

Multiple Cropping Systems and Their Production Potential in Semi-Arid Regions

*Kamalpreet Kaur and Santosh Korav

Department of Agronomy, School of Agriculture, Lovely Professional University, (Phagwara) Jalandhar-144411, Punjab, India

*Corresponding Author's email: kamaljassar988@gmail.com

Multiple cropping simply means growing more than one crop in a year, either at the same time or one after another. This approach is especially useful in semi-arid regions, where water and other resources are limited and not always reliable. Each crop uses sunlight, water, nutrients, and space in its own way, so nothing is wasted. Because of this, farmers often get more total production compared to growing just one crop. Farming in semi-arid areas is always risky because the weather can be unpredictable. Droughts, pests, or poor rainfall can easily damage crops. Multiple cropping helps reduce this risk. If one crop fails, another may still survive and give a yield. This natural balance, known as compensatory growth, helps farmers avoid complete loss and ensures more stable production. Also, since crops are grown in different seasons, the risk is spread out over time, making the system more reliable. Another important advantage is better use of land. With multiple cropping, farmers can produce more from the same piece of land. This is shown by measures like Land Equivalent Ratio (LER) and Relative Yield Total (RYT). A common and effective practice is growing cereals along with legumes. Legumes improve soil health by adding nitrogen, and at the same time, they provide protein-rich food, which is important for nutrition. It needs proper planning and management. While multiple cropping can increase food production and improve access to nutritious foods like pulses, it is not a complete solution for food security. Its benefits are often seasonal and may not last throughout the year. That's why it works best when combined with other approaches, such as having different sources of income, adopting better farming practices, and managing resources wisely.

Introduction

Multiple cropping system is known as growing two or more crops on the same piece of land in one year. It is the intensification of cropping in time and space dimensions, i.e., a greater number of crops within a year and a greater number of crops on the same piece of land at any given period. It includes intercropping, mixed cropping and sequence cropping etc. Farmers have the option to grow crops that need less water, such as maize-wheat, cotton-wheat, soybean-wheat, or mungbean-wheat systems. These cropping patterns are more suitable for areas where water is limited. However, many farmers are still hesitant to adopt them. The main reason is that the profits they earn from these systems (around ₹1.22–1.50 lakh per hectare) are lower compared to the traditional rice-wheat system, which brings in



Figure 1 :- Multiple Cropping System

about ₹1.63 lakh per hectare. Naturally, farmers tend to prefer the option that gives them higher and more assured returns. Certain triple cropping systems—like maize–potato–spring maize and maize–wheat–summer moong—allow farmers to grow three crops in a year, achieving a very high cropping intensity of about 300%. Interestingly, these systems can provide similar or even better income compared to the rice–wheat system. This suggests that, with the right approach and management, farmers can maintain good earnings while also moving towards more water-efficient and diversified cropping practices.

Types of Multiple Cropping System

Intercropping is growing two or more crops simultaneously on the same piece of land with a definite row pattern. It helps farmers make better use of the resources available on their farms and supports more sustainable agriculture. One of the biggest advantages of intercropping is that it keeps the soil covered for a longer time compared to growing a single crop. This protects the soil from drying out and from being washed or blown away. By growing different crops together, farmers can use water more efficiently, keep the soil healthy, and reduce problems like soil erosion.

Mixed cropping is a farming method where two or more crops are grown together in the same field without definite row pattern or fixed ratio. Instead of relying on a single crop, farmers grow different plants side by side, creating a more balanced and diverse system. This method is especially important for **sustainable agriculture**. Different crops use resources like sunlight, water, and soil nutrients in unique ways, so nothing goes to waste. For example, legumes naturally add nitrogen to the soil, which helps cereals grow better. Some crops reach deep into the soil for nutrients, while others use nutrients from the surface, making the system highly efficient.

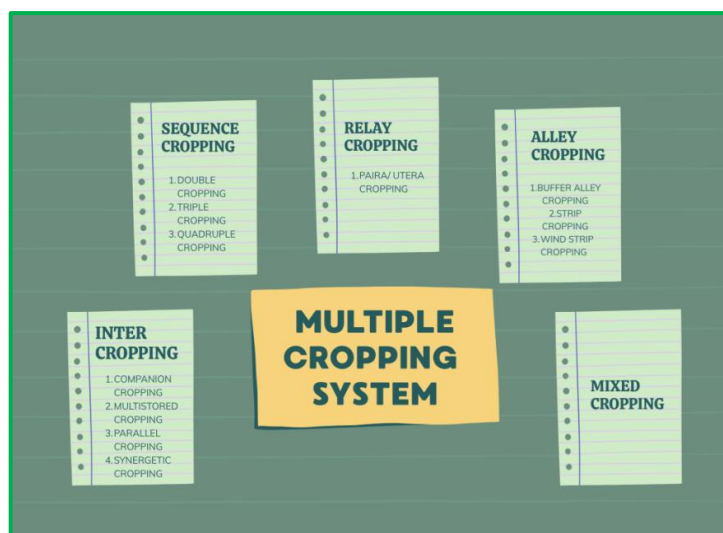


Figure 2:- Types of multiple cropping system

Sequences cropping is a smart farming strategy that keep the soil healthy. In this approach, different crops are planted in the same field one after another over time. By carefully planning which crops follow each other, farmers can boost plant growth and maintain soil fertility. A rotation combines a nutrient-enriching crop with one that uses more soil nutrients, creating a balance that supports long-term productivity. Planting the same crop repeatedly, can harm the soil, reduce yields, and even lead to environmental issues.

Relay cropping can be defined as growing the second crop before harvesting of preceding crop. Generally, 2nd crop is planted after the first crop has reached its reproductive stage of growth but before it is ready to harvest. E.g. potato is planted before the harvesting of maize.

Alley cropping- The crops are grown in alleys formed by a hedge row of trees and shrubs. *Leucaena leucocephala* (subabul) is very suitable for alley cropping system for forage and green leaf manuring.

Production Potential of Multiple Cropping System in Semi-Arid Regions

1. Annual productivity per unit area when more than one crop is grown on the same field in a year.
2. One crop give physical support to another eg. Greengram + maize .
3. Different absorption level of nutrient because of rooting system.
4. Production measured by :- Land equivalent ratio (LER)/ in intercropping ,System productivity(kg/ha/year) , Rice /wheat equivalent yield , Total annual yield.

Advantages

1. Better land utilization.
2. Better resource capture – different root depths and canopy patterns use light/ water/ nutrients completely.
3. Legumes and benefits – N fixation and improve soil health.
4. Risk spreading – failure of one crop may be compensated by another.
5. Higher total output and income – especially vegetables / pulses. Example – cluster pea, garden pea, brinjal etc.

Conclusion

Multiple cropping is a smart and practical way to improve farming, especially in semi-arid regions where water and resources are limited. By growing more than one crop on the same land, farmers can make better use of sunlight, water, and soil nutrients. It also helps keep the soil healthy, especially when crops like legumes are included, and reduces soil erosion. Another big advantage is that if one crop fails, another can still survive, reducing the risk of total loss. Although some systems may give slightly lower profits than traditional methods, options like triple cropping show great promise. Overall, multiple cropping helps farmers get more from their land, ensures more stable yields, and supports better income and food security.

References

1. Brar, A. S., Kaur, K., Sindhu, V. K., Tsolakis, N., and Srari, J. S. (2022). Sustainable water use through multiple cropping systems and precision irrigation. *Journal of Cleaner Production*, 333, 130117.
2. Gebru, H. (2015). A review on the comparative advantages of intercropping to monocropping system. *Journal of Biology, Agriculture and Healthcare*, 5(9), 1-13.
3. Trenbath, B. R. (1999). Multispecies cropping systems in India: Predictions of their productivity, stability, resilience and ecological sustainability. *Agroforestry Systems*, 45(1), 81-107.