Table 13 Severity of major marketing problems in the study area

Factor	Weighted score	Rank
Unorganized Marketing	0.748	1
Dependence on intermediaries	0.636	2
Seasonal oversupply	0.634	3
High Transportation cost	0.542	4
Limited market information	0.474	5

4 Discussion

The bean producing household size in the study area is higher than the average of the country, which is 4.37 (National Statistics Office, 2021), indicating relatively large family units, which is common in rural Nepal. Such family sizes can be advantageous for labor-intensive agricultural activities, as family labor remains a primary input in smallholder farming systems (Bhandari and Ghimire, 2013). The wide range of annual income values of farmers reflects considerable variation among households in terms of resource access and production capacity (Gáfaro et al., 2025).

The human labor constitutes 45.32% of total cost of production highlighting the heavy reliance on manual labor in bean cultivation which is slightly higher than 41.14% reported by Tongbram et al. (2021). Joshi et al. (2022) reported that the total cost of production of Kidney beans per ropani was NRs 21,815 in Darchula district of Nepal, while Tongbram et al. (2021) reported the cost of cultivation of French beans is INR 238,894 per hectare in Manipur, Northeast India. Tongbram et al. (2021) reported a B:C ratio of 1.9,6 and Joshi et al. (2022) reported a B:C ratio of 1.29.

Farmer training programs improve knowledge, awareness, adoption of technologies, efficiency, and overall farm productivity through extension services (Baral and Gyawali, 2024). Cooperatives in Nepal enhance vegetable productivity for smallholders by improving input access, extension services, market linkages, and technology adoption, thereby serving as economic pillars for sustainable agricultural development (Bhattarai and Pandit, 2023). Literacy enhances agricultural productivity in Nepal by enabling farmers to adopt modern technologies, interpret extension advice, and optimize resource allocation in smallholder systems (Pudasaini, 1983a; 1983b). Nakano et al. (2018) documented that farmer training increases the adoption of technologies and increases productivity and profitability in farming. Higher household income and access to credit enable the purchase of quality seeds, fertilizers, and other inputs, which increase yields and returns (Boansi et al., 2024).

Adhikari et al. (2024) also found that pest and disease infestations, followed by inadequate irrigation were the main challenges in bean production in Tilagufa municipality of Kalikot. The incidence of insect pests, such as aphids, whiteflies, jassids, leaf miners, and pod borers, was initiated 25 days after sowing until harvesting (Kumar et al., 2023). Agricultural productivity is reduced by anthracnose in beans by 61.5% (Dhungana et al., 2025). Plant diseases are among the major constraints to achieving potential crop yields, and the costs associated with disease damage and management can substantially influence the overall economics of crop production (Oerke, 2006). Agronomic attributes were enhanced, and anthracnose infection was reduced under cultivar mixtures of beans compared to their sole cropping, both for trailing- and bushy-type beans (Prasad et al., 2016). Improving the efficiency of vegetable marketing in Nepal requires strengthening market information systems that provide timely demand and supply information to producers, traders, and consumers, which helps in making better production and marketing decisions and supporting the country's goal of becoming self-reliant in vegetable production (Malla, 2021).

5 Conclusion

French bean cultivation in Kalikot district is a profitable and important source of food and income, which is reflected by a B:C ratio greater than 1.0, indicating good potential for expansion and commercialization. However, production is constrained mainly by inadequate irrigation, high disease and pest incidence, particularly anthracnose disease and pests such as aphids and pod borer, limited access to quality inputs, and reliance on