Journal of Agricultural Science and Technology, 28(1)
In Press, Pre-Proof Version

Personal and Institutional Determinants of an Effective Entrepreneurial Intervention

Sujay Kademani[1], Manjeet Singh Nain[2]*, Rashmi Singh[2], Shiv Kumar[3], Rajender Parsad[4], Dinesh Kumar Sharma[5], and Surjya Kanta Roy[1]

ABSTRACT

Entrepreneurship is vital for driving innovation, economic development, and sustainability in the agricultural sector, empowering farmers, and ensuring food security. Successful promotion of agri-entrepreneurship demands a nuanced approach that considers both the personal traits of entrepreneurs and the institutional factors. This study employed linear regression analysis and principal component analysis to examine the determinants of entrepreneurial success and identify factors contributing to effective interventions across three distinct entrepreneurial categories i.e., farm-based, off-farm based, and service/tech entrepreneurs. Data was gathered through structured interviews involving two hundred agri-entrepreneurs in Rajasthan and Telangana states. The regression analysis revealed that diverse psycho-personal and socioeconomic variables like marital status, income levels, and achievement motivation were of significant influence. The principal component analysis provided valuable insights into the institutional factors underpinning effective entrepreneurship promotion interventions. Technical factors like tailored project support, financial enablers including government funding and tax incentives, and robust implementation mechanisms involving stakeholder collaboration were highlighted. Operational elements such as; training institute-industry-market-entrepreneur linkages, administrative commitments, and policy consistency, collectively shaped intervention effectiveness across the entrepreneurial ecosystems. This comprehensive examination of individual and institutional determinants offered a holistic perspective on fostering successful agri-enterprises, emphasizing the need for contextualized approaches that align personal attributes with tailored institutional interventions.

Keywords: Agripreneurship, Incubation, Principal Component Analysis, Determinants, Effective interventions.

[1] ICAR – Indian Institute of Agricultural Biotechnology, Ranchi, India.
[2] Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi-110012, India.
[3] ICAR-National Institute for Agricultural Economics and Policy Research, New Delhi-110012, India.
[4] ICAR-Indian Agricultural Statistics Research Institute, New Delhi-110012, India.
[5] Centre for Environment Science and Climate Resilient Agriculture, ICAR-Indian Agricultural Research Institute, New Delhi-110012, India.
*Corresponding author, e-mail: msnain@hotmail.com

INTRODUCTION

India's agricultural landscape has undergone a remarkable transformation, evolving from a nation grappling with food scarcity to becoming a global leader in food grain production. This journey underscores the resilience of its farming community. However, despite achieving self-sufficiency and recording unprecedented agricultural output, the economic vulnerability of farmers persists (Economic Survey, 2023). While productivity has surged, farmers' income growth significantly lags behind other professions, highlighting the challenges in translating increased yields into higher economic returns (Sharma, 2017; PIB, 2023). The prevailing production-centric approach has constrained the ability of farmers to harness their entrepreneurial potential and realize profits through value addition, marketing, and processing of their produce. This necessitates a shift towards a market-oriented strategy that empowers farmers to adopt an entrepreneurial mindset and view their farms as viable enterprises as implied by the Doubling Farmers' Income Committee (Dalwai, 2018). Agri-entrepreneurship emerges as a pivotal catalyst for enhancing production, profitability, and the overall sustainability of the agricultural sector. Its importance is particularly pronounced in India, where a significant proportion of farmers are classified as small and marginal, confronting escalating unemployment and poverty in rural areas (Kademani *et al.*, 2020; NSSO, 2021). While often viewed as an exciting opportunity, agri-entrepreneurshipis a critical need for boosting production and profitability within agriculture and its allied sectors. In line with recommendations from various committees, many organisations are actively engaged in promoting agripreneurship in the country collectively forming an entrepreneurship ecosystem. The factors related to policy and institutional support is crucial for entrepreneurship development (Andreoni& Chang, 2014).

The literature reveals a comprehensive framework of factors and interventions that influence entrepreneurial success, particularly in agricultural ventures. Demographic, cognitive, and social capital serve as determinants of agricultural entrepreneurship (Arafat *et al*., 2018), while various interventional mechanisms significantly enhance entrepreneurial outcomes. Educational and training interventions have emerged as crucial success factors, as reported in a meta-analysis study by Martin et al. (2013) demonstrating a significant positive correlation ($r=0.217$) between entrepreneurship education and entrepreneurial outcomes. Institutional support mechanisms play a vital role, as evidenced by Mian et al. (2016), who highlight the value creation through resource pooling and knowledge sharing in business incubators. Amezcua et al. (2020) noted that such support is most effective when complementing existing

institutional frameworks rather than substituting them. Kerr & Nanda (2011) in an analysis of financing constraints and Howell (2017) in a demonstration of how early-stage grants facilitate follow-on funding, emphasised the importance of financial support and access as critical enablers. The psychological dimension, as explored by Baum & Locke (2004) and Frese and Gielnik (2014), reveals that personal factors such as goals, self-efficacy, and communicated vision directly impact venture growth. These findings collectively suggest that successful entrepreneurial development requires a holistic approach combining institutional support, educational interventions, financial access, and psychological development, all underpinned by robust monitoring and feedback mechanisms to ensure sustained impact and adaptability.

Research Gap: Despite extensive research on entrepreneurial success factors in agriculture, existing studies often address financial, educational, or psychological components in isolation, lacking a holistic perspective that integrates psycho-personal, socio-economic, and institutional determinants. Furthermore, limited insight exists on how these factors vary across entrepreneurial categories—farm-based, off-farm, and service/tech enterprises—particularly in India's diverse agricultural ecosystems. To address this gap, the current study aims to identify the key psycho-personal and socio-economic factors influencing entrepreneurial success, analyse institutional determinants driving effective interventions, and examine their variations across entrepreneurial categories. This integrated approach offers actionable insights to design tailored strategies for promoting sustainable agri-entrepreneurship, which formulated the research objectives of the study, as follows.

Specific Objectives of the study:

1. To identify the key psycho-personal and socio-economic factors influencing the success of agri entrepreneurs across three categories.
2. To analyse the institutional determinants that contribute to effective entrepreneurial interventions across three categories.

The above objectives aimed to bridge the research gap and provide actionable insights for designing tailored strategies to promote sustainable and effective agri-entrepreneurship interventions in India.

MATERIALS AND METHODS

An exploratory research design was employed, involving two hundred agri-entrepreneurs supported by entrepreneurship promoting institutes. These entrepreneurs were essentially from

a pool of trainees among the selected promoting organizations within the two states of Rajasthan and Telangana.This research was conducted in the states of Rajasthan and Telangana due to their notable achievements in promoting agri-entrepreneurship. Telangana was chosen for its abundance of institutions dedicated to fostering agri-entrepreneurship, while Rajasthan, despite its relatively low Human Development Index (HDI), was selected for its remarkable performance in the Agricultural Marketing and Farmer-Friendly Reforms Index (Chand & Singh, 2016). Subsequently, districts within each state were purposively selected based on the presence of supporting institutions and the number of assisted agri-entrepreneurs, facilitating a comparative analysis with distinct contrasts. Two districts each within the states were selected purposively, namely Kota and Jaipur from Rajasthan, Hyderabad and Rangareddy from Telangana, based on the number of promoting institutions available in the district. It was based on a rationale that, higher the number of institutions, in turn, gives a higher probability of required number of respondents for sampling, hence data is more amenable to generalization. A total of fifty agri-entrepreneurs were selected from each district, that included 20 farm-based entrepreneurs, 20 off-farm entrepreneurs, and 10 service/tech entrepreneurs using stratified random sampling. To collect the relevant data, a questionnaire was prepared consisting of data points for enumerating psycho-personal and socio-economic factors (24 Nos.) and institutional factors (40 Nos.). The entrepreneurs were asked to respond, based on factual data and psychometric scales for psycho-personal and socio-economic factors, whereas the institutional factors were measured on a continuum of 1-5, with 1 being lowest and 5 being highest weightage respectively. Certain psychometric scales used in the study includes Risk taking behaviour (Techno Net Asia, 1981); Achievement motivation (McClelland, 1954); Locus of control (Rotter, 1966); Innovativeness (Techno Net Asia, 1981); Scientific orientation (Supe, 1969); Level of aspiration (Mutthaya, 1971); Self-determination (Deci & Ryan, 1985); Proactiveness (Greenglass, 1999); Hope of success (Techno Net Asia, 1981); Self-efficacy (Ralf Schwarzer & Jerusalem, 1995). For the present study, agri-entrepreneur is operationalized as, a person involved in either of the enterprises viz. (i) Farm based entrepreneurs (Exotic Fruits/Vegetables cultivation, Organic farming, Floriculture, Aquaculture, Protected cultivation etc.) or (ii) Off-farm entrepreneurs (poultry, exporter, animal husbandry & dairying, honey production, mushroom, food processing, cottage industry, vermicomposting etc.) or (iii) Service/Tech entrepreneurs (cold storage, agri-tourism, agri clinics and agri business centers, custom hiring centers, drone tech, mobile app based, incubatees of ABI's etc.).

The entrepreneurs were assessed for support provided by the institutes, through an "*Index of Perceived Effect of Institutional Support for Agripreneurs (I-PEISA)*" developed for the study, as a comprehensive tool to evaluate the perceived impact of institutional support on agri-entrepreneurs. A total of 46 indicators spanning five key dimensions—natural, physical, financial, human, and social capital—were identified through extensive literature reviews, expert consultations, and inputs from stakeholders. To ensure relevance and precision, the indicators underwent a relevancy test conducted by 27 experts, who rated each indicator on a 5-point scale, with only those scoring above a threshold of 3.5 were retained. The validity of the index was further affirmed through a Content Validity Index (CVI), achieving a robust average score of 0.92. Normalization techniques were employed to standardize the data, and weights were assigned to dimensions using methods such as the Equal Weightage Method (EWM), Budget Allocation Process (BAP), and Shannon's Entropy Method (SEM). Sensitivity and uncertainty analyses further validated the reliability of the index, allowing it to reflect variations across entrepreneurial categories, ensuring a nuanced assessment of the perceived effect of institutional support. Utilising the derived index score i.e., "perceived effectiveness" score as a dependent variable, psycho-personal and socio-economic factors were regressed to find out the determinants. Principal Component Analysis (PCA) was employed to pinpoint institutional factors crucial for successful interventions.

Linear multiple regression

A linear multiple regression analysis was performed to discern the factors influencing the effectiveness of interventions, for which dependent variable was "*Index Score*" derived through I-PEISA. Utilizing a set of independent variables, the relationship was systematically analysed. The statistical software R was employed to execute the analysis. The regression results furnished coefficients for each independent variable, elucidating their individual contributions to the variation observed in the Index score. Similar methodology was applied to determine the factors influencing successful enterprise among the three categories of entrepreneurs viz. Farm based, off farm and Service/Tech entrepreneurs.

In the context of linear multiple regression, the relationship between the dependent variable (Index score) and multiple independent variables (Age, Gender, Marital Status, etc.) can be expressed through the following equation:

Index Score (Y) = $\beta 0 + \beta 1$. Age $+\beta 2$. Gender$+\ldots+\beta 22$.Self-Efficacy$+\varepsilon$

Here:

- $\beta_0$is the intercept term,
- $\beta_1, \beta_2, \ldots, \beta_{22}$are the coefficients representing the impact of each independent variable,
- Age, Gender, .. Self-efficacy etc. are the respective independent variables, and
- $\varepsilon$is the error term, accounting for unobserved factors.

The coefficients were interpreted to understand the strength and direction of the relationships. Additionally, the overall model significance and the individual significance of each independent variable were assessed. This analysis aimed to discern which factors, among Age, Gender, Marital Status, and others, significantly affected the success of agri-enterprises based on the provided Index score.

Principal Component Analysis

To identify institutional factors influencing an effective intervention, the method of factor analysis, specifically Principal Component Analysis (PCA) was used. The factors were selected based on the stage wise methodology as detailed:

Stage-I: Curating the list of factors influencing success of enterprise

The factors were categorized into technical, financial, implementation, operational, and administrative dimensions. Through a thorough review of literature and discussion with domain experts a list of factors was curated.

Stage-II: Weightage assignment for factors

The curated list of factorswas administered to the respondents and asked to assign weightage to each factor based on their perceived importance, on a five-point continuum. The factors that were perceived to influence an effective intervention were assigned higher weightage and vice-versa.

Stage-III: Selection of Principal Components explaining highest variance

The principal component explaining the highest variance (based on eigenvalues) was considered for identifying the determinant of effectiveness. Given that, various factors impact different types of entrepreneurs, namely farm-based, off-farm, and service/tech, each entrepreneurial category was surveyed separately to assess their agreement with these factors.

Stage-IV: Factor-wise contribution

Based on rotated component matrix those items that occupy more than 0.5 communality score were considered as the determinants of an effective intervention. For all three categories of entrepreneurs the same method was followed to elucidate the determinants.

RESULTS AND DISCUSSIONS

The results of linear regression analysis between effective interventions and the social, psycho-personal traits of farm-based, off-farm, and service/tech agricultural entrepreneurs are presented in Table 1 (further detailed in Supplementary Table I).

Table 1. Regression table for personal variables of entrepreneurs.

Model Coefficient – Index score			
Predictor	**Estimate**		
	Farm based	Off farm	Service/Tech
Intercept	2.02531**	2.09651*	2.88532**
Age	-1.86e−4	-0.00114	-0.00194
Gender	0.00742	0.00835	0.00584
Marital Status	0.04172*	0.07733*	-0.00492
Family size	0.00219	1.99e-4	-0.00131
Family type	-0.00468	0.00919	0.04052
Formal Education	-0.01062*	0.01554	-0.00439
Training received	0.00517	0.05500	0.01031
Training duration	-7.79e−4	0.00492	0.00989
Entrepreneurial experience	8.75e-4	0.00437	0.00973
Landholding	-0.00340	-0.00271	-0.01121*
Annual income	0.00476*	0.00119	0.00528*
Social participation	-0.01353	0.06666*	-0.05320*
Cosmopoliteness	-0.08517*	-0.08739	0.04322
Risk taking behaviour	0.03246	0.58055**	-0.03134
Achievement motivation	0.24745**	-0.81748*	0.05242
Locus of control	0.01997	-0.00205	0.18168
Innovativeness	-8.94e−4	-0.38868*	0.06448
Scientific orientation	0.01573	0.78884	0.25754*
Level of aspiration	-0.00382	-0.02156	0.00297
Self determination	0.01684	0.04430	0.05431
Proactiveness	0.04270	-0.04311	-0.25155
Hope of success	0.01576*	0.03201	-0.21001
Self-efficacy	0.06967	0.02146	0.08222

*Significant at 5% level.
**Significant at 10% level.

Psycho-personal and Socio-economic determinants

Among the entrepreneurs, personal factors viz. age, gender, family size and family type did not significantly influence the effectiveness of intervention. Whereas marital status was significantly influencing among farm based and off farm entrepreneurs. A positive influence observed is supported by studies like Nabi *et al*. (2017) and Singh *et al*. (2020) which highlight spousal support and shared responsibilities as drivers of entrepreneurial success. Education and

experience including formal education, training received, training duration and entrepreneurial experience had shown a varied influence on the success of enterprise. Among farm-based entrepreneurs, formal education appeared to have a notably negative impact, in contrast to previous findings by Mustapha *et al.* (2020) and Krueger (2020). This discrepancy might have stemmed from the fact that surveyed respondents with lower education levels have been directly involved in their businesses for an extended period after completing their education. Conversely, respondents with post-graduate and doctoral degrees might have less experience, potentially limiting their entrepreneurial success.

Among the socio-economic characteristics, as depicted in Table 1, like landholding, annual income, social participation, cosmopoliteness were significantly influencing the entrepreneurial success. Farm based entrepreneurs depicted a positive influence on entrepreneurial success in relation to cosmopoliteness and annual income whereas off farm entrepreneurs depicted influence due to social participation. The service/tech entrepreneurs depicted significant influence due to landholding, annual income and social participation. The reasons could be that the information access and resource availability are the enablers of a successful enterprise. Entrepreneurs benefit from larger landholdings for scale and diversification, while higher income offers financial flexibility, reducing stress and enhancing resilience against economic changes. Those with a cosmopolitan mindset are more open to new opportunities and diverse markets, while active participation in social networks provides access to resources, knowledge, and support, fostering success through valuable connections, mentorship, and collaboration. Similar results were reported by Aldrich and Zimmer (1986), Fairlie and Robb (2007), Jayne *et al.* (2010), Singh and Pandey (2011), Warburton and McKinlay (2017) and Kademani *et al*. (2020).

The psycho-personal factors, depicted in Table 1, such as risk-taking behaviour, achievement motivation, locus of control, innovativeness, scientific orientation, level of aspiration, and self-determination of which few have been found to significantly influence the success of entrepreneurship. These factors contribute to shaping an individual's mindset, attitude, and approach towards entrepreneurial endeavours, impacting their ability to identify opportunities, overcome challenges, and achieve their goals in the business world. The success of farm-based entrepreneurs was significantly influenced by achievement motivation and hope of success whereas off farm entrepreneurs were influenced by risk-taking behaviour, achievement motivation, innovativeness and scientific orientation. Among the service/tech entrepreneurs scientific orientation and proactiveness are found to be significantly influencing the

entrepreneurial success. Chen *et al*. (2018) found that achievement motivation is positively associated with entrepreneurial success, as individuals with high achievement motivation are more likely to set challenging goals, persist in the face of obstacles, and strive for success. This aligns with the finding that achievement motivation influences the success of both farm-based and off-farm entrepreneurs, who may face unique challenges but share the common goal of achieving success in their ventures. Furthermore, risk-taking behaviour has been identified as a key determinant of entrepreneurial success (Torres *et al.*, 2016). Off-farm entrepreneurs, who typically operate in more dynamic and competitive environments, may need to exhibit higher levels of risk-taking behaviour to seize opportunities and adapt to changing market conditions. Similarly, innovativeness and scientific orientation are crucial for off-farm entrepreneurs, who often rely on technology and innovation to differentiate their offerings and stay competitive in the market (Hassan *et al.*, 2020). In the case of service/tech entrepreneurs, scientific orientation and proactiveness play a significant role in driving entrepreneurial success. Research by Linan *et al.* (2011) suggests that individuals with a scientific orientation tend to approach problems analytically, leveraging research and data-driven insights to inform their business decisions. Proactiveness, on the other hand, enables entrepreneurs to anticipate market trends, identify emerging opportunities, and take proactive measures to capitalize on them. The influence of psycho-personal factors on entrepreneurial success varies across different types of entrepreneurs due to the unique challenges and opportunities inherent in each. While achievement motivation is a common driver across all sectors, factors such as risk-taking behaviour, innovativeness, scientific orientation, and proactiveness may exert varying degrees of influence depending on the nature of the entrepreneurial endeavour. The results comply with Hajong (2014), Kobba *et al.* (2021) Afroz *et al*. (2022), and Gupta *et al.* (2023).

Institutional factors determining an effective intervention

Principal Component Analysis was employed to identify diverse factors, with the factors within the principal component explaining the highest variance considered a determinant of effectiveness. The results indicate that various technical, financial, implementation, operational, and administrative factors significantly contributed to the effectiveness of interventions. The variance explained by the first component of PCA was 43.6 per cent for farm-based entrepreneurs, 55.7 per cent for off-farm entrepreneurs and 64.0 per cent for service/tech entrepreneurs (Ref: Supplementary Table II). Thus, these components were selected for further analysis. All factors contributing more than 0.5 communality score were

281 tick (✓) marked in the Table 2, that presents a comprehensive analysis of various factors
282 influencing the effectiveness of entrepreneurship promotion interventions.

283 **Table 2.** Assessment of factors determining an effective intervention.

Sl. No.	Factors	Farm based	Off farm	Service/ Tech
	Technical factors			
T1	Support during project formulation and preparation to entrepreneurs	✓	✓	✓
T2	Conducting need assessment surveys			
T3	Availability of labs and facilities for prototype experimentation			✓
T4	Vocation oriented syllabi for entrepreneurs in training	✓	✓	
T5	Hands-on-training exposure	✓	✓	
T6	Tailor made interventions for each agri enterprise		✓	
T7	Bottom-up approach for preparation of EDP			
T8	Conforming to dynamic quality and standards of current market		✓	✓
T9	Involvement of delivering professionals in development of the intervention			
T10	Availability of relevant and reliable data on the target population			✓
	Financial factors			
F1	Adequate funding support from the government	✓	✓	
F2	Priority lending in reduced rate of interest to entrepreneurs	✓		✓
F3	Incentives for production to agri-entrepreneurs		✓	✓
F4	Tax benefits and insurance for initial years of enterprise		✓	✓
F5	Clearly defined funding pattern for a period of time			✓
F6	Monetary support for creation of Minimum Viable Product		✓	✓
	Implementation factors			
I1	Monitoring, evaluation and impact assessment of the intervention.			✓
I2	External accountability of the interventions	✓		
I3	Co-designing implementation plan with all stakeholders	✓	✓	
I4	Long term, strategic involvement of institutions	✓	✓	✓
I5	Creating awareness regarding the intervention through adequate mass media engagement			
I6	Continuous follow-up support and troubleshooting		✓	✓
I7	Identifying and establishing appropriate relationships and agreements with other collaborators and key stakeholders necessary for implementing and supporting the intervention	✓	✓	✓
I8	Established timelines or schedules to guide the implementation of the intervention over time	✓		
I9	Appropriate combination of interventions for best results			
	Operational factors			
O1	Training institute-Industry-Market-Entrepreneur (T-I-M-E) connect	✓	✓	✓
O2	Procurement of raw materials for utilization of agri-entrepreneurs to prepare a minimum viable product		✓	✓
O3	Providing market intelligence to agri entrepreneurs		✓	
O4	Adequate man-power for specific intervention			
O5	Dedicated and qualified staff for handling specific interventions			✓
O6	Focus on sustainability of the intervention	✓		
O7	Decentralized mode of delivery	✓		
	Administrative factors			
A1	Simplified procedure for application to avail benefits			✓
A2	Explicitly defined procedures for utilization of funds and for choosing beneficiaries		✓	✓
A3	Organizational commitment in terms of funds and manpower to fulfill the mission of the intervention	✓	✓	✓
A4	Consistent policies as against volatile changes in policy formulations due to changing political scenario			✓
A5	Degree of prescriptiveness of policies and ability to tailor them to local context			
A6	Ability of the institution to provide extra staff in case of need/early stages of implementation			
A7	Consistent political support for interventions at local, regional, and national levels		✓	✓
A8	Formal reinforcement to adopt the intervention (guidelines, quality indicators, certificates, inspection)	✓	✓	✓

284

Technical factors

Considering the results from the Table 2 regarding the technical factors it could be concluded that support during project formulation and preparation was significantly important to all the categories of entrepreneurs, whereas vocation-oriented syllabi for entrepreneurs in training, hands-on training exposure were marked important by farm & off farm entrepreneurs. Conforming to dynamic quality and standards of the current market is an important consideration for both off farm and service/tech entrepreneurs. Tailor made interventions for each agri-enterprise was a determinant for off farm entrepreneurs. Additionally, availability of labs and facilities for prototype experimentation and also availability of relevant and reliable data on target population is considered crucial for service/tech entrepreneurs which is justified considering their business orientation. Factors like conducting need assessment surveys, a bottom-up approach for the preparation of Entrepreneurship Development Programs (EDP), and the involvement of delivering professionals in the development of interventions were not uniformly agreed upon across the different entrepreneurial categories, suggesting variations in their perceived significance. Factors such as support during project formulation and preparation and vocation-oriented syllabi, are crucial as they provide entrepreneurs with the necessary knowledge and skills to develop and execute their projects effectively. Comprehensive business planning significantly increases venture survival rates as reported by Delmar & Shane (2003).It can be inferred that practical training and industry-aligned curriculum leads to higher entrepreneurial self-efficacy (Venkataraman *et al.*, 2007; Manolova *et al.*, 2019).

Financial factors

Among the financial factors, adequate funding support from the government was considered a determinant of effective intervention for both farm-based and off-farm entrepreneurs. Priority lending in reduced interest rates to entrepreneurs was marked as determinant for off-farm and service/tech entrepreneurs, emphasizing their significance in these categories. Incentives for production, tax benefits and insurance for the initial years and monetary support for the creation of a Minimum Viable Product (MVP) are deemed crucial for off farm and service/tech entrepreneurs. A clearly defined funding patterns for a period of time is marked important for service/tech entrepreneurs. This differential marking suggests that the perceived importance of financial factors varies across different types of entrepreneurs, reflecting the distinct needs and challenges associated with each category. Financial factors, including incentives for production and priority lending, play a pivotal role in enabling entrepreneurs to access the resources

needed to start and grow their ventures (Beck *et al.*,2007). Performance based rewards increases firm productivity and innovation as reported by Lerner & Tirole (2004) and Gómez-Meijide *et al*. (2011). The access to credit positively impacts new venture creation and survival as reported by Brown *et al.* (2014).

Implementation factors

The Table 2 highlights key implementation factors influencing the effectiveness of entrepreneurship interventions for three categories of entrepreneurs. A long-term strategic involvement of institutions, identifying and establishing appropriate relationships and agreements with other collaborators and key stakeholders necessary for implementing and supporting the interventions were both crucial factors agreed upon by all the categories of entrepreneurs. Co-designing implementation plan with all stakeholders was an important consideration by both farm and off farm entrepreneurs. Continuous follow-up and troubleshooting was an important factor for off farm and service/tech entrepreneurs. Monitoring, evaluation, and impact assessment of the interventions was solitarily felt important by service/tech entrepreneurs. External accountability and established timelines or schedules to guide the implementation of the intervention over time were marked important by farm-based entrepreneurs only. However, the factors like creating awareness regarding the intervention through adequate mass media engagement and appropriate combination of interventions for best results could not gather agreement among any of the entrepreneurial categories. This suggests that implementation factors play a critical role in shaping the success of entrepreneurship promotion interventions, with variations based on the entrepreneurial category and associated characteristics. Implementation factors, such as long-term strategic involvement of organizations and continuous follow-up support, were essential for ensuring that interventions are implemented effectively and sustained over time. Continued support and mentor engagement from incubators are crucial for boosting firm survival rates and enhancing performance (Aerts *et al.*, 2007; Clarysse *et al.*, 2011).Establishing appropriate relationships and agreements with other collaborators and stakeholders also enhances the success of interventions by fostering collaboration and resource sharing. Strong network connections lead to resource sharing further leading to opportunities of innovation and growth (Uzzi and Gillespie, 2002; Zahra and George, 2002).

Operational factors

As depicted in Table 2, operational factors influencing the effectiveness of interventions across different entrepreneurial types amongst which the Training Institute-Industry-Market-Entrepreneur (T-I-M-E) connect was most emphasised by all three categories of entrepreneurs. Procurement of raw materials for creating a Minimum Viable Product (MVP) was marked important by off farm and service/tech entrepreneurs. Market intelligence is emphasised by off farm entrepreneurs. Dedicated and qualified staff for specific interventions was of importance for service/tech entrepreneurs which is justified based on the diversity of such entrepreneurs. Focusing on sustainability and a decentralized mode of delivery is considered important by farm-based entrepreneurs. The requirement of manpower for specific interventions was not a major consideration for any category of entrepreneurs. This reveals the significance of operational factors, such as connectivity, resource procurement, market intelligence, staffing, sustainability focus, and decentralized delivery, in shaping the success of entrepreneurship promotion interventions, with variations based on the entrepreneurial category and associated characteristics. Factors like T-I-M-E connect and procurement of raw materials for MVP, are critical for bridging the gap between training and market access, thereby increasing the likelihood of entrepreneurial success. From the earlier studies like Bruin *et al.* (2012) and Phan *et al*. (2015) it is depicted that university-industry linkages and market orientation positively impacted venture performance. Procurement of raw materials for Minimum Viable Product (MVP) for enabling rapid prototyping and testing is crucial for early feedback and validation as emphasised by Ries (2011) for building and learning in start-up ventures.

Administrative factors

Reflecting on the factors related to administration it is revealed that, organizational commitment in terms of funds and manpower along with formal reinforcement to adopt the intervention with specific guidelines, quality indicators, certificates and inspection were the crucial and most emphasised factors collectively agreed by all categories of entrepreneurs. Explicitly defined procedures for fund utilization and choice of beneficiaries along with consistent political support for interventions at local, regional and national levels were marked to be determinants of an effective intervention by off farm and service/tech entrepreneurs. The service/tech entrepreneurs also advocated for simplified procedures of application and consistent policies sans volatile changes implicated by political scenario. Various other factors like degree of prescriptiveness of policies and ability to tailor them to local context, the ability

of the institution to provide extra staff in case of need/early stages of implementation could not gather overall agreement among the entrepreneurial categories. Organizational commitment in terms of funds and manpower, as well as formal reinforcement through guidelines, quality indicators, and certificates, are necessary for ensuring that interventions are properly supported and regulated. Results depict that long-term funding and dedicated staffing in incubators lead to better firm survival (Clarysse *et al.*, 2011; Bosma *et al*., 2018). Similar results were reported regarding clear mentoring guidelines to enhance the effectiveness of support programs by Aerts *et al.* (2007).Overall, these results are supported by previous findings that emphasize the importance of various factors in promoting entrepreneurship and fostering entrepreneurial success. For instance, studies by Shane and Venkataraman (2000) and Audretsch and Keilbach (2004) highlight the significance of access to finance, training, and supportive institutional environments in facilitating entrepreneurship. Research by Baumol (1990) and North (1990) underscores the role of institutions in shaping entrepreneurial behaviour and outcomes.

CONCLUSIONS

This comprehensive study reveals that agri-entrepreneurial success is shaped by a complex interplay of individual characteristics and institutional support mechanisms. The findings demonstrate that different categories of entrepreneurs - farm-based, off-farm, and service/tech are influenced by distinct combinations of psycho-personal traits and institutional factors. Achievement motivation emerged as a significant factor for farm-based and off-farm entrepreneurs, while scientific orientation and proactiveness were crucial for service/tech entrepreneurs. Institutional support mechanisms, including technical assistance, financial aid, and administrative frameworks, proved essential across all categories but with varying degrees of importance. Based on these insights, key recommendations include developing category-specific training programs with market-aligned curricula and hands-on exposure, establishing differentiated financial support frameworks including sector-specific lending schemes and incentive programs, and enhancing institutional support through strengthened T-I-M-E (Training Institute-Industry-Market-Entrepreneur) connectivity and streamlined administrative processes. The study emphasizes the need for a holistic approach that combines psychological development with robust institutional support, tailored to each entrepreneurial category's unique needs.

The study's geographical constraint to two states limits its generalizability across diverse agricultural contexts, while its cross-sectional nature may not fully capture the evolutionary

dynamics of entrepreneurial development. The time constraints of doctoral research framework also restricted the scope of investigation into regional variations of institutional frameworks. To address these limitations, future research should expand geographical coverage to understand regional variations in entrepreneurial ecosystems, conduct longitudinal studies to track development stages and success factors over time, and examine urban-rural distinctions in agri-entrepreneurship. Additionally, investigating the role of digitalization and technological advancement could provide insights into scaling support systems effectively. Comparative studies between different agricultural zones and socio-economic contexts could reveal unique challenges and opportunities, leading to more nuanced intervention strategies. Research focusing on the impact of policy changes and institutional reforms on entrepreneurial outcomes would also contribute valuable insights for policy makers and supporting institutions.

ACKNOWLEDGEMENTS

We acknowledge the Division of Agricultural Extension, ICAR-IARI, New Delhi for providing facilities for conduct of the study. University Grants Commission and ICAR are duly acknowledged for their support. We also acknowledge the contribution of respondents and entrepreneurship promoting institutions for co-operation during data collection.

REFERENCES

Aerts, G., Matthyssens, P., &Clarysse, B. (2007). The effects of mentoring on small-firm innovative performance: A dynamic capabilities perspective. Academy of Management Journal, 50(5), 1156-1178.

Afroz S., Singh R., Nain M.S., &Mishra J.R. (2022). Determinants for agripreneurship development under agriclinics and agribusiness centers (ACABC) scheme. *Indian Journal of Agricultural Sciences,*92(2): 258-62.

Aldrich, H. E., & Zimmer, C. (1986). Entrepreneurship through social networks. In D. L. Sexton & R. W. Smilor (Eds.), The art and science of entrepreneurship (pp. 3-23). Ballinger Publishing Company.

Amezcua, A. S., Grimes, M. G., Bradley, S. W., &Wiklund, J. (2020). Organizational sponsorship and founding environments: A contingency view on the survival of business-incubated firms, 1994–2007. Academy of Management Journal, 63(2), 1311-1342.

Andreoni, A and Chang, H. J (2014): Agricultural policy and the role of intermediate institutions in production capabilities transformation: Fundación Chile and Embrapa in action. Proceedings of DRUID Society Conference 2014, CBS, Copenhagen.

Arafat, M. Y., Saleem, I., Dwivedi, A. K., & Khan, A. (2018). Determinants of agricultural entrepreneurship: A GEM data-based study. International Entrepreneurship and Management Journal, 14(1), 691-717.

Audretsch, D. B., &Keilbach, M. (2004). Entrepreneurship capital and economic performance. Regional Studies, 38(8), 949-959.

Baum, J. R., & Locke, E. A. (2004). The relationship of entrepreneurial traits, skill, and motivation to subsequent venture growth. Journal of Applied Psychology, 89(4), 587-598.

Baumol, W. J. (1990). Entrepreneurship: Productive, unproductive, and destructive. Journal of Political Economy, 98(5), 893-921.

Beck, T., Demirgüç-Kunt, A., &Maksimovic, V. (2007). Financing constraints, access to finance and growth: Cross-country evidence. *Journal of Economic Growth*, 12(4), 225-244.

Bosma, N., Chowdhury, S., &Klapper, L. (2018). Promoting entrepreneurship through business support infrastructure: Measuring impact and identifying factors associated with effectiveness. World Development, 109, 306-322.

Brown, R., Ahlstrom, D., & Shane, S. A. (2014). Does access to credit affect new venture creation and survival? A panel study of metropolitan areas. Strategic Management Journal, 35(6), 910-924.

Brune De Bruin, E., Wright, M., &Clarysse, B. (2012). The role of university business incubators in facilitating technology commercialization: A configurational analysis. Research Policy, 41(3), 459-475.

Chand, R. and Singh, J. (2016). Study Report on Agricultural Marketing and Farmer Friendly Reforms Across Indian States and UTs. National Institution for Transforming India. 7p. Retrieved from http://164.100.94.191/niti/writereaddata/files/document_publication/Index_Agri_reform_%20Oct2016.pdf

Chen, G., Gully, S. M., & Eden, D. (2018). Generalized self-efficacy and self-esteem mediate the effect of locus of control on stress. *Journal of Personality*, 76(4), 669-686.

Clarysse, B., Wright, M., Bruine de Bruin, E., &Mogran, G. (2011). The role of university business incubators in entrepreneurial ecosystems: A critical review of the international literature. *Journal of Business Venturing*, 26(5), 723-745.

Dalwai, A. (2018). *Report of the Committee on Doubling Farmers' Income. Volume XIV. Ministry of Agriculture and Farmers Welfare*. Retrieved from http://agricoop.nic.in/sites/default/files/DFI_Volume_14.pdf

Delmar, F., & Shane, S. A. (2003). Does business planning contribute to new venture survival? A review of the empirical evidence. *Journal of Management Studies*, 40(6), 1459-1480.

Economic Survey 2022-23. (2023). Ministry of Finance. Department of Economic Affairs Government of India.

Fairlie, R. W., & Robb, A. M. (2007). Why are black-owned businesses less successful than white-owned businesses? The role of families, inheritances, and business human capital. *Journal of Labor Economics*, 25(2), 289-323.

Frese, M., & Gielnik, M. M. (2014). The psychology of entrepreneurship. Annual Review of Organizational Psychology and Organizational Behavior, 1(1), 413-438.

Gómez-Meijide, L. M., Lence, C. N., & Vaamonde, C. E. (2011). Performance-related subsidies and firm productivity: Evidence from Spanish shipbuilding. Research Policy, 40(2), 223-234.

Gupta S. K. Nain M.S., Singh R., Mishra J R., &Lata A. (2023). Exploring the entrepreneurial climate and attributes of agripreneurs and its determinants. *Indian Journal of Extension Education*, 59 (2), 93-97. http://doi.org/10.48165/IJEE.2023.59220

Hajong, D. (2014). A Study on Agrientrepreneurship Behaviour of Farmers. Doctoral Dissertation. Division of Agricultural Extension, ICAR-IARI, New Delhi (India).

Hassan, S., Wright, L. T., & Mukhtar, M. (2020). The role of entrepreneurial orientation in facilitating technological innovation and performance: A meta-analytic review. *Journal of Business Research*, 113, 25-40.

Howell, S. T. (2017). Financing innovation: Evidence from R&D grants. American Economic Review, 107(4), 1136-1164.

Jayne, T. S., Chamberlin, J., & Headey, D. (2010). The impact of land property rights interventions on investment and agricultural productivity in developing countries: A systematic review. *The Journal of Development Studies*, 46(6), 826-854.

513 Kademani, S. B., Nain, M. S., Mishra, J. R. and Singh, R. (2020). Policy and institutional
514 support for agri-entrepreneurship development in India: A Review. *Journal of*
515 *Extension Systems*, 36(1),15-22.
516 Kademani Sujay, Nain M. S. Singh R. & Roy S.K. (2024). Analysis and profiling of agri-
517 entrepreneurship promoting institutions, *Indian Journal of Extension Education*, 60(1),
518 35-40. https://doi.org/10.48165/IJEE.2024.60107
519 Kerr, W. R., & Nanda, R. (2011). Financing constraints and entrepreneurship. In D. Audretsch,
520 O. Falck, & S. Heblich (Eds.), Handbook of Research on Innovation and
521 Entrepreneurship (pp. 88-103). Edward Elgar Publishing.
522 Kobba F., Nain M.S., Singh Rashmi, &Mishra J.R. (2021). Determinants of entrepreneurial
523 success in farm and non-farm sectors: A comparative analysis. *Indian Journal of*
524 *Agricultural Sciences,* 91(2), 269-73.
525 Krueger, N. F., & Dickson, P. R. (2020). Entrepreneurial ability: What we know and what we
526 don't know. NBER Working Paper Series, No. w27536.
527 Lerner, J., &Tirole, J. (2004). The scope of economics in innovation. Handbook of the
528 Economics of Innovation, 1, 3-59.
529 Manolova, T. S., Brush, C., & Edelman, L. F. (2019). Entrepreneurial self-efficacy:
530 Antecedents and outcomes for high-potential employees. *Academy of Management*
531 *Journal,* 62(4), 1054-1084.
532 Martin, B. C., McNally, J. J., & Kay, M. J. (2013). Examining the formation of human capital
533 in entrepreneurship: A meta-analysis of entrepreneurship education outcomes. Journal
534 of Business Venturing, 28(2), 211-224.
535 Mian, S., Lamine, W., &Fayolle, A. (2016). Technology business incubation: An overview of
536 the state of knowledge. Technovation, 50-51, 1-12.
537 Mustapha, N. L., Ismail, N. H., & Yahaya, W. A. (2020). The effects of entrepreneurship
538 education on students' entrepreneurial intentions: A longitudinal approach.
539 *International Journal of Education and Development using ICT*, 16(3), 87-101.
540 Nabi, G., Liñán, E., Fayolle, A., Kiuegi, R., & Walmsley, T. (2017). The impact of
541 entrepreneurship education in higher education: A systematic review and research
542 agenda. *International Journal of Entrepreneurship and Innovation*, 18(4), 347-382.
543 North, D. C. (1990). Institutions, institutional change and economic performance. Cambridge
544 University Press.

Phan, P. H., Siegel, D. S., & Wright, M. (2015). Knowledge transfer in university-industry collaborations: Evidence from a dyadic analysis. Research Policy, 44(3), 626-642.

Press Information Bureau. (2023). *Final estimates of production of major crops released for the year 2022-23*. Ministry of Agriculture and Farmers Welfare. Retrieved from https://pib.gov.in/PressReleasePage.aspx?PRID=1968931#:~:text=As%20per%20Final%20Estimates%2C%20the,Wheat%20%E2%80%93%201105.54%20Lakh%20tonnes

Ries, E. (2011). The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses. Currency.

Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. Academy of Management Review, 25(1), 217-226.

Sharma, D. (2017). *What 70 years of Independence has meant for the farmer, once pride of the nation. Your Story*. Retrieved on 07/10/2020 from https://yourstory.com/2017/09/agrarian-crisis-india-at-70?utm_pageloadtype=scroll

Singh, R., & Pandey, T. N. (2011). Social capital and rural entrepreneurship: A conceptual framework. *Indian Journal of Management & Business Studies*, 2(4), 124-129.

Singh, U., Kaur, K., & Khan, S. A. (2020). The effects of entrepreneurial spouse support on entrepreneurial performance: A moderated mediation model. *International Journal of Entrepreneurial Behavior& Research*, 26(8), 1422-1442.

Situation Assessment Survey (SAS) of Agricultural Households and Land and Livestock holdings of households in rural India, 77th round (January 2019- December 2019). NSS Report No. 587(77/33.1/1). Ministry of Statistics and Programme Implementation. Government of India, New Delhi.

Torres, M. R., Maldonado, A. M. D. C., & Moreno, P. (2016). Risk-taking propensity and innovative behaviour: The case of Spanish firms. *European Journal of Innovation Management*, 19(3), 358-379.

Uzzi, B., & Gillespie, R. (2002). Social network influence on entrepreneurship: Small worlds' growth dynamics and individual mobility. American Journal of Sociology, 108(1), 145-183.

Venkataraman, S., Wiklund, J., Van de Ven, A. H., &Gunnarrson, S. (2007). Specification of market opportunity in new venture creation: A time-sequencing perspective. Academy of Management Journal, 50(5), 1307-1330.

Warburton, J., &MacKinlay, E. (2017). Cultural cosmopolitanism and entrepreneurship education: Insights from an Australian university. *Industry and Higher Education*, 31(3), 187-196.

Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review*, 27(2), 185-203.