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RESEARCH ARTICLE

Methodology standardization for assessing leadership patterns among postgraduate agricultural students

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Abstract

Leadership plays an essential role in developing professional competence, enhancing decision-making ability and fostering effective teamwork in agricultural education. The present study aimed to identify dominant leadership styles and to analyse factors influencing leadership behaviour among postgraduate agriculture students. The present study was conducted among postgraduate students enrolled in state agricultural universities in Southern India during 2024-25 academic year, with a sample size of 200 respondents selected through random sampling techniques. A descriptive-cum-analytical research design was employed to examine their leadership style, locus of control and resilience orientation. Standardized psychometric methodologies were used for primary data collection, including the leadership effectiveness and adaptability description (LEAD) questionnaire, based on the Hersey and Blanchard situational leadership model and the Nicholson McBride resilience questionnaire (NMRQ). The collected data were analysed to understand the adaptability of leadership behaviour and resilience characteristics among agricultural postgraduates. Both descriptive statistics and the multinomial logistic regression model were employed for analysis. Results revealed that the participating leadership style (38.00 %) was most prevalent among agricultural students, followed by delegating (32.50 %), telling (17.00 %) and selling (12.50 %). The model fitting test (χ^2 = 38.130; df = 21; p = 0.012) indicated that the fitted model was statistically significant at 1 % level. Among the predictors, gender, order of birth and locus of control significantly influenced leadership orientation, while variables such as previous education background, decision -making ability and future goal orientation were not significant. The findings underscore the need to integrate structured leadership training and psychological development programs within agricultural education to enhance adaptive, inclusive and resilient leadership competencies among future professionals.

Keywords: agriculture; behaviour; locus of control; psychological factors; situational leadership

Introduction

India's agricultural sector continues to be a cornerstone of its economy. In 2022-23, agriculture and allied activities accounted for roughly 15 % of India's gross value added (GVA). While this share has declined over decades due to rapid growth in industry and services, the sector still supports nearly 44 % of India's workforce. Globally, agriculture contributes only about 4 % of world GDP today. Despite a gradual decline in its relative contribution to GDP, the Indian agricultural economy continues to hold pivotal significance, owing its extensive land footprint and socio-economic role. The Indian agricultural machinery sector has demonstrated robust growth, with the market valued at INR 1232.2 billion in 2024 and projected to reach INR 2693.8 billion by 2033, primarily propelled by rising farm mechanization. Despite this expansion, the sector continues to grapple with substantial financial constraints. Small and marginal farmers, who constitute the majority of the farming population, commonly face multiple challenges, including limited access to institutional credit, high upfront investment requirements for agricultural equipment, elevated interest rates, inadequate marketing support, delays in decision-making related to critical inputs and limited leadership capacity for adopting innovations and mobilizing collective action.

Leadership represents a complex psychological and social process through which individuals influence and motivate others to achieve collective goals (1). Within educational and professional contexts particularly in agriculture and allied disciplines, leadership assumes vital importance as it shapes decision-making, innovation and teamwork core elements of agricultural development (2, 3). Contemporary leadership theories, such as the situational leadership model conceptualize leadership as a flexible behavioural construct that adapts to the maturity and readiness of followers (4-6). This model identifies four key styles such as telling, selling, participating and delegating each reflecting a unique combination of directive and supportive behaviour (7). Understanding the

leadership styles prevalent among agricultural students provides valuable insights into their readiness for future professional and organizational roles (8).

In recent years, the focus of leadership research has expanded beyond behavioural analysis to include personal and psychological determinants that can shape leadership tendencies (9, 10). Demographic factors such as gender and birth order, along with psychological attributes like locus of control, play an important role in influencing leadership behaviour (11). Studies have shown that gender differences often manifest in leadership expression, with males tending to exhibit more directive and task-oriented leadership style, while females more frequently adopt participative and relationship-centered approaches (12, 13). Similarly, birth order theory posits that first-born individuals often develop stronger responsibility and dominance traits due to early family roles, which may translate into a greater propensity for leadership (14).

The locus of control has been identified as a key psychological construct underlying leadership behaviour (15). Individuals with an internal locus of control perceive outcomes as contingent on their own actions, demonstrating higher confidence, initiative and accountability traits that are central to effective leadership (16). Conversely, those with an external locus attribute success or failure to external forces, which can limit proactive leadership engagement (17). Integrating locus of control into leadership assessment provides a richer understanding of how personality and self-regulatory mechanisms influence leadership tendencies among students (18).

While leadership education has gained prominence in agricultural universities, empirical investigations focusing on agricultural students' leadership orientations remain limited. Agricultural students are expected to emerge as community leaders, extension professionals and innovators in rural development programs. Understanding their leadership patterns, along with the demographic and psychological factors influencing these tendencies, is therefore critical for designing targeted leadership development and educational interventions. In view of the above, it was conducted to explore leadership orientation within the framework of situational leadership theory and to identify how demographic and psychological factors influence leadership tendencies (19).

Materials and Methods

Research methods

The present study was conducted to identify the leadership styles among postgraduate students and to examine the factors influencing leadership behaviour among this group. A descriptive-cum-analytical research design was adopted, as it enabled both the identification and explanation of the leadership patterns within the student population. The study was conducted across five state agriculture universities, namely Tamil Nadu Agricultural University (TNAU), Coimbatore; Gandhi Krishi Vigyan Kendra (GKVK), Bengaluru; Professor Jayashankar Telangana Agricultural University (PJTAU), Hyderabad; Acharya NG Ranga Agricultural University (ANGRAU) Guntur and the University of Agricultural Sciences (UAS), Dharwad.

A multistage sampling technique was employed, wherein universities and postgraduate students were selected purposively as target population for data collection, owing to their exposure to leadership roles through academic activities, co-curricular engagement and student organizations. A total of 200 postgraduate students constituted the sample, comprising 40 students from each universities, selecting using a random sampling technique. Both male and female students from various disciplines were included to ensure adequate representation and to capture variations in leadership attributes across individuals.

Data collection

Data were collected during the 2024-25 academic year using standardized instruments and well-framed structured interview schedule. Leadership style was assessed using the leadership effectiveness and adaptability description (LEAD) questionnaire, developed based on the Hersey and Blanchard situational leadership model (20). The instrument comprised twelve statements, evenly categorized under four leadership styles, namely telling, selling, participating and delegating. Each style included three statements and the overall leadership style score ranged from 0 to 12. The model evaluates leadership behaviour across three core dimensions, such as task behaviour, relationship behaviour and maturity level of followers. Responses were scored according to established scoring procedures, enabling identification of the dominant leadership style for each respondent.

To assess the psychological dimension associated with leadership, particularly the locus of control, the Nicholson McBride resilience questionnaire (NMRQ) was used (21). This instrument was used whether an individual possessed an internal or external orientation of control, which is an important determinant of leadership adaptability and effectiveness (22). Along with these standardized tools, a structured schedule was developed to capture information on socio-demographic and psychological factors such as gender, previous education, decision-making ability, commitment to take lead, order of birth and future goal orientation. The schedule was framed based on extensive review of relevant literature and was validated by experts from agricultural extension and behavioural sciences to ensure content validity. The reliability of the instrument was confirmed with a Cronbach's alpha value of 0.88, indicating a high level of internal consistency.

Primary data were collected personally from postgraduate students using a self-administered questionnaire. Before administering the instrument, the objectives and purpose of the study were clearly explained to the respondents. Informed consent was obtained and confidentiality of the responses was maintained throughout the data collection process. This approach ensured unbiased participation and enhanced the reliability of the collected data.

Data analysis was carried out using both descriptive and inferential statistical techniques with the help of IBM-SPSS 26. Descriptive statistics such as mean, frequency and percentage were used to summarize the leadership styles and profile characteristics of respondents. Multinomial logit model (MNL) was employed to identify the influence of socio-demographic and psychological factors on the probability of individuals exhibiting a particular leadership style (23). Since the dependent variable (leadership style) is categorical with more than two outcomes, the MNL model is an appropriate analytical technique. The probability that the i^{th} individual chooses leadership style j (where j = 1, 2, 3, ..., j) is expressed in equation 1:

$$P_{ij} = \frac{e^{\beta_j X_i}}{\sum_{k=1}^{j} e^{\beta_k X_i}} \quad \text{(Eqn. 1)}$$

where,

P_{ij} = probability that individual i belongs to leadership style j

X_i = vector of explanatory (independent) variables (e.g., gender, decision-making, locus of control, commitment to lead, etc.)

β_j = vector of coefficients associated with leadership style j

e = base of natural logarithm

j = number of leadership style categories

In the model, one category (say, delegating style) is treated as the reference (baseline) category. The coefficients (β_j) of other categories are estimated relative to this base category. The estimated coefficients were then interpreted in terms of odds ratios, which indicate the change in the likelihood of belonging to a particular leadership style with respect to changes in the explanatory variables.

Hypotheses

Two hypotheses were formulated for testing the study.

H_1: Leadership style varies across individuals.

H_2: leadership is influenced by certain factors such as gender, previous education, decision-making, commitment to lead, locus of control, order of birth and future goal orientation.

Appropriate statistical tests were applied to validate these hypotheses at the desired level of significance.

Results and Discussion

The results of the study revealed distinct variations in the leadership styles and the socio-demographic and psychological characteristics of the postgraduate students surveyed (24, 25). A detailed description of each variable is presented below:

The distribution of students according to their dominant leadership style is presented in Table 1. It was observed that the majority of the respondents (38.00 %) exhibited a participating leadership style, followed by delegating (32.50 %), telling (17.00 %) and selling (12.50 %) styles. The predominance of the participating leadership style within this cohort may be attributed to a combination of gender dynamics, psychological attributes, birth order effects and future orientation. This leadership style is highly beneficial for India's agricultural sector, especially in strengthening farmer producer organizations (FPOs), improving technology adoption, promoting equity in decision-making and building climate-resilient, community-driven farming systems. The dominance of the participating style indicates that most students tend to involve their peers in decision-making and emphasize relationship-oriented behaviour, reflecting a participative and collaborative leadership orientation.

Table 1. Distribution of respondents based on leadership style

Leadership style	Frequency	Percent (%)	Cumulative percent (%)
Selling	25	12.50	12.50
Telling	34	17.00	29.50
Participating	76	38.00	67.50
Delegating	65	32.50	100.00
Total	200	100.00	

The sample comprised 52.50 % males and 47.50 % females, indicating an almost balanced representation of gender among postgraduate students (Table 2). This balanced distribution provided a fair basis for comparative analysis of leadership styles across gender. Educational background plays a key role in shaping students' leadership orientation and adaptability. The majority of the students (38.00 %) had completed their previous education from private institutions, followed by state board (government) schools (34.00 %) and Kendriya Vidyalaya's (28.00 %) (Table 3). The diversity of educational backgrounds reflects a broad spectrum of academic exposure, contributing to variation in leadership learning and behavioural patterns.

Table 2. Gender distribution of respondents

Gender	Frequency	Percent (%)
Female	95	47.50
Male	105	52.50
Total	200	100.00

Table 3. Distribution based on previous education

Previous education	Frequency	Percent (%)
State Board (Govt.)	68	34.00
Private	76	38.00
Kendriya Vidyala	56	28.00
Total	200	100.00

Decision-making capacity is a vital component of leadership (26). A large proportion of students (85.50 %) reported that they regularly participated in decision-making processes, while only 14.50 % otherwise (Table 4). This clearly shows that the majority of students possess a proactive mindset and the ability to take initiative, traits often associated with effective leadership. Commitment to leadership is another behavioural indicator of leadership potential. As shown in Table 5, 67.50 % of the students expressed their readiness to take leadership roles, while 32.50 % were hesitant. This demonstrates that two-thirds of the respondents have a strong motivational drive towards leadership participation.

Table 4. Distribution based on decision-making ability

Decision-making	Frequency	Percent (%)
Yes	171	85.50
No	29	14.50
Total	200	100.00

Table 5. Distribution based on commitment to take lead

Commitment to lead	Frequency	Percent (%)
Yes	135	67.50
No	65	32.50
Total	200	100.00

The order of birth was included as a psychological determinant of leadership behaviour (27). It was found that 54.50 % of the respondents were first-born, whereas 45.50 % were second-born (Table 6). The higher proportion of first-born individuals may be associated with earlier exposure to responsibility and decision-making roles within the family environments, which can contribute to leadership development.

Table 6. Distribution based on order of birth

Order of birth	Frequency	Percent (%)
First order	109	54.50
Second order	91	45.50
Total	200	100.00

The locus of control, an important psychological variable, was measured using the NMRQ. As shown in Table 7, 60.50 % of the students exhibited an external locus of control, while 39.50 % showed an internal locus of control. The predominance of external orientation suggests that a majority of students attribute outcomes to external factors such as authority or circumstances rather than personal effort or control (28, 29). Nearly, half (46.50 %) of the students aspired for government jobs, followed by entrepreneurship (29.00 %), managerial roles (10.00 %) and banking (8.00 %) (Table 8). A smaller proportion (6.50 %) desired to work in the NGO sector. These findings reflect a mixed orientation towards both job security and self-employment opportunities among the students.

Table 7. Distribution based on locus of control

Locus of control	Frequency	Percent (%)
External	121.00	60.50
Internal	79.00	39.50
Total	200.00	100.00

Table 8. Distribution based on future career goals

Future goal	Frequency	Percent (%)
Manager	20	10.0
Banking	16	8.00
Government job	93	46.50
Entrepreneur	58	29.00
NGO	13	6.50
Total	200	100.00

To verify the proposed hypotheses, a multinomial logistic regression model was fitted to the data and the results are presented in Tables 9 & 10. The results of the model fitting information indicate that the final model provides a statistically significant improvement over the intercept-only model (Table 9). The chi-square value for the overall model was 38.130 with 21 degrees of freedom and a corresponding p-value of 0.012. Since the *p*-value is less than the 5 % level of significance (LOS), it confirms that the model as a whole is statistically significant. This implies that the set of predictors included in the model collectively explains a significant proportion of the variation in the dependent variable, i.e., leadership orientation among respondents (30, 31). Consequently, the null hypothesis (H_1) which posited that leadership style does not vary across individuals is rejected. The fitted model is therefore statistically valid and appropriate for further interpretation, confirming that leadership style indeed varies among individuals.

Table 9. Multinominal model fitting for leadership styles against selected variables

Model	-2 Log Likelihood	Chi-Square	df	Significance
Intercept Only	381.904			
Final	343.774	38.130	21	0.012*

*: statistically significant at 1 % level of probability.

Table 10. Likelihood ratio tests for the model fit of leadership styles

Effect	-2 Log Likelihood of	Chi-Square	df	Significance
Intercept	346.621	2.847	3	0.416
Gender	335.755	9.980	3	0.019*
Previous education	345.914	2.140	3	0.544
Decision making	344.548	0.774	3	0.856
Taking lead	345.252	1.478	3	0.687
Order of birth	365.527	12.753	3	0.005**
Locus of control	348.804	5.030	3	0.002**
Future goal	348.992	5.218	3	0.157

**: statistically significant at 1 % level of probability, *: statistically significant at 5 % level of probability.

The results of the likelihood ratio tests show the individual contribution of each predictor variable to the overall model (Table 10). The chi-square statistic represents the difference between the reduced model (excluding one variable) and the final model (including all predictors). Among the variables analysed, gender ($\chi^2 = 9.980$, $p = 0.019$), order of birth ($\chi^2 = 12.753$, $p = 0.005$) and locus of control ($\chi^2 = 5.030$, $p = 0.002$) were found to be statistically significant. Gender was significant at the 5 % level, while order of birth and locus of control were significant at the 1% level, suggesting that these factors have a meaningful influence on leadership orientation among individuals. Other variables such as previous education, decision-making, commitment to lead and future goal orientation were not statistically significant ($p > 0.05$), implying that their influence on leadership variation was relatively limited within this model.

The findings clearly demonstrate that gender differences play a significant role in shaping leadership style (32-34). The result implies that leadership behaviour and orientation vary between male and female respondents, likely reflecting differences in socialization patterns, leadership exposure and self-perception of competence. The significant effect of order of birth reveals that family hierarchy and early life responsibilities influence leadership tendencies. First-born or earlier-born individuals may develop stronger leadership attributes due to greater responsibility, decision -making experience and opportunities to guide siblings. Furthermore, the strong significance of locus of control underscores the psychological dimension of leadership.

Individuals with an internal locus of control, those who believe they can influence outcomes through their own actions are more likely to exhibit proactive, confident and resilient leadership behaviour. This finding supports leadership theories that emphasize internal control beliefs as foundational to effective leadership. Based on these results, H_2 is partially supported, as

leadership orientation is significantly influenced by gender, order of birth and locus of control, whereas other variables such as education, decision-making and goal orientation were not significant predictors. Research often shows that students especially women, first-borns and those with an internal locus of control tend to prefer participative or collaborative leadership. Studies in agricultural education and FPO settings also report that teamwork, shared decision-making and group problem-solving are highly valued, making participative leadership more common.

Delegating style vs other styles

The multinomial logistic regression model was employed to compare the influence of selected demographic and psychological variables on leadership orientations, using the delegating leadership style as the reference category. The results revealed significant differences across the leadership styles (selling, telling and participating) with varying predictors influencing each orientation. The model results highlight the significance of variables such as gender, order of birth and locus of control, which emerged as key predictors influencing delegating leadership behaviour (35).

Table 11 indicates that gender differences, family birth position and internal psychological orientation are major determinants of persuasive and people-oriented leadership behaviour. For the selling style, gender (p = 0.009) and locus of control (p = 0.004) were significant at the 1 % level, while order of birth (p = 0.022) was significant at the 5 % level. The findings indicate that males, first-born individuals and students with a strong internal locus of control have a higher likelihood of adopting the selling style, which involves persuading and motivating others. In the telling style, order of birth (p = 0.033), gender (p = 0.042) and locus of control (p = 0.020) were all significant at the 5 % level. These results suggest that early-born individuals, males and those with an internal control orientation are more inclined toward directive, instruction-based leadership compared to the autonomy-focused delegating style.

Table 11. Comparison of delegating style with other style of leadership

Effect	Selling (B, significance)	Telling (B, significance)	Participating (B, significance)
Intercept	-0.812 (0.479)	-0.869 (0.421)	0.539 (0.535)
Gender	1.475 (0.009**)	0.908 (0.042*)	0.226 (0.045*)
Previous education	0.459 (0.391)	0.649 (0.177)	0.159 (0.704)
Decision making	-0.310 (0.646)	0.201 (0.768)	0.240 (0.653)
Taking lead	-0.317 (0.566)	-0.572 (0.246)	-0.339 (0.401)
Order of birth	1.164 (0.022*)	0.976 (0.033*)	1.225 (0.001**)
Locus of control	0.782 (0.004**)	0.734 (0.020*)	0.689 (0.021*)
Future goal	-0.375 (0.139)	-0.278 (0.234)	-0.412 (0.032*)

**: statistically significant at 1 % level of probability, *: statistically significant at 5 % level of probability.

The significance of gender again reflects the role of socialization, where males tend to favour structured, authority driven leadership behaviours, while locus of control underlines psychological confidence as a key attribute in directive leadership approaches (36). For the participating style, order of birth (p = 0.001) was significant at the 1 % level, while locus of control (p = 0.021), gender (p = 0.045) and future goal (p = 0.032) were significant at the 5 % level. This indicates that first-born students, those with internal locus of control, females and individuals with clear future aspirations are more likely to adopt collaborative and involvement-oriented leadership. Unlike the delegating style, which emphasizes independent decision-making, the participating style focuses on shared responsibility and group involvement (37).

Selling style vs other styles

The comparative results between the selling style and other leadership styles (telling, participating and delegating) highlight distinct influences of gender, birth order and psychological control beliefs (38, 39). In the telling style vs selling style comparison, gender (p = 0.041), order of birth (p = 0.021) and locus of control (p = 0.045) were statistically significant at the 5 % LOS (Table 12). These findings suggest that males and earlier born individuals with a stronger internal locus of control tend to exhibit directive leadership tendencies. Compared to the selling style, which relies on persuasion and interpersonal influence, the telling style reflects a higher level of authority, structure and supervision.

Table 12. Comparison of selling style with other style of leadership

Effect	Telling (B, significance)	Participating (B, significance)	Delegating (B, significance)
Intercept	-0.057 (0.963)	1.351 (0.205)	-0.812 (0.479)
Gender	-0.566 (0.041*)	-1.249 (0.022*)	-1.475 (0.009**)
Previous education	0.190 (0.735)	-0.300 (0.557)	-0.459 (0.391)
Decision making	0.510 (0.510)	0.549 (0.407)	0.310 (0.646)
Taking lead	-0.255 (0.667)	-0.022 (0.967)	0.317 (0.566)
Order of birth	-0.188 (0.021*)	0.061 (0.028*)	-1.164 (0.022*)
Locus of control	0.635 (0.045*)	0.680 (0.033*)	-0.670 (0.045*)
Future goal	0.097 (0.715)	-0.036 (0.877)	0.375 (0.139)

**: statistically significant at 1 % level of probability, *: statistically significant at 5 % level of probability.

The significant role of locus of control indicates that individuals who believe they can influence outcomes are more confident in leading through clear instructions and command-oriented behavior. The gender (p = 0.022), order of birth (p = 0.028) and locus of control (p = 0.033) were shown statistically significant at the 5 % LOS for the participating style vs selling style. The negative coefficient for gender indicates that females are more inclined toward participative leadership, emphasizing cooperation, shared responsibility and inclusion. Early born individuals on the other hand tend to facilitate collaboration by balancing authority with empathy.

The significant influence of locus of control implies that internally oriented leaders are more confident in fostering group consensus and team-based decision-making, which defines the participative leadership approach. Delegating style vs selling style showed statistical significance at 1 % LOS for gender (p = 0.009) and 5 % LOS for order of birth (p = 0.022) and locus of control (p = 0.045). The negative sign of the coefficients indicates that individuals who exhibit delegating leadership traits differ significantly from those adopting the selling style. Delegating leaders tend to trust others, emphasize empowerment and provide autonomy. The significance of locus of control at 5 % LOS highlights that internally controlled individuals possess greater confidence and accountability, enabling them to delegate responsibilities effectively and maintain trust in their team's capabilities.

The results indicate that the selling leadership style is the least adopted among agricultural students. This finding aligns with research showing that youth in agriculture and STEM-related programs tend to prefer collaborative, participatory and task-oriented leadership, rather than persuasive or sales-driven styles. Several reasons explain this trend. First, agricultural education in India emphasizes technical skills, community development and participatory extension approaches, rather than marketing or sales-oriented competencies. Studies report that agricultural students view themselves primarily as problem solvers and service providers rather than commercial influencers, which reduces their inclination toward selling-oriented leadership. Second, the selling style requires strong persuasive communication, marketing ability and negotiation skills, which are traditionally less emphasized in agricultural curricula.

Research shows that agriculture graduates often lack confidence or training in agribusiness marketing, sales psychology and customer relations skills essential for the selling leadership approach. Third, many agricultural students come from rural, smallholder or farming backgrounds, where selling is associated with market uncertainty, price volatility and mistrust of middlemen. These socio-economic realities often create a preference for leadership styles rooted in cooperation and shared decision-making, rather than styles linked to competitive sales environments.

Telling style vs other styles

Results across all comparisons indicate that gender, order of birth and locus of control significantly influence leadership orientation when compared to the telling leadership style (39). Table 13 showed that gender (p = 0.048), order of birth (p = 0.035) and locus of control (p = 0.041) were significant at the 5 % LOS. This shows that males, first-born individuals and those with a strong internal locus of control are more likely to display selling-style leadership characterized by persuasion, motivation and interpersonal influence. Compared with the telling style, which emphasizes directive communication and control, the selling style is more democratic and relationship-driven, focusing on convincing and guiding rather than commanding followers.

Table 13. Comparison of telling style with other style of leadership

Effect	Selling (B, significance)	Participating (B, significance)	Delegating (B, significance)
Intercept	0.057 (0.963)	1.408 (0.159)	0.869 (0.421)
Gender	0.566 (0.048*)	-0.682 (0.045*)	-0.908 (0.047*)
Previous education	-0.190 (0.735)	-0.490 (0.280)	-0.649 (0.177)
Decision making	-0.510 (0.510)	0.039 (0.954)	-0.201 (0.768)
Taking lead	0.255 (0.667)	0.233 (0.616)	0.572 (0.246)
Order of birth	0.188 (0.035*)	0.248 (0.031*)	-0.976 (0.033*)
Locus of control	-0.635 (0.041*)	0.645 (0.043*)	-0.706 (0.041*)
Future goal	-0.097 (0.715)	-0.133 (0.534)	0.278 (0.234)

**: statistically significant at 1 % level of probability, *: statistically significant at 5 % level of probability.

Participating style vs telling style showed that gender (p = 0.045), order of birth (p = 0.031) and locus of control (p = 0.043) were significant at the 5 % LOS. These findings suggest that female leaders, first-borns and internally oriented individuals are more likely to engage in participative leadership, which emphasizes collaboration, shared responsibility and mutual respect. Compared to the telling style, participative leaders favor team-based decision-making and emphasize communication and consensus-building. This transition from directive to participative leadership highlights the influence of internal control beliefs and demographic disposition on leadership adaptability (40). In the delegating style vs telling style, gender (p = 0.047), order of birth (p = 0.033) and locus of control (p = 0.041) again emerged as significant at the 5 % level. This indicates that early-born individuals and those with internal control tendencies are more likely to adopt a delegating leadership approach characterized by empowerment, autonomy and trust in subordinates.

Participating style vs other styles

The comparison of each leadership style with the participating leadership style reveals significant variations across gender, order of birth and locus of control, indicating that both demographic and psychological factors strongly shape leadership preferences (Table 14). In the selling style vs participating style, gender (p = 0.022), order of birth (p = 0.030) and locus of control (p = 0.043) were statistically significant at the 5 % LOS. This suggests that male and first-born individuals with an internal locus of control are more inclined toward persuasive, influence-based leadership compared to participative leaders, who prefer collaboration and team engagement (41). While the participating style emphasizes shared responsibility and inclusivity, the selling style is more directive and motivational, relying on interpersonal influence (42).

Table 14. Comparison of participating style with other style of leadership

Effect	Selling (B, significance)	Telling (B, significance)	Delegating (B, significance)
Intercept	-1.351 (0.205)	-1.408 (0.159)	-0.539 (0.535)
Gender	1.249 (0.022*)	0.682 (0.047*)	-0.226 (0.048*)
Previous education	0.300 (0.557)	0.490 (0.280)	-0.159 (0.704)
Decision making	-0.549 (0.407)	-0.039 (0.954)	-0.240 (0.653)
Taking lead	0.022 (0.967)	-0.233 (0.616)	0.339 (0.401)
Order of birth	-0.061 (0.030*)	-0.248 (0.039*)	-1.225 (0.001**)
Locus of control	-0.680 (0.043*)	-0.645 (0.045*)	-0.750 (0.042*)
Future goal	0.036 (0.877)	-0.133 (0.534)	0.412 (0.032*)

**: statistically significant at 1 % level of probability, *: statistically significant at 5 % level of probability.

The significant effect of locus of control reflects that internally oriented leaders tend to rely on self-driven motivation to influence others rather than seeking consensus. For the telling style vs participating style, gender (p = 0.047), order of birth (p = 0.039) and locus of control (p = 0.045) again emerged significant at the 5 % LOS. These results highlight that males and early-born individuals with strong internal control tendencies prefer directive, instruction-based leadership styles (43). The telling style involves providing clear commands and maintaining authority, contrasting the participating style, which emphasizes group interaction and decision-sharing (44, 45). Thus, leaders who exhibit higher control beliefs and assertive communication tend to move away from participative approaches toward directive ones when authority and control are prioritized.

Delegating style vs participating style showed that gender (p = 0.048), locus of control (p = 0.042) and future goal orientation (p = 0.032) were statistically significant at 5 % LOS, while order of birth (p = 0.001) was significant at 1 % LOS. This combination reveals that first-born leaders with internal control and long-term goal orientation are more likely to adopt a delegating leadership style. Compared with the participating style, where leaders involve subordinates in decision-making, the delegating style reflects higher trust and empowerment of team members. The significance of locus of control at the 5 % LOS confirms that leaders with strong internal control beliefs are confident in transferring responsibility to others, reinforcing autonomy and self-regulation within teams.

Participating and delegating leadership styles are higher among agricultural students because agricultural education in India promotes teamwork, collaboration and student-led learning. This training naturally encourages shared decision-making and cooperative problem-solving, which are central to participative leadership. Delegating leadership is also common because agricultural programs require students to independently manage field tasks, projects and practical activities. This builds confidence, self-efficacy and an internal locus of control traits linked with participative and delegative styles.

Conclusion

The study revealed clear variations in leadership behaviour among postgraduate agricultural students, confirming that leadership tendencies differ significantly across individuals. A dominant preference for the participating leadership style indicates that students are inclined toward collaborative and relationship oriented approaches, which align well with the cooperative foundations of the agricultural sector. Results from the multinomial logistic regression analysis identified gender, birth order and locus of control as significant predictors of leadership style. Male and first-born students exhibited a stronger inclination toward directive and delegating styles, reflecting higher confidence and self-reliance, whereas female and later-born students tended toward participative leadership, emphasizing empathy, teamwork and shared responsibility. The significant role of locus of control underscores its psychological importance in shaping leadership adaptability.

Students with a strong internal locus of control demonstrated greater initiative, resilience and readiness to assume leadership roles. Therefore, leadership development in agricultural education must adopt a more targeted and competence-based approach, incorporating interventions aligned with these influencing factors. Strategies that build self-efficacy, resilience, communication skills, teamwork and independent decision-making should be prioritized. Given the prevalence of participating and delegating styles, educational programs should integrate experiential learning, including student-managed farms, village extension practicums, FPO-based internships and simulation-driven agribusiness projects. These activities can enhance practical leadership capacity and better prepare graduates for future roles in agricultural innovation, extension services, FPO management and agri-entrepreneurship.

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Authors' contributions

S and DR carried out the research. DR, EC and BL taken the observations from student respondents on leadership at different stages. S and DR analysed the data. The manuscript was prepared by S, DR, BL and KSB; revised by CTS, EC and S; and submitted by DR and S. All authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

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Declaration of generative AI and AI-assisted technologies in the writing process

ChatGPT was used for writing discussion portion of results (in some areas) but Tables and figures were drawn based on the collected data and analysis.

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