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Impact of NFSM Interventions on Chickpea Cultivation in Ajmer District, Rajasthan, India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The impact of the National Food Security Mission (NFSM) on the knowledge levels of chickpea growers in Ajmer district, Rajasthan, focusing on recommended production technologies. A comparison between 200 beneficiary and 200 non-beneficiary farmers revealed significant differences in knowledge across key practices, such as field preparation, use of high-yielding varieties, seed sowing, irrigation management, and post-harvest techniques. Beneficiary farmers exhibited significantly higher knowledge in seven key practices, with Mean Percent Scores (MPS) of 83.43 for field preparation and 82.08 for the use of high-yielding varieties, compared to non-beneficiaries who had lower knowledge, particularly in critical areas like plant protection (49.77 MPS) and weed management (45.25 MPS). The 'Z' test confirmed that the knowledge differences were statistically significant at the 1% and 5% levels. However, no significant difference was found

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in common practices such as seed sowing, seed rate and spacing, and harvesting, suggesting widespread understanding of these practices. The findings highlight the effectiveness of NFSM in improving the knowledge of beneficiary farmers regarding modern chickpea production technologies, although further efforts are needed to address knowledge gaps in crop protection and management practices among non-beneficiaries.

Keywords: NFSM; Chickpea; knowledge; beneficiaries; production.

1. INTRODUCTION

Food security refers to the availability, accessibility, and affordability of food for all people at all times, ensuring sufficient quantities to lead an active and healthy life. It involves three key dimensions: availability, which includes domestic production, imports, and previous stock; accessibility, which ensures food reaches every individual; and affordability, meaning people have enough money to purchase safe, nutritious food. In recent decades, India has seen a decline in food grain production growth, from 2.93% during 1986-97 to 0.93% in 1996-2008, primarily due to lower yields, as shown by the drop in yield growth rate from 3.21% to 1.04% during this period [1]. In response to this, the National Development Council launched the National Food Security Mission (NFSM) in 2007, with the aim of increasing rice, wheat, and pulse production.

The NFSM, a centrally sponsored initiative, originally aimed to boost annual production by 10 million tonnes of rice, 8 million tonnes of wheat, and 2 million tonnes of pulses by the end of the 11th Five Year Plan**.** The mission was extended into the 12th Five Year Plan, with the target of increasing food grain production by 25 million tonnes by 2016-17. Significant changes were made to the approach, financial norms, and implementation strategies based on feedback from states. The NFSM has five key components: NFSM-Rice, NFSM-Wheat, NFSM-Pulse, NFSM-Coarse Cereals, and NFSM-Commercial Crops, all designed to promote agricultural innovations and sustainable development. Chickpea, a vital pulse crop in India, plays an important role in both nutrition and soil health. Pulses like chickpea are essential in Indian agriculture due to their high protein content and ability to fix nitrogen in the soil. The NFSM has been crucial in enhancing chickpea production, particularly in Rajasthan's Ajmer District. In 2021-22, chickpea was grown on 1.95 lakh hectares, producing 2.10 million tonnes at an average yield of 1074 kg per hectare [2]. Since NFSM's launch in 2007-08, interventions such as high-yield seeds, micronutrients, machinery, and pest control measures have been introduced to boost productivity. Ajmer District, with its semi-arid climate, falls under Rajasthan's Agro-Climatic Zone III 'A,' making it suitable for chickpea cultivation. It is now important to assess the impact of NFSM interventions on chickpea farming, specifically the knowledge level of farmers regarding these recommended practices. This research aims to evaluate the awareness and effectiveness of NFSM interventions among chickpea growers in the Ajmer District.

2. MATERIALS AND METHODS

The study was conducted in Ajmer district of Rajasthan, selected due to its significant chickpea production during 2019-20. Chickpea was chosen as the focus crop under the National Food Security Mission (NFSM) interventions in the district. Six Panchayat Samities-Shreenagar, Silora, Kekri, Arai, Sarwar, and Bhinay-were selected as they received NFSM demonstrations on chickpea. From these Panchayat Samities (Table 1 and Fig. 1), 12 villages (two from each) were randomly selected (Table 2), where NFSM interventions were implemented. A total of 200 beneficiary farmers (10% of chickpea growers) and 200 non-beneficiary farmers were selected using random sampling from each Panchayat Samiti, totalling 400 respondents.

To document the socio-economic profile of the respondents, a modified version of the Socio-Economic Status Scale (Rural) by Singh [3] was used. The scale included 11 components such as age, education, caste, annual income, landholding, and more (Table 5). Knowledge level about chickpea interventions under NFSM was measured using a standardized test, which covered nine major aspects of chickpea cultivation like field preparation, seed treatment, and irrigation management. The respondents were scored on a dichotomous scale, with the possible knowledge score ranging from 0 to 64. Knowledge index was calculated using the formula:

$$\text{Knowledge index} = \frac{Possible\ maximum\ obtained\ score}{Knowledge\ score\ obtained} X100$$

The respondents were classified into three categories: low, medium, and high knowledge levels based on mean and standard deviation. A 'Z' test was applied to find the significant differences in knowledge levels between beneficiary and non-beneficiary respondents. The interview schedule was tested for reliability using the 'test-retest' method, yielding a correlation coefficient of 0.731, which was highly significant. Content validity was ensured through expert consultation and thorough review.

The details of the selected respondents are presented in (Table 3), and the aspects of chickpea knowledge assessment are provided in (Table 4).

Table 1. Selection of panchayat samities in Ajmer district

S. No.	Panchayat samities	No. of Beneficiary Respondents (Chickpea)
1.	Shreenagar	300
2.	Silora	200
3.	Kekri	500
4.	Arai	200
5.	Sarwar	500
6.	Bhinay	300
Total		**2000**

Table 2. Name of Panchayat Samity wise Selected villages under study

S. No.	Panchayat Samity	Name of Beneficiary and Non-Beneficiaries Village
1.	Shreenagar	(1) Tihari (2) Lavera
2.	Silora	(3) Bhadun (4) Patan
3.	Kekri	(5) Manda (6) Baghera
4.	Arai	(7) Mundoti (8) Laxmipura
5.	Sarwar	(9) Tantoti (10) Banti
6.	Bhinay	(11) Bubkiya (12) Chanpaneri
Total		**12**

Table 3. Details of the respondent selection

S. No.	Panchayat Samiti	Name of Villages	Selected Respondents	
			Beneficiaries	Non-Beneficiaries
1.	Shreenagar	1- Tihari	15	15
		2- Lavera	15	15
2.	Silora	1- Bhadun	10	10
		2- Patan	10	10
3.	Kekri	1- Manda	25	25
		2- Baghera	25	25
4.	Arai	1- Mundoti	10	10
		2- Laxmipura	10	10
5.	Sarwar	1- Tantoti	25	25
		2- Banti	25	25
6.	Bhinay	1- Bubkiya	15	15
		2- Chanpaneri	15	15
Total		**12**	**200**	**200**

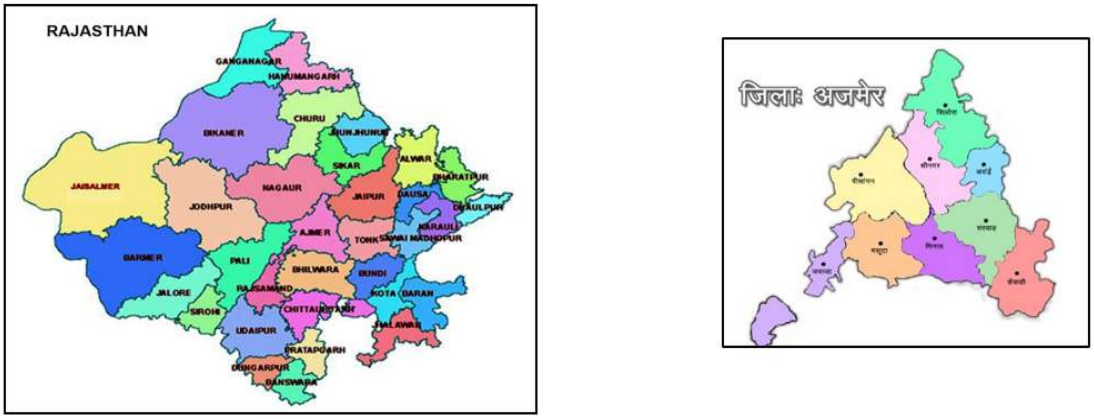

Fig. 1. Location of Ajmer district and its selected Panchayat Samities in Rajasthan

Table 4. Major aspects of knowledge level measurement and their scores distribution (Chickpea)

S. No.	Aspect	No. of Question	Maximum Score
1	Field preparation	3	7
2	Use of high yielding varieties	9	12
3	Seed sowing, Seed rate and spacing	4	4
4	Seed treatment	2	4
5	Manure and fertilizer application	9	11
6	Irrigation management	2	3
7	Weed management	3	4
8	Plant protection measures	7	13
9	Harvesting, threshing and storage	4	6
Total		**43**	**64**

Table 5. Tools used for measurement of dependent and independent variables

Independent Variables		**Measurement**
A	**Socio personal variables**	
1.	Age	Chronological actual age
2.	Education	Structured schedule
3.	Caste	Structured schedule
B	**Socio economic variables**	
1.	Annual income	Structured schedule
2.	Land holding	Structured schedule
3.	Use of farm machinery	Structured schedule
4.	Sources of Irrigation	Structured schedule
C	**Communication variables**	
1.	Source of information	Structured schedule
2.	Extension participation	Structured schedule
3.	Social participation	Structured schedule
D	**Psychological variables**	
1.	Achievement motivation	Modified scale of Sushma (2007)
2.	Economic motivation	Modified scale of Supe (1969)
3.	Risk orientation	Modified scale of Supe (1969)
Dependent variables		**Measurement**
1.	Knowledge level about recommended intervention for Chickpea	Knowledge Index

3. RESULTS AND DISCUSSION

1. Distribution of the chickpea growers according to their knowledge level regarding Chickpea production technology:

The distribution of chickpea growers' knowledge levels about chickpea production technology under the National Food Security Mission (NFSM) reveals a significant impact of the intervention on beneficiaries compared to non-beneficiaries. (Table 6) shows that 56% of the growers had a medium level of knowledge, 18% were in the low-knowledge group, and 26% had a high level of knowledge. Among the beneficiaries, 41% possessed high knowledge, contrasting with just 11% of non-beneficiaries. Additionally, 46.5% of beneficiaries exhibited medium knowledge compared to 65.5% of non-beneficiaries, while 12.5% of beneficiaries and 23.5% of non-beneficiaries fell into the low-knowledge group. These findings indicate that NFSM interventions have successfully increased the knowledge level of beneficiaries, helping them adopt recommended chickpea production practices. This result is consistent with previous research, where governmental programs and extension services played a significant role in enhancing farmers' knowledge and practices. found that structured interventions, such as training and demonstrations, led to improved awareness of new farming techniques, particularly for crops like pulses [4,5]. The gap between beneficiary and non-beneficiary farmers in knowledge levels underscores the critical role of NFSM interventions in knowledge dissemination. Beneficiaries received better access to high-yielding seed varieties, advanced technologies, and pest management strategies, which likely contributed to their improved knowledge [6]. Meanwhile, non-beneficiaries, who had less exposure to these interventions, continued to rely on traditional practices, which may explain their lower knowledge levels. This trend aligns with [*7*], who emphasized that without government support, farmers often lack access to new agricultural technologies and practices.

The difference in knowledge between these groups highlights the need for expanded outreach efforts to ensure that non-beneficiary farmers also benefit from similar training and resources. Previous studies [8,9] have shown that continuous and inclusive extension programs are vital for maintaining and improving agricultural knowledge across broader farming communities, especially in regions where traditional practices prevail.

2. Practice wise knowledge of the Chickpea growers:

he National Food Security Mission (NFSM) introduced key chickpea production technologies, including field preparation, high-yielding varieties, seed sowing, seed rate and spacing, seed treatment, manure and fertilizer application, irrigation management, weed management, plant protection, and harvesting, threshing, and storage. The study assessed knowledge levels of both beneficiary and non-beneficiary farmers regarding these technologies, with results presented in (Table 7). Beneficiary growers exhibited higher knowledge, particularly in field preparation (83.43 Mean Percent Score, MPS), ranked first, and use of high-yielding varieties (82.08 MPS), ranked second. Knowledge about seed sowing, irrigation management, and manure application followed, but lower knowledge levels were noted in weed management (65.75 MPS), plant protection (60.85 MPS), and seed treatment (53.75 MPS). Non-beneficiary farmers, though showing good knowledge in field preparation (73.00 MPS) and seed sowing (72.75 MPS), had poorer scores in weed management (45.25 MPS), plant protection (49.77 MPS), and seed treatment (41.25 MPS).

Table 6. Knowledge level of beneficiary and non-beneficiary chickpea growers about chickpea production technology

N=400

S. No.	Knowledge Level	Non-beneficiary Respondent		Beneficiary Respondents		Total	
		F	%	F	%	F	%
1.	Low (<30.92)	47	23.5	25	12.5	72	**18.0**
2.	Medium (30.92 to 52.20)	131	65.5	93	46.5	224	**56.0**
3.	High (> 52.20)	22	11.0	82	41.0	104	**26.0**
	Total	**200**	**100.0**	**200**	**100**	**400**	**100**

Mean 41.56, S. D. 10.64 F = Frequency, % = per cent

Table 7. Practice wise knowledge level of beneficiary and non-beneficiary chickpea growers about Chickpea production technology

N=400

S.N.	Chickpea Practices	Non-beneficiary growers		Beneficiary chickpea growers		Pooled	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	Field Preparation	73.00	1	83.43	1	78.21	1
2.	Use of High Yielding Varieties	57.17	5	82.08	2	69.63	5
3.	Seed Sowing, Seed rate and Spacing	72.75	2	78.50	3	75.63	2
4.	Seed Treatment	41.25	9	53.75	9	47.50	9
5.	Manure and Fertilizer Application	54.18	6	76.00	6	65.09	6
6.	Irrigation Management	66.33	4	77.33	4	71.83	4
7.	Weed Management	45.25	8	65.75	7	55.50	7
8.	Plant Protection Measures	49.77	7	60.85	8	55.31	8
9.	Harvesting ,Threshing and Storage	70.50	3	76.33	5	73.42	3
	Over all	**58.91**		**72.67**		**65.79**	

The rank correlation (rs) between beneficiary and non-beneficiary knowledge was 0.82, indicating a positive relationship, though beneficiary farmers had generally higher scores. This aligns with prior studies, such as [10,11] which highlight that government interventions significantly improve farmer knowledge, particularly in targeted crops like pulses. Similarly, [12] emphasized the critical role of extension services in knowledge dissemination, while [13] pointed to the need for continuous extension efforts to bridge gaps in less addressed areas like crop protection.

3. Practice wise comparison between beneficiary and non-beneficiary growers about knowledge of Chickpea production technology

The comparison of knowledge between beneficiary and non-beneficiary chickpea growers regarding chickpea production technology reveals significant differences across various practices under the National Food Security Mission (NFSM). To assess this variation, a 'Z' test was applied, and the results are summarized in (Table 8). The data shows that the calculated 'Z' values for five of the practices were significantly higher than the tabulated value at the 1% level, and for two practices, they were higher at the 5% level of significance. This indicates a substantial difference in knowledge between the two groups for seven of the recommended practices. Beneficiary farmers had notably higher knowledge in areas such as field preparation, use of high-yielding varieties, manure and fertilizer application, irrigation management, plant protection measures, weed management, and seed treatment, reflecting the positive impact of NFSM interventions. The higher knowledge levels among beneficiaries can be attributed to their direct engagement with NFSM functionaries and access to training and resources provided by the mission, a pattern observed in prior studies that emphasize the role of extension services in improving farmers' knowledge [14,15]. For two practices-seed sowing, seed rate and spacing, and harvesting, threshing, and storage-the 'Z' test results were non-significant, indicating no meaningful difference in knowledge between beneficiary and non-beneficiary farmers. This may be because these practices are commonly understood and practiced by all farmers, regardless of their involvement with NFSM. The mean values suggest that beneficiary growers consistently demonstrated higher knowledge across most chickpea production technologies compared to non-beneficiaries, emphasizing the effectiveness of NFSM in knowledge dissemination. This result is consistent with earlier research, which found that government interventions improve agricultural practices and outcomes [16,17]. The significant difference in knowledge levels highlights the positive impact of NFSM in enhancing farmers' understanding and adoption of modern chickpea production techniques.

Table 8. Practice wise comparison between beneficiary and non-beneficiary chickpea growers about knowledge of chickpea production technology

S. No.	Package of practices	Non-beneficiary growers (n=200)		Beneficiary growers (n=200)		Z' Value
		Mean +	S.D.	Mean +	S.D.	
1.	Field Preparation	5.11	1.27	5.84	1.12	4.01**
2.	Use of High Yielding Varieties	6.86	1.34	9.85	1.69	13.81**
3.	Seed Sowing, Seed rate and Spacing	2.91	0.76	3.14	0.82	2.07ns
4.	Seed Treatment	1.65	0.84	2.15	1.33	1.89*
5.	Manure and Fertilizer Application	5.96	3.74	8.36	2.21	4.98**
6.	Irrigation Management	1.99	0.69	2.32	0.75	2.93*
7.	Weed Management	1.81	1.2	2.63	1.09	4.84**
8.	Plant Protection Measures	6.47	2.89	7.91	2.71	3.68**
9.	Harvesting, Threshing and Storage	4.23	1.31	4.58	1.16	2.18ns
	Overall	**4.11**	**1.56**	**5.20**	**1.43**	**4.48****

*** Significance at 1 percent level * Significance at 5 percent level*

4. CONCLUSION

The significant impact of the National Food Security Mission (NFSM) on improving the knowledge of beneficiary chickpea growers regarding recommended production technologies. Beneficiary farmers demonstrated higher knowledge levels across most practices, including field preparation, use of high-yielding varieties, and irrigation management, due to their direct involvement with NFSM interventions. In contrast, non-beneficiaries exhibited lower knowledge, particularly in critical areas like plant protection and weed management. The 'Z' test confirmed statistically significant differences in knowledge between the two groups for seven practices, further emphasizing the mission's effectiveness. No significant difference was observed in common practices such as seed sowing, seed rate and spacing, and harvesting, indicating these were well-understood by both groups. The findings suggest that NFSM plays a crucial role in knowledge dissemination and adoption of modern technologies, though additional efforts are needed to bridge gaps in specific practices, especially among non-beneficiary farmers.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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