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Productivity, Input and Operational Costs and Marketing Efficiency of Guar [*Cyamopsis Tetragonoloba* (L.) Taub]: A Legume Crop in Haryana

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ABSTRACT

A field study was conducted in Sirsa, Bhiwani and Hisar in Department of Economics, Baba Mastnath University Rohtak to study the productivity, economics and marketing efficiency of guar during the year 2014-15. It was found that among the operational costs for cultivation of guar, the preparatory cost was significantly higher in Hisar (` 2834/ha) as compared to Sirsa and Bhiwani, while the pre-sowing irrigation was higher in Sirsa district. The sowing costs was significantly higher in Sirsa (` 957/ha). Threshing and transportation costs were significantly higher in Sirsa (` 3924 and ` 350). FYM, DAP, irrigation and chemical weeding were significantly positively correlated with yield. Marketing channel-III (producer and processor only) was found most efficient with an efficiency of 12.03.

Key words: Correlation, Guar, Input, Marketing efficiency, Operational cost, Yield.

INTRODUCTION

Guar (*Cluster bean*) belongs to kingdom plantae, clade angiosperms from *Fabaceae* family with subfamily Papilionaceae. It has chromosome number 2 n = 14 and grown under the arid and semi arid regions of India particularly under the rainfed area (>1150 mm rains) in the dry habitats (Rakesh *et al*., 2011). It originated from Africa but it has been grown throughout Southern Asia. India and Pakistan are leading countries due to suitable agro-climatic conditions for cultivation of guar followed by USA, South Africa, Australia, Brazil, Zaire and Sudan.It is an annual self-pollinated, deep rooted along with well developed laterals drought resistant crop (Ramanjaneyulu *et al.,* 2018). The importance of the crop can be seen that India is one of the first country having the highest area under rainfed *i.e*. about 78 million hectare accounting for 64 per cent of the net sown area of the country. Majority of this area is habituated by rural poor and marginal farmers (0-2.5 acres) encountering multiple risks and uncertainties due to bio-physical and socio-economic conditions (Dalwai, 2012).

India contributed 80 per cent to the total guar production in world followed by Pakistan with 15 per cent and remaining 5 per cent guar was produced in rest of the world. In India, Rajasthan (75%) and Haryana (20%) remained major guar producing states followed by Gujarat (3%) and others (2%) to the total production of guar crop (Singh, 2014).

In Haryana, this crop is mainly grown as dry land agriculture under dry farming receiving less than 750 mm of rainfall, dry land farming receiving rainfall > 750 mm and rainfed farming > 1150 mm. India ranks first among the rainfed countries in the world in terms of area, but counts amongst the lowest in rainfed yields (<1 ton/ha). As high as 78 m.ha. accounting for 64 per cent of the country's net sown area is rainfed. Guar products have become one of the largest agriculture export product from India during the last couple of years. Guar products accounted for 18 per cent of India's total agricultural exports in 2012-13 (Yadav *et al,* 2013).

There are two types of guar seed processing industries, namely, processing of guar seed to guar gum further split to powder. All the split units have indigenous plant and machinery and are mainly located in Jodhpur, Barmer, Sri Ganganagar and Bikaner districts of Rajasthan. Splits are available in various grades in terms of purity (90%, 92%, 95% and 97% respectively). The pulverized gum largely marketed as a commodity and about 40 per cent of the exports are still in the form of refined splits.

The present study was carried out to understand the economic importance of guar crop for its grain, the by-products and its processing, to investigate the marketing channels for efficient marketing and providing better returns to the farmers in Haryana and adding this information in the literature associated with this crop so neglected in past in Indian context.

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MATERIALS AND METHODS

The study was conducted in Sirsa, Hisar and Bhiwani district in Department of Economics, Babamastnath University, Asthal Bohar, Rohtak with the objective to study the guar production, productivity, marketing efficiency, price and margin in Haryana. Three districts under study *viz*. Bhiwani, Hisar and Sirsa were selected purposely on the basis of highest area under guar. From each district three villages were selected on the basis of the arrival of guar as per the recommendation of the market officials and these were Bapora, Chang and Dinod in Bhiwani, Mallapur, Sadalpur and Asrawan in Hisar and Ludesar, Jamal and Rupawas in Sirsa district. There were 225 farmers from all the districts *i.e*. 25 farmers per village from 9 villages under study. The data collected from selected farmers regarding preparatory tillage, seed procurement, seed treatment, fertilizer, sowing, weeding and hoeing, irrigation, disease and insect management, harvesting and threshing and other miscellaneous information related to costs. The data were collected from both primary and secondary sources. The primary data were collected from sample cultivators and intermediaries. A list of all the markets of selected district was obtained from office of market committees. Three markets were selected from each district based on highest arrival of guar crop in markets. From each selected market 10 commission agents were selected for study, thereby constituting 30 commission agent/local traders were in the study.

Market efficiency =

$$\frac{\text{Net price received by producer}}{\text{Total marketing cost + Total margins of intermediaries}}$$

Statistical analysis was done using SAS 9.3 version and the t-test technique was used to compare the means of the different variables under study. The average of the values of the three district was assumed to be the average values of Haryana and comparison was made accordingly.

RESULTS AND DISCUSSION

Rainfall pattern in Haryana

It is evident from the Fig 1 that the average rainfall from 1966 to 2012 ranged from 333.8 to 1207.8 mm, being highest among Yamunanagar, Ambala and Panchkula and lowest in Bhiwani (398.7 mm) followed by Hisar (390.8 mm) and Sirsa (333.8 mm). Rainfall is important for the production of the crops which were by perception thought to be required lesser inputs and guar is the crop which was neglected in Haryana. But due to demand of guar gum in the Arabian countries for its use in petroleum extraction, the demand resulted into fetch the attention of the farmers. Hence rainfall plays a big role in the production of guar.

Factors affected productivity in guar in Haryana

The productivity of guar is affected by many factors and under the study, the following observations were found to affect the productivity of guar.

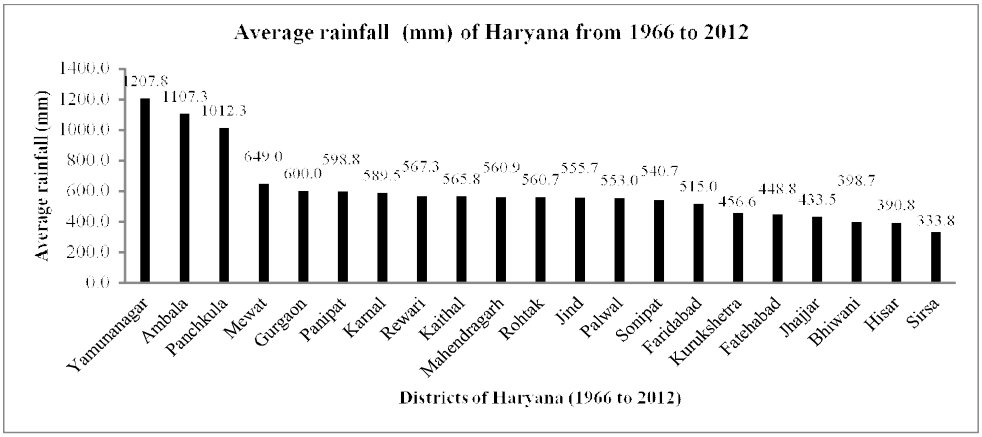
Operational cost

(i) Preparatory tillage cost

Data clearly reveled that in district Hisar, the preparatory cost of guar field was significantly higher (`2834/ha) as compared to Sirsa and Biwani. The increase in cost was due to the operations carried out for preparation in Hisar (2.79) as compared to Sirsa (2.59) and Bhiwani (2.52). However, preparatory costs in Sirsa was higher (`2666/ha) than Bhiwani (`2623/ha) but statistically on par. Both Bhiwani and Sirsa districts had lesser preparatory cost as compared to overall Haryana average preparatory costs of Haryana as a whole (`2707/ha) (Table 1).

(ii) Pre-sowing irrigation

Pre-sowing irrigation cost for guar sowing in Haryana was `753/ha and among the districts under study it was highest in Sirsa district (`915/ha) followed by Hisar (`697/ha) and lowest in Bhiwani (`647/ha) but all were on par with each other.



(Source: https://data.gov.in/resources/district-wise-average-annual-rainfall-haryana-1966-2012#).

Fig 1: Average rainfall of Haryana from 1966 to 2012.

Table 1: Operational costs incurred in the production of guar in Haryana (`/ha).

District	Preparatory tillage quantity	Preparatory tillage	Pre-sowing irrigation	Sowing	Fertilizer application	Manual hoeing/	Harvesting	Threshing	Trans-portation charges
Bhiwani	2.52[b]	2623[b]	647[a]	858[b]	244[a]	343[a]	4358[a]	3285c	242[b]
Hisar	2.79[a]	2834[a]	915[a]	910[a]	232[a]	371[a]	4611[a]	3683[b]	248[b]
Sirsa	2.59[b]	2666[ab]	697[a]	957[a]	287[a]	355[a]	4646[a]	3924[a]	350[a]
Haryana	**0.20**	**2707**	**753**	**908**	**254**	**356**	**4538**	**3631**	**280**
LSD (P = 0.05)		201.11	314.39	53.23	66.70	238.82	180.22	128.6	15.11

Table 2: Correlation between the inputs and yield.

Input used	Yield
Seed quantity (kg/ha)	0.019
FYM quantity (q/ha)	0.178*
DAP (kg/ha)	0.272**
Irrigation	0.567**
Chemical weeding	0.265**
Manual weeding	0.064
Sprays for disease	0.044

*Significant at P= 0.05 level; **significant at P = 0.0001 level.

(iii) Sowing cost

The sowing costs of guar were estimated in Haryana were found to be `908/ha. Among the different districts like Sirsa (`957/ha) it was statistically found higher as compared to Bhiwani (`858/ha) but on par with Hisar (`910/ha) (Table 1).

(iv) Fertilizer application, manual hoeing weeding and harvesting cost

Per hectare average cost for fertilizer application in Haryana as a whole was found to be `254; whereas for; manual hoeing and weeding; it was found to be `356 and harvesting cost was `4538/ha, respectively. These costs were found on par among all the districts under study.

(v) Threshing cost

Overall average threshing cost of guar in Haryana was estimated as `3631 per hectare. Among the districts under study, it was found statistically higher in Sirsa (`3924/ha) than Hisar (`3683/ha) and Bhiwani (`3285/ha).

(vi) Transportation charges

Average transportation charges for guar in Haryana were estimated as `280 per hectare and among the districts, it was found significantly higher in Sirsa (`350/ha) over Hisar (`248/ha) and Bhiwani (`242/ha). This cost depends on the nearness or distance of the agriculture market. Higher the distance, higher will be the transportation charges. Similar justification had been reported by Speranza and Ukovich (1994).

Input costs in Haryana

All the input costs in the guar production presented in Table 3 were found non-significant among the districts under study. However, highest costs were incurred on fertilizer application (`1789/ha) in Haryana. Among the districts, in Sirsa for guar production, maximum fertilizer costs were estimated of `1938.6/ha which was higher than Haryana average fertilizer application cost. Next to fertilizer cost, irrigation costs were found higher among all the districts and maximum irrigation cost incurred in Hisar (`904.3/ha) which was 9.98 per cent higher than Haryana average irrigation cost (Table 3). Seed cost was also one of the maximum cost among the other input costs and was found higher in Hisar (`766.33/ha) as compared to Haryana (`762.0). Seed treatment cost was found maximum in Bhiwani (`210/ha) and in Sirsa (`209/ha) as compared to Haryana (`207.83/ha). Lowest costs incurred in guar on insect pest management (`83.72/ha) in Haryana while among the districts it was found highest in Sirsa (`109/ha).

Correlation between inputs and yield

Yield was found to be positively correlated with seed quantity, FYM (r = 0.178, P<0.05), DAP (r = 0.272, P<0.0001), Irrigation (r = 0.567, P<0.0001), chemical weeding (r = 0.265, P<0.0001), manual weeding and spray for diseases. However, FYM, DAP, Irrigation and chemical weeding were

Table 3: Input costs incurred in guar production in Haryana.

Input costs (`/ha)	Bhiwani	Hisar	Sirsa	Haryana	F value	Pr>F	LSD
Seed cost/ha	757.83[a]	766.33[a]	761.83[a]	762.00	0.04	0.965	62.918
Seed treatment cost/ha	210.00[a]	204.50[a]	209.00[a]	207.83	0.01	0.995	114.530
FYM/ha	681.50[a]	619.70[a]	716.00[a]	672.41	0.03	0.972	802.700
Total fertilizer cost and application	1736.00[a]	1693.80[a]	1938.60[a]	1789.50	0.77	0.464	415.640
Irrigation cost	804.30[a]	904.30[a]	758.00[a]	822.22	0.35	0.702	350.120
Chemical hoeing and weeding	773.70[a]	611.70[a]	535.00[a]	640.11	1.08	0.342	327.040
Manual weeding cost	343.30[a]	371.00[a]	354.70[a]	356.33	0.03	0.974	238.320
Disease management cost	268.17[a]	235.50[a]	381.33[a]	295.00	1.37	0.255	182.000
Insect pest management cost	54.67[a]	87.50[a]	109.00[a]	83.72	0.93	0.395	78.980

Note: Similar alphabets are on par with each other.

Table 4: Marketing pattern of guar in Haryana.

Marketing	Hisar		Sirsa		Bhiwani		Haryana	
channel	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Channel-I	49	65.33	46	61.33	32	42.67	127	56.44
Channel-II	20	26.67	27	36.00	35	46.67	82	36.44
Channel-III	6	8.00	2	2.67	8	10.67	16	7.11
Total	**75**	**100**	**75**	**100**	**75**	**100**	**225**	**100**

Table 5: Marketing efficiency of different channels in Haryana.

Marketing channel	Price received by the farmers (x) (`/q)	Marketing cost (y) `/q	Margins (z) (`/q)	Marketing efficiency (MME)= (x)/ (y)+ (z)
Channel-I	3187	264	157	7.57
Channel-II	3235	261	117	8.56
Channel-III	3328	245	32	12.01

significantly correlated with yield. It means that the guar producer in Haryana must take care of application of FYM in their fields, DAP at the time of sowing while assuring the irrigation at the critical stages. Weed management especially, with chemicals must be followed be higher yield production. Disease in guar like bacterial blight and wilt should be properly managed by the suitable sprays.

Marketing pattern in Haryana

Main channel of marking of guar in Haryana was found channel-I *i.e*. Producer → Village trader → Commission agent → Processor. However, channel-II (Producer → Commission agent → Processor) was the 2nd most prominent channel of marketing. Channel-III (Producer → Processor) was least adapted and followed by only 7.11 per cent of the farmers. In all the three districts under study, Hisar and Sirsa farmers followed the channel-I (65.33 and 61.33%). But the farmers in Bhiwani preferred channel-II (46.67%). Channel-III was followed by the farmers of Bhiwani (10.67%) followed by Hisar (8.0%) and Sirsa (2.67%). The adoption of channel -1 was most prevalent due to requirement of funds during the rabi crop season to be started and wheat is the main crop in these areas (Table 4). Family requirements and other reasons made the farmers to adopt the easy method to sell his produce and to have the liquid cash to carry out his livelihoods. Kumar *et al.* (2017) were of the view that higher production resulted into lesser prices and drought or failure of crop resulted into less compensation by the government to the Indian farmers made them to adopt the easy channels of credit in this environment.

Marketing efficiency of different channels in Haryana

Market efficiency was estimated by Acharya's modified formula (Acharya and Agarwal, 2011). Farmers who followed the channel-III for marketing their guar produce got price of `3328 which was highest among the channel-II (`3235/q) and channel-I (`3187/q). The marketing cost was lowest in Channel-III (`245/q) followed by Channel-II (`261/q) and channel-1 (`264/q) (Table 5). The presence of the intermediaries in channel-1 and II resulted into lesser share of farmers. Hence there is much need to establish the processing units near the producers so that the intermediaries can be eliminated and profit of the farmers' produce can be met out without distress sale. When the marketing channels were compared for their marketing efficiency, it was found that marketing channel-III (farmer to processor) was found most efficient with efficiency 12.03 as followed by Channel-II (8.56) and channel-I (7.57) as shown in Table 5. Although the cost incurred were nearly same in channel-I and channel-II and it was slightly less in channel-III but the margins made a real difference which led to high marketing efficiency in channel-III. The producer and the processor both were benefitted due to easy sale of produce and easy availability of the raw material for the processing. The cost may increase in this channel but the time is reduced due to approachable factor for both producer and the processor.

CONCLUSION

Based on the study it was found that operational costs like preparation of field, sowing, threshing and transportation costs affect the guar production and inputs like FYM, DAP, irrigation and chemical weeding significantly correlated with yield of guar. Marketing channel-III involving only producer and processor has the maximum marketing efficiency.

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