

influence farmers to adopt protected cultivation, emphasizing that farmers are likely to invest in protected vegetable farming with a solid technical and institutional support.

In general, the findings indicate that the growth and expansion of protected farming relies not only on economic capacity of a farmer but also on their access to extension services, technical education and affordable financial support. Strengthening these support systems might encourage wider adoption of tunnel technology, boost agricultural productivity, and improve the quality of life for smallholder farming households.

4.2 Technical features and agronomic implications of plastic tunnel cultivation

The production practices observed during the survey suggest that farmers are more interested in protected farming with modern and improved cultivation practices including use of hybrid seeds, drip irrigation, mulching practices, and integrated nutrient management. Medium sized tunnel dominated the field as they require lower initial investments compared to high tunnels, and they provide sufficient space for intercultural operations such as training and pruning, skating, irrigation and harvesting. Likewise, the farmers of Meghang have mostly used 90 GSM plastic sheets with 6*12 m tunnel dimension, which is due to their suitability, affordability, durability and ease availability. As farmers seek cost effective structures, for their fragmented lands and to withstand climatic conditions, 90 GSM sheets with 6*12 m dimension tunnels happen to be the best choice for farmers (Lamichhane et al., 2023).

Observing the cultivation practices followed by farmers, it shows that, farmers are widely adopting climate smart practices to improve production. The use of drip irrigation helps provide direct water to the crop root zone which reduces water loss through evaporation and improves water use efficiency, while the use of plastic mulch preserves soil moisture, suppresses weed growth, regulates soil temperature, and reduces nutrient losses. The application of organic manure and chemical fertilizers together improves soil structure and ensure adequate supply of nutrients to plants for continuous crop growth and productivity. Similar benefits of integrating protected cultivation, efficient nutrient and irrigation management for sustainable farming have been reported in Nepal by Paudel et al. (2020) and Lamichhane et al. (2023). The adoption and practice of these new technologies indicates a gradual transition from conventional farming towards modern climate resilient vegetable farming.

However, for long term success and profitable business, farmers should take consideration on both the tunnel structures and proper agronomic practices. With technical and extension support and proper farming practices, the business would be profitable.

4.3 Crop choice, tomato dominance and production risk

Tomato is the dominant crop as seen in the study area, it is likely because of its high market demand, relatively higher economic returns and suitability for protected cultivation. Production under plastic tunnel provides favorable microclimate for off-season periods when open field cultivation is limited and market prices are generally higher. This helps farmers to extend production season, improve quality and access more profitable market.

These findings are consistent with recent studies on protected farming in Nepal. A study done by Subedi et al. (2023) shows that tomato is one of the most profitable crop grown under protected structures because of its high yielding potential and better market price compared to other vegetables. Similarly, Lamichhane et al. (2023) reported that tomato is the identified as the principal crop cultivated under protected structures in Nepal, highlighting its economic importance and its ability to adapt under protected structures. These studies suggest that, farmers prefer to invest in tomato for better financial returns despite high management cost.

However, reliance on one main cash crop may create a risk for farmers. Growing tomatoes in protected structures need regular care. If diseases break out or market price falls when the harvest coincide with many farmers, they will lose money. That is why, growing different crops is important. Crop diversification helps to protect against market volatility, reduces the spread of pests and improves soil health, to create more stable and sustainable protected farming in Nepal.