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Economics of cost of cultivation of Greengram in Gadag district of Karnataka

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Abstract
The present study attempted to estimate the cost of cultivation of Greengram in the Gadag district of Karnataka. The multi-stage random sampling procedure was adopted to choose the sample farmers. In the first stage, Gadag district was selected based on highest greengram area. In second stage, taluks having highest area under greengram ware selected. Later two villages from each taluk having highest area under greengram crop were selected in the third stage. Finally, sample of thirty farmers were chosen from each of these selected villages randomly. Thus, the total sample size selected for the present study was totaled to 180. The data pertained to the agricultural year 2014-15. Tabular analysis techniques were used to analyze the data. The results revealed that among the three categories of farmers the total cost incurred by the small farmers was the highest (₹ 22889.08/ha) as compared to medium and large farmer (₹ 22653.45/ha and ₹ 22268.21/ha). Net returns per hectare obtained by large farmers were the highest (₹ 18479.79/ha) as compared to small and medium farmers (₹ 16430.92/ha and ₹ 17138/ha respectively). The gross returns obtained per hectare by overall category of farmers were ₹39953.33 with a yield of 5.93 qtls/ ha. The total variable cost incurred per hectare by small farmers was high (₹18285.25/ha) as compared to medium and large farmers (₹ 17916.33/ha and ₹ 17411.44/ha respectively), and B: C Ratios was 1.77 for the overall study area.

Keywords: categories of farmers, cost, net returns, gross returns and B:C ratio

Introduction
Greengram (*Vigna radiata* L) is belongs to the family Leguminosae and sub-family Papilionaceae and the earlier name of Greengram was *Phaseolus aureus* that has now been changed to *Vigna radiata.* It falls in the group of Asiatic Species of genus Phaseolus. The Greengram was domesticated in India, where its wild progenitor (*Vigna radiata* subspecies *sublobata*) occurs wild. Archaeological evidence has turned up carbonized Greengram on many sites in India. Areas with early finds include the eastern zone of the Harappan civilization in Punjab and Haryana, which dates back about 4500 years, and in South India modern in state named Karnataka it finds date back more than 4000 years. However in South India there are evidences for evolution of larger-seeded greengram about 3500 to 3000 years ago. And greengram were widely cultivated throughout India, Later cultivated greengram spread from India to neighbouring countries like China and Southeast Asia.

Nutritional and medicinal value
Greengram contains about 24 per cent protein, this being about two third of the protein content of soybean, twice that of wheat and thrice that of rice. The protein is comparatively rich in lysine, which is deficient in cereal grains. Hence, a diet combining mungbean and cereal grains forms a balanced amino acid diet. Every100 g of mungbean seeds contains 132 mg calcium, 6.74 mg iron, 189 mg magnesium, 367 mg phosphorus and 124 mg potassium and vitamins like 4.8 mg ascorbic acid, 0.621 mg thiamine, 0.233 mg riboflavin, 2.251 mg niacin, 1.910 mg pantothenic acid and 114 IU vitamin A (Haytowitz and Matthews, 1986). Greengram has high digestibility and palatability, its pods are used as green vegetable. Its whole grains and split grains are used as dal and curry. Being highly digestible, its curry is generally recommended for patients. Its flour is used in various preparations like, halwa, savoury dishes, snacks, pakoras and fried dal, to get very delicious and nutritious products. Its green plants, chopped and mixed with other fodders are palatable feed for animals. It is also used as green manuring crop, which adds nitrogen in addition to humus to the soil. It is a soil protecting crop in rainy season.

Cooked dal of green gram is a very digestive food for invalid and sick persons. Its regular use during childhood, pregnancy and lactation helps one to get the required nutrition and promote health. It is an aperients i.e. a laxative. When given in large quantities. The soup made from it is best article of diet after recovery from acute illness.

Applying in the form of powder is useful in relieving the heat or burning of the eyes. A poultice of this powder is useful for checking secretion of milk and reducing distention of the mammary glands. The soaked greengram is an excellent medicine during cholera, measles, chicken-pox, small-pox, typhoid and all types of fevers. It can be given in a small quantity even during acute phase of appendicitis. Flour of the green gram is an excellent detergent and can be used as a substitute for soap. It removes the dirt and does not cause any skin irritation. Its application over the face bleaches the colour and gives good complexion. Black gram flour is also used for washing the hair with green gram paste to lengthen hair and prevent dandruff.

World

Greengram is widely grown in India (31.62 per cent), Nigeria (6.05 per cent), Brazil (5.34 per cent), and China (4.70 per cent). The crop extends to Canada (3.45 per cent), Australia (2.16 per cent), Mexico (1.96 per cent) and USA (1.66 per cent). The crop in India occupied an area of 3.42 million hectares (M.ha) and India produced 1.34 million tonnes grains in 2011-12 (www.faostat).

India

It is grown primarily during rainy (kharif) season almost in entire India and occupies nearly 80 per cent of the total area under crop. The rabi crop amounts for the remaining 20 per cent of the total area. In spring and summer season also it is now cultivated as a short duration catch crop in places where some irrigation water is available and lands remain fallow during summer. The important states in India growing maximum greengram crop are Rajasthan, Karnataka, Maharashtra and Andhra Pradesh and they occupied respectively 1.27, 0.40, 0.39 and 0.25 million hectare. The states growing lowest are Himachal Pradesh, Jammu and Kashmir, Assam and West Bengal and they occupied 0.0003, 0.0009, 0.007 and 0.019 million hectare in 2011-12. Greengram was practically a kharif crop in Rajasthan, Maharashtra, Gujarat, Madhya Pradesh and Karnataka and predominantly in Andhra Pradesh. Assam grows only Rabi crop and West Bengal grows the crop primarily during the Rabi season. In Bihar also, Greengram is practically a summer crop and the maximum area during summer is found in this state. The state of Uttara Pradesh contributes a considerable area under summer crop and some area under kharif crop.

Karnataka

The major Greengram growing district is Gadag district which stands in first position with the production of 13,944 tonnes and area of 70,316 hectares followed by Dharwad district with the production of 8,432 tonnes with an area of 26,350 hectares and Bagalkote district with the production of 4,883 tonnes with the area of 51,675 hectares (Karnataka State at a Glance, 2011-12).

Gadag

This district has five taluks, covering a geographical area of 4,65,715 hectares, out of which forest area is 32,614 hectares. It's covering population about 10,64,750, out of which 5,37,147 male population and 5,27,427 female population with the population density 140. The climate of the district is generally dry and in the pre-monsoon it is cool. The average rainfall of the district is 612.7 mm in annual and net irrigated area was 79017 ha. The temperature ranges from 14°C to 42°C. There are two main type of soils *viz.*, black and laterite soil. The average water holding capacity is medium to high. Gadag district is endowed with semi - geographically advantage and contributes good towards agriculture production. The major varieties grown in study area are Selection-4, Pusa Baisakhi and Shining moong. (China moong). The districts namely Dharwad, Belagavi, Vijaypur and Raichur comes under Zone- III (www.mofpi.nic.in).

Although India has made significant strides in Greengram production, yet the progress has not been uniform and stable across the states leading to instability in Greengram production. This has affected the low-income people with inadequate diets because shortfall in supplies raises prices and thus reduce the purchasing power of those with small incomes. On the other hand, surpluses in production prove a boon to them in the form of lower prices and thus mitigate upward pressure on prices (Meller, 1981). However, the fluctuations in Greengram production have not only increased in the wake of rapid diffusion of new production technology, compared to earlier periods but also altered the causal relationship between growth and instability. This causal link between growth and instability and variability of agricultural outputs have been hypothesized by many researchers (Sen, 1967; Rao, 1975; Vyas, 1977 and Mehra, 1981) [11, 9, 14, 6].

Materials and Methods

The present study was conducted in Gadag district based on the major greengram producing area in Karnataka, for study purpose primary and secondary data were collected. Primary data relating to costs and returns involved in production of greengram from the selected farmers. Secondary data relating to area, production and productivity of greengram for fifteen years (1998-99 to 2012-13) and other relevant information for the study were collected from the Directorate of Agriculture, Bangalore, District Statistical Office and Joint Director of Agriculture Gadag and Karnataka at a Glance. The multi-stage random sampling procedure was adopted to choose the sample farmers (respondents). In the first stage, Gadag district was selected based on highest greengram area. In second stage, taluks having highest area under greengram ware selected. Later two villages from each taluk having highest area under greengram crop were selected in the third stage. Finally, sample of thirty farmers were chosen from each of these selected villages randomly. Thus, the total sample size selected for the present study was totaled to 180. For this purpose, pre-tested and well-structured schedule were used.

Results and Discussion

Input use management

Inputs used per hectare in greengram cultivation in the study area revealed that the average per hectare utilization of human labour was highest in case of small category farms (33.57 man days) followed by medium farmers (31.50 man days) and large farmers (30.15 man days) because most of the operations such as harvesting, weeding were human labour intensive. Most of the small and medium farmers used bullock labour as against use of machine labour because use of bullock labour worked out to be cheaper than machine labour use, but large farmers used machine for ploughing, sowing and other operations hence the use of machine labour was more on these farms than bullock labour. This might be attributable to accomplishment of quick work and time constraint to cover larger area.

Farmers in the study area used less quantity of farmyard manures, among the various category of farms, the quantity of

farmyard manure (FYM) applied per hectare was the highest in the case of small farmers (2.34 tonnes) followed by medium category farms (1.96 tonnes) and small farms (1.25 tonnes). Although small farmers using more FYM compare to other categories of farmers, but it is less than the recommended level (6 - 8 tonnes/ hectare). Because of low availability of FYM. Results presented in previous chapter revealed that there was high amount of application of chemical fertilizers in anticipation of good yield. The large farmers using high amount of fertilizers i.e. 166.50 kg/ha compared to small (153.26 kg/ha) and medium (141.23 kg/ha). Pesticides and other PPC (Plant Protection Chemicals) were used to minimize / control the pests. PPC chemicals used were high on large farms compared to small and medium farms, similar observation expressed by Puram *et al.* (2010) [8].

Labour utilization and management

The result presented in Table 2 revealed that around 32 human labour, five pair of bullocks and six hour of machine labour per hectare. Among various operations of greengram cultivation harvesting operations consumed highest mandays of labour because farmers usually go for hand picking instead machine harvesting. In greengram cultivation machine labour was most commonly used than bullock labour for the operations like ploughing, harrowing etc. Apart from machine, the operations like harrowing, loadings and transportation of FYM, were done through bullock pair. However among different farm size categories not much difference observed with regard to human labour utilization but slightly difference observed in case of bullock labour and machine labour.

Cost and Returns from greengram cultivation

The results presented in table 4 revealed that among the three categories of farmers the total cost incurred by the small farmers were found high (₹ 22889/ha) as compared to medium farmers and large (₹ 22650/ha and ₹ 22268/ha) respectively. This might be attributable to the fact that small farmers used more human and bullock labour and applied much fertilizers than their counterparts.

The cost of human labour, fertilizers, bullock labour and machine labour were the main items of cost with major share in the variable costs, because most of the operations like harvesting, spraying and weeding were human labour intensive operations and the other operations like harrowing and sowing and inter-cultivation were machine labour and bullock labour intensive activities respectively. The distribution pattern of operational cost under various inputs revealed that cost of human labour was highest in the small farms i.e. ₹ 6714/ha, compared to medium (₹ 6284/ha) and large farmers (₹ 6030/ha). Whereas average bullock labour cost was highest in case of small farmers (₹ 2432/ha) followed by medium (₹ 1848/ha) and large (₹1184/ha). Machine labour use cost was highest in large farmers (₹ 3645/ha) for ploughing, sowing and transportation and was the lowest in the case of small farmers (₹ 2305/ha). The cost of seeds was the lowest on large farms (₹ 717.60/ha) and the highest on medium farms (₹ 823.20/ha). Due to the less availability of FYM in the study area. As well as greengram would normally respond well with chemical fertilizers, hence the cost of FYM used was least and ranged from ₹ 625 (small farmers) to ₹ 1170 (small farmers). Whereas, the expenditure on fertilizers was highest (₹ 3413.25/ha) for large farmers as compared to small (₹3141.83/ha) and medium farmers (₹ 2893.22/ha). It was also noticed that the highest expenditure on pesticide was seen on large farms (₹ 506.85/ha) as compared to small and medium farmers.

For the overall category of respondents, the per hectare cost of cultivation was ₹22603.59 which comprised of 79.06 per cent of variable cost and remaining 20.94 per cent was accounted for fixed cost items. With respect to returns analysis, the gross returns obtained per hectare by large farmers were high (₹ 40748/ha) as compared to small and medium farmers (₹39320/ha and ₹ 39792/ha respectively). Net returns per hectare obtained were high in the case of large farmers were high (₹ 18479.79 /ha) as compared to small and medium farmers (₹ 16430.92/ha and ₹ 17141.52/ha respectively). However, yield obtained by the large farmers was the highest i.e. 6.05 quintals/ha as compared to small and large i.e. 5.83 and 5.92 quintals/ha. This might be due to better output price realized by them than by other counterparts, similar observation expressed by Ankit (2009) [1].

Among the three categories of farmers the total cost incurred by the small farmers was the highest (₹ 22889.08/ha) as compared to medium and large farmer (₹ 22653.45/ha and ₹ 22268.21/ha). Net returns per hectare obtained by large farmers were the highest (₹18479.79/ha) as compared to small and medium farmers (₹ 16430.92/ha and ₹ 17138/ha respectively). The gross returns obtained per hectare by overall category of farmers were ₹39953.33 with a yield of 5.93 qtls/ ha. The total variable cost incurred per hectare by small farmers was high (₹18285.25/ha) as compared to medium and large farmers (₹ 17916.33/ha and ₹ 17411.44/ha respectively). And B: C Ratios was 1.77 for the overall study area.

Among the three categories of farmers total cost incurred by the small farmers was observed high compared to medium and large farmers due to excess use of human and bullock labour which increase the variable cost, but not yield or output compared to large farmers. Hence these resources need to be optimally utilised or partial mechanisation by the small farmers may be adopted for better output.

Table 1: Input use management in Greengram cultivation

Sl. No.	Particulars	Units/ha	Small farmers	Medium farmers	Large farmers	Over all farmers
			(n=75)	(n=57)	(n=48)	(n=180)
1	Seeds	Kgs	12.59	13.72	11.96	12.76
2	Human labour	Man days	33.57	31.50	30.15	31.88
3	Bullock labour	Pair days	6.08	4.62	2.96	4.55
4	Machine labour	Hours	4.61	6.61	7.29	6.17
5	FYM	Tonnes	2.34	1.96	1.25	1.85
6	Fertilizers	Kgs	153.26	141.23	166.50	153.66
7	PPC	₹	412.56	453.78	506.85	457.73

Table 2: Operation wise labour utilization pattern in Greengram cultivation

Sl. No	Particulars	Small Farmers (n=75)			Medium Farmers (n=57)			Large Farmers (n=48)			Over all Farmers (n=180)		
		HL	BL	ML	HL	BL	ML	HL	BL	ML	HL	BL	ML
1	Ploughing	1.62	0.00	3.24	1.67	0.00	3.29	1.52	0.00	3.42	1.60	0.00	3.32
2	Harrowing	1.45	1.82	0.00	1.32	1.29	0.80	1.22	0.61	1.20	1.33	1.24	0.67
3	Loading, transportation and spreading organic manure	3.41	1.23	0.43	2.81	0.92	0.72	3.41	0.00	0.80	3.21	0.72	0.65
4	Sowing	3.23	1.98	0.36	2.96	1.21	1.20	2.45	0.93	1.25	2.88	1.37	0.94
5	Fertilizer Application	1.32	0.00	0.00	1.4	0.00	0.00	1.20	0.00	0.00	1.31	0.00	0.00
6	Weeding	6.45	0.00	0.00	6.62	0.00	0.00	5.40	0.00	0.00	6.09	0.00	0.00
7	Inter cultivation	3.31	1.05	0.00	2.89	1.20	0.00	3.40	1.42	0.00	3.34	1.22	0.00
8	PPC application	2.41	0.00	0.00	2.36	0.00	0.00	2.20	0.00	0.00	2.39	0.00	0.00
9	Harvesting	7.55	0.00	0.00	7.02	0.00	0.00	6.75	0.00	0.00	6.94	0.00	0.00
10	Threshing	2.82	0.00	0.58	2.45	0.00	0.60	2.60	0.00	0.62	2.79	0.00	0.60
	Total	33.57	6.08	4.61	31.50	4.62	6.61	30.15	2.96	7.29	31.88	4.55	6.17

Note: HL- Human Labour, BL- Bullock Labour, ML- Machine Labour

Table 3: Cost of cultivation in Greengram, (₹ /ha)

Sl. No.	Particulars	Small Farmers (n=75)	Medium Farmers (n=57)	Large Farmers (n=48)	Overall Farmers (n=180)
Variable cost					
1	Human labour	6714.00(29.33)	6284.00(27.27)	6030.00(27.08)	6342.67(28.06)
2	Bullock labour	2432.00(10.63)	1848.00(8.16)	1184.00(5.32)	1821.33(8.06)
3	Machine labour	2305.00(10.07)	3305.00(14.59)	3645.00(16.37)	3085.00(13.65)
4	Seeds	755.40(3.30)	823.20(3.63)	717.60(3.22)	765.40(3.39)
5	Organic Manure	1170.00(5.11)	980.00(4.33)	625.00(2.81)	925.00(4.09)
6	Fertilizers	3141.83(13.73)	2895.22(12.78)	3413.25(15.33)	3150.10(13.94)
7	PPC	412.56(1.80)	453.78(2)	506.85(2.28)	457.73(2.03)
8	Interest on working capital @ 8%	1354.46(5.93)	1327.14(5.86)	1289.74(5.79)	1323.78(5.86)
	Subtotal (I)	18285.25(79.89)	17916.33(79.09))	17411.44(78.19)	17871.01(79.06)
Fixed Cost					
1	Rental value of land	3500.00(15.29)	3500.00(15.45)	3500.00(15.72)	3500.00(15.48)
2	Land revenue	40.00(0.17)	40.00(0.18)	40.00(0.18)	40.00(0.18)
3	Depreciation	570.56(2.49)	689.60(3.04)	796.40(3.58)	685.52(3.03)
4	Interest on Fixed capital @ 12%	493.27(2.16)	507.55(2.24)	520.37(2.34)	507.06(2.24)
	Subtotal (II)	4603.83(20.11)	4737.15(20.95)	4856.77(21.81)	4732.58(20.94)
Total cost of cultivation (I+II)		22889.08(100)	22650.48(100)	22268.21(100)	22603.59(100)

Note: Figures in the parentheses indicate percentage to total

Table 4: Cost and Returns of Greengram Production, (Per ha)

Sl. No.	Particulars	Small farmers	Medium farmers	Large farmers	Over all Farmers
		(n=75)	(n=57)	(n=48)	(n=180)
I	Yield obtained				
	a. Main Product				
	Grains (Quintal)	5.83	5.92	6.05	5.93
	b. By Products				
	Hulm (Quintal)	14.25	13.12	14.23	13.87
II	Sale price				
	a. Grains (₹ / Quintal)	6500	6500	6500	6500
	b. Hulm (₹ / Quintal)	100	100	100	100
III	Return realized				
	a. Grains (₹ / ha)	37895.00	38480.00	39325.00	38566.67
	b. Hulm (₹ / ha)	1425.00	1312.00	1423.00	1386.67
IV	Gross returns				
	(Main Products + By Products)	39320	39792	40748	39953.33
V	Total cost of cultivation (₹)	22889.08	22650.48	22268.21	22603.59
VI	Net return (₹ /ha)	16430.92	17141.52	18479.79	17349.74
VII	B:C ratio	1.72	1.76	1.83	1.77

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