



Determinants of ARYA Adoption for Livelihood Security in Nalgonda district of Telangana

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HIGHLIGHTS

- Integrated Farming System had the highest adoption under Attracting and Retaining Youth in Agriculture (ARYA), enhancing income and sustainability.
- Attitude and knowledge were the strongest predictors of adoption.
- Education, income, landholding, and extension contact influenced adoption significantly.

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ABSTRACT

The study was conducted during 2023-25 to identify the determinants influencing the adoption of the ARYA programme in Nalgonda district. Employing a multistage random sampling technique, data were collected from 160 rural youth across four agriculturally prominent blocks using structured interview. The analysis revealed that the integrated farming system emerged as the most widely adopted component of the ARYA programme, followed by animal husbandry and horticultural activities. 70.63 per cent of respondents exhibited medium adoption levels, indicating partial engagement with programme components. Correlation analysis identified attitude ($r = 0.753^{**}$) and knowledge ($r = 0.738^{**}$) as the most significant predictors of adoption, while education, landholding, annual income, and extension contact also showed strong positive associations. The study highlighted critical gaps in the adoption of marketing and post-harvest practices, suggesting the need for strengthening forward linkages, value addition infrastructure, and market accessibility. The findings emphasised the importance of targeted awareness campaigns, skill enhancement initiatives, and institutional support to promote entrepreneurship among rural youth. Strengthening extension services and refining programme implementation strategies can enhance adoption levels, ensuring livelihood security and sustainable development in rural communities.

INTRODUCTION

Agriculture remains the cornerstone of India's rural economy, engaging approximately 58 per cent of the population in agricultural and allied sectors (GoI, 2023). Despite its socio-economic significance, the sector contributes only 17–18 per cent to the national Gross Domestic Product (GDP), highlighting inherent structural inefficiencies and a growing need for targeted reforms

(Chand et al., 2020). Major challenges, including small and fragmented landholdings, degraded soil health, fluctuating productivity, erratic weather patterns, and low adoption of scientific technologies, continue to limit the sector's potential. Globally, the challenge of attracting youth to agriculture is not confined to India alone. Countries in Sub-Saharan Africa, Southeast Asia, and Latin America are facing similar youth disengagement due to poor profitability, lack of innovation, and weak infrastructure

(Simbanegavi, 2019). These shared experiences underscore the urgent need for globally inspired yet locally adopted policies like ARYA to make agriculture appealing again. Furthermore, rural-to-urban migration, driven by diminishing returns in farming, has led to depopulated villages and underutilized farmlands. Initiatives like ARYA offer opportunities to reverse this trend by promoting agro-enterprise development and community-based employment options.

The Government of India has implemented several interventions to rejuvenate rural agriculture and engage key demographic groups. Among these, the ARYA programme, initiated by the Indian Council of Agricultural Research (ICAR) in collaboration with Krishi Vigyan Kendras (KVKs), represents a significant step toward youth-centric agricultural development. ARYA aims to promote agricultural entrepreneurship among rural youth by encouraging them to adopt viable, sustainable, and locally relevant agri-based enterprises. The programme's broader objectives include reducing rural-to-urban migration, increasing income generation at the village level, and fostering innovation in farming practices (ICAR, 2021).

ARYA promotes a variety of entrepreneurial modules such as Integrated Farming Systems (IFS), poultry farming, beekeeping, mushroom cultivation, vermicomposting, fruit and vegetable nurseries, and value-added agri-processing. This comprehensive approach allows youth to diversify their sources of income, manage resources more efficiently, and access sustainable livelihood opportunities (Murthy et al., 2019). Empirical studies have reported positive outcomes associated with ARYA implementation, including improved awareness, increased income, enhanced skills, and greater adoption of improved agricultural technologies (Sayana et al., 2022; Sahoo et al., 2023). However, the success of such programmes is heavily influenced by a range of socio-economic and psychological factors. Research indicates that variables such as education, landholding size, household income, institutional exposure, knowledge level, and personal attitudes significantly determine the likelihood of adoption of agricultural innovations (Afros et al., 2021; Kobba et al., 2021; Gowda et al., 2023; Sai et al., 2024). Youth with higher levels of education and greater exposure to extension services are more likely to recognize the utility of such programmes and adopt them effectively. The Nalgonda district of Telangana serves as a pertinent location for assessing the effectiveness of the ARYA initiative. Characterized by small and marginal landholdings, diverse cropping systems, and moderate levels of infrastructure development, Nalgonda reflects both the opportunities and constraints present in rural agricultural landscapes. Preliminary field insights indicate variable adoption rates of ARYA components across villages, potentially influenced by gaps in awareness, institutional support, and access to necessary resources.

METHODOLOGY

The present study was conducted during the period 2023-2025 in four purposively selected blocks of Nalgonda district of Telangana, namely Miryalaguda, Vemulapalli, Damaracherla, and Tripuraram. These blocks were chosen due to their significant involvement in agricultural activities and the implementation of the ARYA programme aimed at enhancing livelihood security among

farming communities. The study focused on understanding the determinants influencing the adoption of the ARYA programme for livelihood security. A multistage sampling technique was adopted to select the respondents for the study. Initially, the four blocks were purposively selected, followed by random selection of four villages within each block. Subsequently, a total of 160 farmers were selected randomly from these villages to represent diverse socio-economic backgrounds and varying degrees of programme adoption. The sample size ensured adequate representation for meaningful statistical analysis. Primary data were collected through structured interviews using a pre-tested interview schedule designed to capture information on socio-economic characteristics, knowledge, attitude and adoption status related to the ARYA programme. Variables such as family type, education level, size of landholding, annual income, extension contact, innovativeness, and social participation were included based on their relevance in adoption studies. The key dependent variable was the adoption status of the ARYA programme, categorised as fully adopted (2), partially adopted (1) and non-adopters (0). The independent variables included socio-economic and institutional factors hypothesised to influence adoption behaviour. To determine the association between these categorical variables and the adoption status, the Chi-square test was used to assess association between socio-economic characteristics and adoption levels, appropriate for categorical data. Cramér's V was further employed to assess the strength of association, which allowed a deeper understanding of variable influence beyond significance alone (Duke et al., 2020).

Data analysis was performed using IBM SPSS V.26 Statistics software. Before the Chi-square test, data were coded and validated for consistency. The level of significance was fixed at 5% ($p < 0.05$). Variables showing significant association with adoption were identified as key determinants influencing farmers' participation in the ARYA programme. The findings aimed to provide empirical evidence to support targeted extension interventions for enhancing programme adoption and livelihood security in the region.

RESULTS

The analysis of different enterprise components under the ARYA programme is presented in Table 1. Under horticulture aspects, the highest adoption was recorded for vegetable nursery units, with 33.75 per cent of respondents having fully adopted the practice, and 43.12 per cent partially adopting. This component achieved a weighted mean score of 36.79, indicating moderate-to-high engagement. Conversely, mushroom production witnessed only 6.25 per cent full adoption and a significant 58.12 per cent non-adoption. Similarly, commercial floriculture and protected cultivation had modest adoption rates, with non-adoption levels at 43.75 per cent and 50.63 per cent, respectively. In the post-harvest domain, the bakery unit activity showed the highest level of partial adoption (53.12%), while full adoption remained low at 12.50 per cent. The value-added food ventures and training to manage post-harvest losses also demonstrated limited full adoption (12.50% and 9.38%, respectively), with over 47 per cent and 56 per cent of respondents reporting no adoption. The weighted mean for this category stood at 30.54, suggesting that post-harvest interventions under ARYA had relatively weak penetration among the beneficiaries. The

Integrated Farming System (IFS) category displayed the highest overall adoption intensity, with a weighted mean of 46.45. In particular, the vermicompost unit had a full adoption rate of 39.37 per cent and only 18.75 per cent non-adoption. However, entrepreneurship training through IFS showed limited full adoption (5.00%) despite having a relatively high partial adoption rate (52.50%), indicating interest among farmers, but potential gaps in accessibility or implementation. For marketing aspects, adoption remained low. Marketing strategies introduced under the ARYA programme had only 11.25 per cent full adoption, while 48.13 per cent of respondents reported no adoption. Similarly, use of social media for rural enterprises saw 9.37 per cent full adoption and a majority of 51.83 per cent non-adoption. The weighted mean score for marketing was calculated at 32.81, highlighting the need for greater focus on market linkage and digital extension strategies. Within animal husbandry aspects, the most adopted practice was poultry farming, with 24.37 per cent full and 38.75 per cent partial adoption. Goat and sheep rearing, aquaculture, and dairy farming also showed moderate adoption patterns. Among these, dairy farming had a relatively higher partial adoption rate (45.63%), whereas aquaculture and fish rearing had the highest non-adoption rate (50.00%) within the category. The weighted mean for animal husbandry stood at 38.20, suggesting a comparatively better adoption profile than post-harvest and marketing interventions.

The overall adoption level of the ARYA programme. A majority of the respondents (70.63%) fell into the medium adoption category. This indicated that most beneficiaries had implemented several components of the programme, but had not yet fully adopted its entire range of interventions. A smaller segment, 16.87 per cent followed by 12.50 per cent, belonged to the high adoption

category, suggesting that only a limited number of respondents had extensively integrated ARYA-promoted practices, such as integrated farming, value addition, and enterprise diversification into their livelihood activities.

The correlation analysis presented in Table 2 revealed that several socio-psychological and economic variables exhibited statistically significant and positive relationships with the level of adoption of the ARYA (Attracting and Retaining Youth in Agriculture) programme components. Among all variables studied, attitude towards the programme recorded the strongest positive correlation with adoption ($r = 0.753$, $p < 0.01$), followed closely by knowledge level ($r = 0.738$, $p < 0.01$). The robustness of these findings is further confirmed by substantial Chi-square values ($\chi^2 = 1416.486$ for attitude and $\chi^2 = 512.461$ for knowledge) and high Cramer's V coefficients (0.683 and 0.540, respectively), denoting a strong degree of association. Extension contacts ($r = 0.533$, $p < 0.01$) and education level ($r = 0.528$, $p < 0.01$) were also significantly and positively correlated with adoption, underscoring the role of regular interaction with extension personnel and higher educational attainment in enhancing receptiveness to new agricultural practices. These relationships were further supported by significant Chi-square values ($\chi^2 = 1223.348$ for extension contacts and $\chi^2 = 1184.726$ for education level) and strong Cramer's V coefficients (0.646 and 0.608, respectively).

Similarly, annual income ($r = 0.458$, $p < 0.01$) and landholding size ($r = 0.233$, $p < 0.05$) demonstrated significant positive correlations with adoption. This suggests that farmers with stronger economic resources and larger land availability tend to have higher adoption rates. The statistical significance of these relationships was reinforced by high Chi-square values ($\chi^2 = 1528.733$ for income

Table 1. Different adoption aspects of ARYA Programme for livelihood security

Category	Adoption Level			Weightage mean
	Fully Adopted (%)	Partially Adoption (%)	No Adoption (%)	
1. Horticulture aspects				
Vegetable Nursery Units	33.75	43.12	23.13	36.79
Mushroom production	06.25	35.63	58.12	
Commercial floriculture	15.63	40.62	43.75	
Protected cultivation	10.00	39.37	50.63	
2. Post-harvest aspects				
Bakery Unit activities	12.50	53.12	34.38	30.54
Value-added food ventures	12.50	40.00	47.50	
Training provided by the ARYA Programme to manage post-harvest losses	09.38	34.37	56.25	
3. Integrated farming system (IFS)				
Vermicompost unit along with farming	39.37	41.88	18.75	46.45
Entrepreneurship training through IFS initiatives	05.00	52.50	42.50	
4. Marketing aspects				
Marketing strategies provided by the ARYA Programme	11.25	40.62	48.13	32.81
Social media for rural entrepreneurial activities	09.37	38.80	51.83	
5. Animal Husbandry aspects				
Poultry farming activities	24.37	38.75	36.88	38.20
Goat and sheep rearing activities	19.38	41.87	38.75	
Aquaculture and fish rearing	13.75	36.25	50.00	
Dairy farming	20.00	45.63	34.37	

Table 2. Relationship between demographic variables and adoption of ARYA for livelihood security

Independent Variables	Correlation Coefficient “r”	Pearson’s Value Chi-square (χ^2)	Cramer’s V-value	P- value
Age	-0.056 NS	215.332	0.335	p > 0.05
Gender	0.028 NS	18.506	0.340	p > 0.05
Family Type	-0.148 NS	33.080	0.322	p > 0.05
Education	0.528**	114.377**	0.423	p < 0.01
Occupation	0.112 NS	90.267	0.376	p > 0.05
Land Holding	0.233*	1289.550*	0.651	p < 0.05
Annual Income	0.458**	1528.733**	0.709	p < 0.01
Mass media exposure	0.152 NS	283.619	0.356	p > 0.05
Extension Contact	0.533**	457.522**	0.388	p < 0.01
Innovativeness	0.329**	162.709	0.357	p < 0.01
Social Participation	0.104 NS	183.879	0.357	p > 0.05
Knowledge	0.738**	512.461**	0.540	p < 0.01
Attitude	0.753**	1416.486**	0.683	p < 0.01

p < 0.01 = Highly significant (1% level of significance), p < 0.05 = Significant (5% level of significance), p > 0.05 = Not significant

and $\chi^2 = 1289.550$ for landholding size) and robust Cramer’s V scores (0.709 and 0.651, respectively), highlighting the socio-economic advantage in accessing and implementing ARYA interventions. Innovativeness, although moderately correlated with adoption ($r = 0.329$, $p < 0.01$), still exhibited a statistically significant relationship. In contrast, several demographic variables—including age ($r = -0.056$, $p > 0.05$), gender ($r = 0.028$, $p > 0.05$), family type ($r = -0.148$, $p > 0.05$), primary occupation ($r = 0.112$, $p > 0.05$), mass media exposure ($r = 0.152$, $p > 0.05$), and social participation ($r = 0.104$, $p > 0.05$)—did not show statistically significant correlations with adoption. These non-significant results indicate that such demographic characteristics were not decisive factors in influencing an individual’s likelihood of adopting ARYA programme components in the study area.

DISCUSSION

The study identified the Integrated Farming System (IFS) as the most widely adopted component under the ARYA (Attracting and Retaining Youth in Agriculture) programme, reflecting its perceived importance in promoting income diversification and enhancing livelihood resilience among rural youth. The widespread adoption of IFS highlights the practicality of integrating crop production with livestock and allied enterprises, thereby providing a more stable source of income amid uncertainties in resources and markets (Chaudhary et al., 2019; Murthy et al., 2019). Animal husbandry emerged as the second most adopted enterprise. Its popularity can be attributed to its compatibility with small landholdings, relatively low initial investment requirements, and the potential for generating regular income through the sale of milk, eggs, meat, and other livestock products (Sharma, 2021). The enterprise also offers opportunities for women and family members to participate in management, thus increasing household-level engagement in agricultural activities. However, adoption levels were noticeably lower in the areas of marketing and post-harvest management. These constraints hinder the scalability and profitability of agricultural enterprises despite production gains. The results align with Pasula & Sreedaya (2022), who emphasized that strengthening post-production support systems—such as storage

facilities, processing units, branding initiatives, and market linkages—is essential for maximizing income from agricultural ventures.

The analysis also revealed that a majority of respondents demonstrated medium-level adoption of ARYA programme components, indicating partial engagement rather than full-scale integration into their livelihood systems. Similar observations were made by Saleh et al. (2012), who noted that adoption disparities often stem from variations in contextual and perceptual factors. Their work further emphasises that youth who are better informed and supported are more likely to participate in productive agricultural ventures. In this regard, incorporating youth-centric curricula into vocational training and leveraging social media as a dynamic educational platform could significantly improve adoption rates by increasing both knowledge and motivation.

The statistical analysis underscored that attitude and knowledge were the most significant predictors of adoption, as evidenced by strong correlation coefficients. These findings reaffirm the importance of designing targeted awareness campaigns, experiential learning opportunities, and skill-oriented training modules to facilitate positive behavioural change (Sai et al., 2024; Gowda et al., 2023). This reinforces the argument that capacity building, improved economic standing, and consistent institutional engagement play pivotal roles in enhancing the effectiveness of the ARYA programme (Singh, 2023). In contrast, certain demographic characteristics such as age, gender, and social participation did not show any statistically significant influence on adoption. This suggests that individual personal attributes are less decisive compared to enabling conditions, access to resources, and institutional support mechanisms.

CONCLUSION

The ARYA programme had a moderate adoption rate among farmers in Nalgonda district, with most respondents falling under the medium adoption category. Among various components, the Integrated Farming System emerged as the most adopted, indicating its practical viability and integration into local livelihoods. Statistical analysis revealed that adoption was significantly influenced by variables such as attitude, knowledge, education, income,

landholding, and extension contact. The findings emphasised the importance of improving awareness, building positive perceptions, and strengthening institutional support mechanisms to enhance the effectiveness and reach of the ARYA programme. Targeted interventions are required, which include developing mobile-based learning modules, strengthening access to financial services, offering input subsidies for youth-led agri-enterprises, and introducing gender-sensitive training modules. Policy emphasis should also be placed on forming youth cooperatives and establishing forward linkages with processing industries. Strengthening institutional collaboration between ICAR, KVKs, and NGOs can facilitate more localised and inclusive implementation models.

DECLARATIONS

Ethics approval and informed consent: Informed consent was sought from the respondents of the study.

Conflict of interest: The authors declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author declares that they have thoroughly reviewed, revised, and edited the content as needed. The authors take full responsibility for the final content of this publication.

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