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# Assessing the Impact of Agricultural Reforms and Financial Support Mechanisms on Growth, Productivity and Farmer's Welfare: An Empirical Study

Abilash KM*
*(Assistant Professor, Department of MBA, Holy Grace Academy of Management Studies, Thrissur, Kerala.
Email: abilashraji@gmail.com)

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## Abstract:

Agriculture has always been the backbone of the Indian economy, playing a vital role in employment generation, food security, and economic development. The study assesses the impact of farmer's perception on agricultural initiatives, technology adoption and efficiency, technology barriers and financial support mechanisms elevates agricultural growth, productivity, and farmer's welfare. In this study, both descriptive and analytical research design were employed. A standardized questionnaire was administered to 189 respondents to collect primary data and secondary data obtained from various sources. The collected data were analysed using descriptive statistics, factor analysis, correlation analysis and multi regression analysis. The study was conducted in Thrissur district of Kerala, and the data were collected over a period of October 2024 to October 2025 using a researcher assisted survey method to ensure clear understanding of the questionnaire by farmer respondents. Correlation analysis revealed significant positive relationship among farmers' perception of agricultural growth indicators. The regression results indicated that technology support mechanisms play a crucial role in enhancing farmer welfare. Conversely, barriers to technology adoption were found to have a negative impact on farmer welfare.

*Keywords* — Agricultural reforms, Financial support mechanisms, Technology Adoption, Farmer welfare.

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## I. INTRODUCTION

Globally, Indian economy ranks as the sixth largest in the world, with agriculture serving as a backbone for the livelihood of a majority of the population. It not only contributes to GDP but also plays a vital role in shaping rural India with over 45% of the workforce employed in agriculture, and the sector underpins rural livelihoods. (Hassan, 2025) India produces a wide variety of agricultural products because of its diverse climate and soil. They are usually grouped into food crops, like cereals and pulses, cash crops like sugarcane, rubber, cotton and others, oilseeds like sunflower, groundnut, coconut and others, plantation crops like, tea, coffee, and others, horticultural crops like fruits and vegetables, spices like pepper, cardamom, ginger and others. While there have been significant improvements happen in the past decades, the sector continues to grapple with a complex web of challenges such as environmental threats, fragmented landholdings, limited technology adoption, and policy hurdles. Rising temperatures, erratic monsoons, extended dry spells and unseasonal rains directly lower crop yields by including heat stress, disrupt and damage grains at maturity. According to NITI Aayog report, employing 45.8% of the national workforce and producing nearly 1 billion tons of food annually, the sector underpins employment generation, national health outcomes, and inclusive economic growth. Over the last decade, agriculture and allied

sectors have witnessed a steady 3-5% CAGR, fuelled by extensive government efforts, private innovations, and sizeable domestic demand. Despite its contribution been approximately with 14% to the country's total GDP, the agriculture sector faces a continuous decline and this paradox highlights the

need to explore agriculture current challenges, its pivotal role in the economy and opportunities for revitalization. The revolutionary change has brought in Kerala with the ambitious project aiming to provide farmers with a unified platform to access critical information, optimize their practices and enhance productivity, this platform will house an array of tools and services designed to address the unique needs of farmers. The '***Kathir app'*** a pioneering initiative poised with ground-breaking feature focus on climate-based crop planning, integrating climate drop into crop selection processes, also helps farmers to choose the most suitable crops for their specific regions and conditions, promotes sustainable practices by facilitating carbon credit opportunities, customized dashboard offering personalized insights and data visualization will streamline processes such as farmer registration, recordkeeping and benefit distribution make easier for farmers to access the support they need.(Kumar 2024) The another initiative has launched to promote commercial farming is '***Nawodhan***' a project aimed at leveraging unutilised or underutilised land resources in Kerala for commercial farming practices include horticulture, hydroponics, protected cultivation, precision farming, hi-tech intercropping, mushroom cultivation apiculture, crop husbandry and allied sectors. (Kuruvilla 2024) Furthermore, access to agricultural credit contributes significantly to sustainable agricultural development by allowing farmers to implement climate-resilient and environmentally sustainable practices, improve productivity and competitiveness, and support broader socio-economic progress (Galdeano-Gomez et al. 2013: Reddy et al.,2020). Availability of credit is also essential for advancing farm modernization and commercialization, as well as for ensuring optimal resource utilization which in turn strengthens food security and long-term agricultural sustainability (Chaiya et al., 2023; Jaleta et al. 2019)

**Objectives of study**

a) To identify and critically examine major agricultural initiatives and reforms implemented by the government.

b) To analyse the impact of selected agricultural initiatives on agricultural growth with special reference to crop productivity, farm income, technology adoption and efficiency in agricultural practices.

c) To study the role of financial support mechanisms such as credit facilities, subsidies, crop insurance schemes, and income support programs in promoting stability and farmer welfare.

**Hypothesis of study**

a) H1: Perception of agricultural initiatives significantly influences agricultural growth and productivity.

b) H2: Technology adoption and efficiency significantly influence agricultural growth and productivity.

c) H3: Barriers to technology adoption negatively influence farmer's welfare.

d) H4: Financial support mechanisms significantly influence farmer welfare

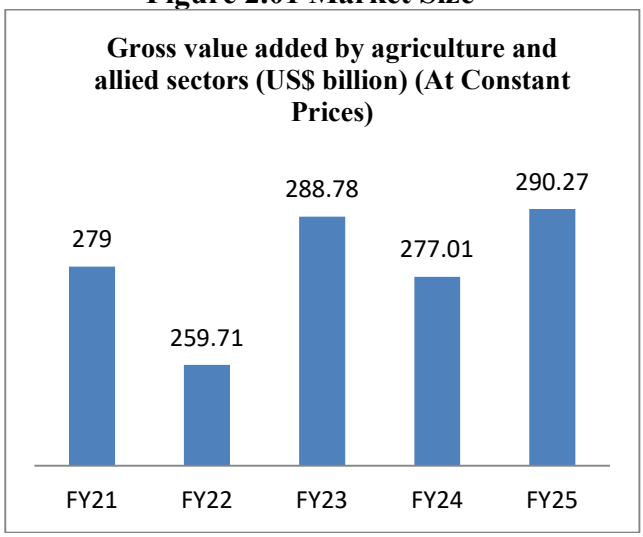
## II. LITERATURE REVIEW

From the reports of IBEF, in the past decade, India's agricultural output has expanded significantly in by recording 40% growth and achieving surplus capacity for exports. In FY25, the sector grew by 5.4% year on year supported by record production and higher trade volumes. India's food grain output for 2024-25 is expected at a record 3539.59 LMT up 6.5% from 2023-24.

As of September 2025, area sown under kharif crops reached 110.5 million hectares compared to 107.8 million hectares during the same period last year. Technology is reshaping the sector. India's smart agriculture market, valued at Rs. 6,033 crore (US$714.1 million) in 2024 is projected to grow at a CAGR of 20.54% to Rs. 33,325 crore (US$3837.6 million) by 2033. Precision farming, digital platforms and automation are driving this shift, enabling higher efficiency and productivity across the agricultural value chain. Below figure 2.01 illustrates the trend in gross value added by agriculture and allied sectors, while figure 2.02 present the area sown under kharif and rabi crops respectively.

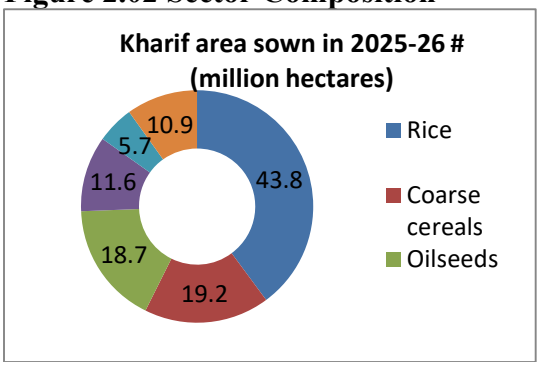
  

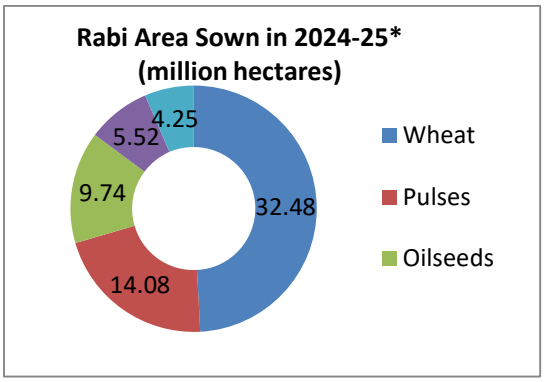
**Figure 2.01 Market Size**




Source: IBEF

**Figure 2.02 Sector Composition**




Source: IBEF

**Perception of agricultural initiatives**: Farmer's perception of climate extremes such as flood drought, cyclone, frost and extreme hotness have been captured distinctively through five categories like no impact, low, medium, high and very high impact. The sample farmers expressed their choices for these strategies based on the perception of climate change or variability and their farming practices Agricultural adaptation varies by time(short-term and long-term) and scale (farm level, regional level, national level) and types. Change in farm management practices involve crop diversification, shortening or lengthening of growing seasons, changing planting dates, altering land under cultivation, and increase/decrease the use of irrigation. (Kumar & Gupta 2021)

**Technology adoption and efficiency:** The adoption of innovations is instrumental in promoting sustainable agricultural models, as precision farming enables efficient soil management practices and contributes to improvements in agricultural product quality. (Invivo, 2016) Precision agriculture, an advanced approach to farming that employs technological tools to enhance agricultural efficiency, has experienced substantial growth in adoption in recent years. The increasing use of GPS enabled tractors reflects this development, allowing farmers to perform operations with greater accuracy and efficiency. Such tractors can be programmed to follow predetermined paths and apply agricultural inputs, including fertilizers and pesticides, only in required areas, thereby minimizing resource wastage and improving crop productivity. Moreover, the growing application of remote sensing technologies equips farmers with essential information on crop conditions, soil moisture status and other key variables, supporting data driven decision making related to input management. (Keskin, 2016)

**Financial support mechanisms**: Anand and Sha (2020) investigated the significance of agricultural subsidies in India, the study shows that the agriculture subsidy was helpful for the growth of the agriculture sector but the some mismanagement, corruption and hurdle in the distribution system make it difficult to reach the benefit to the real beneficiary. Subsidies play a complex role in achieving the sustainable development goals (SDGs), while they can assist the transition to sustainability, their impact can be negative, particularly in the case of financial subsidies for self-help groups (Pati, 2009) Mostly, the effectiveness of subsidies depends upon the design and implementation, if it not been properly structured, it might turn into both beneficial and harmful to the environment. (Heyl et al. 2022)

**Impact on agricultural growth:** Many conventional agricultural products are increasingly unable to satisfy the rising demand of enterprises and consumers. In particular, large-scale agribusiness firms require consistent supplies of high-quality agricultural inputs for efficient production. However

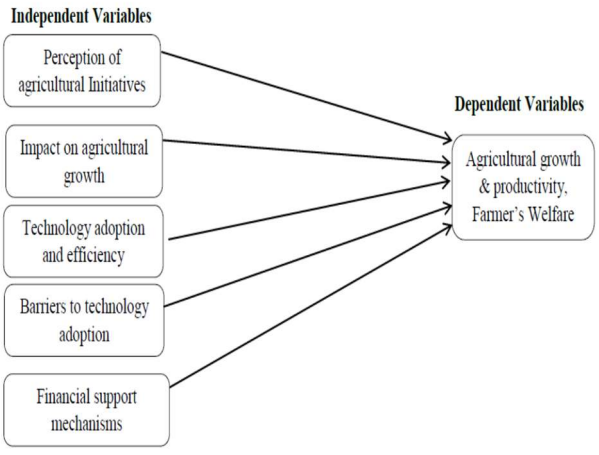
  

traditional agricultural outputs often suffer from limited market acceptance or low market share, which constrains production efficiency and restricts growth in farmers' income. The situation reflects a structural mismatch between agricultural supply and market demand. (Lin et al.2017)

## III. RESEARCH METHODOLOGY

The study is based on primary data are considered appropriate for capturing perceptions, attitudes and behavioural responses related to policy initiatives and support mechanisms along with secondary data inputs collected from research articles, newsletters, websites, social media and various government websites. (Kothari, 2004) The study employed a convenience sampling technique due to constraints related to accessibility, time, and the absence of a comprehensive sampling frame of farmers. So, this allows the researcher to collect data efficiently from farmers who are readily accessible and willing to participate, ensuring timely completion of the field survey. (Etikan, Musa & Alkassim, 2016) Although the questionnaire was originally prepared in English, special care was taken to ensure that all respondents clearly understood the questions. The survey was conducted using a researcher-assisted approach wherein the questions were explained and wherever necessary, verbally translated into the local language to facilitate better comprehension. Data was collected from 189 respondents during the period October 2024 to October 2025. The sample size was considered adequate for applying multivariate statistical techniques such as reliability analysis, factor analysis, correlation and regression.

**Conceptual Model**




## IV. DATA ANALYSIS

From the table 4.1, the reliability analysis of the questionnaire yields a cronbach's alpha value of 0.909 for 22 items, indicating excellent internal consistency among the scale items. A cronbach's alpha value greater than 0.90 suggests that the items included in the instrument are highly consistent in measuring underlying constructs, namely perception of agricultural initiatives, technology adoption, barriers to adoption, financial support mechanisms and related outcomes. The high level of reliability confirms that the questionnaire items are well-correlated and stable, thereby ensuring the dependability of the collected data.

**4.1 Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .909 | 22 |

From the table 4.2, the mean age score of respondents is 2.37 (SD=0.83) indicating that the majority of farmers belong to the middle category, suggesting a relatively active and economically productive farming population. The educational level shows a mean value of 1.84 (SD=0.94) which reflects that most respondents possess lower to moderate levels of formal education, highlighting the need for simplified and accessible communication of agricultural initiatives. Tenant farming records a low mean value of 1.25 (SD=0.44) indicating that a significant proportion of respondents are non-tenant or owner cultivators. The type of lease has a mean score of 1.80 (SD=0.80) suggesting limited diversity in lease arrangement among tenant farmers. Respondents exhibit a moderate to high level of awareness of major government agricultural schemes. Awareness of PM-KISAN records the highest mean score of 3.27 (SD=0.93) indicating that most farmers are moderately to fully aware of this income support scheme. Similarly awareness of Pradhan Mantri Fasal Bima Yojana (PMFBY) shows a mean of 3.04 (SD= 0.89) suggesting reasonably good awareness of crop insurance schemes. Awareness of the Kisan Credit Card (KCC) scheme also reflects a comparable level with a mean score of 3.06 (SD=0.93) indicating that farmers are generally informed about institutional credit facilities. Awareness of input subsidies such as fertilizer, seed, and electricity assistance shows a mean value of 3.16

(SD=0.82) reflecting widespread knowledge and utilization among respondents.

Among various sources of information media and internet platforms emerge as the most influential source with a mean score of 2.96 (SD= 1.04) followed by banks (Mean = 2.85, SD = 1.13) and fellow farmers (Mean = 2.82, SD = 1.15). These findings suggest that digital media, financial institutions, and peer networks play a critical role in disseminating scheme-related information. Government officials report a relatively lower mean score of 2.30 (SD= 1.14), indicating limited direct interaction or outreach effectiveness at the grassroots level. Co-operative societies also show a moderate influence with a mean value of 2.61 (SD = 1.13) suggesting scope for strengthening their role in information dissemination.

**4.2 Descriptive Statistics**

| | N | Mean | Std. Deviation |
|---|---|---|---|
| Age | 189 | 2.370 | .8318 |
| Educational Level | 189 | 1.841 | .9375 |
| Tenant farming | 189 | 1.254 | .4364 |
| Type of lease | 189 | 1.804 | .8048 |
| Awareness of schemes (PM1) | 189 | 3.270 | .9261 |
| Awareness of Schemes (PMFBY2) | 189 | 3.042 | .8922 |
| Awareness of Schemes (KC3) | 189 | 3.058 | .9293 |
| Input subsidies (IS4) | 189 | 3.159 | .8227 |
| Govt officials (GO1) | 189 | 2.302 | 1.1388 |
| Media/ Internet (MI2) | 189 | 2.958 | 1.0408 |
| Fellow farmers (FF3) | 189 | 2.815 | 1.1544 |
| Co-operative societies (CS4) | 189 | 2.608 | 1.1323 |
| Bank (BK1) | 189 | 2.847 | 1.1264 |
| Valid N (list wise) | 189 | | |

From the table 4.3, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for the study is 0.873 which exceeds the recommended minimum threshold of 0.60. A KMO value above 0.80 is considered meritorious, indicating that the sample size is adequate and that the correlations among variable are sufficiently compact to yield reliable and distinct factors. Further, Bartlett's test of Sphericity is statistically ($\chi^2$ = 3023.73, df= 231, p<0.001) rejecting the null hypothesis that the correlation matrix is an identity matrix. This confirms that significant relationship exist among the variables, making the data appropriate for factor analysis.

**4.3 KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .873 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 3023.731 |
| | df | 231 |
| | Sig. | .000 |

From the table 4.4, total variance shows that four components have eigenvalues greater than 1 (i.e. 8.271, 3.197, 2.350, 1.579), which is consistent with Kaiser Criterion for factor retention. The remaining components from 5 to 22 have eigenvalues less than 1 and individually explain marginal proportional of variance and therefore were not retained for further analysis.

**4.4 Total Variance**

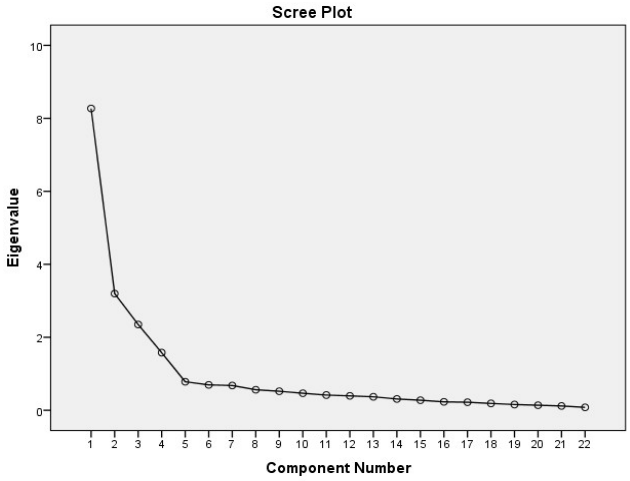
| Component | Initial Eigenvalues | | |
|---|---|---|---|
| | Total | % of Variance | Cumulative % |
| 1 | 8.271 | 37.596 | 37.596 |
| 2 | 3.197 | 14.531 | 52.127 |
| 3 | 2.350 | 10.683 | 62.811 |
| 4 | 1.579 | 7.176 | 69.986 |
| 5 | .782 | 3.553 | 73.539 |
| 6 | .695 | 3.161 | 76.700 |
| 7 | .679 | 3.087 | 79.787 |
| 8 | .562 | 2.556 | 82.343 |
| 9 | .521 | 2.367 | 84.710 |
| 10 | .467 | 2.122 | 86.832 |
| 11 | .416 | 1.893 | 88.725 |

| | | | |
|---|---|---|---|
| 12 | .394 | 1.792 | 90.516 |
| 13 | .370 | 1.680 | 92.197 |
| 14 | .309 | 1.406 | 93.603 |
| 15 | .276 | 1.254 | 94.857 |
| 16 | .231 | 1.052 | 95.909 |
| 17 | .220 | 1.001 | 96.911 |
| 18 | .187 | .852 | 97.763 |
| 19 | .157 | .712 | 98.475 |
| 20 | .138 | .628 | 99.103 |
| 21 | .117 | .533 | 99.636 |
| 22 | .080 | .364 | 100.000 |

The scree plot illustrates the relationship between the component number and corresponding eigenvalues obtained from exploratory factor analysis. As shown in the figure, there is sharp decline in eigenvalues from component 1 to component 4 followed by a distinct flattening of the curve from component 5 onwards. This indicates that the first four components account for a substantial proportion of the total variance, while the remaining components contribute only marginal and progressively smaller amounts of variance.

**Figure 4.1 Scree plot**




Correlation matrix reveals a consistent and statistically significant pattern of relationships among the study variables, supporting the theoretical framework of the research.

**H1: Relationship between perception of agricultural initiatives and agricultural growth**

The results reveal that all perception related items (PAI-PAI5) exhibit positive and statistically significant correlations with agricultural growth indicators (IAG1-IAG4) with correlation coefficients ranging from r=0.157 to r=0.816 ($p < 0.01$). This indicates that farmers who perceive government agricultural initiatives as clear, relevant and effectively implemented tend to report higher levels of crop productivity, income improvement and risk reduction.

**H2: Relationship between Technology adoption and Agricultural growth**

Technology adoption and efficiency variables (TAE1-TAE4) show moderate to strong positive correlations with agricultural growth indicators (IAG1-IAG4) with coefficients ranging from r = 0.169 to r = 0.893 ($p<0.01$). The strongest correlations are observed between advanced technology usage (TAE3 and TAE4) and productivity related outcomes, indicating that increased adoption of modern agricultural technologies contributes to higher efficiency, better decision making and enhanced agricultural output.

**H3: Relationship between Technology adoption and Barriers to technology adoption**

Barriers to technology adoption (BTA1-BTA3) show strong positive correlations among themselves (r = 0.621 to r = 0.685, $p < 0.01$) confirming internal consistency of the barrier construct. Additionally BTA variables exhibit strong correlations with technology adoption variables (TAE1-TAE4) with coefficients ranging from r = 0.564 to r = 0.770 ($p < 0.01$). This suggests that as awareness of technological challenges increases such as cost, lack of training, and information gaps- the perceived constraints on farmer welfare also increase. Although correlation does not imply causation, the results provide directional evidence supporting H3, indicating that barriers to technology adoption are closely associated with reduced farmer welfare.

**H4: Relationship between Financial support mechanisms and Farmer welfare**

Financial support mechanism variable (FSM1-FSM6) demonstrate moderate to strong positive correlations with both agriculture growth and farmer welfare indicators, with coefficients ranging from r=0.231 to r=0.826 ($p<0.01$). Strong correlations are observed between access to institutional credit, subsidies and insurance schemes and improved economic conditions investment in better farming practices and enhanced welfare.

**Table 4.5 Summarized table of Correlation matrix**

| Construct pair | Correlation range | Sig. | Interpretation |
|---|---|---|---|
| PAI - IAG | 0.46-0.82 | p<0.01 | Strong positive association indicating effective policy perception leads to better agricultural outcomes. |
| TAE - IAG | 0.22-0.89 | p<0.01 | Technology adoption plays a critical role in improving agricultural productivity |
| BTA - Welfare | 0.56-0.77 | p<0.01 | Barriers significantly constrain farmer welfare and technology effectiveness |
| FSM - Welfare | 0.23-0.83 | p<0.01 | Financial inclusion and support mechanisms positively impact farmer welfare |

From the table 4.6, a multiple regression analysis was conducted to examine the influence of technology adoption and efficiency (TAE1-TAE4) on barriers to technology adoption (BTA1). The model summary indicates a strong relationship between the predictors and the dependent variable, with an R value of 0.796. The $R^2$ value of 0.633 reveals that 63.3% of the variance in barriers to technology adoption (BTA1) is explained by the four technology adoption variables. The adjusted $R^2$ (0.625) further confirms the robustness of the model after adjusting for the number of predictors. The Durbin-Watson statistic of 2.106 suggests the absence of autocorrelation, indicating that the regression assumptions are satisfactorily met.

**Table 4.6 Model Summary[b]**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|---|---|---|---|---|---|
| 1 | .796[a] | .633 | .625 | .4128 | 2.106 |

a. Predictors: (Constant), TAE4, TAE1, TAE2, TAE3

b. Dependent Variable: BTA1

From the table 4.7, the anova results demonstrate that the regression model is statistically significant ($F=79.415$, $p < 0.01$), confirming that the set of independent variables collectively exerts a significant influence on barriers to technology adoption. This validates the overall fitness of the regression model.

**Table 4.7 ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 54.122 | 4 | 13.530 | 79.415 | .000[b] |
| | Residual | 31.349 | 184 | .170 | | |
| | Total | 85.471 | 188 | | | |

a. Dependent Variable: BTA1

b. Predictors: (Constant), TAE4, TAE1, TAE2, TAE3

From the table 4.8, the co-efficient table reveals that TAE1 (use of modern agricultural technologies) and TAE4 (access to digital platforms and mobile applications) have a positive and statistically significant impact on barriers to technology adoption. Among them, TAE4 emerges as the strongest predictor ($\beta = 0.676$, $p < 0.001$) indicating that digital technology related aspects play a dominant role in shaping perceived barriers. TAE1 also significantly influences barriers ($\beta = 0.265$, $p < 0.001$) suggesting that increased engagement with modern technologies is associated with heightened awareness of practical and operational constraints. In contrast, TAE2 and TAE3 do not show a statistically significant effect on barriers, indicating that improvements in efficiency and cost reduction alone may not substantially alter perceived adoption barriers

**Table 4.8 Co-efficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | (Constant) | .796 | .191 | | 4.176 | .000 |
| | TAE1 | .249 | .069 | .265 | 3.637 | .000 |

| | | | | | |
|---|---|---|---|---|---|
| TAE2 | .034 | .083 | .036 | .415 | .679 |
| TAE3 | -.129 | .098 | -.136 | -1.311 | .192 |
| TAE4 | .655 | .103 | .676 | 6.379 | .000 |

a. Dependent Variable: BTA1

## V. FINDINGS & SUGGESTIONS

The analysis reveals several important insights into farmer's awareness, perception technology adoption, barriers and financial support mechanisms related to government agricultural initiatives. The descriptive statistics indicate that farmers exhibit moderate to high level of awareness of major agricultural schemes such as PM-KISAN, PMFBY, Kisan Credit card, and input subsidies, suggesting effective penetration of flagship government programs. However awareness level vary across information sources, with media, internet platforms, banks and fellow farmers emerging as the dominant channels, while government officials and cooperative societies play a relatively limited role in information dissemination. The reliability analysis confirms the high internal consistency of the measurement items reliability measure the underlying constructs. The factor analysis results further validate the instrument as the KMO value of 0.873 and significant Bartlett's Test of Sphericity confirm the suitability of the data for factor analysis. Four meaningful factors were extracted- perceptions of agricultural initiatives, technology adoption and efficiency, barriers to technology adoption, and financial support mechanisms- which together explain approximately 70% of the total variance, demonstrating strong construct validity. The correlation analysis reveals positive and significant relationships among perception of agricultural initiatives, technology adoption, agricultural growth, and financial support mechanisms. The absence of excessively high-inter construct correlations indicates that multi-collinearity is not a concern, thereby supporting the use of regression analysis. The regression results shows technology adoption and efficiency significantly explain variations in perceived barriers to technology adoption, with digital platforms and modern agriculture tools emerging as the strongest predictors. While increased technology use enhances efficiency, it also raises farmers' awareness of practical challenges such as cost, training, and operational complexity. However, the researcher has some suggestions to improve the effectiveness of agricultural initiatives. It is recommended to enhance digital literacy and training should be provided to farmers effectively utilize mobile application, precision tools and online advisory services; leverage peer networks and cooperatives should be strengthened as they can act as trusted intermediaries for sharing best practices, technology usage and scheme related information; subsidies and financial incentives should be expanded for modern agricultural technologies to make them affordable for small and marginal farmers thereby reducing adoption barriers; banks and financial institutions should simplify procedures related to crop insurance and agricultural credit, ensuring timely disbursement and wider coverage to protect farmers from financial risks; government officials and agricultural extension workers should play a more proactive role in disseminating information through field visits, demonstrations, and localized training programs, especially for farmers with lower educational levels.

## VI. CONCLUSION

The study concludes that government agricultural initiatives have achieved considerable awareness among farmers, and positive perceptions of these initiatives are closely associated with improved agriculture practice, technology adoption and farmer welfare. The empirical evidence the confirms that technology adoption and financial support mechanisms play a crucial role in agricultural growth while barriers to adoption continue to moderate the benefits of technological advancements. Overall, the study provides valuable insights for policymakers, agricultural departments, and financial institutions in designing farmer-centric and technology enabled agricultural policies. The study is limited within the thrissur district, and the inclusion of a restricted set of variables. So, these factors may limit the generalizability and causal interpretation of the findings

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