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CROP DIVERSIFICATION IN HARYANA: ADOPTION PATTERNS AND ASSOCIATION WITH SOCIO-ECONOMIC CHARACTERISTICS OF FARMERS

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ABSTRACT

Crop diversification is increasingly promoted as an effective strategy for enhancing agricultural sustainability, improving farm income, reducing production risks and ensuring efficient utilization of natural resources. Haryana's agriculture has long been dominated by rice wheat monoculture, which has contributed to problems such as lowering water table, declining soil fertility and increasing input costs. In this context, crop diversification has emerged as viable alternative for achieving sustainable agricultural development. The present study was conducted to assess the adoption level of crop diversification practices among farmers and to examine the association between socio-economic characteristics and adoption levels. The study was carried out in selected villages of Haryana using a sample of 320 farmers selected through a multistage sampling technique. Data was collected through a structured interview schedule and analysed using frequency, percentage, mean score, weighted mean score and chi-square tests. Adoption of crop diversification was measured through a comprehensive adoption scale comprising major diversification related agricultural practices. The findings revealed that a majority of the respondents belonged to medium adoption category, followed by high and low adoption categories. Farmers showed relatively higher adoption of crop rotation, inclusion of pluses and oilseed and cultivation of fodder crops, whereas adoption of high value horticultural and integrated diversification enterprises was comparatively lower. The analysis further revealed that socio-economic variables such as education, operational land holding, annual income, extension contact, social participation, mass media exposure and socio-economic status were significantly associated with adoption of crop diversification. The study highlights the importance of strengthening extension services, improving market infrastructure, enhancing awareness programmes and promoting supportive policies to accelerate crop diversification. Increased adoption of diversified farming systems can contribute significantly to agricultural sustainability, resource conservation, income enhancement and livelihood security of farming household in Haryana.

Keywords **:** Crop diversification, adoption, socio-economic characteristics, sustainable agriculture, Haryana, farmers.

Introduction

Agriculture continues to play a vital role in the economy of India, providing livelihood opportunities to a substantial proportion of the rural population. The coming of the monsoon ensures that agriculture remains the primary occupation of the majority of the population of India. In Haryana, agriculture has been the backbone of the rural development and food security since Green Revolution. The state has achieved remarkable growth in agricultural production through the widespread adoption of high yielding varieties, irrigation facilities, fertilizers and mechanization. However, the predominance of the rice wheat monoculture over several decades has resulted in numerous ecological, economic and social challenges i.e. groundwater depletion, soil degradation, declining factor productivity, increasing input costs and reduced farm profitability (Paroda, 2022).

Crop diversification has emerged as an important strategy for addressing these challenges and promoting sustainable agricultural development. Crop diversification refers to the practice of cultivating a

wider range of crops and agricultural enterprises to improve farm income, reduced input costs, enhance resource use efficiency (Joshi *et al*., 2007; Kumar *et al*., 2012a; Sharma, 2011) and strengthen resilience against climatic uncertainties (Sahoo & Behera, 2025). Diversified farming systems have been reported to improve biodiversity, environmental sustainability and economic stability at the farm level (Dasgupta & Bhaumik, 2014; Hufnagel *et al*., 2020).

In India, crop diversification has gained increasing policy attention as a means of improving farmers' livelihood and reducing dependence on cereal based crop cultivation. Diversification towards pulses, oilseed, fruits, vegetables, fodder crops and other high value enterprises has been recognised as a pathway for achieving sustainable agricultural growth and nutritional security (Bharne *et al*., 2025; Mukherjee & Chattopadhyay, 2017). Furthermore, diversified farming systems contribute to income stabilization by reducing the adverse effects of market fluctuations and climatic risks (Neogi & Ghosh, 2022).

From a sociological perspective, crop diversification is not merely a change in cropping pattern but a process that influences the socio-economic conditions of farming households. Adoption of diversified cropping patterns affects employment generation, household income, social participation, access to information, decision making behaviours and interaction with agricultural institutions. The extent of diversification adopted by farmers is often influenced by socio-economic factors such as education, landholding, family characteristics, extension contact, access to markets and mass media exposure (Aheibam & Singh, 2017; Birthal *et al*., 2015).

Recognizing the adverse consequences of excessive dependence on water guzzling crops, both Government of India and Government of Haryana have introduced several initiatives to promote diversification through financial incentives, extension support, market interventions and resource conservation programmes. Nevertheless, the adoption of diversified cropping pattern remains uneven across regions and categories of farmers due to constraints such as market uncertainty, inadequate technical knowledge and limited institutional support (Aditya *et al*., 2017; Jha *et al*., 2017).

Although numerous studies have examined the economic and environmental dimensions of crop diversification, relatively limited attention has been given to understanding its sociological appraisal is necessary to understand the adoption, determinants and impact of crop diversification among farming household.

Objectives

1. Assess adoption level of crop diversification practices.
2. Examine association between socio-economic variables and adoption level.

Material and Method

The present study was conducted in Haryana state during the agricultural year 2024-25 to assess the adoption of crop diversification practices among farmers and examine their association with selected socio-economic characteristics. Haryana was selected purposively due to the growing importance of crop diversification in addressing challenges related to groundwater depletion, declining profitability of traditional cropping systems and sustainable agricultural development.

A multistage sampling design was employed for the selection of respondents. Haryana state was divided into two agroclimatic zones (Malik *et al*., 2023) for the purpose of the study. Two districts were selected randomly from each agro-climatic zone namely Karnal and Kaithal from north eastern zone and Hisar and Bhiwani from South western zone, resulting in a total of four districts. Further, two blocks were selected randomly from each selected district namely Nilokheri and Karnal from Karnal, Kalayat and Kaithal from Kaithal, Tosham and Siwani from Bhiwani and Hisar Block I and Hisar Block II from Hisar district. From each selected block, four villages were chosen randomly. Thus, a total of 32 villages were included in the study.

From each selected village, 10 progressive farmers were selected randomly, constituting a total of 320 respondents. The respondents formed the unit of analysis for the study. Primary data was collected through a well-structured and pre tested interview schedule. The schedule was prepared after an extensive review of literature, consolation with experts and consideration of the objectives of the study. Personal interviews were conducted to collect information regarding socio-economic characteristics and adoption of crop diversification practices.

The independent variables selected for the study were age, caste, education, family type, family size, operational landholding, annual family income, occupation, social participation, mass media exposure, extension contact and socio-economic status. Adoption of crop diversification practices was treated as the dependent variable.

An adoption scale consisting of recommended crop diversification practices was developed top assess the extent of adoption among respondents. Appropriate scores were assigned to each practice according to the level of adoption. Based on the total adoption score obtained by the respondents, they were categorised into low, medium and high adoption groups using cumulative frequency distribution and suitable statistical procedures.

The collected data was than coded, classified, tabulated and analysed using appropriate statistical techniques. Descriptive statistics such as frequency and percentage were used to describe the adoption patterns of crop diversification practices and the distribution of respondents according to adoption level. The chi-square test (χ^2) and contingency coefficient were employed to determine the association between socio-economic characteristics and the adoption level of crop diversification practices.

Results and Discussion

The adoption pattern of crop diversification practices among farmers was assessed across different dimensions, namely soil and land preparation, irrigation and water management, nutrient and soil fertility management, intercropping and system intensification, timely sowing and establishment, variety and crop choices, market driven decisions, tree and land-based diversification, resource and investment management, risk and resilience and institutional support.

The findings revealed considerable variation in the adoption of different crop diversification practices. Under soil and land preparation, a large majority of the respondents (80.94%) fully adopted land levelling practices to improve cropping efficiency, indicates wide spread awareness regarding the importance of proper field preparation. Similarly, more than half of the farmers (54.38%) consistently prioritized climate resilient varieties, while 71.25 per cent were partially prepared to adopt diversification practices. However, more than half of the respondents (52.19%) reported no openness towards major cropping changes, reflecting a degree of reluctance in shifting from traditional cropping systems.

In the domain of irrigation and water management, nearly half of the respondents (49.38%) fully adopted irrigation scheduling according to crop requirements. However, adoption of water saving technologies remained limited, with only 14.06 per cent of farmers reporting full adoption, while majority (75.63%) reported partial adoption. This suggests that although farmers recognize the importance of efficient water management, complete adoption of advanced technologies remains constrained. Similar observations were reported by Choudri *et al*. (2013), who emphasized that efficient water management remains a major challenge in diversified farming systems.

Regarding nutrient and soil fertility management, a substantial proportion of respondents (71.88%) fully adopted nutrient application practices. Nevertheless, only 14.06 per cent fully adopted soil testing for nutrient management decisions, indicating a gap between recommended and actual nutrient management practices. Similar findings were reported by Sahoo & Behera (2025), who observed that diversified farming systems often face constraints related to scientific soil management practices.

Under intercropping and system intensification, most respondents reported partial adoption of scientifically selected intercropping combinations (58.44%) and complementary crop integration (83.75%). Likewise, 80.31 per cent of respondents partially adopted spatial diversification practices, suggesting moderate acceptance of diversification strategies. Similar findings were reported by Mandal & Bezbaruah (2013), who observed gradual adoption of intercropping and diversified cropping systems among farming households.

With respect to variety and crop choices, adoption levels were comparatively higher. A large majority of respondents (83.75%) fully adopted improved crop varieties, while 52.19 per cent fully adopted high value crops. Nearly half of the respondent farmers (47.81%) preferred crops suited to local climatic conditions. These findings support earlier observations that improved varieties severe as an important entry point for diversification among farming household (Birthal *et al*., 2015).

Market oriented diversification practices showed moderate adoption. More than two thirds of the respondents partially followed market trends (68.75%) and demand-based crop selection (74.38%). However, only 12.19 per cent fully adjusted crop choices according to market prices, indicating the continued dominance of production-oriented decision making over market-oriented planning. Aditya *et al*. (2017) also reported that market awareness and price expectations significantly influence diversification decisions among farmers.

The adoption of sustainable agricultural practices showed mixed results. More than half of the respondents (52.19%) fully adopted organic practices, while 45.63 per cent fully adopted soil conservation measures. However, 39.38 per cent reported no

adoption of practices aimed at reducing chemical dependency, highlighting an important area for future extension interventions. Dasgupta & Bhaumik (2014) similarly highlights the importance of sustainable resource management for successful crop diversification.

Cropping system diversification practices revealed encouraging trends. Seventy per cent of the respondents fully adopted multi cropping systems, whereas a majority partially adopted mixed cropping (76.88%), intercropping (58.75%) and crop rotation (63.13%). These findings indicate that farmers are gradually moving towards diversified production systems while still retaining some characteristics of conventional cropping patterns.

Tree and land-based diversification practices exhibited relatively lower adoption levels. Only 26.56 per cent of respondents fully adopted agroforestry systems, while 34.38 per cent fully adopted fruit tree cultivation. The comparatively lower adoption of perennial based diversification may be attributed to longer gestation periods, investment requirements and limited technical guidance. Similar constraints in agroforestry adoption were reported by Sharma (2011) in diversified farming systems.

Table 1: Adoption of crop diversification

Adoption	Fully Adoption	Partially Adoption	No Adoption
Soil and Land Preparation			
Land levelling improves cropping efficiency	259(80.94)	59(18.44)	2(0.63)
Tillage practices enhance soil structure	134(41.88)	186(58.13)	0
Variety selection suits local conditions	107(33.44)	116(36.25)	97(30.31)
Climate-resilient varieties prioritized consistently	174(54.38)	146(45.63)	0(0.00)
Frequently test new crops	0(0.00)	253(79.06)	67(20.94)
Open to cropping changes	46(14.38)	107(33.44)	167(52.19)
Ready for diversification adoption	81(25.31)	228(71.25)	11(03.44)
Irrigation and Water Management			
Irrigation scheduling follows crop needs	158(49.38)	108(33.75)	54(16.88)
Water-saving technologies adopted effectively	45(14.06)	242(75.63)	33(10.31)
Moisture levels managed efficiently	108(33.75)	175(54.69)	37(11.56)
Nutrient and Soil Fertility Management			
Balanced nutrients applied as recommended	230(71.88)	90(28.13)	0
Organic amendments enhance soil fertility	45(14.06)	275(85.94)	0
Soil testing guides nutrient decisions	45(14.06)	220(68.75)	55(17.19)
Intercropping and System Intensification			
Intercropping combinations chosen scientifically	79(24.69)	187(58.44)	54(16.88)
Complementary crops integrated for benefits	52(16.25)	268(83.75)	0
Spatial diversification improves system productivity	0	257(80.31)	83(25.94)
Timely Sowing and Establishment			
Accurate Sowing window	107(33.44)	204(63.75)	09(02.81)
Seed placement ensures proper establishment	76(23.75)	202(63.13)	42(13.13)
Germination conditions optimized through timing	76(23.75)	147(45.94)	97(30.31)
Variety & Crop Choices			
Use improved varieties	268(83.75)	22(06.88)	30(09.38)
Integrate legumes regularly	26(08.13)	276(86.25)	18(05.63)
Add high-value crops	167(52.19)	126(39.38)	27(08.44)
Prefer climate-fit crops	153(47.81)	167(52.19)	0
Choose rotation-friendly crops	84(26.25)	202(63.13)	34(10.63)
Market-Driven			
Follow market trends	86(26.88)	220(68.75)	14(04.38)
Grow demand-based crops	62(19.38)	238(74.38)	20(06.25)
Adjust crops for prices	39(12.19)	270(84.38)	11(03.44)
Prefer profitable crop mix	64(20.00)	224(70.00)	32(10.00)
Knowledge & Training			
Attend diversification training	71(22.19)	164(51.25)	85(26.56)
Applied learned techniques	138(43.13)	182(56.88)	0
Follow extension suggestions	68(21.25)	180(56.25)	72(22.50)

Use scientific crop advice	132(41.25)	168(52.50)	20(06.25)
Sustainable Practice			
Use organic practices	167(52.19)	153(47.81)	0
Apply soil conservation	146(45.63)	133(41.56)	41(12.81)
Reduce chemical dependency	76(23.75)	118(36.88)	126(39.38)
Follow eco-friendly methods	77(24.06)	156(48.75)	84(26.25)
Cropping System Diversification			
Practice mixed cropping	52(16.25)	246(76.88)	32(10.00)
Practice intercropping regularly	34(10.63)	188(58.75)	98(30.63)
Adopt multicropping systems	224(70.00)	96(30.00)	0(0.00)
Use crop rotation systems	84(26.25)	202(63.13)	34(10.63)
Tree and Land-Based Diversification			
Adopt agroforestry systems	85(26.56)	145(45.31)	90(28.13)
Plant fruit trees	110(34.38)	130(40.63)	80(25.00)
Use bund plantations	95(29.69)	150(46.88)	75(23.44)
Integrate perennials wisely	70(21.88)	160(50.00)	90(28.13)
Resource & Investment			
Invest in new tools	55(17.19)	115(35.94)	150(46.88)
Improve irrigation systems	80(25.00)	120(37.50)	120(37.50)
Build storage facilities	40(12.50)	90(28.13)	190(59.38)
Purchase diversification inputs	90(28.13)	135(42.19)	95(29.69)
Risk & Resilience			
Diversify to reduce risk	105(32.81)	165(51.56)	50(15.63)
Spread risk across crops	115(35.94)	155(48.44)	50(15.63)
Adopt drought-safe crops	90(28.13)	140(43.75)	90(28.13)
Improve climate resilience	75(23.44)	170(53.13)	75(23.44)
Institutional & Scheme			
Enrol in crop insurance	125(39.06)	95(29.69)	100(31.25)
Use government schemes	140(43.75)	120(37.50)	60(18.75)
Access subsidy programs	135(42.19)	125(39.06)	60(18.75)
Follow policy recommendations	60(18.75)	150(46.88)	110(34.38)

Resource and investment related practices were among the least adopted dimensions. Nearly half of the respondents (46.88%) reported no investment in new agricultural tools and 59.38 per cent reported no development of storage facilities. These findings indicate that financial and infrastructural constraints remain major barriers to crop diversification. Kumar *et al*. (2012b) also identifies financial limitations and inadequate infrastructure as important barriers to diversification adoption.

Risk management and institutional support practices demonstrated moderate adoption. Around one third of the respondents fully adopted diversification as a strategy to reduce production risk (32.81%) and spread risk across crops (35.94%). Furthermore, 43.75 per cent of farmers fully utilized government schemes related to crop diversification, while 42.19 per cent reported access to subsidy programmes. However, only 18.75 per cent fully followed policy recommendations regarding diversification, suggesting the need for stronger extension support and policy communication mechanisms.

Overall, the findings indicate that farmers exhibited greater adoption of practices directly associated with productivity enhancement and crop management, whereas adoption of investment-intensive, technology driven and long-term diversification practices remained comparatively lower. These results highlight the need for targeted interventions aimed at strengthening technical knowledge, financial support and institutional facilitation for sustainable crop diversification.

Level of adoption of crop diversification among farmers

To assess the overall extent of crop diversification, respondents were categorized into three groups, namely low, medium and high adoption, based on their total adoption scores. The distribution of respondents according to their level of adoption is presented in Table 2.

The data revealed that nearly half of the respondents (48.75%) belonged to the medium adoption category, followed by 27.19 per cent in the high adoption category. While, only 24.06 per cent

found in the low adoption category. The predominance of farmers in the medium adoption category indicates that while respondents have accepted several crop diversification practices, complete adoption of recommended practices is yet to be achieved.

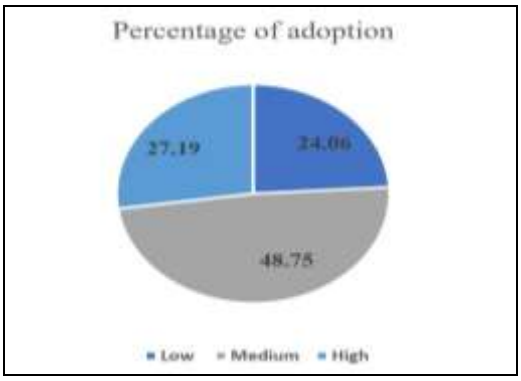

Fig. 1 : Level of adoption of crop diversification among farmers

The relatively high proportion of farmers in the medium adoption group may be attributed to increasing awareness regarding the benefits of diversification, availability of improved crop varieties and extension efforts promoting sustainable agricultural practices. However, the persistence of a sizeable proportion of farmers in the low adoption category suggests the existence of constraints such as limited financial resources, inadequate technical knowledge, market uncertainties and risk associated with shifting from conventional cropping systems. Similar levels of moderate adoption were reported by Mukherjee & Chattopadhyay (2017) and Mandal & Bezbaruah (2013) in studies on crop diversification in eastern India.

The findings further indicate that only about one fourth of the respondents achieved a high level of adoption. This suggests that although crop diversification is gradually gaining acceptance among farmers, adoption remains partial for many recommended practices, particularly those involving higher investment, advanced technologies, agroforestry and long-term resource management strategies.

The results are consistent with the findings of Birthal *et al*. (2015), who reported that adoption of diversified farming systems among Indian farmers is often moderate due to resource limitation and institutional constraints. Similarly, Hufnagel *et al*. (2020) observed that diversification practices are generally adopted incrementally, with farmers initially adopting less risky and easily manageable components before moving towards more complex diversified systems.

Therefore, the predominance of medium adoption among the respondents highlights the need for strengthened extension services, improved access to credit, market support mechanisms and policy interventions to encourage wider adoption of crop diversification practices among farming household in Haryana.

Table 2: Adoption level of the respondents about crop diversification

Level of Adoption	(n=320)	
	Frequency	Percentage
Low (83 to 93)	77	24.06
Medium (94 to 102)	156	48.75
High (Above 103)	84	27.19

Association between socio-economic characteristics and adoption of crop diversification practices

The association between selected socio-economic characteristics of farmers and their adoption level of crop diversification practices was examined using chi-square test. The results are presented in Table 3.

The findings revealed that age of the respondents was significantly associated with adoption of crop diversification (χ^2 = 10.823*). A majority of respondents belonging to the age group of 26-40 years (53.60%) and 41-54 years (50.32%) exhibited medium levels of adoption. In contrast, farmers above 54 years showed relatively higher representation in the high adoption category (37.50%). The significant association suggests that age influences the adoption behaviour of the farmers. Similar findings were reported by Birthal *et al*. (2015), who observed that farming experience and age influence diversification decisions.

Education was found to be highly significantly associated with adoption of crop diversification practices (χ^2 =28.35**). The proportion of respondents with high adoption increased consistently with educational attainment. Among graduates and above, 45.28 per cent belonged to the high adoption category, whereas only 12.35 per cent of respondents educated up to secondary level were categorised as high adopters. The results indicate that education enhances farmers' ability to understand, evaluate and implement diversified agricultural practices. Similar observations were reported by Joshi *et al*. (2007), Kumar *et al*. (2012c) and Hufnagel *et al*. (2020).

Landholding exhibited a significant association with adoption level (χ^2 = 14.211*). More than half of the marginal farmers (57.14%) were found in the high adoption category, while a substantial proportion of semi-medium farmers (54.39%) belonged to the

medium adoption category. The significant relationship indicates that farm size plays an important role in determining the adoption of diversification practices by influencing resource availability and risk bearing capacity. Comparable findings were reported by Sharma (2011) and Mandal & Bezbaruah (2013), who identifies farm size as a significant determinant of diversification behaviour.

Annual family income showed a highly significant association with adoption (χ^2 = 58.073**). Farmers belonging to higher income groups generally demonstrated greater adoption of diversification practices. Income enhances the capacity of farmers to invest in improved technologies, high value crops, irrigation facilities and risk-taking capacity. Similar findings have been reported by Birthal *et al*. (2015), who observed that financial capability positively influences diversification decisions. Similar findings were also reported by Ray & Das (2023).

Table 3: Association between level of socio-economic variables and Knowledge among farmers (n=320)

Socio-Economic Variables	Level of Knowledge			Total
	Low	Medium	High	
Age (years)				
26-40 years	28(22.40)	35(28.00)	62(49.60)	125(39.06)
41-54 years	33(21.29)	48(30.96)	74(47.74)	155(48.43)
Above 54 years	13(32.50)	9(22.50)	18(45.00)	40(12.50)
Total	74 (23.12%)	92(28.75%)	154(48.13%)	320(100%)
C=.093	**χ^2=2.75**			
Caste				
General category	42(20.89)	63(31.34)	96(47.76)	201(62.81)
Backward class	13(20.31)	17(26.56)	34(53.12)	64(20.00)
Scheduled caste	19(34.54)	12(21.81)	24(43.63)	55(17019)
C=0.134	**χ^2=5.817**			
Education				
Illiterate	7(38.89)	4(22.22)	7(38.89)	18(5.63)
Primary	29(41.43)	13(18.57)	28(40.00)	70(21.88)
Secondary	27(33.33)	22(27.16)	32(39.51)	81(25.31)
Senior secondary	1(1.02)	42(42.86)	55(56.12)	98(30.63)
Graduation and above	10(18.87)	11(20.75)	32(60.38)	53(16.56)
C=.377	**χ^2=53.15****			
Family Type				
Nuclear	63(23.33)	77(28.52)	130(48.15)	270(84.38)
Joint	11(22.00)	15(30.00)	24(48.00)	50(15.62)
C=0.014	**χ^2 =0.65**			
Family Size				
Small (up to 4 members)	9(18.00)	12(24.00)	29(58.00)	50(15.63)
Medium (4-8 members)	62(24.41)	74(29.03)	118(46.46)	254(79.38)
Large (more than 8)	3(18.75)	6(37.50)	7(43.75)	16(05.00)
C=0.95	**χ^2 =2.94**			
Landholding				
Marginal up to 2.5	3(21.43%)	4(28.57%)	7(50.00%)	14(04.38)
Small (2.6-5.0)	29(36.25%)	21(26.25%)	30(37.50%)	80(25.00)
Semi-medium (5.1-10.0)	37(21.64%)	53(30.99%)	81(47.37%)	171(53.44)
Medium (10.1-24.7)	5(9.09%)	14(25.45%)	36(65.45%)	55(17.19)
C= 0.124	**χ^2 =21.067***			
Income				
Up to Rs. 5,00,000	37(40.22)	13(14.13)	42(45.65)	92(28.75)
Rs. 5,00,001- Rs. 10,00,000	30(25.21)	35(29.41)	54(45.38)	119(37.19)
Rs. 10,00,001- Rs. 15,00,000	3(04.41)	32(47.06)	33(48.53)	68(21.25)
Above Rs. 15,00,001	4(9.76)	12(29.27)	25(60.98)	41(12.81)
C=0.340	**χ^2 =41.815****			
Subsidiary occupation				
Nil	47(27.49)	49(28.65)	82(47.95)	171(53.44)
Agriculture and Allied Activities	4(13.79)	12(41.38)	13(44.83)	29(09.06)

Small-scale enterprise	16(24.24)	12(18.18)	38(57.58)	66(20.63)
Services	7(14.89)	19(40.43)	21(44.68)	47(14.69)
C=0.185	**χ^2 =11.39**			
Extension contacts				
Low (up to 15)	19(22.35)	22(25.88)	44(51.76)	85(26.56)
Medium (16-20)	48(26.97)	49(27.53)	81(45.51)	178(55.63)
High (above 20)	7(12.28)	21(36.84)	29(50.88)	57(17.81)
C=0.139	**χ^2 =6.268**			
Social participation				
Not a member of organization	24(24.74)	26(26.80)	47(48.45)	97(30.30)
Member of at least one organization	44(28.02)	46(29.30)	67(42.68)	157(49.07)
Member of more than one organization	6(09.09)	20(30.30)	40(60.61)	66(20.63)
C=0.180	**χ^2 =10.67***			
Mass media exposure				
Low (up to 8)	16(29.09)	13(23.63)	26(47.28)	55(17.18)
Medium (9-12)	44(24.85)	52(29.37)	81(45.76)	177(55.31)
High (above 12)	14(15.91)	27(30.68)	47(53.41)	88(27.50)
C=0.117	**χ^2 =4.421**			
Socio-economic Status				
Low (11-16)	38(49.35)	9(11.69)	30(38.96)	77(24.06)
Medium (17-22)	31(15.98)	70(36.08)	93(47.94)	194(60.62)
High (above 23)	5(10.20)	13(26.53)	31(63.27)	49(15.32)
C=.354	**χ^2 =45.910****			

Figures in parenthesis denote percentage *Significant at 5 per cent level
**Highly significant at 1 per cent level

Extension contact was highly significantly associated with adoption of crop diversification practices (χ^2 = 15.585**). Farmers maintaining frequent contact with extension agencies had better adoption levels than those with limited interaction. Extension services play a crucial role in disseminating information regarding improved cropping systems, government schemes and innovative agricultural practices. The findings corroborate earlier studies highlighting the importance of extension support in agricultural technology adoption.

Social participation exhibited a significant association with adoption (χ^2 = 9.397*). Respondents who were members of more than one organisation showed comparatively higher levels of adoption than those were not associated with any organisation. Participation in social organisations facilitates information exchange, collective learning and exposure to new agricultural opportunities, thereby encouraging adoption of diversified farming practices.

Socio-economic status was found to be highly significant associated with adoption level (χ^2 = 16.235**). Respondents belonging to medium and high socio-economic categories displayed greater adoption of crop diversification than those in low socio-economic status category. Higher socio-economic status generally improves access to information, institutional support and production resources, thereby facilitating adoption.

On the other hand, caste (χ^2 = 7.047), family type (χ^2 = 3.772), family size (χ^2 = 5.172), subsidiary occupation (χ^2 = 8.043) and mass media exposure (χ^2 = 3.366) were not found to have a statistically significant association with adoption of crop diversification practices. This indicate that adoption behaviour was more strongly influenced by educational, economic and institutional factors than by demographic characteristics alone.

Overall, the study demonstrates that education, landholding, annual income, extension contact, social participation, socio-economic status and age are important determinants of crop diversification adoption among farmers in Haryana. These findings emphasize the need for targeted extension programmes, capacity building initiatives and institutional support mechanism to enhance adoption of diversified farming and promote sustainable agricultural development.

Conclusion and Policy Implication

The study revealed that a majority of the farmers exhibited a medium level of adoption of crop diversification practices, indicating moderate acceptance of diversified farming systems in Haryana. Higher adoption was observed for improved crop varieties, balanced nutrient management, multi cropping systems and government supported

diversification practices, whereas agroforestry, water saving technologies and investment intensive practices recorded comparatively lower adoption. Age, education, landholding, annual income, extension contact, social participation and socio-economic status were found significantly associated with adoption of crop diversification practices, while caste, family type, family size, subsidiary occupation and mass media exposure showed no significant association. The findings suggest that strengthening extension services, improving institutional support and enhancing farmers' access to information and resources can promote wider adoption of crop diversification and contribute to sustainable agricultural development in Haryana.

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