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Extent of Adoption and Constraints Perceived by the Beneficiaries in Adoption of National Food Security Mission (NFSM) on Pulses

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present study was conducted to examine the extent of adoption and constraints faced by beneficiaries in adoption of NFSM-Pulses scheme in selected districts of Kalyana Karnataka region of Karnataka state. Multistage random sampling technique was used for selection of respondents. A total of 90 beneficiaries were chosen from three districts of Kalyana Karnataka region. Descriptive statistics and Garrett's ranking technique was carried out to examine the adoption level and rank the constraints, respectively. The finding of the study indicated that majority of the farmers adopted

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different intervention of NFSM scheme in that HYV seeds, seed treatment and crop rotation shows 100 per cent adoption. However, poor quality of inputs/machinery supplied under scheme, bias in selection of beneficiary, irregular fallow up by the concerned officer for implementation of scheme, lack of effective capacity building programme/training were the major constraints. The findings emphasize that while the NFSM aims to support pulse production, significant barriers must be addressed to enhance its effectiveness and reach.

Keywords: Beneficiaries; constraints; eligibility; Garrett's ranking; NFSM.

1. INTRODUCTION

Pulses have been cultivated for centuries in rainfed regions with poor soil fertility and moisture-stressed conditions. These seeds come from leguminous plants, part of the Fabaceae family, and serve as excellent feed and fodder for livestock. With their remarkable ability to fix nitrogen biologically, sequester carbon, improve soil health, require minimal water, and endure harsh climates, pulses have long been a key element in sustainable crop production systems, particularly in arid areas (Anonymous, 2016). They also offer good scope for crop diversification, allowing for profitable growth under low-input management conditions in a short growing period. Thus, pulses play an important role in ushering sustainable agriculture.

India is the largest producer and consumer of pulses in the world, contributing around 38 per cent of the world's cultivated area and 28 per cent of world's production of pulses. The country produced 276.69 lakes tonnes of pulses from 361.11 lakh hectares during 2022-23 (Anonymous, 2022). The total geographical area of Karnataka is 190.50 lakh hectares, of which 111.66 lakh hectares is the net cultivable area (Anonymous, 2021). Pulses are grown on 28.91 lakh hectares, with production of 18.42 lakh tonnes. The crop is predominantly cultivated in the Northern parts of the state. The Kalyana Karnataka region is important pulses growing area, covering 12.47 lakh hectares (43.13%) with the production of 9.04 lakh tonnes (48.07%) of state pulses production (Anonymous, 2023).

Although half of the population was employed in agriculture, India faced a situation where the supply of food grains could not keep up with the growing demand, largely due to the rising population. More than a quarter of the state's residents (60 million people) live below the poverty level and. India ranks 111 out of 125 countries in terms of food security (Global Hunger Index-2023) and 200 million people are malnourished (McKay et al., 2023). In order to combat the challenge of deficit food availability in the country, The National Development Council (NDC), in its 53rd meeting held on 29th May, 2007 adopted a resolution to launch a Food Security Mission comprising rice, wheat and pulses in 171 selected districts of the country to increase the annual production of rice by 10 million tonnes, wheat by 8 million tonnes and pulses by 2 million tonnes through area expansion and productivity enhancement in a sustainable manner by promoting improved technologies with respect to seed, integrated nutrient management, including micronutrients, soil amendments, integrated pest management and resource conservation technologies. It had five components during 12th five-year plan viz., NFSM-Rice, wheat, pulses, course cereals and commercial crops (National Food Security Mission).

NFSM-Rice and NFSM-Pulse were implemented in Karnataka during 11th – 12th FYP. Pulses were covered in 13 districts in the beginning and later extended to the entire state. Based on past experience and performance, it has been decided to continue the programme beyond 12th plan with new targets to achieve 13 million tons of additional food grain production comprising of 5 million tons Rice, 3 million tons Wheat, 3 million tons Pulses and 2 million tons Coarse Cereals by 2019-20 (Anonymous, 2017).

The study of government intervention in pulse production is significant due to the reliance on rain-fed agriculture in regions characterized by limited inputs and high risk; over 83 per cent of the area under pulses is rain-fed (Varma, 2019). The National Food Security Mission (NFSM) program has the potential to greatly enhance the livelihood security of smallholder producers by improving pulse production, yield stability, technology dissemination and credit uptake. Therefore, it is essential to evaluate the extent to which the NFSM program meets its intended goals. This research aims to provide insights into the effectiveness of agricultural policies designed to boost pulse production and food security. By analysing how well farmers adopt NFSM

initiatives, the study can identify successful practices that could be replicated in other areas. Additionally, understanding the constraints perceived by beneficiaries will illuminate barriers to adoption, enabling policymakers to develop targeted interventions. Ultimately, this research could help to improve farmer livelihoods and contribute to food security, while also informing future policy adjustments and resource allocation to maximize the benefits of the NFSM for pulse production.

2. METHODOLOGY

2.1 Description of the Study Area

Bidar, Kalaburagi and Raichur districts of Kalyana Karnataka were purposively selected as beneficiaries under NFSM-pulses is relatively higher in the region.

2.2 Study Design

The study is designed to evaluate the impact of the NFSM-Pulses program in Bidar, Kalaburagi and Raichur districts of the Kalyana Karnataka region. The main objectives are to assess the extent of adoption, the benefits derived from the scheme and the constraints faced by farmers in adopting the program. Data will be collected through surveys and interviews with beneficiary farmers, focusing on farming practices and challenges encountered.

2.3 Sampling Method

The multistage random sampling technique was used for selection of sample farmers. In the first stage, Bidar, Raichur and Kalaburagi districts were chosen purposively based on highest number of NFSM beneficiaries in the Kalyana Karnataka region. In the second stage, two taluks from each district were selected purposively. Accordingly, six taluks were selected based on highest number of beneficiaries and area under pulses cultivation to obtain the required number of sample farmers. In the third stage, two villages from each of the chosen taluks were selected randomly. Finally, 15 beneficiary farmers were chosen from villages of each taluk. Thus, a total of 90 sample farmers were chosen from 12 villages across 6 taluks in 3 districts.

2.4 Data Collection Method

For evaluating the objectives of the study, the required data was collected through personal interview method with the help of a well-structured and pre-tested schedule. The primary data pertained to the agricultural year 2023-24.

2.5 Analytical Tools Used

2.5.1 Descriptive statistics

For analysis the extent of adoption, descriptive statistics was used consisting of percentages and averages.

The extent of adoption was assessed by the following formula;

$$\text{Extent of adoption} = \frac{\textit{No.of beneficiaries adopted}}{\textbf{Total No.beneficiaries (90)}} * 100$$

2.5.2 Garrett's ranking technique

The constraints faced by the sample farmers during adoption of NFSM-Scheme were ranked by using Garrett's ranking technique. As per this method, respondents were asked constraints that they were faced in adoption of scheme. Depending upon extent of constraints faced by them rankings were assigned separately to each constraint. Likewise, ranks were assigned to different frequency of various factors/parameters. The results of such rankings were converted into score value by using following formula.

$$\text{Per cent position} = \frac{\mathbf{100}*(\boldsymbol{Rij}-\mathbf{0.5})}{\mathbf{Nj}}$$

Where,

R_{ij} = Rank given for the i^{th} factor by j^{th} respondent.

N_j = Number of factors ranked by the j^{th} respondent.

The per cent position of each rank was converted to scores by referring to tables given by Garret and Woodworth (1969). Then for each factor, the scores of individual respondents were summed up and divided by the total number of respondents for whom scores were gathered. The mean scores for all the factors were ranked.

3. RESULT AND DISCUSSION

3.1 Extent of Adoption of NFSM Interventions

Examining the extent of adoption of various initiatives allows for an understanding of

how widely and effectively farmers are implementing different practices. Evaluating the level of adoption helps pinpoint successful practices as well as those that require improvement. This assessment is crucial for enhancing pulse production and ensuring food security in the region, providing guidance for future interventions and resource allocation. Table 1 presented the extent of adoption of various components of NFSM. The results indicated a high level of adoption for several practices as given below and discussed in detail.

3.1.1 Use of high yielding variety (HYV) pulses seed

The adoption of HYV seeds (100%) among beneficiaries reflected the critical role that high-quality seeds play important role in enhancing crop yields. The complete uptake and adoption rate showed a strong acknowledgment of the direct economic impact of improved seed varieties on agricultural productivity, ultimately contributing to food security and rural income generation.

3.1.2 Cost-saving technology

The adoption of Integrated Disease Management (IDM) by half of the respondents highlighted a moderate interest in disease control measures, which could be further encouraged through targeted economic incentives or education programs. Increased adoption of IDM can lead to reduced losses from crop diseases, directly enhancing economic returns. Integrated Pest Management (IPM) with an adoption rate of 58.89 per cent suggested growing awareness of sustainable pest control practices, which can minimize the economic costs associated with chemical pesticide use while improving long-term profitability.

The impressive 91.11 per cent adoption of Integrated Nutrient Management (INM) depicted that farmers recognize the economic benefits of optimizing nutrient use, potentially leading to higher yields and reduced input costs. The low access rate of Custom Hiring Service Centers (CHSC) (43.33%) suggests a need for improved awareness regarding the economic benefits of these initiatives. Investing in such programs can enhance mechanization, making modern farm equipment more accessible to farmers, which is essential for sustainable agricultural productivity. Split dose application of fertilizer was employed by 92.22 percent of respondents, indicating a strong understanding of the economic benefits of this practice. Raising awareness could further improve crop performance and profitability. The extremely high adoption of bio-agents (96.66%) reflects a strong preference for cost-effective and environmentally sustainable pest management options, which can reduce dependency on expensive chemical inputs and helps improve net returns.

The per cent adoption of seed treatment (100%) indicates its perceived economic value in enhancing seed viability which is crucial for maximizing returns on investment. It is important to note that 86.67 per cent respondent's adoption of mechanization showed a gradual shift towards mechanized farming practices. Increased mechanization can significantly enhance labour efficiency, reduce costs and ultimately improve economic outcomes. The practice of intercropping by 62.22 per cent of respondents highlighted an understanding of the economic benefits of biodiversity including improved soil health and pest control which can lead to enhanced overall profitability.

3.1.3 Resource conservation practices

Majority (86.66%) of respondents adopt of summer ploughing reflected an understanding of its economic benefits in terms of soil health and preparation for subsequent crops, which can enhance yield stability and profitability. Lower adoption rates for practices such as ridges and furrows for planting (25.55%) suggested potential barriers to their implementation, including economic constraints or a lack of information. Promoting these practices could lead to better resource management and increased economic returns.

The moderate adoption of contour bunding (54.44%) and drip/sprinkler irrigation (57.78%) revealed a recognition of the economic benefits of water conservation in agriculture but also highlighted the need for further investment in infrastructure and education to enhance adoption. The full adoption of crop rotation (100%) showcases its recognized importance in maintaining soil fertility and pest and disease management, ultimately supporting long-term economic sustainability.

3.1.4 Participation in demonstration

The participation of 87.77 per cent of respondents in demonstrations underscores the economic value of experiential learning in agriculture. Demonstrations serve as an effective tool for knowledge transfer, allowing farmers to observe and assess the economic viability of new technologies and practices. The high engagement level suggests that such initiatives can lead to increased productivity and consequently improved income levels for farmers.

Enhancing awareness and accessibility of underutilized technologies and practices could further empower farmers to optimize their resource use, thereby increasing agricultural productivity and economic viability. Continued research and targeted economic policies are essential to facilitate the adoption of sustainable agricultural practices that contribute to food security and rural development. The results are supported by Shah (2014), Nain et al. (2015) and Manjunatha et al. (2019) who assessed extent of adoption of different intervention by farmers availing under NFSM scheme and other recommendations.

3.2 Supply/Provision of Farm Equipment under NFSM Scheme

The provision of farm equipment under the NFSM presented in Table 2 covering a range of implements. In case the Rotavator/Side Shift Rotavator, 7 units were distributed costing a value of ₹1,47,840 per unit with a subsidy of ₹60,000 per unit, which accounts 40.58 per cent of the cost. Another important equipment MB Plough distributed to 5 respondents with an average cost of ₹1,02,000 and a subsidy of ₹44,000 per unit resulted 43.14 per cent incentive in the form of subsidy for small and marginal farmers. Chaff Cutters were provided to 6 respondents valued ₹40,000 for each unit and received a subsidy of ₹15,625, which accounts 39.06 per cent of the cost. The seed cum fertilizer drill was purchased by 7 respondents, each costing ₹85,000 and receiving a subsidy of ₹40,750, covering 47.94 per cent of the cost. Cultivators were distributed to 5 participants, costing ₹51,000 each equipment with a subsidy of ₹44,100 accounted for 86.47 per cent of the cost. It was worth to mention that majority of the farmers purchased the Knapsack Power Sprayer 17 units, valued ₹25,500 per unit and received a subsidy of ₹7,500, sharing 29.41 per cent of the cost. The findings highlighted the varying level of subsidy provided for different types of equipment under the NFSM program and 52.22 per cent of beneficiaries had avail the farm equipment under NFSM scheme in the study area.

The distribution of farm equipment under NFSM revealed significant insights into the support provided to farmers through subsidies. The findings showed a strategic approach in subsidizing various farm implements to promote mechanization and efficiency in agricultural practices. Hence, the NFSM's subsidy strategy highlighted a balanced approach towards enhancing agricultural productivity by providing critical farm equipment. The results are supported by Sivagnanam et al. (2019) who assessed particulars of benefit availed during 2007-08 up to 2013-14 under NFSM in Tamil Nadu state.

3.3 Constraints Perceived by Farmers in Adopting NFSM Scheme

The analysis of constraints faced by beneficiaries in availing benefits under the NFSM for pulses was documented in Table 3. It is revealed a multifaceted challenge that significantly impact farmers' ability to adopt and implement the scheme effectively. The Garrett scoring method was used to evaluate the perceptions of farmers regarding the challenges they encounter in the context of the increasing pulses production through area expansion and productivity enhancement.

The analysis of constraints faced by beneficiaries in availing benefits under the NFSM scheme highlighted several key issues. Sample famers stated that the top most constraint as poor quality of inputs and machinery supplied under the scheme with a score of 70.86 ranked I. This issue indicated a substantial dissatisfaction with the materials provided, affecting the overall effectiveness of the scheme. Flowed by the II most critical constraint was bias in the selection of beneficiaries scoring 66.65. This suggested concerns about fairness and transparency in the beneficiary selection process. Irregular follow-up by concerned officers for the scheme's implementation ranked III with a score of 64.94 reflecting inadequate monitoring and support during the scheme’s execution.

Lack of effective capacity building programs and training was ranked IV with a score of 59.60,

pointing to a need for better educational and training opportunities for beneficiaries to maximize the benefits of the scheme. Beneficiaries were also found to be unaware of the eligibility criteria and it required more documentation, which was ranked V with a score of 54.45, indicating a need for clearer communication and simplified processes.

Table 1. Extent of adoption of NFSM interventions by the beneficiaries

(n=90)

Sl. No.	Particulars	No. of beneficiaries adopted	%
I	**Use of HYV seed**	90	100.00
II	**Cost saving technology**		
1	IDM	45	50.00
2	IPM	53	58.89
3	INM	82	91.11
4	CHSC	39	43.33
5	Split does application of fertilizers	83	92.22
6	Bio-agents	87	96.67
7	Seed treatment	90	100.00
8	Mechanization	78	86.67
9	Inter cropping	56	62.22
III	**Resource conservation practices**		
1	Summer ploughing	78	86.67
2	Ridges and furrows for planting	23	25.56
3	Contour bunding	49	54.44
4	Drip irrigation/sprinkler irrigation	52	57.78
5	Compartmental bunding	36	40.00
6	Crop rotation	90	100.00
IV	**Participation in demonstration**	79	87.77

Table 2. Supply/Provision of farm equipment under NFSM scheme in the study area

(n=90)

Sl. No.	Farm implements	No. of beneficiaries	%	Price (₹) /Implement	Subsidy (₹) /Implement	Farmer share (₹)	% Subsidy received
1	Rotavator/Side shift rotavator	07	7.78	1,47,840	60,000	87,840	40.58
2	MB Plough	05	5.56	1,02,000	44,000	58,000	43.14
3	Chaff Cutter	06	6.67	40,000	15,625	24,375	39.06
4	Seed cum fertilizer drill	07	7.78	85,000	40,750	44,250	47.94
5	Cultivators	05	5.56	51,000	44,100	6,900	86.47
6	Knapsack Power sprayer	17	18.89	25,500	7,500	18,000	29.41
	Total	**47**	**52.22**	**4,51,340**	**2,11,975**	**2,39,365**	**46.97**

Table 3. Constraints faced by beneficiaries in availing benefits under NFSM scheme

Sl. No.	Particulars	Score	Rank
1	Poor quality of inputs/machinery supplied under scheme	70.86	I
2	Bias in selection of beneficiary	66.65	II
3	Irregular fallow up by the concerned officer for implementation of scheme	64.94	III
4	Lack of effective capacity building programme/training	59.60	IV
5	Unaware of eligibility criteria for availing the benefits under NFSM scheme and requires more documents	54.45	V
6	Lack of comprehensive information about scheme	50.95	VI
7	Delay in receiving NFSM components	45.30	VII
8	Non-availability of institutional financing under the scheme	39.25	VIII

The lack of comprehensive information about the scheme was ranked VI with a score of 50.95, highlighting gaps in the dissemination of essential details. Delay in receiving NFSM components was the VII constraint, with a score of 45.30, suggesting inefficiencies in the distribution system. Lastly, non-availability of institutional financing under the scheme, with a score of 39.25 was ranked VIII, pointing to challenges in securing financial support for beneficiaries.

Overall, these constraints emphasized the need for improvements in input quality, beneficiary selection processes, follow-up mechanisms, capacity building and communication to enhance the effectiveness and accessibility of the NFSM scheme. The findings emphasize that while the NFSM aims to support pulse production, significant barriers must be addressed to enhance its effectiveness and reach. Addressing these constraints through targeted interventions such as improving the quality of supplied inputs, streamlining procedures, conduct a greater number of training programs and providing better access to financial resources will be crucial for fostering greater participation and successful implementation of the NFSM. The results are reinforced by Barde et al. (2022) and Chaitra et al. (2020) who highlighted the challenges farmers encounter in accessing the benefits of the NFSM scheme.

4. CONCLUSION

The findings emphasize the critical economic implications of various NFSM interventions and benefits. While the high adoption rates of key practices, particularly in usage of high yielding variety seed, seed treatment, crop rotation and nutrient management, indicated positive economic behavior among farmers, there are still opportunities for improvement. Although numerous programs and schemes have been introduced by the government for the welfare of farmers, many of these interventions have not been fully adopted. This lack of widespread adoption is one reason why the targeted outcomes and goals of these programs have not been fully achieved. Therefore, identifying the constraints faced by farmers in adopting these interventions is crucial for implementing agencies and related departments. It will help them assess the situation and refine the interventions to better align with the needs and demands of farmers. Establishing a robust monitoring and evaluation (M&E) mechanism will help in assessing the effectiveness of the NFSM interventions. Regular feedback from farmers can inform policy adjustments align with their needs and conditions, enhancing the overall effectiveness of the scheme.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares 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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