Self-efficacy of farmers practicing specialized and integrated farming systems: a comparative study in Annamayya district, Andhra Pradesh

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ABSTRACT

This study evaluates and compares the psychological self-efficacy and overall psychological well-being of farmers practicing integrated farming system (IFS) vs specialized farming in the Annamayya district of Andhra Pradesh. Utilizing a comparative research design with a sample of 120 farmers (60 specialized and 60 IFS), data were gathered through structured personal interviews and a modified 22-item general self-efficacy scale. The findings demonstrated that IFS practitioners exhibited significantly higher levels of overall self-efficacy compared to specialized farmers, who were predominantly concentrated in the average self-efficacy category. A chi-square test confirmed a statistically significant association between the farming system practiced and overall self-efficacy levels ($chi^2 = 29.33$, $p < 0.001$). Furthermore, correlation analysis revealed that enterprise diversity positively influenced self-efficacy among IFS farmers ($r = 0.260$, $p < 0.05$). IFS practitioners also demonstrated lower levels of anxiety, depression and stress, along with higher overall psychological well-being. Ultimately, managing multi-enterprise operations builds practical problem-solving skills, operational adaptability and psychological resilience.

Keywords: Integrated farming system; Specialized farming; Perceived self-efficacy; Psychological well-being; Enterprise diversification

INTRODUCTION

Agriculture requires farmers to perform multiple activities, manage available resources efficiently, respond to production risks and adapt to changing agro-climatic conditions. Although access to technical knowledge is essential for agricultural development, technical knowledge alone may not ensure its effective application. Although various agricultural innovations have been introduced to enhance productivity, adoption is low in most areas (Quarshie et al 2022). Indicatively, half of the farmers do not use some of the advantageous technologies even after more than 20 per cent of the population is exposed to them, which illustrates a distinct disconnect between knowledge and application (Adams et al 2024). Perceived self-efficacy, defined as an individual's belief in their ability to organise and execute actions required to manage specific situations, is an important psychological factor influencing effort, persistence, decision-making and resilience. Perceived self-efficacy is the belief in one's competence to tackle difficult or novel tasks and to cope with adversity in specific demanding situations (Luszczynska et al 2005). Bandura (1977) has defined self-efficacy as people's belief in their ability to control their functioning and events that affect their lives. Self-efficacy is widely recognised to be an important behavioural predictor, including in agriculture (Bandura 2006, Brown et al 2022, Perry and Davenport 2020).

In farming, self-efficacy may influence how farmers respond to production constraints, adopt new technologies and manage risks. Specialized farming generally concentrates production on a particular enterprise, allowing farmers to develop focused

knowledge and skills. Specialization of production leads to higher economic performance than its diversification (Czyzewski and Smedzik-Ambrozy 2015).

In contrast, the integrated farming systems (IFSs) offer a viable solution in this direction by integrating multiple farming enterprises such as crops, dairy, poultry, fisheries, horticulture and others within a single farm unit (Kumar et al 2025). IFSs involve the management of multiple interrelated enterprises with emphasis on resource recycling and efficient utilisation of farm resources. By adopting IFSs, farmers can address existing economic and environmental issues and gain access to additional household essentials like fuel, fertilizer and feed, leading to a simultaneous boost in overall farm productivity (Islam et al 2015, Al Mamun et al 2012).

The management of multiple enterprises in IFSs may provide farmers with diverse experiences involving problem-solving, planning, decision-making and resource management. Such experiences may contribute to greater perceived competence and confidence.

Although several studies have examined the economic and agronomic advantages of IFSs, comparatively less attention has been given to psychological attributes such as self-efficacy among farmers. Therefore, the present study was undertaken to assess and compare the self-efficacy of farmers practising specialized farming and IFSs and to examine the association between farming system and self-efficacy.

METHODOLOGY

Research design and sampling

The study adopted a comparative research design and was conducted in Annamayya district of Andhra Pradesh. A total sample of 120 farmers was selected through a purposive random sampling procedure. The sample consisted of 60 farmers practicing specialized farming and 60 farmers practicing IFSs.

Measurement of self-efficacy

Self-efficacy was assessed using a researcher-modified 22-item general self-efficacy scale. The scale consisted of three dimensions: effort, initiative and ability (Table 1).

Table 1. Item distribution across dimensions of the modified general self-efficacy scale

Dimension	Number of items
Effort	8
Initiative	8
Ability	6
Total	22

The scale contained 17 positively-worded items and five negatively-worded items. The reverse-scored items were Q11, Q13, Q14, Q16 and Q20. The scale demonstrated good reliability, with a Cronbach's alpha coefficient (Cronbach 1951) of 0.85 and a split-half reliability coefficient (Callender and Osburn 1977) of 0.79.

Data collection and analysis

Data were collected through structured personal interviews with the selected farmers. The obtained scores were classified into three categories such as low, average and high. The categories were coded as 1, 2 and 3 respectively. The data were analysed using frequency and percentage analysis. The chi-square test was used to determine the association between farming system and self-efficacy level, while Pearson's product-moment correlation coefficient (Pearson 1956) was used to examine the relationship between selected personal characteristics and self-efficacy.

RESULTS and DISCUSSION

Socio-demographic, techno-economic and socio-economic profile of the respondents

The empirical data presented in Table 2 highlight distinct differences across socio-demographic, techno-economic and socio-economic dimensions between farmers practicing specialized farming and those adopting IFSs. While middle-aged respondents (35-55 years) dominated both groups (63.33% in specialized vs 65.00% in IFSs), the IFS group showed a higher proportion of older respondents (>55 years: 33.33%) compared to specialized farmers (16.67%). Conversely, younger farmers (up to 35 years) were mostly concentrated in specialized farming (20.00%) compared to IFS (1.67%). Respondents practicing IFSs demonstrated considerably higher formal education levels. Over 90 per cent of IFS respondents possessed

Table 2. Socio-demographic, techno-economic and socio-economic profile of the respondents

Characteristic	Respondents (N = 120)			
	Specialized farming (n = 60)		IFSs (n = 60)	
	Frequency	%	Frequency	%
Age (years)				
Up to 35	12	20.00	1	1.67
35-55	38	63.33	39	65.00
55 and above	10	16.67	20	33.33
Gender				
Males	50	50.00	50	50.00
Females	50	50.00	50	50.00
Education				
Illiterate	7	11.67	0	0.00
Primary level	9	15.00	1	1.67
Secondary level	25	41.67	5	8.33
Intermediate	10	16.67	20	33.33
Degree	7	11.67	23	38.33
Post-graduation	2	3.33	11	18.33
Family type				
Nuclear	34	56.67	27	45.00
Joint	26	43.33	33	55.00
Landholding (acres)				
Up to 2.5	12	20.00	1	1.67
2.6-5.0	30	50.00	4	6.67
5.1-10.0	9	15.00	23	38.33
>10.0	9	15.00	32	53.33
Annual income (lakh Rs)				
<2	12	20.00	1	1.67
2-5	34	56.67	17	28.33
>5	14	23.33	42	70.00
Farming experience (years)				
Up to 10	13	21.67	1	1.67
11-20	33	55.00	17	28.33
>20	14	23.33	42	70.00
Profession				
Agriculture only	60	100.00	0	0.00
Agriculture + horticulture	0	0.00	13	21.67
Agriculture + Animal husbandary	0	0.00	25	41.67
Agriculture + horticulture + Animal husbandary	0	0.00	22	36.67
Source of irrigation				
Rainfed	60	100.00	0	0
Borewell	0	0.00	13	21.67
Pond	0	0.00	25	41.67
Canal	0	0.00	22	36.67
Socio-economic status				
Very poor/BPL	0	0.00	0	0.00
Poor	8	13.33	0	0.00
Lower-middle	43	71.67	0	0.00
Upper-middle	9	15.00	32	53.33
High	0	0.00	28	46.67
Upper high	0	0.00	0	0.00

intermediate or higher education (38.33% degree, 33.33% intermediate and 18.33% post-graduation), whereas, specialized farmers were primarily concentrated in secondary (41.67%), primary (15.00%) or illiterate (11.67%) categories. Joint family structures were more prevalent among IFS practitioners (55.00%), whereas, nuclear families were predominant among specialized farmers (56.67%). A majority of specialized farmers held smaller land parcels (up to 5.0 acres total: 70.00%). In contrast, IFS practitioners held larger operational units (5.1-10.0 acres: 38.33%, >10.0 acres: 53.33%). Furthermore, 70.00 per cent of IFS farmers possessed over 20 years of farming experience compared to 23.33 per cent of specialized farmers. Specialized farmers were exclusively dependent on rainfed agriculture (100.00%) without enterprise diversification. In contrast, 100.00 per cent of IFS practitioners had access to assured irrigation sources (pond: 41.67%, canal: 36.67%, borewell: 21.67%) and combined agriculture with horticulture, animal husbandry or both. IFS farmers achieved substantially higher economic returns, with 70.00 per cent earning >5 lakh rupees annually, leading to upper-middle (53.33%) and high (46.67%) socio-economic classifications. Specialized farmers were primarily situated in the lower-middle (71.67%) or poor (13.33%) socio-economic categories, with 76.67 per cent earning less than 5 lakh rupees.

The elevated literacy levels and accumulated farming experience among IFS adopters provided the cognitive skills necessary to manage multi-enterprise models, optimize input-output recycling and implement modern farm technologies. The higher prevalence of joint families in IFS suggests that the labour-intensive nature of enterprise diversification (managing livestock, orchards and field crops simultaneously) was supported by pooling household labour. Landholding size and assured irrigation infrastructure acted as primary enabling factors. Rainfed conditions and small land units forced specialized farmers into low-input monoculture, whereas, water security allowed IFS farmers to maintain livestock and horticultural components year-round. Multi-enterprise integration mitigates agricultural production risks, generating regular daily or seasonal cash flows (eg milk, fruits) that elevate overall household annual income and socio-economic standing.

The data given in Table 3 show that the dimension-wise analysis revealed prominent variation in the effort dimension between the two groups. A significant three-fourth of specialized farming farmers (75.00%) demonstrated low levels of effort, whereas, the majority of IFS farmers fell into the average (41.67%) and high (35.00%) categories. Regarding initiative, neither group recorded high levels; however, all specialized farming farmers (100.00%) and a majority of IFS farmers (78.33%) exhibited an average level, with the remaining 21.67 per cent of IFS farmers scoring low. In terms of perceived ability, both groups showed a similar trend dominated by average scores (71.67% for specialized farming and 78.33% for IFSs), while 28.33 per cent of specialized farming and 21.67 per cent of IFS farmers fell into the low category. Neither group recorded high scores in the initiative or ability dimensions.

Evaluating overall self-efficacy, IFS farmers demonstrated a distinctly superior profile compared to specialized farming farmers. One-third of IFS farmers (33.33%) attained a high overall self-efficacy level, whereas, no specialized farming farmer achieved this level. Instead, the vast majority of specialized farming respondents (83.33%) were concentrated in the average category and 16.67 per cent fell into the low category. Among IFS farmers, 41.67 per cent possessed average self-efficacy and 25.00 per cent recorded low self-efficacy. Overall, the findings indicate that practicing integrated farming is associated with higher persistence, greater effort and stronger overall psychological capacity among farmers

Psychological well-being profiles of respondents across farming systems

The empirical data presented in Table 4 demonstrate substantial differences in psychological well-being between farmers practicing specialized farming and those adopting IFSs. Across anxiety, depression and stress, specialized farmers experienced elevated psychological distress, whereas, IFS practitioners maintained significantly healthier psychological profiles. High anxiety affects 25.00 per cent of specialized farmers, 23.33 per cent reported above-average anxiety and 13.33 per cent fell into the extremely high category, with 35.00 per cent recording average levels. Conversely, 73.34 per cent of IFS practitioners reported below-average or low anxiety, with only 10.00 per cent experiencing above-average or high anxiety.

A similar disparity is evident in depression levels. Over 86.00 per cent of specialized farmers reported elevated depressive symptoms, categorized as above average (35.00%), extremely high (28.33%)

Table 3. Dimension-wise and overall self-efficacy levels of specialized and IFS farmers

Dimension	Level	Respondents (N = 120)			
		Specialized farming (n = 60)		IFS (n = 60)	
		Frequency	%	Frequency	%
Effort	High	1	1.67	21	35.00
	Average	14	23.33	25	41.67
	Low	45	75.00	14	23.33
Initiative	High	0	0.00	0	0.00
	Average	60	100.00	47	78.33
	Low	0	0.00	13	21.67
Ability	High	0	0.00	0	0.00
	Average	43	71.67	47	78.33
	Low	17	28.33	13	21.67
Overall self-efficacy	High	0	0.00	20	33.33
	Average	50	83.33	25	41.67
	Low	10	16.67	15	25.00

Table 4. Distribution of psychological well-being indicators (anxiety, depression and stress levels) among farmers practicing specialized farming vs integrated farming system

Indicator	Respondents (N = 120)			
	Specialized farming (n = 60)		IFS (n = 60)	
	Frequency	%	Frequency	%
Anxiety level				
Extremely high	8	13.33	6	10.00
High	15	25.00	3	5.00
Above average	14	23.33	3	5.00
Average	21	35.00	4	6.67
Below average	2	3.33	43	71.67
Low	0	0.00	1	1.67
Depression level				
Extremely high	17	28.33	1	1.67
High	14	23.33	0	0.00
Above average	21	35.00	3	5.00
Average	8	13.33	56	93.33
Below average	0	0.00	0	0.00
Low	0	0.00	0	0.00
Stress level				
Extremely high	0	0.00	0	0.00
High	13	21.67	4	6.67
Above average	11	18.33	2	3.33
Average	25	41.67	16	26.67
Below average	9	15.00	10	16.67
Low	2	3.33	28	46.67

or high (23.33%), leaving only 13.33 per cent at average levels. In contrast, 93.33 per cent of IFS farmers remained at a baseline average level, with minimal representation in the above-average (5.00%) or extremely high (1.67%) categories and none reporting high depression.

Stress metrics further confirmed this trend. Among specialized farmers, 81.67 per cent experienced average or elevated stress, comprising 41.67 per cent at average, 21.67 per cent at high and 18.33 per cent at above-average levels. Conversely, 63.34 per cent of IFS practitioners reported low (46.67%) or below-average (16.67%) stress, while only 10.00 per cent experienceed high or above-average levels.

These patterns highlight the role of farm enterprise structure in shaping mental health. Specialized farming relies on single-commodity production and rainfed agriculture, exposing farmers to price volatility, crop failure and seasonal financial gaps that drive chronic distress.

In contrast, IFS diversifies income across crops, horticulture and livestock while enabling resource recycling, providing economic stability that acts as a buffer against psychological strain.

Assessment of dimensions of psychological well-being and overall psychological well-being profile among farmers

The empirical data in Table 5 details respondents' distribution across six dimensions of psychological well-being and their composite scores, showing consistently superior outcomes for IFS practitioners over specialized farmers.

High autonomy was recorded by 66.67 per cent of IFS farmers versus 61.67 per cent of specialized farmers, with low autonomy being nearly twice as high in specialized farming (20.00%) as in IFS (11.67%). Environmental mastery was higher in IFS (70.00 vs 60.00%), whereas, lower was more among specialized farmers (16.67%) than IFS practitioners (10.00%). Personal growth was similar in the high category (60.00% for IFS vs 58.33% for specialized), with low growth occurring in 13.33 per cent of specialized farmers vs 10.00 per cent in IFS.

Positive relations with others were high for 65.00 per cent of IFS farmers compared to 46.67 per cent of specialized farmers, with low scores far more frequent in specialized farming (20.00 vs 8.33%). High purpose in life was reported by 66.67 per cent of IFS farmers vs 53.33 per cent of specialized farmers, while low purpose was over three times higher in specialized farming (16.67 vs 5.00%). High self-acceptance was attained by 75.00 per cent of IFS farmers compared to 61.67 per cent of specialized farmers.

For overall psychological well-being, 65.00 per cent of IFS practitioners scored high, 31.67 per cent average, and 3.33 per cent low. In contrast, specialized farmers recorded 58.33 per cent high, 25.00 per cent average and 16.67 per cent low, five times the low prevalence of the IFS group (3.33%).

Overall, the enterprise diversification and continuous income stability of IFS reinforce environmental mastery, autonomy and social connectedness while mitigating psychological vulnerability.

Association between farming system and overall self-efficacy

The distribution of respondents according to their overall self-efficacy across both farming systems reveals marked structural differences (Table 6). Over one-third of IFS farmers (35.00%) exhibited a high level of self-efficacy, whereas, not a single farmer practicing specialized farming reached the high category. Conversely, the vast majority of specialized farming farmers (83.33%) were concentrated in the average self-efficacy category, compared to 41.67 per cent of IFS farmers. Low self-efficacy was reported by 16.67 per cent of specialized farmers and 23.33 per cent of IFS farmers. To evaluate whether a statistically significant relationship existed between the farming system and self-efficacy level, a chi-square test of independence was performed. The calculated chi-square statistic was 29.33 with 2 degrees of freedom, which is statistically highly significant at the $p < 0.001$ level. This strongly confirms a significant association between the farming system practiced and the overall self-efficacy level of the farmers.

The higher prevalence of high self-efficacy among IFS farmers can be attributed to the operational complexity inherent in integrated systems. Managing multiple interconnected farm components, such as crop production, horticulture and animal husbandry, demands active problem-solving, real-time decision-making, adaptive resource allocation and continuous risk

Table 5. Distribution of respondents according to dimensions of psychological well-being and overall psychological well-being

Psychological dimension	Respondents (N = 120)			
	Specialized farming (n = 60)		IFS (n = 60)	
	Frequency	%	Frequency	%
Autonomy				
High	37	61.67	40	66.67
Average	11	18.33	13	21.67
Low	12	20.00	7	11.67
Environmental mastery				
High	36	60.00	42	70.00
Average	14	23.33	12	20.00
Low	10	16.67	6	10.00
Personal growth				
High	35	58.33	36	60.00
Average	17	28.33	18	30.00
Low	8	13.33	6	10.00
Positive relations with others				
High	28	46.67	39	65.00
Average	20	33.33	16	26.67
Low	12	20.00	5	8.33
Purpose in life				
High	32	53.33	40	66.67
Average	18	30.00	17	28.33
Low	10	16.67	3	5.00
Self-acceptance				
High	37	61.67	45	75.00
Average	13	21.67	10	16.67
Low	10	16.67	5	8.33
Psychological well-being				
High	35	58.33	39	65.00
Average	15	25.00	19	31.67
Low	10	16.67	2	3.33

Table 6. Association between farming system and overall self-efficacy levels of respondents

Self-efficacy level	Respondents (N = 120)			
	Specialized farming (n = 60)		IFS (n = 60)	
	Frequency	%	Frequency	%
High	0	0.00	21	35.00
Average	50	83.33	25	41.67
Low	10	16.67	14	23.33

$\chi^2 = 29.33$; df = 2; $p < 0.001$

management. Successfully navigating these multi-enterprise challenges reinforces farmers' perceived capability and mastery over farm operations. In contrast, specialized farming involves a more singular routine, offering fewer opportunities to develop multi-dimensional managerial confidence and problem-solving resilience.

The correlation analysis (Table 7) reveals distinct patterns regarding how various socio-demographic, socio-economic and techno-economic variables were related to the self-efficacy of farmers across the two production regimes.

Among IFS farmers, the type of farming components exhibited a statistically significant positive relationship with self-efficacy ($r = 0.260$, $p < 0.05$). This indicates that as the diversity and number of enterprise components increase within an integrated setup, the self-efficacy of farmers increases significantly. Managing diverse enterprise units exposes farmers to varied managerial duties, daily problem-solving and continuous learning, which directly strengthens their psychological resilience and confidence in handling farm operations.

Conversely, all other evaluated personal and techno-economic attributes, including age, gender, education level, family type, landholding, annual income, farming experience, farming system and primary irrigation source, showed non-significant relationships with self-efficacy. This implies that within the IFS group, psychological self-belief is driven primarily by the structural complexity and diversification of the farming system rather than background demographic parameters or scale of assets. Among specialized farming farmers, none of the ten selected characteristics demonstrated a statistically significant correlation with self-efficacy at the 5 per cent significance level. The correlation coefficients ranged from a slight negative association for the type of farming components and education to minor positive values for gender, farming experience, landholding and primary irrigation source.

The contrast between the two groups underscores that enterprise diversification acts as a catalyst for self-efficacy building. In specialized monoculture systems, standard routine operations offer fewer cognitive and operational challenges, leading to static confidence levels that remain uninfluenced by personal attributes. In contrast, in integrated systems, the active management of enterprise interactions serves as the primary engine driving psychological confidence, independent of traditional socio-demographic indicators like age, gender or land size.

The higher self-efficacy observed among IFS farmers stems from the multi-enterprise nature of integrated farming. Managing interconnected components (crop, horticulture and livestock) requires adaptive resource management and real-time decision-making (Duru et al 2015). While technical efficiency assessments often show that specialized monocultures operate closer to single-enterprise technical frontiers, integrated systems demand dynamic cross-enterprise

Table 7. Correlation coefficients between selected personal and techno-economic characteristics and self-efficacy of farmers

Personal characteristic	Respondents (N = 120)	
	IFS (n = 60) (r)	Specialized farming (n = 60) (r)
Age	–0.007^{NS}	0.019^{NS}
Gender	–0.000^{NS}	0.031^{NS}
Education level	0.194^{NS}	–0.061^{NS}
Type of family	0.165^{NS}	0.063^{NS}
Type of farming components	0.260*	–0.104^{NS}
Landholding	0.133^{NS}	0.126^{NS}
Annual income	0.228^{NS}	0.062^{NS}
Farming experience	0.033^{NS}	0.021^{NS}
Farming system	0.012^{NS}	0.010^{NS}
Primary irrigation source	0.156^{NS}	0.065^{NS}

*Significant at 5% LoS, NS = Non-significant

coordination (Afi and Parsons 2023). Successfully navigating these operational challenges acts as a continuous mastery experience, fostering greater psychological resilience.

The positive relationship between the type of farming components and self-efficacy indicates that enterprise diversification serves as an active engine for personal capacity building. As farmers incorporate varied components, they engage in continuous experiential learning and complex problem-solving, which substantially strengthens their perceived competence and adaptive confidence independent of standard demographic factors like age or land size (Cofre-Bravo et al 2019, Mizik 2021).

CONCLUSION

Transitioning from specialized monoculture to integrated farming systems (IFSs) offers substantial psychological and mental health benefits alongside economic advantages. Operative complexity, managing livestock, crops and horticulture simultaneously, serves as an ongoing mastery experience that builds confidence, persistence and problem-solving capabilities.

Consequently, IFS farmers displayed higher overall self-efficacy, lower stress and reduced levels of anxiety and depression compared to specialized farmers, who faced greater vulnerabilities from single-commodity dependence and rainfed conditions. Agricultural extension programmes and policy frameworks should not only promote IFS for resource efficiency and income stability, but also leverage enterprise diversification as a tool to enhance farmer resilience, cognitive agency and psychological well-being.

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