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Economic impact of Pratap urd-1 variety of urdbean crop in agro-climatic zone-V of Rajasthan

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Abstract
Present study has been conducted to assess the economic impact of Pratap Urd-1 (KPU 07-08) cultivar of urdbean in comparison to existing varieties. Pratap Urd-1 variety was released from Agriculture Research Station, Kota for rainfed conditions of Rajasthan and notified in the year 2013. The greater parts of adopting farmers (53.33%) and non adopting farmers (46.67%) were from middle age group. The most of adopting farmers (48.33%) and non adopting farmers (51.67%) were matriculation level of education. The most of adopting and non-adopting farmers were from other backward class. It was found that the majority of urdbean farmers (51.11%) having medium family size. The majority of adopting farmers (64.17%) were medium size of land holding (2-10 ha) farmers. The maximum households (45.00%) in the non-adopting farmer were from small size of land holding (1.0-2.0 ha). It also observed that the majority of adopting farmers (57.50%) were earned between 2.5 -5.0 lakh, while majority of non-adopting farmers were earned upto2.5 lacs annually. The maximum of adopting farmers (42.50%) belongs to well off category. and non-adopting farmers were from moderate well-off category (53.33%) in household assets. The farming was occupation for the majority of adopting (77.50%) and non-adopting farmers (83.33%). In case of social capital, the extension contact was high (55.00%) in adopting farmers and the majority of non-adopting farmers were from moderate extension contact category (53.33%). The data depicted on higher average gross returns (Rs 41184/ha) were obtained by adopters from pratap urd-1 plots as compared to non-adopters from existing old variety (Rs 36505/ha). The data revealed that the higher average net return (Rs.4679/ha) was obtained by adopting farmers as compared to non-adopting farmers in the agro-climatic zone-v of Rajasthan. The further study depicted that the 34129 quintal urdbean was additional produced and the income of Rs 1897.26 lacs was increased in agro-climatic zone-v (Kota zone) of Rajasthan due to adoption of pratap urd-1 variety of urdbean crop. The characteristic of Pratap urd-1 which scored highest among producers was tolerance to yellow mosaic virus, reported by 89.16% of producers depending on the variety and assigned Ist rank in their choice.

Keywords: Economic, Pratap urd-1 variety, urdbean crop, agro-climatic zone-V

Introduction
The productivity of pulses in India continues to be quite low (622 q/ha) on account of several biotic and abiotic stresses besides unavailability of quality seeds of improved varieties in time and poor crop management due to unawareness and non-adoption of recommended production and plant protection technologies. India is the world's largest producer as well as consumer of black gram. It produces about 1.5 to 1.9 million tons of urdbean annually from about 3.5 million hectares of area, with an average productivity of 500kg per hectare. Urdbean crop is also gaining momentum since 2015-16 and there has been phenomenal increase in its coverage. During 2017-18 the crop was cultivated over an area of more than 50 Lakh hectares. More than 90 per cent of uradbean production comes from nine states of Madhya Pradesh, Rajasthan, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Maharashtra, Jharkhand, Gujarat and West Bengal (Roy *et al*. 2017) [6].

The variety is the pivot around which entire production system revolves. Therefore, scientific black gram cultivation must be start with selection of appropriate variety for the agro-climatic zone, soil type and season concerned. New varieties are continuously evolved by the research system all over India. Hope fully, outcome of this research in kind of new black gram varieties capable for producing economic importance and help to improve the economic conditions of blackgram growers. The Pratap Urd-1 (KPU 07-08) is a high yielding cultivar having seed yield potential of 9-10 q/ha, matures in 72-78 days moderately resistant against MYMV, leaf crinkle, web blight and powdery mildew and resistant to anthracnose & bacterial leaf spot diseases. This variety is semi-spreading, determinate growth habit, ovate shape of terminal leaflet, hairy and long pods having 6-9 seeds/pod and bold seed size (4.5g/100 seed).

It is also tolerant to stem fly and white fly. It was released for rain fed conditions for Rajasthan and notified in the year 2013 vide notification No. 2817(E) dated 19.9.13.

The spread of the newer varieties replacing the older varieties need to be closely monitored to take advantage of the superior characters of these newer varieties released by various research Institutions. This will help to break the yield plateau that has been experiencing in pulses crops in the recent past and to increase the production and productivity of the crop. Though a number of steps are being taken by the Government to popularize these varieties like Frontline Demonstration, mini kit supply, organizing training programmes for farmers, farm women, seed growers, seed production personnel of public and private seed agencies, extension functionaries of state departments of agriculture, officials of state agricultural universities and NGOs, there is no concrete data to prove that the newer variety Pratap urd-1 of urdbean are spreading faster and replacing the older ones. However, there has been no systematic monitoring of the adoption of these varieties, and economic impacts on producers were not evaluated. Key socio-economic research questions remain unanswered; especially whether this improved variety have effectively contributed to achieving their intended impacts. Therefore, Present study has been conducted to assess the actual spreading of this new variety in terms of area, production, productivity and total income generated in comparison to existing varieties. This study was aimed to analysis the determinants of varietal uptake and the socio-economic impact of this variety on black gram growers with the following specific objectives.

1. To measure the socio-economic and personal traits of adopting and non-adopting farmers and
2. To find the economic impact of Pratap urd-1 variety of urdbean of adopting farmers.

Research Methodology

The Present investigation was conducted in agro-climatic zone v of Rajasthan. The study was based on both secondary and primary data. Secondary data relating to area, production and productivity of urdbean were collected from government publications and web sites to arrive at the trends in area, production and productivity. The approach used for this investigation was to gather information or data from both adopting and non adopting farmers so that the impact of variety can be measure by comparing with and without technology. A survey was carried out in all four districts of Kota zone in Rajasthan during April-May 2019. An exploratory survey was conducted by a team of researchers along with local partners to acquire a broad overview of the adoption process and pattern in the area. The data will be collected through personal contacts with the help of well structured interview schedule. The team was test the instruments with the farmers and adjusted the interview schedule based on the lesson leant from field testing. The structured interview schedule/questionnaire used for the survey was also designed to generate information on socio-economic characteristics of farmers, farmers' preference towards the traits of the variety, crop input, crop outputs, production costs, gross and net return.

The multistage stratified random sampling was used to select the respondents. The each district area was classified in to different strata based upon estimated adoption levels observed during exploratory survey. The proportion of each of the selected district's urdbean area to the total urdbean area of the zone was considered as a criterion to decide number of villages and sample size from each district. The villages from each block/strata were randomly selected as to ensure representativeness of the sample with respect to landholding size, crop yield etc. After discussion with key informants in the selected village, 5 urdbean growing households were selected from each village for collecting the required and relevant information. The sampling framework for the collection of primary data is shown in Table 1. The gathered data were processed, tabulated, classified and analyzed in terms of suitable statistics in the light of objectives of the study.

Table 1: Sampling framework for collection of primary data

District	Urdbean Area ('000ha)	No. of Strata / Block	No. of villages	Households sample		
				Adopting	Non-adopting	Total
Kota	99	2	6	30	15	45
Bundi	139	2	8	40	20	60
Baran	104	2	6	30	15	45
Jhalawar	50	2	4	20	10	30
Total	392	8	24	120	60	180

Results and Discussion

Socio-economic and personal characteristics of urdbean growers: - Households usually use a variety of resources as inputs into their production. These can be classified into natural, financial, human, physical and social capital, as has been popularized in the sustainable livelihoods approach (Carney, 1998) [1], and these have been used here to ensure that all the components of livelihood assets were addressed, summarized in Table 2.

Human capital represents skills, knowledge, attitude and health status that together enable people to pursue different livelihood strategies. The household head remains the main driving force behind any household livelihood strategy, and their education, family size, caste and age had a strong influence on decisions regarding farm investments. The majority of adopting farmers (53.33%) were from middle age group (36-49 years old) followed by young age (27.50%) and old age group (19.17%), respectively. The most of household heads (46.67%) in non-adopting sample were also from middle age group followed by old age (28.33%) and young age (25.00%), respectively. The most of adopting farmers (48.33%) were matriculation level of education followed by graduation (22.50%), middle level (15.84%) and post-graduate (13.33%), respectively. It was also found that the majority of non-adopting farmers (51.67%) were matriculation level of education followed by middle level (28.33%), graduation (15.00%) and post-graduate (5.00%), respectively. The most of adopting and non-adopting farmers were from other backward class followed by scheduled tribe (25.83% & 33.33% respectively). It was observed that the majority of urdbean farmers (51.11%) having medium family size followed by large (37.22%) and small (11.67%) family size respectively.

Natural capital is very important for rural communities because they derive all or part of their livelihoods from resource-based activities. Farm size is a major determinant of the financial status of farmers, plays an important role in family labor employment and income, and may influence production per unit area. The majority of adopting farmers (64.17%) had medium size of land holding (2-10 ha) farmers followed by small size (22.50%) of land holding (1.0-2.0 ha), large size (7.50%) of land holding (>10 ha) and marginal size (5.83%) of land holding (less than 1.0 ha), respectively. Maximum households (45.00%) in the non-adopting sample were from small size of land holding (2.0-10.0 ha), followed by medium size (31.67%) of land holding (1.0-2.0 ha), marginal size (10.00%) of land holding (less than 1.0 ha) and large size (3.33%) of land holding (>10 ha), respectively.

Table 2: Socio-personal characteristics of the urdbean growers in Kota zone of Rajasthan.

Parameters	Category	Adopting farmers		Non-adopting farmers		Total	
		No.	Percent	No.	Percent	No.	Percent
Age	Young age (18-35 year)	33	27.50	15	25.00	48	26.67
	Middle age (36-49 year)	64	53.33	28	46.67	92	51.11
	Old age (50 year and above)	23	19.17	17	28.33	40	22.22
	Total	120	100	60	100	180	100
Level of Education	Upto Middle	19	15.84	18	28.33	37	20.56
	Matriculation (10+2)	58	48.33	31	51.67	89	49.44
	Graduation	27	22.50	08	15.00	35	19.44
	Post Graduation	16	13.33	03	5.00	19	10.56
	Total	120	100	60	100	180	100
Caste	Schedualed Caste	11	09.17	07	11.67	18	10.00
	Schedualed Tribe	31	25.83	20	33.33	51	28.33
	Other backword Class	61	50.83	29	48.33	90	50.00
	Genral category	17	14.17	04	06.67	21	11.67
	Total	120	100	60	100	180	100
Family size	Large (>10 members)	46	38.33	21	35.00	67	37.22
	Medium (5-10 member)	62	51.67	30	50.00	92	51.11
	Small (<5 members)	12	10.00	09	15.00	21	11.67
	Total	120	100	60	100	180	100
Land holding	Marginal (<1.0 ha)	07	05.83	12	10.00	19	10.56
	Small (1.0-2.0 ha)	27	22.50	27	45.00	54	30.00
	Medium (2.0-10 ha)	77	64.17	19	31.67	96	53.33
	Large (>10 ha)	09	07.50	02	03.33	11	06.11
	Total	120	100	60	100	180	100
Annual Income	Upto 2.5 lacs	18	15.00	31	51.67	49	27.22
	Between 2.5 to 5 lacs	69	57.50	16	26.67	85	47.22
	Between 5 to10 lacs	21	17.50	11	18.33	32	17.78
	Above 10 lacs	12	10.00	02	03.33	14	07.78
	Total	120	100	60	100	180	100
Household assets	Well off	51	42.50	09	15.00	60	33.33
	Moderate well off	46	38.33	32	53.33	78	43.33
	Poor	23	19.17	19	31.67	42	23.34
	Total	120	100	60	100	180	100
Occupational	Farming only	93	77.50	50	83.33	143	79.44
	Farming +Business	03	02.50	00	00.00	03	01.67
	Farming +Service	17	14.17	07	11.67	24	13.33
	Farming +Entrepreneur	07	05.83	03	05.00	10	05.56
	Total	120	100	60	100	180	100
Extension contact	Low	13	10.83	25	41.67	38	21.11
	Moderate	41	34.17	32	53.33	73	40.56
	High	66	55.00	03	05.00	69	38.33
	Total	120	100	60	100	180	100

Financial capital is the availability of money or equivalents that enables people to adopt different livelihood strategies. The table 2 also depicted that the majority of adopting farmers (57.50%) were earned between 2.5 -5.0 lacs annually followed by between 5.0-10 lacs (17.50%), less than 2.5 lacs (15.00%) and above 10 lacs (10.00%), respectively. The majority of non-adopting farmers (51.67%) were earned up to 2.5 lacs annually followed by between 2.5 -5.0 lacs, less than 2.5 lacs (26.67%), between 5.0-10 lacs (13.33%), and above 10 lacs (8.33%), respectively.

Physical capital plays a vital role, as it comprises basic infrastructure and producer goods supporting livelihoods. Livestock, tractors, and other ownership all affect household welfare. The maximum numbers of adopting farmers (42.50%) belongs to well off category in household assets followed by moderate well off (38.33%) and poor (19.17%) in household assets respectively. The majority of households in the non-adopting farmers were from moderate well off category (53.33%) followed by poor (31.67%) and well off (15.00%) in household assets respectively. The farming was occupation for the majority of adopting (77.50%) and non-adopting farmers (83.33%) followed by farming + service and farming + entrepreneur occupation respectively. Only few adopting farmers (2.50%) and none of non-adopting farmers were from farming+ business occupation.

The social capital of any society is very important, as mutual trust and connectedness helps to cope with shocks and vulnerability, particularly for the poor. The extension contact was high (55.00%) in adopting farmers followed by high (34.17%) and low extension contact (10.83%), respectively and the majority of non-adopting farmers were from moderate extension contact category (53.33%) followed by low (41.67%) and high extension contact (5.00%) respectively for the gathering the latest agriculture information.

Impact on farm income-yield, cost and return of pratap urd 1 variety of urdbean:- The impact of pratap urd 1 on productivity was assessed through a comparison of average yields between adopting and non-adopting (using data provided by farmers). Table 3 compares average grain yield of improved and old variety on farmers' field in the selected agro-climatic zone-v of Rajasthan (Humid south eastern plain). The data revealed on yield parameter showed that the maximum seed yield was obtained by adopters from pratap urd-1 plots 8.33 qha^{-1} during kharif 2016 followed by 8.23 qha^{-1} (2017), 8.02 qha^{-1} (2015) and 7.42qha^{-1} (2018) respectively with an average of 8.00 qha-1 as compared to non-adopters from existing old varieties 7.40 qha^{-1} during kharif 2016 followed by 7.18 qha^{-1} (2017), 7.10 qha^{-1} (2015) and 6.68 qha^{-1} (2018) respectively with an average of 7.09 qha^{-1} which was increased with an average of 12.83 percent for urdbean production. The data revealed on economic performance showed that the maximum net return was obtained Rs 31642q/ha by adopters during kharif 2017 followed by Rs 30350q/ha (2016), Rs 27052 q/ha (2018) and 26842q/ha (2015) respectively with an average of Rs 28971 q/ha as compared to non-adopters of Rs 25972q/ha during kharif 2017 followed by Rs 25700q/ha (2016), Rs 22908q/ha (2018) and Rs 22588q/ha(2015) respectively with an average of Rs 24292 q/ha. The data depicted on higher average gross returns (Rs 41184/ha) were obtained by adopters from pratap urd-1 plots as compared to non-adopters from existing old variety (Rs 36505/ha). The data revealed that the higher average net return (Rs.4679/ha) was obtained by adopting farmers as compared to non-adopting farmers in the agro-climatic zone-v of Rajasthan. The further study depicted that the 34129.04q urdbean was additional produced and the income of Rs 1897.26 lacs was increased in agro-climatic zone-v of Rajasthan due to adoption of pratap urd-1 variety of urdbean crop (Table 4).

Table 3: Yield, cost and returns of pratap urd- 1 variety of urdbean in agro-climatic zone v of Rajasthan

Year	Average yield (Kg/ha)		% yield increased over existing old variety	Operational cost (Rs/ha)	Gross return (Rs/ha)		Net return (Rs/ha)	
	Adopter	Non-adopter			Adopter	Non-adopter	Adopter	Non-adopter
2015	802	710	12.96	10250	37092	32838	26842	22588
2016	833	740	12.57	11300	41650	37000	30350	25700
2017	823	718	14.62	12800	44442	38772	31642	25972
2018	742	668	11.08	14500	41552	37408	27052	22908
Total	800	709	12.83	12213	41184	36505	28971	24292

Table 4: Estimated income generate by adoption of pratap urd-1 of urdbean in agro-climatic zone-v of Rajasthan

Year	Area under Pratap urd-1 variety (ha)	Yield increased over old variety (Kg/ha)	Additional production (q)	Revenue generated (lacs)
2015	52	92	47.84	2.21
2016	490	93	455.70	22.78
2017	5120	105	5376.00	290.30
2018	38175	74	28249.50	1581.97
Total			34129.04	1897.26

Reasons for preferring the pratap urd-1variety by adopting farmers:-Producers' preferences for certain characteristics are critical for variety adoption. Therefore, understanding the criteria used by producers to evaluate new crop varieties allows breeders to effectively set priorities and target different breeding strategies to different communities. Producers' evaluations of new varieties are also useful to determine whether they have maintained their intrinsic characteristics, and if their agronomic as well as quality and price performances are satisfactory from the view of the end users. The characteristic which scored highest among producers was tolerance to yellow mosaic virus, reported by 89.16% of producers depending on the variety and assigned Ist rank in their choice (Table 5). Other characteristics also scored highly among producers was short duration (85.83%), better in yield (84.66%), bold seeded (77.50%), good in market prices (75.00%) and less insect attack due to hairy pods (72.50%) respectively and assigned IInd, IIIrd, IVth, Vth and VIth rank respectively.

Table 5: Characteristics of Pratap urd 1 variety preferred by adopting farmers

Traits	No. of urdbean grower	% of urdbean grower	Rank
Better in yield	101	84.66	III
Matures in 72-78 day	103	85.83	II
Tolerance to MYMV	107	89.16	I
Bold seeded	93	77.50	IV
Less insect due hairy pods	87	72.50	VI
Good in market price	90	75.00	V

Conclusion: - Present study has been conducted in agro-climatic zone v of Rajasthan to assess the economic impact of Pratap Urd-1 (KPU 07-08) cultivar of urdbean in comparison to existing varieties. The data depicted on higher average gross returns (Rs 41184/ha) were obtained by adopters from pratap urd-1 plots as compared to non-adopters from existing old variety (Rs 36505/ha). The data revealed that the higher average net return (Rs.4679/ha) was obtained by adopting

farmers as compared to non-adopting farmers in the agro-climatic zone-v of Rajasthan. The further study depicted that the 34129.04q urdbean was additional produced and the income of Rs 1897.26 lacs was increased in agro-climatic zone-v of Rajasthan due to adoption of pratap urd-1 variety of urdbean crop. The characteristic which scored highest among producers was tolerance to yellow mosaic virus, reported by 89.16% of producers depending on the variety and assigned Ist rank in their choice.

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