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Exploring the Interconnectedness Between Knowledge Level and Profile Traits of Cluster Frontline Demonstration-pulse Farmers

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ABSTRACT

A study was conducted during March, 2022 in Central Telangana Zone, India to measure the knowledge level of Cluster Frontline Demonstration (CFLD)-Pulse farmers by constructing a Knowledge Test battery. Relevant items were collected from review of literature, publications, and discussions with subject matter specialists' of Krishi Vigyan Kendra and concerned scientists of related fields. Item analysis was done by item difficulty index, item discrimination index and point biserial correlation and 22 items were finalized for knowledge test. The test was administered to 160 respondents (100 beneficiary and 60 non-beneficiary farmers) of the CFLD programme conducted by Krishi Vigyan Kendra Wyra and Malyal belonging to Khammam and Mahabubabad Districts of Telangana state respectively (50 beneficiary and 30 non-beneficiary farmers from each KVK). Majority of the Cluster Frontline Demonstration-beneficiaries (59%) and (50%) of non-beneficiaries were in medium knowledge category. To further validate the factors that were influencing the knowledge gain in the respondents, a correlation between profile traits of respondents and their knowledge level was carried out and further multinomial model test was carried out to validate the result. Individual factors/profile traits influencing knowledge gain were Cosmopoliteness, Resource availability and, Risk taking ability for beneficiary farmers and Cosmopoliteness followed by economic motivation for non-beneficiary farmers. Multinomial model results confirmed that these were determining factors that played major role in knowledge of farmers.

KEYWORDS: CFLD, correlation, knowledge, KVK, pulses, profile, relation, relationship

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1. INTRODUCTION

Pulses are a vital and imperative category of crops alongside cereals that provide high-quality protein to a significant portion of the vegetarian population worldwide (Barik, 2021 and Ali et al., 2023). These crops not only provides substantial nutritional value for humans but also enhances soil fertility through nitrogen fixation (Dong et al., 2022). They can fix atmospheric nitrogen with the help of symbiotic bacteria called Rhizobium, enriching the soil with nutrients and improving soil fertility for subsequent crops (Sangwan et al., 2021; Fahde et al., 2023). Despite India being the leading country in pulse cultivation, the contribution of pulses to the overall food grain production is only 10 % in the nation (Anonymous, 2024a). Although this group of crops is vital from a nutritional standpoint, there has been no notable increase in area and production since the year 1950–51; however, a remarkable growth has been observed in recent years (i.e., from 2020–2021). Total pulses production during 2023–24 is estimated at 242.46 Lakh tonnes which is lower by 5.39 lakh tonnes than the last five years' average pulses production of 247.85 Lakh tonnes (Anonymous, 2024b). With improvements in irrigation and infrastructure resources, the productivity of pulses has surged by approximately 111%, reaching 932 kg ha^{-1} in 2021–22, compared to 441 kg ha^{-1} in 1950–51 (Badhala et al., 2014). The total production of food grains reached 315 mt in 2021–22 (Anonymous, 2022). Initiatives by the government, such as the National Food Security Mission's Cluster Front Line Demonstration (CFLD) program, have made significant strides in boosting pulse productivity in the country. CFLDs are an enduring educational effort carried out under the NFSM in a systematic manner on farmers' fields to illustrate the benefits of new technology (Balai et al., 2021). They serve as a powerful tool for assessing and transferring technology to enhance agricultural production (Sangwan et al., 2021; Singh and Tetarwal, 2022). The Department of Agriculture, Cooperation, and Farmer Welfare has approved the project "Cluster Frontline Demonstrations on Pulses and Oilseeds" under the National Food Security Mission, a scheme funded by the Government of India and executed by KVKs, aimed primarily at enhancing production through demonstrations (Inbasekar, 2014). This initiative focuses on adopting villages by making advanced technologies available and spreading the use of improved seeds, integrated nutrient management, sulfur, bio-fertilizers, weed management, integrated pest and disease management, along with extension activities like training and media campaigns (Singh et al., 2019; Puniya et al., 2021). The central goal of KVK is to minimize the time gap between the creation of technology and its application by farmers to consistently boost productivity and income from agriculture and related sectors. CFLDs serve as a prolonged educational engagement conducted logically on farmers' fields to demonstrate the benefits of new technology (Singh et al., 2018). The current study was designed primarily to evaluate the intricate relationship between knowledge level of farmers participating in CFLDs and farmer's traits primarily responsible for knowledge gain through public programmes. Knowledge is essential for enhancing production and productivity (Sudha Rani et al., 2014). In this study, knowledge is operationally defined as the amount of technical information that respondents hold regarding the technology acquired through vocational training or visits (Choudhary and Yadav, 2012; Paul et al., 2020). A knowledge test was created, standardized, and administered to evaluate the level of understanding among CFLD-pulse farmers concerning various production and protection methods (Pokar et al., 2014). The test was structured to reveal the technological dissemination gap between CFLD-pulse beneficiaries and non-beneficiary farmers (Chandhana et al., 2022) and to point out the factors/traits attributable to comprehending information available through public programmes like CFLD.

2. MATERIALS AND METHODS

The present study was conducted in March, 2022 in Central Telangana Zone at KVK Wyra (17.1918° N, 80.3575° E) and KVK Malyal (17.55°N, 79.961°E) of Khammam and Mahabubabad districts, respectively. These KVKs were purposively selected as they were performing the CFLD Programme since 2015–16 under Pulse crop. From each KVK, 50 respondent farmers as beneficiaries and 30 farmers as Non-beneficiaries were purposively selected.

For the purpose of assessing knowledge gain by farmers of CFLD-pulse on the latest technologies, a knowledge test battery has been constructed and administered to farmers and categorised into low, medium, and high categories.

Then for the 2nd objective i.e., to explore the relationship between knowledge and profile of farmers, correlation has been performed in SPSS software to point out the factors responsible for comprehending information by farmers

$$r=\{\sum XY-(\sum X\sum Y/n\}/\sqrt{\{\sum X^2-(\sum X/X)-\sum Y^2-(\sum Y/Y)\}}$$

The computed 'r' values were then compared with the table values at p=0.05 and p=0.01 levels of significance (LOS). If the 'r' calculated value was greater than or equal to the 'r' table value, the relationship between the selected variables was considered significant; otherwise, it was considered non-significant

3. RESULTS AND DISCUSSION

Results from the study indicated that majority (59%) of the CFLD beneficiary farmers had medium knowledge gain on pulse technologies provided through CFLD

followed by High (28%) and Low (13%) knowledge gain, whereas in CFLD non-beneficiary farmers, (50%) had medium knowledge followed by low (36.6%) and High (13.3%) knowledge. These results were in line with the Abhishek et al. (2023) and Swati et al. (2022) who found that majority of the pigeon pea farmers and groundnut farmers respectively were in medium knowledge category followed by high knowledge category in their study as they were actively involved in pulse cultivation.

It could be concluded that majority of the CFLD beneficiaries and non-beneficiaries were found in medium range, but beneficiaries were followed by High (28%) and non-beneficiaries were followed by (36.6%) low, which means beneficiaries were distributed in medium to high region and non-beneficiaries were distributed in medium to low region.

From the results presented in Table 1, it was clear that the majority of the CFLD beneficiary and non-beneficiary farmers were middle aged. The probable reasons might be that Young farmers might have less interest in farming as they were more interested in non-agricultural practices like business, owning stores and private enterprises, while Old farmers were moving away from farming and given their land holdings for lease to other farmers. As a result, majority of the CFLD beneficiaries and non-beneficiaries were middle aged which is in accordance with the results mentioned by Paradva et al. (2022) who studied the relationship between profile of the green gram growers and their level

Table 1: Profile characteristics of beneficiary and non-beneficiary farmers

Sl. No.	Name of the variable	Categories	Beneficiaries (n=100)	Non-beneficiaries (n=60)	
			F and %	F	%
A. Personal variables					
1.	Age	Young (<35 years)	20	14	23.33
		Middle (35–50 years)	50	28	46.67
		Old (>50 years)	30	18	30.00
2.	Education	Illiterate	9	6	10.00
		Can read	3	1	1.67
		Read and write	2	2	3.33
		Primary school	5	3	5.00
		Middle school	18	14	23.33
		High school	36	18	30.00
		Intermediate	5	3	5.00
		Graduate	14	9	15.00
		PG and Above	8	4	6.67
3.	Farming Experience	Low (3–18)	23	16	26.67
		Medium (18–33)	62	39	65.00
		High (33–50)	15	5	8.33
B. Economic variables					
4.	Land Holding	Marginal (Upto 1 ha)	25	15	25.00
		Small (1–2 ha)	43	29	48.33
		Semi medium (2–4 ha)	25	12	20.00
		Medium (4–10 ha)	7	4	6.67
		Large (>10 ha)	0	0	0
5.	Annual income	Low (<70,069)	2	2	3.33
		Lower-middle (70,070–2.73,099)	45	27	45.00
		Upper-middle (2,73,100–8,45,955)	53	27	45.00
		High (>8,45,956)	0	4	6.67

Table 1: Continue...

Sl. No.	Name of the variable	Categories	Beneficiaries (n=100)	Non-beneficiaries (n=60)	
			F and %	F	%
C. Psychological variables					
6.	Risk-taking ability	Low (22–36)	22	12	20.00
		Medium (36–50)	66	41	68.33
		High (50–64)	12	7	11.67
7.	Economic motivation	Low (7–11)	15	10	16.67
		Medium (11–15)	61	28	46.67
		High(15–19)	24	22	36.66
D. Social variables					
8.	Mass-media exposure	Low (2–7)	35	20	33.33
		Medium (7–12)	58	34	56.67
		High (12–17)	7	6	10.00
9.	Social participation	Low (1)	11	10	16.67
		Medium (2)	75	32	53.33
		High (3)	14	18	30.00

of knowledge about recommended green gram production technology and found that education, land holding, mass media exposure, economic motivation.. has a positive and significant relation with knowledge. While in case of education, more than 1/3rd of the CFLD beneficiary (36%) farmers were of High school educated followed by (18%) of the respondents were Middle school educated and 14% of them were Graduated. Whereas in CFLD non-beneficiary farmers majority (30%) had High school education followed by (23.33%) Middle school, (15%) of them were Graduated, (10%) Illiterate. Seeing that they were primarily middle aged (35–50 years) education levels and farming experience were in accordance with their age. The above table depicted that majority of the CFLD beneficiaries and non- beneficiaries fell under Lower-Middle to Upper-Middle income category followed by Low in beneficiary and high in case of non-beneficiary farmers. Income of the family greatly influence their standard of living and decision making power in the society. In this study beneficiaries were motivated by Cluster frontline demonstrations conducted by KVK scientists to increase their income by selling the product in the form of seed and reuse the seed produced by them for future seasons. The findings of this study were similar with the findings of Abhishek et al. (2023) who found that majority of the pigeon pea growing farmers were in medium income level category. The medium economic motivation of beneficiary farmers, i.e., the will to acquire and create wealth was in accordance with their medium level of age and farming experience as discussed earlier. The economic motivation received significant recognition only when the market economy of agricultural product rises. Not subjecting to the limitation of farmers status like age, education and farming experience, government quests to support the farming community by raising the minimum support price (MSP) for the product that became the good way to raise the economic motivation of the farmers to cultivate the pulse crops with good production technologies, besides providing strong marketing infrastructure.

3.1. Relationship between profile traits and knowledge gain by farmers

In order to study the nature of relationship between profile and knowledge gain by farmers on improved technologies disseminated through CFLDs, correlation coefficients (r) were computed and the values were presented in Table 2. The relationship was tested by using the null hypothesis and empirical hypothesis.

3.1.1. Age vs knowledge

It was evident from the Table 2 that age was negatively significant with Knowledge of CFLD beneficiaries and non-beneficiaries towards Pulse technologies. Aged and more experienced farmers have a strong belief and affinity towards traditional farm technologies and a fear of risk in farm production, their perception level also decreased on latest concepts and methods. They lost interest in achieving goals as they get older which might be the probable reason for negative relationship. This was similar to the results provided by Suman, 2017 and Prashanth et al., 2018 who in their study on relation between profile of vegetable and fruit growers with knowledge reported that age was negatively

Table 2: Correlation coefficients between profile and knowledge of beneficiary and non-beneficiary farmers of CFLD

Sl. No.	Variable	Correlation coefficients('r') Knowledge	
		CFLD Beneficiary farmers	Non-beneficiary farmers
1.	Age	-0.191*	-0.223*
2.	Education	0.507**	0.198*
3.	Mass media exposure	0.465**	0.212*
4.	Annual income	0.278**	0.229*
5.	Land Holding	0.274**	0.189*
6.	Farming Experience	0.197*	0.192*
7.	Social Participation	0.511**	0.222*
8.	Economic motivation	0.567**	0.329**
9.	Risk taking ability	0.632**	0.014*

*: Significant at p=0.05 level of probability; **: Significant at p=0.01 level of probability, NS: Non-significant

correlated with knowledge level of pulse growing farmers and Paradva et al., 2022 and Singh and Jahanara, 2024 said that there is a significant relation among age and knowledge level of farmers highlighting that age is an important factor to be considered while implementing a programme

3.1.2. Education vs knowledge

It could be observed from Table 2 that education had positive and significant relationship with Knowledge level of both beneficiaries and non-beneficiaries. Education not only added knowledge but also expanded view of individuals. Higher the education, wider would be their interaction with other sources and increased the ability to grasp facts, analyze and interpret in accurate way. Educated farmers would have more information seeking habits and better access to all types of communication media. The results were supported by the findings of Singh et al., 2024, Paradva et al., 2022 and Gautam et al., 2020. Asiwal et al., 2025 who observed that farmers with higher education and greater access to extension services exhibited significantly higher knowledge levels about pulse production. This supports the present study, where education showed a positive association with farmers' knowledge

3.1.3. Annual income vs knowledge

It could be observed from Table 2 that Annual income had positive and significant relationship with Knowledge level of beneficiaries and non- beneficiaries. Income of the farmers (both beneficiary and non-beneficiary) greatly influenced their acceptance of information, as they were more prone to innovation or might be early adopters, so they acquired more information on the latest technologies. These results were in line with Asiwal et al., 2025 and Singh and Jahanara, 2024, who observed that farmers with medium-high income category exhibited significantly higher knowledge levels about pulse production. With higher income, farmers were able to adopt new technologies and thus enhanced their scope of information.

3.1.4. Land holding vs knowledge

The Table 2 indicated positive and significant relationship between knowledge and land holding. The probable reason might be more land holding with the farmer raised his economic motivation enabling him to access various kinds of information to increase his farm income by learning new techniques and methods which ultimately increased his knowledge level. These results were in line with Singh and Jahanara, 2024; Singh et al., 2024 and Paradva et al., 2022. and Gautam et al., 2020, who explained that farmers with larger area under pulses were eager to absorb more information and thus enhance their knowledge level. So, with more the area under pulse, farmers are required to learn more and thus has more knowledge.

3.1.5. Farming experience vs knowledge

It was obvious from Table 2 that there was positive and significant relationship between Knowledge and farming experience of beneficiaries and non-beneficiaries. The probable reason might be that, participation in programmes like CFLD might have helped farmers gain more insight and experience on latest technologies and methods, improve their confidence levels and understand new and innovative technology. So, with the increased experience in farming, farmers interest in learning new things increases. These results were in line with findings of Paradva et al., 2022 , Asiwal et al., 2025 and Suman, 2017 who explained that with increased experience in the farming has a positive and significant relation with their enhanced knowledge accumulated through the years of experience in the respective fields.

3.1.6. Mass media exposure vs knowledge

As seen from the above Table 2, mass media exposure had positive and significant relationship with knowledge of beneficiaries. High level of mass media exposure enhanced the respondents knowledge level on several aspects of pulse cultivation practices. Newspaper, agricultural magazines, television, radio, village knowledge centers and mobile services considered to be accelerators of diffusion of innovations. Farmers with constant touch with mass media were likely to have better knowledge on current advances in technology. This results were in line with Paradva et al., 2022, Singh and Jahanara, 2024 and Asiwal et al., 2025, who explained that exposure to proper extension services and

public awareness through the mass media allowed farmers to learn more and enhance their knowledge

3.1.7. Social participation vs knowledge

The Table 2 explained a positive and significant relationship between social participation and knowledge of beneficiaries and non-beneficiaries. The probable reason might be that increased participation in various programmes and organizations made participants expose to latest techniques and different sources of information related to agriculture. Further it also provided better opportunity to have interpersonal interactions which would help in easy adoption of new technologies. This results were in line with findings of Paradva et al., 2022 and Gautam et al., 2020, who observed that with public awareness and participation in the public programmes and organisations has positive and significant relation with enhanced knowledge of the farmers.

3.1.8. Risk taking ability vs knowledge

The Table 2 explained the positive and significant relationship between risk taking ability and Knowledge of beneficiaries. It was the degree to which a farmer was oriented to take risk by trying new ideas and innovations and would naturally prefer to know about advanced technologies and practice them in his own farm land. It was one of the main character of an innovator. Beneficiaries with medium to high level of risk taking ability to acquire more knowledge. The results were in line with Paradva et al., 2022 and Singh and Jahanara, 2024, who found that taking risk in the form of trial and adoption of new innovations has a positive and significant relation with their knowledge on latest technologies and innovations. Present study is linked with the CFLD programme, which involves demonstrating the newly released technologies and varieties to the farmers. In this context, taking and accepting new innovations require risk acceptance.

3.1.9. Economic motivation vs knowledge

The Table 2 depicted that there was a positive and significant relationship between economic motivation and Knowledge of beneficiaries. The probable reason for this might be, a farmer who was aware of his present economic condition had ability to earn income from his farm land, learn more about latest technologies through which he could make good profit. This made him more knowledgeable than others. Farmers learn about alternative management practices for sustaining and increasing productivity through CFLDs, so they became more eager to learn about latest methods and techniques. The results were in line with Paradva et al., 2022, Singh and Jahanara, 2024 and Asiwal et al., 2025, who found that farmers who are financially motivated has a sense of acquiring new information and thus with higher economic motivation has the greater sense of knowledge in the field

3.2. Difference in knowledge of beneficiaries and non-beneficiaries on improved varieties and crop technologies demonstrated through CFLD-pulse

The 'Two sample Z test' was applied to test the significant difference between beneficiaries change in knowledge achieved through CFLD-pulse programme and non-beneficiaries knowledge on Pulse technologies and results were presented in Table 3.

Table 3: Difference in knowledge of beneficiaries (treatment group) and non- beneficiaries (control group) on improved varieties and technologies demonstrated through CFLD

Variable	Respondents	Two sample Z-test		
		Mean	Sample	"Z" values
Knowledge on improved technologies	Beneficiaries	17.59	100	5.12*
	Non-beneficiaries	13.72	60	

*: Significant at p=0.05 level of Probability

It could be seen from the Table 3 that there was a significant difference between the beneficiaries and non-beneficiaries with regard to change in knowledge on pulse technologies.

This Two sample Z-test provided a Z-value (5.12) as indicated in Table 3 was found significant at p=0.05 level of probability indicating that there exists a significant difference in knowledge of beneficiaries in comparison to non-beneficiaries , Hence, we rejected null hypothesis.

The probability value that determined the significance of the test was called the significance level, which was chosen at the design stage of the study, usually 0.05. This meant that if p<0.05, the null hypothesis was rejected. In the present study p=0.003, rejecting the null hypothesis; i.e., showing a significant difference between the beneficiaries and non-beneficiaries with regard to change in knowledge, accepting the empirical hypothesis.

To validate the result, Multiple linear regression as presented in Table 4 has been performed and found that Cosmopoliteness, Resource availability and Risk taking ability were significant in effecting the knowledge of beneficiary farmers.

Multinomial logistic regression has been run separately for beneficiary and Non-beneficiary farmers with knowledge (Low/medium/High) categories as dependent variable and profile traits as independent variables. Usually multinomial model showed how profile characteristics influenced the probability of farmers being in Low, Medium or in High knowledge level.

The Multinomial model chooses any one category as the reference category (eg: Low) and it estimated the log odds

Table 4: Regression coefficients for beneficiary farmers

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
(Constant)	3.070	1.542		1.990	.050
Age	-.010	.032	-.025	-.316	.752
Education	.305	.120	.151	2.532	.013
Annual income	.164	.131	.099	1.252	.214
land holding	.179	.078	.161	2.303	.024
Farming experience	.029	.035	.070	.827	.411
no. of trainings	-.359	.515	-.049	-.697	.487
Economic M.	-.097	.108	-.101	-.899	.371
Mass	.159	.097	.091	1.635	.106
Social	-.550	.513	-.061	-1.070	.287
Achievement M.	.097	.061	.160	1.606	.112
Risk M.	.088	.037	.212	2.358	.021
Cosmopoliteness	1.965	.280	.508	7.019	.000
Resource	1.341	.421	.217	3.185	.002

a. Dependent Variable: knowledge

of being in Medium vs Low and High vs Low for each independent variable. Multinomial logistic regression analysis revealed that farmers' profile characteristics significantly influenced their knowledge level in the CFLD programme. Variables such as education, annual income, landholding size, trainings attended, and extension contact were found to be highly significant predictors of knowledge level (p<0.05). Higher education, income, and exposure to extension services positively influenced the likelihood of farmers attaining Medium and High knowledge levels compared to Low knowledge. These findings underscored the importance of socio-economic factors and extension interventions in enhancing farmer knowledge outcomes. Very few studies have been carried out to validate the drivers within the profile traits that actually influence knowledge level. These results were included in the studies by Paradva et al., 2022 and Singh and Jahanara, 2024 and Gautam et al., 2020 who found that higher income, education and extension services has a positive strong relation with knowledge enhancement and found that they are significant to improve the knowledge level.

4. CONCLUSION

Beneficiaries had participated in various training programme organized by KVK and field days, which made them to observe the real potential of the technologies, built interest and confidence in them to adopt these technologies, making beneficiaries more knowledgeable than other farmers. Whereas non-beneficiaries were not members of CFLD programme and were unable to realize the benefits of latest technologies demonstrated through CFLD, hence they were not able to gain sufficient varietal and technological knowledge.

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