



RESEARCH PAPER

Impact assessment of green gram variety released by Dr. PDKV, Akola

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Abstract : In the varietal front the Pulses Research Station, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola has made significant progress by releasing five excellent green gram varieties for Maharashtra. In green gram variety, Kopergaon was realised 1983. The main objective of this study, to assess the economic impact of University released selected green gram. Partial budget approach was used for estimating the impact of research outcome on income generation. The results revealed that, the gross economic impact of University released variety for last 15 year was Rs. 1383.20 crores. It is concluded that, as per the demand of farmer seed, it is need to increase the seed production of Kopergaon of green gram variety because kopergaon green gram seeds are bold and shiny in appearance with green colour.

Key Words : Gross economic impact, Consumer price index, *Kharif*, Summer season

JEL code: Q1, Q19 and Q00

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INTRODUCTION

The global scenario observed that the area under pulses in India during 2019-2020 was 148.30 lakh hectares producing 80.91 lakh tonnes. In all over India area under green gram during 2019-20 were 34.07 lakh hectares producing 17.56 lakh tonnes, respectively. A large portion of green gram are consumed in same country where they are produced. India alone accounts for more than 50 per cent of the world production.

In green gram (3.36 lakh ha) Maharashtra ranks also second after Rajasthan (23.23 lakh ha) in 2019-20. The production green gram in Maharashtra constitutes,

1.39 lakh tonnes, respectively [DES, ministry of Agri. and FW (DAC and FW), Govt. of India, 2019-20].

In the varietal front the Pulses Research Station, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola has made significant progress by releasing five excellent green gram varieties for Maharashtra. In green gram variety Kopergaon was realised 1983. Koperagaon variety is mostly adopted in states like Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka and Chhattisgarh.

Keeping in view of these aspects the present study was a modest alternate to analyse the economic impact

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of University released variety of green gram in Maharashtra with the specific objectives, to study the growth rates of area, production and productivity of selected green gram, to examine the varietal status of University released selected green gram variety and to assess the economic impact of University released selected green gram variety.

MATERIAL AND METHODS

The present study was undertaken, to study an economic impact assessment of green gram variety released by Dr. PDKV, Akola. It comprises selection of pulses research unit, methods of data collection, analysis of data by applying appropriate statistical tools.

Selection of Pulses Research Unit:

The Pulses Research Station, Dr. P.D.K.V., Akola was selected for estimating the economic impact of Koperagon variety of green gram, respectively in Maharashtra

Selection of variety :

Koperagon variety was selected for the present study because this variety was widely used under cultivation of green gram and the other varieties used as a check.

Collection of data :

The data on area, production and productivity of green gram for Maharashtra and India were collected from the Annual report, Ministry of Agriculture and Farmers welfare, Government of India for the year 1990-91 to 2019-20. The information on expenditure on research, extension, salary, contingency etc. was availed from the office record of Pulses Research Unit, Dr. PDKV, Akola. Data on seed sale of Koperagon was collected from Pulses Research Unit, Dr.PDKV, Akola and MAHABEEJ, Akola.

As the farmers retained the seed for next year also distribute amongsts the other farmers as per demand. So the area under seed spread was considered 25% increase on over total seed. The data on costs and returns of green gram Kopergaon and other variety for the year 2019-20 were compiled from the green gram quick estimate reports of Agricultural Price Cost and Scheme, Department of Agril. Economics and Statistics, Dr. PDKV, Akola.

Performance of green gram :

Compound growth rate :

The compound growth rates were computed based on time series data on area, production and productivity of green gram for Maharashtra and India for study period viz., 2000-01 to 2019-20 using log-linear function. The period 2000-01 to 2019-20 was subdivided into two sub-periods viz., Period-I (2000-01 to 2010-11), Period-II (2011-12 to 2019-20) and entire period (2000-01 to 2019-20).

Partial budgeting technique:

Partial budgeting is used to find the economic viability of partial change in the farm such as use of new variety or new technology or new innovation or new practice or new equipment or new service. Partial budget approach was used for estimating the impact of research outcome on income generation. Partial budgeting is a method of organizing experimental data and information about the cost and benefits from some change in the technologies being used on the farm. The aim is to estimate the change that will occur in farm profit or loss from some change in the farm plan (Boehlje and Eidman, 1984 and Pokharkar *et al.*, 2018).

In this study the four components of partial budgeting were considered viz. i) Added expenditure due to cultivation of improved green gram variety ii) Reduced returns due to cultivation of improved green gram varieties iii) Reduced cost due to cultivation of improved green gram variety and iv) Added returns due to cultivation of improved green gram variety. For up-scaling the economic impact the probability performance of the technology, rate of adoption of technology and depreciation of the technology was considered.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Area, production and productivity of green gram in major states and India :

The information on area, production and productivity of selected green gram crop during the year 2019-20 in major producing states and India is presented in Table 1.

It is revealed from the Table 2 that, Maharashtra state ranks second in of area and production in India. Rajasthan ranks first in area and production of green

gram. However, in case of productivity Jharkhand ranks first and Maharashtra ranks seventh in productivity of green gram. In India three major states Rajasthan, Maharashtra and Karnataka contributes more than 86 per cent area and 85 per cent production of the green gram.

Region wise area, production and productivity of green gram in Maharashtra :

The area, production and productivity of green gram in different decades year in Maharashtra states are presented in Table 2.

Area of green gram :

The Table 2 revealed that, the area of green gram

in Maharashtra State was observed third rank in Vidarbha region *i.e.* 631.50 ha (18.80%) in the year 2019-20 *i.e.* green gram crop of Vidarbha region is third rank position. Major area of green gram crop was observed that in Western Maharashtra *i.e.* 141723 ha (42.19 %) and Marathwada *i.e.* 130932 ha (38.97%).

Production of green gram :

The Table 3 revealed that, the production of green gram in Maharashtra state was decreased in Vidarbha region *i.e.* from 151000 (49.09%) to 28038 (20.07%) tonnes in the year 1990-91 to 2019-20. Marathwada and Western Maharashtra also decreased in production *i.e.* from 87900 to 57888 tonnes and 67100 to 53695 tonnes, respectively during 1990-91 to 2019-20. It is concluded

Table 1: Area, production and productivity of green gram in major states and India (2019-20)

(Area –Lakh ha, Production – Lakh tons and Productivity- qts/ha)							
Sr. No.	State	Area	Rank	Production	Rank	Productivity	Rank
1.	Madhya Pradesh	0.90 (2.64)	5	0.43 (2.45)	6	4.78	6
2.	Maharashtra	3.36 (9.86)	2	1.39 (7.92)	2	4.14	7
3.	Rajasthan	23.23 (68.18)	1	12.87 (73.29)	1	5.54	4
4.	Kamataka	3.05 (8.95)	3	0.92 (5.24)	3	3.02	9
5.	Uttar Pradesh	0.49 (1.44)	9	0.14 (0.80)	10	2.86	10
6.	Odisa	0.70 (2.05)	6	0.22 (1.25)	9	3.14	8
7.	Gujarat	0.94 (2.76)	4	0.63 (3.59)	4	6.70	3
8.	Jharkhand	0.23 (0.68)	10	0.20 (1.14)	8	8.70	1
9.	Telangana	0.60 (1.76)	7	0.45 (2.56)	5	7.50	2
10.	Others	0.57 (1.67)	8	0.31 (1.77)	7	5.44	5
	All India	34.07 (100.00)		17.56 (100.00)		5.15	

Source: DES Normal, 2019, *Kharif* pulses prospects -2020-21

Table 2 : Region wise area of green gram in Maharashtra

(Area: 00 ha)						
Sr. No.	Year	Region				
		Western Maharashtra	Marathwada	Vidarbha	Konkan	Maharashtra
1.	1990-91	1423.00 (20.57)	2839.00 (41.04)	2634.00 (38.07)	22.00 (0.32)	6918.00 (100.00)
2.	2000-01	1286.00 (18.00)	2781.00 (38.93)	3064.00 (42.90)	12.00 (0.17)	7143.00 (100.00)
3.	2010-11	1317.00 (23.78)	2079.00 (37.54)	2128.00 (38.43)	14.00 (0.25)	5538.00 (100.00)
4.	2019-20	1417.23 (42.19)	1309.32 (38.97)	631.50 (18.80)	1.38 (0.04)	3359.43 (100.00)

Source: Maharashtra Agricultural Departmental Website: www.mahaagri.com

Table 3 : Region wise production of green gram in Maharashtra

Production : 00 Tonnes						
Sr.No.	Year	Region				
		Western Maharashtra	Marathwada	Vidarbha	Konkan	Maharashtra
1.	1990-91	671.00 (21.81)	879.00 (28.58)	1510.00 (49.09)	16.00 (0.52)	3076.00 (100.00)
2.	2000-01	525.00 (21.53)	810.00 (33.21)	1098.00 (45.02)	6.00 (0.25)	2439.00 (100.00)
3.	2010-11	1011.00 (27.15)	1366.00 (36.68)	1336.00 (35.88)	10.85 (0.29)	3723.85 (100.00)
4.	2019-20	536.95 (38.44)	578.88 (41.44)	280.38 (20.07)	0.68 (0.05)	1396.88 (100.00)

Source: Maharashtra Agricultural Departmental Website: www.mahaagri.com

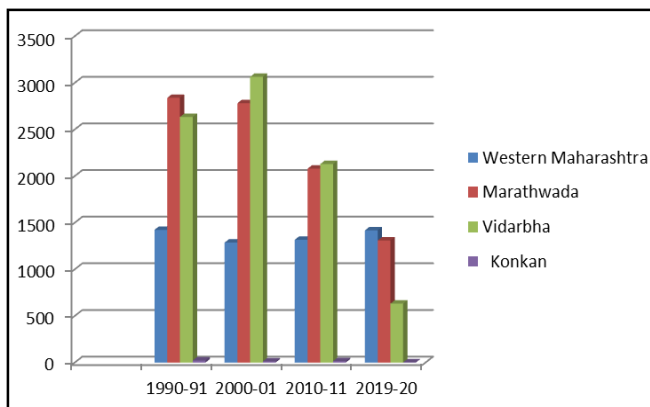


Fig. 1 : Region wise area of green gram in Maharashtra state

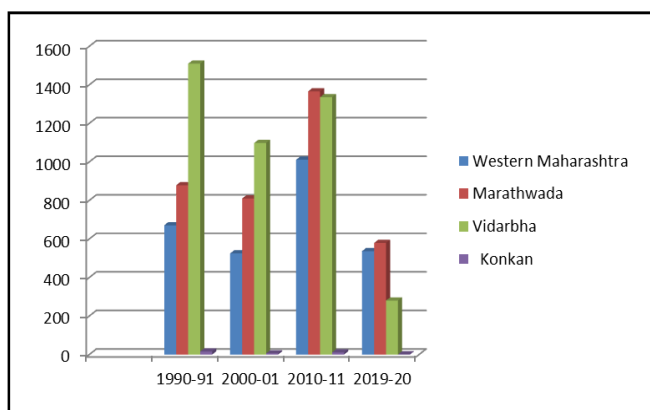


Fig. 2 : Region wise production of green gram in Maharashtra State

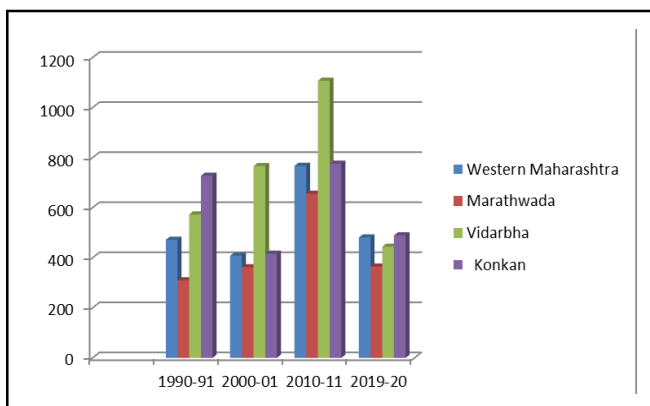


Fig. 3 : Region wise productivity of green gram in Maharashtra state

that, the contribution of green gram production was increasing trend in Marathwada (28.58 to 41.44 %) and Western Maharashtra (21.81 to 38.44 %) over a period of time and in Vidarbha region contribution of production decreased in trend *i.e.* 49.09 to 20.07 % over a period of time in Maharashtra State.

Productivity of green gram:

Table 4, the productivity of green gram during the period 2019-20 for different regions of Maharashtra was more in Vidarbha region *i.e.* 443.99 kg/ha followed by Marathwada *i.e.* 364.75 kg/ha and Western Maharashtra observed that, 481.04 kg/ha.

Performance of green gram :

The compound growth rates of area, production and productivity of green gram during the period 2000-01 to 2019-20 for different regions of Maharashtra state have been estimated and presented in the Table 5.

It is revealed from the Table 5, that the area, production and productivity of green gram have fluctuated during the period under study in different regions and state. The growth rates of area and production of green gram for state was observed to be negatively significant at 1 and 5 per cent level of significance, respectively for the entire period of 20 years. Among the different periods, green gram was stagnant in few periods it was negatively significant indicated that the decreased in area, production and productivity of green gram in all regions of Maharashtra during entire study period.

Varietal status of green gram variety :

The Pulses Research Unit on green gram, Dr.PDKV, Akola has released remarkable varieties of green gram since its establishment. The important green gram variety released by Dr. PDKV, Akola since establishment is presented in Table 6.

The green gram variety *viz.*, Koperagaon is released in the year 1983. This variety is very popular amongst the farmers in earlier period and also current era.

Sr.No.	Year	Region				Productivity : Kg/ha
		Western Maharashtra	Marathwada	Vidarbha	Konkan	Maharashtra
1.	1990-91	471.39	309.62	573.27	727.27	520.39
2.	2000-01	408.00	362.00	766.00	416.00	488.00
3.	2010-11	767.00	656.00	1107.00	775.30	826.33
4.	2019-20	481.04	364.75	443.99	489.33	444.78

Source: Maharashtra Agricultural Departmental Website: www.mahaagri.com

Table 5 : Region wise performance of green gram in Maharashtra

Period	Particular	Region				
		Western Maharashtra	Marathwada	Vidarbha	Konkan	Maharashtra
Period-I (2000-2010)	Area	-1.69	-12.33	-7.49**	3.421*	-5.71**
	Production	-0.77	-3.12	-16.25	-2.36	-7.99*
	Productivity	-0.36	-3.47	0.38	-3.98	-2.42
Period-II (2011-2019)	Area	-6.01*	0.36	-13.04**	-35.89**	2.10
	Production	-1.73	-3.145	-14.46**	-49.61**	-14.08
	Productivity	-4.99	-5.28	-4.62	-9.22	-4.56
Overall Period (2000-2019)	Area	0.74	-6.67*	-8.59**	-15.81**	-3.72**
	Production	-2.32	-5.35	-6.73**	-19.25**	-8.32*
	Productivity	-0.34	-1.263	-4.92**	-3.39	-0.39

Note* and indicate significance of value at P=0.05 and 0.01, respectively

Table 6 : Green gram varieties developed by Dr. PDKV, Akola in Pulses Research Unit

Sr. No.	Variety	Year of release	Place
1.	Green gram Koperagaon	1982	Maharashtra State, Madhya Pradesh, Andhra Pradesh, Karnataka and Chhattisgarh
2.	TARM 1	1997	Maharashtra State
3.	PKV Mung 8802	2001	Maharashtra State
4.	PKV Greengold(AKM9911)	2011	Maharashtra State
5.	PDKV Blackgold(AKU-10-1)	2011	Maharashtra State

Table 7 : Economic impact of University released green gram variety Koperagon (2019-20)

Sr. No	Debit side Particular	Cost (Rs./ha)	Credit side Particular	Cost (Rs./ha)
	Item of added expenditure due to cultivation of improved variety of green gram (Koperagon).		Reduced cost(or savings) due to cultivation of University released variety	
1.	Additional total human labour cost	275.81		
2.	Additional total bullock labour cost	-322.59		
3.	Additional total machine labours cost	14.69		
4.	Additional total seed cost	49.49		
	Additional manure cost	96.77		
5.	Additional fertilizers cost	309.29		
6.	Additional irrigation charges	0.00		
7.	Additional bio-fertilizers/Micronutrient	0.00		
8.	Additional plant protection	41.11		
	Total additional cost	464.57	Total saving due to cultivation of University released variety	0
11.	Opportunity cost of capital @ 6 % per annum for 6 month	13.94		
12.	Management cost @ 5 %	23.23		
13.	Risk premium @ 5 %	23.23	Added returns from university released variety 2.12 qtl. Added main produce @ 4915.68/-/qtls.	10421.24
14.	Research cost per ha.	2372.93		
15.	Extension cost per ha.	12.33		
	Total additional cost due to cultivation of green gram	2910.23		
	Reduced returns due to cultivation of improved green gram (Koperagaon) variety	0.00		
	Total debit side	2910.23	Total credit side	10421.24
Economic impact of University released green gram Production technology over other competing variety of green gram :				10421.24 – 2910.23 = 7511.01

Kopergaon variety is very famous in farming community due to its bold seed and shiny in appearance with green colour. It is suitable for *Kharif* and also summer season. It is synchronous maturity easy for picking of pod. It is mostly adopted in state like Maharashtra State, Madhya Pradesh, Andhra Pradesh, Karnataka and Chhattisgarh. It gives 08 -10 quintals per hectare yield.

In the year 2001, University released PKV green gram 8802 for Maharashtra State. In year 2011 were released two varieties *i.e.* PKV greengold (AKM 9911) and PDKV blackgold (AKU-10-1). These varieties were also famous in farming community. The University alone unable to supply the huge demand of seed. The MAHABEEJ, Akola and NSC, Pune selling the seeds to farmers from 2000 onwards.

Economic impact of green gram variety:

The green gram Kopergaon variety was released

from the year 1983 onwards. However, the majority and prominent varieties of green gram were released after 1983.

It is noted from the Table 7 that, the total additional cost (Direct + Indirect) of University released varieties over other competing varieties was observed to be Rs. 2910.23 per hectare. However, the reduced costs (or saving) and added returns due to University released varieties over other competing varieties was Rs. 10421.24 per hectare. Thus, the total economic worthiness of University released green gram production technology over other competing varieties of green gram in the region was Rs. 7511.01 per ha.

Up-scaling the economic impact of green gram:

These implicitly capture the operation of the LDMR since the field conditions are not akin to the lab conditions

Table 8 : Up scaling the economic impact of green gram variety Koperagaon covering the area of adoption

Sr.No.	Economic impact of University released green gram varieties	Cost (Rs.')
1.	Probability performance of green gram variety	0.82
2.	Rate of adoption of green gram variety	0.88
3.	Depreciation of technology (if 1, No depreciation)	1.00
4.	Economic worthiness of University released variety per ha	7511.01
5.	Economic impact of University released variety per ha	5419.94
6.	Area adopted under University released green gram variety Kopergaon upto 2019-20 (Ha)	304.02
7.	Total economic impact (Rs. In Crores) for the year 2019-20	0.16

Table 9: Economic impact of green gram Kopergaon variety in India

Sr. No.	Year	Gross gain (Rs./ha)	Net gain (Rs./ha)	(Maharashtra + Other state)		
				Area (MS+OS) (ha)	Net economic impact (Crores)	Gross economic impact (Crores)
1.	2005-06	11751.26	1774.88	70866.00	12.58	83.28
2.	2006-07	12984.82	1961.19	103716	20.34	134.67
3.	2007-08	14098.61	2129.41	45270.00	9.64	63.82
4.	2008-09	15700.01	2371.28	621342.00	147.34	975.51
5.	2009-10	18234.63	2754.10	33264.00	9.16	60.66
6.	2010-11	20260.70	3060.12	21424.50	6.56	43.41
7.	2011-12	22094.54	3337.09	18565.56	6.20	41.02
8.	2012-13	24604.17	3716.14	11710.53	4.35	28.81
9.	2013-14	27832.77	4203.78	3160.98	1.33	8.80
10.	2014-15	29895.56	4515.34	1792.44	0.81	5.36
11.	2015-16	31337.07	4733.06	1539.72	0.73	4.83
12.	2016-17	32710.93	4940.56	2475.72	1.22	8.10
13.	2017-18	33480.99	5056.87	1751.76	0.89	5.87
14.	2018-19	34234.14	5170.62	370.08	0.19	1.27
15.	2019-20	35884.85	5419.94	304.02	0.16	1.09
Total economic impact of Kopergaon for 15 years					208.92	1383.20

and the farmer is different from the researcher. The up-scaling the economic impact of green gram research is presented in Table 8. Accordingly the ultimate economic impact of green gram per hectare works out to $7511.01 \times 1.00 \times 0.88 \times 0.82 = 5419.94$. The area under University released green gram varieties for the year 2019-20 was only 304.02 ha. So, the total economic impact to the farming community in Maharashtra state was Rs. 0.16 crores for the year 2019-20.

Economic impact of green gram varieties in India (Maharashtra + Other state):

The economic impact of green gram varieties for 15 years (from year 2005-06 to 2019-20) has been estimated and presented in the Table 9.

The gross and net gain from University released varieties for the year 2019-20 over check variety has been deflated on the basis of Consumer Price Index (CPI). It is noted from the table that the gross and net economic impact of green gram varieties to the farming community in Maharashtra state for the 15 years was Rs. 383.20 crores and 'Rs. 208.92 crores.

The data on actual seed sell of green gram variety from different agencies was not available. Hence, the data under University released green gram varieties was estimated on the basis of breeder seed produced by the University. Breeder seed was converted into foundation and certified seed.

It is also noted that area under green gram Kopergaon tremendously declined *i.e.* 70866.00 to 304.02 ha in over a period of time. And hence, net economic impact of year 2019-20 was only 0.16 crores. It is to be needed increasing seed production of green gram Kopergaon variety. It is more demanded variety by farmers because Kopergaon variety, seeds are bold and shiny in appearance with green colour.

Conclusion :

The Agriculture sector is an important contributor to the economic and social well being of a country. By recognizing this fact, it was felt necessary to take up a study on Economic Impact Assessment of green gram Variety released by Dr.PDKV, Akola.

Maharashtra state rank second in green gram area (9.86%) and production (7.92%) Maharashtra state green gram rank seventh in India. The compound growth rates for area, production and productivity for green gram in Vidarbha were -8.58, -6.73 and -4.92, respectively and stability significant. Similar results was obtain for Maharashtra state it indicates that the area, production and productivity were decreased over a period of time. The area, production and productivity were decline during last 20 years in all region and state as whole.

The total economic worthiness of University released green gram production technology over other competing varieties of green gram in the region was Rs. 7511.01 per hectare *i.e.* the net economic impact to the farming community were Rs. 0.16 crores for green gram in the year 2019-20. The area under University released green gram Kopergaon variety for the year 2019-20 were 304.02 hectare, respectively. The farmers earned gross economic benefit was Rs, 1383.20 crores from fifteen years from Dr. PDKV, Akola released of Kopergaon. It is concluded that, to be needed increasing seed production of green gram, Kopergaon variety. It is more demanded variety by farmers because Kopergaon variety, seeds are bold and shiny in appearance with green colour.

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