



Research article

Actors in customary and modern trade of Caterpillar Fungus in Nepalese high mountains: who holds the power?

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Abstract: This paper assesses the supply chain of Yartsagunbu (Caterpillar Fungus) in Darchula district of Nepal to identify who holds the power and how they gain power for management and marketing. We recorded two types of supply chain: (i) open supply chain, driven by open market, where the product is transported to Kathmandu before export to international market, and (ii) close chain practiced by indigenous Shauka community following customary trade route to Tibet. The open chain is longer with higher number of actors compared to the close chain. This study observed that actors have intensive horizontal competition in the open chain to collect and purchase maximum quantity. Therefore, profit is disproportionately distributed to the actors in higher level of the supply chain. The profit is based on the price the actor receives, which is determined by their bargaining power. An actor's bargaining power is determined by the capital holding capacity, market information, risk appetite, networking and social ties. The study suggests that Government's interventions such as providing security to traders, access to finance, organizing auction and providing market information can help to increase the bargaining power of lower level actors. The study also suggests to minimize the disturbance in the collection site through limiting the collection permit and revising the revenue based on the market price.

Keywords: bargaining power; collectors; Nepal; Shauka; traders; Trans-Himalayan trade

JEL Codes: P28, P36, Q23

1. Introduction

The commercialization of medicinal and aromatic plants (MAPs) and their products as part of green economy can support to achieve Sustainable Development Goals (SDGs) particularly SDGs 1 (no poverty), 12 (responsible production and consumption), and 15 (life on land) for the developing and least developed countries, including Nepal (United Nations, 2017). This is because contribution of the MAPs to the household income of forest dependent poor outweighs the contribution of timber in Nepal (Choudhary, 2007; Sills et al., 2011; Sunderland and Ndoye, 2004; United Nations, 2017). For instance, an estimated 400 metric ton (mt) of MAPs was traded with monetary value of USD 5.5 million in 2015 from Darchula district of Nepal alone (Pyakurel et al., 2018), to which Yartsagunbu dominantly contributed 85% or USD 4.7 million (Pouliot et al., 2018).

Yartsagunbu (English Name: Caterpillar Fungus; Latin Name: *Ophiocordyceps sinensis*) is the high valued fungus with an enormous potential to uplift mountain economy (Chowdhury et al., 2005; Mahapatra and Shackleton, 2011). Yartsagunbu grows on alpine ecosystems of Tibetan plateau and Himalaya particularly in Bhutan, India and Nepal (Winkler, 2009). It is one of the important income sources for rural mountain households, who are involved in collection (Shrestha et al., 2017), and trade (Devkota, 2007; Shrestha and Bawa, 2014). Yartsagunbu collection is celebrated as people's festival in Nepal. It generally starts from mid of May and lasts till mid of July. Thousands of people, including children of more than eight years of age ascent to the alpine pastures and camp for its harvesting during the above mentioned time (Shrestha and Bawa, 2013, Pouliot et al., 2018). Even the seasonal migrants to India take leave from their jobs and join the villagers to collect the species because even an average collection is sufficient to bear more than half the annual household expenses. Households involved in Yartsagunbu collection can earn between USD 1000–2000 per season, which is 40–74% of the total annual cash income in the Himalayas (Winkler, 2008b; Shrestha and Bawa, 2014; Caplins, 2017; Shrestha et al., 2017). The income is generally used to educate children, purchase vehicles, foods, pay debts, and taxes (Winkler, 2008a; Shrestha and Bawa, 2014).

Due to higher income contribution, caravan of harvesters in ever increasing number visit the above high-altitude pasturelands resulting into ever decreased individual quantity collected. Though, the average annual collection has decreased, the total income per capita has increased due to its increasing price in the international market (Shrestha and Bawa, 2013; Pant et al., 2017; Shrestha et al., 2017). The final destination of Yartsagunbu is the international market including China, Hongkong, Thailand, Singapore, UK and Taiwan (TEPC, 2013). The market of Yartsagunbu can be described as oligopsony; with several thousand collectors and few traders in higher level of the supply chain (GON, 2010). This may be because: (i) general traders cannot afford the high transaction costs, (ii) it is sold only in international market, and (iii) has high security risk (THT, 2013).

Despite its noteworthy contribution to household, local and national economies (GON, 2013), the government has paid less attention to manage Yartsagunbu. As a result, there is an unhealthy competition between supply chain actors which has led to unequal distribution of benefits among actors, loss of social relationship, and mutual trust (Pant et al., 2017). Due to such internal competition, Nepalese traders have not yet been able to fully tap the value of the product (Pyakurel and Oli, 2012).

In addition, there is a dramatic reduction in Yartsagunbu and recently it is enlisted as vulnerable species in the IUCN's Red List of Threatened species (Yang, 2020). In this context, understanding the supply chain of Yartsagunbu and how actors interact within the chain may contribute to sustainability of product flow and thus improve the trade in terms of enhancing equitable benefits across the supply chain actors and especially for harvester community for whom it is often the main source of income over a larger period of a year.

The existing literature on Yartsagunbu trade are disproportionately focused on identifying actors and estimating the value they receive (Pouliot et al., 2018; Wallrapp et al., 2019a, b). Usually, supply chain actors maximize their profit with increasing bargaining power (Pyakurel et al., 2018; Dallas et al., 2019). But how they gain bargaining power is less understood in Yartsagunbu supply chain. Having said so, Yartsagunbu trade is traditionally local business and accordingly collection and trade is very much manifested with indigenous communities (Devkota, 2007; Shrestha and Bawa, 2013). Therefore, it is also important to understand the customary trading system in Yartsagunbu. If it exists, then how it functions? This study assessed these aspects exploring the Yartsagunbu trade originating from the far western Darchula District of Nepal.

2. The theoretical context

Market is the main driving force of the management of Yartsagunbu. Formal and informal regulations (e.g., collection and trade permits, revenues, rent seeking) and market characteristics (e.g., price regulation, flow of information, and delivering safety) form the enabling conditions needed for improved market functioning. Though market regulations fall under the jurisdiction of state, it is the private sector that drives the market characteristics. For the commons, property rights are more effective to address the issue of overexploitation (Isaksen and Richter, 2019). Therefore, state intervention with well-defined property rights is needed for the regulation without which there are possibilities of capturing the resources by few powerful groups, continued over exploitation of the resources, conflicts and resultant higher transaction costs leading to market failures (Rausser and Zusman, 1991; Iversen et al., 2006; Neupane, 2015) apart from discrimination of original producers on the ground.

Neoclassical economists argue that if benefits derived from the natural resources only go to an individual or a limited number of people within a group, this will create an asymmetrical power condition which leads to market failure in the long-run bringing inequalities in benefit and cost-sharing (Rausser and Zusman, 1991). Such situation may lead to economic tension and cause significant loss of social welfare as the strong party may increase the profit at the expense of weaker party (Wu and Roe, 2007). At the same time, lack of property rights may lead to severe physical violence and even deaths in highly valued open access resources, such as in Yartsagunbu collection related violence occurred in Manang district of Nepal in June 2005 (Adhikary, 2017). Similarly, locals denied access to the collection site to outsiders in Darchula district (Pant et al., 2017).

The main issue in Yartsagunbu trade is to ensure the equitable distribution of benefits across the supply chain actors. In Yartsagunbu market value chain, asymmetrical information of the parties involved, capital they hold and risk bearing capacity of the individual/group are the key variables which contribute to the bargaining power of one party over the other. Hence there are multi-level players in Yartsagunbu market with different powers. Usually, there are three types of actors: harvester, trader and wholesaler, in medicinal plant trades in the Himalayas (Olsen and Bhattarai, 2005). The bargaining power between the actors is also influenced by the spatial factors as Yartsagunbu trade is

trans-boundary in nature. For the simplicity, this study presents the bilateral bargaining between the two groups of Yartsagunbu collectors and traders and their benefits in different power situations. In the Himalayas, transboundary customary trade still exists. The customary trade is considered as a part of a social system, which is conducted mainly to support other subsistence activities rather than making profits (Moncrieff, 2007). In such case, supply chain actors may go for coalition rather than competition satisfying the basic criteria of cooperative bargaining (Harsanyi, 1963).

Share of profits depends on the bargaining power (0–1) of the two parties in the supply chain. For example, if bargaining power of the district trader is equivalent to 1, then other party (either village contractor or national trader) will have zero bargaining power. In this situation, all profit goes to the district trader (Figure 1), which produces disincentive for the other party. In this case, other party may get some benefit which is equivalent or just higher than the opportunity cost of participating in the trade. If the benefit is lower than the opportunity cost, in such circumstances the other party may exit from the market. In this extreme case, where only one party enjoys overwhelming bargaining power, makes more profit, and tries to capture a larger share of the surplus, the overall efficiency and social welfare are compromised. This may result in higher transaction costs to manage the risks, trust costs, initial capital required, and costs for asymmetrical information. Therefore, extreme scenarios are not conducive from the social welfare point of view. Thus, an equilibrium point is sought which will provide incentive for the both parties and improve the joint bargaining power instead of individual bargaining (Hellmann, 2007), with which there will be more trust, less risk and more incentives for the collectors due to reduction in transaction costs. In a nutshell, the combined benefit is considered as socially optimal.

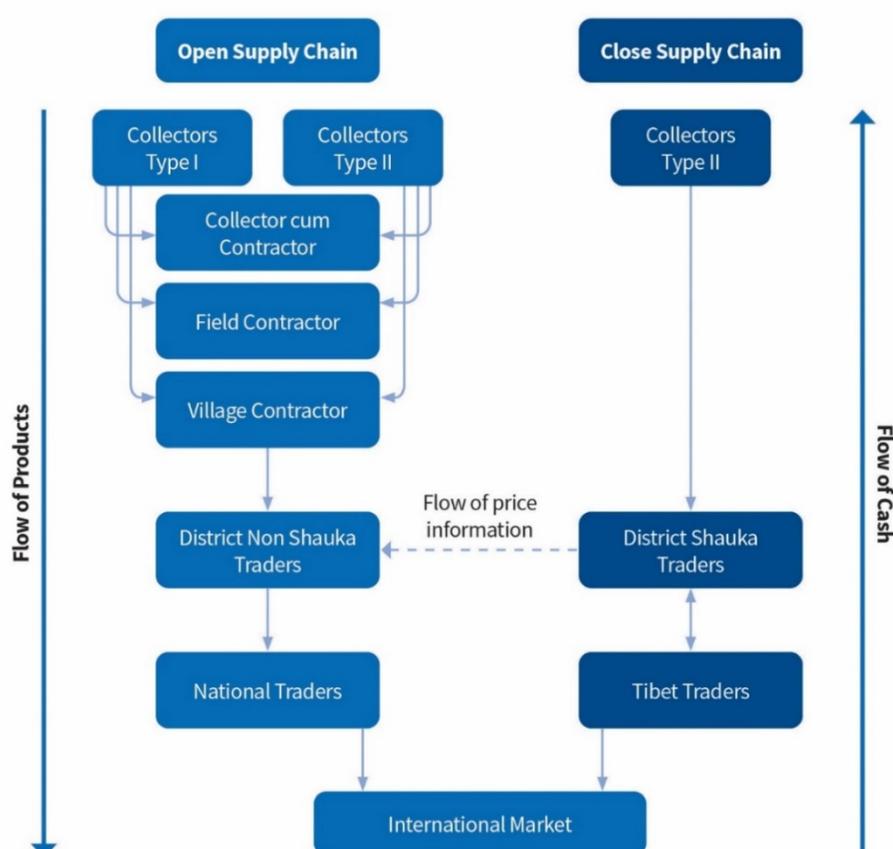


Figure 1. Trade and money flow of Yartsagunbu market chain related to Darchula district, Nepal.

2.1. Study area

Darchula district lies in the far west of Nepal bordering Tibetan Autonomous Region (TAR), of the People Republic of China and Uttarakhand State of India. The district is the second largest Yartsagunbu supplier of Nepal after Dolpa district, which contributes up to 40% of the total royalty collection from the Yartsagunbu trade in Nepal (GON, 2013). Three rural municipalities i.e. Byas, Api-Himal and Marma in the upper valleys of Chamelya and Mahakali rivers, have alpine grass lands ranging between 3500 m to 5200 m above sea level, and are the prime habitat of Yartsagunbu. Majority of the population of Darchula district is involved in Yartsagunbu collection and its trade at different levels as their main source of income.

The study area was selected because of the presence of two distinct types of trade routes (supply chains) existing in the district. The first type of chain links with the national trade system, which is linked with Kathmandu (capital city of Nepal) from all over the country before export. The second type of chain is practiced by indigenous Shauka¹ community, which follows customary trade route and exports to TAR directly from the district. Shauka people are the inhabitants of upper area of the Mahakali valley in both sides of Nepal and India. They have a strong relation both socially and through trade to the Tibetan communities as they are connected through indigenous Trans-Himalayan trade. There is a seasonal trading and exchange of commodities, between the Tibetan Plateau and Indian and Nepal. Besides, animal husbandry and agriculture; the trade with TAR, especially of MAPs is their major income source (Olsen and Bhattarai, 2005; Negi, 2007).

3. Method

This study adopts the mix methods. A total of 92 randomly selected Yartsagunbu collectors were interviewed on site during March and July 2014. In addition, 10 district level traders (five each from Shauka and non-Shauka communities) and 5 national level traders were interviewed. The interview documents the role and linkages between different actors, assesses the characteristics of individual actors and analyses the power dynamics. In this analysis, bargaining power is analysed based on the capital holding, market information, control on quality and risk faced during the transaction (Tokatli, 2006; Hellmann, 2007; Safarzy et al., 2010). These indicators are described in Table 1. The actors' bargaining power is evaluated as low, medium and high based on the score they obtained in each indicator.

Table 1. Description of the indicators for bargaining power.

Indicators	Description	Categories
Capital Holding	The capacity of the actor in cash flow.	Low, Medium, High
Market information	Whether actors can receive the information. In particularly about price of the commodity in the secondary or upper level of market.	Yes, No
Control on quality	Influence of actors to control the quality commodity in the market chain.	Low, Medium, High
Risk	The risk faced by the actors during the transaction.	Low, Medium and High

¹ Shaukas are the migratory herders living in Upper Mahakali valley. They historically dominated Trans Himalayan trade route between Nepal and TAR through Mahakali valleys. There are 174 households living in the study area. (Pant et al., 2017)

In addition, four focused group discussions with collectors were carried out to validate the information obtained from individual responses. The focused groups also discussed the problem faced by collectors, the population pressure on Yartsagunbu collection area, and the information on the price they receive for the collected product.

4. Results

Two types of supply chains were observed in the study sites: (i) open supply chain, and (ii) close supply chain (Figure 1). The open supply chain is defined as a modern trade system, which is linked with national Yartsagunbu trade and Kathmandu is the final destination before exporting to international market. It has four layers: (i) non-Shauka collectors, (ii) contractors, (iii) district traders, and (iv) national traders. The close supply chain is defined as a customary trade system with two layers of actors before the export to TAR: (i) collectors, and (ii) traders. In the close chain, all actors are from the Shauka community and are directly linked with the traders in TAR. The collection sites are also different for Shauka and non-Shauka collectors. Although, two supply chains operate independently, the district traders interact with Shauka traders. Particularly, district non-Shauka traders receive price information from the District Shauka Traders. The open supply chain is complex and often non-transparent compared to the close supply chain.

The number of District Shauka Traders is substantially lower than the number of District non-Shauka Traders (Table 1). The total quantity of Yartsagunbu transported out of Darchula is also significantly high (85–90%) via open supply chain. Table 2 reports that average Yartsagunbu collected by the District non-Shauka Traders is almost double than that of District Shauka Traders.

Table 2. Total number of traders and quantities of registered traders in Darchula (ANCA 2014).

Year	Total number of registered District traders for Yartsagunbu in Darchula			Quantity (kg) of registered Yartsagunbu transported out of Darchula		
	Shauka traders	Non-Shauka Traders	Total	via Tinker pass to China	To Kathmandu	Total
2011	8	31	39	95	695	790
2012	10	35	45	90	619	709
2013	12	45	57	150	804.6	954.6
2014	9	37	46	84.6	760.9	845.5

4.1. Open supply chain

There are thousands of collectors; not only from Darchula but also from other parts of the country such as Dhading, Baitadi, and other districts; who depend on the open Yartsagunbu collection sites in Darchula. These collectors are highly reliant on Yartsagunbu income to support their families. Although, there was no registration system for collectors in the district, it was estimated that more than 4500 collectors visited the pastureland of Byas valley during harvesting season i.e., May to July 2014.

4.1.1. Non-Shauka collectors

We observe two types of non-Shauka collectors in this supply chain. *Collector-type I* are mainly from poor households; either new in this trade or not well connected to the market; and only few members of the households are involved in collection. In addition, they are not regularly involved in the collection. These collectors sell the product to field contractors directly on the site. *Collector-type II* are collectors from the households earning regular income from Yartsagunbu. They mostly are from the district of origin (i.e., Darchula in this case) and have a long involvement in Yartsagunbu trade. They are comparatively well-off than the “*Collectors-Type P*”. This is because their collection cost, in terms of travel cost, is substantially lower than the Type I collectors. They sell their product to the *village contractors* and often receive credit or advance money from the contractor over the year or before the collection season. They have high financial dependency on *village contractors*.

4.1.2. Contractors

There are three types of contractors in the open supply chain: (i) Collectors cum field contractors, (ii) Field contractors, and (iii) Village Contractors. The *collectors cum field contractors* are Yartsagunbu collectors who sometimes purchase Yartsagunbu from their fellow collectors. *Field contractors* do not collect on their own, rather roam freely in the collection site, interact with collectors and purchase from them. They have high chance of getting better quality of Yartsagunbu. *Field contractors* generally work for district level non-Shauka traders and receive advance payment from them. The livelihoods of both collectors cum field contractors and field contractors largely depend on Yartsagunbu trade.

Yartsagunbu is the supplementary business for *village contractors*. Usually, they are from the better-off households compared to the field contractors. Village contractors usually have other business activities such as retail shops. They operate from the village and provide loan to their villagers. Villagers, who are mostly *Collector-Type II*, repay the loan in the form of Yartsagunbu. Usually, *village contractor* has high chance of getting low quality Yartsagunbu as collectors sell directly to the *field contractor* if they get better price. They sell collected Yartsagunbu to District traders (non-shauka).

4.1.3. District traders

District traders (non-Shauka) mostly act as agents of the National traders at Kathmandu. They receive advance payment from National traders and distribute to collectors through field contractors to book the commodity. These traders try to maximize their profit by keeping the buying rate minimum through several strategies including providing advance payment, and manipulating the market information. In addition, District traders (non Shauka) usually bargain the price with national traders based on the market information, particularly of Tibet, from Shauka traders (District level).

These traders also face a great risk of looting during the transportation. In order to avoid this risk, traders act collectively to ensure secure transportation and sometimes charter helicopter to carry Yartsagunbu directly from the collection sites to Kathmandu. These traders prefer bank transactions due to huge amounts involved, and to do transaction via bank, the quantity collected should be legitimized, which are done via paying royalty.

4.1.4. National traders

National traders are very limited in number (15 to 20) and these operate from Kathmandu. They are mostly from the high mountain indigenous community and have good linkage to the international buyers particularly Chinese. These traders also receive advance payment from international buyers which they circulate to the collectors via district traders. There is no established system between national and international traders in Yartsagunbu trade. The letter of credit system (LC) is not in place for this commodity due to the risk associated. The traders also enjoy this informal system since the formal system may increase the transaction costs and also they might lose control over the market due to the lack of cash flow. These traders do not have direct access to the international market and sell only to those international traders. The main trade routes are Kathmandu-Hongkong-Mainland China, Kathmandu-Tibet-Mainland China, and Kathmandu-Tibet-Hongkong-Mainland China. The national traders do not have market information of either final destination (Mainland China) or of immediate international market (Tibet, Hong Kong).

4.2. Close supply chain

The close supply chain has only two actors' level in Nepal: collectors and traders.

4.2.1. Shauka collectors

Shauka collectors (with the attributes of *Collector-type II*) sell their commodity to district Shauka traders. The district Shauka traders sell these products to Chinese traders in Tibet. Since, they are from the same community, they have strong relationships and, mutual trust among each other. In addition, they are better off compared to non-Shauka collectors with regular income from Yartsagunbu and higher net revenue. These collectors prohibit the entrance of outsiders in the pastureland, for example: outsiders are forbidden to collect Yartsagunbu in Kunti Saun. Majority of them sell their products to district traders (Shaukas).

4.2.2. District Shauka traders

In Darchula, only the district Shauka traders have connections with and access to the Chinese market in Taklakot via the Tinker pass, in the Upper Mahakali Valley. This historical trade route and trade system is still functional in the present days. Even Indian Shaukas sell their product to district level Shauka traders in Nepal. Their socio-cultural ties with Indian counterpart have helped them to make a good hold on Yartsagunbu trade. The first-hand information on international market trend is obtained via direct telephonic conversation with Chinese traders. These Shaukas hardly bring their products to the Khalanga (district headquarter, Darchula). They receive collection and transit permits from the Api-Nampa Conservation Area (Head office) at Khalanga. Then, they transfer the products to Taklakot, Pulan County, TAR directly. In other words, they are akin to the national traders in the district.

4.3. *Bargaining power of actors*

In an open supply chain, the capital holding power increases with the level of actors. This means lower level actors have low capital holding power and it is high in national level traders (Table 2). Usually, the price is determined by the bargaining between the buyers and suppliers; and previous year price is the reference price for the bargaining. Non-Shauka district traders receive price information of Tibet market from Shauka district traders. Then, non-Shauka district traders roughly estimate the price to be offered in Kathmandu and international market based on the Tibet market price. This helps non-Shauka district traders make their position in trade particularly with national traders.

The quality control power is determined by the physical presence of actors at the collection site. For instance, village contractors do not visit collection site and wait collectors to bring to them as they provide advance money to the collectors. As a result, collectors sell good quality products in higher price on site and supply low quality to the village contractor. However, different actors may face different risk, for example: collectors have a risk of not getting Yartsagunbu in a required quantity, while field contractors have a risk of theft. This is also equally true that most of the collectors are outsiders and Yartsagunbu market is not common outside the collection site. Waiting in the site looking for better price may increase their cost. Therefore, the collectors have a low bargaining power, while other actors have medium bargaining power.

In a close supply chain, both actors have high capital holding capacity and quality control, and low exposure to the risk. Here, harvesters have advantage of being local resident and traders are also from their own community. For them, Yartsagunbu trade is the traditional practice of exchanging goods rather than earning profit. These actors have a link with well-defined but limited market. In this chain, there is almost no bargaining since market force cannot overcome the mutual trust and social ties.

Table 3. Actors, their capital holding capacity, price information flow, quality control capacity, risk and bargaining power (Field Survey, 2014).

Actor	Capital holding capacity	Price Information	Control on Quality	Risk	Bargaining power
Open Supply Chain					
<i>Collector Type I</i>	Low. Have to sell at field due to poor family income.	No	Low. Sells whatever s/he collects the site.	Medium. May not get enough Yartsaganbu due to increased competition at collection site.	Low. Sells the commodity for immediate earning
<i>Collector Type II</i>	Low. Have to sell Yartsaganbu to village contractor due to high financial dependency on village contractor.	No	Medium. Can sell good quality. Yartsaganbu to field contractors.	Low. Risk of not getting enough Yartsaganbu to pay off village contractor's advance.	Low. Have prior agreement with village contractor
Collector cum field contractor	Medium. Can play with the quality of Yartsaganbu. Have good knowledge of site. Can hold Yartsaganbu for about a month.	No	High. Control quality of Yartsaganbu purchased from collector. Control quality of Yartsaganbu to be sold to district trader.	Medium. Theft of Yartsaganbu during transportation.	Medium. Have their own investment for purchase Take advance from district trader
Field contractor	Medium. Can hold Yartsaganbu for about 3 months, and can play with the product quality.	No	Medium. Have to depend on collector for type of Yartsaganbu they purchase. Have to increase price for getting good quality Yartsaganbu.	Medium. Theft of Yartsaganbu during transportation.	Medium. Cannot bargain with collectors (as are treated as outsiders), however, can negotiate price with district traders

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Actor	Capital holding capacity	Price Information	Control on Quality	Risk	Bargaining power
Village Contractor	High. They control the Yartsaganbu in the village, invest their own money and also receive advance payment from district non Shauka traders. They have broader coverage of product collection.	No	Low. The collector at time sells the good quality Yartsaganbu to field contractors for better price.	Medium. Inferior quality of Yartsaganbu may be received.	Medium. Price of product is generally fixed by them.
District trader “non-Shauka”	Medium. They have to sell the product to national level contractor as per the advance received.	Yes. Received from the District Shauka traders.	Medium. Lack of trust between collector and buyer about price and quality of product.	Medium. Risk in quality and price information system at the district level. Therefore, they want to maximize the profit.	Medium The price of the product is fixed according to the market rate in Kathmandu. These contractors try to keep the buying rate minimum and want to maximize the selling rate, therefore, to get maximum commission in between.

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Actor	Capital holding capacity	Price Information	Control on Quality	Risk	Bargaining power
National Level traders	High. They often invest their own money, and receive advance payment from international buyers. They grade the product as per the market rate.	Price is fixed by international buyers and negotiated by the national traders	Medium. Receives mix quality; grade/ quality as per demand	Medium. Loss, theft, fluctuation of price at international level.	Medium. Price fixed at international market
Close supply chain					
<i>Collector Type II</i>	High. The transaction cost is very minimal, and are better off households. Invest their own money.	No	High. Can sell good quality Yartsagunbu to district traders.	Low. Less exposed to risk because of limited number of collectors in collection site.	Low. Do not have access to external market.
District trader “Shauka”	High. The good quality product is insured because of well-established customary institutions. The supply of product is almost guaranteed.	No	High Mutual trust among Shauka community. Regulates Yartsagunbu collection through customary practice.	Low. The price at international market fluctuates. May have to store Yartsagunbu for long time that results in the degradation of quality.	Medium. They collect good quantity of Yartsagunbu from collectors with limited access to the market

4.4. Assessment of framework condition

The Ministry of Forests and Environment, Nepal has issued the Yartsagunbu Management (collection and transportation) Guideline 2017 to regulate the collection and trade (MOFE, 2017). It has provisioned time window for about one and a half month for Yartsagunbu collection that starts after the middle of May each year. As per the guideline, Api Nampa Conservation Area (ANCA) office is the agency to regulate the collection and transportation of the Yartsagunbu from the pastureland within the ANCA. The collectors have to pay for the collection permit. Any number of collectors can enter the pastures paying royalty as prescribed in the guideline. The transportation permit is issued against payment of royalty, which is NPR 25,000 per kg to transport the product outside the collection site.

The guideline has also provisioned for the operation of facilities such as water supply, management of waste, health services, and security at the collection site. However, the provision to arrange basic facility by the regulatory body is not obligatory. It has frequently used the word “Can Do” which has provided space to ignore these conditions. Similarly, the guideline has also enlisted “Don’ts” at the collection site and during transportation from district. The field observation suggests that monitoring mechanism of those “Don’ts” is not effective due to inadequate resources and the level of motivation of the government staffs to visit these remote sites with adverse climatic condition and tougher travel conditions.

5. Discussion

Out of two supply chains, the open chain is developed due to the free market, and the close chain is the continuation of the customary trade. The supply chain is longer with higher number of actors in open compared to the close chain. This suggests that many actors are entering into the open supply chain, despite the fact that the average collection throughout the season is in decreasing trend in the pastureland. On the other hand, the number of actors remains almost constant in the close chain (Pant et al., 2017). This may be due to the customary trade being not exclusively for profit but is considered as a part of other livelihood activities to obtain goods not available within the trader’s own region (Moncrieff, 2007).

Empirical studies in non-timber value chain indicate that collectors suffer the most as they get low price compared to the end-user price (Banjade and Paudel, 2008; Gubbi and MacMillan, 2008). But, this is not the case in Yartsagunbu trade in Darchula (Pouliot et al., 2018). However, Yartsagunbu is considered as an attractive means of rural poverty reduction though it is unable to generate enough to compensate the social costs. These costs involve: the youth leaving their schools during collection time and the risk of human casualties due to looting, harsh climatic and geographic conditions. This study clearly indicates that the collaboration among supply chain actors, such as in the close chain, may make all actors better-off and contribute to increased social and environmental outcomes as envisaged by SDG goal 1 and 12 (United Nations, 2017). Such cooperation may limit the uncontrolled entry of new actors. But, the supply chain directed by the open market without well-defined property rights may create complexities such as conflicts and physical violence. The increasing number of collectors is not only fuelling conflicts but also degrading habitat and threatening the species. Lower amount of the collected Yartsagunbu, per collectors, also weaken them due to the increased average collection cost. In this

context, a government intervention is required to enhance the bargaining power of value chain actors, particularly of those in the lower level.

The results indicate that bargaining power increases as the chain goes far from the source in the open supply chain. Capital is the principal element of the bargaining power (Tokatli, 2006). In open chain, the lower level actors i.e., actors near source have high financial dependency with the higher level actors, and often enter into the debt-trap (Bhattacharya and Hayat, 2004; Pauls and Franz, 2013). They usually have informal/verbal agreement to supply Yartsagunbu while borrowing money in advance. As a result, borrowers do not have option to enter into the free market and are obliged to sell as per the buyers (lenders) offer. On the other hand, the customary trade practice, in close supply chain, helps to avoid debt trap balancing the bargaining power between collectors and traders. It acknowledges that customary trade is both, an economic as well as a social-relationship (Langdon and Worl, 1981).

In order to earn profit within the trade-debt, collectors develop their own coping strategy. Those, who have received advance money from village contractors, prefer to sell high quality Yartsagunbu in the field. As a result, village contractors, who rely on home delivery, always have low probability of getting high quality Yartsagunbu. The quality of Yartsagunbu they get is the opportunity cost of not visiting the site or waiting at home doing other activities. This suggests that physical presence always have advantage in price-negotiation, which could be helpful to increase control over the quality of products (Wood, 1994).

Market information always play an important role to enhance fair trade (Purcell et al., 2017). There is almost no flow of market information in Yartsagunbu trade. Usually, actors make their position in bargaining based on the information provided by the higher-level actors and previous year's price. If the actors have capacity to wait and access to several higher-level traders, then likelihood of getting higher price increases. At the same time, the district traders of the open value chain receive information from the district traders of the close value chain. This may help to maximize their profit since actors who have access to end-market information are likely to make more profit (Hishe et al., 2016). This could be the reason that district traders of the open value chain do not attempt to enter into the close value chain to gain information.

In addition, the security is another issue in the Yartsagunbu trade. Several incidents have been reported, in newspapers, about killings, theft or looting of the products during the transportation (Jolly, 2011; Dispatch, 2014; Kantipur Daily, 2014). To avoid such risks, the traders have pressure to complete the transactions without any delay. Usually, traders air lift the products from the collection site meaning there is no frequent transportation of the commodity. This situation may lead to unfair trade since there is equal chance of getting high price for inferior quality or lower price for superior quality. At the same time, collectors also face pressure to sell their products since it is hard to access market outside the collection site.

The government should also regulate the pastureland management for the sustainability of the Yartsagunbu trade. It will also help reversing the land degradation and halting the biodiversity loss as envisaged in goal 15 of the SDG (United Nations, 2017). This requires government's intervention through taxing the purchase and sales of Yartsagunbu which help to improve market distortion by ensuring market forces and bringing transparency in transaction, helping the collectors and buyers through sustaining the business and finally improving the ecology of the pasture land by internalizing the environmental costs. The best practices of pasture land management can be taken from Bhutan where the government has regulated the Yartsagunbu collection in its pastures (Wangchuk et al., 2012). In Bhutan, the government monitors the collection and regulates the transaction through auction and

provides security to the traders. The state government of Uttarakhand, India has also regularized the Yartsagunbu collection and manages the pastureland following Bhutan's practice (Government of Uttarakhand, 2018). Unlike the above two cases, Nepalese government allows any number of collectors issued collection permit without considering the carrying capacity of the pastureland.

Overexploitation of Yartsagunbu may threaten the productivity of the pastureland (Pant et al., 2014) and can accelerate the biodiversity loss (United Nations, 2017). This is because over the past years (2010–2014), Yartsagunbu collected from Api-Kunti Saun pastureland, where only Shauka collectors are allowed, have higher price compared to the Yartsagunbu collected from Budi pastureland, which is open to outsiders in Darchula district (Pant et al., 2017). Similarly, the study also showed that quantity collected per collector is in increasing trend in the close value chain, and in decreasing trend in the open value chain. As a result, this species is declared as “threatened” in IUCN's Red List of Endangered Species (Yang, 2020).

In addition, the pastureland management can be promoted revising the royalty rate considering the market. According to the Intergovernmental Fiscal Arrangement Act 2017 (Schedule 4), local level unit gets 25% of the royalty collected however, the trend of revising Yartsagunbu royalty is not favorable to local level units. For instance, the royalty rate was NPR 20,000 per kilogram in 2001, which is about 15% of wholesale price (NPR 130,000/kg) in Kathmandu (Shrestha and Bawa, 2013). Later, the royalty was reduced to NPR 10,000/kg, which was 0.6% of the existing wholesale price of NPR 1.6 million (Shrestha and Bawa, 2013). In 2017, the government revised the royalty rate to NPR 25,000 which was about 0.86–1.13% of existing national market price of NPR 2.2–2.9 million per kg.

6. Conclusions

This study shows that trade of the high value common resources can be improved through increased cooperation among supply chain actors and government's intervention. The customary trade practice, which is more focused on social relationship and maintaining the livelihoods than making profit, has its own advantages over the modern market practice to distribute equitable benefits across the actors of supply chain. But, it fails to accommodate a large number of actors, which is four times lower than the open chain and always runs in a close loop. The open chain, where a large number of populations are involved is dominated by the powerful actors. In open market, profit is disproportionately distributed in the upper level of the supply chain. The cash holding is found to be the major determinants of bargaining power of those actors in the lower level of supply chain.

In the trade of common resources, it is important to improve the access and benefits of the lower level actors without compromising the net social benefits. The study suggested several strategies to make Yartsagunbu supply chain inclusive.

- First, provisioning of security to the traders, particularly during the transportation. It reduces the transaction costs of traders which can be transferred as benefits to collectors.
- Second, improving access to finance to collectors and field contractors reduce their dependency on upper layer actors. This can contribute to shorten the supply chain.
- Third, the flow of market information, during the collection period, also helps to increase bargaining power of the lower level actors. The auction may help to increase competition among high level traders, which provides benefits to collectors and contractors alike.

However, there could be logistic issue to organize auction in the field, and collectors may not have access outside the collection site.

The study suggests further assessments such as on the carrying capacity of pastureland for the sustainability aspects. The issuance of limited number of collection permits may contribute to improving of the pastureland ecosystem and improve field level monitoring on how harvesting is done, which ultimately produce superior quality of the commodity and enhance efficiency of the collectors. In addition, government should revise the royalty rate based on the prevailing market price, which is just 15% of the end user price. This can help to increase the fund size available to local authorities and communities to manage pastureland and improve facilities in the collection site. In addition, Government should also monitor and keep itself informed on what is happening in Bhutan and India and share information on transborder learnings as well as on management models and market aspects.

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Conflict of interest

The authors declare no conflict of interest.

References

- Adhikary K (2017) Ethnobotany, commercialisation and climate change: consequences of the exploitation of yarsagumba in Nepal. *Eur Bull Himal Res* 49: 35–58.
- Banjade MR, Paudel NS (2008) Economic potential of non-timber forest products in Nepal: myth or reality? *J For Livelihood* 7: 36–48.
- Bhattacharya P, Hayat SF (2004) Sustainable NTFP management for rural development: a case from Madhya Pradesh, India. *Int For Rev* 6: 161–168.
- Caplins L (2017) Collecting *Ophiocordyceps sinensis*: an emerging livelihood strategy in the Garhwal, Indian Himalaya. *J Mt Sci* 14: 390–402.
- Choudhary PR (2007) Forest-route to poverty alleviation-myths and realities: analysis of NTFP-livelihood linkages in some Indian states. A poster presented in the RRI Conference in Bangkok, 4–7.
- Chowdhury S, Gulati A, Gumbira-Said E (2005) High value products, supermarkets, and vertical arrangements in Indonesia. Markets, Trade and Institutions Division (MTID) Discussion Paper no 83, International Food Policy Research Institute.
- Dallas MP, Ponte S, Sturgeon TJ (2019) Power in global value chains. *Rev Int Polit Econ* 26: 666–694.
- Devkota S (2007) Yarsagumba [*Cordyceps sinensis* (Berk.) Sacc.]; Traditional utilization in Dolpa District, Western Nepal. *Our Nat* 4: 48–52.

- Dispatch N (2014) Darchula locals killed while hunting for Yarsagumba. Available from: <http://www.nepaldispatch.com/2013/06/8-darchula-locals-killed-while-hunting-for-yarsagumba/>.
- GON (2010) *Nepal Trade Integration Strategy 2010*, Kathmandu, Nepal.
- GON (2013) *Jadibuti bikri bitaran samchhipta lagat: arthik barsa 2070 (A brief NTFPs sale and distribution in fiscal year 2012/2013)*, Government of Nepal.
- Government of Uttarakhand (2018) Yarsagumba collection procedure, Government of Uttarakhand, India.
- Gubbi S, MacMillan DC (2008) Can non-timber forest products solve livelihood problems? A case study from Periyar Tiger Reserve, India. *Oryx* 42: 222–228.
- Harsanyi JC (1963) A simplified bargaining model for the n-person cooperative game. *Int Econ Rev* 4: 194–220.
- Hellmann T (2007) Entrepreneurs and the Process of Obtaining Resources. *J Econ Manage Strat* 16: 81–109.
- Hishe M, Asfaw Z, Giday M (2016) Review on value chain analysis of medicinal plants and the associated challenges. *J Med Plants Stud* 4: 45–55.
- Isaksen ET, Richter A (2019) Tragedy, property rights, and the commons: Investigating the causal relationship from institutions to ecosystem collapse. *J Assoc Environ Resour Econ* 6: 741–781.
- Iversen V, Chhetry B, Francis P, et al. (2006) High value forests, hidden economies and elite capture: Evidence from forest user groups in Nepal's Terai. *Ecol Econ* 58: 93–107.
- Jolly J (2011) Yarsagumba: Curse of Himalayan Annapurna region. BBC News: South Asia. Available from: <http://www.bbc.co.uk/news/world-south-asia-12110240> Access on: July 25, 2014.
- Kantipur Daily (2014) Yarcha pickers robbed of millions. Available from: <http://www.ekantipur.com/2014/06/21/top-story/yarcha-pickers-robbed-of-millions/391125> Access on: July 25, 2014.
- Langdon S, Worl R (1981) *Distribution and exchange of subsistence resources in Alaska*. University of Alaska Arctic Environmental Information and Data Center, Anchorage, Alaska.
- Mahapatra AK, Shackleton CM (2011) Has deregulation of non-timber forest product controls and marketing in Orissa state (India) affected local patterns of use and marketing. *For Policy Econ* 13: 622–629.
- MOFE (2017) *Yarsagumba Management (Collection and Transportation) Guideline 2017*, Ministry of Forests and Environment, Kathmandu, Nepal.
- Moncrieff CF (2007) Traditional ecological knowledge of customary trade of subsistence harvested fish on the Yukon River. U.S. Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program, 2007 Final Report (Study No. 04-265), Anchorage, Alaska.
- Negi CS (2007) Declining transhumance and subtle changes in livelihood patterns and biodiversity in the Kumaon Himalaya. *Mt Res Dev* 27: 114–118.
- Neupane N (2015) *Solving transborder water issues in changing climate scenarios of South Asia*, Governing access to essential resources, Columbia University Press.
- Olsen CS, Bhattarai N (2005) A Typology of conomic gents in the Himalayan plant trade. *Mt Res Dev* 25: 37–43.
- Pant B, Rai RK, Wallrapp C, et al. (2017) Horizontal integration of multiple institutions: Solution for yarsagumba related conflicts in the himalayan region of Nepal? *Int J Commons* 11: 464–486.
- Pant B, Wallrapp C, Ram AK, et al. (2014) Across the Mahakali, Yarsagumba Collection. International Center for Integrated Mountain Development. Kathmandu, Nepal. Available from: <https://www.youtube.com/watch?v=85FLh1HqFds>. Accessed on: 11 November, 2020.

- Pouliot M, Pyakurel D, Smith C (2018) High altitude organic gold: the production network for *Ophiocordyceps sinensis* from far-western Nepal. *J Ethnopharmacol* 218: 59–68.
- Purcell SW, Crona BI, Lalavanua W, et al. (2017) Distribution of economic returns in small-scale fisheries for international markets: A value-chain analysis. *Mar Policy* 86: 9–16.
- Pyakurel D, Bhattarai SI, Smith-Hall C (2018) Patterns of change: The dynamics of medicinal plant trade in far-western Nepal. *J Ethnopharmacol* 224: 323–334.
- Pyakurel D, Oli BR (2012) *NTFPs/MAPs business promotion strategy (2012–2016), from private sector perspective*, FNCCI-AEC/NEHHPA, Kathmandu, Nepal.
- Rausser GC, Zusman P (1991) *Organizational failure and the political economy of water resources management*, California, United States of America.
- Safarzynska K, van den Bergh JCJM (2010) Evolving power and environmental policy: explaining institutional change with group selection. *Ecol Econ* 69: 743–752.
- Shrestha UB, Bawa KS (2014) Economic contribution of Chinese caterpillar fungus to the livelihoods of mountain communities in Nepal. *Biol Conserv* 177: 194–202.
- Shrestha UB, Bawa KS (2013) Trade, harvest, and conservation of caterpillar fungus (*Ophiocordyceps sinensis*) in the Himalayas. *Biol Conserv* 159: 514–520.
- Shrestha UB, Dhital KR, Gautam AP (2017) Economic dependence of mountain communities on Chinese caterpillar fungus *Ophiocordyceps sinensis* (yarsagumba): a case from western Nepal. *Oryx* 53: 1–9.
- Sills E, Shanley P, Paumgarten F, et al. (2011) Evolving perspectives on non-timber forest products, In: *Non-timber forest products in the global context*, Springer, Berlin, Heidelberg, 23–51.
- Sunderland T, Ndoye O (2004) Forest products, livelihoods and conservation: Case studies of non-timber forest products systems. *FAO* 2: 1–55.
- TEPC (2013) Export import data bank, trade and energy promotion centre, Ministry of Commerce and Supplies, Government of Nepal.
- THT (2013) Yarsa worth millions flown to Kathmandu. The Himalayan Times. Available from: <http://www.thehimalayantimes.com/fullNewsphp?headline=Yarsa+worth+millions+flown+to+Kathmandu&NewsID=391049>.
- Tokatli N (2006) Asymmetrical power relations and upgrading among suppliers of global clothing brands: Hugo Boss in Turkey. *J Econ Geogr* 7: 67–92.
- United Nations (2017) The Sustainable Development Goals Report. United Nations.
- Wallrapp C, Faust H, Keck M (2019a) Production networks and borderlands: cross-border yarsagumba trade in the Kailash Landscape. *J Rural Stud* 66: 67–76.
- Wallrapp C, Keck M, Faust H (2019b) Governing the yarshagumba ‘gold rush’: a comparative study of governance systems in the Kailash landscape in India and Nepal. *Int J Commons* 13: 1–24.
- Wangchuk S, Norbu N, Sherub S (2012) *Impacts of Cordyceps collection on livelihoods and alpine ecosystems in Bhutan as ascertained from questionnaire survey of Cordyceps collectors*, Royal Government of Bhutan, UWICE Press, Bumthang.
- Winkler D (2008a) Yartsa Gunbu (*Cordyceps sinensis*) and the fungul commodification of Tibet’s rural economy. *Econ Bot* 62: 291–305.
- Winkler D (2008b) The mushrooming fungi market in Tibet exemplified by *Cordyceps sinensis* and *Tricholoma matsutake*. *J Int Assoc Tibetan Stud* 4: 1–46.
- Winkler D (2009) Caterpillar fungus (*Ophiocordyceps sinensis*) production and sustainability on the Tibetan plateau and in the Himalayas. *Asian Med* 5: 291–316.

- Wood RC (1994) Negotiation basics: concepts, skills and exercises. *Service Ind J* 14: 590–591.
- Wu SY, Roe B (2007) Contract enforcement, social efficiency, and distribution: some experimental evidence. *Am J Agr Econ* 89: 243–258.
- Yang ZL (2020) *Ophiocordyceps sinensis*, The IUCN red list of threatened species 2020: e.T58514773A58514845.



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