additional income from the same field by utilizing fallow land in summer season rather than replacing the existing crop enterprises. The yield of summer mungbean was realised in range of 10.58 to 11.50 quintals ha^{-1} with average yield of 11.14 quintals ha^{-1} in the state. The per hectare gross returns (gross returns only include pod yield and by-product was used as green manure and incorptated into the field) from summer mungbean attained in state were Rs. 47874 with returns over variable cost of Rs. 31831 (Table 3). There is not much difference in potentiality of crop harvested in different areas of state as quality of seed and agronomic practices followed were almost similar.

The cost of production was nearly equal in different regions of the state as inputs used in cultivation of summer

mungbean exhibited similar pattern. The net returns worked out from cultivation of summer mungean were Rs. 3899 in the state. The value of B: C ratio over variable and total cost was estimated 2.99 and 1.09, respectively indicates the economic viability of summer mungbean cultivation in the state. The value of B: C ratio over total cost was low as rental value of land was taken into account. Most of farmers will not cultivate land in summer season and keep as fallow and land rent is spliited into wheat and paddy only. The additional income from mungbean cultivation is genereated from utilization of fallow land in summer season. Similar outcome were also found by Puniya *et al.* (2018), Islam *et al.* (2007) and Miah *et al*. (2005) in their respective studies.

CONCLUSION AND POLICY IMPLICATIONS

It is concluded from the aforesaid discussion that after the harvest of wheat and before the transplanting of rice, the land remains fallow for 65-70 days (April to June). This period could be used to raise a catch crop of summer mungbean. The early emergence of even one day is highly beneficial in this short duration crop. This means mechanization can enable us for timely sowing by which we can earn more through reducing cost of cultivation. It also fixes nitrogen in the soil, requires less irrigation and helps maintain soil fertility and texture. Adding mungbean to the cereal cropping system has the potential to increase farm income, improve soil health and promote sustainability of agriculture on long-term basis. The growth rate for area and production of total pulses were estimated to be negative *i.e*. -12.63 and -11.34 per cent, respectively while in case of summer mungbean, it showed positive sign. The rnungbean production in the study areas is profitable, because B: C ratio over variable cost is 2.99 and picking of pods was not required as both the varieties (SML 668 and MH-421) have synchronous maturity. The farmers reported that the yield of succeeding rice crop was higher as mungbean helps to improve soil fertlity.

Munghean farmers received higher return from investment. The value of B:C ratio indicates that summer mungbean cultivation is economically viable option. It has a vital potential in increasing the farmers income and also helps in improve the soil fertility status by adding the atmospheric nitrogen in soils.

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