Yield Constraints of Black and Green Grams of Pulses: An Analysis of Small and Large Farmers

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Abstract

Pulses are the major sources of dietary protein in the vegetarian diet in our country. Besides being a rich source of protein, they maintain soil fertility through biological nitrogen fixation in soil and thus play a vital role in furthering sustainable agriculture. The study attempts to focus on the yield constraints of small and large farmers producing black and green grams of pulses in Tuticorin District. The proportionate random sampling technique has been adopted to select 150 each of pulses cultivating farmers from 12 villages. The data relates to the month of February 2012. The Garrett's ranking technique was applied to identify the major constraints to the attainment of potential yield and it was found that severity of disease and pest attacks and water shortage were identified as major constraints for both Large and Small farmers cultivating Black Gram of pulses . In the case Green Gram, Large farmers have reported that the inadequate credit facilities and water shortage to be the main constraints to maximum yield. Similarly, the majority of the Small farmers have identified water shortage as a major constraint. Thus, it may be concluded that severity of diseases, inadequate credit facilities and water shortage were identified as major constraints in the study area.

Key words: pulses, protein, soil fertility, yield, constraints, Garrett's ranking.

Introduction

Pulses are the major sources of dietary protein in the vegetarian diet in our country. Besides being a rich source of protein, they maintain soil fertility through biological nitrogen fixation in soil and thus play a vital role in furthering sustainable agriculture (Kannaiyan, 1999). Increase in yield of subsequent crop to the tune of about 20-40 per cent has been recorded (Pande and Joshi, 1995, IIPR, 1998; 1999). In India, owing to its diverse agro-climatic conditions, pulses are grown throughout the year. Presently, India is the largest producer and consumer of pulses in the world, accounting for about 25 per cent of their global production, 27 per cent of their global consumption and about 33 per cent of the world's area under pulses (FAO, 2008). The growth in production and productivity of pulses has lagged behind the population growth rate which has resulted into a decline in per capita availability of pulses from 66 g/day during triennium ending (TE) 1965 to 33 g/day during TE 2005 (Agricultural Statistics at a Glance, 2007) against ICMR (Indian Council of Medical Research) norms of 40 g/day. The study attempts to focus on the yield constraints of small and large farmers producing black and green grams of pulses in Tuticorin District.

Objectives

The Objectives of the present study are:

- To collect data on the socio-economic structure of pulses cultivators in Tuticorin district.
- To estimate the yield constraints of Large and Small farmers producing Black Gram.
- To analyse the yield constraints of Large and Small farmers producing Green Gram of pulses in the study area.

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Methodology

Pulses are mainly cultivated in Vilathikulam and Oottapidaram which show more than 70 per cent of area under cereals and pulses in this district and hence the selection of sample villages restricted to these two blocks. Six villages in each block, which account for the highest area under pulses cultivation in the descending order of magnitude, were selected as the study unit for primary data collection. In Vilathikulam Block Vilathikulam Village, Arunkulam, Guruvarpatti, Sivagnapuram, Somikal and Poothanoor and in Ootapidaram Block Kothali, Meenakshipuram, Lingampatti, Nagampatti, Ootapidaram Village and Katunayaganpatti were selected. A list of pulses cultivators in the selected villages was obtained from the records of the Joint Director of Agriculture, Tuticorin. The proportionate random sampling technique has been adopted to select 150 each of pulses cultivating farmers from these 12 villages. The data relates to the month of February 2012.

Discussion and analysis

Out of 300 sample farmer's cultivations pulses, 150 sample farms are under the category of black gram and remaining 150 sample farms come under green gram. In each crop, the sample farm can be divided into two group's namely small and large farmer based on area under pulses. For that, frequency tables were formed in each crop on the basis of area and its cumulative total was also worked out. The farms of less than 5 acres were grouped on small size and farms of more than or equal to 5 acres are grouped as large size. In the black gram, out of 150 sample farmers, 52 (34.67%) belong to small size and remaining 98 (65.33%) belong to large size. In the green gram, out of 150 sample farmers, 47 belong to small size and remaining 103 belong to large size.

The table shows that in Black Gram, 78.67 per cent of the farmers were in the age group of 30 to 50 years. The age group of 40-50 years was relatively lower in the case of Small

Table 1: Age-Wise Distribution of Sample Farmers

Age (in years)	Black Gram (BG)			Green Gram (GG)		
	Large	Small	Overall	Large	Small	Overall
Less than 30	9 (6.00)	5 (3.33)	14 (9.33)	5 (3.33)	3 (2.00)	8 (5.33)
30-40	60 (40.00)	24 (16.00)	84 (56)	60 (40)	25 (16.7)	85 (56.7)
40-50	22 (14.67)	12 (8.00)	34 (22.67)	24 (16)	12 (8.00)	36 (24.)
Above 50	7 (4.66)	11 (7.34)	18 (12.0)	14(9.33)	7 (4.67)	21 (14.0)
Total	98 (65.33)	52 (34.67)	150 (100)	103(68.7)	47(31.3)	150 (100)

Source: Survey Data.
Figures in brackets represent percentages to total.

Table 2: Literacy Levels of Sample Farmers

Literacy Level	Black Gram (BG)			Green Gram (GG)		
	Large	Small	Overall	Large	Small	Overall
Illiterate	3 (2.00)	3(2.00)	6 (4.00)	2 (1.33)	3 (2.00)	5(3.34)
School level	78 (52.00)	36 (24.00)	114 (76.00)	82 (54.67)	23 (15.33)	105 (70.00)
College level	14 (9.33)	12 (8.00)	26 (17.33)	14 (9.33)	18 (12.0)	32 (21.33)
Professional	3 (2.00)	1 (0.67)	4 (2.67)	5 (3.33)	3 (2.00)	8 (5.33)
Total	98(65.33)	52(34.67)	150 (100)	103 (68.66)	47 (31.33)	150 (100)

Source: Survey data.
Figures in bracket represent percentages to total.

Table 3: Size of Operational Holdings of the Sample Farmers

Size of Holdings (in acres)	Black Gram (BG)			Green Gram (GG)		
	Large	Small	Overall	Large	Small	Overall
Less than 1	15(10.00)	-	15(10.00)	13 (8.67)	-	13(8.67)
1-2	25 (16.67)	-	25(16.67)	22(14.67)	-	22 (14.67)
2-5	58 (38.66)	-	58 (38.67)	68(45.33)	-	68 (45.33)
5-8	-	42(28.00)	42(28.00)	-	41(27.33)	41 (27.33)
Above 8	-	10(6.67)	10(6.66)	-	6 (4.00)	6 (4.00)
Total	98 (65.33)	52 (34.67)	150 (100)	103(68.67)	47(31.33)	150 (100)

Source: Survey data.
Figures in bracket represent percentages to total.

farmers (8.00 per cent) while it was 14.67 per cent in the case of Large farmers to their respective totals. The farmers below 30 years constitute only 9.33 per cent to the total. There above 50 years form 12.00 per cent only.

In case of Green Gram, the farmers below 30 years constitute only 5.33 per cent to the total. Those above 50 years form 14.00 per cent only. The respondents between the age group 30 to 50 years constitute 80.67 per cent. The age group of 30-40 years was relatively higher in the case of Large farmer (40.00 per cent) while it was only 16.67 per cent in the case of Small farmers. Comparing these two crops, it is found that the farmers between age group of 30 to 50 years were found high in Green Gram (80.67 per cent) while it was 78.67 per cent in the case of Black Gram.

The table reveals that in Black Gram 76.00 per cent of the farmers in the study area had only school education, followed by those with college level education (17.33 per cent). The illiterates form 4.00 per cent to the total. The school level education percentage was higher among Large farmers (52.00 per cent) than among Small farmers (24.00 per cent), while in the case of college level education, the Large farmers (9.33 per cent) was considered to be higher than the Small farmers (8.00 per cent).

In Green Gram, farmers having the college level education form 21.33 per cent to the total. It was found that 70.00 per cent of the farmers are the study area had only school education, followed by illiterates (3.34 per cent). The school level education percentage was higher

Table 4: Experience of Sample Farmers in Pulses Cultivation

Experience in Years	Black Gram (BG)			Green Gram (GG)		
	Large	Small	Overall	Large	Small	Overall
Less than 5	10(6.67)	4 (2.67)	14(9.33)	4(2.67)	5 (3.33)	9 (6.00)
5-10	26(17.33)	10(6.67)	36(24.00)	27(18.00)	15(10.00)	42 (28.00)
10-15	57 (38.00)	36(24.00)	93(62.00)	64(42.67)	23(15.33)	87(58.00)
15-20	5 (3.33)	2 (1.33)	7 (4.67)	8(5.33)	4(2.67)	12(8.00)
Total	98 (65.33)	52(34.67)	150(100)	10(68.67)	47(31.33)	150 (100)

Source: Survey Data.
Figures in bracket represent percentages to total.

among Large farmers (54.67 per cent) than among Small farmers (15.33 per cent) respectively.

Black Gram was found to be high in school level educated farmer (76.00 per cent) when compared with Green Gram (70.00 per cent). And illiterates are low in Green Gram (3.34 per cent) when compared with Black Gram.

The table reveals that in Black Gram, nearly 65.34 per cent of the operational holding was below 5 acres and remaining 34.66 per cent were above 5 acres. Among Large farmers, the dominant operational holding was between 2-5 acres (38.67 per cent) while in the Small farm, it was 5-8 acres (28.00 per cent) to the total.

In the case of Green Gram, nearly 68.67 per cent of the operational holding was below 5 acres. The remaining 31.33 per cent belong were above 5 acres. Among Large farmers, the dominant operational holding was between 2-5 acres (45.33 per cent) while in the Small farms, it was 5-8 acres (27.33 per cent) to the total.

Comparing these two crops, Black Gram is low in operational holdings below 5 acres (65.34 per cent) while Green Gram is high in operational holding below 5 acres (68.67 per cent) respectively.

It is observed from the table that in Black Gram 24.00 and 62.00 per cent of the farmers have had the experience of 5-10 years and 10-15 years respectively. While 9.33 per cent of farmers had the experience of less than 5 years and only 4.67 per cent of farmers have experience of 15-20 years.

In Green Gram 28.00 and 58.00 per cent of the farmers had experience of 5-10 years and 10-15 years. While 8.00 per cent of the farmers had experience between 15-20 years and only 6.00 per cent had experienced less than 5 years.

Comparatively, Green Gram has 58.00 per cent of farmers with experience of 10-15 years, whereas in Black Gram 62.00 per cent of farmers had experienced between 10 to 15 years.

Yield Constraints

The factors that prevent farmers from achieving the potential yield under farmer condition are known as 'yield constraints'. There are 3 kinds of constraints (K. Kalirajan, 1980) which cause yield gap. They are (1) environmental constraint, (2) biological constraints and (3) socio-economic constraints. Environmental constraints are caused by (i) environmental difference and (ii) non-transferable technology. Experiment stations are usually located in places ideal for farming, whereas the same is not true for farmer's field. Moreover, there are hardly any cost output constraints at these centres, while farmers often encounter such problems at farm level. Above all, some of the technologies adopted at the experiment station may not be transferable to a farmer's field. These constraints cause Yield Gap I. Biological constraints include (i) variety, (ii) weeds, (iii) diseases and insects, (iv) problem soil, (v) irrigation facilities and (vi) soil fertility. By and large, these constraints arise from the non-application of the required inputs. Experiment

Table 5: Yield Constraints of Large Farmers Producing Black Gram (BG)

Constraints	Mean Score	Rank
Severity of disease and pest attacks	64.75	I
Water shortage	58.64	II
Inadequate credit facilities	49.36	III
Non- availability of input (Seeds)	40.15	IV
Weeds	34.21	V
Traditional methods	31.15	VI

Source: Survey Data.

Table 6: Yield Constraints of Small Farmers Producing Black Gram (BG)

Constraints	Mean Score	Rank
Severity of disease and pest attacks	61.24	I
Water shortage	52.63	II
Inadequate credit facilities	43.44	III
Non- availability of input (Seeds)	41.15	IV
Weeds	36.24	V
Traditional methods	31.49	VI

Source: Survey Data.

Table 7: Yield Constraints of Large Farmers Producing Green Gram (GG)

Constraints	Mean Score	Rank
Inadequate credit facilities	58.15	I
Water shortage	45.99	II
Non-availability of inputs (Seeds)	35.64	III
Severity of disease and pest attacks	31.49	IV
Traditional methods	30.19	V
Weeds	26.62	VI

Source: Survey Data.

station may not face such problems, while farmers often face them at the farm level.

Socio-economic constraints arise from (i) costs and returns, (ii) credit problems, (iii) tradition and attitudes, (iv) knowledge and (v) input availability of institutional facilities. It is the outcome of these constraints which prevent the farmers from adopting the technology as recommended. A farmer may consider the economic viability of following the new technology in terms of its cost and returns. Some farmers may not like to give up their traditional practices. Moreover, some aspects of the technology may not be understood by them. It also results from lack of institutional facilities like non-availability

Table 8: Yield Constraints of Small Farmers Producing Green Gram (GG)

Constraints	Mean Score	Rank
Water shortage	53.63	I
Inadequate credit facilities	45.15	II
Severity of disease and pest attacks	40.61	III
Non-availability of inputs (Seeds)	32.15	IV
Weeds	30.62	V
Traditional methods	22.64	VI

Source: Survey Data.

of inputs and credits. Biological and socio-economic constraints together contribute towards Yield Gap II.

Garrett's ranking technique was adopted to identify the main constraints to potential yield in the study area. The sample farmers were asked to rank the constraints faced by them as per priority. The order of merit assigned to each constraint by the respondents was converted into scores by using the formula

$$\textit{Per cent position} = \frac{100\ (Rij-0.5)}{N_j}$$

where

R_{ij} = Rank given for the i^{th} factor by j^{th} farmer and

N_j = Number of factors ranked by j^{th} farmer.

The per cent position of each rank thus obtained was converted into scores by referring to Garrets ranking table. The scores of all respondents for each factor was then added together and divided by the number of respondents experiencing that particular constraint. The mean scores of each factor thus arrived at were arranged in a descending order and the corresponding ranks allotted.

The farmers cultivating pulses reported six factors among the various biological and socio-economic constraints as the major yield constraints which limited them from achieving the potential yield in the study area. It included water shortage, severity of disease and pest attacks, weeds, credit, non-availability of inputs (seeds) and traditional methods.

It is inferred from the table that the severity of disease and pest attacks was ranked first followed by water shortage. Inadequate credit facilities were ranked third and non-availability of inputs (seeds) ranked fourth. Weeds and traditional methods were ranked fifth and sixth respectively.

It is found from the table that the severity of diseases and pest attacks was ranked first followed by water shortage. Inadequate credit facilities were ranked third and non-availability of inputs (seeds) ranked fourth. Weeds and traditional methods were ranked fifth and sixth.

It is inferred from table that the inadequate credit facilities were ranked first followed by water shortage. Non-availability of input (seeds) was ranked third and severity of diseases and pest attacks ranked fourth.

Traditional methods and weeds were ranked fifth and sixth.

It is found from table that the water shortage was ranked first followed by inadequate credit facilities. Severity of disease and pest attacks was ranked third and non-availability of input (seeds) ranked fourth. Weeds and traditional methods were ranked fifth and sixth.

Conclusion

The Garrett's ranking technique was applied to identify the major constraints to the attainment of potential yield and it was found that severity of disease and pest attacks and water shortage were identified as major constraints for both Large and Small farmers cultivating Black Gram of pulses . In the case Green Gram, Large farmers have reported that the inadequate credit facilities and water shortage to be the main constraints to maximum yield. Similarly, the majority of the Small farmers have identified water shortage as a major constraint. Thus, it may be concluded that severity of diseases, inadequate credit facilities and water shortage were identified as major constraints in the study area.

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