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Ginger value chain analysis: A case of smallholder ginger production and marketing in hills of central Nepal

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Abstract. *Having high export potential and profitable to farmers, Ginger is an important spice crop of hills of central Nepal; however, ginger farmers continue to experience low productivity and were forced to share large profit with unscrupulous traders; further, they are traumatized by fluctuation of price and other problems. In this context, a study was undertaken in Sindhuli, a part of Central Nepal for analyzing value chain of ginger. A pretested semi-structured questionnaire was administered among 120 randomly selected farmers and 10 traders involved in ginger enterprise for the past two years. A face-to-face interview was scheduled to obtain data during October-November, 2018. Compound annual growth analysis revealed that area, production and yield of ginger were increasing at the rate of 1.73%, 1.65% and 0.95%, respectively, over the last seven years and price of ginger, over the past thirteen years, increasing at the rate of 3.28%. Value chain analysis revealed that producer, traders (wholesaler and exporter), retailer and consumer were the major actors involved. Farmers received substantial margin - 55% of the retail price, but the rest of the profit was shared to unscrupulous traders. B/C ratio of ginger farming in the study area was 2.42 revealing that ginger farming was a profitable business; with investment of Rs1.0 (0.0088US$) in ginger, farmers earned additional 1.42 rupees. Low productivity of ginger in the research area was caused by severe incidence of rhizome rot. In addition, price fluctuation, lack of processing and storing infrastructure, timely unavailability of rhizome seed, paucity of improved variety, and lack of farmers' knowledge on improved cultivation practices were the major constraint of ginger farming. Overall, our study points out that solving the constraints, accessing new market, and organizing co-operatives are crucial for sustainable value chain development.*

Keywords: ginger enterprise, questionnaire, farmers, traders, SWOT analysis, benefit cost analysis

Introduction

Ginger (*Zingiber officinale* Roscoe), herbaceous perennial plant, belongs to the family *Zingiberaceae*. Despite being high value cash crop, Ginger, has freedom to grow across the tropical and subtropical regions of the world. Ginger, native to the Southeast Asia, an important spice crop that possesses underground economic part-rhizome; can be consumed as fresh, dried (sutho), powdered, pickle, and candy (Purseglove et al., 1981). Ginger has been used extensively in the traditional and modern medicines for treatment of fever, headache, indigestion, pregnancy disorders, menstrual pain, motion sickness, rheumatoid arthritis and osteoarthritis (Ravindran and Babu, 2004). In addition, ginger is a good source of micronutrients; contains pharmacological active compounds - Gingerol, that possesses powerful anticancer, anti-inflammatory and anti-oxidant properties (Wang et al., 2014).

Being top fourth producer and 15th exporter, Nepali ginger is cultivated in an area of 22649ha with production of 279504 metric tons (MoAD, 2017; FAO, 2017). Nepali ginger has the highest export potential, this can be accounted for by the fact that China and India - the two giant ginger importers are neighbors of Nepal (Workman, 2019). Nepal has been spending Rs.13.3 on import for every rupee of export earnings (TEPC, 2017a); having high export potential, ginger could add solace in the miserable foreign trading. Realizing the fact, Nepal trade integration strategy - 2016 has identified ginger as one of the 12 priority export potentials; the strategy has embarked to boost export of ginger via value addition in the country from 217US$ per metric ton to 815US$ (TEPC, 2017b). However, Nepalese farmers continue to experience low returns from ginger farming; this might be due to fluctuation in price, marketing area and intervention of middlemen in price fixing. Furthermore, poor practices of washing, storage and packaging, paucity of processing facilities, lack of well-equipped laboratories for quality testing and grading, and incidence of pest and diseases are major problems of ginger production in Nepal (Boeckel, 2017). Having no intervention from the government of Nepal for controlling the price, smallholder ginger farmers are prone to unscrupulous trades. For understanding the cause of fluctuation in price, an indepth study of supply chain and marketing must be undertaken. Few researches were undertaken in value chain analysis of ginger, but none of them addressed site specific price fluctuation,

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supply chain and marketing. Keeping these points in view, a study was undertaken to determine price variation, production and marketing, and value chain analysis of ginger in Sindhuli district, Central hills of Nepal.

Material and methods

Sindhuli district of central Nepal, part of province No. 3 of Federal Republic of Nepal was purposefully selected as identifiable number of commercial ginger farmers cultivating ginger for the last two years can be easily found in this region. Being sub-tropical dominant, climate here ranges from tropical to temperate, favorable for ginger production. The study was conducted during October-November, 2018. For the study, field survey and literature review were conducted along with expert consultation, traders survey, Focus Group Discussion (FGD) and Key Informant Interview (KII). Primary data were obtained by using a face-to-face interview method; MoAD, journal, annual reports are the sources of secondary data. The main stakeholders such as farmers, service providers, transporters, and traders (local, district, and wholesaler level) were interviewed for the study. A total of 120 ginger growing farmers were selected randomly; similarly 10 traders including local, district, and wholesaler level were selected and interviewed using a pre-tested semi-structured questionnaire, out of them five are exporters, namely;

1. Bhim Bahadur Thapa (Ratamata, Sindhuli);
2. Rabi Shah (ek no Bazar, Sindhuli);
3. Ram Babu shah (Stall bazaar, Sindhuli);
4. Manoj Chaudhary (Dudhauli Municipality, Sindhuli);
5. Bhuwan Shrestha (Tarkari Bazar, Sindhuli).

Likewise, input suppliers from Madi bazaar, Dudhauli and Krishi Gyan Kendra were consulted and other actors like transporters, representatives from service providers like NGOs, Agricultural Knowledge Centre (Krishi Gyan Kendra) were selected for expert consultation. The collected data were analyzed using SPSS and Microsoft Excel. In addition, value chain mapping and SWOT analysis was also carried out.

Value chain mapping: Mapping was done on the basis of data obtained from field interview with farmers, traders, and expert panel through the value chain. The value chain map was drawn in traditional format with the key stages on the value chain identified on the left of the map, and enterprise associated with each stage on the right of the value chain. The map has differentiated the enterprise that engaged in production and composite enterprise that engaged in more than one stage of the value chain, production and processing.

SWOT analysis: SWOT analysis as a strategic planning tool was used to identify strength, weakness, opportunities and threats related to the ginger enterprise. By this analysis the specific objectives of the enterprise and the factors that support or fizzle out the enterprise were identified.

Benefit cost analysis (BCA): It was done to find out which way is more profitable. Benefit Cost Ratio (B/C), which defines the benefit per unit cost in the following formula was used for benefit cost analysis:

B/C = Gross returns / Total variable cost,

Where:

Gross returns = Price of ginger × Total ginger production;

Total variable cost = Sum of all variable cost (rhizome seed, FYM/Compost, labor bullock).

Result and discussion

Area, production and productivity of ginger in Sindhuli district

Area of ginger cultivation in Sindhuli district has been increasing since last decade; area and production of ginger was increased by 85% each since past ten years (MoAD, 2017). The increasing trend in area and production is accounted for by the fact that demand and price of ginger is increasing in alarming rate (USAID, 2011); sharp increase in production of ginger was observed in year 2012/13. Despite increase in production and area, yield of ginger was decreasing due to incidence of rhizome rot (Acharya et al., 2016). In fiscal year 2016/17 area, production and yield of ginger in Sindhuli district had 671ha, 8344Mt, and 12435kg/ha, respectively (MoAD, 2017). Compound annual growth analysis revealed that area, production and yield of ginger increased at a rate of 1.73%, 1.65% and 0.95%, respectively over the past seven years. Area, production and productivity of ginger in Sindhuli district of Nepal is presented in Figure 1.

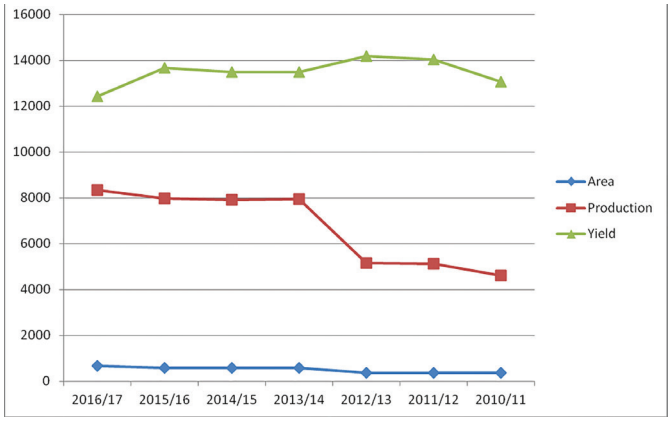

Figure 1. Area (ha), production (t/ha) and yield (kg) of ginger in Sindhuli district

Input supply situation

Rhizome, FYM/manure, chemical fertilizer, pesticides, labor (human and animal) and farm equipments were the inputs required for ginger production; inputs traders (agro-vet) were the major supplier in Sindhuli district. Generally, farmers relied on locally available inputs, thus there was no hindrance on farm equipment availability and FYM; but slight problem in easy availability of labor due to out-migration of Nepalese to Arabian nation. None of the farmers in the study area applied chemical fertilizer in ginger production; this was due to lack of knowledge about importance of chemical fertilizer application and timely unavailability of chemical fertilizer (Pyakurel et al., 2019). Being rhizome basic input, farmers desired high yielding ginger rhizome, but high yielding improved variety has not

been introduced in the study site yet. Farmers almost entirely depended on the informal sector for seed, they include own farm-saved seed, seed purchased from neighbors and relatives, and seed from local market, consistent with the findings of (Wyss, 2018). Although there was higher incidence of rhizome rot disease, neither farmers nor agro-vets had knowledge about their appropriate management. In addition, none of the farmers have adopted any kind of rhizome rot management practice.

Plantation

Farmers used to plant ginger during March to April, provided that weather was favorable; they preferred to plant ginger in early season as they escape hailstones. Generally they were propagated from cutting of rhizome known as bits. The average size of bits was 3-5cm in length, 20-25g in weight with at least one healthy bud. However, in Sindhuli whole rhizome was planted without breaking which increased the recovery of mother yield known as *Mau khanne*. Ginger was cultivated up to 2500 masl of Sindhuli district with terracing either on open field or under shaded condition. Farmers' interview revealed that one deep plowing followed by 2 cross plowing was done for planting of rhizome; incorporation of manure was done along with plowing. According to the field study it was found that ginger was planted in the hilly region of the study area with 30×30cm spacing in raised bed. A similar method of ginger plantation was followed in Sikkim, India (Rahman et al., 2009). Immediately after the planting of rhizome, soil was covered with forest tree leaves, straw, grass and other crop residue.

Disease and pests

Farmers reported that major prevailing disease and pest were: shoot borer, leaf roller, and rhizome rot; decline in yield in year 2017 and 2018 was largely due to severe infestation of rhizome rot. A similar result was observed in Kapukot, Salyan - ginger producing hub of Nepal (Acharya et al., 2016). It was found that farmers were not following any disease and pest management practices. Very few (2%) farmers of the study area were applying chemical pesticide for rhizome rot management; dipping mother rhizome in fungicide solution before planting was the practice they were following.

Harvesting and postharvest handling

After 2-3 months of plantation, mother rhizome (*mau*) is removed leaving the sprouted piece of rhizome in the field. Farmers believed that, this practice gave proper spacing for growth and development of sprouting rhizome. About 70% of the seed rhizome was recovered as mother rhizome, reducing the cost of seed. After a fortnight of mother extraction, earthing up was done. Farmers used to harvest ginger after 7-9 months of plantation, hence, peak harvest period starts from October to February. Green ginger was harvested after 5-6 months of plantation and it was used in making candy, prickles, or household purpose. Large landholding farmers fix the date of harvesting after agreement with traders but small land holding farmers generally harvest at their own convenience time. Small land holding farmers sell their produce to collector, wholesaler, and traders, whereas large land holding farmers sell their produce to district level traders, a similar result was observed by (USAID, 2011). According to the survey, it was found that cleaning and sorting was performed at farmers' level, during this process dirt, debris, diseased and broken rhizome were removed. After cleaning and sorting rhizome, farmers used to pack rhizome in jute bags, this process prevents rhizome from mechanical damage during transportation.

Price determination

Price of ginger in Sindhuli district was determined by the interaction of demand and supply; due to higher demand of ginger the area of ginger cultivation has increased since last decade. The increase in demand of ginger was due to increase in demand of ginger from India (USAID, 2011) and increase in consciousness of the health benefits of ginger among Nepalese consumers. The field study revealed that about 70% of ginger produced from the district was exported to India, thus price of ginger in Sindhuli district is largely determined by the Indian market and unscrupulous traders. Price of ginger in Sindhuli district has been fluctuating since last decade, a similar fluctuation in price was observed across the country (USAID, 2011). An increasing trend of ginger price was observed from 2007 to 2015, in 2016 a sharp decline in price was observed; the sharp decline in price was due to an increase in ginger production and reduction in the rate of demand from the Indian market. In this situation traders compelled merciful farmers to sell ginger at lower price. In 2018 a similar decline in price was observed because India had imposed a ban on import of ginger from Nepal. After lifting the ban on import of ginger by India, the price of ginger was returned to the original profitable state. The compound annual growth rate revealed that price of ginger has been increasing at the rate of 3.28% over the last thirteen years. The trend of variation of price of ginger in Sindhuli district of Nepal is shown in Figure 2. According to the field study it was concluded that fluctuating behavior of price was observed not over years but also within a year, too. The maximum price of ginger was observed during April to May; a plausible explanation to this statement is that farmers used to plant ginger during this period creating a shortage of ginger on the market. The minimum price of ginger was found during October to January. This can be partly accounted for by the fact that October to January is the peak harvesting season, increased supply on the market dropped price down. Seasonal variation of price in ginger is shown in Figure 3.

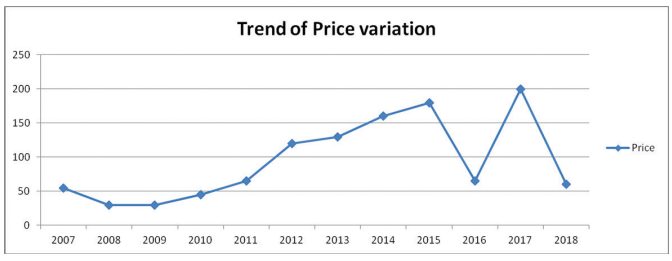

Figure 2. Trend of price variation in the study area

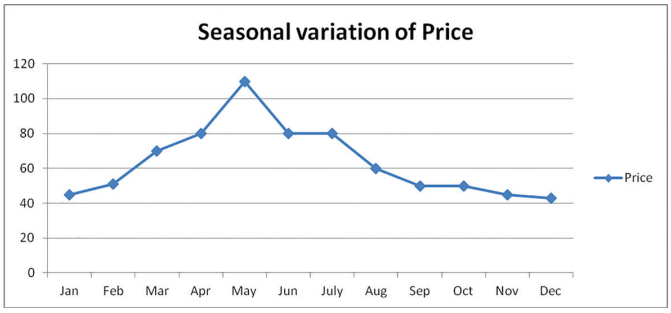

Figure 3. Seasonal variation of price of ginger in the study area

Cost of production and benefit cost analysis

Farmers of Sindhuli used to follow a traditional method of ginger cultivation; they scarcely used modern machinery and chemical inputs like fertilizers and pesticides. The cost of production of ginger in the study area greatly varied, it might be due to variation of amount of inputs used by farmers. The average amount of FYM applied by farmers in the study area was 92.70 doko per kattha (30 kattha= 1ha and 1 doko= 30kg) (Table 1). The amount of rhizome seed applied by farmers was 284.87kg per kattha which was higher than the national average (USAID, 2011). Farmers had purposefully applied higher seed rate so that they could be benefitted from mother rhizome recovery (*mau khanne*). The total number of labor required for planting, mulch collection, weeding, harvesting, and packaging was 4.02 per kattha.

Table 1. Cost of ginger production in Sindhuli district of Nepal

Variables	Mean	SD
Amount of FYM (doko)	92.70	17.69
Amount of seed (kg)	284.87	60.81
Mother rhizome (kg)	184.17	95.25
Productivity (ton/ha)	14.51	3.33
Total labors (no.)	4.02	0.56
Cost of seed (Rs/katta)	28487.10	6081.63
Cost of labor (Rs/katta)	1570.99	316.76
Cost of FYM (Rs/katta)	4635.32	884.91
Cost of land preparation (Rs/katta)	694.06	166.65
Total cost (Rs/katta)	35478.74	6579.27
Total income (Rs/katta)	86359.25	24089.20
B/C ratio	2.42	0.35

*Rs1= 0.0088US$; 1 Doko= 30kg and 30kattha= 1ha

Farmers applied higher dose of seed rate with the belief that they could be benefited from mother rhizome removing. In addition, the cost of seed rhizome is high, thus the cost incurred for seed was exceptionally high. Seed shared higher cost among all other inputs; the cost of seed required for cultivation of ginger in one kattha (30 kattha= 1ha) was Rs28487.10 (250.69US$), while the total cost incurred for ginger production was Rs 35487.47 per kattha (312.28US$). The cost required for labor, FYM, and land preparation was quite lower; labor was Rs1570.99 (13.82US$), FYM was Rs4635.32 (40.79US$), and land preparation was Rs694.06 (6.10US$). Income from ginger farming was accounted by cumulating income from mother rhizome removing (*mau*) and final harvested product; and was found to be Rs86359.25 per kattha (759.96US$). The benefit-cost ratio of ginger farming in the study area was 2.42 indicating that ginger farming was a profitable enterprise; with investment of Rs1.0 (0.0088US$) farmers got additional 1.42.

Import and export analysis

According to the survey, it was found that Sindhuli district is self-sufficient in ginger, no significant amount of ginger importation has been observed since last decade. However, traders of the study area have been exporting ginger for the past five years; in year 2018, India imposed a ban on ginger import from Nepal, thus the amount of export has dropped down to zero, but with the lift of ban over ginger importation, the amount of export has returned to the original state. Ginger exporters of Sindhuli district claimed that in year 2017, export of ginger was 5000t. Further, the amount of ginger export has been increasing, a similar result was observed all across the country (USAID, 2011; TEPC, 2017b).

Value chain mapping

Value chain mapping (shown in Figure 4) indicates graphical representation of ginger enterprise showing how product flows through the primary as well as secondary channels, maintaining in vertical chain where fresh/raw ginger flows from producer to consumer - consumer being at the top. The map presents three key units of value chain: Enablers, listed along the right side of the map, Functions along the left side, and Actors amidst them; the Actors and Enablers are designed by boxes while Functions are represented by the flow diagram. The channels are identified on the basis of the core principle of business units: supply, production, and distribution; the more the units are integrated, the more competitive advantage they acquire, and the more capital-intensive they are.

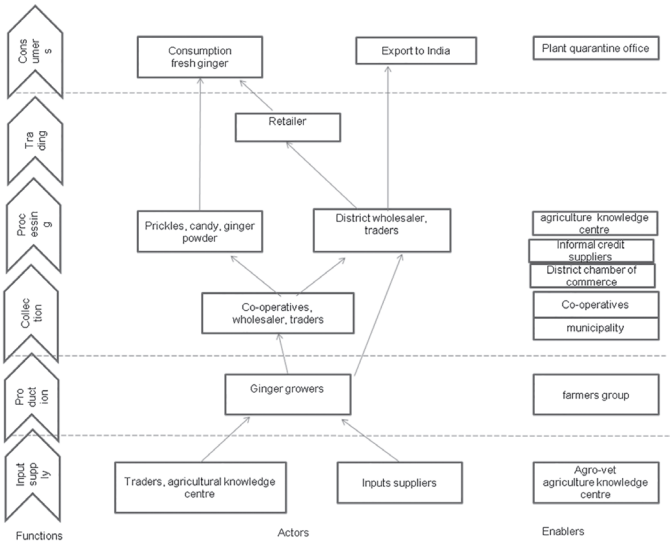

Figure 4. Value chain mapping of ginger enterprise in Sindhuli district

Value chain analysis

Value chain analysis was done to determine all the cost incurred in production, margins and price along the value chain, and the share all actors hold as the products move along farmers, collector, processor, traders and finally to the consumers. The total cost, including cost of production, post-harvest handling and marketing was Rs53.96 (0.475US$) per kg. Loss was quite substantial at farmers' level, ranging from 5-10%. The average price received by farmers, in year 2017, was Rs110 per kg (55% of retail price) and received margin was Rs56.04 (0.493US$) per kg - making ginger enterprise profitable among farmers. However, traders earned a substantial margin from ginger, about 45% of the retail price, which reveals that a large share of the profit from ginger farmers went to the hands of unscrupulous traders, a similar result was observed in potato value chain of Illam distrct of Nepal (Shrestha and Yadav, 2018). The profit from ginger farming can be substantially increased at farm level provided that a certain mechanism should be there for checking unscrupulous trading. Looking at the scenario in the amount of ginger value chain, major exporters (traders) deal in large quantity - about 75% of the total production and extract substantial margin from trading to Bihar, India; however, traumatic loss was faced by both producers and traders in year 2018 as India imposed a ban on ginger importation form Nepal. Traders do not perform significant processing, rather they simply collect in large quantity, grade and sell them. Processing is done by a co-operative named, "Saugat Griha", famous for ginger prickles and candy. The amount and cost required to make 500g of prickle form ginger was 1kg and Rs 400, respectively; the retail price of prickle per bottle (500g) was Rs 500), thus they gained extra Rs 100 from value addition. In addition to that, they made ginger juice; but due to poor market demand the production of prickle and juice was pinched off.

Actors and enablers

The primary actors involved in ginger value chain were input suppliers, but there were many actors involved directly and indirectly in agricultural input supply, they were: agro-vet, Krishi Gyan Kendra, private traders, farmers, and some co-operatives. There were many co-operatives and farmer groups in the study area but none of them had made significant contribution in the ginger sector. Farmers were the major stakeholder of ginger production; apart from production the major task they performed was post-harvest handling (sorting mainly) and transportation to traders, some traders, very few, collected the produce from the farm gate. Agro-vet, farmers group, and agricultural knowledge centre were enablers of ginger production, the findings are consistent with (USAID, 2011) and the value chain of potato and orthodox tea of Illam, Nepal (Adhikari et al., 2017; Shrestha and Yadav, 2018). Traders in the area were district wholesaler, exporters, co-operatives and retailer; none of the traders, except the co-operative named 'Saugat Griha', performed significant processing, but they carried out grading and sorting. Saugat Griha, a co-operative of Sindhuli district famous for ginger processing, generally made ginger prickles and candy. The majority of ginger was exported to India; thus, price was mainly fixed by the exporter. Enablers like Municipality, Co-operatives, District Chamber of Commerce, Agricultural Knowledge Centre supported ginger trading; the findings being in accordance with USAID (2011) and Bhandari et al. (2018).

SWOT analysis

SWOT analysis identified the strength, weakness, opportunity, and threats, where strength and weakness indicate external factors governing ginger commercialization, while threats and opportunities encompass external factors influencing ginger enterprise (Table 2). Researchers, developing agencies, and policy makers must put emphasis on weakness and threats while designing a plan for sustainable growth of the ginger sector.

Table 2. SWOT analysis of ginger enterprises

Strength	Weakness
1. Well developed road network in rural areas. 2. Favorable climate for ginger production. 3. Organic ginger production in the area. 4. Traditional knowledge and skills of farmers. 5. Access to communication facilities. 6. Farmers group and co-operatives are involved in production 7. Potentials for growth in area and productivity. 8. High demand of ginger in India and China.	1. High incidence of rhizome rot. 2. Poor adoption of improved variety. 3. Poor value addition activities. 4. Timely unavailability of inputs (seed, fertilizer, labor, pesticides). 5. Poor adoption of improved technology. 6. Weak backward and forward linkage.

Opportunity	Threats
1. Scope for establishing ginger processing industries. 2. Scope for value added products. 3. Continue production of organic ginger. 4. Government policy support as ginger is high value income generating crop. 5. Potential to increase area and productivity.	1. Serious threats of rhizome rot disease. 2. Decreasing labor availability due to migration. 3. Price fluctuation. 4. Shoot borer and leaf roller are also emerging threats.

Conclusion

Compound annual growth analysis revealed that area, production, and yield of ginger has been increasing at the rate of 1.73%, 1.65% and 0.95%, respectively, over the last seven years and price of ginger has been increasing at the rate of 3.28% over the last thirteen years. Value chain analysis revealed that producers, traders (wholesaler and exporter), retailer, and consumer were the major actors involved. The majority of the ginger produce was exported to India, thus the price was largely determined by the Indian market; accessing new markets, China being the major importer, could solve the problem of price fluctuation. Farmers received substantial margin - 55% of the retail price, but the rest of the profit was shared by unscrupulous traders. B/C ratio in ginger farming in the study area was 2.42 revealing that ginger was a profitable farming; with investment of Rs 1 in ginger, farmers earned additional 1.42 rupees. Low productivity of ginger in the research area was due to severe incidence of rhizome rot. In addition, price fluctuation, lack of processing and storing infrastructure, timely unavailability of rhizome seed, paucity of improved variety, and lack of farmers' knowledge on improved cultivation practices were the major constraints of ginger farming. It would be better to suggest concerned organization to provide training on ginger cultivation, strengthen input supply situation, access new market, and check unscrupulous trading by organizing co-operatives and farmers groups for sustainable ginger farming. Ginger farming in Sindhuli district demands further researches on efficiency and risk attitudes of ginger farmers, feasibility of mechanization, and sustainable management of rhizome rot.

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