Research Article

Indian Journal of Extension Education
Vol. 59, No. 1 (January–March), 2023, (24-27)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Extent of Adoption of Intercropping Practices Among Farmers of Haryana

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ARTICLE INFO

Keywords: Adoption, Intercropping, Haryana, Agriculture, Farmers, Reasons

http://doi.org/10.48165/IJEE.2023.59105

Conflict of Interest: None

ABSTRACT

Intercropping is a variant of multiple cropping practices that includes the cultivation of two or more crops in definite close proximity. The current study was led in dry and wet agro-climatic zones of Haryana in 2022 with an objective to assess the adoption of intercropping practices among farmers of Haryana. The primary data were collected personally from 120 respondents through a well-structured interview schedule. Findings revealed that nearly three-fifths of the respondents had medium level of adoption of intercropping practices and the farmers were adopting intercropping mainly in vegetables. Highly significant association was found between education, mass media exposure, inheritance with level of adoption of the intercropping system. A significant association was found between age, caste, annual income, land holding, extension contacts with level of adoption. The main reasons for adoption of intercropping were higher income and improved socio-economic status. The paper recommends on field training/demonstration for farmers who were adopting intercropping so that adoption of intercropping can be made efficient and from this more number of farmers will be encouraged to adopt intercropping.

INTRODUCTION

Recent agricultural problems have forced agricultural planners and development agencies to review the role of multiple cropping systems as a means to enhance agricultural production. The term “cropping system” represents a method of maximum crop production in available land in a cropping cycle with minimum natural resource degradation and the adoption of high-intensity cropping systems may be a feasible option to increase agricultural sustainability, productivity and production as a whole (Meena et al., 2011). Multiple cropping is one of the foremost necessary practices to enrich the field’s biodiversity. Intercropping is a variant of multiple cropping practices that includes the growing of two or more crops in definite close proximity. By cultivating more than one crop at a time in the same field, farmers maximise water use efficiency, maintain soil fertility and minimise soil erosion in their fields, which are the serious drawbacks of solo-cropping (Maitra et al., 2019). the most vital goal of intercropping is to produce a higher yield on a given portion of land by efficient use of resources that would otherwise not be utilised by a single crop (Kaur et al., 2015). In addition, intercropping holds the promise of providing benefits to small farmers through increased crop yields and income as well as improved resource use (Himmelstein et al., 2017).

The multiplicity of cropping systems has been one of the important features of Indian farming and it is mainly attributed to the prevailing socio-economic conditions of the farming community. However, it has been estimated that more than 250 double-cropping systems are followed throughout the country. India accounts for about 28 per cent of the area and 25 per cent of global production by intercropping over a dozen pulse crops depending on the resource availability and local needs (Sharma et al., 2017). Presently, the main focus of the Haryana Government is also the diversification of the cropping pattern of the state and for this diversification, the intercropping will play a vital role in efficiently

Received 22-11-2022; Accepted 12-12-2022

utilising the space and by growing various crops in fields. Intercropping is also proving to be beneficial for the farmers who were adopting it, as it provides additional income, the fertilizer dose given to one crop is also received by the other crop and this reduces the input cost and the vacant space in the fields is also utilized efficiently. In view of the decreasing land holding and increasing input cost, more and more farmers are increasing towards of intercropping (Kamboj, 2022).

METHODOLOGY

The exploratory research design was used in the study and the study was carried out in two agro-climatic zones of Haryana i.e., dry and wet zone in 2022. Bhiwani and Hisar districts were selected from the dry zone whereas Kaithal and Karnal districts were selected from the wet zone of Haryana State with an objective to know the extent of adoption of intercropping practices by farmers of Haryana. Further, two blocks from each selected district randomly and then from each block a cluster of villages were selected purposely i.e., villages in which farmers were adopting intercropping (Chang and Bamla villages from Bhiwani block, Chanana village from siwani block, kaimri and shadwa villages from Hisar I, Dhani pirwala and Sainipura villages from Hansi 1 block, Kailram and Batta villages from Kalayat block, Titram and keorak villages from Kaithal block, Mubarkabad and Bastara villages from Gharaunda block, Dhanora jagir and Bibipur jattan village from Indri block). Thus, 15 respondents were selected from each block and a whole 120 respondents were selected from the 8 blocks of 4 districts. The data was collected through a well-structured pre-tested interview schedule which was prepared according to the objectives of the study.

For assessing the adoption of intercropping practices, the answers were recorded on a continuum of three point as no, partial and full adoption and were given 0, 1 and 2 scores, respectively. The total score obtained by each respondent from all practices was the adoption score of the individual respondent. Finally, the raw adoption score was transformed into an adoption index. On the basis of scores gained, the respondents were categorised into low (up to 31), medium (32 to 42) and high (43-53). The data were analysed using MS Excel, OP STAT and Statistical Package for Social Sciences (SPSS) for computing frequency, percentage, Chi-square (χ^2) and Coefficient of contingency (C).

$C= \sqrt{\chi^2/ \chi^2 + N}$, where χ^2 = chi square value and N is the total number of observations.

To measure the socio-economic profiles of the respondents thirteen variables were selected viz, Age, education, caste, subsidiary occupation, income, type and size of family, land-holding, social participation, extension contact, mass-media exposure, social expectations and inheritance. Scores were given to all these independent variables to assess their relationship with adoption (dependent variable).

RESULTS AND DISCUSSION

Table 1 depicts the overall level of adoption of intercropping among farmers and analysis of data revealed that nearly fifty-seven per cent of the respondents had medium level of adoption while 24.20 per cent and 18.30 per cent had high and level of adoption of intercropping respectively. The findings were supported by Nagdanbhai (2012) who stated that sixty per cent of the respondents had medium level of adoption while (21.67%) and (18.33%) had low and medium level of adoption of recommended crop production technology of castor as intercrop with groundnut. The findings were also in line with Islam (2017) who reported that more than half of the respondents (52.30%) had medium level of adoption while 22.90 per cent and 24.80 per cent had low and high level of adoption of intercropping with mango whereas Jat et al., (2022) stated that more than two-fifth of the respondents (41.66%) had medium level of adoption while 33.95 per cent and 24.38 per cent had low and high level of adoption of Recommended Wheat Production Practices among Wheat Growers.

Table 1. Distribution of the respondents on the basis on their level of adoption of intercropping

Adoption level	Percentage
Low (23-31)	18.30
Medium (32-42)	57.50
High (43-53)	24.20

Further, Results from Table 2 has given insights about the distribution of the respondents according to pattern of intercropping adopted by them in different seasons. In rabi season farmers were adopting intercropping mainly in vegetable crops and the main vegetables that were intercropped in rabi season were onion, tomato, cauliflower, bottle gourd and capsicum. The results are in line with the findings of Lasihram et al., (2022), who reported that farmers grow different crop under different combination in intercropping and in rabi season farmers were adopting intercropping majorly in vegetables followed by wheat, pea and chickpea. In kharif season majority of the farmers (50.80%) were also adopting intercropping in vegetables and the main vegetables that were intercropped were Indian round gourd (tinda), okra, chilli, tomato and egg plant (brinjal). The findings are supported by Laishram et al., (2022), who stated that in kharif season major crops grown in study area was tomato, capsicum, cucumber, bottle gourd, chilli, okra and egg plant (brinjal). In zaid season majority of the farmers (22.50%) were adopting intercropping in fruits and the main crops that were intercropped were guava, oranges, watermelon and muskmelon.

Extent of adoption of intercropping

The data in Table 3 depicts the adoption period of intercropping. The analysis revealed that more than one-third of the respondents (35.00%) had been adopting intercropping for more than three years, as intercropping proving to be beneficial in several ways viz increased income, improved soil fertility, efficient utilisation of natural resources etc. to the farmers, so they were continuing the adoption for the next years.

Relationship between profile of the farmers with their level of adoption of intercropping

The results of the study showed that independent variables viz education, mass media and inheritance were found highly significantly associated with the level of adoption of intercropping,

Table 2. Distribution of respondents according to the pattern adopted in intercropping

Pattern of Intercropping	Full Adoption	Partial Adoption	No Adoption	Mean Score	Rank
Rabi season					
Fruit + fruit	17(14.12)	2(1.67)	101((84.20)	0.30	III
Fruit + vegetable	31(25.80)	7(5.80)	82(68.40)	0.57*	II
Fruit + cereals	14(11.67)	1(0.83)	105(87.50)	0.24	IV
Fruit + oilseed	10(8.33)	1(0.83)	109(90.84)	0.17	V
Fruit + flower	1(0.83)	7(5.83)	112(93.34)	0.07	VI
Vegetable + vegetable	48(40.00)	6(5.00)	66(55.00)	0.85*	I
Cash crop + vegetable	3(2.50)	-	117(97.50)	0.05	VII
Overall Mean Score				0.32	
Kharif season					
Fruit + fruit	18(15.00)	1(0.83)	101(84.17)	0.30	III
Fruit + vegetable	22(18.40)	20(16.60)	78(65.00)	0.53*	II
Fruit + fodder	2(1.67)	16(13.33)	102(85.00)	0.16	IV
Fruit + flower	2(1.67)	8(6.67)	110(91.66)	0.10	V
Vegetable + vegetable	61(50.80)	6(5.00)	53(44.20)	1.06*	I
Overall Mean Score				0.43	
Zaid season					
Fruit + Fruit	27(22.50)	23(19.20)	70(58.30)	0.64*	I
Fruit + vegetable	4(3.33)	46(38.33)	70(58.34)	0.45*	II
Vegetable + vegetable	1(0.83)	11(9.17)	108(90.00)	0.10	III
Overall Mean Score				0.40	

Figures in parenthesis denotes the percentage

Table 3. Extent of adoption of intercropping

Time period	Percentage
Less than one year	18.30
One to two years	21.70
Two to three years	25.00
More than three years	35.00

this could be inferred from the reason that education and access to modern digital technology helped the farmers to increase their level of knowledge in terms of space management and application of fertilizer at efficient level in intercropping etc. and with this increased level of knowledge, farmers were adopting it efficiently. While the independent variables viz age, caste, annual income, land holding and extension contacts had significant association with level of adoption. With increase in farmers' age their level of experience also increases in terms of farming practices and the farmer who have more land and high income can adopt new agricultural technology or we can say that they can take the risk of adopting new agricultural technology. The findings were supported by Kumari et al., (2021) where they reported that age, landholding, type and size of family, education, income and mass media exposure had a significant relation with level of adoption of drip irrigation in citrus cultivation. Also, Nagdanbhai (2012) reported that education, extension participation, social participation, mass media exposure and risk orientation had a significant association with level of adoption of recommended crop production technology of castor as intercrop with groundnut. Kota et al., (2021) revealed that farm size, education status, exposure to extension service had significant association with adoption of intercropping in cotton. The findings were in line with Islam (2017) who stated that training received, innovativeness, extension contacts, crop diversification had significant association with level of adoption of intercropping in mango also Singh et al., (2021) reported that extension contacts, environment consciousness, relative advantage, complexity and observability had significant relationship with level of of Adoption of Happy Seeder Technology.

Reasons for adoption

Table 5 depicts the reasons for adoption of intercropping by the farmers of Haryana. To get higher income from the same amount of land is mostly the one of the important reasons for majority of the farmers. The reason of higher income has been given rank I on the basis of mean score. The other reasons for

Table 4. Relationship between profile of respondents with their level of adoption of intercropping

Socio-economic Variables	Chi-square value (χ^2)	Coefficient of contingency (C)
Age	12.906*	0.312
Education	25.096**	0.416
Caste	13.023*	0.313
Subsidiary occupation	5.109	0.202
Annual income (Rs)	9.699*	0.273
Family type	0.975	0.090
Family size	5.225	0.204
Land holding	15.042*	0.334
Social participation	1.437	0.109
Extension contacts	10.038*	0.278
Mass media exposure	14.289**	0.326
Social expectations	1.934	0.126
Inheritance	19.767**	0.376

*Significant at 5 per cent level of significance; **Highly significant at 1 per cent level of significance

Table 5. Reasons for adoption of intercropping

Statements	Yes	No	Mean score	Rank
Reduced risk of crop failure	77(64.20)	43(35.80)	0.64	VI
Increase in nutrients accumulation in soil, resulting in fertilizer saving	63(52.50)	57(47.50)	0.52	VIII
Improvement in soil quality	64(53.30)	56(46.70)	0.53	VII
Higher income	106(88.30)	14(11.70)	0.88*	I
Better utilisation of natural resources	102(85.00)	18(15.00)	0.85*	III
Improved socio-economic status	105(87.50)	15(12.50)	0.87*	II
Improved weed management	78(65.00)	42(35.00)	0.65	V
To diversify the cropping pattern	92(76.77)	28(23.33)	0.76*	IV
Overall Mean Score			0.71	

*=Higher than overall mean score

adoption were improved socio-economic status, better utilisation of natural resources, to diversify the cropping pattern, improved weed management, reduced risk of crop failure, improvement in soil quality and increase in nutrients accumulation in soil, resulting in fertilizer saving. The findings were in line with Dwivedi et al., (2015) in which they reported that the principal reasons for smallholder farmers to intercrop were flexibility, profit maximization, risk minimization, soil conservation, improvement of soil fertility, weed, pests and diseases minimizing and balanced nutrition.

CONCLUSION

It is concluded from the study that maximum number of the farmers had a medium level of adoption of intercropping practices and higher income, improved socio-economic status and utilisation of natural resources were the major reasons for adoption of intercropping. It becomes very vital for extension workers to play a vital role in creating awareness and disseminating the knowledge among new farmers who were adopting intercropping about the recommended practices of intercropping in terms of space management, fertilizer application and regarding co-operative and competitive crops through training as well as field demonstration. As we have very limited agricultural land, so there is a need to create a feasible and sustainable agricultural system like intercropping with the efficient use of natural resources so that our upcoming generations do not feel deprived in terms of their sustenance needs.

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