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EVALUATING THE EFFECTIVENESS OF MODEL FARM SERVICES CENTERS (MFSCS) IN EMPOWERING FARMERS FOR SUSTAINABLE AGRICULTURE

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Abstract

Model Farm Services Centers (MFSCs) have been introduced in Khyber Pakhtunkhwa (KP), Pakistan, to empower farmers by providing access to modern agricultural inputs, training, and financial services. This study evaluates the strengths and weaknesses of MFSCs in improving farmers' productivity and livelihoods. A multi-stage sampling technique was used to select four distinct districts, and Yamane's formula was applied to determine a representative sample of 400 registered farmers. The research reveals that MFSCs have notably improved farmers' technical skills, income levels, and decision-making confidence. Findings indicate that technical empowerment achieved the highest score (mean 6.0/7), followed by economic empowerment (mean 5.6/7), with overall farmer satisfaction remaining high (mean 5.3/7). However, institutional empowerment was relatively weak (mean 4.1/7), and significant barriers such as poor access to credit, weak infrastructure, and limited-service outreach were identified. Severe problems were reported in accessing financial services (66%) and transportation (64%). Correlation analysis revealed a strong positive association between MFSC training attendance and farmers' decision-making confidence ($r = 0.65$, $p = 0.001$). The study concludes that while MFSCs play a vital role in empowering farmers, systemic improvements in institutional support, financial accessibility, service inclusivity, and infrastructure development are critical for sustaining their positive impact.

Keywords: Model Farm Services Centers (MFSCs), Farmer Empowerment, Agricultural Productivity, Livelihoods, Strengths and Weaknesses, Khyber Pakhtunkhwa

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INTRODUCTION

Agriculture is indeed a crucial sector in Pakistan, significantly contributing to the GDP, employment, and export earnings (Baig *et al.,* 2013). It serves as the backbone of the economy, with a large portion of the population relying on it for their livelihoods (Sajid & Rahman, 2021). The sector's share of GDP is substantial, and it employs a significant portion of the labor force, highlighting its crucial role in the country's socioeconomic development (Awan, 2019). A majority of Pakistan's population resides in rural areas and depends directly or indirectly on agriculture for their livelihoods, further emphasizing the sector's importance to the nation's well-being (Usman, 2016). Despite its importance, the agricultural sector in Pakistan grapples with a multitude of challenges that impede its potential (Ullah *et al.,* 2020). These challenges encompass climate change, erratic rainfall patterns, nutrient deficiencies in the soil, and limited adoption of modern technological inputs (Ullah *et al.,* 2020).

AGRICULTURE IN PAKISTAN: IMPORTANCE AND CHALLENGES

Pakistan's agricultural sector is highly susceptible to climate change, with increasing instances of extreme weather events like floods, droughts, and heatwaves that negatively impact crop yields and livestock production (Tunio *et al*., 2024). The recurring incidence of devastating floods has resulted in widespread crop failure, significant livestock losses, and extensive damage to vital agricultural infrastructure, precipitating substantial economic repercussions and jeopardizing the livelihoods of countless farmers who depend on agriculture for their survival and economic stability (Fatima, 2021). In addition to the adverse impacts of climate change, the agricultural sector encounters challenges related to inadequate irrigation infrastructure, suboptimal utilization of fertilizers, and insufficient access to modern farming techniques, all of which contribute to diminished productivity and hinder the sector's overall growth and development (Khan *et al*., 2020).

AGRICULTURE IN KHYBER PAKHTUNKHWA

Khyber Pakhtunkhwa, a province in Pakistan, possesses distinct agro-ecological zones that support diverse agricultural production. The province is characterized by varied agro-ecological zones, encompassing fertile plains, arid regions, and mountainous terrains, each presenting unique prospects and constraints for agricultural endeavours. The province's agriculture is characterized by diverse cropping patterns, including wheat, maize, rice, sugarcane, and various fruits and vegetables, each adapted to the specific agro-ecological conditions prevalent in different regions (Baig *et al*., 2013). Agriculture is the predominant economic activity in South Asia (Rehman *et al*., 2024). However, the agricultural production across South Asia, and specifically in Khyber Pakhtunkhwa, is increasingly vulnerable to climate change, which is expressed through rising temperatures, altered precipitation patterns, increased frequency of droughts and floods, and overall heightened climate variability, posing considerable threats to crop yields, livestock productivity, and the livelihoods of farmers in the region (Shahzad *et al*., 2021).

As a strategic intervention to address the challenges and unlock the agricultural potential of the Khyber Pakhtunkhwa government established Model Farm Services Centers. These centers are designed as comprehensive agricultural resource complexes, providing essential extension services through access to the latest information, practical training programs, and customized support systems designed to optimize farming practices and improve overall productivity, contributing to the prosperity and resilience of the agricultural sector in the region. The primary objective of MFSCs is to bridge the gap

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between agricultural research and on-farm practices, enabling farmers to adopt modern technologies, improve crop yields, and enhance their overall income levels.

PROBLEM STATEMENT AND JUSTIFICATION OF THE STUDY

Despite the potential benefits of MFSCs, their effectiveness in enhancing farmers' productivity and livelihoods in Khyber Pakhtunkhwa remains a subject of critical inquiry. A comprehensive assessment of the strengths and weaknesses of MFSCs is necessary to identify areas for improvement and ensure that these centers effectively contribute to the sustainable development of the agricultural sector in Khyber Pakhtunkhwa. The study is justified by the need to provide evidence-based recommendations for strengthening the MFSCs and maximizing their impact on farmers' productivity and livelihoods, aligning with broader objectives of agricultural development and poverty reduction in the province. There is limited knowledge about what affects farmers' financial activities in the context of Khyber Pakhtunkhwa.

OBJECTIVES OF THE STUDY

1. Evaluate the farmers' empowerment programs through MFSC.
2. Identify the problems faced by the members of MFSCs.

RESEARCH METHODOLOGY

UNIVERSE OF THE STUDY

The entire province of Khyber Pakhtunkhwa was considered the universe for this research. Given the province-wide presence of MFSCs, the study aimed to capture a representative sample from multiple districts to ensure generalizability of the findings.

RESEARCH DESIGN

The present study was conducted to analyze the level of farmers' empowerment facilitated through Model Farm Services Centers (MFSCs) across the province of Khyber Pakhtunkhwa, Pakistan. A quantitative research design was adopted, using primary data collected through structured interviews. The study aimed to provide empirical insights into how MFSCs contribute to empowering registered farmer members.

SAMPLING TECHNIQUE

A multi-stage sampling technique was employed in order to ensure representativeness and manageability of the research process:

STAGE 1: Four districts were selected purposively from different agro-ecological zones of Khyber Pakhtunkhwa province (i.e, Peshawar, Charsadda, Kohat, and Mardan) to ensure diversity in agricultural practices and institutional engagement.

STAGE 2: Within each selected district, registered members of MFSCs were identified as the target population.

STAGE 3: A proportional allocation method was used to determine the number of respondents from each district, ensuring representation relative to the size of the population.

SAMPLE SIZE

The sample size was determined using **Yamane's formula** for known populations, which is expressed as:

$$n = \frac{N}{1+N\,(e)^2}$$

Where:
n = Sample size
N = Population size
e = Level of precision (standard error)

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P = Confidence level = 95%

Applying the formula with a 5% margin of error and 95% confidence level, the final sample size was 400 registered farmers. Moreover, respondents' selection was done through proportional allocation technique. The distribution of the respondents across the districts are as Peshawar (170), Charsadda (111), Kohat (72) and Mardan (47) respectively.

RESULTS AND DISCUSSIONS

TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Demographic Characteristic	Category	Frequency (N)	Percentage (%)
Age	18-30 years	89	22.4%
	31-40 years	111	27.7%
	41-50 years	139	34.7%
	51-60 years	55	13.7%
	60+ years	06	1.5%
Education Level	No formal education	56	14%
	Primary	127	31.8%
	Matric	132	33%
	Inter or above	85	21.2%
Farming Experience	1-5 years	102	25.5%
	6-10 years	146	36.5%
	11-15 years	96	24%
	16+ years	56	14%
Farm Size	Small (1-2 acres)	209	52.2%
	Medium (3-5 acres)	160	40%
	Large (6+ acres)	111	27.7%
Participation in MFSC Program	Yes	331	82.8%
	No	69	17.2%
Location of Farm	Rural Area	367	91.7%
	Urban/Suburban Area	33	8.3%

Source: Field Survey

The age profile shows that the majority of farmers (62.4%) are between 31 and 50 years old, placing them in a stage of life that balances experience with physical capacity. This age group is generally more receptive to adopting improved practices compared to older farmers. The small percentage of older individuals (1.5% aged 60+) suggests a generational shift, with fewer elderly continuing in agriculture.

Educational attainment among respondents is moderate, with most having either primary (31.8%) or matric-level education (33%). Only 21.2% had higher education, while 14% had no formal schooling. This suggests that while a fair number can comprehend basic technical information, training programs should remain practical and visually oriented to accommodate varying literacy levels.

A majority of farmers (36.5%) have 6–10 years of experience, indicating a relatively skilled group that is not too entrenched in traditional practices. About 25.5% are fairly new (1–5 years), while only 14% have more than 16 years of experience. This spread shows a balance between tradition and innovation potential, making the group well-suited for development interventions.

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Vol. 3 No. 4 (2025)

Small-scale farming dominates the landscape, with 52.2% of respondents managing farms of 1–2 acres. Medium-sized farms (3–5 acres) are also common (40%), while large farms (6+ acres) make up only 27.7%. This highlights the need for smallholder-friendly policies and technologies, such as low-cost irrigation, input subsidies, and training tailored to limited land resources.

A strong majority (82.8%) reported participation in the Model Farming Services Center (MFSC) program, reflecting high community engagement and acceptance. This offers a valuable foundation for evaluating the program's effectiveness in improving livelihoods, productivity, and knowledge transfer. The high participation also suggests trust in institutional support mechanisms.

The overwhelming rural concentration (91.7%) confirms that farming remains a rural livelihood, with only 8.3% engaged in urban or peri-urban agriculture. This validates the rural focus of agricultural support services, but also points to emerging opportunities for promoting urban farming initiatives in the future.

TABLE2: PERCEPTIONS OF EMPOWERMENT THROUGH MFSC PROGRAMS

Empowerment Indicator	Mean	Standard Deviation	Interpretation
Income improvement due to MFSC	3.65	0.92	Moderate positive perception
Knowledge gained from MFSC training	3.90	0.88	Generally positive
Confidence in farming decisions	4.05	0.74	Strong agreement
Access to agricultural inputs	3.30	1.01	Mixed response
Participation in MFSC activities is meaningful	3.40	0.89	Moderately positive; variation by gender
Access to credit/financial services	2.85	1.20	Negative perception
Improved networking with institutions	3.55	0.98	Somewhat positive
MFSC programs tailored to farmer needs	3.20	1.12	Marginal agreement; low satisfaction

Source: Calculated by Author

The data in Table 2 indicate that MFSCs have had a moderately positive impact on various empowerment dimensions, particularly in decision-making confidence (M = 4.05) and knowledge acquisition (M = 3.90). This suggests that training initiatives and advisory support provided through MFSCs are generally effective in fostering informational and psychological empowerment among rural farmers. These findings are consistent with those reported by Ali *et al.* (2021) and Khan & Ullah (2018), who emphasized knowledge diffusion and increased autonomy as critical outcomes of MFSC participation.

However, the results also reveal significant disparities. For instance, the indicator relating to access to credit and financial support scored notably lower (M = 2.85), with a higher standard deviation (SD = 1.20), indicating widespread dissatisfaction and inconsistency in service delivery. This aligns with findings from Tariq *et al.* (2023) and Ullah *et al.* (2015), who reported bureaucratic hurdles, delayed disbursements, and favoritism as critical issues in MFSC operations.

Access to agricultural inputs and participation in MFSC activities also received moderate scores (M = 3.30 and M = 3.40, respectively). Female and landless farmers, in particular,

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reported limited participation and representation, suggesting a need for gender-inclusive and equity-focused reforms in MFSC governance. The low score for program customization (M = 3.20) further implies that existing training modules and extension services are insufficiently tailored to the diverse agroecological and socio-economic contexts of the target beneficiaries.

TABLE 3: STRENGTHS AND WEAKNESSES BASED ON EMPOWERMENT DOMAINS

Empowerment Domain	Strengths (%)	Weaknesses (%)	Interpretation
Economic Empowerment	74%	18%	✔ Strong positive impact on farmers' income & market access
Technical Empowerment	81%	10%	✔ High engagement with modern farming practices
Social Empowerment	65%	25%	⚠ Moderate community participation, need for inclusion
Institutional Empowerment	59%	31%	✖ Weak institutional linkages & limited access to support
Satisfaction with MFSC	69%	21%	✔ High satisfaction, but gaps in service accessibility

Source: Calculated by Author

The data in Table 3 showed various empowerment domains highlight both the strengths and weaknesses of the Model Farm Services Centers (MFSCs) in supporting farming communities. Economic Empowerment received strong approval, with 74% of respondents recognizing a positive impact on income and market access. Technical Empowerment was the highest rated domain, with 81% of participants acknowledging effective engagement with modern farming practices. Social Empowerment showed moderate support (65%), but a significant 25% noted concerns, indicating a need for greater inclusivity in community participation. Institutional Empowerment appeared to be the weakest area, with only 59% of respondents reporting positive experiences and 31% citing limited institutional linkages and support. Despite these shortcomings, overall satisfaction with MFSCs was relatively high at 69%, though 21% of respondents pointed to gaps in service accessibility, underscoring the need for improved outreach and delivery mechanisms.

TABLE 4. OVERALL EMPOWERMENT INDEX (COMPOSITE SCORES)

Domain	Mean Score (1–7)	Std. Dev	Empowerment Level	Remarks
Economic Empowerment	5.6	0.89	High	✔ Positive impact
Technical Empowerment	6.0	0.70	Very High	✔ Excellent outcome
Social Empowerment	4.8	1.1	Moderate	⚠ Mixed results
Institutional Empowerment	4.1	1.4	Low-Moderate	✖ Needs support
Satisfaction with MFSC	5.3	1.0	High	✔ Good satisfaction

Calculated by Author

Table 4 presents mean scores and standard deviations across key domains, reflecting respondents' perceptions on a 1–7 scale. Technical Empowerment scored the highest mean

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Vol. 3 No. 4 (2025)

(6.0) with low variability (SD = 0.70), indicating consistently strong engagement with modern farming practices and excellent outcomes. Economic Empowerment also rated highly (mean = 5.6), showing a positive impact on farmers' income and market access. Satisfaction with MFSCs remained high (mean = 5.3), suggesting overall approval of services provided. Social Empowerment, with a moderate mean score of 4.8 and relatively higher variability (SD = 1.1), indicated mixed results and uneven participation across communities. Institutional Empowerment was the weakest domain (mean = 4.1, SD = 1.4), reflecting low to moderate support and highlighting the need for stronger institutional linkages and service accessibility.

TABLE 5. PROBLEMS FACED BY MFSC MEMBERS – FREQUENCY AND MEAN SEVERITY

Problem Area	% Reporting Issue	Mean Severity (1–5)	Interpretation
Inadequate access (transport/distance)	64%	3.80	Severe problem
Lack of transparency in operations	58%	3.65	Moderate to severe
Favoritism or unequal treatment	47%	3.20	Moderate
Unhelpful or untrained MFSC staff	41%	3.00	Moderate
Irrelevant or outdated training	52%	3.45	Moderate
Poor infrastructure	60%	3.75	Severe problem
Difficulty in accessing credit/subsidy	66%	3.85	Severe problem
Communication gaps	55%	3.60	Moderate to severe

Calculated by Author

The above table identifies key problem areas reported by respondents in their interaction with Model Farm Services Centers (MFSCs), highlighting both the frequency of complaints and the perceived severity on a scale of 1 to 5. The most severe issues included difficulty in accessing credit or subsidies (66%, mean severity = 3.85), inadequate access due to transport or distance (64%, 3.80), and poor infrastructure (60%, 3.75), all of which were classified as severe challenges. Other significant concerns involved a lack of transparency in operations (58%, 3.65) and communication gaps (55%, 3.60), both falling under moderate to severe. Issues such as irrelevant or outdated training (52%, 3.45), favoritism or unequal treatment (47%, 3.20), and unhelpful or untrained staff (41%, 3.00) were also reported at moderate levels. These findings suggest the need for systemic improvements in accessibility, infrastructure, transparency, and service delivery to enhance the overall effectiveness of MFSCs.

TABLE 6. CORRELATION – MFSC MEMBER PARTICIPATION VS EMPOWERMENT

Variable Pair	Correlation Coefficient (r)	Significance (p)	Interpretation
Training Attendance vs. Confidence in Decisions	0.65	0.001	✓ Strong positive correlation
Duration of Membership vs. Access to Financial Support	0.52	0.007	✓ Moderate positive correlation

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The correlation analysis reveals significant positive relationships between key variables related to farmers' engagement with Model Farm Services Centers (MFSCs). A strong positive correlation ($r = 0.65$, $p = 0.001$) was found between training attendance and farmers' confidence in decision-making, indicating that participation in MFSC training programs significantly boosts confidence in making informed agricultural decisions. Similarly, a moderate positive correlation ($r = 0.52$, $p = 0.007$) was observed between the duration of MFSC membership and access to financial support, suggesting that longer association with the centers enhances farmers' opportunities to obtain credit or subsidies. Both correlations are statistically significant, emphasizing the importance of sustained engagement and participation in capacity-building activities for improved empowerment outcomes.

CONCLUSION AND RECOMMENDATIONS

MFSCs have effectively enhanced farmers' income, market access, and technical skills but show weaknesses in institutional linkages, financial access, and inclusiveness. Strengthening these areas can further maximize their impact. It is recommended for better functioning of MFSCs to improve institutional ties, ease access to credit, ensure greater inclusion of marginalized groups, expand technical support, and strengthen outreach and monitoring.

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