



Potential and Prospects of Intercropping with Reference to Himachal Pradesh

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Intercropping, the agricultural practice of cultivating two or more crops in the same space at the same time is an old and commonly used cropping practice which aims to match efficiently crop demands to the available growth resources and labour. The most common advantage of intercropping is the production of greater yield on a given piece of land by making more efficient use of the available growth resources using a mixture of crops of different rooting ability, canopy structure, height, and nutrient requirements based on the complementary utilization of growth resources by the component crops.

Introduction

Intercropping is an age old practice of growing simultaneously two or more crops on the same piece of land. Intercropping has been recognized as a potentially beneficial system of crop production and evidences suggest that it can provide substantial yield advantage over sole cropping, not by costly inputs but by a simple expedient of growing crops and this system also plays an important role in subsistence food production in both developed and developing countries, especially in situations of limited water resources (Tsubo *et al.*, 2005).

Intercropping in appropriate planting pattern and row proportion has ample scope for improving the bonus yield of intercrop(s) without adversely affecting the yield of main crop. Besides this, intercropping acts as an insurance against hazards of weather, guards against crop failure by disease or insect-pest incidence, ensures efficient utilization of land and other resources (Paradkar *et al.*, 1993). Intercropping maintains superiority to sole-cropping in terms of monetary gains.

Intercropping/mixed cropping utilizes full space available for raising of crops and practically no portion of the field is left bare as the crops have varying root depths and they take the plant food from different layers of the soil. In addition, it maintains soil fertility and gives higher yields.

Under conditions of erratic rainfall versatility of grain legume and non-legume in mixture especially soybean, urd, moong, pigeonpea, rajmash and non-legumes like Brassica spp. and linseed can be exploited for obtaining higher yields per unit area per unit time because of their consistently good performance over a wide range of climatic and soil conditions. All these above mentioned situations along with diversified needs of the farmers might have led to the adoption of mixed cropping / intercropping.

Mixed cropping is traditionally defined as a system of growing two or more than two crops in the same ground area without any row arrangement, while intercropping implies the growing of two or more crops simultaneously in the same ground area in rows of definite geometric pattern. The crops are not sown exactly at the same time and their harvesting times

may be quite different, but they are usually simultaneous for significant part of their growing period.

Intercropping is not only practiced in India but in almost all the countries of the world and is likely to be a common practice throughout the developing countries in the near future. This has been the important feature of the Indian agriculture having the backing of centuries old experience of large community of farmers.

Objectives of Intercropping

1. Insurance against main crop failure under aberrant weather conditions or pest epidemics.
2. Increase in total productivity per unit land area.
3. Judicious utilization of resources such as land, labour and inputs

Principles of Intercropping

1. The time of peak nutrient demands of component crops should not overlap.
2. Competition for light should be minimum among the component crops.
3. Complementary should exist between the component crops.
4. The differences in maturity of component crops should be at least 30 days.

Types of Intercropping

1. **Mixed intercropping:** Growing two or more crops simultaneously with no distinct row arrangement.
2. **Row intercropping:** Growing two or more crops simultaneously where one or more crops are planted in rows.
3. **Relay intercropping:** Growing two or more crops simultaneously during part of the life cycle of each. Second crop is planted after the first crop has reached its reproductive stage but before it is ready for harvest.
4. **Strip intercropping:** Growing two or more crops simultaneously in different strips wide enough to permit independent cultivation but narrow enough for the crops to interact ergonomically.

Inter Cropping in Cereals: Intercropping with cereal is an excellent way of improving the resource utilization because the cereals utilize the rainy season resources while late maturing crops exploits the post-rainy season resources such as residual moisture. Soybean is good compatible companion crop with maize. Pearl millet is a quick tillering and fast growing crop that attains full canopy development within 20-30 days of seedling establishment. It can be inter-cropped with groundnut, black-gram or castor.

Inter Cropping in Pulses: For Pigeon pea, short duration grain legumes such as black-gram and soybean are the best companion crops in Peninsular India. Groundnut is also a suitable inter-crop.

Inter Cropping in Cotton: It is initially a slow growing crop. Any short duration and fast growing crops such as groundnut, black-gram, green-gram or cluster bean are the compatible companion crops.

Inter Cropping in Sugarcane: Sugarcane is slow growing up to 80-90 days. Since the crop is planted in rows 0.8-1.0m apart, considerable space is available for inter-cropping. Short duration crops maturing in 80-90 days can be advocated as inter-crops. Black-gram and soybean are found suitable.

The popularity of intercropping system has been due to many obvious advantages viz.

1. Intercropping gives additional yield and income/unit area than sole cropping.
2. It acts as an insurance against failure of crops in abnormal year.

3. Inter-crops maintain the soil fertility as the nutrient uptake is made from both layers of soil.
4. Intercrops provide shade and support to the other crop.
5. Better control of weeds.
6. Inter cropping system utilizes resources efficiently and their productivity is increased.
7. Reduction in soil runoff.
8. Intercropping with cash crops is highly profitable.
9. It helps to avoid inter-crop competition and thus a higher number of crop plants are grown per unit area.
10. Reducing the incidence of insects, pests and diseases.

Fertilization, especially with nitrogen plays an important role in influencing the productivity of cereal crops (Tiwari *et al.*, 1973). During recent years there has been a considerable price hike in this input and therefore, has become almost out of the reach of the average farmers, so this attracted the attention of all the concerned with agricultural production. Legumes are capable of converting atmospheric nitrogen with the help of symbiotic bacteria (*Rhizobium* spp.) into a form which can be utilized by the host plant (Nelson and Tisdale, 1970). Apart from this, legumes are rich source of protein when included in diet. Legume cultivation for any of the above reason requires replacement of some other crop or other uses of land, which does seem to be a practical proposition under the proposition under the present conditions of population explosion.

Row crops like maize, wheat, rice, barley and sugarcane etc. which provide a sufficient inter space to grow these pulses in between the rows, serve as a measure against the vagaries of weather.

Methods of Sowing of Mixed/Intercrops

The crops concerned in the mixture are sown either by broadcasting or in the rows. In the first case the seeds are mixed together in the required proportions, sown by broadcasting and given a light ploughing or harrowing to cover the seeds. The most systematic and interesting method is to sow the crops in rows either simultaneously or one after the other. Drill sowing is common in this method and it is managed with much skill.

Important Intercropping Systems

1. **Rice:** Rice in puddled conditions, intercropped with other varieties of rice. In upland cultivation with, Jowar, Maize, Soybean and Pigeon pea
2. **Maize:** with Soybean, Mash, Moong, Cowpea, Arhar etc.
3. **Wheat:** with gram, Lentil, Rai, Pea, Sarson, Rapeseed, Linseed.
4. **Sugarcane:** with Potato, Wheat, Arhar, Moong, Mash, Cowpea and fodder crops like Cowpea.

Prospects of Intercropping

There is great scope of intercropping for increasing the production without affecting the area under other crops and has greater significance in wide spaced crops. Willey (1975) observed that a crop can grow better in the presence of other crops in intercropping system than in sole crop where there is a beneficial effect of intercrop.

Various prospects of intercropping are:

1. Economy of space, time and labour
2. Vagaries of weather
3. Economic value of intercrops
4. Yield from the intercrops

5. Insect-pest and diseases
6. Mixed / intercropping and rotation of crops
7. Role of legumes in the grain-legume mixture and economy in fertilizers
8. Weed control
9. Maintain soil fertility
10. Efficient utilization of resources

Disadvantages

1. Yield decreases as the crops differ in their competitive abilities.
2. Management of intercrops having different cultural practices seems to be difficult task.
3. Improved implements cannot be used efficiently.
4. Higher amount of fertilizer or irrigation water cannot be utilized properly as the component crops vary in their response of these resources.
5. Harvesting is difficult.

Conclusion

Apart from the complementary effects, the productivity per unit area per unit time can be increased by intercropping cereals with compatible crops like legumes and oilseeds. This practice provides not only food but also helps in stepping up the pulse production, without curtailing the area under cereals.

The success of intercropping largely depends upon proper geometry, selection of compatible intercrops in order to reduce intercropping competition and also beneficial effects of legumes to non-legumes. Hence, more emphasis should be laid on further research to find proper planting geometry, compatible intercrops and for maximum contribution of nitrogen from legumes to non-legumes in a particular agro climatic condition.

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