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CONTENTS

Attitude and constraints faced by the beneficiaries of Pradhan Mantri Krishi Sinchayee Yojana in Garhwal region of Uttarakhand

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ABSTRACT: As Indian agriculture is mostly rainfed, making provision for the irrigation is really a matter of great concern for the policy makers of India. Water is a scarce resource and not available in plenty, focus on 'more crop per drop of water' emphasises the significance of improving water use efficiency. Despite lots of investment in making provisions of irrigation water for the farmers, the situation in terms of productivity and production efficiency has not changed much. To address this challenge, the *Pradhan Mantri Krishi Sinchayee Yojana* (PMKSY) was started in 2015 with the goal of making adequate provision of water for irrigation and achieving convergence of investments in the irrigation sector at the field level. The present study was undertaken to find out the attitude of PMKSY beneficiaries and the identify the constraints faced by them. The study was conducted in Dehradun district of Garhwal division of Uttarakhand which was selected purposively as it has the highest number of PMKSY beneficiaries. Total Four villages were selected randomly from two blocks. The study sample included 122 beneficiary farmers selected by using Probability Proportionate to Size (PPS) method. The study findings revealed that 59.01 per cent of beneficiary farmers showed favourable attitude towards PMKSY. Further, major infrastructural constraints faced by beneficiary farmers were unavailability of spare parts, lack of adequate information, poor quality of pipes, micro-tubes and other materials and poor after-sales services. Financial constraints were 'requiring high and frequent maintenance, difficult and time taking subsidy disbursement, poor subsidy and favouritism shown by government officials' and geographical constraints were 'unavailability of clean water and fragmented land holding'.

Key words: Attitude, constraints, irrigation, PMKSY, rainfed agriculture

The Indian economy is predominantly focused on agriculture, with more than half of the people relying on farming and related businesses for a living. Increased population and the need for food security have increased the demand for irrigation water, which can only be met by making smart use of available water resources. Ansari and Sunetha (2014) observed that access to accurate, timely, and reliable information plays a crucial role in the adoption of appropriate technology. Hence, there is an urgent need to identify information needs related to various facets of agriculture.

We all know that water is a crucial input for agriculture, accounting for over 80 per cent of total water consumption in the country. The net irrigated area accounts for roughly 49 per cent of the total net sown area in the country. Canal systems irrigate about 40 per cent of the net irrigated land, while groundwater irrigates 60 per cent. (Anonymous, 2019). The proportion of agriculture in overall water usage is predicted to decrease from its current level of 85 per cent to 74 per cent in 2050 as a result of growing inter-sectoral rivalry (Ministry of Jal Shakti, 2015). This suggests that in order to make agriculture sustainable over time, effective irrigation techniques must be adopted. Despite being a water-rich state due to several rivers originating from the state, the farming in Uttarakhand, particularly in hilly areas, is mostly rainfed. In 2018-19, the net irrigated area of Uttarakhand was 3.22 lakh hectares, accounting for barely 45 percent of total cultivated land.

A number of programmes in agriculture sector are in operation in Uttarakhand, but the outcomes are not very appealing and effective. According to the Report of the Comptroller and Auditor General of India (2008), the Accelerated Irrigation Benefit Programme (AIBP) plan has had no substantial impact on improving irrigation potential in the state of Uttarakhand. Under National Mission on Micro Irrigation, the average penetration of micro irrigation in India is 19 per cent, and in Uttarakhand it is only 1.7 per cent. Uttarakhand achieved only 21.39 per

cent of physical and 31.11 per cent of the financial targets. Despite having a good number of beneficiaries and number of schemes running the net irrigated area and the production is not increasing significantly. As a result, the Government has combined all irrigation initiatives and schemes under PMKSY with effect from 2015-16 with the goal of improving physical access to water on farms, expanding the area under agriculture that can be farmed with guaranteed irrigation, improving on-farm water use efficiency, introducing sustainable water conservation practices, and so on. PMKSY activities will contribute in the formulation of future water requirements. The current study's objectives are to find out the socio-personal, economic and communication characteristics of PMKSY beneficiaries, to determine their attitude towards PMKSY and to identify the constraints faced by them in getting the benefits of scheme.

MATERIALS AND METHODS

The study was conducted in Dehradun district of Garhwal division in Uttarakhand which was selected purposively as it has the highest number of PMKSY beneficiaries. Two blocks, namely Doiwala and Raipur were selected randomly. Further, total Four villages, i.e., Doiwala and Fatehpur Danda villages from Doiwala block while Sarona and Harbhajwala villages from Raipur block, were selected randomly. The sample size comprised 122 beneficiary farmers from the selected four villages using Probability Proportionate to Size (PPS) method. The data was collected using a pre-tested structured interview schedule. The focus of the study was on attitude of farmers towards PMKSY, and the constraints faced by the beneficiary farmers.

Attitude: Attitude was measured by using the scale developed by Patel and Patel in 2000 for measuring the attitude of farmers towards watershed development programme. Scale was modified according to the components of PMKSY. The scale consists of 16 questions, against each of the 16 statements there were five columns representing a five-point continuum of Agreement or Disagreement to the statements as followed by Likert scale.

Constraint analysis: Factor analysis was used to find out the major constraints faced by the beneficiary farmers. It is a data summarization and data reduction technique. Kaiser-Meyer-Olkin and Bartlett's Test are two methods for determining sampling adequacy in factor analysis. The Kaiser-Meyer-Olkin measure of Sampling Adequacy is a statistic that measures the proportion of variance in your variables that is caused by underlying factors. High numbers (near to 1.0) often imply that factor analysis with your data may be useful. If the value is less than 0.50, the factor analysis results are unlikely to be relevant. The total variance extracted table output is used to determine how many components are to be 'extracted'. Using Kaiser's criterion, output components with an eigenvalue of 1 or greater were chosen for component identification. The total variance of a set of observations or data points is a measure of their variability. The total of the squared discrepancies between each observation and the mean of the observations is used to compute it. In a factor or principal component analysis, the scree plot is a graphical depiction of the eigenvalues of the components. It is used to identify how many aspects or components to keep for further examination.

RESULTS AND DISCUSSION

Profile characteristics of beneficiaries of PMKSY-

The findings of the present study found that the most of the beneficiary farmers were male (77.87%), belonged to general caste (71.31%); majority of the them were in middle age group (51.64%), had medium social participation (51.64%), medium farming experience (50.82%) and medium annual income (58.20%). Further, maximum number of respondents were educated upto middle school (22.13%), had medium cropping intensity (48.36%) and medium land holding (42.62%). Majority of them use canals as an irrigation source (60.66%), used furrow method (67.21%) and had medium information seeking behaviour (60.66%). The study also revealed that the majority of beneficiary farmers belonged to the middle and old age groups (Patidar, 2015) which could be related to the fact that young people are less interested in farming because

agriculture is regarded as a labour-intensive job with a higher degree of risk. Furthermore, due to a lack of interest in farming and in quest of better chances, they go to cities and towns for jobs and education, leaving agriculture as an occupation behind.

The study findings revealed that majority of farmers join social organisations such as gram panchayat, co-operative societies, farmers clubs, SHG etc., primarily to benefit from the services provided by the organisation, regardless of their interest in such organisations. This could explain the majority of respondents' medium level of social participation (Yadav *et al.*, 2021). It can be seen from Table 1 that half (50.82%) of the beneficiary farmers had medium farming experience followed by 40.16 per cent had low and 9.02 per cent had high farming experience respectively. These farmers, who had less experience, experimented with various irrigation methods and discovered that the MIS subsidy was more profitable and better for farming. Furthermore, farmers with more farming experience frequently perform the same irrigation practices over the years and find them more comfortable, which could explain why there are fewer beneficiary farmers in the higher farming experience category. These results were in line with the study findings reported by Adhikari (2021).

Additionally, the findings clearly shows that the majority of farmers (58.20%) were classified as having a 'medium' annual income. The findings are consistent with Chauhan (2018), who reported that the majority of respondents came from middle-income families. Majority of the beneficiary farmers used furrow method (67.21%), followed by the drip irrigation (56.56%), flood irrigation (41.80), sprinkle irrigation (38.52%) and manual irrigation (22.13%). Farmers used both traditional irrigation methods and scientific irrigation methods. Furrow irrigation, flood irrigation, drip irrigation and sprinkle irrigation were the four main methods of irrigation used by farmers in the study area. It suggests that farmers who used modern irrigation methods were also using traditional irrigation methods to raise some of the crops. The findings are similar to Rudrapur *et al.* (2015) who reported that majority of respondents used furrow irrigation method. According to Table 1, majority (42.62%) of the beneficiaries were medium farmers (Meena, 2019), 22.13 per cent were semi-medium farmers, 16.39 per cent were small farmers, and 10.66 per cent were marginal farmers and only a small minority (8.20%) were large farmers. According to the current findings, the PMKSY micro irrigation subsidy primarily benefited medium, small, and semi-medium farmers. It could be because PMKSY gave subsidies for land holdings ranging from 0.4 to 5 hectares. Moreover, mostly small and marginal farmers grow food for their own consumption and so they might have lacked interest in adoption of micro irrigation and availing the subsidy support. It is also found that majority of the beneficiary farmers (60.66%) had medium information seeking behavior, 21.31 per cent beneficiary farmers had low and 18.03 per cent had high level of information seeking behaviour. The reason may be because beneficiary farmers had medium level of social participation. The above findings are in line with Chauhan (2018) who reported that majority of the respondents had medium information seeking behaviour.

***Attitude of beneficiaries towards PMKSY*:** The findings of the study revealed that majority (59.01%) of the respondents displayed favourable attitude towards Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) followed by less favourable (22.95%) and more favourable (18.04%) beneficiary farmers. Based on the aforementioned findings, it can be deduced that a significant majority of beneficiary farmers exhibited a neutral attitude towards PMKSY. This can be attributed to several factors, including moderate levels of social participation and information-seeking behavior. Moreover, farmers have been exposed to modern and scientific irrigation techniques, which have enhanced their understanding of the value of efficient irrigation. Consequently, they have displayed a neutral attitude towards the irrigation scheme. The above findings are in line with Singh and Sinha (2017), Devilal (2021), Verma *et. al,* (2016) and Singh and Dangi (2022).

Table 1: Distribution of beneficiaries according to profile characteristics (n=122)

S. No.	Categories	Frequency	Percentage
1	*Age*		
	a. Young (22-40)	26	21.31
	b. Middle (41 to 58)	63	51.64
	c. Old (59-76)	33	27.05
2	*Sex*		
	a. Male	95	77.87
	b. Female	27	22.13
3	*Education*		
	a. Illiterate	13	10.66
	b. Primary School	17	13.93
	c. Middle school	27	22.13
	d. High School	38	31.15
	e. Intermediate	12	9.84
	f. Graduation and above	15	12.29
4	*Caste*		
	a. SC/ST	22	18.03
	b. OBC	13	10.66
	c. GENERAL	87	71.31
5	*Social Participation*		
	a. Low (upto 1)	36	29.51
	b. Medium (1-3)	63	51.64
	c. High (>3)	23	18.85
6	*Farming Experience*		
	a. Short term (<21)	49	40.16
	b. Medium term (21-41)	62	50.82
	c. Long term (> 41)	11	9.02
7	*Annual Income*		
	a. Low (18000-262000)	41	33.61
	b. Medium (262000-506000)	71	58.2
	c. High (>506000)	10	8.2
8	*Source of Irrigation*		
	a. Canals	74	60.66
	b. Tube wells	54	44.26
	c. Tanks	40	32.79
	d. Rivers	25	20.49
	e. Wells	6	4.92
	f. Ponds	0	0
9	*Irrigation Methods*		
A.	Traditional methods		
	a. Furrow	82	67.21
	b. Flood	51	41.8
	c. Manual	27	22.13
B.	Scientific methods		
	a. Drip	69	56.56
	b. Sprinkle	47	38.52
10	*Land Holdings*		
	a. Marginal (>1.00)	13	10.66
	b. Small (1.00-2.00)	20	16.39
	c. Semi- Medium (2.00-4.00)	27	22.13
	d. Medium (4.00-10.00)	52	42.62
	e. Large (> 10.00)	10	8.2
11	*Cropping Intensity*		
	a. Low (60-130)	47	38.52
	b. Medium (131-200)	59	48.36
	c. High (201-270)	16	13.12
12	*Information Seeking Behaviour*		
	a. Low (upto 8)	26	21.31
	b. Medium (8-22)	74	60.66
	c. High (>22)	22	18.03

Table 2: Distribution of beneficiaries according to Attitude towards PMKSY (n=122)

S. No.	Category	Frequency	Percentage
1	Less Favourable (<32.46)	8	6.56
2	Favourable (32.46- 58.76)	72	59.01
3	More Favourable (>58.76)	42	34.43
	Total	122	100.00

Constraints faced by the beneficiaries in getting the benefits of the scheme: The study's data analysed using Factor Analysis to discover the major obstacles faced by beneficiary farmers in getting the benefits of the scheme. A typical method for grouping variables is principal component analysis. Varimax rotation is utilised to properly evaluate factors. The first step in identifying the limits that farmers experience in getting the benefits of the scheme is the Kaiser-Meyer-Olkin and Bartlett's Tests to assess sampling adequacy. The Kaiser-Meyer-Olkin measure of Sampling Adequacy is a statistic that reflects the amount of variance in your variables that is common variance, i.e., that could be produced by underlying factors. High scores (near to 1.0) often imply that factor analysis may be effective with your data. If the value is less than 0.50, the factor analysis results will most likely be useless. When the test is applied on data, the following result was revealed:

The KMO score in this case is 0.768, indicating that the data is suited for factor analysis because it is near to 1. The Bartlett's sphericity test is a test of the null hypothesis that the correlation matrix is an identity matrix, indicating that the variables are uncorrelated. A low p-value for this test shows that the correlation matrix differs considerably from an identity matrix and is thus eligible for factor analysis. In this case, the p-value is quite low (<0.001), indicating that the correlation matrix differs significantly from an identity matrix and is thus eligible for factor analysis. The number of degrees

Table 3: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.768
Bartlett's Test of Sphericity	Approx. Chi-Square	313.162
	Df	45
	Sig.	<.001

of freedom (df=45) equals the number of distinct correlations between the variables. Based on this information, it is possible to conclude that the data is adequate for factor analysis and that there are likely underlying variables that explain the limits farmers experienced in getting the benefits of the scheme. These underlying factors can be identified and grouped using factor analysis.

The total variance extracted from table output is used to determine how many components are to be 'extracted'. Table 4 demonstrates that output components with an eigenvalue of 1 or more were chosen for component identifications using Kaiser's criterion. Total Variance indicates how many components satisfy this requirement. Eigenvalues for each component are listed and three components are recorded as having eigenvalues 1 or more. These three components explain a total of 57.84 per cent of the variance.

The scree plot is a graphical representation of the eigenvalues of a dataset's principal components in decreasing order. It displays the amount of variance explained by each component and aids in identifying the best number of components to keep for future study. The Kaiser criterion recommends keeping components

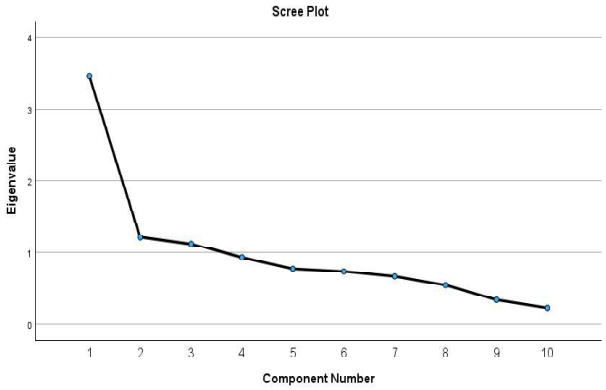

Fig. 1: Scree Plot

with eigenvalues greater than 1. The scree plot, on the other hand, can provide extra information to help determine the number of components to keep. Scree plots often show a curve with a high slope at first, followed by a more gradual slope. The plot's "elbow point" illustrates where the slope transitions from steep to gradual, and this point can be used to calculate the number of components to keep.

In the Rotated Component Matrix, the loadings of each variable on the three factors chosen are looked for as the highest loading variables on each component - they can be used to help you identify major constraints faced by the beneficiary farmers.

Table 4: Total Variance

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.461	34.614	34.614	3.461	34.614	34.614	2.847	28.467	28.467
2	1.207	12.071	46.684	1.207	12.071	46.684	1.721	17.209	45.676
3	1.116	11.16	57.844	1.116	11.16	57.844	1.217	12.168	57.844
4	0.931	9.307	67.151						
5	0.774	7.741	74.892						
6	0.736	7.364	82.256						
7	0.667	6.673	88.928						
8	0.543	5.432	94.361						
9	0.337	3.374	97.734						
10	0.227	2.266	100						

Extraction Method: Principal Component Analysis.

Table 5: Rotated Component Matrix

Rotated Component Matrix[a]			
Statements	Component		
	1	2	3
Unavailability of spare parts.	0.684		
Lack of adequate information at right time.	0.813		
Poor quality of pipes, micro-tubes and other materials.	0.87		
Poor after sales service provided by the companies.	0.775		
Requires high and frequent maintenance.	0.518	0.552	
Subsidy disbursement is very difficult and time taking		0.533	
Poor subsidy.		0.514	
Unavailability of clean water			0.507
Favouritism shown by government officials.		0.738	
Fragmented land holding.			0.837
Extraction Method: Principal Component Analysis.			
Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 4 iterations.			

The nature of the underlying variable represented by each component were-

A. Component 1(Infrastructural constraints)- Unavailability of spare parts, Lack of adequate information at right time, Poor quality of pipes, micro-tubes and other materials, Poor after sales service provided by the companies.

B. Component 2 (Financial constraints)- Requires high and frequent maintenance, Subsidy disbursement is very difficult and time taking, Poor subsidy, Favouritism shown by government officials,

C. Component 3 (Geographical constraints)- Unavailability of clean water, Fragmented land holding.

Thus, we can see the various types of constraints – Infrastructural, Financial, and Geographical - faced by the beneficiary farmers

CONCLUSION

The study findings indicate that a large majority of beneficiaries (94%) had favourable attitude towards PMKSY. Besides, if the constraints (Infrastructural, Financial, and Geographical) as identified under this study are taken care of, it can make the PMKSY a very useful programme for taking care of the lack of irrigation facilities in the study area concerned. The PMKSY will help the governments (Central as well as State) to address the issue of increasing food production, with the limited land and water resources available, and by adopting integrated water resource management framework. PMKSY would help in drought proofing the rainfed agriculture and at the same time enhance sustainability of irrigated agriculture by minimizing land degradation due to salinization, waterlogging, and imbalanced use of chemical fertilizers. It will also address the issues of equity of water access on one hand, while dealing with food and nutritional security for the growing population on the other. By building partnerships through PMKSY with different partners including farmers, extension agents, implementing agencies, private companies and government functionaries of different line departments, smallholder farmers would derive tangible economic benefits with increased production and value through the value-chain approach in the mission mode.

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