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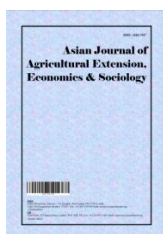
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# Constraints in Adoption of Intercropping in Horticultural Crops among Farmers of Haryana

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## Authors' contributions

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

## Article Information

DOI: 10.9734/AJAEES/2022/v40i1031065

## Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/89923>

**Original Research Article**

**Received 15 May 2022**  
**Accepted 19 July 2022**  
**Published 21 July 2022**

## ABSTRACT

Intercropping can also be referred to as mixed cropping or Polyculture i.e., cultivating two or more crops in the same space at the same time. The present research was conducted in Haryana state to know the reasons for adoption as well as constraints in adoption of intercropping. The study was conducted in four districts of Haryana namely Bhiwani and Hisar from the dry zone and Karnal and Kaithal from the wet zone of Haryana. Further, two blocks were selected randomly from each district and from each block 15 respondents were selected randomly from clusters of villages. Hence, a total of 120 respondents were selected for the purpose of the study. The study revealed major constraints in adoption of intercropping by the farmers. No MSP for horticultural crops, lack of storage facilities, harvesting problems, expert management, labour intensive, uncompetitive price etc. as the major constraints to the farmers which could be the possible reasons for non-adoption of intercropping by the other farmers. This study recommends introducing of Minimum Support Price for horticultural crops and there should be facility of cold storage for horticultural produces of the farmers.

**Keywords:** Constraints; adoption; intercropping; horticulture; farmer.

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## 1. INTRODUCTION

Agriculture plays a major role in developing countries by contributing to important sectors, i.e., filling the food basket of a country and providing raw materials for industries. But in the 21st century, the pressure on agriculture and its allied activities is continuously increasing, as the population of the world has increased rapidly and due to the increased population and development of urban clusters along with industrial growth in the developing countries, there is a shrinkage in the availability of land for cultivation and soils around the world are affected by land degradation processes as a consequence of the abuse of grazing, fire, mining, or intensive agriculture [1]. Agriculture in the next decade will have to produce more food from a smaller area of land through more efficient use of natural resources with minimal impact on the atmosphere to satisfy the growing population demands [2]. So, these 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 viable option to increase agricultural sustainability, productivity and production as a whole [3]. Multiple cropping is one of the most necessary practices to enrich the field's biodiversity. Intercropping is one of the types of multiple cropping system that can be referred as cultivating of two or more crops in the same field at the same time, for example, growing rice + soybean in a 4:2 row ratio i.e., after every 4 rows of rice, 2 rows of soybean is grown. In addition, intercropping holds the promise of providing benefits to small farmers through increased crop yields and income as well as improved resource use [4]. Traditional agriculture, as practised through the centuries all over the world, has always included different forms of intercropping. In fact, several crops have been grown with one another for hundreds of years and crop mixtures probably represent some of the earliest farming systems practiced [5].

India is a tropical country, endowed with multiple climatic conditions and has a diversified agrarian sector. The concept of the cropping system is as old as agriculture in India. The multiplicity or mixability of cropping systems has been one of

the most important aspects of Indian farming and it is mainly attributed to the prevailing socio-economic conditions of the agrarian community [6]. The greatest challenge of the present time in agriculture in front of a populous country like India is to produce more farm products, namely food, fodder, fuel and fibre to meet the increasing human and animal needs from the limited availability of cultivable land. Under this situation, one of the important strategies to increase agricultural output is the development of high-intensity sequential cropping and intercropping systems [7].

Agriculture is also the primary sector of Haryana state and therefore; the majority of the population is somewhat dependent on agriculture and its allied activities. Haryana is known as 'bread basket' of India. Over the years, Haryana state has adopted progressive policies for strengthening the agriculture sector by enhancing investments, promoting research and development system, public distribution system, irrigation development, land acquisition policies, subsidies towards credit and power use, infrastructure like roads, market, power generation and supply, etc [6]. The state has a diversified agroecology and cropping systems. The total geographical area of Haryana is 43,71,000 ha, out of which cropped area is 64,71,000 ha and the area under Horticultural crops is 5,28,940 ha which covers around (8.17%) of the cropped area [8]. Currently, fruits, vegetables and flowers, are significant horticultural crops developed in Haryana which represents (6.40%) of the total crop region in the state and every possible effort is being made to achieve the target of (10%) area of cultivation under horticulture crops [8].

So, looking at the importance of intercropping system, the present study was conducted to find out the major constraints that were faced by the farmers in adoption of intercropping in horticultural crops and to make suggestions on the basis of findings.

## 2. METHODOLOGY

The study was conducted in two agro-climatic zones i.e., dry and wet zone of Haryana. The zone defined as wet zone in comparative terms with that of Western zone as it receives more rains in northern and less in southern parts and the mean annual rainfall ranges from 500 to 1000 mm. Temperatures vary greatly in this zone, May and June are the hottest; and January and

February are the coldest months. A major part of southwest Haryana is arid and it is known as dry zone, receiving less than 500 mm annual rainfall. The southwest monsoon contributes around 80-85 per cent of total annual rainfall. From October to mid-April, weather remains almost dry except occasional light showers during these months. Bhiwani and Hisar districts were selected randomly from the dry zone further two blocks Bhiwani and Siwani were selected randomly from Bhiwani district while Hisar I and Hansi I blocks were selected from Hisar district. Karnal and Kaithal districts were selected randomly from the wet zone further two blocks Gharuanda and Indri were selected randomly from Karnal and Kalayat and Kaithal blocks were selected from Kaithal district. Further, from each block a cluster of villages were selected purposely i.e., villages in which farmers were adopting intercropping (the villages were Chang, Bamla, Chanana, Kaimri, Shyadhwa, Dhanipirwala, Sainipura, Kailram, Batta, Titram, Keorak, Mubarkabad, Bastara, Dhanora Jagir and Bibipur jattan). Thus, 15 respondents were selected from each block and a whole 120 respondents were selected from the 8 blocks of 4 districts. The data were collected with a well-structured interview schedule and were analysed using MS Excel, OP STAT and Statistical Package for Social Sciences (SPSS) for computing frequency, percentage, weighted score and average mean score. Constraint index (CI) was developed as suggested by Angral [9]. This index measured and compared the constraints expressed by different respondents.

$$CI = \frac{VS \times 2 + S \times 1}{N}$$

Where, VS = Very serious, S= serious, N= total number of respondents

The constraints themselves were classified into 3 sets viz; very serious, serious and not so serious. The Constraint index was recorded on a 1-to-6-point scale, with 6 being the most severe and 1 being the least severe.

### 3. RESULTS AND DISCUSSION

#### 3.1 Constraints in Adoption of Intercropping System

In the state of Haryana, Intercropping is mainly done majorly in Horticultural crops. The reason could be that as Haryana Provides MSP for Wheat and Rice so, majorly farmers adopt rice-wheat cropping system but now farmers are shifting towards horticultural crops as

government had introduced various subsidies and scheme for horticulture. Intercropping is mainly done in horticultural crops, the reason behind that is the empty space got left in field when farmers adopt horticultural crops and in case of fruits, generally first commercial yield got in four years so, farmers adopt intercropping during the initial four-year time to get some profit. The major crops that were selected for the study were onion, tomato, cauliflower, bottle gourd, capsicum, Indian jujube (Ber), lemon, strawberry, spinach i.e., farmers majorly adopting intercropping in fruits and vegetables i.e., in horticultural crops.

The findings of the present study as well as relevant discussion has been summarized here: The constraints were kept open ended and the responses were noted in the schedule itself. The frequency for each constraint was worked out and converted in to percentage elucidated in Table 1.

Analysis revealed that more than seventy-one per cent of the respondents had considered the constraint 'No minimum support price for horticulture crops' as very serious. The reason behind that is existing MSP system that is only in some crops so, this act as a constraint for the farmers who want to adopt horticultural crops, as there is no surety for assured price and procurement whereas in those crops there is an assurance for procurement and price.

It appears from the Table 1 that three-fifth of the respondents (60.00%) had considered the constraint 'Lack of storage facilities at long distance purchase agency' as very serious. As horticulture crops are perishable crops and due to this perishable nature farmers don't have time for bargaining for good price and they have to sell at low price or the price that buyers and this perishable nature also compel the farmers to sell their produces in the distress sale.

The result presented in the Table 1 showed that the sixty per cent of the farmers had considered the constraint 'Harvesting is difficult' as very serious which were also reported by Nagdanbhai [10], Sancley and Mazhar [11]. In intercropping, there exist more than one crop in the field and till date there is no machinery which can do harvesting on different crops at same field and also you need special labour for harvesting and this increases the input cost of the farmers that's why farmers considered harvesting problem as one of the major constraints,



**Fig. 1. Map of the study area**

The Table 1 depicts that nearly half of the respondents (59.16%) had considered the constraints 'Expert management' as very serious. In intercropping there is more than one crops in single field and this require special attention to the crops as there could be competition between the crops for sunlight, water, fertilizers etc. so, majority of the farmers considered this constraint as one of the major.

Fifty-five per cent of the respondents had considered the problem of 'labour intensive' as very serious. As discussed above, intercropping requires expert management and this compel the majority of the farmers to hire labour and

sometimes the marginal farmers were unable to hire farmers and due to that it becomes constraint for them.

More than half of the respondents (55.83%) had faced the problem 'uncompetitive price and sales channels' and considered it as very serious which were also reported by Jirgi *et al.* [12] and Yap *et al.* [13]. As discussed above, horticultural crops are perishable in nature and due to that those farmers were compelled to sell their produce at competitive prices and due to that farmers didn't get the enough profit and that become constraint for them and reason for non-adoption for the other farmers.

**Table 1. Constraints faced in adoption of intercropping**

<b>Constraints</b>	<b>Very serious</b>	<b>Serious</b>	<b>Not so serious</b>	<b>WS</b>	<b>AMS</b>	<b>Constraint Index (CI)</b>	<b>Rank</b>
No minimum support price for horticulture crops	86 (71.67)	27 (22.50)	7 (5.83)	319	2.658	1.99	I
Lack of storage facilities at long-distance purchase agency	72 (60.00)	35 (29.17)	13 (10.83)	299	2.491	1.79	II
Harvesting is difficult	72 (60.00)	34 (28.33)	14 (11.67)	298	2.483	1.78	III
It requires more attention and thus increased intensive, expert management	71 (59.17)	35 (29.17)	14 (11.66)	297	2.475	1.77	IV
Labour intensive	66 (55.00)	40 (33.33)	14 (11.67)	292	2.433	1.72	V
Uncompetitive Prices and Sale Channels	67 (55.83)	38 (31.67)	15 (12.50)	292	2.433	1.72	VI
Control of pests, diseases, and weeds are difficult	35 (29.17)	50 (41.66)	35 (29.17)	240	2.000	1.20	VII
Competitive effects among component crops	24 (20.00)	56 (46.67)	40 (33.33)	224	1.866	1.04	VIII
Lack of training infrastructure	21 (17.50)	47 (39.17)	52 (43.33)	209	1.741	0.89	IX
Nonavailability of subsidies	23 (19.17)	40 (33.33)	57 (47.50)	206	1.716	0.86	X
Mechanization is difficult	21 (17.50)	43 (35.83)	56 (46.67)	205	1.708	0.85	XI
Unavailability of technical labour	16 (13.33)	36 (30.00)	68 (56.67)	188	1.566	0.68	XII

#### 4. CONCLUSION

Farmers of Haryana who were doing intercropping in horticultural crops had been facing some major constraints i.e., no MSP for horticultural crops, uncompetitive price and marketing channels, lack of storage facilities for storing of perishable horticultural produce, expert management and labour intensive as major problems and these problems had to be solved so that new farmers can also get motivation to adopt intercropping. This study recommends introducing Minimum Support Price for horticultural crops and making storage facilities available to farmers so that they can store their produce for some amount of time.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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