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**FROM EDITOR'S DESK**

*We are pleased to share with you the current issue of IJEE & RD for the year 2025. Total 28 research papers on areas pertaining to significant contemporary issues of rural development and agricultural extension are included in the present issue. The research papers related to Agriculture, Community Science, Management, Dairy & Animal Husbandry, and Rural Development in general forms the major content of this volume. I am highly grateful to the Editorial board and Executive Editor Prof. and Dean Dhriti Solanki for their untiring and painstaking efforts in bringing out this issue in time. Prof. F.L. Sharma on Editorial Board deserves special thanks for his commendable work and shouldering the responsibility of bringing this task to reality. He has always been instrumental in pooling efforts of editorial board members to complete the work in time keeping in view the non-impact points of NAAS. We appreciate the continuous cooperation extended by the President of the society Prof. P.N. Kalla and Vice-presidents Prof. Archana Raj Singh & Prof. B.S. Bhimawat for their guidance and help in this matter. We are also grateful to Prof. N.K. Panjabi, Secretary of the society for his continuous cooperation and free hand in completing the task well in time, financial resources are never been limiting factor for the good cause of society's development. The contributors of research papers are precious and highly valued members of the society. We are heartily thankful to them for their trust in the society and sharing their research work through this platform. We expect the similar type of cooperation from the members in future too. We assure the contributors and members to come up to their expectations in the years to come. We are grateful to Dr. S.S. Sisodia, Professor & Head, Department of Extension Education, RCA for his cooperation, providing space and resources for any work related to RSEE. Thanks are also due to Prof. Rajshree Upadhyay, Dept. of EECM, College of Community and Applied Sciences for her cooperation and concern in all matters related to this journal. Last but not the least Image Print Media deserves special appreciation and thanks for printing the journal in time.*

*Best regards*

**S.K. Sharma**  
Chief Editor





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## **CHALLENGES FACED BY AGRI-TECH STARTUPS IN RAJASTHAN**

**Shekhar Sumit\*, Seema Tyagi\*\* and Vasupriya Parashar\*\*\***

### **ABSTRACT**

Agri-tech startups in India offer innovative solutions such as digital marketing platforms, advisory services and transparent pricing to transform the agricultural sector. These startups leverage modern technologies to enhance productivity, profitability, and efficiency in agriculture. With increasing investments and government support, the agri-tech sector is poised for growth, redefining Indian agriculture and attracting more investments. The purpose of this study was to analyze the challenges for agri-tech startups in Rajasthan. The co-founder of agri-tech startups operating in Rajasthan were involved in the present study for in-depth investigation. The startups identified were divided in categories like upstream supply chain, downstream supply chain, agri-fintech, precision agriculture and farm mechanization. Out of these, a total of 10 agri-tech startups were selected from the upstream and downstream supply chain categories because they had the highest number of startups operating in the study area. The Rajasthan Startup Policy 2022 supports the entire startup ecosystem, including agri-tech, providing incentives, training, and enabling conditions. However, awareness of certain initiatives within the policy was limited among startups. Slow digital technology adoption by farmers, small land-holding size, low awareness of agri-tech solutions and problems in last mile delivery as well as procurement are the biggest problems faced by the agri-tech startups in Rajasthan. This paper discusses the different challenges being faced by these Agri-Tech startups in Rajasthan and the way forward to help them overcome these challenges.

### **INTRODUCTION**

An 'Agri-tech Startup' is a venture aimed at creating products or services that improve agricultural output using the latest technological advancements. The agri-tech sector in India is poised for significant growth and holds immense potential. With increasing investments and the support of the investor community, the agri-tech sector in India is expected to thrive and redefine the future of Indian agriculture. It is evident that the agri-tech sector in India holds immense potential for growth and innovation. There are various categories of agri-tech startups like upstream supply chain technology, downstream supply chain technology, agriculture finance and insurance technology, precision agriculture, robotics and mechanism, agriculture infrastructure technology: warehousing and logistics and agriculture biotechnology and biomaterials which are functioning towards making the occupation of

farming more profitable by leveraging technologies. As per Spherical Insights report (2020), the global agri-tech market was valued at US \$ 19,542.7 million in 2021 and is projected to grow at a CAGR of 17.3 per cent to US \$ 46,372.5 million by 2030. Among the regional agri-tech startup ecosystems, North America and Asia account for 48 per cent and 20 per cent of the top 25 Agtech and New Food startups, respectively.

Around 2,028 agri-tech startups are operational in India. Investments in agri-tech startups (agri and food tech combined) doubled to \$ 4.6 billion during the Financial Year (FY) 2022 which is 119 per cent more than that of Financial Year 2021. More than 1000 agri-tech startups have emerged over the last six years in India. Bengaluru is biggest established startup ecosystem of India followed by Mumbai and Delhi. As per DPIIT, Rajasthan stands at the 10th place among the highest number of agri-startups (as of 10<sup>th</sup> November, 2021). Rajasthan is one of the

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states that has imbibed innovation and technology as the core agendas for economic development. The state has been working hand-in-hand with the central government for developing an ecosystem for the startups. Accelerators and Incubators are a crucial component of any startup ecosystem. They provide the best possible technical support to the startups to reduce their gestation period. Agri-tech startups have emerged as a driving force behind the modernization of the agricultural sector, leveraging innovative technologies to enhance productivity, sustainability, and profitability. The analysis of the agricultural landscape, market dynamics, and government initiatives in Rajasthan helped in identifying the areas where agri-tech startups can make a significant impact. This knowledge will provide valuable insights into the potential gaps and areas for improvement. Therefore, this research will uncover the barriers, hurdles, and limitations that hinder the growth and success of these startups in Rajasthan which are essential for devising effective strategies and policies.

The agri-tech sector itself is an ecosystem of companies working towards making the occupation of farming more profitable by leveraging technologies like data analytics, SaaS (Software as a Service), Artificial Intelligence (AI) and Machine Learning (ML).

**Upstream Supply Chain Agri-Tech Startups:** These startups focus on improving input access for farmers through digitalization of the input supply chains, as in, e-commerce in seeds, fertilizers, pesticides.

**Downstream Supply Chain Agri-Tech Startups:** Startups in this category deploy technology-led solutions to optimize output supply chains and create linkages at various levels of aggregation and with end consumers.

## RESEARCH METHODOLOGY

The study was conducted in Rajasthan state as research area because it is among the few states that have a startup ecosystem which is being funded and promoted by the state government. Descriptive research design was used to attain the objective of the study. The objective was to identify the challenges currently faced by the agri-tech startups in Rajasthan. A semi-structured questionnaire was developed by the investigator to receive response from the co-founders of agri-tech startups operating in Rajasthan. The questionnaire was mailed to numerous co-founders of agri-tech startups in upstream and downstream supply chain categories. A total of 10 agri-tech startups were selected from the upstream (3) and downstream (7) supply chain categories because they had the highest number of startups operating in the study area. The Agri-Tech start-ups under these two categories were selected by convenience sampling.

The challenges and biggest challenges faced by the upstream as well as downstream supply chain agri-tech startups in Rajasthan were also compared and analysed using Garrett ranking method devised by Henry Garrett.

### Garrett Ranking Method

First of all, the Per cent Positions were calculated

**Table 1: Agri-tech startups operating in Rajasthan under different categories**

Category	Name of Startups	Number of Startups
Upstream Supply Chain	DeHaat, Gramophone, Agrostar, BigHaat, Bharat Agri, FarMart, Innoterra, AgriBolo, Freshokartz, Farmers Stop, Visron, Fasal Amrit	10
Downstream Supply Chain	Samunnati, Agrowave, Otipy, Vegrow, ApnaGodam, Bijak, DeHaat, Gramophone, Freshokartz, FarMart, Segritech, Innofarms, Kisantreat, Go Naturo, The Modern Farmers	15
Agri-Fintech	Samunnati Financial Intermediation, FarMart, Freshokartz, Innoterra	4
Precision Agriculture and Farm Mechanism	Fasal, AgNext, Aarav Unmanned Systems	3

using the given formula -

$$\text{Per cent Position} = \frac{100(R_{ij} - 0.5)}{N_j}$$

where,

$R_{ij}$  = Rank given for  $i$ th item by  $j$ th individual

$N_j$  = No. of items ranked by  $j$ th individuals

## RESULTS AND DISCUSSION

The challenges faced by the upstream and downstream agri-tech startups have been identified and a comparison has been made between both the categories. The challenges faced by these startups were ranked with the help of Garrett Ranking Technique on the basis of response received from the respondents.

Data pertaining to Table 2 depicted that slow digital technology adoption by farmers due to high prices and volatile revenues with total garrett value

234 and rank I, small land-holding size reducing the cost effectiveness of digital technology with total garrett value 222 and rank II, low digital literacy with and knowledge about agri-tech solutions among farmers total garrett value 174 and rank III and problems in last mile delivery to remote locations due to poor road/rail connectivity with total garrett value 168 and rank IV are the biggest challenges faced by the upstream agri-tech startups in Rajasthan.

The above findings are similar with the findings of Wong *et al.* (2021) who studied the Indian agitech startup ecosystem for 'CGIAR -Platform for Big Data in Agriculture' report and observed that the Indian agtech startup ecosystem is not effectively implementing digital innovations for improving the livelihood of small and marginal farmers to a great extent. This is happening due to lack of agricultural and market data to guide the agtech startups. Also study of Bhardwaj (2022) is in line with above findings as reported that majority

**Table 2: Challenges faced by upstream agri-tech startups in Rajasthan**

(n=3)

S. No.	Challenges/ranks	Garrett Value										Total	Ranking
		1	2	3	4	5	6	7	8	9	10		
1.	Slow digital technology adoption by the farmers	164	70	0	0	0	0	0	0	0	0	234	1
2.	Small landholdings size reducing the cost effectiveness of digital technology	82	140	0	0	0	0	0	0	0	0	222	2
3.	Low digital literacy and knowledge about agritech solutions among the farmers	0	0	126	0	0	48	0	0	0	0	174	3
4.	Problems in last mile delivery of products due to poor connectivity to remote locations (road and rail infrastructures)	0	0	0	116	52	0	0	0	0	0	168	4
5.	Rigid traditional agricultural practices	0	0	63	0	0	96	0	0	0	0	159	5
6.	Gaining trust of the farmers	0	0	0	0	104	0	42	0	0	0	146	6
7.	Low perceived value of start-ups among target segments	0	0	0	0	0	0	84	37	0	0	121	7
8.	Inadequate data available on requirements of agri inputs by farmers	0	0	0	0	0	0	0	37	29	18	84	8
9.	Solutions provided by the start-ups are not yet localized completely as per the market needs	0	0	0	0	0	0	0	37	29	18	84	8
10.	Diversity in agricultural practices across the state	0	0	0	0	0	0	0	0	29	36	65	10

**Table 3: Challenges faced by downstream agri-tech startups in Rajasthan****(n=7)**

S.No.	Challenges/ranks	Garrett Value										Total	Ranking
		1	2	3	4	5	6	7	8	9	10		
1.	Slow digital technology adoption by the farmers	164	280	63	0	0	0	0	0	0	0	507	1
2.	Small and scattered landholdings reducing cost effectiveness of farm gate procurement	410	70	0	0	0	0	0	0	0	18	498	2
3.	Low awareness about agritech solutions among the farmers	0	0	315	58	0	0	0	0	0	0	443	3
4.	Problems in farm gate procurement of agri commodities due to poor connectivity to remote locations (road and rail infrastructures)	0	0	0	58	260	0	0	0	0	0	381	4
5.	Gaining trust of the farmers	0	0	0	58	104	48	126	0	0	0	336	5
6.	Low perceived value of start-ups among target segments	0	0	0	58	0	96	126	0	29	0	309	6
7.	Rigid traditional agricultural practices leading to lesser yields	0	0	0	58	0	96	42	111	0	0	307	7
8.	Non- uniform quality of agricultural produce due to non-standard farming practices	0	0	0	58	0	96	0	3	29	36	256	8
9.	Inaccurate and non-updated data available on area, production and yield	0	70	0	58	0	0	0	0	58	54	240	9
10.	Solutions provided by the start-ups are not yet localized completely as per the market needs	0	0		0	0	0	0	111	87	18	216	10

**Table 4: Comparison of biggest challenges faced by upstream and downstream agri-tech startups in Rajasthan****(N=10)**

S. No	Upstream agri-tech start-ups (n=3)	Downstream agri-tech start-ups (n=7)
1	Slow digital technology adoption by farmers due to high prices and volatile revenues	Slow digital technological adoption among farmers due lack of technical know-how
2	Small land-holding size reducing the cost effectiveness of modern technology	Small and scattered land-holdings reducing cost effectiveness of farm gate procurement
3	Low digital literacy and knowledge about agri-tech solutions among farmers	Low awareness about agri-tech solutions among the farmers
4	Problems in last mile delivery to remote locations due to poor road/rail connectivity	Problems in farm gate procurement in remote locations due to poor road / rail connectivity

of farmers have small and marginal landholdings as their biggest challenge of agritech startups.

From Table 3, it is clear that slow digital technological adoption among farmers due lack of technical know-how with total garrett value 507 and rank I, small and scattered land-holdings reducing cost effectiveness of farm gate procurement with total garrett value 498 and rank II, low awareness about agri-tech solutions among the farmers with total garrett value and rank III, problems in farm gate procurement in remote locations due to poor road / rail connectivity with total garrett value 381 and rank IV and gaining trust of the farmers with total garrett value 336 and rank V are the biggest challenges faced by the downstream agri-tech startups in Rajasthan.

The findings of the study are similar to the findings of Adhya and Sahoo (2022) who studied the agri-tech startup ecosystem in India. They found that Indian agri-tech startups are now capable of resolving inherent challenges in Indian agriculture. The authors identified reluctance of investors towards agri-tech sector, inadequate farm level information, immature government startup promotion initiatives, lack of industrial expertise and poor connectivity with the rural areas as some of the major challenges faced by the agri-tech startups. Also, findings of the study are in line with the findings of Ilankumaran (2019) who studied the scenario of Indian startups with special reference to agri tech startups to identify the opportunities and challenges. He identified low landholding size, talent retention, long gestation period and low rate of return for the investors are the major challenges faced by the agri tech startups.

Table 4 clearly shows that slow digital technology adoption by farmers, small land-holding size, low awareness of agri-tech solutions and problems in last mile delivery as well as farm gate procurement are the biggest problems faced by the agri-tech startups in Rajasthan.

## CONCLUSION

It can be concluded from the present study that slow digital technology adoption by farmers, small

land-holding size, low awareness of agri-tech solutions and problems in last mile delivery as well as procurement are the biggest problems faced by the agri-tech startups in Rajasthan. The reason behind such findings must be small and scattered landholdings decrease the cost effectiveness of farm gate procurement and lack of technical know-how among farmers limits the farmers from using any technology to its full potential. For this instance government should also ensure that agri-tech startups receive the necessary support, incentives, and training to foster their growth and success. Moreover, exclusive information counters for agri-tech startups can be setup at various district, state as well as national level trade fairs and exhibitions by the government, enhanced handholding support to the agri-tech startups by providing 1-on-1 assistance to them and capacity building programs and training campaigns can be implemented by the government and NGOs in the rural areas to overcome the challenges. Agri-tech startups are crucial players in connecting farmers, traders, and consumers, while also addressing the challenges of the sector. With increasing supportive government policies, the agri-tech sector in India is expected to witness significant progress and become an integral part of Indian agriculture, attracting investments and creating value.

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# EFFECT OF VARIOUS TILLAGE AND NUTRIENT MANAGEMENT PRACTICES ON PRODUCTIVITY OF MAIZE-WHEAT-GREEN GRAM CROPPING SEQUENCE

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## ABSTRACT

A field experiment was conducted on fix site in maize-wheat-green gram cropping sequence with three tillage practices (Zero tillage, conventional tillage and on permanent beds) and three nutrient management practices (Recommended dose of nutrient, site specific nutrient management and 60 % recommended dose of nutrient + green seeker based nutrient dose). These nine treatment combinations were evaluated in factorial randomized block design replicated thrice. during kharif 2020-21 at Instructional Farm Rajasthan College of Agriculture Udaipur. The objectives were to study impact of various tillage and nutrient management practices on productivity of maize, wheat and green gram in maize-wheat-green gram cropping sequence. Pratap Maize Hybrid-3, Raj-4077 and K-851 were used as test varieties in this cropping sequence experiment. The highest maize grain and stover yield were recorded under zero tillage which were statistically at par with that of yield recorded under conventional tillage, however proved significantly higher over yield recorded on permanent bed. In wheat, grain and straw and in green gram, seed yield recorded under zero tillage were significantly higher over that of yield recorded in conventional and permanent bed. With significant highest cropping sequence maize equivalent yield (132.97 q ha<sup>-1</sup>), net return (Rs. 115609 ha<sup>-1</sup>) and B:C ratio (2.47) zero tillage proved best practice compared to yield recorded from conventional tillage and from permanent bed. With highest maize grain (52.72 q ha<sup>-1</sup>), stover (79.42 q ha<sup>-1</sup>), wheat grain (46.06 q ha<sup>-1</sup>), straw (71.09 q ha<sup>-1</sup>), green gram seed (3.69 q ha<sup>-1</sup>), cropping sequence maize equivalent yield (136.27 q ha<sup>-1</sup>), net return (Rs. 120326 ha<sup>-1</sup>) and B:C ratio (2.47), site specific nutrient management practice proved best practice for management of nutrient in maize-wheat-green gram cropping sequence compared to rest of other practices.

## INTRODUCTION

Maize is an important cereal crop of the world grown on approximately 140 m ha area under diverse climatic conditions. In India Rajasthan ranks first in respect of area, wherein this crop occupies 0.99 m ha area with production of 22.07 m t and productivity of 22.28 kg ha<sup>-1</sup> (Govt. of Raj. 2025). Maize is a versatile product with uses ranging from industrial products to food preparations, as well as direct human consumption. Of the different forms used for human consumption, 45 per cent is consumed as staple food in various forms *viz*, bread, biscuits, cookies or transformed into corn flakes, soups, fresh-roasted sweets, boiled cobs and vegetables etc. Maize grain is main ration for poultry birds. Forage maize is used as fresh or dry fodder.

In Rajasthan, maize-wheat-green gram is a major cropping sequence. Approximately 80 per cent area of maize is under rainfed condition wherein uncertainty & uneven distribution of monsoon, poor fertility status & soil health and inadequate land preparation are major constraints for low productivity. Beneficial effect of conservation tillage and balanced fertilization on soil health, its tilth, productivity and economics are well documented. The information on these aspects is meagre in Southern Rajasthan, a leading state of maize-wheat-green gram cultivation in India. The present investigation was undertaken at fixed site in three maize-wheat-green gram cropping sequence during 2020-21 with objective to assess impact of tillage and nutrient management practices on productivity,

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soil health and economics. During study period remarkable changes were recorded in productivity, soil health and economics.

## RESEARCH METHODOLOGY

A field experiment was conducted during kharif 2020-21 at the Instructional Farm, Rajasthan College of Agriculture, Udaipur which is situated at 23°34'N latitude, 72°42'E longitude and 582.17 meter above the mean sea level. The soil of the experiment site was clay loam having pH 7.8, organic carbon 0.83, available nitrogen 295.3 kg ha<sup>-1</sup>, phosphorus 17.7 kg ha<sup>-1</sup> and potassium 290.6 kg ha<sup>-1</sup> in the plough layer. The well distributed rainfall of 666.8 mm was recorded during crop growth period. The treatments consisted three tillage practices (Zero tillage, conventional tillage and on permanent beds) and three nutrient management (Recommended dose of nutrient, site specific nutrient management and 60 per cent recommended dose of nutrient + green seeker based nutrient dose). These nine treatment combinations were evaluated in factorial randomized block design replicated thrice. The SSNM dos was calculated through software developed Indian Plant Nutrition Institute, whereas green seeker-based dose was calculated through green seeker reading recording recorded at knee high stage of crop. The maize crop was sown manually in first week of July, 2020, wheat in first week of November 2020 and green gram in the first week of April 2021 and harvested in September 2020, March 2021 and 2021 June, respectively. The experimental plot size was 9 x 15 m. Thinning was carried out at 15 days after sowing to maintain required plant population in maize crops. The crops were harvested at their respective maturity. In order to minimize weed crop competition, plant protection and better growth, the recommended weedicides, insecticides and other cultural practices were carried out as and when required and the crops were raised with their other recommended packages and practices. Net return and B:C ratio were calculated on the basis of prevailing market prices of inputs and produce. The popular maize hybrid "Pratap Maize Hybrid-3,

wheat and gram varieties "Raj-4077" and "K-851" were used as test varieties in this cropping sequence experiment. Data of each character collected were statistically analyzed using standard procedure of variance analysis.

## RESULTS AND DISCUSSION

The data in Table 1 reveal that the highest maize grain and stover yield were recorded under zero tillage which were statistically at par with that of yield recorded under conventional tillage, however proved significantly higher over yield recorded from permanent bed. In wheat, grain and straw and in green gram, seed yield recorded under zero tillage were significantly higher over that of yield recorded in conventional and permanent bed. Further, data in Table 2 reveal that N, P and K content of maize and wheat grain fail to record statistical significance. The nutrients accumulation in first crop grain viz., maize failed to record statistical significance under tillage practices, however, in wheat grain highest N, P and K accumulation was recorded under zero tillage which were significantly higher over that of nutrients accumulated in rest of other tillage practices. Similarly, N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O status of soil at end of sequence were significantly higher under zero tillage compared to rest of other tillage practices. In present investigation, the response under zero tillage in term of grain yield, nutrient content and accumulation and soil nutrient status might be on account of enrichment of soil with these three major nutrients (N, P and k) to the level of sufficiency on top part of soil by crop residue under no tillage activities which in turn promoted growth of plant right from early stage (Kumar, 2009 and Suthar *et al.*, 2012). Further with significant highest maize equivalent yield (132.97 q ha<sup>-1</sup>), net return (Rs. 115609 ha<sup>-1</sup>) and B:C ratio (2.47) zero tillage proved best practice compared to conventional tillage and from permanent bed. With highest maize grain (52.72 q ha<sup>-1</sup>), stover (79.42 q ha<sup>-1</sup>), wheat grain (46.06 q ha<sup>-1</sup>), straw (71.09 q ha<sup>-1</sup>), green gram seed (3.69 q ha<sup>-1</sup>), cropping sequence maize equivalent yield (136.27 q ha<sup>-1</sup>), net return (Rs.120326 ha<sup>-1</sup>) and B:C ratio (2.47), site specific

nutrient management practice proved best practice for management of nutrient in maize-wheat-green gram cropping sequence compared to rest of other practices. In maize *viz.*, first crop of sequence, nutrient content and its accumulation failed to record statistical significance, However, in second crop wheat highest nutrient content and its accumulation in wheat grain was recorded under SSNM practice.

The highest N, P and K retain in soil after sequence were recorded in RDN which were statistically at par with SSNM practice. The increase in N, P and K content of soil at harvest under RDN and SSNM practices seems to be on account of sufficient availability of these nutrients in soil even after efficient absorption, translocation and utilization of these mineral nutrients to the plant's parts (Halvin *et al.*,

**Table 1. Effect of various tillage and nutrient management practices on performance of maize-wheat-green gram cropping sequence**

Treatment	Yield (q ha <sup>-1</sup> )					Sequence maize equivalent yield (q ha <sup>-1</sup> )	Net Return (Rs. ha <sup>-1</sup> )	B:C Ratio
	Maize		Wheat		Green Gram			
	Grain	Stover	Grain	Straw	Seed			
<b>Tillage practice</b>								
Zero tillage	46.55	70.08	46.67	70.48	3.65	132.97	115609	2.47
Conventional tillage	44.63	65.56	37.54	61.73	3.17	115.20	93876	1.97
On permanent bed	42.23	61.88	40.13	60.74	3.36	116.41	91411	1.72
Sem±	1.27	1.77	1.08	1.50	0.07	1.82	2354	0.05
CD (P = 0.05)	4.99	6.96	4.26	5.89	0.27	7.15	9242	0.18
<b>Nutrient Management</b>								
RDN	44.92	65.70	42.04	65.07	3.19	119.32	98534	1.97
SSNM	52.72	79.42	46.06	71.09	3.69	136.27	120326	2.47
60 % RDN + Green seeker	35.77	52.40	36.24	56.79	3.31	108.98	82035	1.71
Sem±	0.96	1.43	1.01	1.77	0.03	1.52	2179	0.04
CD (P = 0.05)	2.96	4.41	3.12	5.45	0.09	4.68	6714	0.13

RDN: Recommended dose of nutrient, SSNM: Site specific nutrient management

**Table 2. Effect of various tillage and nutrient management practices on nutrient content, uptake of maize and wheat grain and soil nutrient status at end of cropping sequence**

Treatment	Nutrient content in grain (%)						Nutrient uptake by grain (kg ha <sup>-1</sup> )						Soil nutrient status at end of sequence (kg ha <sup>-1</sup> )			
	Maize			Wheat			Maize			Wheat			N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
	N	P	K	N	P	K	N	P	K	N	P	K				
<b>Tillage practice</b>																
Zero tillage	1.72	0.34	0.437	80.05	15.91	20.34	1.68	0.33	0.431	78.35	15.18	20.09	277.38	17.88	290.12	
Conventional tillage	1.69	0.34	0.427	75.27	14.97	19.08	1.66	0.32	0.425	62.25	11.93	15.95	270.80	17.06	284.11	
On permanent bed	1.70	0.34	0.430	71.88	14.28	18.18	1.67	0.32	0.429	66.93	12.91	17.18	272.04	17.47	286.08	
Sem±	0.021	0.001	0.004	2.64	0.55	0.64	0.01	0.001	0.005	1.76	0.33	0.40	1.53	0.03	0.65	
CD (P = 0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	6.91	1.30	1.56	5.00	0.11	2.55	
<b>Nutrient Management</b>																
RDN	1.65	0.33	0.429	74.04	14.87	19.27	1.62	0.32	0.421	68.21	13.32	17.69	276.01	18.08	290.86	
SSNM	1.73	0.34	0.435	91.19	18.00	22.93	1.69	0.33	0.431	77.93	15.02	19.85	274.09	17.62	288.43	
60 % RDN + Green seeker	1.73	0.34	0.431	61.97	12.28	15.39	1.69	0.32	0.432	61.38	11.69	15.67	270.12	16.70	281.02	
Sem±	0.011	0.001	0.004	1.83	0.36	0.39	0.011	0.001	0.003	1.77	0.34	0.46	1.92	0.22	3.24	
CD (P = 0.05)	NS	NS	NS	5.65	1.10	1.20	NS	NS	NS	5.45	1.06	1.41	5.91	0.68	9.98	

RDN: Recommended dose of nutrient, SSNM: Site specific nutrient management

2005). Further the increased nutrients in grain of both crops subscribe to the view that there was adequate supply of metabolites from shoot to roots. This might have facilitated better root growth thus higher extraction of nutrients from soil environment. The results of present findings were in close accordance with that of Kumar, (2009), Suthar *et al.*, (2013) and Kumawat *et al.*, (2014).

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## **CONSTRAINTS FACED BY FARMER PRODUCER ORGANISATIONS (FPOS) IN SOUTHERN RAJASTHAN**

**Karna Varaniya\*, Seema Tyagi\*\* and Vasupriya Parashar\*\*\***

### **ABSTRACT**

FPOs are promoted as part of the "One District One Product" initiative, which aims to foster specialization, enhance branding, improve marketing strategies, facilitate processing, and boost exports for agricultural products. The idea behind the Farmer Producer Organizations (FPOs) was that "Farmers, who are the producers of their agriculture products, can form the groups and can register themselves under the Indian Companies Act. There is a need for aggregation of farmers in order to benefit from economies of scale. Members of farmers group are able to leverage collective strength and bargaining power to access inputs, services and appropriate technologies leading to reduction in transaction costs. Therefore, FPOs have emerged as crucial entities in the agricultural sector, enabling smallholder farmers to collectively engage in crop production, commercialization, and value chain activities. However, the success achieved has been limited. Keeping this in view, the study attempted to explore the constraints and challenges of Farmer Producer Organisations (FPOs) in Southern Rajasthan mainly targeting six districts namely, Banswara, Chittorgarh, Dungarpur, Jalore, Pratapgarh and Udaipur aiming to provide insights into their current state and operational dynamics. The study employed a mixed-methods approach, combining qualitative and quantitative data collection methods. Total 200 FPO members from the selected 30 FPOs (5 FPO from each selected 6 district) were interviewed to solicit the constraints encountered in running of the FPOs. The study highlighted that the main obstacles encountered by FPOs hindering their efficient functioning were majorly, technical and managerial constraints, financial constraints, legal and regulatory constraints and operational constraints. The study further found that Banswara district encountered severe financial constraints, while in Chittorgarh district, operational constraints and legal and regulatory constraints were prominent. Dungarpur district faced challenges in technical and managerial aspects as well as market constraints. Jalore district encountered obstacles related to legal and regulatory issues and technical and managerial aspects. Pratapgarh FPOs primarily dealt with financial constraints and marketing challenges. Lastly, Udaipur district faced operational constraints and technical and managerial challenges.

### **INTRODUCTION**

Agriculture has historically played a significant role in the Indian economy, although its contribution to the GDP is overshadowed by the service and manufacturing sectors. Nonetheless, it is important to recognize that many services have emerged as a result of modern agricultural practices. This highlights the crucial role of marketing in driving economic growth. Therefore, it is imperative to enhance the marketing facilities available. Several measures can be taken to improve the effectiveness of the Indian agricultural marketing system,

especially considering the evolving marketing landscape. (Purty & Khatua, 2020).

Integrating small-scale farmers into the larger agricultural framework is crucial for preventing their exclusion and giving them access to the benefits of agricultural products (Vadivelu and Kiran, 2013) as farmer collectives they are viewed as an important element in linking smallholders to modern markets (input and output) which provide many benefits for this interface. Trebbin and Hassler (2012), Fischer and Qaim (2012), Olwande and Mathenge (2012) observed that organization among smallholder

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farmers has proved to be one of the means of overcoming market imperfections for smallholder farmers. Membership in farming organizations has a positive impact on the income of small-scale farmers and membership to such organizations is considered important for increasing the level of agricultural production and yielding economic benefit to farmers as well as promoting their general welfare (Oyeyinka *et al.*, 2013).

Farmer Producer Organizations are groups of rural producers coming together to form organizations, in order to pursue specific common interest of their members developing technical and economic activities that benefit their members and maintain relations with partners operating in their economic and institutional environment. Farmers' organizations (FOs) are essential institutions for the empowerment, poverty alleviations and advancement of farmers and the rural poor (FAO, 2006). India is witnessing a tremendous shift of importance from increasing productivity to increasing profitability, but ways to achieve this is still in question.

Most FPOs are impacted by a variety of constraints, such as those pertaining to the individual, technological, financial, infrastructure, and competitive markets. The idea is to create a one-stop shop that offers solutions in order to boost the income of farmers, especially small and marginal farmers. It is important to isolate the constraints which hinder the effective and efficient performance to perform efficiently and with farmer producer organization, the important challenges are mainly related to the working environment and also dynamics. There are so many constraints that hinder with the income and profitability of farmers in particular area. Therefore, the study was designed to identify the constraints that keep farmers from utilizing full benefit from aggregation, including organizational, technical, economic, marketing, personal, and infrastructure constraints.

## RESEARCH METHODOLOGY

From the selected area of study i.e. Southern Rajasthan, six districts were undertaken for study.

From each district 5 FPOs were chosen for study purpose. Therefore, the total number of FPOs for study was 30. The selection of FPOs was based on the criteria that FPOs having more than 3 years from the date of their establishment were taken up for the study purpose.

Descriptive research design was used to attain the objective of the study. Total 200 FPO members were selected for the investigation employing convenient sampling, as it allowed for better interaction with the selected respondents since the researcher belonged to this place. Secondly, it allowed ease of access and availability of respondents for the collection of information.

The process of data collection involved conducting face to face interviews with FPO members in their respective villages which helped to gain insights into the challenges being faced by them. Besides personal interview with members of selected FPOs, focussed group discussions were also undertaken to gain a deep understanding regarding the problems being faced in efficient running of these FPOs. The constraints encountered by FPOs were assigned ranks based, with Rank I indicating the most severe constraint and Rank IX indicating the least severe constraint. The severity of each constraint was measured on a scale from 0 to 9, with higher values indicating more significant limitations.

In order to assess the severity of these constraints, the Rank Based Quotient (RBQ) technique proposed by Sabarathnam (1998) was employed to rank the identified issues.

Rank = (Sum of Constraint Importance Scores) / (Number of Constraints)

$$RBQ = \sum \frac{f_i(n+1-i) \times 100}{N \times n}$$

Where,

$f_i$  = Number of respondents for particular constraint under  $i^{\text{th}}$  rank

$N$  = Number of respondents

$n$  = Number of constraints identified

$i$  = rank of the problem/ constraint

## RESULTS AND DISCUSSION

The FPO members were asked to rank different constraints faced by them related to FPO under nine identified categories. These constraints were categorized as Legal and Regulatory constraints, Infrastructural constraints, Technical and Managerial constraints, Financial constraints, Marketing constraints, Social and Cultural constraints, Technical constraints. The results of the study are discussed as under:

### I. Constraints faced by FPOs in different district of Southern Rajasthan

**Table 1: Distribution of respondents on the basis of constraints faced by FPOs in Banswara district**

N=200

	Constraints	RBQ Mean	Rank
1.	Financial Constraints	90.22	I
2.	Technical and Managerial Constraints	82.56	II
3.	Legal and Regulatory Constraints	72.88	III
4.	Market Constraints	63.33	IV
5.	Infrastructure Constraints	58.89	V
6.	Competition and Conflicts	40.44	VI
7.	Operational Constraints	37.33	VII
8.	Governance Constraints	19.11	VIII
9.	Social and Cultural Constraints	14.22	IX

According to the data in Table 1, the most severe constraint is financial constraints, with a severity score of 90.22, placing it at Rank I. This suggests that the organization faces significant limitations related to its financial resources and stability, because the majority of farmer members were from the category of marginal and small scale farmers. The second-highest ranked constraint is technical and managerial constraints, with a severity score of 82.56, this indicates notable limitations in the technical and managerial aspects of the organization's operations. Legal and regulatory constraints are the third-ranked constraint, with a severity score of 72.88; this suggests challenges related to compliance with laws and regulations. The other major constraints are shown in the table with their respective RBQ mean and ranks.

**Table 2: Distribution of respondents on the basis of constraints faced by FPOs in Chittorgarh district**

N=200

	Constraints	RBQ Mean	Rank
1.	Operational Constraints	92.22	I
2.	Legal and Regulatory Constraints	81.11	II
3.	Technical and Managerial Constraints	70.00	III
4.	Financial Constraints	58.89	IV
5.	Market Constraints	53.33	V
6.	Infrastructure Constraints	47.78	VI
7.	Competition and Conflicts	36.66	VII
8.	Social and Cultural Constraints	34.44	VIII
9.	Governance Constraints	25.56	IX

Data pertaining to Table 2 show that the most severe constraint is the operational constraint, with a severity score of 92.22, ranking it as Rank I. This suggests that the operational aspect of the organization faces significant limitations. FPOs may face difficulties in accessing quality agricultural inputs like seeds, fertilizers, and pesticides. Inadequate availability, affordability, and accessibility of inputs can negatively impact on productivity and profitability. The next highest-ranked constraint is the legal and regulatory constraint, with a severity score of 81.11, this indicates that compliance with laws and regulations poses a considerable challenge. Following that is the technical and managerial constraint, with a severity score of 70.00, this implies that technical and managerial aspects of the organization encounter notable restrictions.

**Table 3: Distribution of respondents on the basis of constraints faced by FPOs in Dungarpur district**

N=200

	Constraints	RBQ Mean	Rank
1.	Technical and Managerial Constraints	91.44	I
2.	Market Constraints	83.22	II
3.	Operational Constraints	72.11	III
4.	Financial Constraints	60.00	IV
5.	Infrastructure Constraints	54.44	V
6.	Legal and Regulatory Constraints	46.88	VI
7.	Competition and Conflicts	37.78	VII
8.	Governance Constraints	26.67	VIII
9.	Social and Cultural Constraints	25.55	IX

It can be observed from the Table 3 that, the most severe constraint is the technical and managerial constraint, with a severity score of

91.44, placing it at Rank I. This suggest that the organization faces significant limitations in its technical and managerial aspects. FPO facing constraints like adopting and implementing modern farming techniques, training and capacity building programs, value chain management, inadequate marketing and branding of products. The second-highest ranked constraint is market constraints, with a severity score of 83.22. This indicate that the organization encounters considerable challenges related to market dynamics and competition. Following that is the operational constraint, ranked third with a severity score of 72.11; this suggests notable limitations in the operational aspects of the organization. Financial constraints are the fourth-ranked constraint, with a severity score of 60.00, placing it at Rank IV. The other major constraints are shown in the table with their respective RBQ mean and ranks.

The above findings are in tune with the findings of Dash and Mazhar (2021) who provided an in-depth analysis of the impact of Farmer Producer Organizations (FPOs) on its member respondents in Puri district of Odisha. The study identifies certain technical and economic challenges that hinder the full realization of benefits for FPO members. Additionally, farmers continue to face difficulties in securing remunerative prices for their products due to middlemen exploitation and limited awareness among farmers about market availability and demand.

**Table 4: Distribution of respondents on the basis of constraints faced by FPOs in Jalore district**

N=200

	Constraints	RBQ Mean	Rank
1.	Legal and Regulatory Constraints	93.33	I
2.	Technical and Managerial Constraints	82.22	II
3.	Governance Constraints	71.11	III
4.	Market Constraints	63.45	IV
5.	Financial Constraints	48.89	V
6.	Infrastructure Constraints	44.44	VI
7.	Operational Constraints	36.77	VII
8.	Competition and Conflicts	35.56	VIII
9.	Social and Cultural Constraints	26.66	IX

It can be clearly seen from the Table 4 that the most severe constraint is legal and regulatory

constraints, with a severity score of 93.33, placing it at Rank I. This suggest that compliance with legal and regulatory requirements poses significant challenges for the organization. The FPO adheres to various legal and regulatory requirements, including registration, governance structure, taxation, and compliance with agricultural and cooperative laws. These regulations sometimes pose challenges in terms of paperwork, bureaucracy and understanding the legal framework. The second-highest ranked constraint is technical and managerial constraints, with a severity score of 82.22, corresponding to Rank II. This indicates notable limitations in the technical and managerial aspects of the organization's operations. Following that is the governance constraint, ranked third with a severity score of 71.11. This suggests that the organization faces significant limitations in terms of governance practices and structures. Market constraints are the fourth-ranked constraint, with a severity score of 63.45. This implies that the organization encounters notable challenges related to market dynamics and competition.

**Table 5: Distribution of respondents on the basis of constraints faced by FPOs in Pratapgarh district**

N=200

	Constraints	RBQ Mean	Rank
1.	Financial Constraints	90.89	I
2.	Market Constraints	79.78	II
3.	Technical and Managerial Constraints	65.67	III
4.	Infrastructure Constraints	58.45	IV
5.	Operational Constraints	49.11	V
6.	Legal and Regulatory Constraints	48.00	VI
7.	Governance Constraints	46.44	VII
8.	Competition and Conflicts	35.33	VIII
9.	Social and Cultural Constraints	24.22	IX

According to data in the Table 5, the most severe constraint is financial constraints, with a severity score of 90.89, placing it at Rank I. This suggest that the organization faces significant limitations related to its financial resources and stability. FPOs are unable to access affordable credit and financial services. It prevents FPOs from expanding their production capacity and diversifying their product offering. The second-highest ranked constraint is market constraints, with a severity score of 79.78,

corresponding to Rank II. This indicates notable challenges for the organization in terms of market dynamics and competition. Following that is the technical and managerial constraint, ranked third with a severity score of 65.67. This suggests limitations in the technical and managerial aspects of the organization's operations. Infrastructure constraints are the fourth-ranked constraint, with a severity score of 58.45. This implies that the organization faces notable limitations related to its infrastructure and facilities.

The above findings are in line with the findings of Patel *et al.* (2023) who stated that services and economic activities are needed to be improved and updated as respondents faced challenges in economic activities.

**Table 6: Distribution of respondents on the basis of constraints faced by FPOs in Udaipur district**

**N=200**

	Constraints	RBQ Mean	Rank
1.	Operational Constraints	90.22	I
2.	Technical and Managerial Constraints	79.11	II
3.	Financial Constraints	65.11	III
4.	Legal and Regulatory Constraints	56.89	IV
5.	Governance Constraints	51.33	V
6.	Infrastructure Constraints	45.78	VI
7.	Competition and Conflicts	38.44	VII
8.	Market Constraints	35.55	VIII
9.	Social and Cultural Constraints	34.66	IX

A close look into the data depicted in Table 6 reveals that most severe constraint is operational constraints, with a severity score of 90.22, placing it at Rank I. This suggests that the organization faces significant limitations in its day-to-day operations. FPOs are facing problems in adoption of improved farming practices because of lack of technical knowledge among them. The second-highest ranked constraint is technical and managerial constraints, with a severity score of 79.11, corresponding to Rank II. This indicates notable limitations in the technical and managerial aspects of the organization's operations. Financial constraints are the third-ranked constraint, with a severity score of 65.11, this implies that the organization faces limitations concerning its financial resources and stability.

The above finding are similar to the findings of Singh *et al.* (2018) that examined the sustainability of Farmer Producer Organizations (FPOs) in India, with a focus on the states of Punjab and Gujarat. The study identified several challenges that FPOs faced in sustaining their operations, such as inadequate government support and lack of access to financing being the major ones.

## II. Overall Constraints faced by the selected FPOs in Southern Rajasthan

**Table 7: Distribution of respondents according to overall constraints faced by FPOs in different district of Southern Rajasthan**

**N=200**

	Constraints	RBQ Mean	Rank
1.	Technical and Managerial	80.62	I
2.	Financial	70.48	II
3.	Legal and Regulatory	68.85	III
4.	Operational	62.96	IV
5.	Market	60.51	V
6.	Infrastructure	50	VI
7.	Competition and conflicts	39.88	VII
8.	Governance	37.25	VIII
9.	Social and Cultural	29.4	IX

Table 7 provides overall ranking of different constraints faced by the FPOs of the selected districts of Southern Rajasthan based on their RBQ mean scores across various domains. The top-ranked constraint were "Technical and Managerial" (Rank I), indicating its significant impact on the business activities of the FPOs. Following closely were "Financial", "Legal and Regulatory" constraints that ranked II and III, respectively. Operational and market-related factors also hold considerable importance and these were ranked as IV and V in the overall constraints being faced by the FPOs. Infrastructure, competition, governance, and social-cultural factors had a relatively lower significance. These ranking of constraints highlight the major areas that need to be focused upon and improve for making FPOs more functional and remunerative in the long run.

Similar findings can be seen in the investigation

of Tiwari and Upadhyay (2021) who conducted a study for the analysis of the constraints faced by the members of the Farmer Producer Organizations in Udaipur District of Rajasthan. The five constraints experienced by the members of the FPO were personal, infrastructural, operational, economic and marketing. The overall MPS and rank were found as 36.17 (V), 65.39 (III), 67.60 (I), 65.50 (II) and 50.10 (IV), respectively according to the constraints. It is indicated that operational and economic constraints were the major obstacles faced by the FPO members. So there is need to manage these constraints so that they do not affect the organizations significantly and FPO can achieve sustainable growth and realize its true potential. For up scaling and better functioning of the FPOs it is necessary to consider these constraints at priority level by the Government officials and policy planners.

## CONCLUSION

There were 70 Farmer Producer Organizations (FPOs) that were working in Southern Rajasthan. Total 30 FPOs were selected for indepth study that had been functioning effectively for around seven years with memberships ranging from 1001 to 1500 farmers. These FPOs were financed, supported and had linkages with National Bank for Agriculture and Rural Development, Small Farmers' Agri-Business Consortium, Rajasthan Agriculture Competitiveness Project and ACCESS. They were adhering to a consistent organizational structure and they were primarily engaged in production activities besides marketing and value addition to contribute to the agricultural sector. However, the FPOs faced significant challenges in finance, technology, management, marketing, and operations, hindering their growth. To address these constraints, strategies suggested include improving financial access, promoting financial literacy and capacity building, and providing technical training. Additionally, establishing market linkages and conducting market research aiming to streamline operations and enhance technology adoption will also contribute to their overall growth and development. Implementing these strategies in the study area is expected to empower the FPOs, enabling them to

overcome challenges and thrive in their endeavours.

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# **UTILITY PERCEPTION OF STUDENTS TOWARDS RURAL ENTREPRENEURSHIP AWARENESS DEVELOPEMENT YOJANA (READY)**

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## **ABSTRACT**

Rural Entrepreneurship Awareness Development Yojana abbreviated as "READY" is a new initiative of ICAR to reorient graduates of agriculture and allied subjects for ensuring and assuring employability and develop entrepreneurs for knowledge intensive agriculture. The present study is conducted to assess the utility perception of the programme among the students of Maharan Pratap University of Agriculture and Technology, Udaipur. For study respondents from Rajasthan College of Agriculture, Udaipur, College of Agriculture Bhilwara, Rabindra Nath Tagore College of Agriculture Kapasan and Govind Guru PG College Banswara were selected. Total of 120 respondents were selected for the proposed study with the help of proportionate random sampling method and data is collected through interview schedule. It is found that 66.66 per cent of respondents had medium level of overall utility perception of "READY" programme. The aspect practical experience gained is most favoured by respondents with a MPS of 79.53, followed by aspect namely skills gaind with MPS of 75.98 and least ranked aspect was extension programme planning and management with MPS of 72.41.

## **INTRODUCTION**

"Student READY" (Rural Entrepreneurship Awareness Development Yojana) is an initiative of Indian Council of Agricultural Research to reorient graduates of agriculture and allied subjects for ensuring and assuring employability and develop entrepreneurs for emerging knowledge intensive agriculture.

This programme includes five components i.e., Experiential Learning, Rural Awareness Works Experience, In-Plant Training / Industrial Attachment, Hands-on Training (HOT) / Skill Development Training and Students Projects.

The Fifth Dean's Committee recommended "Student READY" (Rural Entrepreneurship Awareness Development Yojana) in the Agricultural Universities of the country. The yojana has been conceptualized to reorient graduates of agriculture and allied subjects to ensure and assure

employability and to develop entrepreneurs for emerging knowledge intensive agriculture by articulating knowledge, skill, ability and experiences.

The "Student READY" programme was implemented in over 55 agricultural universities during the academic season 2016-17 and 2017-18. The council provide stipend @Rs. 3000/- per month per student for maximum of six months. Therefore, during the final year of their academic programme, the students are getting continuous financial support in the form of profit share from experiential learning programme and stipend during RAW/In Plant Training/Industrial attachment/ Internship/student project.

This programme in true sense has trained the students to become Job Givers rather than Job Seekers and has contributed effectively to wards the Skill India programme of the Government of India.

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## RESEARCH METHODOLOGY

This study is conducted in the service area of MPUAT, Udaipur, four colleges have been selected for study which comes under the administrative and financial jurisdiction of MPUAT. Two of them are constituent agriculture college i.e., RCA, Udaipur and COA Bhilwara and one is private agriculture college i.e., RNTCOA Kapasan and one is govt. college with agriculture faculty i.e., GGPGC Banswara. These college are selected on the fact that they are of agriculture faculty and successful completed a batch of 5<sup>th</sup> Dean committee and conducted "READY" programme.

## RESULTS AND DISCUSSION

Distribution of respondents on the basis of utility perception of "READY" programme among the students of MPUAT.

To get an insight of utility perception of "READY" programme the respondents were grouped into (i) high (ii) medium (iii) low categories.

The information in Table 1 indicate that majority of the respondents (66.66 %) fall in the category of medium level utility perception of "READY" programme among the students followed by 17.50 per cent fall in the category of high-level utility perception, the results further shows that 15.84 per cent of respondents found in the category of low level of utility perception of "READY" programme.

**Table 1: Distribution of students on the basis of overall utility perception of "READY" programme**

No.	Utility Perception	f	%
1.	Low(<122.06)	19	15.84
2.	Medium(122.06-208.04)	80	66.66
3.	High (>208.04)	21	17.50
Total		120	100

f=frequency,%=per cent, Mean =165.05, S.D.=42.98

**Category wise utility perception of "READY" programme:** Category-wise utility perception of "READY" programme was calculated to obtain a clear picture of utility perception of "READY" programme among the students of

MPUAT, Udaipur.

**Table 2: Category wise utility perception of "READY" programme**

No.	Aspects	MPS	RANK
1.	Gaining Communication Skills	74.52	IV
2.	Knowledge on Farm Resource Management	73.99	V
3.	Extension Programme Planning and Management	72.41	VI
4.	Knowledge gained	74.91	III
5.	Skills gained	75.98	II
6.	Practical experience gained	79.53	I

MPS = Mean Percent Score

Here in Table 2 different aspects of utility perception of "READY" programme are given with their mean per cent score and rank. The information in Table 2 reveal that "Practical experience gained" ranked I with MPS79.53.

Further examining the Table 2, it is found that "Skills gained" stands at rank II with a MPS of 75.98. Further the "Knowledge gained" ranked III with a mean per cent score of 74.91, aspect "gaining communication skills" stands at ranked IV with a MPS of 74.52.

Data of Table 2 reveal that "Knowledge on Farm Resource Management", "Extension Programme Planning and Management" ranked V and VI with a respective MPS of 73.99 and 72.41, respectively.

## CONCLUSION

The study concluded that 66.66 per cent of the students belonged to the medium level of overall utility perception of "READY" programme and 17.50 per cent of the students belonged to the low-level of overall utility perception of "READY" programme.

In category wise distribution we found that "Practical Experience Gained" stands at rank I with MPS of 79.53 and "Skills Gained" ranks II with MPS of 75.98.

On the basis results, it is recommended that

"Student READY" programme is a good and practical programme for effective manpower development so that policy maker should found the constraints and should modify the policy and programme for the better implementation of the same should be assured.

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## COMBINING ABILITY ANALYSIS IN SWEET CORN (*Zea mays* L. Ssp. *saccharata*) HYBRID IN UDAIPUR REGION

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### ABSTRACT

The present investigation was carried out using eighteen elite diverse parents and crossing them in line x tester pattern, using fifteen inbreds as females and three as testers during Kharif 2018. The developed 45 single cross sweet corn hybrids were evaluated at Udaipur during Kharif 2019 in RBD with three replications for various growth, yield attributing and yield and quality parameters to estimate general and specific combining ability effects. Cross L5 x T2 possessed significant and positive SCA effects for green cob weight/ plant, green cob yield, green fodder yield and TSS content of green grain. Hybrid L6 x T3 possessed significant and positive sca effects for green cob weight/ plant, green cob yield and green fodder yield. L10 x T1 and L15 x T3 possessed significant and positive sca effects for green cob weight/ plant and green cob yield while hybrid L1 x T3 possessed significant and positive sca effects for green cob weight/ plant, green cob yield and TSS content.

### INTRODUCTION

Sweet corn (*Zea mays* L. Ssp. *saccharata*), is a specialty corn which is characterized by translucent, horny appearance of kernel when matures and wrinkled when it dries. The mutant genes *su*, *su1* and *se* prevent the conversion of sugar into starch and thus such corn tastes sweet. Total sugar content in sweet corn at milky stage ranges from 25-30 % as compared to 2-5% of normal corn (Sadaiah *et al.*, 2013). Popularity of sweet corn is increasing in the national and international market due to the sweetness and tenderness of its kernels and its appetizing taste, which has in turn resulted in its increased cultivation in the country. Use of sweet corn at immature stage as well as in a variety of cuisines has increased its market value and export potential ensuring good returns to the farmers. Further, the left-over plant after the harvest of cobs can be used as fresh or dry fodder for the animals. Sweet corn breeding aims to improve quality and appearance as well as cob yield. The genetic base of sweet corn breeding programme is relatively narrow and related inbreds often are crossed to make hybrids that meet the strict market requirements on quality and appearance (Tracy,

1994). The quality parameters are relatively more important especially because of direct consumption of sweet corn as vegetable and the preference of the consumers. In the present study, attempts were made to identify superior hybrid combinations using line x tester method. Combining ability analysis helps to screen out superior cross combinations as well as selection of suitable parents for hybrid development by evaluating the available inbreds in term of their genetic value. In breeding of high yielding hybrids/varieties, the breeder often faces the problem of selecting the desirable parents. Information on combining ability provides guidelines to the plant breeder in selecting the elite parents and desirable cross combinations to be used in the formulation of systematic breeding programme and at the same time reveals the nature of gene action involved in the inheritance of various traits, combining ability analysis also provide there quisite information on the magnitude of gab and sac variances and effects, to formulate an efficient breeding methodology.

### RESEARCH METHODOLOGY

Eighteen diverse sweet corn inbred lines were used as parents (fifteen females and three testers).

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The crosses were made at Instructional Farm, RCA, Udaipur during kharif 2018. Total 66 genotypes comprising of 45 sweet corn hybrids, 18 parental lines and 3 standard checks (Priya, Madhuri and Sugar-75) were evaluated in RBD at Instructional Farm, RCA, Udaipur during Kharif-2019 in RBD with three replications. Recommended agronomic practices were used to raise a healthy crop. Observations were recorded for 20 characters *viz.*, days to 50 per cent tasseling, days to 50 per cent silking, plant height, ear height, number of leaves/plant, length of leaf, breadth of leaf, days to green cob harvest, number of ear/plant, ear length, ear girth, number of grain rows/ear, number of grains/row, 100 fresh seed weight, green cob weight/plant, moisture per cent of green grain, green cob yield, green fodder yield, TSS content of green grain and protein content. Ten plants were taken from each row for recording observations from each replication. TSS content was recorded using hand refractometer. The analysis of variance for general and specific combining ability effects over the environments and in three individual environments was done for different characters under the study using line x tester mating design provided by Kempthorne (1957).

## RESULTS AND DISCUSSION

The results for analysis of variance for combining ability are presented in the Table-2, which reveals that the mean sum of squares due to lines were found significant for the characters ear height, number of leaves/plant, breadth of leaf, ear length, ear girth, number of grains/row, 100 fresh seed weight, moisture per cent of green grain and green cob yield, while the mean sum of squares due to testers was reported to be significant for the characters days to 50 per cent tasseling and silking, plant height, ear height, breadth of leaf, days to green cob harvest, number of grains/row, green cob yield, green fodder yield, TSS content of green grain and protein content. Variance due to line x tester interaction was found significant for all the characters except for characters days to green cob harvest, 100 fresh seed weight and protein content. This indicates that the experimental material possessed

considerable variability and that both gca and sca were involve in the genetic control of various characters.

For days to green cob harvest, none of the lines exhibited significant general combining ability effects in negative direction. Eight lines were reported to exhibit significant and positive general combining ability effects for green cob weight/plant, maximal and positively perceptible effects were shown by the line L7 (0.08) which was followed up by L2 (0.04), L13 (0.03), L3 and L8 (0.02 each) and L9, L11 and L12 (0.01 each). Analysis for green cob yield reveals that seven lines exhibited significant and positive general combining ability effects, where maximal positively significant effects was shown by the line L7 (4686.30) succeeded by L2 (3105.19), L13 (1701.85), L8 (1410.74), L3 (1374.07), L9 (1112.96) and L12 (732.96). Eight lines exhibited positive and significant general combining ability effects for green fodder yield, highest magnitude was exhibited by the line L3 (4976.22) succeeded by L13 (4491.78), L2 (4181.78), L4 (4156.22), L7 (4105.11), L1 (3936.22), L14 (1326.22) and L12 (1864.00). For TSS content, positive and significant general combining ability effects were reveals by four lines, where maximal effects were observed for the line L11 (1.17) succeeded by L7 (1.09), L5 (0.76) and L14 (0.60). For days to green cob harvest, one tester T2 showed significant and negative general combining ability effect. For green cob weight/plant, tester T1 (0.02) had perceptible and positive general combining ability effects. Tester T1 (1347.41) showed positively perceptible general combining ability effects for green cob yield. Maximum effects were exhibited by the tester T1 (2991.33) succeeded by T2 (1840.44) for green fodder yield. Tester T1 (1.03) showed significantly positive general combining ability effects for TSS content. None of the sweet corn hybrids in possessed significantly negative specific combining ability effects for days to green cob harvest. Fourteen sweet corn hybrids exhibited significantly positive specific combining ability effects for green cob weight/plant and maximum effects was shown by L5 x T2 (0.09) succeeded by L10 x T1 (0.06),

L6 x T3 (0.05), L15 x T3 (0.05), L1 x T3 (0.04), L4 x T3 (0.04), L7 x T1 (0.03), L14 x T1 (0.03), L3 x T2 (0.03), L8 x T2 (0.03), L6 x T1 (0.02), L2 x T2 (0.02), L15 x T2 (0.02) and L14 x T3 (0.02). Fifteen sweet corn hybrids had significant specific combining ability effects in positive direction for green cob yield, with highest positively perceptible specific combining ability effect being observed for the hybrid L5 x T2 (5112.59) succeeded by L10 x T1 (3812.59), L15 x T3 (3142.59), L6 x T3 (3007.04), L1 x T3 (2362.59), L4 x T3 (2273.70), L14 x T1 (2001.48), L3 x T2 (1961.48), L8 x T2 (1961.48), L7 x T1 (1770.37), L2 x T3 (1361.48), L15 x T2 (1231.48), L9 x T1 (1230.37), L6 x T1 (1213.70) and L13 x T3 (1101.48). For green fodder yield, eighteen sweet corn hybrids showed positively perceptible specific combining ability effects, where maximum specific combining ability effect was shown by the hybrid L4 x T2 (15677.33) succeeded by L5 x T2 (9675.11), L6 x T3 (8395.11), L3 x T1 (8266.44), L8 x T2 (6877.33), L8 x T3 (5889.56), L15 x T3 (5565.11), L7 x T1 (5267.56), L13 x T1 (4777.56), L1 x T3 (4249.56), L12 x T2 (3066.22), L9 x T3 (2968.44), L10 x T2 (2937.33), L12 x T1 (2705.33), L14 x T2 (2390.67), L1 x T1 (2363.11), L2 x T1 (2287.56) and L10 x T1 (2249.78). Seven sweet corn hybrids were reported to show significant specific combining ability effects in positive direction for TSS content where highest effect was shown by the sweet corn hybrid L14 x T2 (2.11) succeeded by L2 x T3 (1.94), L7 x T2 (1.76), L12 x T1 (1.60), L1 x T3 (1.60), L5 x T2 (1.56) and L10 x T3 (1.35).

Cross L5 x T2 possessed significant and positive

sca effects for green cob weight/ plant, green cob yield, green fodder yield and TSS content of green grain. Hybrid L6 x T3 possessed significant and positive sca effects for green cob weight/ plant, green cob yield and green fodder yield. L10 x T1 and L15 x T3 possessed significant and positive sca effects for green cob weight/ plant and green cob yield while hybrid L1 x T3 possessed significant and positive sca effects for green cob weight/ plant, green cob yield and TSS content. Singh *et al.* (2017), Elayaraja *et al.* (2018), Ola *et al.* (2018), Al-joboory and Al-gaisi (2019), Chinthiya *et al.* (2019), Hassan *et al.* (2019), Kumar *et al.* (2019), Nanditha *et al.* (2019), Sharma *et al.* (2019), Tesfaye *et al.* (2019) and Al- Hazemawi *et al.* (2020) reported similar results for combining ability analysis on maize.

## CONCLUSION

The study under discussion finally revealed that some of inbred lines and testers used in the present investigation can be selected for the successful development of single cross hybrids since they possessed high to good performance with good general combining ability for green cob yield and TSS content and other yield contributing traits. Characters inherited through additive mode of inheritance can be improved by selection method. Some of the selected hybrids under study revealed good economic heterotic response along with good performance with high significant and positive sca effects for green cob yield and TSS content. Hence, these hybrids may be concluded for commercial exploitation and could be recommended for testing in multi-location trials.

**Table 1. List of genotypes used**

S. No	Symbol	Pedigree	S. No	Symbol	Pedigree
1.	L <sub>1</sub>	SC-7-2-1-2-6-1	10.	L <sub>10</sub>	BAJ-SC-17-2
2.	L <sub>2</sub>	SC-18728	11.	L <sub>11</sub>	BAJ-SC-17-1
3.	L <sub>3</sub>	BAJ-SC-17-6	12.	L <sub>12</sub>	DMSC-28
4.	L <sub>4</sub>	BAJ-SC-17-10	13.	L <sub>13</sub>	Mas Madu (sh2 sh2)
5.	L <sub>5</sub>	BAJ-SC-17-12	14.	L <sub>14</sub>	MRCSC-12
6.	L <sub>6</sub>	BAJ-SC-17-9	15.	L <sub>15</sub>	SC-33
7.	L <sub>7</sub>	BAJ-SC-17-11	16.	T <sub>1</sub>	SC-35
8.	L <sub>8</sub>	BAJ-SC-17-8	17.	T <sub>2</sub>	SC-32
9.	L <sub>9</sub>	BAJ-SC-17-4	18.	T <sub>3</sub>	DMRSC-1

Table 2. Analysis of variance for combining ability for different characters in sweet corn

Source	d.f.	Mean sum of squares									
		Days to 50% Tasseling	Day to 50 % silking	Plant height (cm)	Ear height (cm)	Number of leave plant <sup>-1</sup>	Length of leaf (cm)	Breadth of leaf (cm)	Day to green cob harvest	No of ear plant <sup>-1</sup>	Ear length (cm)
Crosses	44	15.22**	17.05**	2876.43**	1026.42**	4.3**	256.61**	2.84**	16.55	0.1**	34.21**
Line effe.	14	10.94	10.99	2731.64	1090.82**	6.39*	285.68	3.78**	11.91	0.14	62.31**
Tester effe.	2	111.09**	117.12**	10330.24*	10916.19**	6.92	574.88	22.88**	106.45**	0.16	29.42
Line x Tes. effe.	28	10.51**	12.93**	2416.41**	287.81**	3.08**	219.35**	0.93**	12.44	0.09**	20.5**
Error	124	2.62	3.4	254.13	24.43	0.88	17.2	0.36	12.47	0.0019	1.86

Table 2. Analysis of variance for combining ability for different characters in sweet corn (Continued)

Source	d.f.	Mean sum of squares									
		Ear girth (cm)	Grain row ear-1	Grains row <sup>-1</sup>	100 fresh seed weight (g)	Green cob weight Plant <sup>-1</sup> (kg)	Moisture of green grain (%)	Green cob yield (kg ha <sup>-1</sup> )	Green fodder yield (kg ha <sup>-1</sup> )	TSS of green grain (%)	Protein content (%)
Crosses	44	4.2**	5.54**	204.41**	4.24**	0.01**	119.89**	36382558.92**	208659141.82**	6.87**	0.01
Line effe.	14	7*	3.93	288.43*	7.3**	0.02	211.2*	60651750.26**	239270675.87	6.67	0.01
Tester effe.	2	6.58	16.56	1023.78**	5.94	0.03	74.59	94986740.74*	802831215.56*	38.36**	0.06**
Line x Tes. effe.	28	2.63**	5.56**	103.87**	2.59	0.01**	77.47**	20061950.26**	150912512.38**	4.72**	0.01
Error	124	0.55	1.2	11.84	1.69	0.0001	24.62	833171.16	2081550.4	0.77	0.04

\*\*\* significant at 5 and 1%, respectively

Table 3. GCA effects for different characters in sweet corn

S. No.	Lines/ testers	Days to 50% Tasseling	Day to 50 % silking	Plant height (cm)	Ear height (cm)	Number of leave plant <sup>-1</sup>	Length of leaf (cm)	Breadth of leaf (cm)	Day to green cob harvest	No of ear plant <sup>-1</sup>	Ear length (cm)
1.	L1	-1.09*	-1.48*	11.87*	11.58**	-0.62*	2.34	0.4*	-1.53	-0.05**	2.35**
2.	L2	0.8	0.41	-9.05	22.92**	1.22**	5.88**	1.07**	0.36	-0.05**	2.28**
3.	L3	0.02	-0.48	7.17	-0.22	0.48	-3.8**	-0.23	-0.53	0.04**	2.71**
4.	L4	0.24	0.07	7.9	-5.92**	0.39	4.66**	1.09**	0.03	-0.05**	-0.7
5.	L5	0.91	0.96	3.96	0.66	0.62*	-0.92	-0.28	0.92	0.28**	-2.77**
6.	L6	1.8**	1.63**	0.46	-5.08**	-0.14	-1.05	-0.6**	1.7	-0.05**	-4.06**
7.	L7	-0.2	-0.7	14.31**	10.66**	-0.28	1.24	0.41*	-0.64	0.31**	2.79**
8.	L8	-0.64	-0.37	11.77*	-2.87	-0.29	4.58**	-0.62**	-0.41	-0.05**	2.7**
9.	L9	-0.87	-0.81	0.6	-12.65**	-0.81*	-3.56*	-0.59**	-0.86	-0.05**	0.44
10.	L10	-1.31*	-0.48	-39.76**	-7.72**	0.26	-6.74**	-0.57**	-0.64	-0.05**	-1.85**
11	L11	-0.42	-1.37*	9.47	-5.72**	0.17	2.9*	0.08	-1.3	-0.05**	-0.43
12	L12	0.24	0.52	14.77**	11.68**	0.14	5.12**	0.08	0.59	-0.04**	1.42**
13	L13	-1.98**	-1.15	-7.13	-7.01**	1.08**	6.54**	0.75**	-1.19	-0.05**	1.6**
14	L14	1.91**	2.19**	11.99*	8.33**	0.06	-3.1*	0.07	2.36*	-0.05**	-1.02*
15	L15	0.58	1.07	-38.33**	-18.62**	-2.28**	-14.1**	-1.05**	1.14	-0.05**	-5.46**
16	T1	1.71**	1.03**	5.29*	-0.16	0.44**	0.4	0.27**	1.01	-0.01	0.85**
17	T2	-1.38**	-1.86**	-17.09**	-15.5**	-0.3*	-3.76**	0.53**	-1.77**	0.06**	-0.09
18	T3	-0.33	0.83**	11.8**	15.65**	-0.15	3.36**	-0.81**	0.76	-0.05**	-0.76**
	SE										
19	GCA line	0.54	0.61	5.31	1.65	0.31	1.38	0.2	1.18	0.01	0.45
20	GCA tester	0.24	0.27	2.38	0.74	0.14	0.62	0.09	0.53	0.01	0.2
21	gi-gj lines	0.76	0.87	7.51	2.33	0.44	1.96	0.28	1.66	0.02	0.64
22	gi-gj tester	0.34	0.39	3.36	1.04	0.2	0.87	0.13	0.74	0.01	0.29
	CD (5%)										
23	GCA line	1.07	1.22	10.52	3.26	0.62	2.74	0.4	2.33	0.03	0.9
24	GCA tester	0.48	0.54	4.7	1.46	0.28	1.22	0.18	1.04	0.01	0.4
25	gi-gj lines	1.51	1.72	14.87	4.61	0.88	3.87	0.56	3.29	0.04	1.27
26	gi-gj tester	0.68	0.77	6.65	2.06	0.39	1.73	0.25	1.47	0.02	0.57

Table 3. GCA effects for different characters in sweet corn (Continued)

S. No.	Lines/testers	Ear girth (cm)	Grain row ear <sup>-1</sup>	Grains row <sup>-1</sup>	100 Fresh seed weight (g)	Green cob weight plant <sup>-1</sup> (kg)	Moisture of green grain (%)	Green cob yield (kg ha <sup>-1</sup> )	Green fodder yield (kg ha <sup>-1</sup> )	TSS content of green grain (%)	Protein content (%)
1.	L1	-1.4**	1.02**	4.92**	-1.44**	-0.01**	-6.84**	-515.93	3936.22**	0.26	-0.02
2.	L2	1.21**	0.27	3.66**	1.26**	0.04**	-5.72**	3105.19**	4181.78**	-0.09	0.03
3.	L3	0.39	0.69	1.31	0.39	0.02**	6.37**	1374.07**	4976.22**	-0.56	-0.03
4.	L4	0.16	-0.41	0.56	0.19	0	0.17	159.63	4156.22**	-1.72**	0.03
5.	L5	-0.98**	-0.62	-3.35**	-1.04*	-0.02**	0.08	-1177.04**	345.11	0.76*	-0.04
6.	L6	-0.12	0.28	-8.08**	-0.08	-0.05**	1.55	-3170.37**	-5209.33**	-0.44	0.01
7.	L7	1.16**	0.27	7.28**	1.17**	0.08**	1.97	4686.3**	4105.11**	1.09**	-0.01
8.	L8	-0.53*	-0.34	5.95**	-0.54	0.02**	4.47**	1410.74**	-8363.78**	-0.8**	0.01
9.	L9	1.03**	0.98**	-1.36	1.05*	0.01**	4.76**	1112.96**	-869.33	0.55	-0.03
10.	L10	-0.43	-1.04**	-1.12	-0.43	-0.04**	-2.88	-2872.59**	-3317.11**	0.57	0.04
11.	L11	0.8**	0.38	1.95	0.77	0.01**	4.58**	376.3	449.56	1.17**	-0.06
12.	L12	0.51*	0.35	0.78	0.51	0.01**	1.96	732.96*	1864**	-0.1	0.08
13.	L13	-0.07	-0.4	5.68**	-0.09	0.03**	-9.84**	1701.85**	4491.78**	0.16	-0.05
14.	L14	-0.16	-1.04**	-4.7**	-0.1	-0.02**	3.51*	-1214.81**	1326.22**	0.6*	0.03
15.	L15	-1.57**	-0.37	-13.49**	-1.62**	-0.1**	-4.15*	-5709.26**	-12072.67**	-1.43**	0.01
17.	T1	0.39**	-0.55**	5.22**	0.38	0.02**	0.7	1347.41**	2991.33**	1.03**	-0.04
18.	T2	-0.38**	-0.1	-4.13**	-0.35	0	-1.49*	191.85	1840.44**	-0.75**	0.03
19.	T3	-0.01	0.65**	-1.1*	-0.03	-0.03**	0.78	-1539.26**	-4831.78**	-0.29*	0.01
20.	SE										
21.	GCA line	0.25	0.37	1.15	0.43	0.0033	1.65	304.26	480.92	0.29	0.07
22.	GCA tester	0.11	0.16	0.51	0.19	0.0015	0.74	136.07	215.07	0.13	0.03
23.	gi-gj lines	0.35	0.52	1.62	0.61	0.0047	2.34	430.29	680.12	0.41	0.09
24.	gi-gj tester	0.16	0.23	0.73	0.27	0.0021	1.05	192.43	304.16	0.18	0.04
25.	CD (5%)										
26.	GCA line	0.49	0.72	2.27	0.86	0.007	3.27	602.22	951.87	0.58	0.13
27.	GCA tester	0.22	0.32	1.02	0.38	0.003	1.46	269.32	425.69	0.26	0.06
28.	gi-gj lines	0.69	1.02	3.21	1.21	0.009	4.63	851.66	1346.15	0.82	0.19
29.	gi-gj tester	0.31	0.46	1.44	0.54	0.004	2.07	380.88	602.02	0.37	0.08

\*\* significant at 5 and 1%, respectively

Table 4. SCA effects for different characters in sweet corn

S. No.	Lines/testers	Days to 50% Tasseling	Day to 50 % silking	Plant height (cm)	Ear height (cm)	Number of leave plant <sup>-1</sup>	Length of leaf (cm)	Breadth of leaf (cm)	Day to green cob harvest	No of ear plant <sup>-1</sup>	Ear length (cm)
1	L1 X T1	-1.27	-1.59	-11.21	1.07	0.53	0.48	0.06	-1.9	0.01	-0.53
2	L2 X T1	1.51	1.53	44.31**	17.76**	-0.03	9.9**	-0.61	1.21	0.01	-2.79**
3	L3 X T1	-0.04	0.75	-6.84	2.97	1.73**	-1.42	-0.31	0.44	-0.04	2.65**
4	L4 X T1	0.4	0.53	-9.21	2.3	0.26	-2.51	0.44	0.21	0.01	0.23
5	L5 X T1	0.73	1.3	-17.6	-4.95	-0.48	2.34	-0.26	1.33	-0.32**	0.56
6	L6 X T1	-0.82	-0.7	-0.26	-11.21**	1.34*	-8.16**	0.06	-0.45	0.01	2.91**
7	L7 X T1	2.51**	2.97**	-11.95	5.38	0.31	2.58	0.05	3.21	0.24**	0.9
8	L8 X T1	-0.38	-0.36	7.69	-6.42*	-0.84	3.27	0.08	-0.34	0.01	0.89
9	L9 X T1	-0.16	-0.25	0.69	-1.31	-0.98	-1.62	0.05	-0.23	0.01	2.91**
10	L10 X T1	-0.71	-1.59	36.43**	-1.33	-0.94	4.59	0.06	-1.45	0.01	0.6
11	L11 X T1	-0.93	-1.03	4.89	6.4*	-0.27	3.92	0.38	-1.12	0.01	-0.71
12	L12 X T1	0.4	-0.59	-7.11	7.4*	0.16	-6.63**	-0.65	-0.67	0	1.1
13	L13 X T1	-0.04	0.75	6.26	-2.24	-0.03	1.25	-0.23	0.77	0.01	-0.87
14	L14 X T1	-1.27	-1.92	3.54	-4.52	-0.04	3.98	0.39	-1.45	0.01	-0.62
15	L15 X T1	0.07	0.19	-39.64**	-11.3**	-0.72	-11.98**	0.5	0.44	0.01	-7.25**
16	L1 X T2	2.16*	1.97	-7.14	-9.39**	-0.64	-4.03	-1.2**	2.21	-0.06*	-1.52
17	L2 X T2	-0.73	-0.25	12.75	-19.84**	-0.34	-13.88**	0.13	-0.01	-0.06*	1.09
18	L3 X T2	-2.96**	-3.36**	19*	1.84	-0.74	8.77**	0.47	-3.12	0.08**	0.66
19	L4 X T2	-1.18	-1.59	9.03	11.91**	1.35*	-7.69**	0.08	-1.34	-0.06*	-1.36
20	L5 X T2	0.16	-0.47	0.54	-4.65	0.16	4.89*	0.44	-0.56	0.6**	2.24**
21	L6 X T2	2.27*	1.86	-26.73**	1.13	-2.21**	-1.88	-0.2	1.66	-0.06*	-3.67**
22	L7 X T2	-0.73	-0.81	-0.58	-4.65	-0.08	2.77	-0.18	-1.01	0.07**	-1.48
23	L8 X T2	-0.29	-1.14	-2.87	2.95	1.04	-0.58	-0.21	-1.23	-0.06*	0.41
24	L9 X T2	-0.07	-0.7	-9.4	3.76	0.56	-6.8**	-0.15	-0.79	-0.06*	-1.87*
25	L10 X T2	-3.62**	-2.7*	39.96**	3.74	1.61**	11.88**	0.77*	-2.67	-0.06*	1.62*
26	L11 X T2	0.49	0.86	-5.4	2.97	0.82	5.13*	0.12	0.99	-0.06*	0.87

\*,\*\* significant at 5 and 1%, respectively (Continued)

Table 4. SCA effects for different characters in sweet corn (Continued)

S. No.	Lines/testers	Days to 50% Tasseling	Day to 50 % silking	Plant height (cm)	Ear height (cm)	Number of leave plant <sup>-1</sup>	Length of leaf (cm)	Breadth of leaf (cm)	Day to green cob harvest	No of ear plant <sup>-1</sup>	Ear length (cm)
27	L12 X T2	-0.18	0.3	4.33	9.34**	-0.5	5.86*	0.12	0.44	-0.04	0.08
28	L13 X T2	1.04	0.97	-24.14**	-4.8	-0.44	-1.53	0.44	0.88	-0.06*	-0.13
29	L14 X T2	2.16*	2.3*	-5.76	-2.08	-0.41	-1.93	0.13	1.99	-0.06*	0.66
30	L15 X T2	1.49	2.75*	-3.6	7.77**	-0.16	-0.97	-0.76*	2.55	-0.06*	2.39**
31	L1 X T3	-0.89	-0.39	18.34*	8.32**	0.11	3.55	1.14**	-0.32	0.05*	2.05*
32	L2 X T3	-0.78	-1.27	-57.07**	2.08	0.38	3.97	0.48	-1.21	0.05*	1.69*
33	L3 X T3	3**	2.61*	-12.16	-4.81	-0.99	-7.35**	-0.16	2.68	-0.04	-3.31**
34	L4 X T3	0.78	1.06	0.18	-14.21**	-1.6**	10.2**	-0.51	1.13	0.05*	1.13
35	L5 X T3	-0.89	-0.83	17.05	9.6**	0.33	-7.23**	-0.18	-0.76	-0.28**	-2.8**
36	L6 X T3	-1.44	-1.16	26.99**	10.08**	0.87	10.04**	0.14	-1.21	0.05*	0.76
37	L7 X T3	-1.78	-2.16*	12.53	-0.73	-0.23	-5.35*	0.13	-2.21	-0.31**	0.58
38	L8 X T3	0.67	1.5	-4.82	3.47	-0.2	-2.69	0.13	1.57	0.05*	-1.3
39	L9 X T3	0.22	0.95	8.71	-2.45	0.41	8.42**	0.1	1.01	0.05*	-1.04
40	L10 X T3	4.33**	4.28**	-76.39**	-2.41	-0.67	-16.47**	-0.82*	4.13*	0.05*	-2.22**
41	L11 X T3	0.44	0.17	0.51	-9.38**	-0.56	-9.05**	-0.5	0.13	0.05*	-0.17
42	L12 X T3	-0.22	0.28	2.78	-16.74**	0.35	0.77	0.53	0.24	0.04	-1.19
43	L13 X T3	-1	-1.72	17.88	7.05*	0.46	0.28	-0.21	-1.65	0.05*	1
44	L14 X T3	-0.89	-0.39	2.22	6.6*	0.45	-2.05	-0.52	-0.54	0.05*	-0.04
45	L15 X T3	-1.56	-2.94**	43.24**	3.52	0.89	12.95**	0.25	-2.99	0.05*	4.86**
46	SE										
47	SCA	0.93	1.06	9.2	2.85	0.54	2.39	0.35	2.04	0.03	0.79
48	sij-skl	1.32	1.51	13.02	4.04	0.77	3.39	0.49	2.88	0.04	1.11
49	CD (5%)										
50	SCA	1.85	2.11	18.22	5.65	1.07	4.74	0.69	4.04	0.05	1.56
51	sij-skl	2.62	2.98	25.76	7.99	1.52	6.7	0.97	5.71	0.07	2.2

\*\* significant at 5 and 1%, respectively (Continued)

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# CONSTRAINTS FACED BY FARMERS IN ADOPTION OF IMPROVED SORGHUM CROP [*Sorghum bicolor* (L.) Monech] PRODUCTION TECHNOLOGY IN BHILWARA DISTRICT OF RAJASTHAN

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## ABSTRACT

In Bhilwara, sorghum is grown in 57.4 thousand hectares and total production of sorghum is 54.1 thousands tones (District collectorate, Bhilwara). The study was undertaken to identify the constraints faced by farmers in sorghum crop cultivation. In Bhilwara district, two tehsils were selected and out of these two tehsils six villages were selected randomly for study. Thus, 120 sorghum growers were personally interviewed with the help of a well structured interview schedule. Main constraints faced by farmers were in adoption of the recommended package of practices of sorghum, for better interpretation and analysis ten constraints were studied among which highest ranked constraints was soil treatment (82.50%), followed by Plant protection measures, which was ranked second (81.15%), Seed treatment was placed at third rank (79.44%), Improved variety was ranked fourth (78.54%), Weed management was ranked fifth (72.60%), Irrigation schedule ranked sixth (71.98%), Manure and fertilizer ranked seventh (70.52%), Soil and land preparation was placed at eighth position (69.86%) followed by Seed rate and sowing, which was ranked ninth (69.06%). The lowest constraints ranked was harvesting, which was assigned tenth rank (68.61%).

## INTRODUCTION

Sorghum (*Sorghum bicolor* (L.) Moench) is an important cereal crop that plays a vital role in food and nutritional security, particularly in arid and semi-arid regions of the world. It belongs to the family Poaceae and is widely grown for its adaptability to harsh agro-climatic conditions. Sorghum is believed to have originated in north-eastern Africa, particularly in the region of present day Ethiopia, from where its spread to India, Middle East and other parts of the world. Globally, sorghum is cultivated in over 40 countries, covering approximately 42 million hectares, with an annual production of around 60 million metric tonnes. The United States leads in global sorghum production, followed by countries such as Nigeria, Sudan, and India. In India, sorghum is the fifth most important cereal crop after rice, wheat, maize and barley, occupying about 4.3 million hectares with an annual production of approximately 7.5 million metric tonnes and an average productivity of 1.6 tonnes

per hectare (Anonymous, FAO 2018). Total area of sorghum in Bhilwara is 57.4 thousand hectare and total production of sorghum is 54.1 thousand tonnes per ha.

Major sorghum-growing states in India include Maharashtra, Karnataka, Madhya Pradesh, Rajasthan, Andhra Pradesh, and Tamil Nadu. Sorghum is known for its high resilience to drought, high temperatures, and low soil fertility, making it a "climate-smart" crop. It is often referred to as a "camel crop" because of its ability to survive and produce reasonably well under stress conditions where other cereals fail. Nutritionally, sorghum is a rich source of energy and is gluten-free, making it suitable for people with gluten intolerance. It contains approximately 72 grams of carbohydrates, 11 grams of protein, 6.7 grams of dietary fiber per 100 grams, and provides essential minerals such as potassium, calcium, and iron. The grain is rich in antioxidants and phytochemicals that offer various health benefits, including diabetes control and heart

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health. Sorghum is also known as "Global Grain" due to its multi-purpose utility for food, fodder, feed, and fuel (4Fs), sorghum is a crucial crop for sustainable agriculture in rainfed regions. In this scenario sorghum emerges as a most important crop as fodder due to its high palatability and high value of crude protein and other nutrients. (Mbulwe, 2025). With the development of improved varieties and hybrid technologies, there is significant potential to increase productivity and enhance farmer incomes, making sorghum an integral part of future food and nutritional strategies. The adoption of these new varieties must be accompanied by improved cultivation practices to fully realize their potential. Rohilla *et al.* (2021) identified multiple challenges faced by kharif sorghum growers, including high input costs, expensive tillage operations, untimely availability of seeds, labour shortages at harvest, and inadequate knowledge of scientific plant protection measures.

**RESEARCH METHODOLOGY**

The study was conducted in Bhilwara district of Rajasthan. District has maximum area under sorghum crop in southern Rajasthan. Two tehsil Shahpura and Antali were purposely selected based on maximum area under sorghum crop. From each tehsil 3 villages were selected. A list of sorghum farmers was prepared. A total of 120 farmers were selected (20 from each village) randomly from six villages. The study relied primarily on primary data collected through personal interviews using a well structured and pre-tested interview schedule by researcher. There were ten major constraints (Improved variety, Soil and land preparation, soil treatment, seed treatment, seed rate and sowing, Manure and fertilizer, Irrigation schedule, Weed management, Plant protection measures and

harvesting) included in the scale to measure major constraints faced by sorghum farmers.

**RESULTS AND DISCUSSION**

Overall analysis of data presented in Table 1 reveals that the average of perceived level of constraints of sorghum farmers was 60.71 per cent. The data further reveal that majority of respondents (59.17%) were found in the medium constraint level followed by high (21.67%) and low level perceived by (19.17%) the respondents.

**Constraints in adoption of improved sorghum crop cultivation practices by the respondents:** For better interpretation and analysis, ten constraints were studied among which highest ranked constraints was soil treatment with total MPS of 82.50 followed by Plant protection measures, which was ranked second and MPS of 81.51. Seed treatment was placed at third rank and MPS was 79.44, Improved variety was ranked fourth with MPS of 78.5. Weed management was recorded total MPS of 72.60 and ranked fifth, Irrigation schedule ranked sixth with an overall MPS of 71.98, Manure and fertilizer ranked seventh had MPS of 70.52, Soil and land preparation was placed at eighth position recorded a total MPS of 69.86 followed by Seed rate and sowing, which was ranked ninth with MPS of 69.06. The lowest constraint ranked was harvesting, which was assigned tenth rank with overall MPS of 68.61.

**CONCLUSION**

The average perceived level of constraints of sorghum farmers was 60.7 per cent. Data reveal that 59.00 per cent of the respondents experienced a medium level of constraints in adopting improved practices, while 22.00 per cent reported a high level of constraints. Only 19.00 per cent faced fewer

**Table 1: Constraint level of farmers**

S.No	Constraint level	Total (n=120)	
		Frequency	%
1.	Low (<57.33)	23	19.17
2.	Medium (57.33 to 63.6)	71	59.17
3.	High (> 63.6)	26	21.67
	<b>Total</b>	<b>120</b>	<b>100</b>

**Table 2: Constraints perceived by sorghum crop farmers**

S.No	Constraints	MPS	RANK
<b>1. Improved variety</b>			
1.	Lack of knowledge about improved sorghum variety	80.83	2
2.	High cost of improved variety	82.50	1
3.	Non-availability of recommended sorghum variety	73.75	4
4.	New variety susceptible to insect pest	77.08	3
<b>2. Soil and land preparation</b>			
1.	Hiring cost of labour	87.08	1
2.	Problematic soil	64.58	2
3.	Timely un-availability of ploughing facility	57.92	3
<b>3. Soil treatment</b>			
1.	Lack of knowledge about soil treatment.	83.75	1
2.	Lack of knowledge about chemicals and their recommended dose	82.92	2
3.	Lack of knowledge about proper time of application	80.83	3
<b>4. Seed treatment</b>			
1.	No knowledge of seed treatment	77.92	2
2.	Non-availability of chemicals for seed treatment	77.50	3
3.	Lack of knowledge about proper time of application	81.25	1
<b>5. Seed rate and sowing</b>			
1.	Lack of knowledge about recommended seed rate	76.67	1
2.	Lack of implement to maintain (R*R) and (P*P) distance	65.83	4
3.	Lack of knowledge about date of sowing	67.08	3
4.	Lack of knowledge about depth of sowing	66.67	2
<b>6. Manures and Fertilizer application</b>			
<b>A. Manures</b>			
1.	Actual dose not known	53.75	8
2.	Inadequate availability of FYM	61.67	7
3.	Non-availability of FYM	62.92	6
4.	Composting technique not known	68.75	5
<b>B. Fertilizers</b>			
1.	Actual dose not known	80.42	2
2.	High cost of fertilizers.	82.08	1
3.	Non-availability on time.	75.83	4
4.	Time of application not known	78.75	3
<b>7. Irrigation schedule</b>			
1.	Stages of irrigation not known	66.25	4
2.	Inadequate water	74.58	1
3.	Inadequate irrigation facility	73.33	3
4.	Non-availability of proper electricity	73.75	2
<b>8. Weed management</b>			
1.	Lack of knowledge about chemical use for weed management	69.17	4
2.	High cost of labour	74.92	3
3.	High cost of weedicide chemicals	72.90	2
4.	Lack of knowledge about dose of chemicals	75.42	1
<b>9. Plant protection measures</b>			
<b>A. Insect- pest control</b>			
1.	Lack of knowledge about sorghum insect- pest.	78.33	5
2.	Lack of knowledge about mode of damage	76.50	8
3.	Lack of knowledge about chemicals to control insect-pest.	82.50	4
4.	Lack of knowledge about dose of application	84.58	3
<b>B. Diseases control</b>			
1.	Lack of knowledge about sorghum diseases.	77.50	6
2.	Lack of knowledge about mode of damage.	77.08	7
3.	Lack of knowledge about chemical to control diseases .	85.58	2
4.	Lack of knowledge about dose of application.	88.33	1
<b>10. Harvesting</b>			
1.	Lack of knowledge about harvesting stage	58.75	3
2.	Lack of knowledge about right time of harvesting.	70.83	2
3.	Lack of knowledge about sorghum storage insect pest.	76.25	1

MPS = Mean Per cent Score

**Table 3: Overall constraints perceived by farmers**

S.No	Constraints	Total (n=120)	
		MPS	RANK
1.	Improved variety	78.54	4
2.	Soil and land preparation	69.86	8
3.	Soil treatment	82.50	1
4.	Seed treatment	79.44	3
5.	Seed rate and sowing	69.06	9
6.	Manure and fertilizer	70.52	7
7.	Irrigation schedule	71.98	6
8.	Weed management	72.60	5
9.	Plant protection measures	81.51	2
10.	Harvesting	68.61	10

MPS = Mean Percent Score

constraints. The most prominent constraint identified was related to the non-availability of facility for soil treatment, which was perceived as the most severe constraint by the respondents and ranked first with an MPS of 82.50. Limited availability of plant protection measures is the second most severe constraints faced by the respondents.

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# PERFORMANCE OF SWEET CORN HYBRID (*Zea mays* L. Ssp. *Saccharata*) UNDER ORGANIC NUTRIENT MANAGEMENT AND FOLIAR SPRAY OF BIO-STIMULENTS

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## ABSTRACT

A field experiment was conducted during kharif 2021 at Instructional Farm, Rajasthan College of Agriculture, Udaipur to work out organic nutrient management practices for sweet corn using different organic sources of nutrient and bio-stimulants. The treatment consisted four combinations of different organic nutrient sources (T1: Control, T2: 100 per cent recommended dose of nutrient applied through vermicompost, T3: 100 per cent recommended dose of nutrient applied through Neem Cake, T4: 50 per cent recommended dose of nutrient through vermicompost + 50 per cent recommended dose of nutrient applied through neem cake) three foliar sprays of bio-stimulants (F1: Control, F2: foliar spray of "Vermi Wash" and F3: foliar spray of "Panch Gavya" ) at knee high stage of crop growth. Sweet corn hybrid "Sugar-75" was used as a test hybrid. With highest plant height, green cobs yield (98.73 tha<sup>-1</sup>), green fodder yield (394.62 tha<sup>-1</sup>) and net return (Rs. 222378 ha<sup>-1</sup>), application of 50 per cent recommended dose of nutrient applied through vermicompost + 50 per cent recommended dose of nutrient through neem cake proved best treatment over rest of the treatments. Foliar application vermi wash proved profitable with highest green cob yield (91.67 t ha<sup>-1</sup>), green fodder yield (375.97 t ha<sup>-1</sup>) and net returns (Rs 213266 ha<sup>-1</sup>) over rest of foliar spray of bio-stimulants. The other phenological parameters like plant population, days to tasselling and silking failed to record perceptible variation under different organic sources of nutrients and foliar spray of bio-stimulants.

## INTRODUCTION

Maize is an important cereal crop of world and staple food of tribal people in many parts of country. Nowadays use of sweet corn cobs at immature stages as roasted and boiled ears is a popular practice as the kernels are sweet, creamy, tender, crispy and test almost shell-less. After harvesting green cobs, plant of maize is used as green fresh fodder or dry fodder. Due to sweet taste and tenderness of green cobs as well as quality green fodder, cultivation of sweet corn is the first choice of farmers nowadays. Therefore, development of sweet corn varieties with enhanced sugar content of soft grains is gaining popularity (Suthar *et al.*, 2014). Looking to its wider adoptability and under era of organic cultivation, identification of organic nutrient management practices having wider adaptability and responsiveness is considered

essential for gaining more popularity and exploiting higher yield of sweet corn. Amongst nutrient, nitrogen plays an important role in synthesis of chlorophyll, amino acids and other organic compounds of physiological significance in plant system (Havlin *et al.*, 2005). Phosphorus plays an important role in energy transfer in living cells by means of high energy phosphate bonds of ATP (Reddy and Reddy, 2002). Our most of soils are having medium to low status of nitrogen and phosphorus, hence adequate nitrogen and phosphorus fertilization is considered to be one of the most important pre-requisites for increasing green cob and fodder yield. Considering these facts and paucity of research findings the trial was conducted to work out optimum dose/combination of organic source of nitrogen and phosphorus fertilization for popular sweet corn hybrid "Sugar-75" under

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agroclimatic condition of sub-humid southern and Arawali hills of Rajasthan.

## RESEARCH METHODOLOGY

A field experiment was conducted during kharif 2021 at the Instructional Farm, Rajasthan College of Agriculture, Udaipur which is situated at 23°34'N latitude, 72°42'E longitude and 582.17 meter above the mean sea level. The soil of the experiment site was clay loam having pH 7.8, organic carbon 0.82, available nitrogen 290.3 kg ha<sup>-1</sup>, phosphorus 18.1 kg ha<sup>-1</sup> and potassium 305.4 kg ha<sup>-1</sup> in the plough layer. The well distributed rainfall of 674.4 mm was recorded during crop growth period. The treatments consisted four treatments of organic sources for providing recommended dose (90 kg N + 60 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>) of nutrients (T1: Control, T2: 100 per cent recommended dose of nutrient applied through vermicompost, T3: 100 per cent recommended dose of nutrient applied through Neem Cake: T4: 50 per cent recommended dose of nutrient applied through vermicompost + 50 per cent recommended dose of nutrient applied through neem cake) and three sources of foliar sprays of bio-stimulants (F1: Control, F2: foliar spray of "Vermi Wash" and F3: foliar spray of "Panch Gavya" ) at knee high stage. These twelve treatment combinations were evaluated in randomized block design replicated thrice. The crop was sown manually on 8<sup>th</sup> July, 2021 by placing seeds at a depth of 5-6 cm at 60 x 25 cm. The experimental plot size was 3 x 5 m. Thinning was carried out at 15 days after sowing to maintain required plant population. The green cobs were harvested 15 days after silking when grains were in milky stage. Crop was harvested for green fodder after plucking green cobs. In order to minimize weed competition, pre-emergence application of atrazine at 0.5 kg ha<sup>-1</sup> followed by one hoeing and earthing up at 20 days after sowing was carried out. Net return and B:C ratio were calculated on the basis of prevailing market prices of inputs and produce. The popular sweet corn hybrid "Sugar-75" was used as test hybrid. Data of each character collected were statistically analyzed using standard procedure of variance analysis.

## RESULTS AND DISCUSSION

The data in Table 1 reveal that the phenological parameters like plant population, days to 50 per cent tasseling and days to 50 per cent silking failed to attained statistical significance under application of recommended dose of nutrients through different organic sources of nutrient application. At harvest, crop 'Sugar-75' attained the highest plant height under application of 100 per cent recommended dose of nutrient through vermicompost which was significantly higher over rest of the organic sources of nutrients. However, significantly higher green cob yield (98.73 t/ha), green fodder yield (394.62 t/ha) and net return (Rs. 222378 ha<sup>-1</sup>), was recorded under application of 50 per cent recommended dose of nutrient applied through vermicompost + 50 per cent recommended dose of nutrient through neem cake and proved best treatment over rest of the sources of nutrients. Under present investigation, the significant response of combined application of vermicompost and neem cake for application of nutrient might be on account of enrichment of soil with these two major nutrients (N and P) to the level of sufficiency and their slow-release nature of nutrients which in turn promoted growth of plant right from early stage (Kumar, 2009 and Suthar *et al.*, 2012). Further, amongst foliar spray of various bio-stimulants, foliar application of vermi wash proved profitable with significant highest plant height (205.3 cm), green cob yield (91.67 t ha<sup>-1</sup>) green fodder yield (375.97 t ha<sup>-1</sup>) and net returns (Rs 213266 ha<sup>-1</sup>) over rest of foliar spray of the bio-stimulants. The better response of vermi was on account of its rich plant nutritional composition and their quick availability (Halvinet *et al.*, 2005). The higher availability of nitrogen and phosphorus directly through foliar absorption seems to have promoted development of morphological structure by virtue of multiplication of cell division which is well reflected through increased plant height (Kumar, 2009). The other phenological parameters like plant population, days to tasselling and silking failed to record perceptible variation under foliar application of different bio-stimulants for nutrient application. The results are in close conformity with

**Table 1. Performance of sweet corn under different organic nutrient management and foliar application of various bio-stimulants**

Organic sources of nutrient	Plant population (000 ha <sup>-1</sup> )	Plant height (cm)	Days to 50 %		Yield (t ha <sup>-1</sup> )		Net return (Rs ha <sup>-1</sup> )
			Tasselling	Silking	Green Cobs	Green Fodder	
T <sub>1</sub> -Control	81.73	152.0	45.4	48.1	58.71	274.08	152646
T <sub>2</sub> -100 % RDF by VC	81.40	212.9	45.0	49.4	93.70	373.89	202588
T <sub>3</sub> -100 % RDF by NC	81.85	202.0	45.1	49.8	88.92	356.45	200696
T <sub>5</sub> -50 % RDF by VC + 50 % by NC	81.70	222.0	45.0	49.6	98.73	394.62	222378
Sem±	0.162	1.67	0.15	0.24	0.703	2.670	1932
CD (P = 0.05)	NS	4.78	NS	NS	2.019	7.664	5545
<b>Foliar Spray of Organic Stimulants</b>							
F <sub>1</sub> -Control	81.74	190.7	45.3	49.1	76.71	315.90	172136
F <sub>2</sub> -Vermi Wash	81.61	205.3	45.2	49.5	91.67	375.97	213266
F <sub>3</sub> -Panch Gavya	81.66	195.6	45.0	49.1	86.66	357.42	198329
Sem±	0.216	2.22	0.19	0.32	0.938	3.559	2575
CD (P = 0.05)	NS	6.38	NS	NS	2.692	10.219	7394

findings of Suthar *et al.*, 2014.

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# **CONSTRAINTS AND SUGGESTIONS OF BENEFICIARIES REGARDING EFFECTIVE EXTENSION SERVICES OF KRISHI VIGYAN KENDRA IN BIKANER DISTRICT OF RAJASTHAN**

**Vasupriya Parashar\*, Prasanlata Arya\*\* and Seema Tyagi\*\*\***

## **ABSTRACT**

Over the past many years, a vast number of public extension projects have been put into operation in the country. It begins with the introduction of Training and Visit system in a grassroot level in selected districts of some states. Later, in order to assist government extension, the Indian Council of Agricultural Research (ICAR) started getting concerned in extension activities with the help of increased significant participation with the beginning and stretch of Krishi Vigyan Kendra's (KVKs) through extension services. While, receiving the extension services, some constraints are faced by the beneficiaries of organization which proves as barriers in the effectiveness of extension services delivery through organization. Therefore, efforts have been made to study the constraints perceived by the beneficiaries in accessing the extension services delivered by the organization and suggestions offered by them to improve the extension services. The investigation was conducted by selecting the sample of 60 farmers (women and men) of Krishi Vigyan Kendra of Bikaner district of Rajasthan and interviewing them by structured interview schedule. From the list provided by the organisation itself 60 beneficiaries were selected for the study. The ex-post facto Research design was used for this study. Thus, through frequency and percentage data is analysed. It was found that majority of the beneficiaries encountered general constraint as organisation do not provide subsidies (61.66%) and lack of resources (61.66%) and specific as lack of input services on menstrual health and hygiene (100%). Further, majority of the beneficiaries suggested for organisation should organise cultural programmes for transfer of technology (83.33%) as general suggestion and should establish skill development centre for enterprise (96.66%) as specific suggestions in entrepreneurship development.

## **INTRODUCTION**

With enhancement in government policies, demand and supply characteristics of technology, and marketing modification, agriculture extension system is facing extra opportunities collectively with challenges. For that extension organizations generally responsible for transforming improved agricultural technologies from the point of production to its units of utilisation. Over the past many years, a vast number of public extension projects have been put into operation in the country. It begins with the introduction of Training and Visit system at a grassroot level in selected districts of some states. In order to assist government extension, the Indian Council of Agricultural

Research (ICAR) started getting concerned in extension activities with the help of increased significant participation with the beginning and stretch of Krishi Vigyan Kendra's (KVKs) through extension services. The function of extension services is to disseminate technology and knowledge to bring desirable change in farming and rural community in terms of attitude and behavior. Extension services play a critical role in changing the skills and knowledge of the individual which is disseminated by the organization. Though, there are some flaws in delivery of effective extension services, there are some constraints faced by the beneficiaries of organization which proves as barriers in the effectiveness of extension services delivery through

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organization. Therefore efforts have been made to study the constraints perceived by the beneficiaries in accessing the extension services delivered by the organization. Suggestions are the improvement or corrections offered by the individual to the planner or the organization to direct work into effective situation. Suggestions offered by the beneficiary are valuable for the organization for the effective functioning in extension services. Thus, suggestions are also procured from the beneficiaries for making improvement in extension services.

### RESEARCH METHODOLOGY

The present study was conducted in KVK which is included under Swami Keshwanand Rajasthan Agricultural University (SKRAU) of Bikaner district of Rajasthan. The ex-post facto Research design was used for this study. From Bikaner district two blocks namely Kolayat and Bikaner was purposively chosen for the study as recommended by the organisation as blocks were having highest number of active farmers as beneficiaries of Krishi Vigyan Kendra. A list of farmers (women and men) or beneficiaries who have direct contact and member of the organisation was collected from the

organisation. Thus, from the list total sixty beneficiaries were selected for the investigation. The data were collected from 60 beneficiaries through personal interview method and with a well-structured interview schedule. Five major areas as agriculture management, livestock management, health and hygiene, women empowerment and entrepreneurship development were selected. To determine the constraints and suggestions offered by the beneficiaries regarding extension services rendered by the Krishi Vigyan Kendra, general and specific constraints and suggestions were framed keeping in the mind the flaws found during the investigation of extension services. Various constraints and suggestions were specially framed and categorized specifically on the basis of major areas of development and for the study by evaluating the questions from the experts. The constraints and suggestions was analyzed with the answer in "yes" and "no" and then computed with the help of frequency and percentage method as statistical tool.

### RESULTS AND DISCUSION

**I. Constraints:** Visualisation of Table 1 reveals the data of constraints faced by the beneficiaries of

**Table 1. Distribution of beneficiaries according to the general constraints faced in receiving extension services delivered by KVK**

S.No.	General Constraints	KVK (N=60)	
		f	%
1.	Unaware of various extension organizations	36	60
2.	Unaware of extension services	21	35
3.	Lack of personal counseling	29	48.33
4.	Due to poor economic status	33	55
5.	Poor literacy level	35	58.33
6.	Lack of infrastructure facilities	12	20
7.	High cost of innovations	10	16.66
8.	Lack of financial assistance for participants	24	40
9.	Lack of resources	37	61.66
10.	Not providing subsidies	37	61.66
11.	Lack of time to participate in extension activities	16	26.66
12.	Lack of transport facilities to participate in extension activities	6	10
13.	Lack of information received through publicity	7	11.66
14.	Lack of mass media exposure	14	23.33
15.	Lack of cooperation among neighbors/ family members/ society/ community	11	18.33
16.	Lack of cooperation of leaders	19	31.66
17.	Wrong guidance given by input dealers	12	20
18.	Illiteracy	10	16.66

KVK and observed that 61.66 per cent of the beneficiaries of Krishi Vigyan Kendra encountered general constraints related to lack of resources and lack of subsidies by the organization, 60 per cent of them encountered problem of unaware of various extension organization, 58.33 per cent of them have problem of poor literacy level, 55 per cent of them encountered poor economic status, 48.33 per cent of the beneficiaries reported constraint of lack of personal counseling, 40 per cent of them faced lack of financial assistance for participants as problem, 35 per cent of them were unaware of various extension activities, 31.66 per cent of beneficiaries encountered problem of lack of leader's cooperation, 26.66 per cent of the beneficiaries faced lack of time to participate in extension activities and 23.33 per cent of them faced problem of lack of mass media exposure whereas, only 20, 18.33, 16.66, 11.66 and 10 per cent of the beneficiaries of KVK encountered problem of wrong guidance given by input dealers, lack of infrastructure facilities,

lack of cooperation among neighbors/ family members/ society/ community, illiteracy, lack of information received through publicity and transportation facilities, respectively.

Table 2 divulges the data related to specific constraints faced by beneficiaries in rendering extension services and shows that, with respect to data related to area of development in agriculture management, twenty and less than twenty per cent of beneficiaries reported constraint of non-availability of input services by organization (20%), unsuitability of extension service to farming condition (16%) and lack of advisory services on pest and disease control (11.66%). Data regarding livestock management, more than half of the beneficiaries faced problem of lack of input services on dairy management (70%) and lack of proper information given by organization disease and control, dairy management, fodder management and breeding practices (53.33%). With respect to data related

**Table 2. Distribution of beneficiaries according to the specific constraints faced in receiving extension services delivered by KVK**

S.No.	Specific Constraints	KVK (N=60)	
		f	%
<b>I.</b>	<b>Agriculture management</b>		
1.	Unsuitability of extension service to my farming condition.	10	16.66
2.	Non-availability of input services by organization	12	20
3.	Lack of advisory services on pest and disease control	7	11.66
<b>II.</b>	<b>Livestock management</b>		
1.	Lack of proper information given by organization disease and control, dairy management, fodder management and breeding practices	32	53.33
2.	Lack of input services on dairy management	42	70
3.	Lack of scientific training on different aspect of livestock management	24	40
<b>III.</b>	<b>Health and hygiene</b>		
1.	Lack of information related to personal and environmental hygiene	29	48.33
2.	Lack of training on disease prevention and control and food hygiene.	29	48.33
3.	Lack of input services on menstrual health and hygiene.	60	100
<b>IV.</b>	<b>Women empowerment</b>		
1.	Unaware of gender sensitization	42	70
2.	Lack of input services on value addition and cooking and processing.	22	36.66
3.	Lack of demonstration labs and equipments for drudgery reduction techniques	23	38.33
4.	Organization do not provide knowledge related legal rights and acts of women	52	86.66
<b>V.</b>	<b>Entrepreneurship development</b>		
1.	Lack of inputs services provided on skill development	29	48.33
2.	Lack of information provided on market research and finance policy	31	51.66

to health and hygiene, cent percent of the beneficiaries faced lack of input services on menstrual health and hygiene as a problem and 48.33 per cent of them faced problem of lack of information related to personal and environmental hygiene and lack of training on disease prevention and control and food hygiene. It can also be seen from the data of women empowerment that majority of the beneficiaries faced constraint of organization do not provide knowledge related legal rights and acts of women (86.66%) and unaware of gender sensitization (70%). Further the table also depicted the data related to entrepreneurship development and stated that 51.66 per cent of beneficiaries faced problem of lack of information provided on market research and finance policy and 48.33 per cent of them having problem of lack of inputs services provided in skill development.

**I. Suggestions:** Perusal of the Table 3 shows the general suggestion offered by the beneficiaries of KVK to improve extension services more effective. The data in the tables shows that 88.33, 78.33, 60, 55, 45, 38.33, 33.33 and 31.66 per cent of the beneficiaries had suggested for technology should be transferred through cultural programmes, programmes should be implemented for school dropouts, popularizing small savings, programmes should be implemented for self employment, organisation should provide

meteorological information, should arrange timely finance, provide technical guidance on innovative technologies and should have frequent visit of extension workers to the farmers field, respectively. Whereas, only 23.33, 11.66 and 8.33 per cent of beneficiaries offered suggestions of organisation need to conduct more extension activities, dissemination of information should be in time and organisation should adopt single window system, respectively.

Data pertaining to Table 4 depicted specific suggestions according to various development areas of agriculture. The data related to agriculture management shows that more than half of the beneficiaries suggested for Promoting contract farming (56.66%), Compensation for crop losses (86.66%) and to promote and input in fencing for farms (93.33%) whereas, only 8.33, 8.33 and 6.66 per cent of the beneficiaries suggested for establishment of seed procurement and distribution centre, crop diagnostic centre and labs and popularizing farm implements, respectively. Further the table also shows the data related to livestock management and reveals that majority of the beneficiaries offered suggestions about milking equipments should be popularize (88.33%) and information on improved breed should be provided (68.33%). With respect to data related to health and hygiene majority of the beneficiaries give suggestions on promoting inputs on menstrual health

**Table 3. Distribution of beneficiaries according to the general suggestions offered about extension services provided by KVK**

S.No.	General Suggestions	KVK (N=60)	
		f	%
1.	Technology transfer through cultural programmes	50	83.33
2.	Programmes for school dropouts	47	78.33
3.	Programmes for self employment	33	55
4.	Providing meteorological information	27	45
5.	Popularizing small savings	36	60
6.	Arranging timely finance	23	38.33
7.	Frequent visit of extension workers to the farmers field	19	31.66
8.	Need to conduct more extension activities	14	23.33
9.	Provide technical guidance on innovative technologies	20	33.33
10.	Dissemination of information should be in time	7	11.66
11.	Adopting single window system	5	8.33
12.	Promote resources management	19	31.66

**Table 4. Distribution of beneficiaries according to the specific suggestions offered about extension services provided by KVK**

S.No.	Specific Suggestions	KVK (N=60)	
		f	%
<b>I.</b>	<b>Agriculture management</b>		
1.	Popularizing farm implements	4	6.66
2.	Establishing seed procurement and distribution centre	5	8.33
3.	Establishing crop diagnostic centre and labs	5	8.33
4.	Promoting contract farming	34	56.66
5.	Compensation for crop losses	52	86.66
6.	More concentration on field crops	17	28.33
7.	Promote and input in fencing for farms	56	93.33
<b>II.</b>	<b>Livestock management</b>		
1.	Popularizing milking equipments	53	88.33
2.	Information on improved breed	41	68.33
3.	Inputs provided on innovative and nutritive fodder for cattle	32	53.33
<b>III.</b>	<b>Health and hygiene</b>		
1.	Programmes for personal hygiene and environment hygiene	48	80
2.	Promoting inputs on menstrual health and hygiene	56	93.33
3.	Programmes on disease prevention and control	45	75
<b>IV.</b>	<b>Women empowerment</b>		
1.	Employing adequate women extension workers for women	47	75
2.	Value addition of local crops available	16	26.66
3.	Advisory services on women rights and acts	51	85
<b>V.</b>	<b>Entrepreneurship development</b>		
1.	More concentration on innovative equipments	57	95
2.	More concentration imposed on information of market assistance	56	93.33
3.	Establishing skill development centre for enterprise	58	96.66

and hygiene (93.33%), programmes for personal hygiene and environment hygiene (80%) and programmes on disease prevention and control (75%). It can also be seen from the data in the table that majority of the beneficiaries appeal for the improvement in advisory services on women rights and acts (85%) and to employ adequate women extension workers for women (75%) in the field of women empowerment. While, the data related to entrepreneurship development reveals that more than ninety percent of the beneficiaries suggested for more concentration imposed on information of market assistance (93.33%), innovative equipments (95%) and establishing skill development centre for enterprise (96.66%).

## CONCLUSION

It can be concluded from the investigation that majority of the beneficiaries faced general constraint

as lack of resource, organisation do not provide subsidies and they are unaware of various extension organisation whereas, cent percent of the beneficiaries reported specific constraint in development area health and hygiene as lack of input services on menstrual health and hygiene. Further the study also reveals that majority of the beneficiaries suggested on organisation should provide technology transfer through cultural programme, programmes for school dropout and should popularize small savings as general suggestions whereas, more than ninety per cent of the beneficiaries suggested in development area entrepreneurship development and health and hygiene as organisation should establish skill development centre for enterprise, more concentration imposed on information of market assistance and promote and input in fencing for farms, respectively.

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# **CONSUMER BUYING BEHAVIOUR FOR MILLET PRODUCTS IN BIKANER DISTRICT OF RAJASTHAN**

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## **ABSTRACT**

A variety of nutrient-rich, drought-tolerant plants known as millets. As Indian millets are so high in protein, vitamins, and minerals, they are nutritionally superior to wheat and rice. Also, they are devoid of gluten and have a low glycemic index, making them perfect for those who have diabetes or celiac disease. The new cooking methods using minor millets have enormous promise as protein- and mineral-rich supplements to treat disorders like Protein Calorie Malnutrition (PCM) and mineral deficiencies that are common in school-age children. Therefore, to ensure nutritious food consumption and to conflicts the various health issues this generation is facing, it is essential to understand how consumers feel about millet-based products and to identify the factors influencing their purchasing decisions. Given this context, the current study was conducted to determine the factors influencing sample consumers' purchasing decisions for millet products as well as to gauge consumer acceptance of millet products provided by various organisations in the study area. To meet the objectives data was collected from 120 consumers across the Bikaner district of Rajasthan. Results revealed that quality was the crucial factor among the respondents that influencing the purchase of millet based products. Among all the channels of information dissemination on health benefits of millet products, Friends and family has more influence as it can reach all the age groups easily. Additionally, it was discovered that the primary factor influencing respondent's consumption of millet-based products in the study area was health benefits, supporting the idea that millets are one of the world's healthiest foods. Major millets were having very good awareness among the respondents and for minor millets the awareness among the respondent were not good as compare to major millets. Many millet products were frequently available in the market like daliya, millet poha, etc. Quality was ranked as a crucial factor for consumer acceptance of the millet-based product by the majority of respondents. Therefore, the quality part in millet based products should be enhanced to increase consumer acceptance by addition of natural or artificial preservatives. As many millet product brands were available in the market where the ITC is the most preferred brand for the respondents.

## **INTRODUCTION**

India's food ecosystem presents enormous investment prospects with encouraging growth in the food retail sector, supportive economic policies, and alluring fiscal incentives. The Government of India (GoI) is taking all necessary measures through the Ministry of Food Processing Industries (MoFPI) to increase foreign investment in India's food processing sector. The GoI has allocated INR 4600 Cr to the umbrella PMKSY plan March 2026. Two further flagship programmes have also been carried out by the ministry of food processing industries and throughout the projection period, it

is expected that the millet market will grow at a CAGR of 4.8 per cent. (Invest india, 2023)

Sorghum, finger millet, pearl millet, barnyard millet, proso millet, and little millet are a few of the cereal varieties that fall under the millets category. They are grown on more than 32 million hectares of agricultural land globally in dry, semi-arid, and subhumid climates. The three countries that produce the most millet worldwide-India, Niger, and China-account for more over 55.0 per cent of the total. The world's largest millet producer is India. Yet, due to limited water availability and subtropical climate conditions that are favourable to millet

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production, many governments have recently encouraged dryland agriculture, which has resulted in a sharp increase in millet output throughout Africa (APEDA, 2022).

The state of Rajasthan (29.05%) has the most land cultivated with millets, followed by Maharashtra (20.67%), Karnataka (13.46%), Uttar Pradesh (8.06%), Madhya Pradesh (6.11%), Gujarat (3.94%), and Tamil Nadu (3.74%). In recent years, the states of Gujarat and Madhya Pradesh have planted more millets. The highest yields, however, were found in Gujarat (1762.05 kg/ha), Andhra Pradesh (2626.58 kg/ha), Tamil Nadu (2153.22 kg/ha), Haryana (1906.78 kg/ha), and Madhya Pradesh (1729.70 kg/ha). In comparison to other states, Gujarat and Andhra Pradesh have displayed higher levels of productivity. (ASSOCHAM, 2022)

#### State wise millet production in India (2018-21)

State	2018-19	2019-20	2020-21	Share (%)
Rajasthan	6993.32	7333.29	8360.94	16.3%
Karnataka	5519.9	6813.62	7931.22	15.5%
Maharashtra	3096.69	4392.59	6082.11	11.9%
Madhya Pradesh	5147.2	5029.43	4953.65	9.7%

Source -APEDA (2022) cited from Rajasthan millet value added products catalogue

The total amount of millet produced in India increased from 43059.45 million tonnes in 2018-19 to 51323.8 million tonnes in 2020-21, representing an increase of 7.49 percent, or 2019-20, to 2020-21. It is clear that Rajasthan contributes the most (16.3%) to India's millet production. Karnataka (15.5%), Maharashtra (11.9%), and Uttar Pradesh (9%) are the next-highest millet producers. These four states collectively contribute (4%) to India's millet production.

As per APEDA report Bikaner District of Rajasthan had total millet cultivated area in 2017 was 133.3 thousand (Ha.) and production was 73.2 thousand (tonnes) or total area share was around 2.39 per cent and production was around 1.39 per

cent.

The millet-based packaged food market in India is fragmented due to the prevalence of numerous small-scale producers. The market is dominated by large firms. The majority of millet-based processed food businesses prioritise thorough research and development (R&D) initiatives. They are working hard to diversify their product offerings and produce new packaged foods made from millet. Some of the well-known businesses in the packaged millet-based foods market include Bliss Tree India, Coastal Foods, Early Foods, FirmRoots Private Limited, ITC Limited, Marico, Moon Foods, Naturally Yours, NumNum, OGMO Foods, Priya Foods, Quaker Oats Company, Slurrr Farms, Sri Lakshmi Foods, Swiss Bake Ingredients Pvt. Ltd., Tropolite, Indian market for food.(Openpr, 2022)

Ernst & Young further states that, " the shift in consumer consumption habits is brought on by a significant change in lifestyle, an increase in nuclear families, and heightened consumer awareness thanks to the media and well-known chefs."

#### RESEARCH METHODOLOGY

Primary and secondary data were collected to meet the objectives of the study. Primary data were collected from the consumers and retailers with the help of semi structured interview schedule and secondary data was collected from various reports, research papers and government databases.

The sample was selected on the basis of Convenience sampling for the consumers of the study area and approximate 120 Consumers from 4 different areas of Bikaner district of Rajasthan was selected as a Sampling Unit

To study the objectives, the respondents of the selected areas who consumed millet and millet products were taken as the sample unit for study purpose and data was collected from them.

The objective was to collect demographic details like age, income group, gender, educational level etc. The extent of awareness among the millet consumers was found through interview schedule and the data were analyzed and presented through

appropriate tables and graphs and to analyze the preference of millet consumers from different segments of millet products like cookies, brownie, muffins and tutti fruity cake, laddu, Khichdi etc. and last objective was to identify the factors influencing the consumer buying behaviour like socio- cultural, health, time saving, living standards, occupation etc.

Weighted average was used for factor analysis on various factors such as flavour, taste, colour, packaging, price, etc. based on the importance given by the respondents to these different factors.

## RESULTS AND DISCUSSION

### 1. Demographic Profile and Consumer Awareness of Millet Products in Study Area :

According to the findings, the consumption of millet products varies depending on the age group. According to the results of the survey, 33 per cent of the respondents were between the ages of 18 to 25 years. Following that, 36 per cent of respondents were between the ages of 25 and 35 years. Only 18 per cent of consumers were above the age of 45 years, while only 13 per cent were between the ages of 35 and 45 years. These results highlighted that the millet based products have become a good choice among young people. The variety and nutritional value of these foods is well recognised in educated mass and since they are more exposed to media, it also helps them make choices for consuming millet based products.

Out of 120 consumers, all the consumers were educated. Nearly half of them (47%) were graduated and more than one fourth (28%) had completed post-graduate education. The rest of the consumers were those who (17%) had completed either 10th or 12th grade, while 8 per cent there were those who had education upto secondary level. These results are encouraging where the consumption of millet based products is seen in educated mass.

The survey results related to profession of the consumers clearly depicts that the consumers were almost equally distributed majorly into two categories i.e., service class (34%) and students

(32%). These are those categories of respondents who have more social interaction outside their family owing to the nature of work they are engaged into. Therefore they are well versed and aware of the new and innovative products food that are available in the market. Also, they seek opinion of their company and this becomes a base of their decision making.

It was found that all the respondents were aware about Bajra (100 %) followed by Jowar (98.33%), Ragi (75%), Sanwa (65.83%), Kangani (42.50%), Kodo (36.67%), Chena (35%) and 34.17 per cent were aware about Kutki. So according to this research the millet awareness among the respondents of the sample area was good for major millets like Bajra, Jowar etc. but for the minor millets, it was not good as compared to major millets.

**2. Consumer Preference of Different Millet Products and Their Brands:** The results reveals that consumers mostly preferred to use millet products during dinner time and at the time of lunch because during these time people tend to prefer healthy food diet which could be prepared easily and consumed in less time as compared to normal course preparation.

It was noted that most preferred millet food products at time of breakfast are chapati and upma as they contain high percentage i.e. 60 per cent and 33.33 per cent, respectively. Other products like idli and dosa mix, daliya and poha also quietly preferred by the respondents. Students tends to prefer poha, pulao and noodles more as they are convenient to prepare.

It was further found that consumer tend to prefer light millet products while having evening snacks or along with tea as a refreshment so they consume products like khakra, papad, dhokla and cookies more. People consume millet Kebabs and cutlets as snacks.

The study depicts that people use millet products mostly at their homes. Out of 120 consumers, 86.66 per cent consumers revealed that they preferred to consume convenience food at home and these numbers have increased after Covid 19. They also

consume it during functions either at their place or outside. The major reason is that people now prefer healthy diets and secondly, they want to save time in their hectic schedule.

Survey of research reveals that the most preferred brand of millet food products by consumer in Bikaner, Rajasthan was ITC because of its superiority in taste and easily availability, therefore ITC accounts for 66.66 per cent of total sample population with its image among customers, followed by TATA with 56.66 per cent, Maru Shakti with 34.16 per cent, consumers that only preferred millet products from local stores was 20.83 per cent followed by Bazic foods with 19.16 per cent, Golden millet with 17.50 per cent, Healthy master with 10.83 per cent, Millet Amma with 8.33 per cent, O'Buddy's with 3.33 per cent and Millet snacks with 2.50 per cent.

**3. Factors Influencing the Consumer Buying Behaviour of Millet Products:** The results depict that the consumers buying decision towards millet products is mainly affected by relatives/friends/neighbours that attain highest in responses (66.66%) from consumers along with parents (56.66%) as now a days parents are more inclined towards millets as they are good for health. Also the children of the family and shopkeepers also had important role in buying decision of the consumers

**Table 2: Factors affecting consumer buying decision**

Factors	Weighted Average	Ranks assigned
Price	3.65	4
Taste	3.841	3
Quantity	3.033	6
Packaging	2.783	7
Quality	3.983	1
Nutritional Value	3.941	2
Place of Availability	3.358	5
Certification	2.65	9
Branding	2.675	8

Source: Researcher's own computation of field data

According to Table 2 the attribute that affect mostly the buying decision of consumer is quality,

nutritional value, taste, price and place of availability as these were having the rating between 1 to 5 for factors affecting for millet products. Therefore, the quantity, packaging, branding and certification were minor affecting factors that had rating of 6 to 9.

It was found that 89.16 per cent consumers clearly revealed that the major reason for using millet products were that it is healthy food, revitalized by consuming it. It is followed by 79.16 per cent consumers who said it is high in nutrition one of the major reasons of consuming convenience food and to maintain living standard with being trendy as well as taste and easy to prepare are important reasons found and all other reasons account remaining combined.

## CONCLUSION

Among 120 million millet product consumers, their spending habits vary with 44% spending between Rs. 10,000 and 25,000 per month. Millet meals are preferred for dinner and lunch. Chapati and upma are popular breakfast choices. Consumers primarily consume millet products at home but also at work. Relatives/friends/neighbors and parents influence their purchasing decisions. Factors like quality, nutrition, taste, price, and availability impact buying behavior. Consumers prefer millet products for their health benefits (89.16%) and nutritional value (79.16%). Trendiness and status symbol play a smaller role in their preference

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## ENTREPRENEURIAL BEHAVIOUR OF DAIRY FARMERS IN UDAIPUR DISTRICT OF RAJASTHAN

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and Latika Sharma\*\*\*\*\*

### ABSTRACT

Dairy enterprise could play a more constructive role in promoting rural welfare and reducing poverty by generating employment at farm level is increasingly being recognized. It is one of the promising sectors for entrepreneurship development in India. The present study was conducted in Girwa and Jhadol tehsils of Udaipur district in Rajasthan considering highest livestock population combining cows and buffaloes in Southern Rajasthan. The Primary data were collected from 120 respondents from 6 villages using a structured interview schedule. Seven components were studied among which highest ranked component was decision-making ability (35.19%), followed by risk taking ability, which was ranked second (32.27%), Ability to coordinate was placed at third rank (30.74%), Scientific orientation was ranked fourth (29.18%), Market orientation was ranked fifth (27.61%), Economic motivation was placed at sixth position (26.25%), The lowest ranked component was innovativeness, which was assigned seventh rank (22.04%).

### INTRODUCTION

Dairy enterprise could play a more constructive role in promoting rural welfare and reducing poverty by generating employment at farm level is increasingly being recognized. A sustainable and financially viable dairy farming, which will generate income and self-employment through entrepreneurship, is the need of the day (Saha *et al.*, 2003). In the present era, it is increasingly being realized that entrepreneurship contributes to development of a country in numerous ways, viz. assembling and harnessing the various inputs, bearing the risks, innovating and imitating the methods of production to reduce the cost and increase its quality and quantity, expanding the horizons of the market, coordinating and managing the manufacturing unit at various levels. Dairy is a significant aspect of farming development and is additionally considered as a possible area of trade income as India has the biggest milk maker on the planet, dairy endeavor turns out to be non-stop revenue as well as gives great business freedoms

to the poor provinces.

Entrepreneurship is the focal power of monetary action, which is needed for the advancement of the country and entrepreneurs are the critical people of any country in advancing financial development and innovative change. In fact, the rapid economic development of a country crucially depends upon the number of entrepreneurs in the country. The emergence of entrepreneurs in communities depends upon closely inter connected social, religious, cultural, psychological and economic factors. The dairy area plays a multi-faceted part in the financial improvements of country family units. Animals' raising emphatically affects value regarding pay and work and dairy enterprise provides significant improvement in income of dairy farmers (Sanjesh 2015). It has the highest potential of generating income and employment through augmenting productivity of milch animals. It is one of the promising sectors for entrepreneurship development in India.

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## RESEARCH METHODOLOGY

The study was conducted in Udaipur district of Rajasthan, a major Livestock population in Southern Rajasthan. Two tehsils, Girwa and Jhadol were purposely selected based on highest livestock population. From each tehsil, three villages Kaladwas, Tidi and Chanavada from Girwa tehsil and Makradeo, Selana and Manas from Jhadol tehsil were chosen. From the selected villages, a list of dairy farmers was prepared. A total of 120 farmers were selected (20 from each village) randomly from the six villages to represent entrepreneurial behaviour. The study relied primarily on primary data, collected through personal interviews using a well structured and pre-tested interview schedule by researcher. There were seven components (innovativeness, decisions making ability, risk taking ability, co-coordinating ability, scientific orientation, economic motivation, market orientation) included in the scale to measure entrepreneurial behaviour of dairy farmers.

## RESULTS AND DISCUSSION

Overall analysis of data presented in Table 1 reveal that the average entrepreneurial behaviour of dairy farmers was 53.43 per cent. Data further reveal that majority (54.16%) of dairy farmers had medium level of entrepreneurial behaviour followed by low (25.00%) and high(20.84%) entrepreneurial behaviour. Since the entrepreneurial behaviour is constituted of different components, the overall entrepreneurial behaviour of dairy farmers was found to be with medium level.

**Table 1: Overall entrepreneurial behaviour of dairy farmers**

No.	Category	f (n=120)	%
1	Low(<40.79)	30	25.00
2	Medium(40.79to 66.06)	65	54.16
3	High(>66.06)	25	20.84

### Components wise of entrepreneurial behaviour of dairy farmers:

The overall entrepreneurial behaviour of dairy

farmers was measured through the combination of all above discussed components. The highest ranked component was decision-making ability with an overall MPS of 35.19, in which Girwa and Jhadol tehsils were recorded with MPS of 32.67 and 31.31 respectively. It was followed by risk taking ability, which was ranked second with overall MPS of 32.27, where Girwa and Jhadol were with MPS of 34.11 and 30.44, respectively. Ability to coordinate was placed at third rank with MPS of 30.74, in which Girwa and Jhadol were recorded with MPS of 31.29 and 30.18, respectively. Scientific orientation was ranked fourth with overall MPS of 29.18, in which Girwa and Jhadol were recorded with MPS of 27.90 and 30.47, respectively. Market orientation was ranked fifth with overall MPS of 27.61, where Girwa and Jhadol tehsils were recorded with MPS of 25.63 and 29.60, respectively. Economic motivation was placed at sixth position with MPS of 26.25, in which Girwa and Jhadol were with MPS of 26.01 and 26.48, respectively. The lowest ranked component was innovativeness, which was assigned seventh rank with an overall MPS of 22.04, in which Girwa and Jhadol tehsils were recorded with MPS of 21.96 and 22.12, respectively.

**Table 2: Components wise entrepreneurial behaviour of dairy farmers**

No	Components	MPS	Rank
1	Innovativeness	22.04	VII
2	Decision Making Ability	35.19	I
3	Risk Taking Ability	32.27	II
4	Ability to Co-Ordinate	30.74	III
5	Scientific Orientation	29.18	IV
6	Economic Motivation	26.25	VI
7	Market Orientation	27.61	V

MPS=Mean Percent Score

The selected components *viz*, innovativeness, decision-making ability, risk taking ability, ability to co-ordinate, scientific orientation, economic motivation, market orientation are described briefly.

**Innovativeness:** In terms of innovativeness, the practice was the use of sterilized scalpels and disinfectants with MPS 48.75 ranked first, followed by online marketing by farmers with MPS 37.91 ranked second. The use of fat testing kits with MPS 37.08, having milk separation machines ranked fourth along with maintenance of breeding record with MPS 36.66. Selling remaining by-products of milk along with milk in local market was assigned fifth position with MPS 33.75. Having milk pasteurization facility ranked sixth with MPS 32.08. Using social media on content creation for

knowledge sharing was assigned seventh position with MPS 28.75, Periodical animal health check-ups ranked eighth with MPS 27.91, CCTV monitoring was assigned ninth position with MPS 22.09 and vaccination of animals assigned tenth position with MPS 22.08, suggesting a gap in advanced or preventive measures. And the results of the same are presented in Table 3.

**Decision-Making Ability:** According to Table 4, in terms of decision making ability, fodder management was assigned first rank with MPS of

**Table 3: Innovativeness of Dairy farmers**

S.No	Statements	Total (n=120)	
		MPS	Rank
1	Closed circuit TV monitoring of dairy animals	22.09	IX
2	Use of sterilized scalpel cutting navel cord and application of disinfectant on the cut end of the navel cord	48.75	I
3	Selling dairy products and other farm products through online market places	37.91	II
4	Maintenance of breeding record	36.66	IV
5	Using social media on content creation for knowledge sharing	28.75	VII
6	Having milk pasteurization facility	32.08	VI
7	Having milk separation machines	36.66	IV
8	Having fat testing kit	37.08	III
9	Periodical animal health check-ups	27.91	VIII
10	Vaccination of animals	22.08	X
11	Selling remaining by-products of milk along with milk in local market	33.75	V

MPS=Mean Percent Score

**Table 4: Decision-making ability of Dairy Farmers**

S.No	Statements	Total (n=120)	
		MPS	Rank
1	Breed of milch animal to be purchased	59.16	II
2	Fodder management	70.00	I
3	Insurance of animals	55.08	III
4	Adoption of new practices/ideas/technologies	52.08	IV
5	Selection of breed for crossing	42.08	IX
6	Quantity of concentrate to be fed to milch animals	44.58	VI
7	Type of concentrate to be purchased	32.08	XI
8	Quantity of milk to be kept for household	46.66	V
9	Expansion of enterprise	42.5	VIII
10	Utilization of earned money	43.33	VII
11	Purchase and sale of animals	39.58	XI

MPS=Mean Percent Score

70.00. It was followed by the decision regarding breed of milch animal to be purchased, which was assigned second position with MPS of 59.16. Insurance of animals was placed at third rank with MPS of 55.08.

The decision regarding adoption of new practices, ideas or technologies was assigned fourth rank with MPS of 52.08. Quantity of milk to be kept for household use was ranked fifth with MPS of 46.66. Utilization of earned money was placed at sixth position with MPS of 43.33. Quantity of concentrate to be fed to milch animals was ranked seventh with MPS of 44.58. Purchase and sale of animals was assigned eighth rank with MPS of 39.58. Expansion of enterprise was ranked ninth with MPS of 42.50. Selection of breed for crossing was assigned tenth position with MPS of 42.08. The lowest ranked area of decision making was found to be type of concentrate to be purchased,

which was ranked eleventh with MPS of 32.08.

**Risk taking ability:** As clearly shown in Table 5 it is evident with regard to risk taking ability, the practice of handling large number of customers with fewer handlers was ranked first with MPS of 54.16. It was followed by higher investment of capital in dairy farming, which was placed at second position with MPS of 52.08. Investment in purchase of more animals was assigned third rank with MPS of 50.41. Trying entirely new practices in dairy enterprise to gain maximum profit was placed at fourth position with MPS of 45.41. The lowest ranked activity in this component was investment in purchase of equipments and machines for improving efficiency and quality of milk production, which was placed at fifth rank with MPS of 40.00.

**Ability to co-ordinate activities:** In terms of ability to coordinate, as shown in Table 6 the highest

**Table 5: Risk-Taking Ability of Dairy Farmers**

S.No	Statements	Total (n=120)	
		MPS	Rank
1	Handling large number of customers with less handlers	54.16	I
2	Higher investment of capital in dairy farming	52.08	II
3	Trying entirely new practices in dairy enterprise to gain maximum profit	45.41	IV
4	Investment in purchase of equipments and machines for improving efficiency and quality of milk production	40.00	V
5	Investment in purchase of more animals	50.41	III

MPS=Mean Percent Score

**Table 6: Ability to Co-ordinate activities of Dairy Farmers**

S.No	Statements	Total (n=120)	
		MPS	Rank
1	Co-ordination with feed supplier for uninterrupted and timely supply of feed	60.83	I
2	Co-ordination with veterinarian for health of animals	58.33	II
3	Co-ordination with concentrate supplier for uninterrupted and timely supply of concentrate	38.33	VIII
4	Co-ordination with sub-ordinates for healthy work environment and timely completion of work	32.50	IX
5	Co-ordination with customers for better marketing	41.66	VII
6	Co-ordination with financing institutes for obtaining loan	42.91	VI
7	Co-ordination with dairy experts for purchasing machines and equipments	43.75	V
8	Consulting veterinarian for purchasing new breeds of milch animals	50.83	III
9	Co-ordination with milk co-operatives for dairying facilities	45.83	IV

MPS=Mean Percent Score

ranked practice was co-ordination with feed supplier for uninterrupted and timely supply of feed, which was placed at first position with MPS of 60.83. It was followed by co-ordination with veterinarian for health of animals, which was ranked second with MPS of 58.33. Consulting veterinarian for purchasing new breeds of milch animals was placed at third position with MPS of 50.83. Co-ordination with milk co-operatives for dairying facilities was ranked fourth with MPS of 45.83. Co-ordination with dairy experts for purchasing machines and equipments was placed at fifth position with MPS of 43.75. Co-ordination with financing institutes for obtaining loan was ranked sixth with overall MPS of 42.91. Co-ordination with customers for better marketing was assigned seventh rank with MPS of 41.66. Co-ordination with concentrate supplier for uninterrupted and timely supply of concentrate was ranked eighth with MPS of 38.33. The lowest ranked practice was co-ordination with subordinates for healthy work environment and timely completion of work, which was placed at ninth position with MPS of 32.50.

**Scientific Orientation:** According to results presented in Table 7, with regard to scientific orientation, the highest ranked practice was establishing quarantine sheds for ill animals, which was placed at first position with MPS of 52.91. It was followed by practicing calf management by colostrum feeding, dehorning, vaccinating and deworming, which was ranked second with MPS of 51.66. Providing animals with a balanced diet based on their specific needs and life stage was ranked third with MPS of 51.60. Regular visits to established dairies for exposure of innovative ideas ranked fourth with MPS of 50.00. Detection of silent heat in cattle was assigned fifth position with MPS of 47.91. Adopting grazing systems like extensive, semi-intensive, and intensive systems was placed at sixth position with MPS of 47.08. Regular health check-ups to minimize disease outbreaks ranked seventh with MPS of 47.91. Milking animals in separate house was ranked eighth with MPS of 42.50. Providing a separate bull pen with service stall for breeding purposes was placed at ninth position with MPS of 40.00. Regularly disinfecting

**Table 7: Scientific Orientation of Dairy Farmers**

S.No	Statements	Total (n=120)	
		MPS	Rank
1	Timely vaccination for prevention of diseases	43.75	VII
2	Regular health check-up to minimize disease outbreaks	47.91	V
3	Providing animals with a balanced diet based on their specific needs and life stage	51.60	III
4	Milking animals in separate house	42.50	VIII
5	Adoption of milk pasteurization, cooling, storage, and transportation standards to maintain its quality and safety.	31.66	XII
6	Adopting grazing systems like extensive system, semi-intensive system and intensive system	47.08	VI
7	Providing a separate bull pen with a service stall for breeding purposes	40.00	IX
8	Establishing quarantine sheds for ill animals	52.91	I
9	Practicing calf management by colostrum feeding, dehorning, vaccinating and deworming	51.66	II
10	Regular visits to established dairies for exposure of innovative ideas	50.00	IV
11	Regularly contacting mass media for more information	37.50	X
12	Regularly disinfecting cattle shed by insecticides	35.83	XI
13	Always keep in touch with veterinarian for fertilization of animals	25.83	XIII

MPS=Mean Percent Score

cattle shed by insecticides was ranked tenth with MPS of 35.83. Regularly contacting mass media for more information was assigned eleventh rank with MPS of 37.50. Adoption of milk pasteurization, cooling, storage and transportation standards to maintain its quality and safety was ranked twelfth with MPS of 31.66. The lowest ranked activity was always keeping in touch with veterinarian for fertilization of animals, which was assigned thirteenth position with MPS of 25.83.

**Economic Motivation:** In terms of economic motivation, the most prioritized activity among dairyfarmers was making significant investments in livestock, infrastructure, and technology, which was ranked first with an MPS of 41.25. It was followed by focusing more on the sale of milk products and by-products rather than milk, which ranked second with MPS of 40.41. Keeping crossbreed cows or high milk-yielding breeds of buffaloes to increase

monetary profits by producing more milk was assigned third rank with MPS of 40.00. Making efficient use of resources such as labour, land, and capital was placed at fourth position with MPS of 39.16. Focusing on factors like milk quality, quantity, and price to earn more profit was ranked fifth with MPS of 38.75. The lowest ranked economic motivation was using new modern facilities for quality production, which was placed at sixth position with MPS of 36.66, in which both Girwa and Jhadol tehsils were recorded with equal MPS of 36.66, and the results are clearly presented in Table 8.

**Market Orientation:** As the result from Table 9 was analyzed with regard to market orientation, the most preferred behaviour was selling milk at a place which gives more money, which was ranked first with an MPS of 45.00. Analyzing and adapting to the actions of competitors was placed at second

**Table 8: Economic Motivation of Dairy Farmers**

S.No	Statements	Total (n=120)	
		MPS	Rank
1	Making significant investments in livestock, infrastructure, and technology	41.25	I
2	Focusing on factors like milk quality, quantity, and price to earn more profit	38.75	V
3	Making efficient use of resources, such as labor, land, and capital	39.16	IV
4	Using new modern facilities for quality production	36.66	VI
5	Keeping cross breed cows/high milk yielding breeds of buffaloes to increase monetary profits by producing more milk	40.00	III
6	More focus on sale of milk products and by-products rather than milk	40.41	II

MPS=Mean Percent Score

**Table 9: Market Orientation of Dairy Farmers**

S.No	Statements	Total (n=120)	
		MPS	Rank
1	Selling milk at place which gives more money	45.00	I
2	Selling products by considering demand and supply of milk and milk products in the market	42.08	IV
3	Maintaining the quality of milk and by products for better return	38.33	VI
4	Keeping yourself in touch with current market trend	35.41	VII
5	Analyzing and adapting to the actions of competitors	44.16	II
6	Understanding consumers preferences and requirements	42.91	III
7	Sale of quality and fresh products	42.08	IV

MPS=Mean Percent Score

rank with MPS of 44.16. Understanding consumer preferences and requirements was ranked third with MPS of 42.91. Selling quality and fresh products was assigned fourth position with MPS of 42.08. Selling products by considering demand and supply of milk and milk products in the market was ranked fifth with MPS of 42.08. Maintaining the quality of milk and by-products for better return was placed at sixth rank with MPS of 38.33. The lowest ranked market-oriented behaviour was keeping in touch with current market trends, which was placed at seventh position with MPS of 35.41

### CONCLUSION

Entrepreneurial behaviour is constituted of different components, in innovativeness use of sterilized scalpel for cutting navel cord and application of disinfectant was ranked highest with MPS 48.75 and vaccination of animals ranked lowest with MPS 22.08, it was found that in decision-making ability fodder management ranked highest with MPS 70.00 and type of concentrate to be purchased lowest with MPS 32.08. In risk taking ability handling of large customers ranked highest with MPS 54.16 and investment in purchasing equipments and machines ranked lowest with MPS 40.00. In co-ordination ability, co-ordination with feed supplier ranked highest with MPS 60.83, while co-ordination with subordinates ranked lowest with MPS 32.50 and in scientific orientation establishing quarantine sheds for ill animals ranked highest with MPS 52.91, while keeping in touch with veterinarian ranked lowest with MPS 25.83. It was found that in economic motivation making significant investments in livestock, infrastructure, and technology, which was ranked highest with an MPS of 41.25 and using modern facilities for quality production ranked lowest with MPS 36.66, and in market orientation selling milk at place which gives more money ranked highest with MPS 45.00 and keeping in touch with market trends ranked lowest

with MPS 35.41. Among overall entrepreneurial behavior decision making ability ranked highest with MPS 35.19 and economic motivation ranked the lowest with MPS 26.25.

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# ENTREPRENEURIAL COMPETENCY IN AGRICULTURE STUDENTS OF EXPERIENTIAL LEARNING PROGRAMME IN RAJASTHAN

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## ABSTRACT

The study explores Entrepreneurial competency among agriculture students of Sri Karan Narendra Agriculture University, Jobner through Experiential Learning Programme (ELP) by analyzing responses from 142 undergraduate students. Among the parameters chosen for entrepreneurial competency of ELP, nearly sixty per cent of the undergraduate students had a medium level of innovativeness. It might be due to medium awareness and knowledge about ELP tools. It can also be explained from the data that sixty per cent of respondents had medium level of risk orientation and general skills whereas, rest of them expressed high and low level of risk orientation and general skills. The study exposed that the entrepreneurial competencies in experimental group were at medium level.

## INTRODUCTION

The study was conducted in four constituent colleges viz., SKNCOA Jobner (Jaipur), COA Lalsot (Dausa), COA Fatehpur-Shekhawati (Sikar) and COA Kumher (Bharatpur) of Sri Karan Narendra Agriculture University, Jobner during their participation in the Experiential Learning Programme (ELP). Experiential Learning Programme (ELP) students are the key and future human resources for agricultural teaching, research, extension work and entrepreneurship. The present study is an attempt to explore Entrepreneurial competency among agriculture students of SKNAU, Jobner through ELP. The results of the study have served to evolve guidelines for the authorities to take appropriate action to improve upon the deficiencies. The outcome of the study is practically useful, as the number of Experiential Learning Programme (ELP) students an increasing over the period in Rajasthan state. The results are helpful for the planners and administrators to formulate suitable programmes and design appropriate strategies for developing exploring Entrepreneurial competency among agriculture students. Since no such effort has been made in the past to undertake such study in this area, and the

study has suggested some measures to improve the competencies of the students for agricultural entrepreneurship.

## RESEARCH METHODOLOGY

An ex-post-facto design was adopted to study the outcomes after the intervention had taken place. The study was conducted in four constituent colleges viz., SKNCOA Jobner (Jaipur), COA Lalsot (Dausa), COA Fatehpur-Shekhawati (Sikar) and COA Kumher (Bharatpur) which directly comes under the administrative jurisdiction of Sri Karan Narendra Agriculture University, Jobner. The students who were registered in the ELP Programme during the academic session 2021-22 were taken for the study so that after completing their degree they have sufficient time to start any enterprise.

**Sampling procedure:** Selection of Colleges: Out of four constituent colleges of SKNAU, Jobner which had conducted ELP programme during the academic session 2021-22, Two Colleges, one having maximum number and second having minimum number of students registered in the ELP programme were selected for the study.

Thus, SKNCOA, Jobner (Jaipur) having maximum number of students i.e. 114 and COA,

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Kumher (Bharatpur) having minimum number of students i.e. 28 were selected for the present study.

**Selection of respondents:** The selection of these students depends on dependent Variable of Entrepreneurial competency refers to the skills, knowledge and abilities required to successfully start, run and grow a business or venture. The structured schedule consisting of a set of four cross culturally valid entrepreneurial characteristics for superior performance viz., Innovativeness, Risk orientation, General skills and Persistence were taken into consideration.

The schedule prepared for each of 4 competencies had five statements, among each 5 statements one was negative and other four were positively stated. The respondents responses were scored on a 5-point continuum with very well= 5 score, well= 4 score, somewhat= 3 score, very little= 2 score and not at all= 1 score for positive statements and reverse scoring for negative statement. Thus, maximum score for each of the 4 competencies was 25 and minimum score was 5. And the respondents for each of 4 competencies were categorized in same manner into five categories grouped in three categories on the basis of Mean  $\pm$  SD.

S.No.	Category	Score
1	Low	Up to 70
2	Medium	71-90
3	High	Above & 91

## RESULTS AND DISCUSSION

Entrepreneurship is the creative response to an environment that combines innovativeness, readiness to take risk, sensing opportunities, heightened initiative, standard of excellence, persistence in

achieving goals, positive orientation to problem solving and constant striving for growth and excellence. When all those attributes are developed in one person, the person can be successful in any field of activity such as industry, business, education, public or professional bodies etc. (Mitchelmore and Rowley 2010).

**Innovativeness:** The study reveals that nearly sixty per cent of the respondents had a medium level of innovativeness. It might be due to medium awareness about ELP. Due to lack of entrepreneurial competency, many agricultural graduate students are not in position to take advantages of agricultural enterprise for their self-employment.

**Risk orientation:** The study indicates that 61.97 per cent of respondents had medium level of risk orientation whereas, 19.72 per cent of them had high and 18.31 per cent of them had low level of risk orientation.

**General skills:** The study discloses that 56.34 per cent of respondents had medium level of general skills whereas, 23.94 per cent of them had high level of general skills and about one fifth (19.72%) indicated low level of general skills.

**Persistence:** The study concludes that 52.11 per cent of respondents had medium level of persistence, whereas 36.62 per cent of them had high and 11.27 per cent of them had low level of persistence.

The findings of Donald (2014), Singh (2016), Otekunrinand Leah (2017), Kris and Kristjan (2017), Kumar (2017), Schneider (2017), Shahiwala (2017), Mahadalle and Kaplan (2017), Modak (2018), Bindiya (2018), Sundaram (2020) Chaithrashree et al. (2020) and Mahmood *et al.* (2021) were also on similar trend.

**Table 1. Constituent colleges of SKNAU, Jobner where ELP was conducted**

S. No.	Name of constituent colleges	Number of students conducting ELP programme during 2021-22
1.	SKNCOA, Jobner (Jaipur)	114
2.	COA, Lalsot (Dausa)	49
3.	COA, Fatehpur- Shekhawati (Sikar)	54
4.	COA, Kumher (Bharatpur)	28

**Table 2. Distribution of respondents according to their Innovativeness, Risk orientation, General skills and Persistence(n=142)**

S. No.	Innovativeness	Number of respondents	Percentage
1.	Low (up to 12)	30	21.13
2.	Medium (13 to 19)	86	60.56
3.	High (Above 19)	26	18.31
<b>Total</b>		<b>142</b>	<b>100</b>
<b>Mean = 15.099, SD = 3.4277</b>			
<b>Risk orientation</b>			
1.	Low (up to 13)	26	18.31
2.	Medium (14 to 19)	88	61.97
3.	High (Above 19)	28	19.72
<b>Total</b>		<b>142</b>	<b>100</b>
<b>Mean = 15.732, SD = 2.8357</b>			
<b>General skills</b>			
1.	Low (up to 35)	28	19.72
2.	Medium (36 to 47)	80	56.34
3.	High (Above 47)	34	23.94
<b>Total</b>		<b>142</b>	<b>100</b>
<b>Mean = 40.88, SD = 5.72</b>			
<b>Persistence</b>			
1.	Low (up to 2)	16	11.27
2.	Medium (3 to 4)	74	52.11
3.	High (Above 4)	52	36.62
<b>Total</b>		<b>142</b>	<b>100</b>
<b>Mean = 3.4296, SD = 0.9557</b>			

**Table 3: Distribution of respondents based on overall entrepreneurial competency of Agriculture students(n=142)**

S. No.	Category	Number of respondents	Percentage
1.	Low (up to 70)	29	20.42
2.	Medium (71-90)	86	60.56
3.	High (Above & 91)	27	19.01
<b>Total</b>		<b>142</b>	<b>100</b>
<b>Mean-80.566, SD- 10.237</b>			

**Overall entrepreneurial competency of Agriculture students:** The data reveal that 60.56 per cent of respondents had medium level of overall entrepreneurial competency whereas, 20.42 per cent of them had high and 19.01 per cent of them had low level of overall entrepreneurial competency. Consequently, it can be concluded that maximum number of the respondents were in medium overall entrepreneurial competency category.

The knowledge of entrepreneurial competency parameters in agriculture students helps in

understanding the entrepreneurship choice behavior of the Experiential Learning Programme (ELP) students as well as to enable counselors them to formulate an effective Experiential Learning Programme (ELP). Study will also help the academic and policy makers to make marked improvement in the Experiential Learning Programme (ELP) of undergraduate agriculture colleges.

## CONCLUSION

Among the parameters chosen for entrepreneurial competency of ELP, revealed that

nearly sixty per cent of the undergraduate students of agriculture had a medium level of innovativeness, risk orientation and general skills. It might be due to medium awareness, medium knowledge about ELP tools.

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## **CONSTRAINTS FACED BY THE SHG MEMBERS IN SAURASHTRA REGION OF GUJARAT**

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### **ABSTRACT**

The self-help group (SHG) approach is a new paradigm into the field of rural development which main objectives are to increase the well-being of the poor people, provide access to resources and credit, increase self-confidence, self-esteem and increase their creditability in all aspects of lives. The lack of information regarding online purchasing and selling system was the most severe constraint encountered by the majority of the SHG members. Besides, transportation facilities are not adequate was severe constraints experienced by the SHG members. The problems like lack of information about demand of consumers, contradiction in decision taking among the SHG members, family issues and personal problems, lack of cooperation among all women members were less severe problems faced by the SHG members.

### **INTRODUCTION**

Self-Help Group is a small voluntary association of poor people preferably the same socio-economic back drop. The micro- credit given to them to start enterprises and it can be for all women group and all men group. However, it has been the experience that women's groups perform better in all the important activities of SHGs. SHG is a medium for the development of saving habit among the women.

Self-Help Groups are informal associations of people who choose to come together to find ways to improve their living conditions. They help to build social capital among the poor, especially women.

The most important functions of a Self-Help Groups are (a) to encourage and motivate its members to save (b) to persuade them to make a collective plan for generation of additional income (c) to act as a conduit for formal banking services to reach them. Such groups work as a collective guarantee system for members who propose to borrow from organized sources. Consequently, Self-Help Groups have emerged as the most effective mechanism for delivery of micro-finance services to the poor. The range of financial services may include products such as deposits, loans, money

transfer and insurance. (Anon., 2017b)

### **Guiding principles for formation of the SHG**

1. Effort is built on mutual trust and mutual support.
2. Every individual is equal and responsible.
3. Every individual is committed to the cause of the group.
4. Decision is based on the principles of consensus.
5. The belief and commitment by an individual that through the group their standard of living will improve.
6. Savings is the foundation on which to build the group for collective action.

### **Some characteristics features of the SHG**

- a. The SHG is generally an economically homogeneous group formed through a process of self-selection based upon the affinity of its members.
- b. Most of the SHGs are women's groups with membership ranging between 10 and 20.
- c. SHGs have well-defined rules and regulation, hold regular meetings and maintain records and savings and credit discipline.

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- d. SHGs are self-managed institutions characterized by participatory and collective decision making.

### RESEARCH METHODOLOGY

180 SHG women members were selected from 18 villages of the 6 talukas of Junagadh and Rajkot districts of Saurashtra region by employing multistage sampling technique. An interview schedule was developed in accordance with the objectives of the study and it was pre tested and translated into Gujarati. The data of this study were collected with the help of structural interview schedule. The collected data were classified, tabulated, analyzed and interpreted in order to make the findings meaningful. The statistical measures such as percentage, mean, mean per cent score, standard deviation, correlation co-efficient and Z test were used in the study.

### RESULTS & DISCUSSION

Women in SHG were challenged in diverse ways. The groups identified numerous challenges and hurdles which make their activities difficult. The causes of the problems may arise from within the family or their own organization (SHG) or emanate from out of the external environment and their community. An inventory of 20 statements that affect the performance of SHGs and become obstacles in effective functioning of the SHG was used to measure the constraints level. Respondents were asked to give their response on four point continuum most severe, severe, less severe and not at all.

It is evident from the data incorporated in Table 1 that the lack of information regarding online purchasing and selling system was the most severe constraint encountered by the majority of the SHG members and was ranked first by the SHG women

**Table 1 : Constraints faced by the SHG women members**

(n = 180)

Sr. No.	Constraints	Score	MPS	Rank
1	Problem in getting loan	349	64.62	VI
2	Inadequate information about loan repayment and interest rate	348	64.44	VII
3	Lack of information about demand of consumers	177	32.77	XV
4	Family issues and personal problems	99	18.33	XVII
5	Lack of information about market opportunities	284	52.59	XI
6	Not getting training on management of SHG	184	34.07	XIV
7	Communication problem with bankers	315	58.33	IX
8	Lack of cooperation among all women members	84	15.55	XVIII
9	Lack of time because of other social responsibilities	263	48.70	XII
10	Non availability of the raw material	387	71.66	IV
11	Lack of information regarding online purchasing and selling system	510	94.44	I
12	Transportation facilities are not adequate	490	90.74	II
13	Sometime marketing is difficult work	429	79.44	III
14	Lack of information about new occupation suitable to their socio-economic condition	383	70.92	V
15	Unaware about the rules and regulation of the bank	341	63.14	VIII
16	Lack of perfection in management part	284	52.59	XI
17	Contradiction in decision taking among the SHG members	117	21.66	XVI
18	Opening the account in bank is tedious for us	214	39.62	XIII
19	Lack of machinery and equipments	348	64.44	VII
20	Competition for selling the products in market is very high	297	55.00	X
	<b>Total</b>	<b>5897</b>		

MPS = Mean per cent score

members. Besides, transportation facility are not adequate was severe constraints perceived by the SHG members and was ranked second by the respondents. The next most important constraint faced by the SHG members was sometime marketing is difficult was ranked third by the SHG women members. Non availability of the raw material was another serious constraint was ranked fourth by the respondents followed by lack of information about new occupation suitable to their socioeconomic condition was ranked fifth by the SHG members.

Table 1 further shows that problem in getting loan and inadequate information about loan repayment and interest rate were also another serious constraints faced by the SHG members and ranked sixth and seventh by the respondents, respectively. While, problem of lack of machinery and equipments was also ranked seventh by the respondents.

Whereas, the other constraints in descending order of their magnitude were related to unaware about the rules and regulation of the bank, communication problem with bankers were ranked eighth and ninth by the SHG members.

Moreover, competition for selling the products in market is very high, lack of information about market opportunities and lack of perfection in management part, lack of time because of other social responsibilities, the opening the account in bank is tedious job and the next important problem was not getting training on management of SHG were ranked 10<sup>th</sup>, 11<sup>th</sup>, 12<sup>th</sup>, 13<sup>th</sup> and 14<sup>th</sup> by the respondents.

The constraints like lack of information about demand of consumers, contradiction in decision taking among the SHG members, family issues and personal problems, lack of cooperation among all women members were less severe problems faced by SHG women members and were ranked 15<sup>th</sup>, 16<sup>th</sup>, 17<sup>th</sup> and 18<sup>th</sup>, respectively.

This finding is in line with the findings of Parmar (2014) and contradict with the finding of Minimol and Makesh (2012).

## CONCLUSION

It can be concluded that that lack of information regarding online purchasing and selling system and problem of the transportation facility were the most severe constraints faced by the SHG women members. The probable reason might be that respondents were not well acquainted to online system and it might be difficult for them and because of the lack of resources for purchasing the vehicle for transportation require heavy investment.

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# **CORRELATION BETWEEN PERSONAL AND SOCIO-ECONOMIC CHARACTERISTICS AND ATTITUDE OF MANGO ORCHARDISTS TOWARDS ECO-FRIENDLY MANAGEMENT PRACTICES OF MANGO**

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## **ABSTRACT**

The present study was conducted in Ratangiri and Sindhudurg districts of south Konkan in Maharashtra by interviewing 200 mango growers. The relationship between personal and socio-economic characteristics and attitude of mango orchardists towards eco-friendly management practices of mango was found non-significant while multiple regressions also found non significant means some other variables play role in influencing the dependent and independent variables. The value of coefficient of multiple determinations (R<sup>2</sup>) in case of total respondents was 0.0820 indicating thereby that 8.20 per cent variation in attitude towards eco-friendly management practices is explained by eleven independent variables under the study.

## **INTRODUCTION**

The increase or decrease in one variable is accompanied by an increase or decrease in the other variable, the two are said to be correlated and the phenomenon is known as correlation. Correlation coefficient is a measure of the relationship between two variables which are at the interval or ratio level of measurement and are linearly related. Multiple correlation coefficient measures the combined relation between a dependent and a series of independent variables while steps wise multiple regression analysis is to insert variables in turn until regression equation is satisfactory.

Generally attitude of the person is depending on the personal and socio-economic characteristics of the person. Here, personal and socio-economic characteristics and attitude of mango orchardists towards eco-friendly management practices of mango is taken for observing the relation between them. It is assumed that the mango orchardist have positive attitude toward eco-friendly management practices and certain relationship with their characteristics. Keeping this in view the present study was conducted with following objectives.

1. To study the relationship between personal and socio-economic characteristics and attitude of mango orchardists towards eco-friendly management practices of mango
2. To study the extent of contribution of independent variables in dependent variable.

## **RESEARCH METHODOLOGY**

The present study was conducted in Ratangiri and Sindhudurg districts of south Konkan in Maharashtra. The two districts, four tehsils and 20 villages were selected on the basis of maximum area under mango cultivation. Ten mango orchardists were selected randomly from each village. Total 200 mango orchardists were interviewed with special designed interview schedule. The statistical tools like correlation coefficient and multiple regressions were used. To find out the relationship between personal, socio-economic, psychological and communication variables of respondents *viz.*, age, education, area under mango, experience in mango cultivation, annual income, yield of mango, scientific orientation, market orientation, innovativeness, information seeking behaviour and knowledge about ill effect

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of pesticides & chemical fertilizers and attitude of mango orchardist towards eco-friendly management practices of mango, correlation coefficient was applied. Multiple regressions were applied for the study of extent of contribution.

## RESULTS AND DISCUSSION

The results are presented as below:

**1. Relationship between personal and socio-economic characteristics and attitude of mango orchardists towards eco-friendly management practices of mango:** For finding out the relationship of the independent variables with the dependent variables, correlation coefficient (r) was worked out. The selected variables and their relationship with dependent variable are shown in table 1.

From Table 1, it is seen that relation between independent variables like age, education, area under mango, experience in mango cultivation, annual income, yield of mango, scientific orientation, market orientation, innovativeness, information seeking behaviour and knowledge about ill effect of pesticides & chemical fertilizers were not significantly related with attitude towards eco-friendly management practices.

A non-significant relationship between age and attitude towards eco-friendly management practices means that while farmers of all age may hold varied opinion, age is not the primary predictor of whether farmers embraces or reject these practices.

In essence, while education is an important input for shaping attitude, it is not the sole determinant. For a positive and significant relationship to emerge education must be integrated with other influencing factors like economic incentives, effective extension services and community based approaches to create a holistic change in attitude and practices.

A non-significant relationship between area under mango cultivation and attitude towards eco-friendly management practices could be due to farmers in large scale cultivation focusing on economic gains over environmental concerns or a lack of awareness, training or practical support for sustainable methods even in extensive areas.

The non-significant relationship between experience in mango cultivation and attitude towards eco-friendly management practices arise because experience does not always translate to awareness or acceptance of sustainable practices, as far farmers may prioritize short term gains, lack of information on new technique or face socio-economic barriers

**Table 1. Relationship between personal and socio-economic characteristics and attitude of mango orchardists towards eco-friendly management practices of mango**

Sl. No	Independent and dependent variables	Correlation coefficient (r)
1.	Age and Attitude	0.074102 NS
2.	Education and Attitude	0.047397 NS
3.	Area under mango cultivation and Attitude	0.021874 NS
4.	Experience in mango cultivation and Attitude	0.058498 NS
5.	Annual income and Attitude	0.060323 NS
6.	Yield of mango and Attitude	0.111143 NS
7.	Scientific orientation and Attitude	0.057693 NS
8.	Market orientation and Attitude	-0.00889 NS
9.	Innovativeness and Attitude	0.123269 NS
10.	Information seeking behaviour and Attitude	0.140895 NS
11.	Knowledge about ill effects of pesticides and, chemical fertilizers and Attitude	0.19435 NS

NS : Non Significant

to change. For instance, experienced farmers might have deeply ingrained conventional practices and these might be acknowledge gap regarding the long term benefits of eco-friendly methods, even if they are aware of some risk.

A non-significant relationship between annual income and attitude towards eco-friendly management practices may occur because farmer's perception of sustainable practices is often influenced more by other factors like perceived benefits, access to information and resources, socio-cultural norms and government support, rather than solely by financial capacity. Higher income does not automatically translate to eco-friendly practices; a farmer with a lower income might still prioritize sustainable methods for long term soil health and environmental conservation, while a wealthier farmer may not, especially if there are insufficient incentives or knowledge.

A non-significant relationship between yield of mango and attitude towards eco-friendly management practices could be due to farmers not fully understanding or implementing these practices correctly, other more significant factors influencing yield (like climate or input cost), the short time frame for effects to become apparent, or the complex interplay of multiple factors that outweigh individual attitudes. Also the perception of profitability and the actual implementation of the practices are distinct factors, where good intentions do not always translate into practice.

A non-significant relationship between scientific orientation and attitude towards eco-friendly management practices can be due to factors such as lack of practical application, high costs associated with new technologies, insufficient training and knowledge dissemination, farmer's primary focus on economic returns over environmental benefits and the influence of socio-cultural factors or personal norms that may override scientific knowledge. It could also be that the existing scientific orientation or the eco-friendly practices are not perceived as directly beneficial or applicable to the specific challenges and context of local mango farming

practices, such as water management or pest control.

Non significant relationship between market orientation and attitude towards eco-friendly management practices can occur if farmers perceive high costs and risks associated with eco-friendly practices without clear market incentives, if traditional marketing practices take precedence over sustainability in their decision making. Other factors such as limited financial resources, the immediate need to address production or market constraints and a lack of supportive policies can also hinder the adoption of sustainable practices despite a market orientated approach, leading to this disconnect.

A non-significant relationship between innovativeness and attitude towards eco-friendly management practices could be due to a lack of awareness, a lack of perceived benefit, financial constraints, lack of local support or infrastructure or the existence of traditional, effective practices that are not considered innovative. While innovativeness is often linked to the adoption of new ideas, it may not translate into a positive attitude if the eco-friendly practices themselves are not perceived as relevant, beneficial or feasible by the mango growers.

A non-significant relationship between information seeking behaviour and attitude towards eco-friendly management practices could be due to factors like perceived lack of practical benefit despite seeking information, high adoption cost, lack of trust in information sources, weak perceived control over implementing practices, or the influence of other socio-economic and institutional factors that outweigh knowledge acquisition. Farmers may seek information for other reasons, such as curiosity or meeting immediate need, but not necessarily to change their core attitudes or practices.

The reason why the knowledge about ill effect of pesticides and chemical fertilizer may not strongly correlate with attitude towards eco-friendly management practices is due to a lack of supportive factors, including insufficient information dissemination, economic pressures favouring

traditional methods weak extension services, insufficient technical expertise in alternatives and the influence of commercial interests prioritizing profit over sustainability. Farmer's knowledge alone does not translate to attitude when other barriers hinder sustainable practices.

**2. Extent of contribution of independent variables in dependent variable:** To know the functional relationship of the dependent variables, the regression analysis was worked out. The step down regression was used to know the dominant variable in the study. The coefficient of multiple determinations ( $R^2$ ) was calculated for knowing the joint effect of dependent variables in the dependent variables. Multi-variable relationship between personal and socio-economic characteristics and attitude of mango orchardists towards eco-friendly management practices of mango are shown in Table 2.

The data from Table 2, it is seen that regression coefficient of the variables like area under mango cultivation, experience in mango cultivation, total annual income and market orientation were negatively non significant with attitude towards eco-friendly management practices of mango. The variables like age, education, yield of mango, scientific orientation, innovativeness, information seeking behaviour and knowledge about ill effects of pesticides and chemical fertilizers were non-

significant towards eco-friendly management practices of mango.

A negatively non significant relationship between an independent variables and attitude towards eco-friendly management practices of mango can occur because the true effect is too small to be detected, the sample size is too small, attitude behaviour gaps limit the correlation, multicollinearity issues distort the results or there are issues with how attitude or the dependent variable were measured, reducing precision.

A non-significant statistical result between an independent variables and attitude indicates the independent variables does not reliably influence or explain changes in attitude in given study, often due to factors like small sample sizes, flawed research design, poorly measured variable or the presence of confounding factors that mask the true relationship. Other possible reasons include the variable being genuinely unrelated to the attitude or the relationship being too weak or complex to detect with the current study's methodology

The value of coefficient of multiple determinations ( $R^2$ ) in case of total respondents was 0.0820 indicating thereby that 8.20 per cent variation in attitude towards eco-friendly management practices is explained by eleven independent variables under the study.

**Table 2. Multi-variable relationship between personal and socio-economic characteristics and attitude of mango orchardists towards eco-friendly management practices of mango**

Sl. No	Independent and dependent variables	Regression coefficient (r)
1.	Age and Attitude	0.08268
2.	Education and Attitude	0.007196
3.	Area under mango cultivation and Attitude	-0.07186
4.	Experience in mango cultivation and Attitude	-0.0154
5.	Annual income and Attitude	-0.78929E
6.	Yield of mango and Attitude	0.7345
7.	Scientific orientation and Attitude	0.08984
8.	Market orientation and Attitude	-0.1241
9.	Innovativeness and Attitude	0.4069
10.	Information seeking behaviour and Attitude	0.1085
11.	Knowledge about ill effects of pesticides and, chemical fertilizers and Attitude	0.5871
	<b><math>R^2</math></b>	<b>0.0820</b>

## CONCLUSIONS

The relationship between personal and socio-economic characteristics and attitude of mango orchardists towards eco-friendly management practices of mango was found non-significant while multiple regressions also found non significant means some other variables play role in influencing the dependent and independent variables.

The value of coefficient of multiple determinations (R<sup>2</sup>) in case of total respondents was 0.0820 indicating thereby that 8.20 per cent variation in attitude towards eco-friendly management practices is explained by eleven independent variables under the study.

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## EFFICACY OF PYROCLOSTROBIN 13.3%+EPOXYCONAZOLE 5% AGAINST CUMIN BLIGHT (*Alternaria burnsii*)

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### ABSTRACT

Front line demonstration is an appropriate means for demonstration as well as transfer of improved agricultural innovations to the farming community. A field experiment on the efficacy of Pyroclostrobin 13.3%+Epoxyconazole 5% against cumin blight was conducted at farmers as well as the instructional farm of Krishi Vigyan Kendra, Nagaur-II to find out the bio-efficacy of Pyroclostrobin 13.3%+Epoxyconazole 5% @ 1ml/lit. Experiments were conducted against the cumin blight during rabi season in both years. Experiment was completed with two treatments T1: Carbendazim 12 + Mancozeb 63% @ 2g/litre and T2 Pyroclostrobin 13.3%+Epoxyconazole 5% @ 1ml/litre of water. The incidence of blight appeared in the last week of January and reached its peak in the second week of February. The minimum disease intensity of cumin blight was found in the T2 (Pyroclostrobin 13.3%+Epoxyconazole 5% @ 1.5 ml/liter of water) with 5.00 percent, while 40.00 per cent disease intensity was observed in T1 (Carbendazim 12 + Mancozeb 63 % @ 2g/liter). The economic yield of cumin was maximum increased in T2 with 8.90 q/ha it is higher as compared to T1.

### INTRODUCTION

Cumin (*Cuminum cyminum* L.) is an economically prime seed spice and it is mostly cultivated in India, Syria, United Arab Emirates, Turkey, Iran, Pakistan, Egypt and Italy. India is estimated to produce 70% and more cumin of the world. Area under cumin cultivation in India is 10.36 lakh ha with production of 7.25 lakh tonnes and productivity of 634.98 kg/ha (Anonymous 2022). In Rajasthan, cumin is grown during rabi season which is a good source of financial earnings to the farmers. It is mainly grown in Barmer, Jodhpur, Jalore, Jaisalmer and Nagaur districts. Cumin cultivated in an area of 6.09 lakh ha and gave production of 3.03 lakh tonnes with average productivity of 457.57 kg/ha (Anonymous 2022).

Cumin suffers from several pathogens, which adversely affect the economic yield of farmers (Dange 1995, Sharma *et al.* 2010). The vascular

wilt caused by *Fusarium oxysporum* sp. *cumini*, powdery mildew caused by *Erysiphe polygoni* and alternaria blight caused *Aternaria burnsii* are major cumin diseases and occur in moderate to severe form in farmer's field of Rajasthan reported by Sharma *et al.*, (2013). The second most devastating disease of cumin is blight which is caused by *Alternaria burnsii* and is an accountable disease which causes economic yield losses of up to 70% (Holliday 1980). Cumin blight was first time seen in India in Gujarat by Uppal *et al.*, (1938), and in Rajasthan by Joshi (1955). Alternaria blight caused by *A. burnsii* is one of the most dreaded diseases and a major production constraint for the successful cultivation of cumin crop. The disease is now widespread in all the cumin-growing states of India as well as in Pakistan (Shakir *et al.*, 1995). The blight pathogen *A. burnsii* is internally and externally seed-borne (Swarup and Mathur, 1972). The disease leads to serious yield losses under favourable

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weather conditions (Patel and Desai, 1971). Seed losses to the extent of 83 per cent due to blight have been reported. Persistent cold and cloudy weather are congenial for blight development (Gemawat and Prasad, 1969, Bhatnagar *et al.*, 1995).

Cumin is popularly used for flavouring food and as herbal medicine and culinary for flavouring vegetables, pickles, soups, etc. Its seeds contain 17.7 per cent protein, 23.8 per cent fat, 35.5 per cent carbohydrates and 7.7 per cent minerals. In addition, cumin seeds also contain 6.2 per cent moisture, 0.09 per cent calcium, 0.45 per cent phosphorus, 0.048 per cent iron, 1.6 per cent sodium, 2.1 per cent potassium and also vitamins B1, B2, niacin, vitamin A, vitamin C etc. (Shankaracharya and Natrajan, 1971; Chadha, 2006). Cumin seeds are aromatic and nutty-flavoured. Volatile oil from cumin seeds is used in the perfumery, liquor, flavouring and cardinals and it is known to have stimulatory, carminative, stomatic, antidiarrheal and dyspepsia medicinal properties (Patel, 1993).

### RESEARCH METHODOLOGY

The investigations on "Management of blight, *Alternaria burnsii* infesting cumin" was conducted during the Rabi season of 2021-22 and 2022-23 at farmers' field. Two fungicidal treatments (T1: Carbendazim 12 + Mancozeb 63 @ 2g/litre and T2: Pyraclostrobin 13.3% + Epoxiconazole 5% @ 1.5 ml/liter of water) were tested against the A. blight. The fungicides were applied twice at 15 days intervals from disease initiation. Observations from vegetative to maturity stage were regularly observed and mean data was prepared. Data were recorded on blight, the number of infected plants, and no. of healthy plants. The economical yield was also recorded in both treatments.

Per cent disease incidence =

$$\frac{\text{Number of rotted plants}}{\text{Total number of plants}} \times 100$$

Increase in grain yield =

$$\frac{\text{Grain yield from improved technology plot} - \text{Grain yield from farmer plot}}{\text{Grain yield from farmer plot}} \times 100$$

**Table 1. Details of Trial**

Parameter	Details
Crop	Cumin
Season	Rabi, 2021-22 & 2022-23
Variety	GC-4
Soil type	Sandy soil
Replications	10
Plot size	0.4 ha
Location	Agoonta, Bugatpura

### RESULTS & DISCUSSION

The disease intensity was significantly affected by the fungicides. *Alternaria* blight severity was significantly reduced by the Pyraclostrobin 13.3% + Epoxyconazole 5% @ 1.5 ml/liter of water. The severity ranged from 9 to 40 per cent. The lowest disease infestation (9%) was observed in T2 while the maximum severity (40%) was recorded in T1. The maximum seed yield of cumin was observed in T2 (7.5q/ha) whereas the lowest in T1 (5.9). Gohel and Gohel (2023) conducted an experiment on chemical management of cumin blight and found that thiram 75 WS @ 3 g/kg as a seed treatment then after foliar spraying of fungi-toxicant combo product metiram + pyraclostrobin or fluxapyroxad + pyraclostrobin as three foliar spray at 15 days' gape were found highly effective against cumin blight and also recorded the highest cost-benefit ratio. Sharma and Lekha (2023) reported that combo of Tebuconazole + Trifloxystrobin @ 500 g/ha and Pyraclostrobin + Epoxiconazole @ 500 ml/ha were highly effective to eliminates the important threat i.e. *Alternaria* leaf spot of sesame. In this study, combo-product of Pyraclostrobin + Epoxiconazole @ 750 ml/ha effectively reduced cumin blight (76-80%) and found most effective. Kakraliya *et al.* (2021) tested

**Table 2. Details of Treatment**

Treatment	Detail	Dose
T1	Carbendazim 12% + Mencozeb 63%	2g/liter water
T2	Pyroclostrobin 13.3% + Epoxyconazole 5%	1.5 ml/lit. water

**Table 3. Effect of fungicide on blight disease of cumin under field condition**

Treatment	Percent Disease Incidence	Yield q/ha	%Increase in yield over control
T1- Carbendazim 12% + Mencozeb 63%	40	5.9	-
T2- Pyroclostrobin 13.3% + Epoxyconazole 5%	9	7.5	27

different fungi-toxicants under lab and field conditions for the control of cumin blight and found that Azoxystrobin and propiconazole recorded minimum disease and found most effective against cumin blight. But looking the circumstances of chemical pesticides residues on cumin seed for export promotion, combo-product of Pyraclostrobin + Epoxiconazole @ 750 ml/ha and is recommended to farmer community for the management of cumin blight.

### CONCLUSION

It may be concluded that foliar application of Pyroclostrobin 13.3%+Epoxyconazol 5% @ 1.5 ml/liter of water reduces the severity of *Alternaria* blight and increased the seed yield of cumin.

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## **CONSTRAINTS FACED BY FARMERS IN ADOPTION OF CROP DIVERSIFICATION IN SOUTHERN RAJASTHAN**

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and Kapil Dev Ameta\*\*\*\*\***

### **ABSTRACT**

The diversification in agriculture helps to avoid risk and uncertainty due to climatic and biological vagaries. It minimizes the adverse effects of the current system of crop specialization and monoculture for better resource use, nutrient recycling, minimizing risks and uncertainty and better soil conditions. The study was conducted in Udaipur and Salumber districts of southern Rajasthan. The study was undertaken to identify the constraints faced by respondents in adoption of crop diversification intervention. In southern Rajasthan Udaipur and Salumber districts were selected and out of these ten villages were selected for study because respondents were beneficiary of the pilot project on crop diversification. Thus, 120 respondents were personally interviewed with the help of a well structured interview schedule. It was observed that the most prominent category of constraints faced by the respondents was "Other farming constraints," which attained first rank. The second major constraint category was "Ecological constraints," with second rank. "Marketing constraints" ranked third and "Production constraints" were ranked fourth.

### **INTRODUCTION**

Small and marginal farmers form the backbone of rural India, making up 85.00 per cent of the farming community but owning only 44.00 per cent of the total operational land. Enhancing the economic well-being of small and large farmers cannot be achieved through the cultivation of low-return crops like cereals or pulses alone. Hence, there is a need to shift the cropping pattern toward high-value crops, such as fruits, vegetables and spices—a strategy known as crop diversification. This approach aims to optimize the use of resources such as land and water, while promoting overall agricultural development.

Crop diversification offers farmers viable alternatives for cultivation, helping them mitigate risks. change, relying on a single crop makes farming systems more vulnerable. Introducing a mix of crops with different growing seasons and water requirements can help buffer against weather-related crop failures. Crop diversification helps to

identify the impact of physical and socio-economic conditions on the agriculture. Furthermore, it also helps us in knowing the contemporary competition among crop for area, for effect on double cropping, rotation, total production and per hectare productivity.

This practice serves as a sustainable alternative to conventional farming methods, ensuring stable employment, increased income, and responsiveness to shifting consumer demands. Crop diversification involves reallocating inputs among different crops based on their comparative advantage. In modern agriculture, this usually means transitioning from traditional low-value crops to those with higher economic returns. This method supports a comprehensive agricultural development model, enabling farmers to better withstand external shocks, thereby fostering self-reliance and sustainability. It addresses income instability and aligns with the World Trade Organization (WTO)-led multilateral trading framework, where price incentives influence

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production decisions. In response to global agricultural market demands and changing population needs, many south-east Asian countries have adopted crop diversification. Their focus has shifted towards cultivating high-value crops such as fruits, vegetables, and spices. This transition occurs either through expanding cultivation areas or replacing traditional crops. When properly implemented, diversification can raise farm income, create jobs, reduce poverty and conserve soil and water resources (Pingali and Rosegrant, 1995; Ramesh Chand, 1996).

## RESEARCH METHODOLOGY

The study was conducted in Udaipur and Salumber district of southern Rajasthan because the pilot project for crop diversification has run in these districts. Three tehsils from these districts were selected for study. Total 10 villages were selected from these tehsils. A total of 120 farmers were selected (beneficiary of project). The study relied primarily on primary data collected through personal interviews using a well structured and pre-tested interview schedule by researcher. There were four major constraints (Production related, marketing related, ecological constraints and other farming related constraints) included in the scale to measure constraints faced by respondents.

## RESULTS AND DISCUSSION

Overall analysis of data presented in Table 1 reveal that the average of perceived level of constraints respondents was 33.68 per cent. The data further reveal that majority of respondents (72.50%) were found in the middle constraint level followed by low (18.33%) and high level perceived (9.17%) in both districts. In Udaipur district majority

of respondents (60.00%) were found in the middle constraint level followed by low (18.33%) and high level (21.67%), respectively. In Salumber district majority of respondents (71.67%) were found in the middle constraint level followed by low (11.67%) and high level (16.67%), respectively.

**Constraints in adoption of crop diversification by respondents:** As described in Table 2 and 3, four constraints were studied among which highest ranked constraints was other farming constraints with total MPS of 55.47. This category scored 51.07 in Udaipur and 56.89 in Salumber. Next ecological constraints, which was ranked second and MPS of 54.90 comprising 54.27 from Udaipur and 56.98 from Salumber. Marketing constraints was placed at third rank and MPS was 51.20 based on values of 49.79 for Udaipur and 52.29 for Salumber and production constraints was ranked fourth with MPS of 50.32 for Udaipur 45.74 and Salumber 52.50.

## CONCLUSION

The average perceived level of constraints by respondents was 33.68 per cent. The data further revealed that majority of respondents (72.50%) were found in the middle constraint level followed by low (18.33%) and high level perceived (9.17%) in both districts. In Udaipur district majority of respondents (60.00%) were found in the middle constraint level followed by low (18.33%) and high level (21.67%), respectively. In Salumber district majority of respondents (71.67%) were found in the middle constraint level followed by low (11.67%) and high level (16.67%). It was observed that most prominent category of constraints faced by the respondents was "Other farming constraints," which

**Table 1: Constraint level of farmers**

S. No.	Constraints level	Udaipur (n <sub>1</sub> =60)		Salumber (n <sub>2</sub> =60)		Total (n=120)	
		f	%	f	%	f	%
1	Low	11	18.33	7	11.66	22	18.33
2	Middle	36	60.00	43	71.67	87	72.50
3	High	13	21.67	10	16.67	11	9.17
	Total	60	100.00	60	100.00	120	100.00

**Table 2: Constraints perceived by respondents in adoption of crop diversification**

S.No	Constraints	Udaipur (n <sub>1</sub> =60)		Salumber (n <sub>2</sub> =60)		Total (n=120)	
		MPS	Rank	MPS	Rank	MPS	Rank
<b>1.</b>	<b>Production related</b>						
1	Small land holding	55.00	1	71.67	1	63.33	1
2	Cash shortage when needed	50.00	2	65.83	2	57.92	2
3	Fertilizer and Plant protection chemicals not available on time	47.50	4	51.67	4	49.58	4
4	Un-fertile holding	49.17	3	49.17	5	49.17	5
5	Costly labour	45.00	5	55.83	3	50.42	3
6	Non-availability of skilled labour at operation period	39.17	11	42.50	10	40.83	10
7	Fluctuating production	40.00	9	45.83	8	42.92	9
8	Lack of irrigation facilities	43.33	7	43.33	9	43.33	8
9	Non-availability of quality seed and planting material	42.50	8	46.67	7	44.58	6
10	Less technical knowledge	44.25	6	48.83	6	43.67	7
11	Costly inputs	39.67	10	41.83	11	39.58	11
<b>2.</b>	<b>Marketing related</b>						
1	High transport charges and lack of all-weather roads	59.17	1	56.67	2	57.92	2
2	Distant markets	50.83	4	54.17	3	52.50	4
3	Lack of vehicles and non-availability in time	57.50	2	60.00	1	58.75	1
4	Fluctuating price	54.17	3	53.33	4	53.75	3
5	Inadequate storage facilities	46.67	5	49.17	6	47.92	5
6	Malpractices by traders at the time of auction	43.33	6	42.50	7	42.91	7
7	Lack of market intelligence	39.17	7	50.00	5	44.58	6
<b>3.</b>	<b>Ecological constraints</b>						
1	Loss of soil fertility	58.33	4	49.17	7	53.75	5
2	Soil erosion	45.83	7	56.67	4	51.25	6
3	Loss of water holding capacity	42.50	8	48.33	8	45.41	8
4	Loss of genetic diversity of planting material	46.67	6	50.83	6	48.75	7
5	Incidence of diseases and insect pests attack	55.00	5	54.17	5	54.58	4
6	Erratic rain fall	60.83	2	73.33	1	67.08	1
7	Irrigation water quality	65.83	1	60.83	3	63.33	2
8	Loss of soil organisms/ predator	59.16	3	62.50	2	60.83	3
<b>4.</b>	<b>Other farming related</b>						
1	Less experience in the field	49.17	5	50.00	7	49.58	6
2	No local processing facilities	61.67	1	65.83	3	63.75	1
3	Large initial investment needed	53.33	3	55.00	5	54.17	5
4	Lack of policy support	50.83	4	68.33	2	59.58	2
5	Wild animals menace	41.67	6	70.00	1	55.83	4
6	Lack of proper knowledge about the application of insecticides, pesticides and fertilizers	60.83	2	56.67	4	58.75	3
7	Costly inputs	40.00	7	53.33	6	46.66	7

MPS = Mean Per cent Score

**Table 3: Overall constraints perceived by farmers**

S. NO.	Constraints	Udaipur (n <sub>1</sub> =60)		Salumber (n <sub>2</sub> =60)		Total (n=120)	
		MPS	Rank	MPS	Rank	MPS	Rank
1	Production constraints	45.74	4	52.50	3	50.32	4
2	Marketing constraints	49.79	3	52.29	4	51.20	3
3	Ecological constraints	54.27	1	56.98	1	54.90	2
4	Other farming constraints	51.07	2	56.89	2	55.47	1

MPS = Mean Per cent Score

attained the highest overall MPS of 55.47, it means this is major problem for famers and "Production constraints" were ranked fourth with the lowest MPS of 50.32, it means production related problems are least in crop diversification. This research serves as a valuable reference for policymakers, extension workers, and agricultural planners aiming to bridge the gap between research and field-level adoption among spice crop cultivators in Rajasthan.

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# PERSONAL PROFILES OF INSURED LOANEE FARMERS OF NAIS AND WBCIS FOR WHEAT IN UDAIPUR DISTRICT OF RAJASTHAN

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## ABSTRACT

The study was conducted to know the personal profiles of insured loanee farmers of the National Agricultural Insurance Scheme and Weather Based Crop Insurance Scheme for wheat crop in Salumber and Vallabhnagar tehsils of Udaipur district. The 150 insured loanee farmers were selected through proportionate random sampling. The findings indicate that a majority of selected farmers (42.7%) belong to the middle-aged group (36-50 years), with significant proportions from Scheduled Tribe (34.0%) and Scheduled Caste (32.0%) communities, followed by Other Backward Class (18.7%) and General category (15.3%). Most of selected farmers are illiterate or possess only functional literacy. In terms of landholding, 44% are small farmers (1-2 ha), 49.3% are large (above 2 ha) and 6.7% are marginal farmers (less than 1 ha). The data also show moderate levels of economic motivation, innovativeness, extension contacts, and farming experience among respondents.

## INTRODUCTION

Agriculture plays a vital role in the Indian economy, providing livelihood to a majority of the rural population and contribute significantly to the nation's food security and economic development. However, it is marked by high vulnerability to various risks such as erratic rainfall, droughts, floods, pest infestations, and crop diseases, which often lead to substantial yield and income losses for farmers. These risks are particularly acute in rainfed regions like Southern Rajasthan, where the uncertainty of weather and climatic conditions severely impacts the productivity of staple crops like wheat. As a result, farmers face frequent financial distress and indebtedness, underscoring the need for efficient risk management strategies to safeguard their livelihoods and promote agricultural sustainability (Rao, 2011).

Crop insurance has emerged globally as an essential tool to mitigate the financial risks borne by farmers due to natural calamities and other yield-reducing factors. It helps in transferring agricultural risks from individual farmers to a larger pool,

thereby stabilizing farmers' incomes and encouraging the adoption of modern agricultural practices. In India, the government has introduced several crop insurance programs over the decades to support farmers, among which the National Agricultural Insurance Scheme (NAIS) and the Weather Based Crop Insurance Scheme (WBCIS) are prominent (Mahajan & Bobade, 2012). The NAIS, launched widely in 1999, functions on an indemnity basis, providing compensation based on actual yield losses in designated areas. This scheme has been instrumental in broadening insurance coverage, including both loanee and non-loanee farmers, and covering a range of crops including wheat (Kumar *et al.*, 2011).

The WBCIS, initiated in 2007, represents a technical innovation in crop insurance, relying on weather indexes such as rainfall, temperature, frost, and humidity as proxies for crop losses. This parametric approach allows faster and more objective, claim settlements and lower administrative costs as it circumvents the need for extensive farm-level loss assessment. Globally, weather-index

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insurance models have been recognized for reducing basis risk and improving the efficiency of insurance delivery, especially in areas with limited historical yield data (Clarke *et al.*, 2012). In India, WBCIS has gained importance as it addresses some limitations of traditional yield-based insurance models and suits the agro-climatic variability of regions such as Rajasthan.

## RESEARCH METHODOLOGY

The study was conducted in the Udaipur district of Southern Rajasthan. Udaipur district comprises eleven tehsils, viz., Jhadol, Lasadia, Girva, Gogunda, Kherwara, Kotda, Mawli, Sarada, Salumber, and Vallabhnagar. The NAIS and WBCIS have been operated in around 200 villages each in the villages of Salumber and Vallabhnagar tehsils. Ten villages (5 from Salumber and 5 from Vallabhnagar), within a radius of 10 km from the tehsil headquarters of Salumber and Vallabhnagar, were included for the investigation. A good number of farmers under NAIS and WBCIS were insured loan farmers in both the tehsils. It was planned to select 150 (75 from Salumber and 75 from Vallabhnagar tehsils) insured loanee farmers from the selected villages. To achieve the desired size of sample, a proportionate random sampling procedure was used to identify insured loanee farmers under both schemes. Prior to drawing sample from every village, a pre-survey was conducted for preparing the list of those insured beneficiaries and who have drawn loan under crop insurance through NAIS and WBCIS. The investigation is a comparative study of NAIS and WBCIS of both the tehsils. NAIS is no more in operation. WBCIS is still being executed. Therefore, the investigation was carried out combining 'Ex-post-Facto Research design (for NAIS) and process evaluation study design (for WBCIS). Process evaluation is carried out during execution of any programme.

## RESULTS AND DISCUSSION

**Age:** Out of 150 farmers, majority of the ILFs, i.e., 64 (42.7 per cent), belong to the middle-aged group of 36 to 50 years (Table 1). The respondents in the old and young aged group were found to be

57 (38.0 per cent) and 29 (19.33 per cent) respectively. It means that a total of 150 ILFs, 121 (80.67 per cent) belong to young and old age groups respectively. Further, it was noted that 33 (44.00 per cent) insured loanee farmers of Salumber tehsil and 31 (41.33 per cent) of Vallabhnagar tehsil farmers belong to the middle age group, whereas, in old age group, Vallabhnagar and Salumber farmers were found to be of 31 (41.33 per cent) and 26 (34.67 per cent), respectively. Likewise, the representation of Salumber and Vallabhnagar farmers in the young aged group were 16 (21.17 per cent) and 13 (17.34 per cent), respectively. It is concluded that majority from both the tehsils' of respondents fell under middle to old age group between 36 years to 50 and above. The findings are in line with the findings of Verma *et al.*, (2018) Shehrawat *et al.*, (2020) and Samota *et al.*, (2024)

**Caste :** Majority of the loanee farmers, i.e. 51 (34.0 per cent) of the total 150 belong to scheduled tribe category followed by 48 (32.0 per cent) from scheduled caste, 28 (18.7 per cent) from other backward class, and 23 (15.3 per cent) from general (Table 1). Further, 27 (36.00 per cent) Salumber farmers belong to ST followed by 25 (33.33 per cent) from SC, 16 (21.34 per cent) OBC category and 7 (9.33 per cent) farmers were from general category. In Vallabhnagar 24 (32.00 per cent) farmers belong to ST followed by 23 (47.06 per cent) from SC, 16 (21.33 per cent) general categories and 12 (16.00 per cent) farmers were from OBC. The ILFs were found largely from ST and SC castes in both the tehsils. The findings are in the line with the findings of Prasad (2018).

**Education:** The maximum 50 (33.3 per cent) of the ILFs of both the tehsils were illiterate, while 27 (18.0 per cent) had functional literacy, 25 (16.7 per cent), 18 (12.0 per cent), 13 (8.7 per cent), 8 (5.3 per cent), 5 (3.3 per cent) and 4 (5.84 per cent) ILFs had middle, secondary, senior secondary, graduate and post graduate level of education respectively (Table 1). The 60 (40 per cent) of the respondents from both the tehsils were educated up to the primary level, with illiteracy among 25 (33.33 per cent) of the total. The finding are in the

**Table.1 Distribution of respondents on the basis of personal profile of the beneficiaries and non-beneficiaries under the NAIP project (n=152)**

S.No	Category	Vallabh Nagar	Salumber	Total
<b>A. Age</b>				
1	Young (18-35 years)	13 (44.83) 17.34*	16 (55.17) 21.33*	29 (19.33)
2	Middle (36 to 50 years)	31 (48.44) 41.33*	33 (51.56) 44.00*	64 (42.7)
3	Old (50 years)	31 (54.39) 41.33*	26 (45.61) 34.67*	57 (38.0)
<b>B. Caste</b>				
1	General	16 (69.57) 21.33*	7 (30.43) 9.33*	23 (15.3)
2	OBC	12 (42.86) 16.00*	16 (57.14) 21.34*	28 (18.7)
3	ST	24 (47.06) 32.00*	27 (52.94) 36.00*	51 (34.0)
4	SC	23 (47.92) 30.67*	25 (52.08) 33.33*	48 (32.0)
5	General	16 (69.57) 21.33*	7 (30.43) 9.33*	23 (15.3)
<b>C. Education Level</b>				
1.	Illiterate	25 (50.00) 33.33*	25 (50.00) 33.33*	50 (33.3)
2.	Functional literacy	12 (44.44) 16.00*	15 (55.56) 20.00*	27 (18.0)
3.	Primary	14 (56.00) 18.67*	11 (44.00) 14.67*	25 (16.7)
4.	Middle	9 (50.00) 12.00*	9 (50.00) 12.00*	18 (12.0)
5.	Secondary	7 (53.85) 9.33*	6 (46.15) 8.00*	13 (8.7)
6.	Senior Secondary	4 (50.00) 5.33*	4 (50.00) 5.33*	8 (5.3)
7.	Graduate	2 (50.00) 2.67*	3 (50.00) 4.00*	5 (3.3)
8.	Postgraduate	2 (40.00) 2.67*	2 (40.00) 2.67*	4 (2.7)
<b>D. Economic Motivation</b>				
1.	Low (23.33-47.78)	30 (44.78) 40.00*	39 (58.21) 52.00*	69 (46.00)
2.	Moderate (47.78-72.23)	35 (60.34) 46.67*	23 (37.70) 30.67*	58 (38.67)
3.	High (72.23-96.68)	10 (43.48) 13.33*	13 (59.10) 17.33*	23 (15.33)
<b>E. Land Holding</b>				
1	Marginal farmers (Less than 1 ha)	5 (50.00) 6.67*	5 (50.00) 6.67*	10 (6.7)
2	Small farmers (1-2 ha)	29 (43.94) 38.67*	37 (50.06) 49.33*	66 (44.0)
3	Big farmers (above 2 ha)	41 (55.41) 54.66*	33 (44.59) 44.00*	74 (49.3)
<b>F. Extension Contact</b>				
1	Low (4.17-18.07)	34 (55.74) 45.33*	27 (44.26) 36.00*	61 (40.7)
2	Moderate (18.70-31.97)	24 (42.86) 32.00*	32 (57.14) 42.67*	56 (37.3)
3	High (31.97-45.87)	17 (51.52) 22.67*	16 (48.48) 21.33*	33 (22.0)
<b>G. Innovativeness</b>				
1	Low (25.33-49.33)	34 (53.13) 45.33*	30 (46.87) 40.00*	64 (42.7)
2	Moderate (49.33-73.33)	33 (48.53) 44.00*	35 (51.47) 46.67*	68 (45.3)
3	High (73.33-97.33)	8 (44.44) 10.67*	10 (55.56) 13.30*	18 (12.0)
<b>H. Farming Experience</b>				
1	Low (7.00-22.00)	30 (44.12) 40.00*	38 (55.88) 50.67*	68 (45.3)
2	Moderate (22.00-37.00)	29 (51.79) 38.67*	27 (48.21) 36.00*	56 (37.3)
3	High (37.00-52.00)	16 (61.54) 21.33*	10 (38.46) 13.33*	26 (17.3)
<b>Total</b>		75 (100)	75 (100)	150 (100)

n= Total number of respondents, \*= Percentage to columns, Figures in the parentheses show percentage of rows

line with the findings of More (2018) & Jamanal *et al.* (2020), Meena and Badhala (2024).

**Economic Motivation:** Out of the total 150 ILFs, 69 (46.00 per cent) were under the low economic motivation, whereas, 58 (38.67 per cent) of them were observed under moderate economic motivation, and 23 (15.33 per cent) fell under higher level of economic motivation (Table 1). A comparative view of economic motivation of Vallabhnagar and Salumber farmers highlights that majority 30 (40.00 per cent) and 39 (52.00 per cent) respectively were in low category. It was also noted that 35 (46.67 per cent) and 23 (30.67 per cent) respondents, respectively from Vallabhnagar and Salumber were put under moderate level of economic motivation. Whereas, 10 (13.33 per cent) and 13 (17.33 per cent) of Vallabhnagar and Salumber respondents were in high economic motivation. Therefore, it was concluded that as far as economic motivation is concerned, Vallabhnagar farmers were more motivated as compared to Salumber farmers. The findings are in the line with the findings of Prasad (2018).

**Land Holding:** Out of the total 150 ILFs, 10 (6.7 percent) were reported to be marginal farmers (less than 1 ha of land), whereas, 66 (44.00 per cent) of the total were small farmers (1 to 2 ha land) and 74 (49.30 per cent) were reported large farmers (above 2 ha land) (Table 1). The 5 ILFs (6.67 per cent) of both Vallabhnagar and Salumber were categorized as marginal farmers. While, 29 (38.67 per cent) of Vallabhnagar and 37 (49.33 per cent) of Salumber were under small farmers group. About 41 (54.66 per cent) of Vallabhnagar and 33 (44.00 per cent) of Salumber farmers were under large farmers group. It is interesting that equally 70 (46.67 per cent) ILFs of both the tehsils were observed small and large size of landholding. This finding is in line with the findings of khare (2013) Meena (2019), Meena *et al.*, (2024) and Gujar *et al.* (2025).

**Extension contact:** Out of 150 ILFs, 61 (40.70 per cent) have low level of extension contacts, whereas, 56 (37.30 per cent) have moderate level and remaining 33 (22.00 per cent) respondents were

observed high level of extension contacts (Table 1). The majority of Vallabhnagar and Salumber ILFs were observed low level of extension contacts i.e. 34 (45.33 per cent) and 27 (36.00 per cent), respectively. Further 24 (32.00 per cent) and 32 (42.67 per cent) of Vallabhnagar and Salumber farmers, respectively were reported moderate level of extension contacts and 17 (22.67 per cent) and 16 (21.33 per cent) were reported high level of extension contacts, respectively. It is concluded that Salumber ILFs 48 (32 per cent) were ahead in extension contacts as against 41 (27.33 per cent) of Vallabhnagar. It may be due to the fact that Salumber tehsil is nearer to Udaipur headquarts than Vallabhnagar. These findings were in conformity with the findings of Thirumorthy and Geetha (2017), and Sheoran *et al.*, (2024).

**Innovativeness:** Out of 150 ILFs 68 (45.30 per cent) of both the tehsil were reported moderate level of innovativeness, whereas, 64 (42.70 per cent) had low level of innovativeness and 18 (12.00 per cent) respondents were observed high level of innovativeness. The majority of Vallabhnagar and Salumber farmers i.e. 33 (44.00 per cent) and 35 (46.67 per cent), respectively were from moderate innovativeness. It was also noted that 34 (45.33 per cent) and 30 (40.00 per cent) of the ILFs from Vallabhnagar and Salumber respectively, were under low category of innovativeness, whereas, 8 (10.67 per cent) and 10 (13.30 per cent) respondents belonged to high category. It is concluded that Salumber farmers were more innovative as compared to Vallabhnagar farmers. These findings were in line with the finding of Sihare (2015), Katkar (2009) and Meena (2019).

**Farming experience:** The 68 (45.30 per cent) of the total ILFs possessed low level of experience, whereas, 56 (37.30 per cent) reported moderate level of experience and 26 (17.30 per cent) of the respondents were observed high level of experience (Table 1). A comparative view of experience in farming of Vallabhnagar farmers and Salumber farmers highlights that majority of them i.e. 30 (40.00 per cent) and 38 (50.67 per cent), respectively were

in low category. It was also noted that 29 (38.67 per cent) and 27 (36.00 per cent) respondents from Vallabhnagar and Salumber, respectively were under moderate category of farming experience. Whereas, 21.33 and 13.33 per cent of Vallabhnagar and Salumber respondents, respectively were in high category. It is inferred that insured loanee farmers of Vallabhnagar tehsil were superior in terms of experience in farming occupation over Salumber. The insured loanee farmers of both the tehsils possessed farming experience ranging from moderate to low. Meaning, the ILFs did not have adequate experience in the farming. This is due to the fact most of the ILFs represented from SC and ST and they earn their bread and butter through labour rather than farming. These findings were in conformity with the findings of Jamanal *et al.* (2020) and Chauhan (2020).

## CONCLUSION

It was concluded that the majority of respondents fall within the middle-aged group, indicating active participation in farming activities and insurance uptake. A significant proportion belong to socially marginalized communities, highlighting the inclusivity of the schemes in reaching vulnerable populations. Educational attainment varies widely, with many farmers having limited formal education, which may impact their understanding and effective utilization of insurance products. These factors collectively underscore the importance of tailored outreach, awareness programs, and support mechanisms to enhance the efficacy and reach of crop insurance initiatives in the region.

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# **CONSTRAINTS AND SUGGESTIONS PERCEIVED BY POST GRADUATE STUDENTS OF SOCIAL SCIENCE GROUP IN AGRICULTURE TO START AGRICULTURE ENTREPRENEURSHIP**

**Soniya Saran\*, Banwari Lal\*\*, Mahendra Kumar\*\*\* and Devanand Meena\*\*\*\***

## **ABSTRACT**

The present study was conducted for finding out the constraints faced by post graduate students of social science group in agriculture to start agri entrepreneurship and gather suggestions for overcoming these constraints. Total 108 post graduate students of Social Science Group (Extension Education, Agricultural Economics and Agricultural Statistics) in Agriculture were purposively chosen for the study. The study was conducted in eight agriculture colleges located under five agricultural universities in Rajasthan. Interview method was used for data collection. All constraints were tabulated on the basis of mean per cent score and further ranking of different constraints was made with the help of its mean per cent scores. The result of the study revealed that the major constraints faced by post graduate students were; 'Less practical knowledge about Entrepreneurship' (73.77 MPS), 'Less no. of visits / tours to various enterprises' (73.15 MPS) and 'Lack of market oriented education' (70.68 MPS) got first, second and third rank, respectively. Whereas, all suggestions were tabulated on the basis of frequency and percentage score and further ranking of different suggestions was made with the help of its percentage scores. The important suggestions suggested by post graduate students were; Practical oriented and skill based entrepreneurial activity should be imparted (100%), Visits to various enterprises should be undertaken from time to time (92.59%) and More practical knowledge related to entrepreneurship should be given (89.81%) got first, second and third rank, respectively.

## **INTRODUCTION**

India is a nation predominantly of youth. According to the latest United Nations data as presented by Worldometer, India's population has exceeded 1.41 billion, with over 65 per cent of its citizens below the age of 35 (Worldometer, 2025). India holds immense potential for agricultural entrepreneurship as an agriculture-based economy. However, there is a growing concern as youth interest in agriculture continues to decline. Engaging and retaining young people in this sector has become vigorous for ensuring the future food security of the nation. Consequently, it is essential to attract youth and renew their interest in agriculture, heartening them to pursue to become agricultural entrepreneurs or choose self-employment in the sector.

As per the Global Entrepreneurship Monitor (GEM) Report 2022-23, more people in India are starting their own businesses. In 2021, around 14.4 per cent of adults (aged 18-64) were involved in starting or running a new business. This is a big increase from 5.3 per cent in 2020. Also, the number of people who fully own businesses increased from 5.9 per cent in 2020 to 8.5 per cent in 2021. Entrepreneurship and agriculture are closely connected. Agriculture affects the lives of people all over the world because it provides food, raw materials and employment. This is why entrepreneurs in agriculture will always be important. To support this, agricultural education and research must focus on new ideas, creativity and sharing knowledge with society. This is especially important for a country like India, which has a very young population. More

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than half of India's population is below the age of 25 and about 65 per cent are under the age of 35 (Verma *et al.*, 2021).

The objective of the study is “To identify the constraints faced by Post Graduate Students of Social Science Group in Agriculture and gather suggestions for overcoming them”.

## RESEARCH METHODOLOGY

The present study was carried out in five agricultural universities located in Rajasthan. These include Agriculture University, Jodhpur; SKN Agriculture University, Jobner; MPUAT, Udaipur; SKRAU, Bikaner; and Agriculture University, Kota. All 108 students enrolled in the first and second year of the M.Sc. (Agri.) program in the Social Science group (Extension Education, Agricultural Economics and Agricultural Statistics) in the selected colleges were purposively chosen for the study. The eight colleges under five agricultural universities of Rajasthan *viz.*, College of Agriculture, Jodhpur; SKN College of Agriculture, Jobner; Rajasthan College of Agriculture, Udaipur; College of Community and Applied Science, Udaipur; College of Agriculture, Bikaner; College of Community Science, Bikaner; College of Agriculture, Sriganganagar and College of Agriculture, Kota were selected. Data were collected through personal interview schedule from these respondents. The data pertaining to constraints has been collected through statements of the structured schedule and tabulated on the basis of mean per cent scores and further ranking was made with help of its mean per

cent scores. Respondents were free to express their suggestions in order to eliminate the constraints encountered by them to start Agri-entrepreneurship. All suggestions were tabulated on the basis of frequency and percentage score and further ranking of different suggestions was made with the help of its percentage scores.

## RESULTS AND DISCUSSION

The students were requested to express the constraints perceived by them about unfavourable conditions to start agri-business. The data presented in table 1 reveal that among the different constraints faced by the post graduates in starting agribusiness the 'Less practical knowledge about Entrepreneurship' having a MPS of 73.77 which perceived as the most severe constraint at the top priority by the post agriculture graduates. It is followed by; 'Less no. of visits / tours to various enterprises' having a MPS of 73.15. There after third important one is 'Lack of market oriented education' which is having a MPS of 70.68. The fourth serious constraints is 'Limited extra-curricular activities related to entrepreneurship' MPS of 69.44. The fifth serious constraints are 'Lack of provision of experience sharing of different agricultural enterprises' which is having a MPS of 66.98. There after sixth important one is 'Lack of internship / attachment in company/ organization', which is having a MPS of 65.74. The constraint "Uncertainty in market and market crashes" was perceived as the seventh severe constraint by the agriculture post graduates (MPS 64.81). The constraint "Poor

**Table 1. Constraints faced by post graduates in starting agri- business (n=108)**

S. No	Constraints	MPS	Rank
1.	Degree/Courses not completed within required time period.	61.73	X
2.	Less practical knowledge about Entrepreneurship.	73.77	I
3.	Less no. of visits / tours to various enterprises.	73.15	II
4.	Limited extra-curricular activities related to entrepreneurship.	69.44	IV
5.	Problems in getting the required capital.	62.35	IX
6.	Lack of market-oriented education	70.68	III
7.	Uncertainty in the market and market crashes.	64.81	VII
8.	Lack of provision of experience sharing of different agricultural enterprises.	66.98	V
9.	Lack of internship / attachment in company/ organization.	65.74	VI
10.	Poor availability of raw material	63.58	VIII

availability of raw material" was perceived as the eighth most severe constraint by the agriculture post graduates (MPS 63.58). The constraint "Problems in getting the required capital" was perceived as the ninth severe constraint by agriculture post graduates (MPS 62.35), whereas the constraint "Degree/Courses not completed within required time period" was perceived as the least severely perceived constraint by post graduates which is having a MPS of 61.73.

#### **Suggestions to overcome the constraints:**

The data regarding suggestions for improving entrepreneurial development revealed varying levels of support among respondents. A total of 108 responses were analyzed. It is evident from the Table 2 that the important suggestion suggested by post graduate students was practical-oriented and skill-based entrepreneurial activities should be imparted received the highest frequency, with 108 respondents (100.00%), ranking first. The second-ranked suggestion, visits to various enterprises should be undertaken from time to time, was supported by 100 respondents (92.59%). More practical knowledge related to entrepreneurship should be given was the third most frequent suggestion, with 97 respondents (89.81%) in agreement. This was followed by training and demonstrations related to

modern technology should be conducted, which received 84 responses (77.78%), ranking fourth. Extracurricular activities related to entrepreneurship should be conducted was supported by 64 respondents (59.26%), ranking fifth. The suggestion that knowledge about government policy on agri-business should be given was endorsed by 46 respondents (42.59%), placing it sixth. The least supported suggestion was that procedures for obtaining loans should be shortened, with 40 respondents (37.04%), ranking seventh.

The study further reveals that agriculture post graduates face several key constraints in starting agri-business ventures, with the foremost being a lack of practical knowledge about entrepreneurship, limited exposure through visits or tours to enterprises and inadequate market-oriented education. Other significant challenges include insufficient extra-curricular activities, lack of internships, difficulty in securing capital and market uncertainties. These findings highlight the need for more hands-on training, enhanced practical learning opportunities and stronger financial and institutional support to better prepare post graduates for successful agricultural entrepreneurship. The findings were in accordance with the studies conducted by Reddy and Chandawat (2021).

**Table 2: Suggestions obtained from the post graduate students to overcome constraints to start the agri-business (n=108)**

S. No	Suggestions	Frequency	Per cent	Rank
1	Practical oriented and skill based entrepreneurial activity should be imparted.	108	100.00	I
2	Training and demonstrations related to modern technology should be conducted.	84	77.78	IV
3	Visits to various enterprises should be undertaken from time to time.	100	92.59	II
4	More practical knowledge related to entrepreneurship should be given.	97	89.81	III
5	Procedures for obtaining loan should be shortened.	40	37.04	VII
6	Extracurricular activities related to entrepreneurship should be conducted.	64	59.26	V
7	Knowledge about policy of government about agri-business should be given	46	42.59	VI

## CONCLUSION

It can be concluded that the important constraints faced by respondents were; 'Less practical knowledge about Entrepreneurship', 'Less no. of visits / tours to various enterprises', 'Lack of market oriented education' and 'Limited extra-curricular activities related to entrepreneurship' which got first, second and third rank, respectively. Whereas, major suggestions were; 'Practical oriented and skill based entrepreneurial activity should be imparted', 'Visits to various enterprises should be undertaken from time to time' and 'More practical knowledge related to entrepreneurship should be given' which got first, second and third rank, respectively.

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# ESTIMATION OF RELATIVE HETROSIS FOR GREEN COB YIELD AND QUALITY TRAITS IN SWEET CORN (*Zea mays* L. Ssp. *saccharata*) HYBRIDS

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## ABSTRACT

The study was carried out to estimate average heterosis for green cob yield and quality traits in sweet corn hybrids (*Zea mays* L. Ssp. *saccharata*). Forty-five hybrids using line x tester mating design were developed, which along with their eighteen parents and three checks (Priya, Madhuri and Sugar-75) were evaluated at three locations during kharif 2019 and rabi 2019-20, in randomized block design and average heterosis was estimated for fourteen characters. Estimates of heterosis were found positively significant for 42 hybrids for green cob yield over the environments, with hybrid L8 x T3 (354.12 %) exhibiting maximum and positively significant heterosis for the green cob yield. Hybrid L3 x T1 in E1 and E2 (374.48 and 445.02 %, respectively) and L8 x T3 (413.55 %) in E3 reported highest significant relative heterosis for green cob yield.

## INTRODUCTION

Sweet corn (*Zea mays* var. *saccharata*) is a specialty corn which is characterized by translucent, horny appearance of kernel when matures and wrinkled when it dries. The mutant genes *su*, *su1* and *se* prevent the conversion of sugar into starch and thus such corn tastes sweet. Total sugar content in sweet corn at milky stage ranges from 25-30% as compared to 2-5% of normal corn (Sadaiah *et al.*, 2013). Sweet corn breeding aims to improve quality and appearance as well as cob yield. The genetic base of sweet corn breeding programme is relatively narrow and related inbreds often are crossed to make hybrids that meet the strict market requirements on quality and appearance (Tracy, 1994). However, development of superior hybrids is more difficult in sweet corn because the heterotic patterns are poorly defined (Revilla and Tracy, 1997). Generally, all commercial sweet corn hybrids are based on one or more defective endosperm mutants, and production of high quality seed is more difficult for sweet corn than for most types of corn (Tracy, 1994). Recombining the same inbreds repeatedly without infusion of new heterotic combinations may lead to the depletion of heterosis (Revilla *et al.*, 2000). Sweet corn breeders have

often focused on improving quality and ear appearance, rather than on enhancing yield (Tracy, 1993). But emphasis on kernel sweetness along with yield needs to be considered as the major objective of sweet corn improvement. The quality parameters are relatively more important especially because of direct consumption of sweet corn as vegetable and the preference of the consumers. In the present study, attempts were made to identify superior hybrid combinations using line x tester method.

## RESEARCH METHODOLOGY

Eighteen diverse sweet corn inbred lines were used as parents (fifteen females and three testers) (Table 1). The crosses were made at Instructional Farm, RCA, Udaipur during kharif 2018. Total 66 genotypes comprising of 45 sweet corn hybrids, 18 parental lines and 3 standard checks (Priya, Madhuri and Sugar-75) were evaluated in RBD in three environments (E1 at Instructional Farm, RCA, Udaipur during Kharif-2019, E2 at ARS, Banswara during Kharif-2019 and E3 at Instructional Farm, RCA, Udaipur during Rabi-2019-20) in RBD with three replications. Recommended agronomic practices were used to raise a healthy crop. Observations were recorded for 14 characters like

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days to 50 per cent tasseling, days to 50 per cent silking, plant height, ear height, days to green cob harvest, ear length, ear girth, number of grain rows/cob, number of grains/rows, green cob weight/plant, green cob yield, green fodder yield, TSS content of green grain and protein content. Ten plants were taken from each row for recording observations from each replication. TSS content was recorded using hand refractometer. Heterosis over mid-parent was calculated with the standard formula and the significance of heterosis was tested using 't' test.

## RESULTS AND DISCUSSION

The degree and direction of heterotic response varied not only from character to character but also hybrid to hybrid over the environments. For characters related to crop duration like days to tasseling, silking and maturity, negative heterosis is desirable. For yield characters like plant height, ear length and girth, number of grain rows/ear, number of grains/rows, green cob yield, green fodder yield and green cob weight/plant and for quality characters like sugar content and protein content, heterosis in positive direction is desirable. Further for characters like days to 50 per cent tasseling and silking, days to maturity and ear placement, heterosis should be significant in the negative direction. While, for the characters related to yield and its attributes and quality, positively significant heterosis is desirable. Estimates for average heterosis were found positively significant for 42 hybrids for green cob yield over the environments among which the sweet corn hybrid L8 x T3 (354.12%) exhibited maximum and positively significant heterosis for the green cob

yield. The hybrid L8 x T3 also exhibited positively significant mid parent heterosis for green cob weight/plant (335.15%). For green fodder yield, 41 hybrids showed significantly positive relative heterosis over the environments, where the hybrid L1 x T3 (274.98%) exhibited maximum vigour over the mid parents. Over all 28 hybrids manifested significant heterosis in positive direction for TSS content of green grain where maximum mid parent heterosis was shown by the hybrid L14 x T2 (28.46%). For ear length, hybrid L1 x T3 (104.78%) exhibited maximum and significantly positive mid parent heterosis. The sweet corn hybrid L15 x T2 (1.70%) evinced highest and positively significant mid parent heterosis for protein content. The sweet corn hybrids L10 x T2 and L12 x T2 exhibited maximum significant negative mid parent heterosis for days to 50 per cent tasseling (-18.24%) and silking (-17.95%) respectively. Hybrid L12 x T2 (-14.11%) reported maximum and significant mid parent heterosis in negative direction for days to green cob harvest. Maximum estimate of mid parent heterosis in positively significant direction for plant height and number of grain rows/ear was reported for the sweet corn hybrid L2 x T1 (82.11% and 32.12%). The sweet corn hybrid L8 x T3 recorded highest and positively significant relative heterosis for ear girth (55.72%) and green cob weight/plant (335.15%). Hybrid L3 x T3 (144.69%) revealed maximum heterosis for number of grains/rows over the mid parent in positively perceptible direction. The results were in conformity with the earlier findings of Choudhary *et al.*, (2017), Yuwono *et al.*, (2017) Kumari *et al.*, (2018) and Mahato (2018).

**Table 1. List of genotypes used**

S. No	Symbol	Pedigree	S. No	Symbol	Pedigree
1.	L <sub>1</sub>	SC-7-2-1-2-6-1	10.	L <sub>10</sub>	BAJ-SC-17-2
2.	L <sub>2</sub>	SC-18728	11.	L <sub>11</sub>	BAJ-SC-17-1
3.	L <sub>3</sub>	BAJ-SC-17-6	12.	L <sub>12</sub>	DMSC-28
4.	L <sub>4</sub>	BAJ-SC-17-10	13.	L <sub>13</sub>	Mas Madu (sh2 sh2)
5.	L <sub>5</sub>	BAJ-SC-17-12	14.	L <sub>14</sub>	MRCSC-12
6.	L <sub>6</sub>	BAJ-SC-17-9	15.	L <sub>15</sub>	SC-33
7.	L <sub>7</sub>	BAJ-SC-17-11	16.	T <sub>1</sub>	SC-35
8.	L <sub>8</sub>	BAJ-SC-17-8	17.	T <sub>2</sub>	SC-32
9.	L <sub>9</sub>	BAJ-SC-17-4	18.	T <sub>3</sub>	DMRSC-1

**Table 2. Relative heterosis for sweet corn hybrids for various characters**

S. No.	Crosses	Relative heterosis for sweet corn hybrids					
		Days to green cob harvest	Green cob weight/plant (kg)	Green cob yield (kg ha <sup>-1</sup> )	Green fodder yield (kg ha <sup>-1</sup> )	TSS content of green grain (%)	Protein content (%)
1	L <sub>1</sub> X T <sub>1</sub>	-5.95**	143.89**	146**	154.26**	13.27**	-0.79
2	L <sub>2</sub> X T <sub>1</sub>	-5.32**	144.87**	146.03**	119.09**	7.96**	-0.35
3	L <sub>3</sub> X T <sub>1</sub>	-8.12**	214.15**	219.18**	200.97**	6.51**	-0.37
4	L <sub>4</sub> X T <sub>1</sub>	-5.44**	59.65**	59.31**	66.17**	-5.68**	0.14
5	L <sub>5</sub> X T <sub>1</sub>	-2.98	93.11**	93.08**	66.78**	5.26*	-0.23
6	L <sub>6</sub> X T <sub>1</sub>	-4.68*	93.59**	94.21**	60.9**	-2.27	0.16
7	L <sub>7</sub> X T <sub>1</sub>	-3.42	236.31**	241.52**	223.38**	13.97**	-0.34
8	L <sub>8</sub> X T <sub>1</sub>	-4.21*	188**	192.02**	17.95**	-3.99*	0.06
9	L <sub>9</sub> X T <sub>1</sub>	-1.9	52.73**	54.16**	88.37**	17.99**	-0.03
10	L <sub>10</sub> X T <sub>1</sub>	-7.39**	105.23**	105.95**	45.23**	-0.86	0.05
11	L <sub>11</sub> X T <sub>1</sub>	-6.18**	96.58**	98.32**	132.3**	9.4**	-0.11
12	L <sub>12</sub> X T <sub>1</sub>	-4.52*	160.25**	162.82**	217.87**	23.59**	1.01
13	L <sub>13</sub> X T <sub>1</sub>	-8.31**	122.24**	123.21**	172.3**	7.4**	-0.66
14	L <sub>14</sub> X T <sub>1</sub>	-9.49**	127.1**	128.69**	65.3**	11.38**	-0.14
15	L <sub>15</sub> X T <sub>1</sub>	-0.48	-22.46*	-26.47**	-31.26**	-11.23**	0.99
16	L <sub>1</sub> X T <sub>2</sub>	-7.68**	145.94**	148.52**	139.26**	6.58**	1.33
17	L <sub>2</sub> X T <sub>2</sub>	-9.92**	151.91**	153.41**	155.14**	6.38*	0.24
18	L <sub>3</sub> X T <sub>2</sub>	-11.31**	193.08**	197.22**	132.06**	-2.12	1.31
19	L <sub>4</sub> X T <sub>2</sub>	-13.03**	47.02**	46.3**	220.53**	-12.05**	0.27
20	L <sub>5</sub> X T <sub>2</sub>	-11.38**	177.23**	180.36**	223.51**	17.59**	1.26
21	L <sub>6</sub> X T <sub>2</sub>	-4.3*	-16.56*	-19.34**	-20.95**	-6.61**	0.69
22	L <sub>7</sub> X T <sub>2</sub>	-11**	164.29**	166.74**	146.77**	21.32**	1.41*
23	L <sub>8</sub> X T <sub>2</sub>	-5.65**	219.43**	225.45**	91.1**	-5.95**	0.99
24	L <sub>9</sub> X T <sub>2</sub>	-7.76**	19.19**	18.21**	10.55**	20.11**	1.59*
25	L <sub>10</sub> X T <sub>2</sub>	-13.49**	31.72**	30.69**	71.37**	0.87	1.13
26	L <sub>11</sub> X T <sub>2</sub>	-9.43**	90.68**	91.05**	76.47**	7.59**	1.63*
27	L <sub>12</sub> X T <sub>2</sub>	-14.11**	128.71**	130.51**	161.2**	19.34**	0.63
28	L <sub>13</sub> X T <sub>2</sub>	-11.83**	77.42**	77.51**	60.57**	23.03**	1.07
29	L <sub>14</sub> X T <sub>2</sub>	-10.93**	81.38**	82.9**	72.2**	28.46**	0.8
30	L <sub>15</sub> X T <sub>2</sub>	-1.2	37.3**	35.8**	-3.22	-14.41**	1.7*
31	L <sub>1</sub> X T <sub>3</sub>	-6.99**	305.44**	321.68**	274.98**	24.14**	1.16
32	L <sub>2</sub> X T <sub>3</sub>	-9.48**	236.59**	260.22**	235.77**	22.81**	-0.21
33	L <sub>3</sub> X T <sub>3</sub>	-8.53**	224.19**	233.66**	173.26**	8.72**	0.95
34	L <sub>4</sub> X T <sub>3</sub>	-8.39**	108.18**	109.08**	40.71**	0.79	-0.47
35	L <sub>5</sub> X T <sub>3</sub>	-6.96**	130.7**	133.19**	146.46**	8.14**	0.67
36	L <sub>6</sub> X T <sub>3</sub>	-5.71**	197.26**	204.16**	163.56**	-8.64**	0.13
37	L <sub>7</sub> X T <sub>3</sub>	-9.29**	296.67**	307.6**	233.46**	4.58*	1.06
38	L <sub>8</sub> X T <sub>3</sub>	-8.38**	335.15**	354.12**	184.81**	-8.23**	0.18
39	L <sub>9</sub> X T <sub>3</sub>	-5.19**	20.03**	19.67**	31.9**	16.52**	1.06
40	L <sub>10</sub> X T <sub>3</sub>	-5.65**	19.11*	14.14	-23.38**	12.5**	0.06
41	L <sub>11</sub> X T <sub>3</sub>	-7.97**	109.8**	123.48**	147.26**	6.34**	0.45
42	L <sub>12</sub> X T <sub>3</sub>	-7.68**	178.56**	183.82**	95.96**	-1.55	0.96
43	L <sub>13</sub> X T <sub>3</sub>	-11.74**	184.87**	188.63**	72.08**	21.4**	1.12
44	L <sub>14</sub> X T <sub>3</sub>	-9.77**	153.94**	157.77**	107.2**	4.46	0.2
45	L <sub>15</sub> X T <sub>3</sub>	-4.45*	185.75**	192.12**	52.44**	-10.79**	0.13
46	S.E.Diff.	1.81	0.01	380.61	573.62	0.31	0.07
47	CD 5%	3.56	0.02	748.42	1127.94	0.61	0.14
48	CD 1%	4.69	0.03	985.44	1485.17	0.8	0.18

\*\*\* significant at 5 and 1%, respectively

## CONCLUSION

The quality parameters are relatively more important especially because of direct consumption of sweet corn as vegetable and the preference of the consumers. The overall results indicated that emphasis on green cob yield, green fodder yield and kernel sweetness may be considered in the objective of sweet corn hybrid development.

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# **BENEFITS AND CHALLENGES OF SOIL HEALTH CARD SCHEME IN SRI GANAGANAGAR DISTRICT OF RAJASTHAN**

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## **ABSTRACT**

The present study evaluates the working the Soil Health Card (SHC) scheme in Sri Ganganagar district of Rajasthan, focusing on its benefits and challenges as perceived by farmers. Initiated by the Government of India in 2015, the SHC scheme aims to provide farmers with scientific insights into soil health and nutrient management. Data were collected from 128 farmers across four tehsils using structured interviews and analyzed using Henry Garrett's ranking technique. Findings reveal that productivity enhancement is the most significant benefit, followed by reduced fertilizer expenses and improved crop quality. However, major challenges include inadequate follow-up by extension workers, lack of knowledge in determining fertilizers quantity to be applied on field and incomplete soil sampling procedure. Additionally, limited awareness and insufficient access to soil testing labs hinder the scheme's full utilization. Farmers emphasized the need for technical training, regular field support, and infrastructural improvements. The study highlights that while the SHC scheme holds strong potential to promote sustainable agriculture, strategic interventions are necessary to overcome implementation barriers.

## **INTRODUCTION**

Soil is a living, breathing mixture of minerals, organic matter, water, air, and countless micro organisms all working together to support life on Earth. Soil testing is a scientific yet practical way to understand what's really going on beneath the surface of our farms. It helps assess how fertile the soil is and what nutrients crops might need to grow well. By checking things like soil texture, structure, pH level, how much water the soil can hold, and how well it can exchange nutrients, soil testing gives a complete picture of soil health. For this, Soil Health Card (SHC) scheme, launched by the Indian government in 2015, is designed to empower farmers with vital knowledge about their soil. Managed by the Department of Agriculture, the initiative provides farmers with customized cards that detail the nutrient status of their land and offer crop-wise fertilizer suggestions. The process of giving Soil Health Cards (SHCs) to farmers includes several important steps to help improve soil fertility and crop yields. It starts with collecting soil samples

from farms based on set grid sizes. These samples are then tested in labs to check for nutrient levels and other soil properties. After testing, a Soil Health Card is created for each farmer. It shows the condition of their soil and gives specific advice on which fertilizers and soil treatments to use. These cards are then handed out through agricultural extension workers, using land ownership records to make sure each farmer gets the right card. During the 2023-24 year, by April 2024, Rajasthan collected about 43.95 lakh soil samples, including those from districts such as Sri Ganganagar. Out of these, approximately 3 lakh samples were actually tested, and from that, around 2.40 lakh Soil Health Cards were issued. To support this work, the state operates a well-established network of 113 Soil Testing Laboratories. Hence, the study justifies the how the Soil Health Card (SHC) scheme provides farmers of Sri Ganaganagar district with scientific insights into soil fertility, helping them make informed decisions about fertilizer use. It sets the context by detailing the SHC distribution process and its

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implementation in Rajasthan, highlighting both progress and gaps.

## RESEARCH METHODOLOGY

A descriptive design was used for investigation. The present study was undertaken in Sri Ganaganagar district of Rajasthan by convenience sampling, under which 4 Tehsils were selected as Sri Ganganagar, Padampur, Raisingh Nagar and Suratgarh by judgemental sampling. The procedure of data collection was conducted in 16 villages (4 villages from each Tehsil) from which 128 farmers (8 farmers from each village), who were using soil health card was selected by convenience sampling. Convenience sampling allows for the selection of participants based on ease of access and availability. A structured interview schedule was used to collect data from farmers. In order to study the benefits of soil health card, the data were collected from the farmers related to benefits of soil health card like improved crop yields and practices and sustainable soil management through a straight forward item-rating scale. Further, to identify the key challenges in adopting the Soil Health Card information was taken that included lack of awareness, educational gaps, accessibility challenges, and other challenges. Garrett Ranking method was employed to identify and compare the major benefits and challenges faced by farmers in using adoption of soil health card facilities. Garrett scores were computed using the formula.

$$\text{Percentage position} = 100 \left( \frac{R_{ij} - 0.5}{N_j} \right)$$

Where,

$R_{ij}$  = Rank given for  $i$ th item by the  $j$ th individual

$N_j$  = Number of items ranked by  $j$ th individual

The percentage position for each rank assigned by respondents was calculated and converted into scores using the Garrett table. The average Garrett score for each component of benefit and challenges was then computed and arranged in descending order. The components with the highest mean score was deemed the most significant and assigned the top rank accordingly.

## RESULTS AND DISCUSSION

**I. Benefits of Soil Health Card Scheme:** The Soil Health Card Scheme helps farmers grow more crops, spend less on fertilizers by optimizing usage, boost crop quality, and make fertilizer application more efficient. By giving personalized soil insights, the scheme supports sustainable farming and smarter soil management benefitting farmers through higher yields and lower costs while improving overall agricultural output.

Table 1 shows the distribution of farmers by the rank assigned to the benefits of SHC scheme. Data in the table show that increased productivity is top-rated with the first rank given by 51 farmers, second rank given by 46 farmers and third rank given by 31 farmers. Other than this, increased fertilizers use efficiency was assigned first, second, thirds and fourth rank by 45, 48, 12 and 23 farmers, respectively. Further the table also shows that 38 famers ranked first to benefit of SHC on reducing fertilizer cost, 26 farmers who marked it second rank, 22 famers ranked it third and 42 of them ranked it fourth. Moreover, 25, 34, 37 and 32 famers gave and ranked first, second, third and fourth, respectively to the improved crop quality by adoption of SHC.

Further, to analyze the benefits influencing the

**Table 1: Distribution of famers according to their ranking of SHC Scheme benefits**

**N=128**

Benefits	Rank Assigned by farmers (f)			
	Rank 1	Rank 2	Rank 3	Rank 4
Productivity enhancement	51	46	31	0
Increased fertilizer use efficiency	45	48	12	23
Lowering fertilizer expenses	38	26	22	42
Improved crop quality	25	34	37	32

adoption of Soil Health Card recommendations, Garrett's Ranking Technique was employed to convert the ranks given by farmers into scores. The per cent position for each rank was calculated as depicted in Table 2 using the formula. The corresponding Garrett values were then obtained from Garrett's Table. The results show benefits that ranked first had the highest Garrett mean score of 73, indicating it was perceived as the most significant by the farmers. The second-ranked factor recorded a Garrett mean score of 57, followed by the third and fourth ranks with Garrett mean score of 44 and 28, respectively, reflecting a declining order of importance. This technique effectively quantified farmers' opinion about the benefits of Soil Health Card scheme in the study area.

Further, it is interesting to observe from Table 3, the Garrett value computation of SHC scheme benefits based on farmer's opinion. The productivity enhancement emerged as the most critical benefit influencing farmers' adoption of Soil Health Card scheme, as it received the highest number of Rank 1<sup>st</sup> with Garrett value computation 3723. This underscores the farmers' strong opinion for interventions that directly improve crop yields. Similarly, increased fertilizer use efficiency was highly prioritized with Rank 2<sup>nd</sup> with Garrett value computation 2565, reflecting the growing awareness among farmers about the need for optimizing fertilizer

application to achieve better results. Correspondingly, lowering fertilizer expenses and improved crop quality were marked as comparatively less significant as Rank 3<sup>rd</sup> and Rank 4<sup>th</sup> with Garrett value computation 1672 and 700, respectively. This distribution suggests that while economic savings and crop quality improvements are recognized benefits, they are secondary to the overarching goal of maximizing productivity. The ranking pattern highlights that adoption decisions are primarily driven by tangible yield gains and efficient resource utilization, indicating where future interventions and awareness campaigns should focus to enhance the effectiveness of the Soil Health Card scheme.

Table 4 summarizes the ranking of benefits associated with the adoption of Soil Health Card scheme based on total scores and average values calculated by Garrett value computation. The total score for each benefit was calculated by multiplying the number of respondents assigning a particular rank to that factor with the corresponding Garrett value, and summing these across all ranks. The average score was then obtained by dividing the total score by the number of respondents. Productivity enhancement secured the highest total score of 9344 and an average of 73, thereby ranking first. This indicates that farmers consider increased productivity as the most significant benefit of

**Table 2: Garrett's Mean Score according to ranking given on SHC scheme benefits by farmers**

N=128

Benefits	Percent Position	Garret Value	Rank
Productivity enhancement	12.5	73	I
Increased fertilizer use efficiency	37.5	57	II
Lowering fertilizer expenses	62.5	44	III
Improved crop quality	87.5	28	IV

**Table 3: Garrett's value computation of the SHC scheme benefits based on farmers opinion**

N=128

Benefits	Rank 1	Rank 2	Rank 3	Rank 4
Productivity enhancement	3723	3358	2263	0
Increased fertilizer use efficiency	2565	2736	684	1311
Lowering fertilizer expenses	1672	1144	968	1848
Improved crop quality	700	952	1036	896

following Soil Health Card recommendations. Increased fertilizer use efficiency was ranked second, with a total score of 7296 and an average of 57, indicating that farmers prioritize direct productivity gains over resource-use efficiency. Lowering fertilizer expenses stood third, with a total score of 5632 and an average of 44, highlighting the importance farmers place on cost savings in fertilizer use. Interestingly, improved crop quality was ranked fourth, with a total score of 3584 and an average of 49.11, suggesting that while quality improvement is valued, it is perceived as slightly less critical. This ranking pattern highlights the farmers' preference for tangible yield and cost-related benefits as key drivers for adopting the Soil Health Card scheme.

Findings of the present study align with the findings of Chouhan *et al.* (2017) who examined yields for kharif crops (paddy, soybean, maize) in Madhya Pradesh. They reported yield increases of 19.4%, 13.8%, and 9.6%, respectively, followed by substantial income gains up to 139.8% higher net income when recommendations were adopted which shows productivity enhancement emerged as the top-ranked benefit. Further, similar study was conducted by Singh *et al.* (2023) in Bareilly (UP) who founded SHC adoption in wheat, paddy, and sugarcane led to yield increases of 30.8%, 29.8%, and 32.9%, respectively, along with cost reductions and income gains which support the present findings as observations on lowering fertilizer costs and boosting profitability.

## II. Challenges faced by farmers regarding Soil Health Card Scheme

**1. Challenges faced by farmers in implementing SHC recommendations.** Farmers face several challenges when trying to follow Soil Health Card recommendations. Many don't have a local soil testing lab, forcing them to travel long distances or delay testing. A number of them also lack knowledge about soil management and how to interpret the SHC advice. Sometimes, the recommended inputs aren't available in local markets, and finding time to implement the guidance

can be difficult, specially during busy seasons. All these issues make it hard for farmers to effectively use Soil Health Cards.

The main problems faced by farmers in Sri Ganganagar in following the Soil Health Card (SHC) advice. Nearly half of the farmers (49%) reported that recommended inputs were not available, while about 23 per cent mentioned that they lacked sufficient time to follow the advice, especially during peak farm activities. To address these issues, it is recommended that extension agencies ensure timely availability of inputs through better coordination with local suppliers and cooperatives. Additionally, flexible and farmer-friendly advisory services, such as mobile-based reminders, community meetings during off-peak hours, and on-field demonstrations, should be introduced to help farmers manage their time effectively while still adopting the recommended practices. Around 13 per cent of farmers felt they didn't get enough help or guidance on what to do. Another 12 per cent said there isn't enough soil testing labs nearby, which makes testing harder. The problems of lack of knowledge were reported by only 3 per cent farmers. Therefore, there is enough knowledge disseminated by the extension workers of SHC scheme and lack of knowledge was isn't major issue as compared to the other challenges.

**Challenges faced by farmers in the adoption of SHC recommendations:** There are many challenges faced by farmers in using Soil Health Cards (SHCs) *viz.*, poor follow up by extension workers, difficulty in calculating fertilizer doses to be applied on field, inaccurate soil sampling or soil sampling is taken from limited farmer field, delays in receiving SHCs from the offices where soil sample is being submitted for testing and difficulty in obtaining recommended micronutrients and bio-fertilizers as suggested by SHC. Addressing these issues is crucial, as soil health plays a key role in boosting crop yields and overall farm productivity.

Table 5 shows the ranks of different challenges faced by farmers in adopting Soil Health Card (SHC) recommendations. The table presents the distribution of farmer's frequency. The major

**Table 4: Ranking of Garrett value computation of SHC Scheme benefits based on farmers opinion**

(N=128)

Benefits	Total	Average	Rank
Productivity enhancement	9344	73	I
Increased fertilizer use efficiency	7296	57	II
Lowering fertilizer expenses	5632	44	III
Improved crop quality	3584	28	IV

**Table 5: Distribution of famers according to their ranking on challenges faced in adoption of SHC recommendations**

N=128

Challenges	Rank Assigned by farmers (f)				
	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Inadequate follow-up by extension worker	46	31	25	16	10
Lack of knowledge in determining fertilizers rate to be applied on field	41	19	45	13	10
Inaccurate soil sampling/ sample collection from limited farmers field	30	52	9	17	20
Delayed card distribution after soil sample collection	12	9	34	31	42
Difficulty in obtaining recommended micronutrients and bio-fertilizers as suggested	8	27	32	36	25

challenge identified was inadequate follow-up by extension worker, which was ranked as the top issue by 46 farmers, second by 31 farmers, third by 25 farmers, fourth by 16 farmers, and fifth by 10 farmers. Further the data also shows that another constraint faced by 41, 19, 45, 13 and 10 farmers was lack of knowledge in determining fertilizers rate to be applied on field and ranked first, second, third, fourth and fifth, respectively. Moreover, Inaccurate technique of soil sampling as extension agents collect soil sample from limited farmers field was marked as other challenge by 30 farmers who assigned this challenge as first rank, 52 farmers assigned second rank, 9 of them assigned third rank, 17 of them assigned fourth rank and 20 of them assigned fifth rank.

The findings are in parallel with the findings of Charel *et al.*, (2024) who reported lack of farmer training to interpret cards and absence of local soil-testing labs, which shows poor knowledge and limited lab access, as key barriers.

Divulges of the Table 6 shows the Garrett mean score based on challenges faced by farmers in

adopting SHC scheme recommendations. The data in the table depicts that inadequate follow-up by extension workers with Garrett mean score of 75 was observed top most challenge by farmers, followed by lack of knowledge in determining fertilizers rate to be applied on field was ranked second with Garrett score of 60, followed by inaccurate soil sampling or sample collection from limited farmers field was ranked third and Garrett mean score 50, followed by delay of card distribution after soil sample collection was ranked fourth with Garrett mean score 40 and difficulty in obtaining recommended micronutrients and bio-fertilizers as suggested was ranked fifth with Garrett mean score 25. This scoring shows how each issue was weighted according to its importance, based on standard Garrett values used in survey analysis. The ranks individual Garrett value has been computed and tabulated in Table 7.

Table 7 explains how the Garrett scores were calculated. For each issue, the Garrett value assigned to its ranking positions was added up to get a total score. These totals were then listed in

Table 7 to show the final ranking of all the issues based on their overall importance using the Garrett method. The data in table clearly indicate that inadequate follow-up by extension worker appeared as the top most challenge in farmers' adoption of Soil Health Card recommendations, as it received Rank 1<sup>st</sup> with Garrett value 3450, rank 2<sup>nd</sup> with Garrett value 2325, rank 3<sup>rd</sup> with Garrett value 1875, rank 4<sup>th</sup> with Garrett value 1200 and rank 5<sup>th</sup> with Garrett value 750. This highlighted that there is not as much of visit to farmers by extension agents and ultimately feedback are not taken from farmers. Similarly, lack of knowledge in determining fertilizers rate to be applied on field was secondly observed challenge assigned rank 1<sup>st</sup> with Garrett value 2460, rank 2<sup>nd</sup> with Garrett value 1140, rank 3<sup>rd</sup> with Garrett value 2700, rank 4<sup>th</sup> with Garrett value 780 and rank 5<sup>th</sup> with Garrett value 600. Moreover, inaccurate soil sampling technique/ sample collection from limited farmers field was perceived another

challenge with Garrett value as 1500, 2600, 450, 850 and 1000, thereby, assigned rank as first, second, third, fourth and fifth, respectively. The ranking pattern highlights that adoption decisions of SHC are primarily affected by some barriers like less feedback, difficulty in determining quantity of the fertilizers and sample is collected from limited farmer's field, indicating that there should be proper follow up activities for future interventions.

Table 8 reveals that inadequate follow-up by extension worker is the top constraint with a total score of 9600 and an average of 75, ranked I. It is followed by lack of knowledge in determining fertilizers rate to be applied on field with total score of 7680 (average 60, rank II) and inaccurate soil sampling/ sample collection from limited farmers field with total score of 6400 (average 54.68, rank III). Further, Lower-ranked issues include delayed card distribution after soil sample collection with total Garrett score of 5120 (average 40, rank IV) and

**Table 6: Garrett's Mean Score according to ranking given on challenges faced by famers in adoption of SHC recommendations**

N=128

Challenges	Percent Position	Garret Value	Rank
Inadequate follow-up by extension worker	10	75	I
Lack of knowledge in determining fertilizers rate to be applied on field	30	60	II
Inaccurate soil sampling/ sample collection from limited farmers field	50	50	III
Delayed card distribution after soil sample collection	70	40	IV
Difficulty in obtaining recommended micronutrients and bio-fertilizers as suggested	90	25	V

**Table 7: Garrett's value computation of challenges faced by farmers in adoption of SHC recommendations**

(N=128)

Challenges	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Inadequate follow-up by extension worker	3450	2325	1875	1200	750
Lack of knowledge in determining fertilizers rate to be applied on field	2460	1140	2700	780	600
Inaccurate soil sampling/ sample collection from limited farmers field	1500	2600	450	850	1000
Delayed card distribution after soil sample collection	480	360	1360	1240	1680
Difficulty in obtaining recommended micronutrients and bio-fertilizers as suggested	200	675	800	900	625

**Table 8: Ranking of Garrett value computation on challenges faced by farmers in adoption of SHC recommendations**

(N=128)

Challenges	Total	Average	Rank
Inadequate follow-up by extension worker	9600	75	I
Lack of knowledge in determining fertilizers rate to be applied on field	7680	60	II
Inaccurate soil sampling/ sample collection from limited farmers field	6400	50	III
Delayed card distribution after soil sample collection	5120	40	IV
Difficulty in obtaining recommended micronutrients and bio-fertilizers	3200	25	V

difficulty in obtaining recommended micronutrients and bio-fertilizers with total Garrett value of 3200 (average 25, rank V).

Similar study was conducted by Patel *et al.* (2023) who founded that about 71 per cent cited poor follow-up from extension agencies, 59 per cent noted that soil samples were not collected from every field, and 57 per cent experienced delays in receiving their SHC results.

**III. Suggestions given by farmers to overcome the challenges faced in adoption and implementation of Soil Health Card recommendations.** Farmers face several challenges when trying to put Soil Health Card (SHC) advice into action. Many need financial help to buy recommended inputs like fertilizers or organic amendments. There's also limited access to soil testing labs, which delays getting soil data. Regular follow-up visits by extension workers are often missing, so many farmers struggle without guidance. Finally, training programs are needed to boost farmers' understanding of soil health management. Strategies are needed to improve the implementation of Soil Health Card recommendation, include financial support, better lab access, consistent follow-up, and training are all essential to help farmers to apply SHC recommendations effectively.

Results shows the suggestion given by farmers of Sri Ganganagar in order to help them to overcome the challenges faced in adoption of Soil Health Card (SHC) recommendations. Nearly half of the farmers (47%) said they need more technical training and guidance, showing that they want to learn how to use the SHC recommendations

properly. Around 31 per cent of farmers said they would benefit from regular visits and support from agricultural officers to help them to keep using the SHC methods over time. About 17 per cent mentioned that it would be easier to follow the advice if there were more soil testing labs nearby. Lastly, only 5 per cent said they needed financial support to afford the recommended practices.

### CONCLUSION

The study concludes that the Soil Health Card (SHC) scheme has significantly benefited farmers by enhancing productivity, reducing fertilizer expenses, and promoting efficient nutrient use. Among these, productivity improvement was identified as the most valued benefit. However, several challenges hinder the full adoption of SHC recommendations, particularly inadequate follow-up by extension worker and lack of knowledge in determining fertilizers rate to be applied on field. Lack of technical knowledge and limited access to soil testing facilities were also major challenges encountered by the farmers in implementation of SHC scheme. Farmers expressed a strong need for training, regular support, and better infrastructure. Addressing these gaps is crucial to maximize the scheme's impact on sustainable and profitable farming.

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# **AWARENESS OF STUDENTS TOWARDS SOCIAL MEDIA IN AGRICULTURE UNIVERSITIES OF RAJASTHAN**

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and Rashmi Bhinda\*\*\*\***

## **ABSTRACT**

Social media are modern interactive communication channels through which people connect to one another, share ideas, experiences, pictures, messages and information of common interest. The present study was conducted in Agriculture University of Rajasthan by selecting three agriculture colleges i.e. RCA, Udaipur, SKNCOA, Jobner and COA, Bikaner purposively. Among these three colleges selected 240 students were selected randomly. The results indicated that awareness of different social media sites shows that 94.16 per cent of postgraduate students were aware about telegram, 67.91 per cent of students having linkedIn account, 96.25 per cent of postgraduate students were heard about research gate, 70.41 per cent were heard about academia and 88.75 per cent of postgraduate students of agriculture universities were aware about instagram and its used. They found that there were no significant differences among selected universities of Rajasthan about awareness of different social media sites.

## **INTRODUCTION**

Social media are modern interactive communication channels through which people connect to one another, share ideas, experiences, pictures, messages and information of common interest. Social media provide tools by which people can communicate, share information and create new relationships. Penuel and Riel (2007) define social networking as "a set of people and the relationships between them". This definition is found today in the social networking services that promote the development of online communities of people. These sites allow user to make new friends, chatting with friends and family, sharing pictures and ideas that they cannot do offline. Social media provides more benefits that expand their perception of society, self and the humanity (Boyd, 2007). Social Media helps to create specific interest groups in agriculture (Thakur et al, 2017)

## **RESEARCH METHODOLOGY**

The present study was conducted in Rajasthan

which means "Land of Maharajas". The state of Rajasthan consists five Agricultural Universities, out of which three agricultural universities namely Maharana Pratap University of Agriculture & Technology, Udaipur, Sri Karan Narendra Agriculture University, Jobner and Swami Keshwanand Rajasthan Agriculture University, Bikaner were selected on the basis of post graduate programmes (M.Sc. and Ph.D. in Agriculture) are running for more than 20 years in various discipline. Therefore, the selected colleges are Rajasthan College of Agriculture (MPUAT, Udaipur), SKN College of Agriculture Jobner (SKNAU, Jobner) & College of Agriculture (SKRAU, Bikaner) for the present study. From the list so prepared, 80 post graduate scholars were selected from each identified college with the help of random sampling technique. Thus, a total of 240 post graduate students were included in the sample of study. A structured interview questionnaire was developed to collect information from the respondents. Collected data were analyzed using statistical tools

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such as mean, standard deviation, mean score, Analysis of variance (ANOVA).

**RESULTS AND DISCUSSION**

Awareness of postgraduate students towards different social media sites: To identify the awareness of postgraduate students about social media, 5 social media were selected according to their features of social media sites. To gather knowledge of the respondent related to different social media i.e. Telegram, LinkedIn, Research gate, Academia, Instagram

**1. Classification of postgraduate students on the basis of awareness about Telegram**

The overall data in Table 1 depict that 94.16 per cent of postgraduate students were aware about telegram followed by 82.50 per cent students used telegram for agriculture information. Whereas, 81.66 per cent students knew about the main purpose of telegram and 81.25 per cent knew about how to send message through telegram.

It is clear from the data in Table 1 that 96.25, 92.50 and 93.75 per cent of the postgraduate students were aware about telegram in RCA, Udaipur, SKNCOA, Jobner and COA, Bikaner respectively, whereas 80.00, 83.75 and 83.75 per cent students used telegram for agriculture information, 91.25, 75.00 and 78.75 per cent students knew about the main purpose of telegram and 83.75, 78.75 and 81.25 per cent students knew about how to send message through telegram in RCA, Udaipur, SKNCOA, Jobner and COA, Bikaner, respectively. Similar findings of the results

Meena *et al.*, (2024) who found that research scholar were aware of different social media sites.

**2. Distribution of postgraduate students according to awareness about LinkedIn**

The overall data in Table 2 reveal that the majority of postgraduate students of agriculture universities in Rajasthan had linkedIn account further, 60.00 per cent students knew about which type of people can be member on linkedIn and 51.66 per cent students knew about how to download slides on linkedIn and only 49.58 per cent students used to sharing thoughts on linkedIn.

College wise data in Table 2 depict that the most of students of RCA, Udaipur, SKNCOA, Jobner and COA, Bikaner i.e.62.50, 80.00, and 61.25 per cent, respectively had linkedIn followed by 55.00, 66.25 and 58.75 per cent students knew about which type of people could member on linkedIn. While 47.50, 60.00 and 47.50 per cent students knew about how to download slides on linkedIn and 40.00, 56.25 and 52.50 per cent students of RCA, Udaipur, SKNCOA and COA, Bikaner, respectively used to sharing thoughts on linkedIn.

Similar findings are the agreement by Kenchakkanavar *et al.*, (2018) found that most of research scholars were aware of linkedin.

**3. Categorization of postgraduate students on the basis of awareness about Research gate**

The overall data show in table 3 that 96.25 per cent of postgraduate students were heard about research gate followed by 90.41 per cent students

**Table 1: Awareness of postgraduate students regarding Telegram**

S. No.	Particulars	RCA Udaipur (n1=80)		SKNCOA Jobner (n2=80)		COA Bikaner (n3=80)		Overall (n=240)	
		f	%	f	%	f	%	f	%
1.	Aware about telegram	77	96.25	74	92.50	75	93.75	226	94.16
2.	The main purpose of this site	73	91.25	60	75.00	63	78.75	196	81.66
3.	How to send message	67	83.75	63	78.75	65	81.25	195	81.25
4.	Telegram be used for agriculture information	64	80.00	67	83.75	67	83.75	198	82.50

f=frequency, %= Per cent

had searching papers on research gate. Whereas 77.08 per cent students knew about text uploading on research gate and 76.66 per cent students were aware about discovering scientific information.

Further analysis of Table 3 reveals that 97.50, 95.00 and 96.25 per cent of postgraduate students were heard about research gate in RCA, Udaipur, SKNCOA, Jobner and COA, Bikaner, respectively. Whereas 92.50, 86.25 and 92.50 per cent students had searching papers on research gate and 73.75, 77.50 and 80.00 per cent students knew about text uploading on research gate in RCA, Udaipur, SKNCOA, Jobner and COA, Bikaner, respectively. Only 76.25, 75.00 and 78.75 per cent students were aware about discovering scientific information.

#### 4. Classification of postgraduate students according to awareness about Academia

The data in Table 4 reveal that majority of students (70.41 %) were heard about academia. While, 63.33 per cent of students knew about the purpose of academia, 62.08 per cent students had uploading your research work on academia and

55.83 per cent students were creating profile on academia.

Separate data clearly indicate in Table 4 that most of postgraduate students of RCA, Udaipur, SKNCOA, Jobner and COA, Bikaner i.e. 76.25, 62.50 and 72.50 per cent were heard about academia followed by 67.50, 60.00 and 62.50 per cent students knew about the purpose of academia, respectively. Whereas, 68.75, 58.75 and 58.75 per cent students of RCA, Udaipur, SKNCOA, Jobner and COA, Bikaner, respectively had uploading your research work on academia and 63.75, 41.25 and 62.50 percent students were creating profile on academia.

#### 5. Categorization of postgraduate students according to awareness about Instagram

The overall data in Table 5 show that 88.75 per cent of postgraduate students of agriculture universities were aware about its used followed by 86.66 per cent of postgraduate students had instagram account, 81.25 per cent students knew about how to work on instagram and 75.83 per cent students were aware about sharing agriculture

**Table 2 Awareness of postgraduate students regarding LinkedIn**

S. No	Particulars	RCA Udaipur (n1=80)		SKNCOA Jobner (n2=80)		COA Bikaner (n3=80)		Overall (n=240)	
		f	%	f	%	f	%	f	%
1.	LinkedIn account	50	62.50	64	80.00	49	61.25	163	67.91
2.	Type of people can be member of this	44	55.00	53	66.25	47	58.75	144	60.00
3.	Download slides on linkedIn	38	47.50	48	60.00	38	47.50	124	51.66
4.	Share thoughts on linkedIn	32	40.00	45	56.25	42	52.50	119	49.58

f=frequency, %= Per cent

**Table 3: Awareness of postgraduate students regarding Research gate**

S. No	Particulars	RCA Udaipur (n1=80)		SKNCOA Jobner (n2=80)		COA Bikaner (n3=80)		Overall (n=240)	
		f	%	f	%	f	%	f	%
1.	Heard about research gate	78	97.50	76	95.00	77	96.25	231	96.25
2.	Text can be uploading on it	59	73.75	62	77.50	64	80.00	185	77.08
3.	Search research papers on research gate	74	92.50	69	86.25	74	92.50	217	90.41
4.	Discover scientific information	61	76.25	60	75.00	63	78.75	184	76.66

f=frequency, %= Per cent

information on instagram.

The college wise data analysis in Table 5 show that 90.00, 88.75 and 87.50 per cent of students were aware about its used in RCA, Udaipur, SKNCOA, Jobner and COA, Bikaner, respectively. Whereas, 92.50, 80.00 and 87.50 per cent students had instagram account, 85.00, 78.75 and 80.00 per cent students were knew about how to work on instagram and 80.00, 77.50 and 70.00 per cent students were aware about sharing agriculture information on instagram in RCA, Udaipur, SKNCOA, Jobner and COA, Bikaner, respectively. The findings are supported by Fayaz (2020) found that majority of students were aware of instagram.

#### Comparison between students of selected agriculture colleges according to awareness about social media

To find out the difference in awareness among postgraduates students towards social media. Analysis of variance one way test used .

$NH_{01}$ : There is no significant difference among the selected agriculture colleges about awareness of social media

$RH_1$ : There is significant difference among the selected agriculture colleges about awareness of social media

The data show that calculated F value 2.10 was found to be less than tabulated value which is statically non significant. So the null hypothesis ( $NH_{01}$ ): "There is no significant difference among the selected agriculture colleges about awareness of social media" was accepted and research hypothesis was rejected. A Similar awareness among post graduate may be the reason that almost a similar knowledge received from a selected colleges of agriculture universities.

The findings are supported by Mishra (2020) who found that there was no significant differences among selected universities of Rajasthan about awareness of e- resource.

**Table 4: Awareness of postgraduate students regarding Academia**

S. No.	Particulars	RCA Udaipur (n1=80)		SKNCOA Jobner (n2=80)		COA Bikaner (n3=80)		Overall (n=240)	
		f	%	f	%	f	%	f	%
1.	Heard about academia	61	76.25	50	62.50	58	72.50	169	70.41
2.	Create profile on academia	51	63.75	33	41.25	50	62.50	134	55.83
3.	Upload your research work on academia	55	68.75	47	58.75	47	58.75	149	62.08
4.	Purpose of academia	54	67.50	48	60.00	50	62.50	152	63.33

f=frequency, %= Per cent

**Table 5: Awareness of postgraduate students regarding Instagram**

S. No.	Particulars	RCA Udaipur (n1=80)		SKNCOA Jobner (n2=80)		COA Bikaner (n3=80)		Overall (n=240)	
		f	%	f	%	f	%	f	%
1.	Have an instagram account	74	92.50	64	80.00	70	87.50	208	86.66
2.	Aware about its use	72	90.00	71	88.75	70	87.50	213	88.75
3.	know to work on instagram	68	85.00	63	78.75	64	80.00	195	81.25
4.	Share agriculture information on instagram	64	80.00	62	77.50	56	70.00	182	75.83

f=frequency, %= Per cent

## CONCLUSION

It can be concluded that majority of postgraduate students were aware of social media. They were more focused of these social media sites were used for academic purpose for this study. The study also concluded that most of students were aware, heard and used about social media sites i.e. telegram, linkedIn , academia, research gate and instagram. They found that there were no significant differences among selected universities of Rajasthan about awareness of social media.

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# FACTORS AFFECTING ENTREPRENEURIAL BEHAVIOUR OF DAIRY ENTREPRENEURS: AN EMPIRICAL ANALYSIS

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## ABSTRACT

The present study was conducted in Akhnoor and R.S. Pura blocks of purposively selected Jammu district of Jammu and Kashmir to find out the relationship between the selected entrepreneurial traits and personal antecedents of 200 dairy entrepreneurs selected by applying proportionate random sampling technique. Results indicate a positive relationship between all the twelve entrepreneurial traits and personal antecedents of the respondents except family type and caste, which were found to be non significant at 0.05 level of probability. Further, age, education, farming experience, occupation, family size, land holding, annual income, credit behaviour and herd size were found to have positive and significant influence on the entrepreneurial behaviour of the respondents. This finding will enrich the existing body of knowledge on entrepreneurship and help in the development of entrepreneurship in Jammu region. The finding validates the effect of personal antecedents on entrepreneurship traits and also encourages training agencies and academicians to develop courses on entrepreneurship development in order to develop the entrepreneurial competencies among the trainees.

## INTRODUCTION

Animal husbandry and dairy production is an integral part of Indian agriculture. It is land saving and gender neutral enterprise which provides supplementary income and employment to the rural households, the majority of whom are landless, marginal and small farmers. At present, India is the world's largest producer of milk. The role of dairy enterprise in Indian agriculture is now changing from subsistence level to commercialized one so as to meet the increasing demand of milk and milk products of the increasing population. The economy of the country cannot improve unless animal husbandry progress along with agricultural production.

Entrepreneurship has become the need of the hour with good potential to improve the livelihood and generate employment. Entrepreneurship is one of the most important inputs for development of dairying, which could prove vital for economic development for the country. Entrepreneurship is directly related to the socio-economic development of the society (Petrin, 1992). Entrepreneurship means identifying/innovating ideas, products and services, mobilizing resources, organizing production/services and finally marketing them

covering the risk with constant strive for growth and excellence (Jhamtani, 1996). A sustainable and financially viable dairy farming, which will generate income and self-employment through entrepreneurship, is need of the day. In this context entrepreneur is one of the most important inputs for development of dairying, which may prove phenomenal for economic development of farming community or regions dominated with dairy farming. Development of economy of any nation depends primarily on the important role played by entrepreneurs. Entrepreneur is a person who organizes, manages and assumes the risk of a business (Jhamtani, 1996).

Empirical studies conducted in the past have worked out some important characteristics, which can provide a working profile of farm entrepreneurs. List of these characteristics include need for achievement, risk taking, self confidence, problem solving, locus of control, effective communication leadership, originality, use of feedback, profit orientation and personal efficacy (Bhagat *et al.*, 2005). Farm entrepreneur may not need all these traits; but the more he has, the greater the chances of being an entrepreneur. The understanding of this

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may help in predicting the success of dairy enterprise in generating more income and social goods. At the same time it is of utmost importance to know the factors, which in different magnitude affect the entrepreneurial behaviour of dairy farmers. Most of the small and marginal farmers are dependent on dairy farming and there is need to enhance the income of the farmers. Hence, entrepreneurship development in milk production, marketing and processing is need of the hour. Dairying provides the main source of income next to agriculture in rural areas. The future of dairy industry lies in developing entrepreneurial skills and competencies among dairy entrepreneurs.

However, entrepreneurship extends beyond material resources; it is fundamentally influenced by entrepreneurial traits and mindsets (Kurjono *et al.*, 2020). Traits such as economic motivation, risk orientation, information seeking behavior, and achievement motivation significantly shape entrepreneurial intentions, even among individuals traditionally not categorized as entrepreneurs (Anjum *et al.*, 2024; Ndofirepi, 2020). These traits often remain untapped due to limited education, inadequate financial resources, and restricted access to modern technologies. Such constraints suppress their ability to innovate and seize entrepreneurial opportunities (Sathya, 2019; Chaudhary *et al.*, 2023; Vijaya Kumar, 2016).

There are various factors responsible for the entrepreneurial success in dairying. Academicians and researchers have different opinions regarding the influence of different personal antecedents on entrepreneurial traits ultimately resulting in entrepreneurial success.. However, it has been confirmed by many researchers that personality traits play a significant role in attaining entrepreneurial success. In view of this, the present study was undertaken with an objective to find out the relationship between selected entrepreneurial traits and personal antecedents of the respondents in Jammu district of Jammu and Kashmir.

## RESEARCH METHODOLOGY

The present study was conducted in purposively

selected Jammu district of Jammu and Kashmir as it had maximum milch bovine population. Jammu district consists of twenty blocks, out of which two blocks *viz.*, R.S. Pura and Akhnoor were selected based on maximum milch bovine population. Then from each of the selected block, five villages which fall within the radius of 15 km from the block headquarters were selected on the basis of possessing highest milch bovine population. Thus in all, 10 villages were taken for the study. After knowing the number of dairy owners in each village, a proportionate sample of 200 respondents was selected from these villages. Further, on the basis of number of milch animals (bovine) possessed by them, the respondents were divided into three categories of small, medium and large dairy farmers. Thus, there were 80, 68 and 52 small, medium and large dairy farmers, respectively.

An interview schedule was developed, pre-tested among non-sample respondents and modified. The data were collected from 200 respondents by conducting personal interview of respondents with the help of modified interview schedule. The collected data were scored, compiled, tabulated and subjected to various statistical tools to draw meaningful results and conclusions. In order to find out relationship of selected independent variables with entrepreneurial traits of dairy entrepreneurs, Pearson product moment correlation coefficient ( $r$ ) was worked out. To know the contributory influence of selected independent variables on entrepreneurial behaviour of dairy entrepreneurs, multiple regression analysis was carried out.

## RESULTS AND DISCUSSION

The findings have been presented and discussed in the following sub heads:

### **Relationship between total commitment and immersion and personal antecedents of the respondents:**

A perusal of the data contained in Table 1 reveal that age, education, family size, farming experience, occupation, caste, land holding, annual income, social participation, credit behaviour and herd size

**Table 1: Relationship between selected entrepreneurial traits and personal antecedents of the respondents**

Entrepreneurial Traits	Age (Y <sub>1</sub> )	Educational (Y <sub>2</sub> )	Farming experience (Y <sub>3</sub> )	Occupation (Y <sub>4</sub> )	Family type (Y <sub>5</sub> )	Family size (Y <sub>6</sub> )	Caste (Y <sub>7</sub> )	Land holding (Y <sub>8</sub> )	Annual income (Y <sub>9</sub> )	Social Participation (Y <sub>10</sub> )	Credit behaviour (Y <sub>11</sub> )	Herd size (Y <sub>12</sub> )
X <sub>1</sub> -Total commitment and immersion	0.617*	0.745*	0.484*	0.516*	0.015 <sup>NS</sup>	0.234*	0.183 <sup>NS</sup>	0.772*	0.523*	0.512*	0.673*	0.892*
X <sub>2</sub> -Achievement motivation	-0.654*	0.447*	0.252*	0.618*	0.026 <sup>NS</sup>	0.429*	0.114 <sup>NS</sup>	0.653*	0.420*	0.416*	0.593*	0.558*
X <sub>3</sub> -Management orientation	0.567*	0.471*	0.286*	0.657*	0.041 <sup>NS</sup>	0.556*	0.008 <sup>NS</sup>	0.678*	0.378*	0.550*	0.304*	0.482*
X <sub>4</sub> -Risk taking ability	-0.389*	0.457*	0.223*	0.436*	0.143 <sup>NS</sup>	0.332*	0.032 <sup>NS</sup>	0.579*	0.389*	0.447*	0.551*	0.555*
X <sub>5</sub> -Decision making ability	0.772*	0.662*	0.575*	0.648*	0.231 <sup>NS</sup>	0.415*	0.117 <sup>NS</sup>	0.421*	0.591*	0.642*	0.633*	0.646*
X <sub>6</sub> -Self confidence	-0.548*	0.712*	0.445*	0.675*	0.212 <sup>NS</sup>	0.632*	0.217 <sup>NS</sup>	0.677*	0.648*	0.679*	0.543*	0.541*
X <sub>7</sub> -Leadership ability	0.469*	0.357*	0.138*	0.151*	0.104 <sup>NS</sup>	0.158*	0.053 <sup>NS</sup>	0.548*	0.477*	0.529*	0.245*	0.214*
X <sub>8</sub> -Utilization of available assistance	0.217*	0.428*	0.217*	0.271*	0.078 <sup>NS</sup>	0.277*	0.061 <sup>NS</sup>	-0.161*	0.228*	0.479*	0.326*	-0.114*
X <sub>9</sub> -Economic motivation	0.597*	0.578*	0.264*	0.478*	0.031 <sup>NS</sup>	0.563*	0.013 <sup>NS</sup>	0.522*	0.469*	0.713*	0.411*	0.491*
X <sub>10</sub> -Scientific orientation	-0.452*	0.468*	0.334*	0.356*	0.005 <sup>NS</sup>	0.212*	0.049 <sup>NS</sup>	0.463*	0.283*	0.510*	0.352*	0.665*
X <sub>11</sub> -Innovativeness	-0.247*	0.353*	0.414*	0.262*	0.018 <sup>NS</sup>	0.452*	0.121 <sup>NS</sup>	0.455*	0.452*	0.356*	0.455*	0.335*
X <sub>12</sub> -High tolerance to failure/ambiguity	0.378*	0.451*	0.352*	0.245*	0.019 <sup>NS</sup>	0.645*	0.214 <sup>NS</sup>	0.218*	0.493*	0.291*	-0.419*	-0.187*

\* Significant at 5% level, NS = Non-significant

of the respondents were significantly and positively related with total commitment and immersion. Whereas, caste and family type had no relationship with total commitment and immersion. The variables like age, education, farming experience, herd size, land holding, annual income, credit behaviour and social participation in one or other way may have influenced one or more traits of entrepreneurial behaviour.

#### **Relationship between achievement motivation and personal antecedents of the respondents:**

Data in Table 1 vividly corroborate that education, farming experience, occupation, family size, land holding, annual income, social participation, credit behaviour and herd size of the selected dairy farmers had a positive and significant correlation with achievement motivation. Besides, age had significant and negative relationship with achievement motivation. Contrarily, family type and caste had no relationship with achievement motivation. Similar findings were reported by David and Edward (2011).

#### **Relationship between management orientation and personal antecedents of the respondents:**

It is ostensible from the data contained in Table

1 that age, education, farming experience, occupation, family size, land holding, annual income, social participation, credit behaviour and herd size of the respondents were significantly and positively correlated with management orientation. However, family type and caste had no relationship with management orientation.

#### **Relationship between risk taking ability and personal antecedents of the respondents:**

Data presented in Table 1 show that education, farming experience, occupation, family size, land holding, annual income, social participation, credit behaviour and herd size of the respondents had significant and positive correlation with their risk taking ability. Whereas, age had significant and negative correlation with risk taking ability. Contrary to it, caste and family type of the respondents was not found correlated with their risk taking ability.

#### **Relationship between decision making ability and personal antecedents of the respondents:**

Data given in Table 1 show that age, education, farming experience, occupation, family size, land holding, annual income, social participation, credit behaviour and herd size of the selected dairy farmers were significantly and positively correlated with their

**Table 2: Regression analysis between personal antecedents and entrepreneurial traits of the respondents**

S. No.	Variables	'b' value
1.	Age	0.325**
2.	Education	0.417**
3.	Farming experience	0.513**
4.	Occupation	0.262**
5.	Family type	-0.304
6.	Family size	0.396**
7.	Caste	-0.072
8.	Land holding	0.274**
9.	Annual income	0.283**
10.	Social participation	-0.052
11.	Credit behaviour	0.142**
12.	Herd size	0.729**
<b>R<sup>2</sup> = 0.857</b>		

\*\*Significant at 0.01 level of probability

decision making ability. However, caste and family type of the respondents was not found correlated with their decision making ability.

#### **Relationship between self confidence and personal antecedents of the respondents:**

Data in Table 1 show that education, farming experience, occupation, family size, land holding, annual income, social participation, credit behaviour and herd size of the respondents had significant and positive relationship with self confidence. Besides, age had significant and negative correlation with self confidence. Contrary to it, caste and family type of the respondents had non-significant relationship with their self-confidence. Similar findings were reported by Lawrence and Ganguli (2012).

#### **Relationship between leadership ability and personal antecedents of the respondents:**

A perusal of data incorporated in Table 1 discern that age, education, farming experience, occupation, land holding, family size, annual income, credit behaviour, social participation and herd size were significantly and positively correlated with leadership ability possessed by the respondents. Contrarily, family type and caste of the selected dairy farmers had non-significant relationship with their leadership ability.

#### **Relationship between utilization of available assistance and personal antecedents of the respondents:**

A glance at the data incorporated in Table 1 show that age, education, farming experience, occupation, family size, annual income, social participation and credit behaviour of the selected dairy farmers had a significant and positive correlation with utilization of available assistance. Besides, land holding and herd size had significant and negative correlation with utilization of available assistance. Contrary to it, family type and caste of the respondents had no relationship with utilization of available assistance.

#### **Relationship between economic motivation and personal antecedents of the respondents:**

A critical look at the Table 1 brings to focus that

age, education, farming experience, occupation, family size, land holding, annual income, social participation, credit behaviour and herd size of the respondents had a significant and positive correlation with economic motivation. However, caste and family type of the respondents had no relationship with economic motivation.

#### **Relationship between scientific orientation and personal antecedents of the respondents:**

Data incorporated in Table 1 reveal that education, farming experience, occupation, land holding, annual income, family size, social participation, credit behaviour and herd size of the respondents were significantly and positively correlated with scientific orientation. Besides, age had significant and negative relationship with scientific orientation. Contrary to it, family type and caste had no relationship with scientific orientation.

#### **Relationship between innovativeness and personal antecedents of the respondents:**

A glance at the data incorporated in Table 1 vividly corroborate that education, farming experience, occupation, family size, land holding, annual income, social participation, credit behaviour and herd size of the selected dairy farmers had significant and positive correlation with innovativeness. Whereas, age had significant and negative relationship with innovativeness. Contrary to it, family type and caste of the respondents had no relationship with their innovativeness.

#### **Relationship between high tolerance to failure/ambiguity and personal antecedents of the respondents:**

It is ostensible from the data given in Table 1 that age, education, farming experience, occupation, family size, land holding, annual income and social participation of the respondents had significant and positive correlation with high tolerance to failure/ambiguity. Besides, credit behaviour and herd size had significant and negative correlation with high tolerance to failure/ambiguity. Contrarily, caste and family type had no relationship with high tolerance to failure/ambiguity.

### Factors affecting entrepreneurial behaviour of the respondents:

In order to assess the contribution of independent variables towards the entrepreneurial behaviour, multiple regression analysis was carried out and results are presented in Table 2. Age, education, farming experience, occupation, family size, land holding, annual income, credit behaviour and herd size were found to have positive and significant influence on the entrepreneurial behaviour of the respondents. Other variables *viz.* family type, caste and social participation were found to have negative and non-significant relationship towards entrepreneurial behaviour. The  $R^2$  value was 0.857 and indicates that all the independent variables taken together could explain a variation of 85.7 percent in the entrepreneurial behaviour of the selected dairy entrepreneurs.

### CONCLUSION

This study provides a comprehensive understanding that entrepreneurial traits namely, total commitment and immersion, achievement motivation, management orientation, risk taking ability, innovativeness, self-confidence, leadership ability, utilization of available assistance, economic motivation, scientific orientation, decision making ability and high tolerance to failure / ambiguity had significant relationship with age, education, farming experience, occupation, family size, land holding, annual income, social participation credit behaviour and herd size except caste and family type. Besides, age, education, farming experience, occupation, family size, land holding, annual income, credit behaviour and herd size were found to have positive and significant influence on the entrepreneurial behaviour of the respondents. Hence, it is recommended that frequent training programmes focusing on developing entrepreneurial competencies among dairy entrepreneurs should be organized so that they could consider dairying as an enterprise and get motivation to inculcate in them the needed attributes of an ideal entrepreneur. Based on the study findings, this research provides valuable insights for the policy makers and agricultural

stakeholders to provide a conducive environment for entrepreneurship promotion.

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# KNOWLEDGE AND ADOPTION OF RECOMMENDED OKRA CULTIVATION PRACTICES IN SOUTHERN RAJASTHAN

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## ABSTRACT

The study was conducted to assess the knowledge and adoption of recommended okra (*Abelmoschus esculentus* L.) cultivation practices in Udaipur and Banswara districts of Southern Rajasthan. An ex-post-facto research design was adopted and data were collected from 240 respondents through random sampling. The results revealed that the majority of respondents (70.00%) had medium level of knowledge, while 15.00 per cent each were categorized under low and high knowledge groups. District-wise analysis showed that Udaipur had a slightly higher share of high-knowledge farmers, whereas Banswara had more in the medium group. Aspect-wise assessment indicated that harvesting and post-harvesting handling (MPS: 67.15) and irrigation management (MPS: 65.10) were the most adopted practices, whereas plant protection measures (MPS: 54.48) and cultural practices (MPS: 58.25) were relatively weaker. Manurial practices reflected moderate adoption with greater reliance on organic manures compared to fertilizers and bio-fertilizers. The findings suggest that while farmers possess satisfactory operational knowledge, critical gaps persist in seed treatment, varietal use and disease management, necessitating targeted extension and training interventions to enhance productivity and profitability.

## INTRODUCTION

Okra (*Abelmoschus esculentus*), popularly known as lady finger or "bhindi," is one of the most important vegetable crops cultivated in India. It is a rich source of vitamins, minerals and dietary fiber and contributes to both food and nutritional security. India is the largest producer of okra in the world, accounting for over 70.00 per cent of global production. According to the Department of Agriculture & Farmers Welfare (2024-25), vegetable production in India stood at 219.67 million tonnes, in which okra occupies a prominent position. In Southern Rajasthan, districts such as Udaipur, Banswara, Dungarpur, Chittorgarh and Pratapgarh have favourable agro-climatic conditions for okra cultivation. Farmers in these regions grow okra not only for household consumption but also as a commercial crop due to its high demand, short duration and profitability. However, the productivity and returns from okra largely depend on the extent to which farmers possess knowledge of

recommended practices and the degree of their adoption in actual cultivation. Recommended practices for okra include the use of improved/hybrid varieties, timely sowing, seed treatment, balanced nutrient application, integrated pest and disease management, efficient irrigation scheduling and proper harvesting techniques. Yet, variations exist in the knowledge and adoption levels among farmers due to constraints like limited technical guidance, lack of awareness and restricted access to inputs. Keeping these considerations in view, the present study was undertaken with the specific objective: "To assess the knowledge and adoption of recommended okra cultivation practices in Southern Rajasthan."

## RESEARCH METHODOLOGY

An ex-post-facto research design was employed for the present study to assess the knowledge and adoption of recommended okra cultivation practices. The study was conducted in Southern Rajasthan,

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which comprises seven districts: Udaipur, Rajsamand, Banswara, Dungarpur, Chittorgarh, Pratapgarh and Bhilwara. Out of these, Udaipur and Banswara were purposively selected due to the highest numbers of respondents under okra cultivation. From each selected district, three tehsils were purposively identified based on the maximum number of okra farmers. From each tehsil, two villages were randomly selected, resulting in a total of twelve villages for the study. A representative sample of 240 okra farmers (20 from each village) was selected as respondents. Primary data were collected using a structured interview schedule developed to capture information on socio-economic characteristics, knowledge of recommended okra practices and adoption levels. The schedule was pre-tested and modified to ensure reliability and validity.

**RESULTS AND DISCUSSION**

To get an overview of the knowledge and adoption level, the okra farmers were classified into three categories i.e. low, medium and high on the basis of mean and standard deviation of the obtained scores by the respondents. The results of the same have been presented in Table 1.

The distribution of okra farmers according to their knowledge and adoption levels of recommended cultivation practices in Udaipur and Banswara districts. It is evident that the majority of

farmers fell into the medium category for both knowledge (65.42%) and adoption (70.00%). In terms of knowledge, 21.67 per cent of farmers in Udaipur belonged to the high category compared to only 09.17 per cent in Banswara, indicating better awareness among Udaipur respondents. Conversely, low knowledge levels were slightly higher in Udaipur (20.83%) than in Banswara (17.50%).

Regarding adoption, both districts showed similar trends, with over two-thirds of farmers adopting practices at the medium level (71.67% in Udaipur and 68.33% in Banswara). However, high adoption was marginally higher in Banswara (16.67%) as compared to Udaipur (13.33%). Overall, the findings suggest that while farmers in both districts have attained medium levels of knowledge and adoption, there exists a noticeable gap between awareness and full implementation, particularly in Banswara for knowledge and in Udaipur for adoption.

The aspect-wise knowledge and adoption of recommended cultivation practices by okra growers in Udaipur and Banswara districts were assessed through Mean Percent Score (MPS) and ranking. The results indicate clear differences between knowledge and adoption levels across various aspects. The results have been presented in Table 2.

**Table 1: Distribution of Okra farmers According to Level of Knowledge and Adoption of Recommended Cultivation Practices**

(n = 240)

Category	Udaipur (Knowledge f/ %)	Banswara (Knowledge f/ %)	Total (Knowledge f/ %)	Udaipur (Adoption f/ %)	Banswara (Adoption f/ %)	Total (Adoption f/ %)
Low level	25 (20.83)	21 (17.50)	<b>46</b> <b>(19.17)</b>	18 (15.00)	18 (15.00)	<b>36</b> <b>(15.00)</b>
Medium level	69 (57.50)	88 (73.33)	<b>157</b> <b>(65.42)</b>	86 (71.67)	82 (68.33)	<b>168</b> <b>(70.00)</b>
High level	26 (21.67)	11 (09.17)	<b>37</b> <b>(15.41)</b>	16 (13.33)	20 (16.67)	<b>36</b> <b>(15.00)</b>
Total	120 (100.00)	120 (100.00)	<b>240</b> <b>(100.00)</b>	120 (100.00)	120 (100.00)	<b>240</b> <b>(100.00)</b>

f= frequency, % = per cent

**Table 2. Aspect-wise Knowledge and Adoption of Cultivation Practices of Okra Farmers in Southern Rajasthan****n=240**

S. No	Aspect / Sub-aspect	Knowledge Udaipur (MPS, Rank)	Knowledge Banswara (MPS, Rank)	Knowledge Total (MPS, Rank)	Adoption Udaipur (MPS, Rank)	Adoption Banswara (MPS, Rank)	Adoption Total (MPS, Rank)
A	Cultural Practices	69.33 (6)	74.17 (3)	<b>71.75 (5)</b>	54.17 (6)	62.33 (3)	<b>58.25 (5)</b>
1	Soil & land preparation	74.17 (3)	82.50 (2)	<b>78.33 (2)</b>	53.33 (3)	73.33 (2)	<b>63.33 (2)</b>
2	Use of improved varieties	56.67 (4)	65.83 (4)	<b>61.25 (4)</b>	62.92 (2)	55.83 (4)	<b>59.38 (3)</b>
3	Sowing season & method	78.33 (2)	88.33 (1)	<b>83.33 (1)</b>	67.50 (1)	74.58 (1)	<b>71.04 (1)</b>
4	Seed rate & spacing	80.83 (1)	71.67 (3)	<b>76.25 (3)</b>	46.67 (4)	56.25 (3)	<b>51.46 (4)</b>
5	Soil & seed treatment	56.67 (4)	62.50 (5)	<b>59.58 (5)</b>	40.42 (5)	51.67 (5)	<b>46.04 (5)</b>
B	Manurial Practices	72.78 (4)	75.83 (5)	<b>74.31 (4)</b>	55.83 (5)	63.19 (2)	<b>59.51 (4)</b>
1	Application of organic manures	81.67 (1)	90.00 (1)	<b>85.83 (1)</b>	69.17 (1)	91.25 (1)	<b>80.21 (1)</b>
2	Application of fertilizer	72.50 (2)	70.83 (2)	<b>71.67 (2)</b>	61.67 (2)	51.25 (2)	<b>56.46 (2)</b>
3	Application of bio-fertilizers	64.17 (3)	66.67 (3)	<b>60.83 (3)</b>	36.67 (3)	47.08 (3)	<b>41.88 (3)</b>
C	Irrigation Management	77.08 (2)	75.42 (4)	<b>76.25 (3)</b>	69.38 (1)	60.83 (4)	<b>65.10 (2)</b>
1	Methods of irrigation	80.83 (1)	79.17 (1)	<b>80.00 (1)</b>	67.92 (1)	61.67 (1)	<b>64.79 (2)</b>
2	Recommended irrigation schedule	73.33 (2)	71.67 (2)	<b>72.50 (2)</b>	70.83 (2)	60.00 (2)	<b>65.42 (1)</b>
D	Inter-cultural Operations	76.67 (3)	77.50 (2)	<b>77.08 (2)</b>	64.38 (3)	55.00 (5)	<b>59.69 (3)</b>
1	Manual weeding	71.67 (2)	76.67 (2)	<b>74.17 (2)</b>	67.92 (1)	63.75 (1)	<b>65.83 (1)</b>
2	Weedicide	81.67 (1)	78.33 (1)	<b>80.00 (1)</b>	60.83 (2)	46.25 (2)	<b>53.54 (2)</b>
E	Plant Protection Measures	70.00 (5)	59.17 (6)	<b>64.58 (6)</b>	62.92 (4)	46.04 (6)	<b>54.48 (6)</b>
1	Pest observation & chemical control	65.83 (2)	67.50 (1)	<b>66.67 (1)</b>	42.08 (1)	53.33 (1)	<b>68.75 (1)</b>
2	Disease observation & chemical control	74.17 (1)	50.83 (2)	<b>62.50 (2)</b>	41.67 (2)	38.75 (2)	<b>40.21 (2)</b>
F	Harvesting & Post-harvest Handling	77.78 (1)	86.11 (1)	<b>81.94 (1)</b>	67.78 (2)	66.53 (1)	<b>67.15 (1)</b>
1	Appropriate stage/time of harvesting	81.67 (1)	90.00 (1)	<b>85.83 (1)</b>	76.25 (1)	77.92 (1)	<b>77.08 (1)</b>
2	Sorting & grading / cleaning	72.50 (3)	79.17 (3)	<b>75.83 (3)</b>	62.08 (3)	58.75 (3)	<b>60.42 (3)</b>
3	Packaging & marketing	79.17 (2)	89.17 (2)	<b>84.17 (2)</b>	65.00 (2)	62.92 (2)	<b>63.96 (2)</b>

MPS= Mean Percent Score

The table presents the aspect-wise knowledge and adoption of okra cultivation practices by farmers in Southern Rajasthan, covering Udaipur and Banswara districts. In terms of knowledge, "harvesting and post-harvest handling" ranked first (81.94 MPS), followed by "inter-cultural operations" (77.08 MPS), "irrigation management" (76.25 MPS), "manurial practices" (74.31 MPS), "cultural practices" (71.75 MPS) and "plant protection measures" (64.58 MPS), which ranked lowest. Farmers in Udaipur reported comparatively higher knowledge in aspects such as "seed rate and spacing" (80.83 MPS) and "weedicide application" (81.67 MPS), whereas farmers in Banswara exhibited superior knowledge in "sowing season & method" (88.33 MPS) and "appropriate harvesting stage" (90.00 MPS).

The table also reveals that, on the adoption side, "harvesting and post-harvest handling" ranked highest (67.15 MPS), followed by "irrigation management" (65.10 MPS), "inter-cultural operations" (59.69 MPS), "manurial practices" (59.51 MPS), "cultural practices" (58.25 MPS) and "plant protection measures" (54.48 MPS), which remained the least adopted. Farmers in Udaipur demonstrated relatively higher adoption of "sowing season & method" (67.50 MPS) and "manual weeding" (67.92 MPS), whereas farmers in Banswara recorded better adoption in the "application of organic manures" (91.25 MPS) and "harvesting at the appropriate stage" (77.92 MPS).

District-wise comparative analysis shows that knowledge levels were consistently higher than adoption levels across all aspects, reflecting a gap between awareness and actual implementation. While farmers possess adequate knowledge of crucial practices such as improved varieties, irrigation methods and harvesting techniques, their practical adoption is comparatively limited, particularly in plant protection measures and soil/seed treatment. These findings suggest the need for targeted extension efforts to bridge the knowledge-adoption gap, with emphasis on plant protection, seed treatment, and scientific nutrient management

for enhancing okra productivity in southern Rajasthan.

## CONCLUSION

The study concluded that most okra farmers in southern Rajasthan have medium-level knowledge and adoption of recommended practices, with better awareness of cultural and irrigation practices, while gaps exist in nutrient management, pest control, and post-harvest handling. Strengthening extension services through training and demonstrations, promoting farmer learning, ensuring access to quality inputs and providing timely information via digital media, along with periodic monitoring and research support, can enhance both knowledge and adoption, ultimately improving okra productivity and profitability in the region.

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# **CONSTRAINTS FACED BY FARMERS IN ADOPTION OF NATURAL FARMING IN BHILWARA DISTRICT OF RAJASTHAN**

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## **ABSTRACT**

Natural Farming is a viable and sustainable option to overcome the ill effects of chemical based farming. Natural farming methods promote nonchemical and homemade pest control methods. It drastically cut down production costs by replacing the chemical fertilizers and pesticides with home-grown products like Jeevamrit, Beejamrit, Neemastra, Agniastra etc. The present study was conducted in Bhilwara district of Rajasthan considering this project is running in this district. The study was undertaken to identify the constraints faced by respondents in adoption of natural farming. The Primary data was collected from 126 respondents from 5 villages using a structured interview schedule. It was observed that the most prominent category of constraints faced by the respondents was "Marketing constraints," which attained first rank. The second major constraint category was "Financial constraints," with second rank. "Input constraints" ranked third and "Technical constraints" were ranked fourth.

## **INTRODUCTION**

Natural farming, as the name implies, is the art, practice and increasingly the science of working in harmony with nature to achieve greater productivity with fewer inputs. In Krishi Vigyan Kendra, Bhilwara, Natural Farming project is started in 2023. This project is providing training to the farmers about preparation methods and use of natural farming components i.e. Dhanjewamrit, Jeevamrit, Neemastra and Beejamrit. At the core of Natural Farming practices are use of Jeevamritha and Beejamritha. Jeevamritha is a fermented liquid mixture made from cow dung, cow urine, jaggery, pulse flour and bund soil combined with water. It is rich in beneficial microorganisms that act as bio-stimulants, enhancing activity of both soil and phyllosphere microbes when applied to the field or foliage. Beejamritha, a concentrated version of Jeevamritha without water, is used as a seed

treatment. It helps beneficial microbes colonize roots and leaves of germinating seeds, promoting healthy plant growth.

Other key components of natural farming include Achhadana (bio-mulching), intercropping and the use of indigenous seeds. Additionally, natural farming encourages the use of homemade bio-pesticide formulations like Neemastra, Agniastra and Brahmastra, which help manage pests such as mealy bugs, sucking pests, fruit borers, stem borers, pod borers and leaf rollers. Natural farming has been observed to partially improve soil health, likely due to the rapid development of heterotrophic microbial communities and an increase in soil organic matter. While some studies report a slight decline in yield, others have shown no significant reduction, indicating that outcomes may vary depending on local conditions and crop types.

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## RESEARCH METHODOLOGY

The study was conducted in Bhilwara district of Rajasthan considering this project is running in this district. Three Panchayat samiti namely Suwana, Mandal and Sawaipur were selected for present investigation on the basis of highest number of farmers registered for natural farming project. From Sawaipur Panchayat samiti two village i.e. Sopura and Udliyas and from Mandal Panchayat samiti one village Bhagwanpura and from Suwana Panchayat samiti two village i. e. Maheshpura and Pondras were chosen. From the selected villages, a list of Natural Farming Project farmers was prepared. A total of 126 farmers (trained farmers) were selected. From 5 village to represent constraints faced by farmers. The study relied primarily on primary data, collected through personal interviews using a well-structured and pretested interview schedule by researcher. There were four major constraints (input related, technical related, financial related and marketing related constraints) included in the scale to measure constraints faced by respondents.

## RESULTS AND DISCUSSION

### Constraints in adoption of Natural Farming by respondents

As described in Table 1 and 2 four categories of constraints were studied among which highest ranked constraints was "Marketing constraints" with total MPS of 74.50. Next "Financial constraints" which was ranked second and MPS of 73.20. "Input constraints" were placed at third rank and MPS was 64.28. "Technical constraints" were ranked fourth with MPS of 42.53.

**Table 1: Aspect wise constraints faced by farmers in adoption of Natural Farming**

S. No.	Constraints	MPS	Rank
1	Input Constraints	64.28	3
2	Technical Constraints	42.53	4
3	Financial Constraints	73.20	2
4	Marketing Constraints	74.50	1

MPS = Mean Per cent Score

**Table 2: Constraints perceived by respondents in adoption of Natural Farming**

S. No.	Constraints	MPS	Rank
<b>1. Input constraints</b>			
1	Lack of supply of quality seed	75.39	2
2	Lack of FYM for components of natural farming	74.60	3
3	Lack of tools needed to make the components of Natural farming	71.42	5
4	Lack of control measures for pestand diseases	72.22	4
5	Non-availability of traditional seeds	76.98	1
<b>2. Technical constraints</b>			
1	Lack of skill for seed treatment	78.57	3
2	Lack of knowledge about adequate quantity and methods of fertilizer application	75.39	5
3	Non-availability of technical guidance for making components of natural farming	76.19	4
4	Lack of inadequate information	82.53	1
5	Inadequate training facilities	80.95	2
<b>3. Financial constraints</b>			
1	Low yield as compare to conventional farming	76.98	2
2	Lack of subsidy from government on Natural farming	74.60	3
3	Small Land holding	78.57	1
4	Non-availability of credit at low interest rates	73.01	4
5	In adequate economical support from government in from of crop insurance	70.63	5
<b>4. Marketing constraints</b>			
1	Lack of credit facility in marketing	72.22	7

2	Lack of storage facilities	84.92	1
3	Lack of transport facilities	80.95	2
4	Problems of middlemen/village agent of mandi merchant	74.60	6
5	Undue mandi taxes on the poor product	75.39	5
6	Lack of latest market information	79.65	3
7	High cost of transportation	76.19	4
8	Lack of procurement price of produce fixed by the Government	70.63	8

MPS = Mean Per cent Score

### CONCLUSION

It was observed that most prominent category of constraints faced by the respondents was "Marketing constraints," which attained the highest overall MPS of 74.50, it means this is major problem for famers and "Technical constraints" were ranked fourth with the lowest MPS of 42.53, it means Technical related problems are least in Natural Farming adoption. This research serves as

a valuable reference for policymakers, extension workers, and agricultural planners aiming to bridge the gap between research and field-level workers.

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# **CONSTRAINTS FACED BY FARMERS IN ADOPTION OF DISTRICT AGRO-MET UNIT (DAMU) PROJECT IN CHITTORGARH DISTRICT OF RAJASTHAN**

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## **ABSTRACT**

District Agro-Meteorological Units (DAMUs) generate and distribute quantitative weather forecasts for districts and blocks up to five days in advance, specifically for agricultural use. These forecasts cover key meteorological parameters such as rainfall, maximum and minimum temperatures, wind speed and direction, relative humidity and cloud cover. The AMFUs/DAMUs use these forecasts to generate district/block-level Agro-Met advisories twice a week, on Tuesday and Friday and distribute them to the farming community to assist them in making informed decisions for day-to-day farm operations. The study was conducted in Chittorgarh and Bhadesar tehsil of Chittorgarh district of southern Rajasthan considering this project is running in this district. The study was undertaken to identify the constraints faced by respondents in adoption of DAMU Project. The Primary data was collected from 100 respondents from 4 villages using a structured interview schedule. It was observed that the most prominent category of constraints faced by the respondents was "Technical constraints," which attained first rank. The second major constraint category was "General constraints," with second rank. "Financial constraints" ranked third and "Input constraints" were ranked fourth.

## **INTRODUCTION**

Small and marginal farmers form the backbone of rural India, making up 85.00 per cent of the farming community but owning only 44.00 per cent of the total operational land. Agriculture stands out from other economic sectors due to its heavy reliance on weather conditions. Throughout the growing season, both directly and indirectly, weather plays a crucial role in crop growth and yield. Unpredictable weather patterns can heighten the risk of crop failure in specific regions. Severe weather events such as droughts, floods, hail storms or frost can quickly stress plants, leading to poor yields and increased production costs. However, accurate and well-interpreted weather information, especially when tailored with agricultural advisories, can help reduce these risks. Effective planning and management of agricultural activities such as

selecting suitable cultivars, determining optimal sowing times, applying fertilizers, pesticides and insecticides as needed, ensuring efficient irrigation and scheduling harvests require weather forecasts across all time scales. In particular, short-term forecasts enable timely adjustments to daily operations, helping to reduce losses caused by adverse weather and enhancing the yield, quantity and quality of agricultural output. Meteorological information plays a vital role in agricultural practices by supporting increased and more consistent crop yields.

Meteorological data also supports the implementation of multiple cropping systems in irrigated regions and tree-based farming systems in rainfed areas. It contributes to integrated pest management, soil and water conservation, watershed development and the promotion of

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agroforestry practices in drylands, sloped terrains and areas prone to erosion. Moreover, it plays a key role in advancing water management technologies for sustainable agricultural development. In light of these developments and technological advancements, the India Meteorological Department (IMD) has established a network of over 130 Agro-Meteorological Field Units (AMFUs) across the country. Under the Gramin Krishi Mausam Sewa (GKMS) scheme, it was recommended that the India Meteorological Department (IMD) set up District Agro-Meteorological Units (DAMUs) in 530 districts, supplementing the 130 existing AMFUs. While, the goal was to complete this by 2021-2022, DAMUs have currently been established at 189 locations within the premises of Krishi Vigyan Kendra's (KVKs) under the GKMS program.

### RESEARCH METHODOLOGY

The study was conducted in Chittorgarh and Bhadesar tehsil of Chittorgarh district of southern Rajasthan considering this project is running in this district. Two tehsils from these districts were selected for study. Total 4 villages were selected from these tehsils. A total of 100 farmers were selected. The study relied primarily on primary data collected through personal interviews using a well-structured and pre-tested interview schedule by researcher. There were four major constraints (General related, technical related, financial constraints and input related constraints) included in the scale to measure constraints faced by respondents.

### RESULTS AND DISCUSSION

Overall analysis of data presented in Table 1 reveal that the average of perceived level of

constraints respondents was 33.68 per cent. The data further reveal that majority of respondents (72.50%) were found in the middle constraint level followed by low (18.33%) and high level perceived (9.17%) in both districts. In Udaipur district majority of respondents (60.00%) were found in the middle constraint level followed by low (18.33%) and high level (21.67%), respectively. In Salumber district majority of respondents (71.67%) were found in the middle constraint level followed by low (11.67%) and high level (16.67%), respectively.

### Constraints in adoption of crop diversification by respondents

As described in Table 2 and 3, four constraints were studied among which highest ranked constraints was other farming constraints with total MPS of 55.47. This category scored 51.07 in Udaipur and 56.89 in Salumber. Next ecological constraints, which was ranked second and MPS of 54.90 comprising 54.27 from Udaipur and 56.98 from Salumber. Marketing constraints was placed at third rank and MPS was 51.20 based on values of 49.79 for Udaipur and 52.29 for Salumber and production constraints was ranked fourth with MPS of 50.32 for Udaipur 45.74 and Salumber 52.50.

### CONCLUSION

The average perceived level of constraints by respondents was 33.68 per cent. The data further revealed that majority of respondents (72.50%) were found in the middle constraint level followed by low (18.33%) and high level perceived (9.17%) in both districts. In Udaipur district majority of respondents (60.00%) were found in the middle constraint level followed by low (18.33%) and high level (21.67%), respectively. In Salumber district

**Table 1: Constraint level of farmers**

S. No.	Constraints level	Udaipur (n <sub>1</sub> =60)		Salumber (n <sub>2</sub> =60)		Total (n=120)	
		f	%	f	%	f	%
1	Low	11	18.33	7	11.66	22	18.33
2	Middle	36	60.00	43	71.67	87	72.50
3	High	13	21.67	10	16.67	11	9.17
	<b>Total</b>	<b>60</b>	<b>100.00</b>	<b>60</b>	<b>100.00</b>	<b>120</b>	<b>100.00</b>

**Table 2: Constraints perceived by respondents in adoption of crop diversification**

S.No	Constraints	Udaipur (n <sub>1</sub> =60)		Salumber (n <sub>2</sub> =60)		Total (n=120)	
		MPS	Rank	MPS	Rank	MPS	Rank
<b>1.</b>	<b>Production related</b>						
1	Small land holding	55.00	1	71.67	1	63.33	1
2	Cash shortage when needed	50.00	2	65.83	2	57.92	2
3	Fertilizer and Plant protection chemicals not available on time	47.50	4	51.67	4	49.58	4
4	Un-fertile holding	49.17	3	49.17	5	49.17	5
5	Costly labour	45.00	5	55.83	3	50.42	3
6	Non-availability of skilled labour at operation period	39.17	11	42.50	10	40.83	10
7	Fluctuating production	40.00	9	45.83	8	42.92	9
8	Lack of irrigation facilities	43.33	7	43.33	9	43.33	8
9	Non-availability of quality seed and planting material	42.50	8	46.67	7	44.58	6
10	Less technical knowledge	44.25	6	48.83	6	43.67	7
11	Costly inputs	39.67	10	41.83	11	39.58	11
<b>2.</b>	<b>Marketing related</b>						
1	High transport charges and lack of all-weather roads	59.17	1	56.67	2	57.92	2
2	Distant markets	50.83	4	54.17	3	52.50	4
3	Lack of vehicles and non-availability in time	57.50	2	60.00	1	58.75	1
4	Fluctuating price	54.17	3	53.33	4	53.75	3
5	Inadequate storage facilities	46.67	5	49.17	6	47.92	5
6	Malpractices by traders at the time of auction	43.33	6	42.50	7	42.91	7
7	Lack of market intelligence	39.17	7	50.00	5	44.58	6
<b>3.</b>	<b>Ecological constraints</b>						
1	Loss of soil fertility	58.33	4	49.17	7	53.75	5
2	Soil erosion	45.83	7	56.67	4	51.25	6
3	Loss of water holding capacity	42.50	8	48.33	8	45.41	8
4	Loss of genetic diversity of planting material	46.67	6	50.83	6	48.75	7
5	Incidence of diseases and insect pests attack	55.00	5	54.17	5	54.58	4
6	Erratic rain fall	60.83	2	73.33	1	67.08	1
7	Irrigation water quality	65.83	1	60.83	3	63.33	2
8	Loss of soil organisms/ predator	59.16	3	62.50	2	60.83	3
<b>4.</b>	<b>Other farming related</b>						
1	Less experience in the field	49.17	5	50.00	7	49.58	6
2	No local processing facilities	61.67	1	65.83	3	63.75	1
3	Large initial investment needed	53.33	3	55.00	5	54.17	5
4	Lack of policy support	50.83	4	68.33	2	59.58	2
5	Wild animals menace	41.67	6	70.00	1	55.83	4
6	Lack of proper knowledge about the application of insecticides, pesticides and fertilizers	60.83	2	56.67	4	58.75	3
7	Costly inputs	40.00	7	53.33	6	46.66	7

MPS = Mean Per cent Score

**Table 3: Overall constraints perceived by farmers**

S.No.	Constraints	Udaipur (n <sub>1</sub> =60)		Salumber (n <sub>2</sub> =60)		Total (n=120)	
		MPS	Rank	MPS	Rank	MPS	Rank
1	Production constraints	45.74	4	52.50	3	50.32	4
2	Marketing constraints	49.79	3	52.29	4	51.20	3
3	Ecological constraints	54.27	1	56.98	1	54.90	2
4	Other farming constraints	51.07	2	56.89	2	55.47	1

MPS = Mean Per cent Score

majority of respondents (71.67%) were found in the middle constraint level followed by low (11.67%) and high level (16.67%). It was observed that most prominent category of constraints faced by the respondents was "Other farming constraints," which attained the highest overall MPS of 55.47, it means this is major problem for farmers and "Production constraints" were ranked fourth with the lowest MPS of 50.32, it means production related problems are least in crop diversification. This research serves as a valuable reference for policy makers, extension workers, and agricultural planners aiming to bridge the gap between research and field-level adoption among spice crop cultivators in Rajasthan.

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# SOCIO-ECONOMIC PROFILE OF RAPESEED-MUSTARD GROWERS OF JAMMU REGION

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## ABSTRACT

The study was carried out in the purposively selected Jammu district of Jammu and Kashmir to examine the socio-economic profile of rapeseed-mustard farmers. Data were collected through personal interview method and analyzed using simple statistical tools such as frequency and mean percentage scores. Findings revealed that majority of the respondents were in the 44-58 year age group, possessed middle-level education, and pursued agriculture alongside business. A majority lived in nuclear families with a family size of 2-7 members. Furthermore, most farmers were marginal landholders, cultivating less than one hectare of land.

## INTRODUCTION

Oilseeds are a vital component of India's agricultural output, ranking second only to cereals. They contribute approximately 3 per cent to the nation's Gross National Product (GNP), occupy 13 per cent of the gross cropped area, and account for 10 per cent of the total value of agricultural produce (Kumar *et al.*, 2018). Among oilseed crops, soybean leads with a 39 per cent share, followed by groundnut at 26 per cent, and rapeseed-mustard at 24 per cent, collectively making up over 88 per cent of India's oilseed production (Bhagat *et al.*, 2022; Nadaf *et al.*, 2021). In terms of edible oil production, rapeseed-mustard takes precedence with a 31 per cent share, followed by soybean at 26 per cent and groundnut at 25 per cent. Despite its significance, rapeseed-mustard productivity in Jammu and Kashmir, spanning over 43,000 hectares, remains low at 7.85 q/ha compared to the national average of 14.19 q/ha in 2022-23, with a national production of 124.93 lakh tonnes (Indiastat, 2023). This gap is largely due to limited adoption of modern farming practices, resource constraints, and the sub-tropical climate's variability in Jammu district. The Seed Minikit Programme, implemented under the National Food Security Mission-Oilseeds (NFSM-OS) during the Rabi 2021-22 season, distributed 8307 minikits of high-yielding varieties (HYVs) and

hybrids, notably *Brassica juncea* (Indian mustard), which dominates over 75 per cent of the cultivated area due to its adaptability to rainfed conditions. However, low productivity persists, necessitating an evaluation of the program's effectiveness and the challenges faced by farmers. The present investigation has been carried out to study the socio-economic profile of rapeseed-mustard farmers in Jammu region of Jammu & Kashmir.

## RESEARCH METHODOLOGY

The present study was conducted in Jammu District of Jammu & Kashmir, Jammu district comprises four agricultural sub-divisions namely R.S. Pura, Marh, Akhnoor and Dansal. Among these, three sub-divisions Akhnoor, Dansal and Marh were purposively selected for the research due to their high coverage of beneficiaries under the Rapeseed-Mustard Seed Minikit Programme implemented as part of the National Food Security Mission-Oilseeds (NFSM-OS). From each of these sub-divisions, 40 beneficiaries of the programme were chosen using a random sampling method without replacement, resulting in a total of 120 beneficiary respondents. Additionally, 20 non-beneficiary rapeseed-mustard growers were randomly selected from each sub-division, yielding a sample of 60 non-beneficiary respondents. Thus, the total study sample comprised 180 respondents, consisting of 120 beneficiaries and 60 non-

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beneficiaries. Data were collected through personal interview method using a standardized interview schedule designed to ensure consistency and reliability. The collected data were systematically tabulated for analysis.

## RESULTS AND DISCUSSION

### Age of the Respondents:

Table 1 reveals that, the average age of beneficiary farmers in Marh, Akhnoor and Dansal sub-divisions was 54.14 years, 50.73 years and 48.87 years respectively. The overall mean age in three sub-divisions was 51.24 years ( $\pm 13.22$ ). Majority of the beneficiary farmers (38 per cent) belonged to the age group of 44-58 years followed by 35 per cent who belonged to age group of 24-43 years and 27 per cent who belonged to age group of 59-72 years respectively.

In case of non-beneficiary farmers, the average age in Marh, Akhnoor and Dansal sub-divisions was 47.24 years, 52.08 and 50.29 years respectively. The overall average age in three sub-divisions was 49.87 years ( $\pm 11.09$ ). Majority of the non-beneficiary farmers (52 per cent) belonged to the age group of 44-58 years followed by 31 per cent who belonged to age group of 24-43 years and 17 per cent belonged to young age group of 59-72 years respectively.

### Education

The educational background of beneficiary farmers varied across sub-divisions. Overall, 37 per cent beneficiary farmers in three sub-divisions were middle pass followed by 26 per cent who had matric level education, 22 per cent who had completed higher secondary education (12+2), 10 per cent had graduate and above qualification, 4 per cent were primary pass and none of the beneficiary farmers were below primary. Besides, 2 per cent of the beneficiary farmers were illiterate. The average formal education was highest in Akhnoor sub-division which was 10.34 years ( $\pm 3.42$ ) followed by 10.08 years ( $\pm 3.89$ ) in Marh, and the lowest was in Dansal sub-division which was 9.37 years ( $\pm 3.14$ ). The overall formal education completed

by beneficiary farmers was 9.93 years ( $\pm 3.08$ ).

However, in case of non-beneficiary farmers, overall, 44 per cent of the respondents were middle passed followed by 23 per cent farmers who were matriculate, 18 per cent had done higher secondary (10+2) and 8 per cent were primary pass. Only 5 per cent farmers were having graduation and above qualification and none of the non-beneficiary farmers were below primary and illiterate. The average formal education was highest in Akhnoor sub-division which 10.51 years ( $\pm 4.08$ ) followed by 9.38 years ( $\pm 2.87$ ) in Marh sub-division, and the lowest was in Dansal sub-division which was 8.54 years ( $\pm 2.77$ ). The overall formal education was 9.47 years ( $\pm 2.68$ ).

### Marital status

The data in Table 1 show that the majority of beneficiary farmers (98 per cent) were married, with only 2 per cent unmarried. For non-beneficiary farmers, 95 per cent were married, and 5 per cent were unmarried.

### Farming experience

Data in the Table 1 show that the overall average farming experience of beneficiary farmers in Marh, Akhnoor and Dansal sub-divisions was 27.30 years ( $\pm 13.89$ ), 24.75 years ( $\pm 11.45$ ) and 21.05 years ( $\pm 8.52$ ) respectively. Furthermore, the overall farming experience of beneficiary farmers was 24.36 years ( $\pm 10.84$ ).

However, the average farming experience of non-beneficiary farmers in Marh, Akhnoor and Dansal sub-divisions was 25.53 years ( $\pm 10.43$ ), 29.25 years ( $\pm 12.72$ ) and 26.85 years ( $\pm 10.24$ ) respectively. The overall average farming experience of non-beneficiary farmers was 27.21 years ( $\pm 12.62$ ).

### Family size

Table 1 shows that the average family size of beneficiary farmers in Marh sub-division was 6.41 ( $\pm 3.09$ ) members, followed by 5.86 ( $\pm 2.54$ ) members in Akhnoor sub-division and 6.24 ( $\pm 2.85$ ) members in Dansal sub-division. The overall

average family size of the beneficiary farmers was 6.17 ( $\pm 2.91$ ) members. In the case of non-beneficiary farmers, the average family size in Marh sub-division was 5.73 ( $\pm 2.58$ ) members, followed by 6.27 ( $\pm 2.61$ ) members in Akhnoor sub-division and 5.42 ( $\pm 3.17$ ) members in Dansal sub-division. The overall average family size of the non-beneficiary farmers was 5.81 ( $\pm 2.68$ ) members.

Furthermore, 65 per cent, 80 per cent, and 73 per cent of the beneficiary farmers in Marh, Akhnoor, and Dansal sub-divisions had a family size of 2-7 members, respectively, followed by 27 per cent, 15 per cent, and 22 per cent of farmers in Marh, Akhnoor, and Dansal sub-divisions who had a family size of 8-11 members, and 8 per cent, 5 per cent, and 5 per cent of farmers in Marh, Akhnoor, and Dansal sub-divisions who had a family size of 12-22 members, respectively. Overall, 72 per cent of the beneficiary farmers had a family size of 2-7 members, followed by 22 per cent with 8-11 members, and only 6 per cent had a family size

between 12-22 members.

In case of non-beneficiary farmers, 80 per cent, 70 per cent, and 85 per cent of the farmers in Marh, Akhnoor, and Dansal sub-divisions had a family size of 2-7 members, followed by 15 per cent, 20 per cent, and 15 per cent with a family size of 8-11 members, and 5 per cent and 10 per cent with a family size of 12-22 members, respectively. Overall, 78 per cent of the non-beneficiary farmers had a family size of 2-7 members, followed by 16 per cent with 8-11 members, and only 6 per cent had a family size between 12-22 members (Table 2).

### Type of family

Overall, 68 per cent of the beneficiary farmers had nuclear families and 32 per cent had joint families. In Marh, Akhnoor and Dansal sub-divisions, the percentage of nuclear families was 62 per cent, 75 per cent and 68 per cent respectively, whereas the percentage of joint families was 38 per cent, 25 per cent and 32 per cent respectively.

**Table 1: Socio-personal profile of the respondents**

Parameters	Beneficiary farmers				Non-beneficiary farmers			
	Marh (n=40)	Akhnoor (n=40)	Dansal (n=40)	Overall (n=120)	Marh (n=20)	Akhnoor (n=20)	Dansal (n=20)	Overall (n=60)
Mean age (years)	54.14 $\pm 14.38$	50.73 $\pm 11.21$	48.87 $\pm 11.07$	<b>51.24</b> <b><math>\pm 13.22</math></b>	47.24 $\pm 9.78$	52.08 $\pm 12.86$	50.29 $\pm 10.64$	<b>49.87</b> <b><math>\pm 11.09</math></b>
<b>Categorization of age (per cent farmers)</b>								
24-43 yrs	32	45	27	<b>35</b>	50	25	20	<b>31</b>
44-58 yrs	25	27	55	<b>38</b>	35	55	65	<b>52</b>
59-72 yrs	32	27	17	<b>27</b>	15	20	15	<b>17</b>
<b>Education level (per cent farmers)</b>								
Illiterate	3	-	3	<b>2</b>	-	-	-	-
Primary	-	5	8	<b>4</b>	5	15	5	<b>8</b>
Middle	37	32	42	<b>37</b>	55	30	40	<b>44</b>
Matric	30	23	25	<b>26</b>	20	20	30	<b>23</b>
10+2	23	28	15	<b>22</b>	10	30	15	<b>18</b>
Graduate & above	7	15	8	<b>10</b>	10	5	-	<b>5</b>
<b>Marital status (per cent farmers)</b>								
Married	100	98	98	<b>98</b>	95	90	100	<b>95</b>
Un-married	-	2	2	<b>2</b>	5	10	-	<b>5</b>
Mean education (years)	10.08 $\pm 3.89$	10.34 $\pm 3.42$	9.37 $\pm 3.14$	<b>9.93</b> <b><math>\pm 3.08</math></b>	9.48 $\pm 2.87$	10.51 $\pm 3.08$	8.64 $\pm 2.77$	<b>9.47</b> <b><math>\pm 2.68</math></b>
Average farming experience (years)	27.30 $\pm 13.89$	24.75 $\pm 11.45$	21.05 $\pm 8.52$	<b>24.36</b> <b><math>\pm 10.84</math></b>	25.53 $\pm 10.43$	29.25 $\pm 12.72$	26.85 $\pm 10.24$	<b>27.21</b> <b><math>\pm 12.62</math></b>

$\pm$ Means Standard deviation (S.D.)

In case of non-beneficiary farmers, overall, 75 per cent farmers had nuclear families and 25 per cent had joint families. In Marh sub-division, 75 per cent farmers had nuclear families and 25 per cent farmers had joint families. The percentage of nuclear families was 60 per cent and 90 per cent in Akhnoor and Dansal sub-division respectively, whereas the joint families accounted for 40 per cent and 10 per cent, respectively. (Table 2).

### Land holding and farm size of the respondents

In the case of beneficiary farmers, the average operational land holding in the Marh, Akhnoor, and Dansal sub-divisions was 1.37, 1.29, and 0.99 hectares respectively. Overall, the average operational land holding across all sub-divisions was 1.22 hectares. While, in case of non-beneficiary farmers, the overall average operational land holding was 0.81 ha which include 0.83, 0.91 and 0.69 hectares from Marh, Akhnoor, and Dansal sub-divisions, respectively.

Regarding owned land, beneficiary farmers in Marh, Akhnoor, and Dansal held 1.27 hectares, 1.31 hectares, and 0.96 hectares, respectively, with the overall 1.18 ha of land owned by them. In case of non-beneficiary farmers, the overall owned land was 0.77 hectares which include 0.78, 0.84 and 0.69 hectares from Marh, Akhnoor, and Dansal sub-divisions, respectively.

The leased-in land holdings of beneficiary farmers

were recorded at 0.12 hectares for Marh, 0.02 hectares for Akhnoor, and 0.03 hectares for Dansal sub-divisions respectively. Conversely, leased-out land stood at 0.02 hectares in Marh and 0.04 hectares in Akhnoor. Across all sub-divisions, the overall leased-in and leased-out land holdings were 0.05 and 0.02 hectares, respectively. In case of non-beneficiary farmers, the overall leased-in land holding was 0.05 hectares which include 0.04 hectares in Marh and 0.07 hectares in Akhnoor sub-divisions while none of the non-beneficiary farmers had leased out land holding.

As for irrigated landholding, the average irrigated area in Marh, Akhnoor, and Dansal sub-divisions was 1.13, 0.77, and 0.24 hectares, respectively while average un-irrigated land holdings were 0.24 hectares in Marh, 0.52 hectares in Akhnoor, and 0.75 hectares in Dansal. In total, beneficiary farmers had an average irrigated land holding of 0.70 hectares, while the overall average un-irrigated land holding was 0.52 hectares. In case of non-beneficiary farmers, the average irrigated area in Marh, Akhnoor, and Dansal sub-divisions was 0.49, 0.61, and 0.08 hectares respectively while average un-irrigated land holdings were 0.34 hectares in Marh, 0.30 hectares in Akhnoor and 0.61 hectares in Dansal sub-divisions respectively. In total, non-beneficiary farmers had an average irrigated land holding of 0.39 hectares, while the overall average un-irrigated land holding was 0.42 hectares.

**Table 2: Family composition of the respondents**

Parameters	Beneficiary farmers				Non-beneficiary farmers			
	Marh (n=40)	Akhnoor (n=40)	Dansal (n=40)	Overall (n=120)	Marh (n=20)	Akhnoor (n=20)	Dansal (n=20)	Overall (n=60)
<b>Avg. family size</b>	6.41 ±3.09	5.86 ±2.54	6.24 ±2.85	<b>6.17</b> <b>±2.91</b>	5.73 ±2.58	6.27 ±2.61	5.42 ±3.17	<b>5.81</b> <b>±2.68</b>
<b>Family type(per cent farmers)</b>								
Nuclear	62	75	68	<b>68</b>	75	60	90	<b>75</b>
Joint	38	25	32	<b>32</b>	25	40	10	<b>25</b>
<b>Family size(per cent farmers)</b>								
2-7 members	65	80	73	<b>72</b>	80	70	85	<b>78</b>
8-11 members	27	15	22	<b>22</b>	15	20	15	<b>16</b>
12-22 members	8	5	5	<b>6</b>	5	5	-	<b>6</b>

±Means Standard deviation (S.D.)

### Categorization of the respondents on the basis of farm size

The data presented in Table 3 indicate that 45 per cent, 50 per cent and 60 per cent beneficiary farmers in Marh, Akhnoor, and Dansal sub-divisions respectively, belonged to marginal farmers (<1 ha) category. Besides, overall, 52 per cent of beneficiary farmers belong to this category. In the case of non-beneficiary farmers, 75 per cent, 60 per cent and 80 per cent of farmers in the Marh, Akhnoor, and Dansal sub-divisions, respectively, fell under the marginal farmer category (<1 ha). Overall, 72 per cent of non-beneficiary farmers fell under this category.

Further, 42 per cent, 25 per cent, and 35 per cent of farmers in Marh, Akhnoor, and Dansal sub-divisions respectively are categorized as small farmers (1-2 ha). Overall, 34 per cent of farmers belonged to this category. In the case of non-beneficiary farmers, 25 per cent of farmers in Marh, 35 per cent farmers in Akhnoor, and 10 per cent farmers in Dansal sub-divisions are categorized as small farmers (1-2 ha), bringing the overall

percentage to 23 per cent.

Furthermore, 8 per cent, 22 per cent, and 5 per cent of farmers in Marh, Akhnoor, and Dansal sub-divisions, respectively, belonged to the semi-medium category (2-4 ha), with an overall percentage of 12 per cent respondents. In the case of non-beneficiary farmers, overall, 5 per cent of the farmers were in the semi-medium category (2-4 ha) which include 5 per cent and 10 per cent farmers from Akhnoor and Dansal sub-divisions, respectively.

Moreover, the findings indicate that 5 per cent beneficiary farmers from Marh and 3 per cent of farmers each from Akhnoor and Dansal sub-divisions belonged to medium farmers category (4-10 ha). Overall, 2 per cent of farmers fell in this category. Interestingly, none of the non-beneficiary farmers belonged to medium farmers category.

### Occupation of the respondents

Overall, 51 per cent of the beneficiary farmers had agriculture as their main occupation followed by agriculture + business (20 per cent), agriculture + private job (11 per cent), agriculture + government

**Table 3: Land holding and farm size detail of the respondents**

Particular	Marh (n=40)	Akhnoor (n=40)	Dansal (n=40)	Overall (n=120)	Marh (n=20)	Akhnoor (n=20)	Dansal (n=20)	Overall (n=60)
<b>Average operational land holding (ha)</b>	1.37 ±1.08	1.29 ±1.23	0.99 ±0.57	<b>1.22</b> <b>±0.96</b>	0.83 ±0.35	0.91 ±0.53	0.69 ±0.41	<b>0.81</b> <b>±0.43</b>
<b>Owned</b>	1.27 ±0.92	1.31 ±1.42	0.96 ±0.66	<b>1.18</b> <b>±0.98</b>	0.78 ±0.33	0.84 ±0.43	0.69 ±0.39	<b>0.77</b> <b>±0.38</b>
<b>Leased in</b>	0.12 ±0.38	0.02 ±0.09	0.03 ±0.14	<b>0.05</b> <b>±0.20</b>	0.046 ±0.11	0.07 ±0.201	-	<b>0.05</b> <b>±0.11</b>
<b>Leased out</b>	0.02 ±0.11	0.04 ±0.20	-	<b>0.02</b> <b>±0.10</b>	-	-	-	-
Average Irrigated land holding(ha)	1.13 ±1.09	0.77 ±1.18	0.24 ±0.51	<b>0.70</b> <b>±0.92</b>	0.49 ±0.38	0.61 ±0.631	0.08 ±0.28	<b>0.39</b> <b>±0.43</b>
Average un irrigated land holding(ha)	0.24 ±0.49	0.52 ±0.61	0.75 ±0.65	<b>0.52</b> <b>±0.58</b>	0.34 ±0.36	0.30 ±0.352	0.61 ±0.25	<b>0.42</b> <b>±0.32</b>
<b>Categorization of farm size (per cent farmers)</b>								
Marginal (<1ha)	45	50	57	<b>51</b>	75	60	80	<b>72</b>
Small (1-2ha)	42	25	35	<b>34</b>	25	35	10	<b>23</b>
Semi-medium (2-4ha)	8	22	5	<b>12</b>	-	5	10	<b>5</b>
Medium (4-10ha)	5	3	3	<b>2</b>	-	-	-	-

± is standard deviation, Categorization of farm size as per MoA&FW (2019)

**Table 4: Occupational status of the respondents**

Parameters	Beneficiary farmers				Non-beneficiary farmers			
	Marh (n=40)	Akhnoor (n=40)	Dansal (n=40)	Overall (n=120)	Marh (n=20)	Akhnoor (n=20)	Dansal (n=20)	Overall (n=60)
<b>Occupation (per cent farmers)</b>								
Agriculture only	20(50)	45	60	<b>51</b>	70	40	60	<b>58</b>
Agriculture+ Business	20	25	15	<b>20</b>	5	25	-	<b>11</b>
Agriculture+ Government job	7	13	7	<b>9</b>	10	10	5	<b>7</b>
Agriculture+ Govt retired	3	10	-	<b>4</b>	-	-	5	<b>2</b>
Agriculture + Private job	15	8	8	<b>11</b>	-	15	-	<b>5</b>
Agriculture + Labour	5	-	10	<b>5</b>	5	25	20	<b>17</b>

Figures in decimals are rounded off to the nearest whole number

job (9 per cent), agriculture + labor (5 per cent) and agriculture + government retired (4 per cent). In comparison, overall, 58 per cent of the non-beneficiary farmers had agriculture as their main occupation followed by agriculture + labor (17 per cent), agriculture + business (11 per cent), agriculture + government job (7 per cent), agriculture + private job (5 per cent) and agriculture + government retired (2 per cent).

## CONCLUSION

The study highlights that rapeseed-mustard cultivation in Jammu region is predominantly carried out by middle-aged farmers with moderate education and long farming experience. Most households are nuclear in nature, with relatively large family sizes, and farmers primarily belong to the marginal and small landholding categories, reflecting the prevalence of small-scale agriculture. Despite their engagement in agriculture as the main occupation, limited land, resources, and irrigation facilities restrict productivity. These findings underline the need for greater support in terms of technology adoption, capacity building, and extension services to enhance productivity and sustainability of rapeseed-mustard farming in the region.

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# **EMPOWERMENT OF RURAL WOMEN THROUGH NRLM FUNDED SELF-HELP GROUPS**

**Rakesh Kumar\*, P.S. Slathia\*\*, Narinder Paul\*\*\* and J.S. Manhas\*\*\*\***

## **ABSTRACT**

The current study was carried out in the Miran Sahib block of the Jammu District of J&K in 2025 to evaluate the empowerment of rural women through Self-Help Groups financed by the National Rural Livelihood Mission (NRLM). In the Miran Sahib Block of the Jammu District, 130 randomly chosen members of various SHGs constituted under the NRLM provided the data for this study. The study's main conclusions showed that rural women's social and economic empowerment significantly improved after joining these self-help groups. In order to support their families, respondents indicated that they would like additional training to improve their entrepreneurial abilities. Significant improvements in personal empowerment are found, especially in domains like family decision-making, communication abilities, and self-confidence.

## **INTRODUCTION**

The Deendayal Antyodaya Yojana - National Rural Livelihood Mission (DAY NRLM), formerly NRLM, is a flagship program of the Indian Government aimed at alleviating rural poverty by organizing poor households, particularly women, into Self-Help Groups (SHGs) and enabling their access to sustainable livelihood services. A Self Help Group (SHG) is a small, voluntary association of people-typically from similar socio-economic backgrounds-who come together for the purpose of solving common problems, improving their standard of living, and supporting each other financially and socially. SHGs help women earn income, save, become more self confident, self reliant and economic empowerment also contributes to social and political empowerment (Kiran Kumari, 2024). SHGs have improved living standards and revenues from livelihood options (Vasanth Gouri, 2025). SHGs are empowering the rural women in multiple ways. SHGs are yielding significant positive impact through microfinance + entrepreneurship on economic, social, and psychological dimensions of empowerment. In Jammu & Kashmir, DAY NRLM is implemented through the Jammu & Kashmir State Rural

Livelihoods Mission (JKSRLM), locally known as Umeed, which strives to mobilize and empower rural women across the region (Daily Excelsior, 2024), As of 2025, 94,000 SHGs have been formed under JK NRLM, covering approximately 7.55 lakh rural households (Kashmir Life, 2025). Keeping in view the potential role SHGs could play in all round empowerment of rural resource poor women, the present study was planned and conducted with the objective to study the impact of NRLM funded SHGs on social and economic empowerment of rural women in Jammu district of J&K UT.

## **RESEARCH METHODOLOGY**

The present study was conducted in purposively selected Miran Sahib Block of Jammu district in 2025. Random sampling technique was employed for selecting the 130 rural women members of different self help groups at Block level. Primary data was collected by using interview schedule having both open as well close ended questions from sampled women members of different self help groups. Appropriate statistical techniques employed for the analysis and interpretation of gathered primary data. Secondary data was used from different published government reports.

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## RESULTS AND DISCUSSION

### 1. Demographic Profile of sampled members of self help group

#### 1.1 Age Profile of SHG Members

The data in Table 1 indicates that a significant majority of the SHG members (62%) fall within the 26-35 years age group, followed by 23% in the above 35 years category, and 15% in the 18-25 years age group. The average age of the respondents is 35 years, with a standard deviation of 14, suggesting a fairly broad age distribution. This age distribution reflects a youthful and economically active population, which aligns with national trends observed in rural SHG participation. According to a report by the Ministry of Rural Development (MoRD, 2023), most SHG participants fall between the ages of 25-40, as this group is most likely to engage in entrepreneurial and income-generating activities due to fewer domestic responsibilities and greater mobility.

#### 1.2 Educational Background of SHG Members

In terms of education, the majority of SHG members (58%) have studied up to high school, followed by 15% who are below primary level, 8% who have reached higher secondary, 7% who are

graduates or above, and another 7% who studied up to middle school. This suggests that while most SHG members possess basic literacy and education, there remains a significant proportion (22%) with very low educational attainment. This finding is consistent with several studies indicating that women with moderate education levels tend to participate more actively in SHGs due to better understanding of group processes, financial transactions, and communication (Kumar & Jha, 2018). The presence of some highly educated women (7% graduates and above) shows that SHGs are also inclusive of diverse educational backgrounds and not restricted to only low-literate populations. These members can potentially take up leadership roles, act as facilitators, or support others in record-keeping and financial literacy.

### 2. Participation in SHG Activities

Data on participation in various Self-Help Group (SHG) activities reveal high engagement levels among the 130 members surveyed (Table 2). Regular attendance at SHG meetings was reported by 77% of members, while all members (100%) contributed regularly to savings. Additionally, 58% attended vocational training sessions, and 54% participated in awareness programmes.

**Table 1. Demographic Profile of sampled members of self help group**

**N=130**

Variable	Category	Frequency	%age
Age (in years)	18-25	20	15
	26-35	80	62
	Above 35	30	23
Education	Below primary	20	15
	Upto middle	10	7
	Upto high school level	75	58
	Upto Higher secondary Level	15	8
	Graduate and above	10	7

**Table 2. Participation in SHG Activities**

**N = 130**

SHG Activities	Frequency of participation	Frequency	% age
Attending meeting	Regular	100	77%
Saving contribution	Regular	130	100%
Vocational training	Attended	75	58%
Awareness programmes	Attended	70	54%

Participation in regular savings contributions (100%) underscores the importance of financial discipline and group solidarity, foundational elements of SHG functioning and financial empowerment (Swain & Wallentin, 2009). Regular meeting attendance by 77% of members demonstrates active engagement in group decision-making and collective problem-solving. These meetings provide platforms for sharing knowledge, discussing challenges, and strategizing for income-generating activities. The participation rates in vocational training (58%) and awareness programmes (54%) suggest moderate uptake of capacity-building opportunities.

### 3. Income generating/livelihood activities started after joining the SHG

Among the 130 respondents, various income-generating activities were initiated by member in the Self-Help Group (SHG) (Table 3). The most commonly started activity was pickle making (42%), followed by preparing millet processed products (23%). Other activities included mushroom cultivation (15%), spices grinding on a small scale (12%), rearing dairy animals such as cows or

buffaloes (9%), and opening cosmetic shops (8%). The data indicate that SHG membership facilitated the diversification of livelihood activities among participants, promoting economic empowerment and self-reliance. The prominence of pickle making (42%) and millet processing (23%) aligns with the utilization of locally available resources and traditional skills which are vital in rural self-employment (Dutta, 2011). These activities require relatively low capital investment and have good market potential, making them accessible and sustainable for SHG members (Swain & Wallentin, 2009). Mushroom cultivation (15%) and spices grinding (12%) represent value-added agricultural enterprises that contribute to livelihood diversification and increased income opportunities. Livestock rearing (9%) continues to play a crucial role in rural livelihoods, providing both income and nutritional benefits. Although opening cosmetic shops (8%) had the lowest uptake, it indicates a shift towards small-scale retail entrepreneurship and urban-oriented businesses, reflecting evolving aspirations and economic diversification among SHG members.

**Table 3. Income generating/livelihood activities started after joining the SHG**

Activities	Frequency (N=130)*	Per cent
Pickle/Jam making	55	42%
Preparing millet processed products	30	23%
Opening Cosmetic shops	10	8%
Rearing dairy animal (Cow/Buffalo)	12	9%
Started mushroom cultivation	20	15%
Started spices grinding on small scale	15	12%

\*Multiple Response

**Table 4. Improvement in decision making after SHG membership**

N=130

Area of decision making	Before SHG membership	After SHG membership	Improvement in decision making
Household purchases	30%	80%	50%
Children's education	20%	85%	65%
Starting new income generating activity	05%	60%	55%
Purchase of farm machinery	05%	45%	40%
Purchase of any new dairy animal	15%	55%	40%
Participation in social activities	10%	60%	50%

#### 4. Improvement in decision making after SHG membership

The data collected from 130 Self-Help Group (SHG) members highlight significant improvements in decision-making capabilities across various domains following SHG membership (Table 4). Significant increases were observed in decision-making involvement in children's education (65%), starting new income-generating activities (55%), and household purchases (50%). Similarly, there was notable improvement in decisions regarding participation in social activities (50%), purchase of farm machinery (40%), and purchase of new dairy animals (40%). Improvements in decisions related to household purchases (50%) and social participation (50%) reflect an expansion of agency in daily life and social spheres, indicating growing autonomy and social capital among members (Cornwall & Edwards, 2010). The increased influence over farm machinery and livestock purchases further confirms enhanced control over productive assets, which is crucial for sustainable livelihood improvements (Dutta, 2011).

#### 5. Perception of Empowerment

Data in Table 5 summarize the response of 130 participants to six statements measuring perception of empowerment. Overall, a majority of participants agreed with statements indicating increased personal empowerment. The most significant agreement was seen in confidence in public speaking (77%), followed by self-confidence in facing tough life situations (69.2%) and influencing family decisions (69.2%). Conversely, community-level influence

saw the lowest agreement at 42.3%, with a relatively high percentage (34.6%) disagreeing. The data suggest significant personal empowerment gains, particularly in areas such as communication skills, self-confidence, and family decision-making. These findings support the notion that empowerment is often experienced first at the individual level, particularly through increased confidence (Kabeer, 2001). Only 42.3% felt they could influence community decisions. Community-level empowerment often requires not just individual initiative but also systemic support (Cornwall & Edwards, 2010).

#### 6. Challenges Faced by SHG Members

Data in Table 6 illustrate the major challenges experienced by members of Self Help Groups (SHGs). A significant majority of respondents (85%) reported lack of trainings in income-generating activities as a major challenge, indicating a serious gap in skill development support within SHGs. This challenge is reported in studies such as Sanyal (2009), which observed that microfinance, without proper investment avenues or market linkages, can lead to repayment stress and even dropout from SHGs. Loan repayment pressure was reported by 58% of members, suggesting financial strain or inadequate income to meet repayment obligations. According to Kabeer (2005), access to resources must be accompanied by capacity-building to ensure empowerment. Without skill development, microfinance may lead to increased debt rather than financial independence. Conflicts among group members were mentioned by 19%,

**Table 5. Perception of Empowerment by the SHG Members**

**N=130**

Statements	Agree	Neutral	Disagree
I feel more confident in public speaking	100 (77%)	10 (08%)	20 (15%)
I can influence decisions in my family	90 (69.2%)	15(11.5%)	25(19.3%)
Social participation has improved	70 (53.8%)	20 (15.4%)	40 (30.8%)
I can influence decisions in my community	55 (42.3%)	30(23.1%)	45 (34.6%)
Knowledge about different types of banking transactions increased	80 (61.4%)	10 (08%)	40 (30.8%)
Increased self confidence in facing tough life situations	90 (69.2%)	20 (15.4%)	20(15.4%)

**Table 6: Challenges Faced by SHG Members**

Challenges	Frequency	Per cent
Loan repayment pressure	75	58%
Conflicts among group members	25	19%
Lack of trainings in income generating activities	110	85%

**Table 7: Suggestions given by SHG members for improving the functioning of SHGs**

Suggestions	Frequency	Per cent
More skill development trainings	130	100%
Easier access to credit	100	77%
Support in marketing of SHG products	60	46%

\*Multiple Response

highlighting interpersonal or leadership issues within some SHGs. According to Desai and Joshi (2014), internal conflicts, if unresolved, can lead to group disintegration and loss of collective bargaining power.

### 7. Suggestions given by SHG members for improving the functioning of SHGs

As shown in the Table 7, all respondents (100%) indicated the need for additional skill development training, making it the most cited area of concern. Easier access to credit was reported by 77% of respondents, followed by 46% who expressed a need for support in marketing their products. The findings clearly highlight that SHG members are primarily in need of skill development, better access to credit facilities, and assistance in the marketing of their products. NABARD (2017) emphasized that continuous skill upgrading is essential for both individual empowerment and the overall sustainability of SHGs. Similarly, Kumar and Gupta (2020), in a study conducted in Uttar Pradesh, found that women who received skill development trainings reported significant improvements in household income and decision-making capacity. Singh and Kaur (2015) reported that lack of market information, poor packaging, absence of branding are some of the key barriers to successful marketing of SHG products. The Indian government's DAY-NRLM (Deendayal Antyodaya Yojana-National Rural Livelihoods Mission) also aims to improve credit linkage for SHGs. However, implementation challenges persist, and many groups still struggle to

access sufficient financial support for enterprise development (Ministry of Rural Development, 2020).

### CONCLUSION

It is concluded on the basis of major findings that the SHG movement is composed largely of economically active, moderately educated women—a segment highly receptive to capacity-building and economic empowerment. However, to ensure inclusiveness and maximize potential, refined strategies are essential to address the diverse educational and age profiles of SHG members. High participation in savings and meetings affirms strong member commitment and group cohesion in SHGs, while vocational and awareness activities, though moderately attended, play a vital role in empowerment. It is also concluded that from the findings of this study that SHGs act as effective platforms for initiating diverse income-generating activities that enhance economic independence and empowerment. Empowerment appears to have been achieved at the personal and familial levels among the majority of respondents. Present study helped to understand that how SHGs are working in real life situations. However, further efforts are needed to support community-level engagement and financial inclusion. The study confirms that SHG membership significantly improves decision-making power across various economic, household, and social domains. These findings underscore the importance of group-based interventions to be

promoted in future for empowerment and sustainable development.

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# HARNESSING PECTIN INNOVATIONS FOR PERSONALIZED NUTRITION: EXPLORING HEALTH BENEFITS AND OVERCOMING CHALLENGES

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## ABSTRACT

This review explores the role of pectin in personalized nutrition, highlighting its health benefits, challenges, and future directions. Pectin, a soluble dietary fiber from various fruits and vegetables, offers significant advantages such as blood sugar management, digestive health promotion, and weight control. Integrating pectin-rich foods into tailored nutrition plans effectively addresses individual health goals and dietary needs. However, potential allergies, sensitivities, and risks of over consumption must be acknowledged, emphasizing the need for moderation and balanced intake. Current research is enhancing the functionality of pectin in personalized nutrition, focusing on its variability, personalized prebiotics, and genomic influences to optimize health outcomes. Despite its promising potential, the challenges of allergies and over consumption necessitate personalized care and professional guidance. In conclusion, advancements in nutrigenomics and microbiome analysis are driving personalized nutrition, offering customized solutions for health optimization. Pectin's versatility and benefits make it a key component in tailored dietary plans, with the potential to revolutionize health and well-being by addressing diverse health concerns and individual preferences.

## INTRODUCTION

In today's health-conscious society, the quest for effective dietary solutions drives attention towards natural compounds like pectin, a versatile biopolymer known for its soluble fiber attributes. Recognized for its transformative impact on food properties, pectin is emerging as a cornerstone in promoting health and sustainability (Mellinas *et al.*, 2020).

Pectin, a complex heteropoly saccharide abundant in plant cell walls, plays a crucial role in defining the texture and quality of fruits and vegetables. Its multifaceted composition, primarily consisting of galacturonic acid units, contributes to its diverse functionalities in food and industrial settings. From gelling and thickening to stabilizing and emulsifying, pectin offers a spectrum of applications that enhance product appeal and nutritional value (Martau *et al.*, 2019).

In the domain of tailored nutrition, leveraging the

inherent properties of pectin offers a science-driven approach to address specific health concerns. By incorporating pectin into personalized dietary regimens, tailored to individual needs and preferences, a holistic approach to wellness can be achieved, fostering long-term health and sustainability (Celis Morales *et al.*, 2014).

**Understanding Pectin:** Pectin is a general term for a group of natural polymers that occur as structural materials in all land growing plants. It is thus part of the natural diet of man. They are the vital structural polysaccharides in plant cell walls; primarily consist of galacturonic acid units. However, their composition, structure, and molecular weight can vary significantly. These polysaccharides are of ten found in association with other essential cell wall components, including cellulose, hemicellulose, and lignin. In most cases, pectin is situated within the primary cell wall and the middle lamella of many plant species (Mellerowicz and Sundberg, 2008).

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The quantity and type of pectin present in fruits and vegetables are pivotal factors that influence the texture of these foods throughout their entire lifecycle, from growth and maturation to storage and processing (Voragen *et al.*, 2003).

Pectin is emerging as a key player in promoting good health, not only by transforming the food constitution, but also by enhancing tastes and textures (Mellinas *et al.*, 2020). With its multifaceted properties, pectin has enjoyed extensive use in the food and beverage industries, where it serves as a valuable ingredient for its roles as a gelling agent, thickening agent, stabilizer, and emulsifier, contributing to the texture and quality of a wide range of products.

**Properties and functions of pectin:** Pectin serves essential functions in a range of industries, particularly in food science and pharmaceuticals. Pectin is known for its solubility in water, forming a gel-like consistency, a characteristic skillfully harnessed in the production of jams and jellies. Additionally, it imparts viscosity to liquid solutions, making it a valuable thickening agent in a wide array of food products. The ability to form gels, especially when combined with sugars and acidic conditions, is crucial in the creation of jams and jellies. Pectin's remarkable water-holding capacity allows it to absorb and retain substantial amounts of moisture, contributing to the desired texture and moisture retention in numerous food items. Its capacity to bind to various substances, including water, plays a crucial role in stabilizing specific food products and preventing the unwanted release of liquid. Furthermore, pectin's gelling properties are notably pH-sensitive, typically requiring an acidic environment for the proper formation of gels. These properties collectively make pectin an invaluable component in food products and various industrial applications. Pectin possesses a set of remarkable properties that make it an essential component in various industries, especially in the realm of food science. One of its key attributes is its solubility in water, resulting in the formation of a gel-like substance. This property is put to excellent use in the production of jams and jellies, where it

contributes to the desired consistency and texture (Khan *et al.*, 2013).

Beyond solubility, pectin exhibits the remarkable ability to impart viscosity to liquid solutions, serving as a valuable thickening agent in a wide array of food products. Its gelling capacity is equally noteworthy, particularly when combined with sugars and acidic conditions, as it plays a critical role in creating jams and jellies, bestowing upon them their characteristic texture and appeal. (Christiaens *et al.*, 2016)

Pectin's water-holding capacity is a highly beneficial attribute, as it can absorb and retain significant amounts of moisture, enhancing the texture and moisture retention in various food applications. Additionally, its binding capabilities are instrumental, allowing it to bind to various substances, including water. This property is particularly valuable in stabilizing specific food products and preventing unwanted liquid release, a phenomenon known as syneresis. (Liang and Luo, 2020).

It's important to recognize that pectin's gelling properties are intricately linked to pH sensitivity, typically necessitating an acidic environment for the proper formation of gels. These combined properties underscore pectin's versatility and its pivotal role in a diverse range of food products and industrial applications, making it a crucial ingredient in culinary and manufacturing contexts alike (Fraeye, 2010).

**Role of Pectin in Tailored Nutrition:** Personalized nutrition refers to tailored nutritional recommendations aimed at promoting health, maintaining wellness, and preventing diseases. Pectin, a versatile biopolymer, holds numerous health benefits and medical uses, notably in creating gels for jams and jellies (Ghai *et al.*, 2012). Within tailored nutrition, pectin plays a significant role due to its adaptable nature and multifaceted health advantages.

**Pectin in Digestive Health Customization:** Pectin's soluble nature enables it to absorb water, forming a gel-like substance in the intestines that

promotes regular bowel movements (Ghai *et al.*, 2012). It aids in managing diarrhea, balances gut microbiota, protects the gut lining, and reduces the risk of colon-related diseases (Jackson, 2007).

**Pectin in Gut Microbiota Modulation:** Pectin acts as a prebiotic, promoting the growth of beneficial gut bacteria, leading to improved gut health. Research studies highlight the potential of pectin, especially from sources like kiwi fruit and green banana, in fostering a healthy gut environment (Parker *et al.*, 2010).

**Pectin in Blood Sugar Regulation:** Pectin helps regulate blood sugar levels by slowing down sugar absorption, making it beneficial for individuals with diabetes or those at risk (Silva *et al.*, 2011). It reduces glycemic response, enhances insulin sensitivity, promotes satiety, and aids in weight management. Studies demonstrate the hypoglycemic properties of pectin from sources like *Passiflora edulis* and soybean (Silva *et al.*, 2011; Jones *et al.*, 2015; Makarova *et al.*, 2014).

These findings underscore the potential of pectin as a natural dietary component in tailored nutrition regimens, offering a holistic approach to improving health outcomes and addressing individualized dietary needs.

**Role of Pectin in Weight Management:** Pectin, renowned for inducing fullness and satiety, supports weight management by controlling appetite and calorie intake (Zhao *et al.*, 2022). Its ability to curb overeating and cravings, coupled with promoting portion control, aids in creating a necessary calorie deficit for weight loss. Integrating pectin-rich foods into a balanced lifestyle is essential, and consulting healthcare professionals can provide tailored guidance (Zhao *et al.*, 2022).

**Role of Pectin in Blood Cholesterol Customization:** Pectin lowers total and LDL cholesterol levels by binding to bile acids, inhibiting cholesterol reabsorption, and promoting bile acid excretion (Brouns *et al.*, 2011). Its modulation of gut microbiota and antioxidant properties further contribute to healthier cholesterol levels (Pascale *et al.*, 2022; Theuwissen and Mensink, 2008).

**Tailoring Pectin for Functional Foods:** Pectin, a soluble dietary fiber abundant in fruits, can enhance the nutritional profile and taste of functional foods for adults. These products offer additional health benefits beyond basic nutrition. Researchers are exploring methods to customize pectin for functional foods, optimizing its features to meet diverse dietary needs and preferences. By modifying its structure, pectin can be tailored to create functional and delicious foods. This section introduces the exciting realm of customizing pectin and sets the stage for further exploration into its methods and outcomes in functional food development.

Humerez *et al.* (2022) conducted a study on the production and molecular characterization of customized citrus pectin-derived compounds. They aimed to generate tailored variants of citrus pectin with different degrees of methylesterification (DM) and comparable average molecular weight (MW) through controlled enzymatic and chemical modifications. Three treatments were applied to commercial citrus pectin materials, resulting in variations in methylesterification, molecular weight, and oligomeric composition. These findings offer potential applications for these modified citrus pectin variants in various industries (Humerez-Flores *et al.*, 2022).

**Practical Applications and Recommendations:** Incorporating pectin in the diet offers various health benefits, and understanding practical applications and recommendations can help optimize its impact on well-being. Here's a brief exploration of how to seamlessly integrate pectin into daily routine for a balanced and nutritious lifestyle.

**Incorporating Pectin into Diet:** Incorporating pectin into the diet is not only easy but also diverse, offering a range of delicious and nutritious options. Whether enjoyed as whole snacks, added to beverages, or used in cooking and baking, these methods provide a convenient and flavorful means to reap the health benefits of pectin.

There are numerous diverse ways to incorporate pectin into the diet to reap its health benefits.

Consuming pectin-rich fruits such as apples, citrus fruits, and berries as whole snacks or adding them to cereal, smoothies, or yogurt is an easy method. Spreading homemade or store-bought jams on whole-grain toast, pancakes, or waffles provides a tasty option. Blending whole fruits or fruit purees with leafy greens in smoothies enhances fiber and nutrient intake. Adding diced apples, citrus zest, or berries to morning oatmeal, or using fruit preserves for flavor, is another nutritious approach. Making home made jellies and jams from pectin-rich fruits allows for control over sugar content and the creation of unique flavor combinations. Incorporating citrus fruits like oranges and grape fruits in salads can enhance their taste and texture with natural juiciness. Additionally, chia seeds combined with fruit and yogurt make a healthy dessert option like chia seed pudding. Pectin supplements, available in various forms such as capsules and powders, should be added to the diet after consulting a healthcare provider. Cooking with pectin-rich ingredients, like including apple slices or citrus zest in pork dishes, marinades, and dressings, can elevate flavors. Lastly, baking with fruits or apple sauce increases the pectin content in baked goods, making them healthier. These versatile methods ensure a balanced and nutritious lifestyle while enjoying the benefits of pectin (Steigerwald *et al.*, 2021).

**Recommended daily intake of pectin:** The recommended daily intake of pectin can vary based on individual dietary needs and health goals. There isn't a specific Recommended Dietary Allowance (RDA) for pectin like there is for certain vitamins and minerals. However, including pectin-rich foods in your diet is generally beneficial. Here's a general guideline for pectin intake.

**Table 1. Recommended Daily Intake (RDI) for Pectin**

Age Group	Recommended Daily Pectin Intake (RDI)
Children	About 10-15 grams of dietary fiber (including pectin)
Adults	About 25-30 grams of dietary fiber (including pectin)

Recommendations are based on typical dietary fiber intake, which includes pectin. It's important to note that individual requirements may vary based on factors such as age, sex, activity level, and specific health conditions. The best way to incorporate pectin into the diet is by consuming a variety of fruits and vegetables, especially those that are known for their high pectin content. Adjust the intake based on dietary preferences and nutritional needs.

Hydration is also important as pectin's water-absorbing properties work best when accompanied by adequate water intake (Chandel *et al.*, 2022).

**Tailored Pectin Nutrition Plans:** Tailored nutrition plans featuring pectin offer effective strategies for achieving various health goals and addressing individual dietary needs. Incorporating pectin-rich foods like apples, citrus fruits, and select vegetables can provide valuable dietary fiber and other health benefits, supporting objectives such as blood sugar management, digestive health, and weight control. Personalized nutrition plans can optimize pectin intake while considering individual preferences and dietary restrictions, encompassing pectin-rich recipes, portion control, and a balanced food selection. Consulting registered dietitians or nutritionists ensures tailored strategies aligned with individual health goals (Lara-Espinoza *et al.*, 2018).

**Challenges and Considerations:** While generally safe, potential allergies or sensitivities to pectin should be acknowledged. Allergic reactions, though rare, may occur, particularly in individuals with fruit allergies or sensitivities to high-fiber foods. Precautions include scrutinizing labels for pectin additives and seeking medical advice for known allergies. Over consumption of pectin may lead to digestive discomfort and interfere with mineral absorption, emphasizing moderation and balanced dietary intake. Consultation with healthcare providers helps manage risks and address individual sensitivities (Chandel *et al.*, 2022).

**Future Directions and Research:** Research on tailoring pectin for functional foods is evolving, with innovations focusing on enhancing mouthfeel, reducing sugar content, and fortifying nutritional

profiles. Pectin's potential as a carrier for bioactive compounds and its applicability across diverse products signal exciting developments in functional food creation. As personalized nutrition gains traction, the integration of pectin into customized supplements and food formulations offers promising avenues to optimize health outcomes. Ongoing research explores pectin's variability, personalized prebiotics, and genomic influences, shaping the future of personalized nutrition (Yu *et al.*, 2023).

## CONCLUSION

Personalized nutrition, fueled by advancements in nutrigenomics and microbiome analysis, offers tailored solutions to optimize health outcomes. Pectin's versatility and health benefits make it a valuable component in tailored dietary plans, addressing diverse health concerns while considering individual preferences and needs. As personalized nutrition continues to evolve, it promises to deliver customized dietary recommendations that leverage pectin's unique properties to promote individual well-being (Beukema *et al.*, 2020).

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# SOIL HEALTH SECURITY: NATURAL RESOURCES PROPERTY RIGHTS AND ENVIRONMENTAL LEGAL PERSPECTIVE

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## ABSTRACT

This research study aims: 1. to define existing patterns of thought and to assess the worth of nature in economic and political decisions. 2. to examine the challenges especially the thought of conservationists that get pissed in such decision-making rounds 3. to understand the actual cost to be spent on preservation 4. to give respect to such values. 5. to concentrate on the conservation of natural resources 6. to legally evaluate interconnection between protected areas, biodiversity, and human rights law 7. to examine the relationship between climate change and human rights law 8. to focus on the role that environmental law and human rights law for the conservation of natural resources property rights 9. to locate the development of the current climate change adaptation and mitigation frameworks. The application of Keynes' law of consumption known as 'psychological law of consumption' in this regard depicts the capitalist laissezfaire economy in the world in which nature's extraction, exploration, and exploitation depend upon economic wellness of the consumer, instead of the economic investment done in the wellness of nature, because nature is a commodity in its parts and in its wholeness.

## INTRODUCTION

Environmental programmes in emerging contemporary climate action and climate change include the life-safety of natural resources and their protection concerning farm lands, free farm land holdings, highlands and green grasslands or arid zones, fallow/wastelands, co-operative farming etc. Thus, development perspective to retain sustainable goals problematizes the attention towards the below given queries - How far have Farmers been provided with soil health security, while holding farm lands and processing cultivation in pre-harvest and post-harvest times? If they have been provided any such security on account of conscious-raising and capacity building, have they been able to avail the optimal use of the provided security? If ownership conditions (of farmers or stakeholders or the state/community owners) have not been guaranteed with Soil Health security and safety from the prevailing soil degradation on account of the soil pollution,

that happens as result of agricultural waste, industrial waste, urban waste, and hazardous waste, then what kind of conditional clauses have been secured from the critical legal perspective?

Human rights and environment are a valuable sourcebook that explores the uncharted territory that lies between environmental and human rights legislation. Human beings can ensure fundamental equality and adequate conditions of life in environment that permits a life of dignity and well-being, only when United Nations 17 SDGs and the Subcontinent India 19 SDGs mission of "Earth Forward in Environment Sustainable Governance" create dialogues by way of critiques and discourses on forums in order to contribute to building an empowered world, interconnected communities, flourishing ecosystems, and innovative business approaches towards responsible governance, the scope of data technologies, and the power of policies.

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Since post-independence of India, the real coordinated efforts have been in process for changing the economic conditions of the peasants through legislative measures to remove impediments to the progress of the agrarian sector, that first started with the First Plan from which agricultural legislation was part of a purposeful national effort to bring social and economic justice. Hence four categories of agrarian legislations mainly restructured to change the agrarian structure that also touched the periphery of the private law in context of equality and prosperity. They are: (1) The abolition of the intermediaries (2) Tenancy Reforms (3) Ceilings of land Holdings (4) The laws relating to 'Bhoodaan' (Land-Gift) and 'Gramdaan' (a movement started by Acharya Vinoba Bhave in 1950s to collect donations of land for distribution among the landless).

Localising Early Lessons from India 2019. Sustainable Development Goals -India is fully committed to the 2030 Agenda, including the Sustainable Development Goals (SDGs). There is a convergence of India's national development goals and agenda of, 'Sabka Saath, Sabka Vikas' or 'Collective Efforts, Inclusive Growth,' with the SDGs. Nearly 55% of farm land getting irrigation and to increase irrigation cover that has been attributed to a massive expansion of land under agriculture especially in the dryland farm zones of Telangana, Gujarat, Madhya Pradesh, Karnataka and in Uttar Pradesh states of India in the financial year a 500 billion INR worth micro-irrigation fund (MIF) was created with the National Bank for Agriculture and Rural Development (NABARD) to help states mobilise resources. Under the fund central assistance worth 127 billion INR has been released to states, out of which 118 billion INR got utilised in that financial year. Besides there are five irrigation driven programmes and projects in the PMKSY to expand the cultivated area, reduce wastage of water and improve water - use efficiency. These are the Accelerated Irrigation Benefit Programmes (AIBP), Har Khet Ko Pani - Surface Minor Irrigation, PMKSY (Pradhanmantri Krishi Sinchayee Yojna) groundwater projects, special

package for Maharashtra, Rajasthan and Srihind Feeder and Shahpur Kandi Project

### **Challenges in Agrarian Economy Structure**

The surveys for research studies have exposed that soil degradation occur on ground of procuring direct benefits and indirect benefits. The role of affluent families is to extract maximum 'indirect benefit' by way of non-productive use of the Nature's sources. The chemical, non-biological plants, chemical or extraction of minerals and metal factories or mining industrial areas are the facts and fund raising sources at cheap labour cost with an unsecured zone of encroached rights concerning to property of life, liberty, and labour. Sarcasm on the "intention" is that natural resources property rights, which are exploited for commercial purpose and gains, are considered as bundle of objects with no bundle of rights accrued to their worthwhile existence. To understand the complexity of 'direct benefit' is basically a lopsided issue especially considering where the natural resources' predicament on humanitarian grounds has been endangered. The connotations of 'direct benefit' and 'indirect benefits' disparities are instrumental to prevailing corruption practices among backward or vulnerable sections of society where everyday livelihood is a major concern, instead to think about their role in sustainable environment governance or to coordinate with major market-sharers of big enterprises in understanding where things are related to job-markets or any sort of nuisance. Some of the case studies reflect how the intent of direct benefits and indirect benefits viciously draw a pattern of malfeasance.

There is an urgent need to reformulate laws after a research and surveillance of the affected conditions created on account of anthropogenic factors. The study will examine the mechanisms of human-created pollution that destroy the natural environment, commit a crime against nature, violate human rights as well. In India Ministry of Agriculture and Irrigation has been consciously undertaking a study of all the existing enactments and acts that falls in the purview of the state and central governments to ensure crop

protection relating to the entry of pests and diseases from one state to another uniform model legislation governing the increasing groundwater over-exploitation, entrusting a policy to maintain small and minor irrigation works, to integrate the programme inter alia regarding on-farm developments in command area of irrigation projects .

Soil degradation means decline in quality and quantity of soil. Soil fertility depends upon soil nutrients and soil health is an anthropogenic question in environmental law and in the environmentally sustainable development goals and governance for climate action and for climate protection.

While in Europe an emerging necessity for revisioning of the Helsinki Conventions got updated in 1992, then in 2014 in purview of the geopolitical changes and emerging environmental challenges in the Baltic Sea region, including inland waters as well as the water of the sea itself and the seabed. Despite the measures taken in the whole catchment area of the Baltic Sea to reduce land-air and sea pollution; the non-committed stakeholders, traders and fiefdoms have been found engaged transboundary or in their respective regions in lots of environmental illegal nuisances.

While reasoning on cross-cultural perspective regarding environmental problems both in the areas of India and Germany, certain issues constitute a major inquiry for soil health and socio-economic justice of the protected, reserved, or unprotected areas of natural resources that gives life and breath to all living beings, besides help 'Nature' to sustain living being's life. The project proposal raises consciousness in order to have the best of the productivity and sustainability of Soil Health.

To conserve habitats, biological diversity, and the sustainable use of marine resources, the major focus of the study lies on these queries - How far have the legal contracting parties ensured monitoring and assessment of the catchment areas? To what level are the water quality objectives followed? how does soil health get affected if non-discriminatory operations and transmission of electricity or hydro

power are regularised or regulated? How to prevent white-collar crimes that are related to the illegal exploitation of green incentives?

Agriculture was generally excluded from intellectual property protection in India and there was no legal system of Plant Breeders' Rights or Farmers' Rights for decades. The Seed Association of India, formed in 1985, has actively promoted the need for plant breeders' rights in the country. With the adoption of the WTO Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs), bilateral and multilateral pressure was also exerted on India to establish intellectual property rights in agriculture. There was enormous protest against implementing TRIPs by non-governmental organizations and farmers' lobbies in the country. The Protection of Plant Varieties and Farmers Rights Act (PPVFR), 2001 arose amidst this controversy. The PPVFR Act initially emerged as a result of the demands of the seed industry for breeder's rights

Most of all health - both of Soil and of Humans - appears to be the subject that bridges gaps between the two fields of environmental protection and socio-ecological justice in India. The research article raises consciousness to have the best of the productivity and sustainability of Soil Health.

The population explosion in the developing countries has caused enormous pressure on farm lands and its quality of production, besides high demand with increasing supply at the same time. To satisfy these emerging demands, the conditions have been created to procure modern scientific techniques such as advanced technology, expansion of irrigation facilities, use of chemical fertilizers, pesticides, and insecticides, developing hybrid varieties of seeds, changing agricultural practices, mechanisation of agriculture, varying crop sequences and land ownership and the land tenure. Besides the capitalists' market economic measures of expansion and conversion of agricultural land and forest areas, subsequent large-scale deforestation and poor-scale management changed the natural limits.

According to the results of an investigation

published by the University of Hamburg in December 1975, 50,000 species of plants will be eradicated or seriously threatened. At the other end of the scale 240 species of insects are increasing at an alarming rate. Pesticides no longer have any effect. Many tropical countries facing the alarming disease of malaria amongst almost more than 30%. The densely populated areas of Africa have been ruined in maintaining ecological balance, so failing in performing protective function. The World Wild Life, International Union for Conservation of Nature, United Nations Environment Programme, Friends of the Earth, Audubon Society, Sierra club, Greenpeace and many other organisations and action-groups fighting losing battles.

The Member States of the United Nations adopted the Sustainable Development Goals (SDGs) by General Assembly resolution A/RES/70/1 of 25 September 2015. The aim of this resolution is to achieve these 17 goals by 2030 with a view towards ending all forms of poverty, fighting inequalities, and tackling climate change while ensuring that no one is left behind. The United Nations Sustainable Development Group (UNSDG) unites the 40 UN funds, programmes, specialized agencies, departments, and offices delivering together for sustainable development. The UN Secretariat for SDGs helps governments and stakeholders make the SDGs a reality, providing substantive policy support and capacity-building for the goals and their related thematic issues. The Division for Sustainable Development Goals (DSDG) in the United Nations Department of Economic and Social Affairs (UNDESA) acts as the Secretariat for the SDGs.

The 17 SDGs and 169 targets are part of a transformative agenda - the 2030 Agenda for Sustainable Development adopted by 193 Member States at the UN General Assembly Summit in September 2015, and which came into effect on 1 January 2016. At the core of this global agenda for 2030 is the principle of universality: 'Leave No One Behind' . On 1 January 2016, the Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development, which was adopted

by Countries in September 2015 at an historic UN Summit, came into force. These new Goals apply to all nations who are supposed to achieve the SDGs in the coming 15 years. The SDGs build on the success of the Millennium Development Goals (MDGs) and aim to go further are: -

- to end all forms of poverty, end poverty, and hunger
- stop climate change and prevent its most devastating effects
- protect and restore the planet's environment and natural resources
- advance equality, education, peace, and healthy living for all people

### **Insurgency and Insolvency Regarding Ecosystem Imbalances and Deterioration**

This research study has undertaken some of the impacted ecosystems where there are overexploitation and counter-use of bye-laws for the currently enforced convention to protect ecological process as per the convention on the protection of the Marine Environment of the Baltic Sea Area that got signed in 1974 by all Baltic Sea coastal countries. Moreover, the purpose is to take a review of the regulated markets.

Below mentioned case studies in short refer to some of the examples that are conditioned per se the regulation of tenancy relationship and the ceiling on holdings that attempt to rationalize the soil, water, and land - man relationship and to understand consolidated, dynamic, environmental approach towards the reorganization of operations and progress in effective regulation through legislative measures in order to facilitate proper land use and land-management

### **Case Study 1 - Groundwater waste ownership**

Many natural resources are considered common resources-that is, no one owns them but everyone can use them. Their overuse by some can negatively affect everyone. For example, groundwater in some places is considered a common resource that all farmers can withdraw. But if an individual user only

cares about watering his or her own crop, and wants to use as much water as possible from a shared watershed with limited water availability, it can lead to over-extraction, causing all users in the area to suffer shortages. Similar scenarios often ensue when it comes to fishing in the open sea and logging in forests. Garret Hardin described these situations as the "Tragedy of the Commons."

### **Case Study - 2 Groundwater Waste and contamination**

The condition of the groundwater in Switzerland still allows for the production of sufficient quantities of safe drinking water. However, contamination of groundwater occurs at numerous monitoring sites of the NAQUA, especially in intensively farmed areas. The groundwater is most heavily polluted by nitrate. In addition, at more than half of the NAQUA monitoring sites, residues of artificial, and in some cases persistent, substances are detected in the groundwater, such as degradation products of pesticides. The areas surrounding drinking water wells are increasingly being used or built over and thus can no longer fulfil their protective function. This also means that the water protection legislation concerning groundwater protection is not being implemented consistently enough.

### **Case Study -3 - Infringing Intellectual Property Rights in Agriculture**

Agriculture discipline or Agriculture as a commercial resource of capitalist economy has generally been excluded from intellectual property protection in India and there has been no such effective legal system for Plant Breeders' Rights or Farmers' Rights even since post-independent India. The Seed Association of India, formed in 1985, has actively promoted the need for plant breeders' rights in the country. With the adoption of the WTO Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs), bilateral and multilateral pressure was also exerted on India to establish intellectual property rights in agriculture. There was enormous protest against implementing TRIPs by non-governmental organizations and farmers' lobbies in the country. The Protection of Plant Varieties and

Farmers Rights Act (PPVFR), 2001 arose amidst this controversy.

### **Case Study - 4. -Mismanagement of Irrigation Projects and Property Rights**

Mostly irrigation as an indispensable part of extensive and intensive cultivation, comes under the logistical contingency of common-property regimes that is a shared ownership with the help of generating common-pool resources. In other words, it is to be implied that if CPRs are involved to build human-created resource systems of water. That is contract is there that cost of the shared pool of resources is the liability of all, but suppose one farmer has used being a power player in farm holdings the maximum water, yet the cost of its use shared by all. That means one's individual use of a unit makes it unavailable to others (irrigation water consumed by one farmer cannot be consumed by someone else because there is open -access of water and infrastructure. So, in this case two ownerships are at mess - private ownership versus state ownership.

### **Case Study - 5. Failure in Effective Obligation of Unbundling Electricity Networks**

This case study indeed comes under a different legal perspective with regard to power-supply not only to lands and its inhabitants, but most importantly to serve the public interest zone of irrigation and agricultural projects that are essential parameters for SDGs undertaken by any agency or by any country or by any organization. One of the cases that got to the court in the year 2021 was between Federal Republic of Germany and European Union. The role of European Union Member State's viz-a-viz electricity or power supply sector concerning the ownership and right to property following up national regulatory authorities. Moreover, the member state as the independent transmission operator shares held in the vertical integrated undertaking for managing transmission systems of electricity and natural gas. Thirdly the ordinance regarding vertical integrated undertaking was mandatory so as to encompass activities carried on outside the European Union by third-country undertakings leading to an extension of the European

Union's regulatory power, contrary to international law. Such third-country undertakings would in fact acquire rights and become subject to obligations without operating on the territory of the European Union.

### **Case Study - 6 - Criminal Infiltration in the Green Energy Sector**

The criminal activities in producing electricity from renewable sources of power sector have almost swiped the control of state and its regulation, and completely have overtaken the sources of easy profits and controlled the economy of their territories. In this regard the researcher brings into light the wind power sector that is medium of nexus amongst local officials, entrepreneurs and criminal gangsters, such nexus finally colluding the construction of wind power farms. Moreover, the paper aims to track investment pattern and different incentives and prices regulated by market itself that are shared to produce and import green electricity certificate (GSE). This paper is relevant in the context of the research study area to understand market liquidity, related to white-collar crimes engaged in the illegal exploitation of green incentives, circulates in the estimated accreditation of the starting phases of projects and in the rapid development or in collusion of such sectors.

### **Case Study -7 - Industrial Waste and Contamination of Soil and Water**

Here is the true story of an advocate and activist who filed a lawsuit despite being a target of gender lens and other kinds of pressures to withdraw the charges against the company Pacific Gas & Electric Company in 1966 (in Hinkley, a small southern California community in the Mojave Desert) that used chemical Chromium 6 to prevent rust in the natural gas pumping station, but its toxic emission and percolation in the undersurface soil of the residential area contaminated the drinking water-supply and the writer and the advocate says "the small community suffered asthma, a complaint of a chronic cough, recurring bronchitis, recurring rashes, unusual joint aches, nosebleeds."

### **Case Study - 8 - Protecting Biofuel for ecosystem immunity**

The Ordinance on Evidence of a Positive Ecological Balance of Sustainable Biofuels entered into force on April 15, 2009. Tax relief or exemption is granted only to suppliers which show evidence prior to their first tax registration that their biofuels meet all the ecological and social minimum standards of the relevant ordinances. Additionally, the Ordinance on the Prevention of Air Pollution regulates certain requirements with respect to fuels and emissions by industries and traffic. This ordinance contains certain definitions relating to fuel substances. In particular, it sets limits on the amounts of different substances which fuels may contain, and clarifies whether such fuels may be obtained on the market. Any party which commercially imports or sells fuels is required to declare and inform the customs authority and customers respectively of the quality of such fuels.

### **Case Study - 9 - The environmental impact of polymer usage**

For instance, biodegradable polymers such as polyvinyl alcohol (PVOH/PVA), and polycaprolactone (PCL) are made from petrochemicals that play a significant role in global warming. Thermoplastics are recyclable unlike thermosets, where polymeric fibers are mainly produced using thermoplastics. However, the accumulation of plastics, along with other materials, is becoming a serious problem for all countries in the world. These materials occupy a significant volume in landfills and dumps today. Recently, the presence of huge amounts of plastic fragments in the oceans has been observed, where a considerable part of them come from the streets, going through the drains with the rain, and then going into the rivers and lakes, and then to the oceans.

The Review of Literature mentioned below refers to many of the other factors that act as conditions or pre-emptive situations that indicate significant challenges to sort out specific pathways which could take many years to get humans compatible with the pre-requisites of Soil health Security accordingly

the implied legal Environmental Framework regulating biodiversity protection, marine species, and oceans conservation, besides land and river bodies' natural resources conservation. Some of the references for exploring cutting-edge implications are as follows:

1. <https://sciencedirect.com>Bromley, 1992, von Benda-Beckmann and von Benda-Beckmann, 1999.

The focus on property rights, as they apply in practice, provides an important "bottom-up" perspective on natural resource governance that is complementary to analyses centred on the relationships between different governmental actors.

2. <https://sciencedirect.com>Agrawal & Ribot, 1999. Property rights can prevent ecosystem degradation. 'Situation Assessment Survey of Farmers' (SAS), India Today. 2003

An alarming trend has been witnessed in India in recent years with rising rates of farmers committing suicide. Newspapers echoing the 'crisis in Indian agriculture' continue to report daily incidents of suicides in various parts of the country. Several different reasons have been put forward as the cause of suicides including: mounting debt of farmers, crop failures due to overuse of pesticides, imbalances of international trade, or social and psychological factors.

3. The Nature's Guide: Understanding our Relationship with Nature. CEE North East - Ministry of HRD, Govt. of India. 2001

Nature is our capital. Nature has a capital value. Till date the Nature as a capital has been overexploited at the cost of prosperity and progress. The most standard value is given to money, ignoring the value of nature. The comparative overview is to understand the approaches adopted to screw natural resources or to have maximum extraction of nature's capital in simplistic terms. Secondly the human means persistently encroach the fate of Nature.

4. W. Van Dieren& M. G. W. Hummelinck "Nature's Price" - The Economics of Mother Earth. Great Britain: Marion Boyars Publishers

Ltd.; 1979.

What is even worse, items deducted from nature are entered as assets. The loss inflicted on essential sources of life such as water, some air, forests, and marshes are added to the measure for prosperity which is called the Gross National Product. The price is a measure of the value which people give to goods. And we do accept that goods produced by man have a price, but the man or men cannot see the contrary aspect of enlightenment that matters to God's creation that is Nature and its Natural Resources and the same man cannot see the 'goods' of nature, obtained free, and satisfying the same needs, also have a price or a value.

5. Fischer, Elizabeth. Expanding Legal Imagination. Environmental Law: A Very Short Introduction. Oxford Academic. <https://academic.oup.com>

The author concerns with epistemic responsibility and legal culture. The creation and operation of environmental law has forced lawyers to reflect upon and develop legal concepts, rules, and principles. This is because environmental law is not confined to the world of contract law in which two parties are legally bound by an agreement-an agreement that manages their legal expectations, obligations, and rights. Legal imagination is needed to develop law to respond to a world of multiple interconnected parties, scientific uncertainty, and socio-political conflict. 'Expanding legal imagination' discusses the growth of international environmental law; considers the differences between nuisance law and criminal law; and explains environmental impact assessments as well as legal standing and access to courts.

6. Gilbert Jeremie. Natural Resources and Human Rights: An Appraisal. Oxford University Press. 2018.

In this book the author brings forth the framework in the perspective of the potential synergies between international environmental law and human rights when it comes to the protection and conservation of the natural resources. From legal point of three major areas of potential convergence has been considered. They are - It first focuses on the pollution of natural resources and analyses how

human rights law offers a potential platform to seek remedies for the victims of pollution.

7. Thomas Sikor Jun He and Guillaume Lestrelin. *Property Rights Regimes and Natural Resources: A Conceptual Analysis Revisited*. World Development Vol. 93, pp. 337-349, 2017 0305-750X 2017 The Author(s). Published by Elsevier Ltd.

The conceptual framework has profoundly influenced research on natural resource governance, common property, and community resource management. Many researchers have used the conceptual schema and the idea of property as bundles of rights to move beyond simplistic categories of state, private, and common property, and to distinguish different kinds of common property regimes.

8. Ding, Helen, and Peter Veit. *Equity and Governance: Reasons Property Rights Are Essential for Healthy Ecosystems*. World Resources Institute. Sept. 2016. <https://www.wri.org/insights/3-reasons-property-rights-are-essential-healthy-ecosystems>

Assigning property rights to resources may help reduce degradation. For example, in the Philippines' zanjera irrigation community - Rice farmers in the Philippines, the government granted ownership over the water supply to a farming community. Farmers then established rules governing the use of water, where farmers would withdraw water in rotation under the supervision of another farmer. If conflicts arose, a local court would resolve them. This arrangement-which effectively avoided overexploitation of the local water source-would never have occurred without community property rights.

9. Development on independence of energy regulator. *Stek: Netherlands*. July 3, 2023

The ECJ judgments have played an important role in exposing fundamental flaws in energy law and practice. The ACM has set aside long-standing case law and statutory provisions, and it has become more aware of the exclusive powers conferred on

it by EU law. Energy market participants have also become aware of the additional arguments this may provide in legal proceedings. That, in turn, has led to intensified judicial scrutiny - the ACM itself was sent back to the drawing board by the CBB because it had unlawfully followed ministerial instructions.

10. Ramana Anitha. *Background Study 4 - Farmers' Rights in India: A Case Study*. University of Pune, India. Fridtjof NansensInstitut The Fridtjof Nansen Institute, Oslo. 2006. <https://www.fni.no>

The International Treaty on Plant Genetic Resources for Food and Agriculture recognizes Farmers' Rights and obliges the countries being Parties to the Treaty to protect and promote these rights. Countries, however, have not yet been able to evolve any consensus on how to define or implement Farmers' Rights. International coordination in this regard is also lacking. These are serious drawbacks that could prevent Farmers' Rights from becoming a realistic and workable mechanism. This report attempts to evolve options for the practical implementation of Farmers' Rights through a case study of India. Over forty stakeholders, including farmers, NGOs, industry, and government representatives in India have been interviewed to explore methods to realize Farmers' Rights.

11. *Electricity Regulation in India: An Overview*. <https://uk.practicallaw.thomsonreuters.com>

India is the third-largest producer of electricity in the world. As of 30 September 2020, the total installed power capacity in India is 373.029GW. The overall generation of electricity increased from 1.376 trillion kWh during 2018-19 to 1.389 trillion kWh in 2019-2020. The electricity demand in India is projected to grow together with the increased electrification and economic growth. From time to time, the Government of India (in consultation with the state governments and Central Electricity Authority (CEA)) publishes the National Tariff Policy and National Electricity Policy to develop an electricity system based on optimal utilisation of resources such as coal, natural gas, nuclear, hydro,

and renewable sources of energy. The Government of India (in consultation with state governments) notified the National Tariff Policy in January 2016 (NTP). In May 2020, the Government of India announced the privatisation of the distribution companies in the union territories (administrative division governed by the Government of India) to improve the operational and financial efficiency of the companies.

12. Florian Thevenon, Chris Carroll, and João Sousa (editors). *Plastic Debris in the Ocean: The Characterization of Marine Plastics and their Environmental Impacts, Situation Analysis Report*. International Union for Conservation of Nature. Global Marine and Polar Programme Rue Mauverney 28 1196 Gland, Switzerland. <https://www.iucn.org/>. <https://portals.iucn.org>.

Parties to the Basel Convention in 2008 also adopted the Bali Declaration on "Waste Management for Human Health and Livelihoods." Here, the declaration encourages States to take action in order to develop waste management practices that further consider health issues surrounding waste production. Because of the known health risks posed by marine debris items that are plastic, there is clear reasoning for marine plastic pollution to be considered in this context.

13. Corcoran, E., *et al.* *Sick Water? The Central Role of Waste Water in Sustainable Development. - A Rapid Response Management*. UNEP (United Nations Environment Programme), Un-Habitat, Nairobi, Kenya. 2010.

When considering waste management, it is also important to consider measures to treat waste water as sewage outlets are one of the key sources of marine debris. Waste water can include items such as sanitary towels, tampons, plastic cotton, and wool bud sticks (all of which might have plastic parts), and microplastic items such as plastic fibres from clothes. At the European level for instance the EU Urban Waste Water Treatment Directive requires that all Member States must ensure that sewerage

discharges serving populations over 10,000 in coastal areas and 2,000 in estuarine areas must receive secondary treatment prior to discharge (Interwies et al, 2013). In other less developed regions across the world, the Figure 4.3: The 12 Regional Seas participating in UNEP-assisted marine litter activities (UNEP, 2009). 40 situations regarding measures to tackle waste water treatment are certainly less advanced and it is estimated that 90% of all waste water in developing countries is still discharged directly without treatment.

14. Deiana, Claudio; Geraci, Andrea. "Are Wind Turbines a Mafia Windfall? The Unintended Consequences of Green Incentives." *Social Science Research Network (SSRN)*. ZBW - Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics Düsternbrooker Weg 120 24105 Kiel (Germany) <https://www.zbw.eu>

The European Green Deal commits the European Union to becoming climate-neutral by 2050 and to helping companies become world leaders in clean products and green technologies.<sup>1</sup> The ambitious and wide-ranging measures set out in the plan aim at achieving significant reductions in carbon emissions, and a net-zero target will be given legislative force in new climate laws. Since its announcement, the European Commission (EC) has without hesitation started pushing out legislative initiatives.<sup>2</sup> The European Green Deal is not the first policy supporting investment in green energy. The past twenty years have seen the introduction of several public support schemes to produce electricity from natural renewable sources. The green sector, and particularly wind energy, has registered rapid growth in Western countries since the adoption of the Kyoto Protocol in 1997, often spurred by generous national and supranational support schemes aimed at reducing carbon alternatives.

15. The Water Integrity Network (WIN). [www.waterintegritynetwork.net](http://www.waterintegritynetwork.net)

The Water Integrity Network, formed in 2006, aims to fight corruption in the water sector. It stimulates anti-corruption activities in the water

sector locally, nationally, and globally. It promotes solutions'-oriented action and coalition-building between civil society, the private and public sectors, media, and governments. Canal irrigation, tube-well irrigation and wastewater irrigation are identified as three types of irrigation systems with specific governance and corruption risks. In public canal irrigation, the largest risk is related to capital intensive investments, and operation and maintenance by irrigation officials. In tube-well irrigation, corruption risks are mainly related to the regulation of groundwater overdraft. Wastewater irrigation is an informal practice with few corruption risks. However, the lack of formal governance increases health risks related to wastewater use.

16. Towards a Gender and Water Index: Gender Indicator Development for the World Water Development. Barbara von Koppen. International Water Management Institute. <https://assets.publishing.service.gov.uk>

This book is useful to understand in simple terms - Sharing in Water-Related Employment and Other Benefits - The role of water in increasing productivity and profitability in self-employment for men and women as direct benefit users. As an indirect benefit-users they can sought job or wage employment in the state owned or privately owned water-enterprises. Wage employment is generated in farming, cattle rearing, forestry, mines, tourism business etc. While being in service or in integration with these sorts of set up, farmers or natives get to know about the usages of hydro-power, navigation, and other functions of water in the society.

17. Info Curia Case Law. <https://curia.europa.eu>

In Case C 718/18, ACTION for failure to fulfil obligations under Article 258 TFEU, brought on 16 November 2018. European Commission, represented by M. Noll-Ehlers and O. Beynet, acting as Agents (applicant). Federal Republic of Germany, represented initially by J. Möller and T. Henze, acting as Agents, and subsequently by J. Möller and S. Eisenberg, acting as Agents (defendant). And supported by: Kingdom of Sweden, represented initially by C. Meyer-Seitz,

A. Falk, H. Shev, J. Lundberg and H. Eklinder, acting as Agents, and subsequently by C. Meyer-Seitz, H. Shev and H. Eklinder, acting as Agents (intervene).

The Federal Republic of Germany argues that an interpretation of Article 2(21) of Directive 2009/72 and Article 2(20) of Directive 2009/73 as meaning that the concept of a 'VIU' covers activities outside the European Union carried on by third-country undertakings is contrary to the obligation to interpret acts of secondary legislation in accordance with primary EU law. Those directives, being based on Article 47(2) and Articles 55 and 95 of the EC Treaty (now Article 53(2) and Articles 62 and 114 TFEU respectively), must seek to facilitate the exercise of freedom of establishment and the provision of services, and to harmonise the rules of the Member States concerning the establishment and functioning of the internal market. However, those provisions of primary law cannot be considered an adequate legal basis for the adoption of provisions which apply to the economic activities of undertakings operating in a third country. In addition, since the activities that third-country undertakings carry on outside the European Union do not have any effect on the internal market, there is no need to impose on those undertakings restrictions on the free movement of capital within the meaning of Article 63 TFEU, or to restrict the freedom of those undertakings and those who work for them to conduct a business, enshrined in Article 15(1) and Article 16 of the Charter of Fundamental Rights of the European Union ('the Charter'), and the right to property under Article 17(1) of the Charter, which are recognised in Directives 2009/72 and 2009/73, for the purposes of achieving the goal of ensuring the efficient and non-discriminatory operation of transmission systems within the European Union.

18. Kapoor, S. P & D. D. Mehta. Economic Price Income & Development. Agra: Ram Prasad & Sons; 1965.

Elasticity of supply raises the demand too, that corresponds relatively to the inelasticity of pursuing

means and ends, finally adapting to undemocratic reductionist individualistic fragmented positional advantage and unequal bargaining power-structure. If we go further to understand the approach that actually diseased the nature capital is the local prejudices, liberal values, identity-conferring associations, hunger and quest for brands and its populist culture, which no doubt impartially expands the horizon of liberal constitutionalism, cultural imperialism that failed in rationality even by way of philosophical meditations, religious experiences or ethical rules to measure economic principles at the expense of nature and of the environment.

19. Ahmed, Bilal *et al.* Destruction of Cell Topography, Morphology, Membrane, Inhibition of Respiration, Biofilm Formation, and Bioactive Molecule Production by Nanoparticles of Ag, ZnO, CuO, TiO<sub>2</sub>, and Al<sub>2</sub>O<sub>3</sub> toward Beneficial Soil Bacteria. American Chemical Society, 2022.

Among Nanoparticles, the production of metal and metal oxide NPs (MONPs) due to their wide range of end uses are likely to enhance their probability to enter the environment during the production, use, and disposal. The NPs emerging from sources like industries, sewage wastes, wastewater treatment plants, tannery effluents, and other metal discharging industries are the major cause of nano-pollution that adds considerable amounts of NPs to the terrestrial environment.

20. "Illegal Trafficking in Endangered Plant Species and Varieties." Environmental Crime: Crime Areas. Europol. <https://www.europol.europa.eu/publications-events/publications/environmental-crime-in-age-of-climate-change-2022-threat-assessment>.

As a party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since 2015, the EU is obliged to protect roughly 30,000 species of listed plants against over-exploitation through international trade. In 2015 Europol supported Operation COBRA III, the largest-ever coordinated international law-enforcement operation targeting the illegal trade in

endangered species. The operation recovered a huge amount of wildlife contraband, including endangered flora.

21. Parry, L. Martin. Editor. Climate Change 2007. Impacts Adaptation Vulnerability: Working Groups. Cambridge University Press. <https://books.google.co.in/books>

Climate Change 2007 - Impacts, Adaptation and Vulnerability provides the most comprehensive and up-to-date scientific assessment of the impacts of climate change, the vulnerability of natural and human environments, and the potential for response through adaptation.

22. Climate Action Plan 2050. | FAOLEX. Food and Agriculture Organization. [www.fao.org](http://www.fao.org)

The Climate Action Plan 2050 is a strategy for modernizing the economy and provides guidance for all areas of action up to 2050 and for upcoming investments, especially for the period up to 2030. The Climate Action Plan 2050 will be regularly updated in accordance with the Paris Agreement

22. U.S. Bureau of Labour Statistics. Environmental Engineers. Occupational Outlook Handbook. <https://www.bls.gov/ooh/architecture-and-engineering/environmental-engineers.htm>.

Environmental engineers work on a variety of projects. For example, they may conduct hazardous-waste management studies in which they evaluate a hazard and advise on treating and containing it. They also design systems for municipal and industrial water supplies and wastewater treatment. In government, they may focus on prevention and compliance, such as researching the environmental impact of proposed construction projects or enforcing regulations for disposal of agricultural waste.

## CONCLUSION

The political economic fiefdoms merge their ambitions in Nature's economy and the Man and the Natural World instead being in harmony of coexistence engaged in power-game of the predator

versus hunted. The prominent examples of such transition occurred due to capitalists' self-sufficiency both on technology of warfare and production. South Asia has been a major area of conflict between people and predators unlike Europe and North America - their history hardly been told, especially when understanding the culture of empire, disappearance of wild life and natural resources such as forests and woods as habitats of wildlife etc. which badly affected general impoverishment of regions' ecology. Although the expansion of agriculture has been a by product of the declining 'dangerous beasts' in postcolonial/ colonial India, yet the dynamics of people-nature relations in the pre-colonial period of South Asia or of Sub-Continent India had been very different, from what was to follow the consolidation of colonial power or neo-colonial power, especially after 1857, which got focused to Agrarian Frontiers by retaliating against carnivores, hence the dynamics of interaction since then undergone a very significant change in terms of co-existence of people and predators.

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