DEVELOPING CORN VALUE CHAINS OF MINORITY ETHNIC HOUSEHOLDS IN LAO CAI PROVINCE, VIETNAM

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ABSTRACT

This study focused on analyzing corn value chains in Lao Cai province as well as proposing solutions to upgrade the corn value chains in order to improve the livelihoods of ethnic minorities in Lao Cai. The study used data from a survey of 120 corn ethnic minority households and corn value chain actors in Lao Cai in 2016. Descriptive statistics, comparative statistics, and the values chain analysis method are the main methods used in the study. Research results showed that farmers used outdated cultivation techniques, especially ethnic minority households in upland communes, and often produced corn by extensive farming methods (no fertilizer or a small quantity of fertilizer) with unsecured technical procedures. The product distribution channel is long with many stakeholders. Nearly 75% of the corn producers sell their products to traders in their commune who then sell it to three other levels of agents (the district, province) before the products reach the consumer.

Keywords: Corn value chain, ethnic minorities, livelihoods.

Phát triển chuỗi giá trị ngô của các hộ dân tộc thiểu số tại tỉnh Lào Cai, Việt Nam

TÓM TẮT

Nghiên cứu tập trung phân tích chuỗi giá trị ngô tại tại tỉnh Lào Cai cũng như đề xuất một số giải pháp nâng cấp chuỗi giá trị ngô từ đó nâng cao sinh kế cho đồng bào dân tộc thiểu số ở Lào Cai. Nghiên cứu sử dụng số liệu điều tra 120 hộ đồng bào dân tộc thiểu số trồng ngô và các tác nhân tham gia chuỗi giá trị ngô tại Lào Cai năm 2016. Các phương pháp thống kê mô tả, thống kê so sánh, phân tích chuỗi giá trị là các phương pháp chính sử dụng trong nghiên cứu. Kết quả nghiên cứu cho thấy Sự hiểu biết không đồng đều và thấp, đặc biệt là các hộ gia đình dân tộc thiểu số ở các xã miền núi thường sản xuất ngô theo các phương pháp canh tác rộng rãi (không phân bón hoặc phân bón rất ít) với các quy trình kỹ thuật không đảm bảo. Kênh phân phối sản phẩm dài với nhiều bên liên quan. Gần 75% hộ sản xuất ngô bán sản phẩm của họ cho các thương nhân tại xã của họ và sau đó bán lại cho 3 tác nhân khác (quận, huyện, tỉnh) trước khi đến với người tiêu dùng.

Từ khóa: Chuỗi giá trị ngô, dân tộc thiểu số, sinh kế.

1. INTRODUCTION

Corn is one of the key agricultural products in Lao Cai province. According to statistics in 2015, corn planted acreage in Lao Cai province was approximately 37,434 hectares, the average corn yield was over 3.6 tons/ha, and output was about 133,152 tones/year (Lao Cai Statistic Department, 2016). However, the circulation of corn products is difficult. The linkage between producers and other stakeholders in the value chain is not tight. The main consumers of corn products in Lao Cai are Chinese, which may lead to fluctuations in prices, and low and unsustainable income for corn farmers, greatly affecting the livelihoods and living conditions for people in this region. Therefore, the development of the corn value chain in Lao Cai

province still faces many difficulties. The main objective of this study was to assess the market performance of the stakeholders in the hybrid corn value chain, propose strategies to improve the economic value of the chain, and increase income for producers and other stakeholders in the chain, especially for the poor and ethnic minority households in Lao Cai province.

2. DATA AND RESEARCH METHODS

2.1. Methods of data collection

Secondary data: Data on production and consumption of the products was collected from statistics of the districts and province. Reports were collected on the production, processing, and consumption of hybrid corn in the province, districts, and communes within the study sites. The studies were related to the value chains for agricultural products from various sources.

Primary data: Primary data was collected through direct interviews with households involved in the production and trading of corn with using contents in a questionnaire (semi-structural) prepared in advance and with additional questions for clarification. For this study, 120 corn farmers were randomly selected and interviewed in three different districts of Lao Cai province (Bac Ha, Muong Khuong and Simacai). These districts have the largest number of hybrid corn producers and the highest quantity of hybrid corn in Lao Cai. In addition, collectors, processors, and other traders involved in the value chain of hybrid corn in the communes and districts were interviewed using prepared questionnaires.

Key person interview (KPI): In addition, the leaders of the relevant departments (DARD, DOIT, Agriculture Extension Center), leaders of the districts, and leaders of the professional departments in the three surveyed districts and villages were interviewed to collect information about the overall corn production status of the province, districts, and communes. The information collected from those interviews helped us create an overview of development strategies for corn production in Lao Cai province.

Focus group discussions: From each village, one group of 5-10 people acted as representatives for their economic circumstances, gender, and ethnicity, and was invited to the village cultural building or village leaders' houses to collect information. The methods of participatory discussions were made during the group meetings to collect information on the production and consumption of corn in the villages, in addition to the social and cultural elements, experiences, production, marketing of products, and price fluctuations from many different perspectives.

2.2. Data analysis

Data collected from the stakeholders involved in the value chain of corn was input into Excel and processed using STATA software.

The study used descriptive methods, comparative statistics methods, and value chain analysis methods to describe the status of production, processing, and consumption of products in the corn value chain in Lao Cai province. These methods also helped analyze and compare the distribution of benefits and costs among stakeholders in the hybrid corn value chain.

SWOT matrix analysis was also conducted to assess the internal and external factors, including strengths, weaknesses, opportunities, and threats/risks, that are affecting the development of the hybrid corn value chain. Therefore, this analysis helped us propose solutions/development strategies to upgrade the value chain of hybrid corn.

3. RESULTS AND DISCUSSION

3.1. Analysis of the hybrid corn value chain

3.1.1. General information on corn production in Lao Cai province and the surveyed districts

Lao Cai is a mountainous, border province with three sides bounded by Yen Bai, Ha Giang, and Lai Chau provinces, and one side bordering Yunnan Province (China). Corn is one of the

main agricultural crops of Lao Cai. Lao Cai province had a total corn acreage of 37,434 hectares, with the average corn productivity of over 3.6 tones/ha and a yield of 133,152 tones. More than 90% of the total area is planted with hybrid corn, when the rest (less than 10%) is for waxy corn and other local corn varieties (Lao Cai Department of Agriculture and Rural Development, 2016).

Muong Khuong, Simacai, and Bac Ha are three mountainous districts that have large corn acreage in Lao Cai province, accounting for 19.05%, 12.15% and, 15.24% (over 46%), respectively, of corn acreage in the province in 2015 (Lao Cai Department of statistics, 2017). The total production of corn in 2015 in Lao Cai province was 133 thousand tons, while corn production in the three districts of Muong Khuong, Bac Ha, and Simacai contributed over 45% of the total corn output of Lao Cai province (Lao Cai Department of statistics, 2017).

Corn yields in Lao Cai province in general and districts in particular are still low, around 3.5 tones/ ha. With favorable weather and climate, Lao Cai province in general and the three districts of Muong Khuong, Bac Ha, and Simacai plant corn in three major seasons as follows:

- Spring corn crop: Plant in February - March in lowland districts/communes

- Summer corn crop: Plant in March - April in upland districts/communes

- Summer-autumn corn crop (main crop): Plant in the end of June - middle of July in upland districts/communes and alluvial land in lowland areas.

The procedures for planting and growing corn are simple, so they are suitable for intensive levels by ethnic minorities. Currently, the majority of the people already know how to apply technological advances to production (the rate of hybrid corn used in production in the localities occupies more than 90% of the cultivated area), thereby improving productivity, output, and economic efficiency of corn production. However, a selection of the people from ethnic minorities and poor households who lack funds and scientific and technical knowledge are cultivating corn in the form of extensive planting (using less fertilizer), and abusing plant protection products (mainly herbicides).

Table 1. Acreage, productivity, and yield of corn in Lao Cai province and surveyed districts, 2015

		Unit	Lao Cai province	By district		
				Muong Khuong	Simacai	Bac Ha
Yearly average	Acreage	ha	37,434.0	7,130.0	4,550.0	5,706.0
	Productivity	quintal/ha	35.6	34.1	34.6	34.9
	Yield	ton	133,152.0	24,325.0	15,727.0	19,918.0
In which:						
1. Winter corn	Acreage	ha	806.5	-	-	-
	Productivity	ton/ha	2.81	-	-	-
	Yield	ton	2,266.0	-	-	-
2. Spring corn	Acreage	ha	11,318.0	1,530.0	100.0	338.0
	Productivity	ton/ha	3.65	33.4	28.5	28.2
	Yield	ton	41,337.0	5,110.0	285.0	953.0
3. Summer-autumn corn (main season)	Acreage	ha	12,618.0	4,000.0	3,250.0	3,918.0
	Productivity	ton/ha	3.56	35.2	35.3	36.6
	Yield	ton	44,923.0	14,065.0	11,458.0	14,340.0
4. Spring-summer corn	Acreage	ha	12,691.0	1,600.0	1,200.0	1,450.0
	Productivity	ton/ha	3.52	32.2	33.2	31.9
	Yield	ton	44,626.0	5,150.0	3,984.0	4,625.0

Source: Lao Cai Provincial Statistics Office, 2016

3.1.2. Description of the corn value chain

The average planted area with hybrid varieties in 2015 accounted for 97.5% of the total corn planted area. Therefore, in this study, we focused on the value chain analysis of the hybrid corn produced by corn farmers in the studied areas.

As can be seen in the diagram of the corn value chain of the three studied districts (Figure 1), there are six main stakeholders in the corn value chain, namely (1) Input suppliers; (2) Corn producers; (3) Village/Commune collectors; (4) District-level collectors; (5) Province-level collectors (companies, agricultural product processing and export enterprises); and (6) Retailers.

Corn marketing channels: The value chain diagram of corn shows that there are two main marketing channels (traditional) occupying the largest proportion of the commercial corn in the studied districts, including:

Marketing channel 1: Corn farmers ⇨ Village/commune collectors ⇨ District-level collectors ⇨ Retailers ⇨ Consumers

The survey showed that most of the corn producers use about 25% of the total hybrid corn production for animal feeds and cooking wine, while 75% is for commercial purposes. About 40% of corn production in the chain is collected by the collectors at the communes and 20% by households who have large-scale production to sell directly to the major collectors in the district. The mobile collectors sell about 36% of the products purchased to district-level collectors and 4% to grocery shops in the communes. The grocery shops in the villages sell about 16.15% of the products purchased to district-level collectors and 2.85% of corn production to the provincial collectors (large firms of agribusiness processors, such as An Nghiep Company Limited, Anh Kien Company Limited, and Tay Bac Import Export Company Limited). After collecting corn from the communes, district-level collectors conduct preliminary processing and packaging, and sell about 10.85% to traders in southern provinces (Ho Chi Minh City, An Giang, Dong Nai, etc.) and the northern provinces (Hanoi, Hai Duong, Hung Yen, etc.), about 50.5% to large province-level traders and enterprises, and 3.6% to the millers and retailers in the districts. The large collectors in the province (companies and agribusinesses) export around 34.68% to China, and sell 18.67% to traders in the southern and northern provinces.

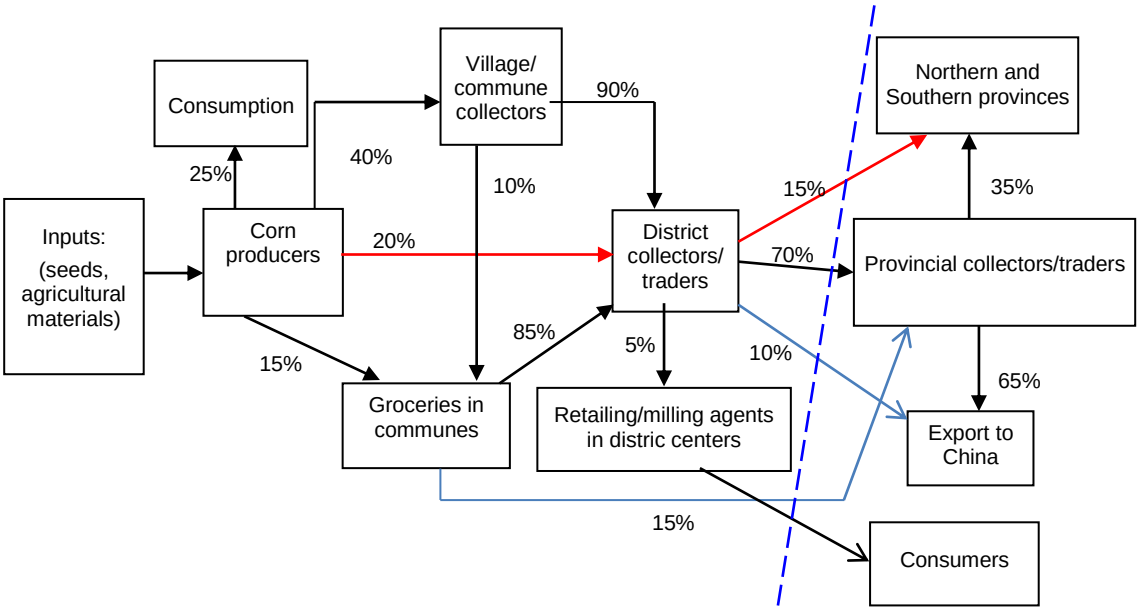

Figure 1. The hybrid corn value chain of the surveyed districts, Lao Cai province

Besides the aforementioned traditional hybrid corn consumption marketing channels, in the surveyed areas, there are five others hybrid corn marketing channels including (1) Marketing channel 2: farmers sold hybrid corn to district level collectors. Then retailers bought hybrid corn from district level collectors after that they sold it to consumers. The third channel, it was similar with channel second, however district level collectors did not involve in this channel. The fourth channel was different with previous channel, district level collectors bought hybrid corn from farmers, then they sold to province level collectors. Province level collectors export hybrid corn to China. Fifth channel was similar with the fourth channel, however famers sold directly hybrid corn to province level collectors. The final channel was simple, famers sold directly hybrid corn to consumers.

Although some marketing channels bring higher profits for stakeholders than marketing channels 1 and 2, due to capacity constraints and the stakeholders (collectors) being out of the surveyed areas (channels 3 and 4), or low proportion of corn commodities exchanged in these channels (channels 5 and 6), we could not approach or analyze them in depth.

3.1.3. Analysis of the stakeholders in the corn value chain

3.1.3.1. Input suppliers

There are two business modes that input suppliers for corn production in Lao Cai. The first type includes level 1 and level 2 agents specialized in selling agricultural materials and seed at district centers or clusters of communes. The second type is the grocery shops in communes selling agricultural materials and purchasing agricultural products (corn, rice, etc.). About 70.5% of the corn producing households buy materials and seeds from grocery shops. Several corn farmers said that it is easier to purchase seeds and materials from the grocery shops and to pay on credit. Moreover, they buy a small amount but many times, so they think that buying in the grocery shops in the communes is more favorable.

Most of the input suppliers must borrow money, of which a high proportion of the money borrowed is from banks, and about 65% of input suppliers use loan money to ensure they have enough working capital. However, input suppliers usually have difficulty accessing loans from banks to get enough money to serve their business.

3.1.3.2. Producers

* General characteristics of the surveyed households

Information collected from the surveyed corn household farmers in communes of the three studied districts are shown in Table 3.3.

The average age of household heads of corn farmers in the surveyed areas was 41 years old, the figure in Simacai district was the lowest (37 years old). The lower age of the household heads in corn producing households is one of the advantages in transferring advanced technologies in corn production because they can approach the knowledge more easily and readily. However, the literacy of corn farmers is quite low with 4.3 years of formal education on average. This will be one of the limitations and challenges for accessing market knowledge, negotiating, and applying technological advances in corn production. The number of main labors / household in the surveyed districts ranges from 1- 6 people, with an average of 3.1 people / household. The total average income of the corn producing households ranges from 14.7 - 54.9 million VND/year. The income from corn production contributes approximately 21.7 - 28.4% of the total income of the household groups in the surveyed districts, and the average for all of the surveyed corn producing households is 24.3%. This means that corn plays an important role in improving income of the households in the areas.

The average number of years of corn planting experience of corn farmers is 18.6 years, while households in Muong Khuong have the most years of experience in corn planting (20.2 years). Most corn producing households lack capital, and 90.2% of surveyed households said that they are in lack of capital for production.

* Status of corn production of the surveyed households

The average agricultural acreage of households is 0.9 ha/household while corn planted acreages of households is approximately 0.6 ha/household. The average number of corn planting plots per household reached around 2. With the adoption of policies on concentrating farming land for large production areas within the province and districts, the fragmentation of land for agricultural production has improved significantly. However, there are still a number of areas with households owning 4-5 plots, and the fact that corn plots of the households are scattered will be one of the obstacles for cultivation, and increases the cost of production, harvesting, and selling products. Corn productivity on average for the surveyed households reached 3.8 tons/ha, and this corn productivity is still higher than in Lao Cai with an average of 3.4 ton/ha (Tran Hoang, 2015).

* The status of corn consumption of the households

The buyers of corn from the households: Due to far distances from households to district centers, they usually sell a large part of their corn product to collectors in the villages/communes by exchanging corn for other living necessities or agricultural materials (approximately 55% of corn yield produced by the households). Meanwhile, corn producers in the communes near the district centers, who have large yields of corn and vehicles, are more likely to sell corn to large district-level collectors (20%) at higher prices than those selling to commune-level collectors. Most of the households sold dried corn after it was harvested. The main reason is that households can store dried corn and sell it when the selling price is high or when cash is needed.

In terms of negotiation ability on the selling price of farmers, if they are able to negotiate and make decisions about the price of the product, they will have more opportunities to get more benefits. However, through the survey, we saw that corn farmers are dominated in the decision-making about the selling price of the products. Approximately 74.5% households interviewed replied that corn prices are up to the buyers' valuation, about 14.3% of the surveyed people said they sold corn at the selling price according to neighbors, and 11.2% of households answered the price is based upon the agreement between the two parties. This is one of the weaknesses of the corn producing households due to limited qualifications, knowledge, and information about the market as well as poor economic accounting of the production of the households, then, the ability to negotiate when joining the chain is very limited.

Table 2. General characteristics of corn farmers in the study areas

Indicators	Unit	Muong Khuong	Simacai	Bac Ha	Average
Average age of household heads	Year	40.9	37.1	44.0	40.7
Number of household members	Person	5.1	5.7	4.6	5.1
Number of labors in each household	Person	3.2	3.2	2.9	3.1
Number of labors in each planting corn household	Person	3.1	3.1	2.8	3.0
Percentage of income from corn	%	28.4	22.9	21.7	24.3
Number of schooling year of the household heads	Grade	4.2	4.8	3.8	4.3
Experience in planting corn	Year	20.2	17.5	18.1	18.6
Agricultural acreage/household	m^2	9,690.9	8,034.5	9,247.0	8,990.8
Corn acreage/household	m^2	6,700.4	5,615.9	5,900.1	6,072.1
Number of plots for corn planting/household	slot	1.8	2.2	2	2.0
Average corn productivity	ton/ha	4.3	3.4	3.8	3.8
Corn yield/household	Tons	2.88	1.91	2.24	2.33

Source: Synthesis from surveys, 2016

Table 3. Characteristics of small collectors in the villages/communes

Indicator	UNIT	Average	Min	Max
Age of the collectors	Year	42.5	31	52
Business experience	Year	12.5	3	23
Laborers for corn collecting	Persons	1.3	1	2
Yield of corn collected annually	Ton	38	13	55
Percentage of loss	%	2.8	1	3.2
Income from corn business	Million VND/year	10.5	4.2	16.5

Source: Synthesis from surveys, 2016

Table 4. Characteristics of the district-level collectors

Indicator	Unit	Average	Min	Max
Age of the collectors	Year	44.6	32	60
Business experience	Year	13.5	5	30
Laborers for corn collecting from family	Person	1.5	1	2
Hired labor	Person	1.6	1	5
Yield of corn collected annually	Ton	250	80	800
Percentage of loss	%	3.8	2	5
Income from corn	Million VND /year	48	15	150

Source: Synthesis from surveys, 2016

3.1.3.3. Local small collectors (in villages/communes)

* Characteristics of capacity

The corn collectors in villages and communes in the three studied districts could be divided into two types of collectors, namely mobile collectors and collectors at grocery shops in the villages/communes. Collectors in the villages and communes have approximately 13 years of business experience on average. They mostly use family laborers for doing business, 1.3 people on average. The quantity of corn purchased by the collectors varies significantly, with some buying 13 tons/year and some others reaching 52 tons/year.

* Functions/activities

Mobile collectors and traders usually deliver living necessities, such as rice and food, to a farmer's house by motorbike, so these collectors get prices that are 10 - 15% lower than the market prices. They will sell corn to the district-level collectors or to collectors at the grocery shops. There are not many collectors following this type (2 - 3 people/communes), thereby the total quantity of corn purchased in this type is low. Collectors - grocery shops sell living necessities, agricultural production inputs. and seeds, and at the same time they purchase agricultural commodities, including corn. They often sell fertilizers, seeds, and essential supplies (rice, food, etc.) for corn producing households who then sell their products at the shops or at home. The shops typically purchase corn at lower prices than the market prices (by 5-10%). Nevertheless, corn producing households still sell corn to the shops because they have a strong relationship; they can help poor households in difficulty or they provide materials and seeds for corn producing households, and in exchange, households have to sell their products. The number of collectors in this type in the various commune's studies ranged from 5 - 7/ commune so their quantity of corn every year is rather large from 13 - 52 tons/ year / household.

3.1.3.4. Collectors at district-level

* Characteristics of capacity

As can be seen from Table 3.5, the district-level collectors have 13.5 years of business experience on average. The collectors have an average of 1.5 employees from their families, but corn procurement activities require a lot of male labor for portage, transportation, drying, and bagging of corn. Therefore, large collectors are more likely to hire more workers to work, and the average number of employees hired is 1.6 people/collector. Besides, during the corn purchasing season, there is a greater need to transport workers, porters, and dry corn, so they hire seasonal workers. The quantity of corn procured by these units is quite high. According to estimates, the district-level collectors gathered 250 tons /year on average, the highest of which was 800 tons /year.

* Functions (activities)

District-level collectors purchased corn from communes then sent it to primary processing and packaging, and rented trucks to sell corn to the traders in the province (the agri-products export and processing enterprises) and other provinces. A number of collectors purchased fresh corn (after splitting seeds) at a price equal to 65% of the price for dried corn, then hired laborers to dry the corn until approximately 15% humidity, bag the corn, and transport it as required by the collectors in the province. Most collectors in the province paid 50 to 70% cash back on purchases. However, the premises outside of the province often overlap the payment period or pay after 10 - 15 days (accounting for 30 - 50%).

3.1.4. Analysis of the linkages between stakeholders in the corn value chain

In the corn value chain, the stakeholders are linked to each other, however this is just temporarily or seasonally, as shown below:

The linkage between corn producing households and input suppliers is relatively tight. For agents selling materials and seeds, they offer cash or deferred cash payments/payment on credit (about 50%) for the value of the materials but take into account the bank interest rates are higher by (1 - 2%). Small collectors - grocery shops at the commune sell living necessities and purchase corn at the same time, and about 60 - 70% of the corn producing households buy basic necessities in the form of debt signed. The collectors also offer loans (with high interest rates) and help poor households in cases of sickness. Large district-level collectors often invest indirectly through collectors in communes (such as loans or investments in agricultural materials with low interest rates). Small collectors in the communes are considered as agents selling agricultural materials and collecting/buying corn from commune-level collectors. Then, the commune collectors sell products to district-level collectors at the agreed price. About 18 - 20% of households with economic and transporting capacity contact district-level collectors to sell products. The link between them and the corn farmers is not close, as the collectors only buy corn when the farmers want to sell, and without contracts at the price decided by the collectors.

Collectors in the corn value chain usually exchange information on yield, market prices, and their buying prices. A number of commune-level collectors borrow money or agricultural materials from district-level collectors, and then the district-level collectors will buy corn from these farmers. When receiving corn from commune collectors, the district-level collectors deduct the lending money or pay in cash from 70 - 100%. The district-level collectors contact collectors inside or outside of the province via telephone in order to make oral agreements. The relationship between the collectors in the chain is through the purchasing of products (so called partners). They often have no contracts or debentures signed by both parties.

Collectors and retailers often have long-term close business relationships. Retailers buy corn primarily from a fixed collector and usually enjoy preferential prices and times of payment. The retail agents are often located in central districts and cities (town of Bac Ha, Lao Cai City).

Table 5. Economic performance of corn production of household groups in the communes participating in the program, 2015 (average of 1 ha of corn planted land)

Indicator	UNIT	Muong Khuong	Simacai	Bac Ha	Average
Gross output (GO)	1000 VND	20,425.0	15,300.0	17,670.0	17,798.3
Intermediate costs (IC)	1000 VND	5,175.5	4,555.0	4,901.5	4,877.3
In-kind costs (family labor)	1000 VND	6,118.5	4,601.0	5,433.1	5,384.2
Total costs (TC)	1000 VND	11,293.9	9,156.1	10,334.6	10,261.5
Value added (VA= GO-IC)	1000 VND	15,249.5	10,745.0	12,768.5	12,921.0
Profit (Pr=GO-TC)	1000 VND	9,131.1	6,143.9	7,335.4	7,536.8
VA/IC	Times	2.95	2.36	2.61	2.64
Profit/TC	Times	0.81	0.67	0.71	0.73

Source: Synthesis from surveys, 2016

3.1.5. Economic analysis of the corn value chain

* Analysis economic efficiency of production of the corn farmers

An analysis of the economic performance of corn production was conducted in order to determine profits obtained by corn farmers in the study area, which will help guide farmers to make more effective investments in producing corn in the following growing period.

The results in Table 3.6 show that the total gross output from 1 ha of cross-bred corn planted on the land of surveyed households averaged 17.8 million VND/ha, of which, corn producing households in Muong Khuong achieved the highest production with approximately 20.4 million VND/ha, households in Bac Ha came next (approximately 17.67 million VND/ha), and households in Simacai had the lowest production with 15.3 million VND/ha. The reason for the gaps is due to the different corn productivities, as well as the quality of corn varying by location leading to the differences in prices of corn (in Simacai and Bac Ha, the prices of corn were lower than those in Muong Khuong).

Intermediate Costs: intermediate costs for corn production of the surveyed households averaged nearly 4.9 million VND/ha, equivalent to 47.5% of the total investment costs. By comparing the three districts, the underlying trend of the intermediate costs is the same as the trend generated for gross output. Of the intermediate costs for corn production of the households, the cost of fertilizers accounts for a large proportion of the input costs for corn production.

Family labor costs: Labor costs for corn production, including an estimation of the cost of family laborers based on the costs of hiring local employees for production and harvesting corn, are nearly 5.4 million VND/ha on average, occupying 10 - 15% of investment costs (mainly for large-scale production households during the period of seasonal stress).

The average value added calculated for 1 ha of planted corn in all households surveyed was 12.9 million VND/ha, the highest was in Muong Khuong (15.2 million VND/ha) and the lowest was in Simacai (10.7 million/ha). Similarly, the average net profit calculated over 1 ha of corn planted of farmer households was 7.5 million VND/ha, the highest was in Muong Khuong (9.1 million VND/ha) and lowest was in Simacai (approximately 6.1 million VND/ha).

* Analysis of economic performance of each stakeholder in the corn value chain

To examine the distribution of interests among stakeholders in the corn value chain, we selected the market channel 2 in corn production to conduct an economic analysis, and planning and calculation results of the economic performance of production and business in the corn value chain stakeholders are shown in table 6.

Table 6. Economic performance of production and business of the stakeholders in the corn value chain in the study areas, 2015 (accounted for 1 ton of dry corn)

Indicator	Unit	Corn farmers	Commune collectors	District-level collectors	Retailers
Channel 1: Corn farmers - Commune collectors - District-level collectors - Retailers					
Gross output (GO)	1000 VND	4,647.0	5,137.0	6,146.0	6,600.0
Intermediate costs (IC)	1000 VND	1,272.3	4,785.2	5,863.6	6,097.4
Total costs (TC)	1000 VND	2,676.9	4,839.0	5,910.8	6,270.5
Value added (VA= GO-IC)	1000 VND	3,374.7	351.8	282.4	502.6
Profit (Pr=GO-TC)	1000 VND	1,970.1	298.0	235.2	329.5
Profit/TC	Times	0.74	0.06	0.04	0.05
Channel 2: Corn farmers - District-level collectors - Retailers					
Gross output (GO)	1000 VND	5,137.0		6,146.0	6,600.0
Intermediate costs (IC)	1000 VND	1,490.2		5,863.6	6,097.4
Total costs (TC)	1000 VND	2,718.7		5,910.8	6,270.5
Value added (VA= GO-IC)	1000 VND	3,646.8		2,82.4	502.6
Profit (Pr=GO-TC)	1000 VND	2,318.3		2,35.2	329.5
Profit/TC	Times	0.86		0.04	0.05

Source: Synthesis from surveys, 2016

Table 7. Distribution of value added and net profit of the stakeholders in the corn value chain in the surveyed areas, 2015

Stakeholders	Value added (VA)		Net profit (Pr)	
	Amount of money (1000 VND/ ton)	Percentage (%)	Amount of money (1000 VND/ton)	Percentage (%)
Channel 1: Corn farmers - Commune collectors - District-level collectors - Retailers				
Corn farmers	3,374.7	74.80	1,970.1	70.4
Commune-level collectors	351.8	7.80	262.0	9.4
District-level collectors	282.4	6.26	235.2	8.4
Retailers	502.6	11.14	329.5	11.8
Total	4,511.4	100.00	2,796.8	100.0
Channel 2: Corn farmers - District-level collectors - Retailers				
Corn farmers	3,675.3	82.4	2,372.1	80.8
District-level collectors	282.4	6.3	235.2	8.0
Retailers	502.6	11.3	329.5	11.2
Total	4,460.3	100.0	2,936.8	100.0

Source: Synthesis from surveys, 2016

Channel 2: Corn farmers - District-level collectors - Retailers- Consumers

Corn farmers: Intermediate costs of corn farmers was very low at 1,490.2 thousand VND/ton of corn, and corn farmers sold products to district collectors at an average price of 5,137 VND/kg. Value added generated by corn farmers was 3,646.8 thousand VND/ton, and after deducting the costs for gasoline and transportation, the net profit for corn farmers was 2,318.3 thousand VND/ton corn, which was higher than the net profits when farmers sold to commune-level

collectors (402.03 thousand VND / 1 ton of corn). Net profit increases by 20.04% in comparison with the profits observed in market channel 1.

* Distribution of value added and net profit of the stakeholders in the corn chain

Through analyses on the distribution of value added and net profit, we can see the distribution of benefits in the value chain to the stakeholders, which will be used as the basis to evaluate the effectiveness of the distribution channels and identify the consumption channel bringing about the most benefits for the value chain, especially for the corn farmers. Results from the evaluation on the distribution of value added and net profit to the stakeholders in each market channel are shown in Table 7.

Marketing channel 2: Corn farmers - District-level collectors - Retailers- Consumers

Distribution of value added (VA): The total value added of market channel 2 reached 4,460.3 thousand VND/ton of corn, of which corn farmers gained 3,675.3 thousand VND/ton of corn (82.4%), retailers gained 502.6 thousand VND/ton of corn (11.3%), and lastly, district-level collectors gained 282.4 thousand VND/ton of corn (6.3%).

Distribution of net profit (Pr): The total net profit of the value chain was 2,936.8 thousand VND/ton of corn, of which corn producers gained 2,372.1 thousand VND/ton (80.8%), retailers gained 329.5 thousand VND/ton of corn (11.2%), and lastly, district-level collectors gained 235.2 thousand VND/ton of corn (8.0%).

The analysis on the distribution of profits to the stakeholders in market channel 2 showed that when the producers sold products directly to district-level collectors, the producers received a higher proportion of value added (increasing by 7.6%) and the net profit for the producers rose by 10.3% than when the producers sold products directly to collectors in the communes. These figures should be paid more attention to by participating organizations to aid producers in finding new markets, organizing collector groups, providing support for transportation costs, and signing contracts for consuming outputs so that they can sell products directly to the district, province collectors, animal feed processing companies, or retail agents, thus shortening the distribution channel in order to improve profits for corn producers in the study areas.

3.1.6. Strengths, weaknesses, opportunities, and threats for the corn value chain (SWOT)

The analysis of the strengths, weaknesses, opportunities, and threats will be the basis to prepare a product development strategy. Limiting the weaknesses and threats while promoting the strengths and opportunities to develop and enhance the corn value chain is the purpose of this study. The results of the SWOT analysis of the corn value chain are illustrated in Table 8.

3.2. Solutions to improve livelihoods of minority ethnic households in Lao Cai province via developing corn value chain

Studying the corn value chain in the mountainous Lao Cai province in three districts (Muong Khuong, Simacai, Bac Ha) showed that due to uneven literacy, a high ratio of poor households in some communes, limited technical proficiency, and a limited capacity in corn production and market access of farmer households, the development of an effective corn value chain will require implementing comprehensive and synchronized measures to enhance capacity, technical innovations, manufacturing support, and marketing. Therefore, we propose a number of solutions as follows:

3.2.1. Strengthening the capacity for cadres and stakeholders of the value chain

Strengthening the common interest groups, conducting training on corn production technology and production planning, marketing, conducting field trips to learn from other models in Vietnam, and training for cadres from agriculture extension centers/stations villages/communes to transfer the knowledge to farmers in their villages.

3.2.2. Finding new markets and shortening the distribution channel of corn commodities

Connecting the market (organizing workshops, trade fairs to find new markets), supporting the common interest groups to link enterprises and cooperatives to consume the products, and supporting transportation costs for the enterprises/cooperatives who buy corn from the common interest groups and farmer households.

3.2.3. Upgrading the quality of products and reducing the investment costs through post-harvest activities

Providing support in procuring seeds and fertilizers, establishing pilot models and exhibiting models for new high-yield and good quality corn varieties, and instructing common interest groups on planting, growing, and preservation of corn post-harvesting.

Combining the training on planting, growing corn technologies and training on post-harvest corn preservation technologies using knowledge appropriate for the conditions of the local households, especially the preservation technology for whole corn (because by custom, most of the households from ethnic minorities preserve the whole corn ears).

Also, we can support small-capacity corn dryers (using firewood) to improve the quality of corn, and prolonging preservation to improve the value of corn commodity. Currently, according to the corn farming practices, households still leave corn in the field and do not harvest it immediately, resulting in high moisture and decreased quality of corn, especially in the rainy season. So, if there is a small dryer for each cluster of villages / communes, it will help households improve corn preservation, and increase the quality of corn, selling price, and production efficiency.

Table 8. SWOT analysis of the corn value chain development in the study areas

Strengths (S) Large corn planted acreage Abundant labor Hardworking people with long years of experience in corn production Appropriate soil and climate conditions for growing corn, suitable for the poor invest in Easy to plant, grow, primarily process, and preserve corn crops Huge demand from the market, collectors buy corn locally	Weaknesses (W) Due to steep and fragmented corn planted land, corn cultivation is difficult and cost of production is high Low literacy, lack of knowledge about science and technology of cultivation, husbandry and growing, harvesting, and preserving corn Poor farming practices, a number of households produce corn following the method of extensive corn cultivation, leading to low-productivity, pests, and decay Lack of capital for production, buying materials on credit then paying back in products (corn), usually leading to extortion Producers have limited capacity to negotiate / bargain with the sellers Limited access to market information or lack of capacity to approach market information Very low capacity for farming and economic accounting management of the households Lack of links among the value chain stakeholders Inefficient post-harvest preservation (lack of storage areas, no dryer), leading to low quality corn Lack of water as corn is usually grown in mills without irrigation systems (depend heavily on the weather)
Opportunities (O) There are projects locally deployed creating opportunities for people to improve their knowledge in production The state support programs for mountainous districts, such as 135, and there are a number of provincial support policies to boost corn production and consumption The large potential consumption market for corn as Vietnam still has to import corn from abroad for processing animal feed A number of high-yield cross-bred corn varieties and new advanced technologies are available to apply to production	Threats (T) Increasing input prices; the prices of fertilizer and corn seed are increasing, while the quality of corn varieties, materials, and fertilizers are difficult to control Changing weather and climate; prolonged dry, hot, and drought seasons, leading to poor crops; or chilling cold and biting cold, affecting corn productivity Serious pest damage Increasingly fierce competitiveness in the market, due to the import of genetically modified corn and corn production in neighboring provinces with better quality and lower costs Unstable prices (depreciation season)

3.2.4. Strengthening advocacy activities to raise awareness of corn production farmers

Organizing dissemination campaigns through the mass media of the communes/villages (commune/village speakers), the integration of activities into the meetings of communist party at commune and village levels and other socio-politic organizations, and community meetings in order to disseminate information. Besides, group tours could be organized for the common interest groups to learn corn production models, applications of new technologies, and technological advances in the production of corn in order to improve efficiency and incomes of farmer households in this region and create good linkages with companies/enterprises in order to change the mindsets of corn farmers from the backward production practices to market-oriented production (selling fresh corn to companies when it is on the field).

4. CONCLUSIONS AND IMPLICATIONS

Hybrid corn is one of the key crops, contributing greatly to creating jobs, producing income, and ensuring food security for local populations, particularly in the mountainous communes which are home to many poor households and people from ethnic minorities in Lao Cai province.

Economic performance of corn production of households in the three districts have certain differences: for every VND invested in corn production, the households will gain about 2.64 VND of value added and the average profit/costs ratio for all of the surveyed households reached 0.73 times. Distribution of profits to stakeholders in the value chain is still not reasonable, our producers participated in planting and growing, and struggled during the 3-4 months of intensive work, but they only obtained 70.4% of the profit, while corn traders joined the business for just a short time, but they earned 29.6% of the total profit of the value profit chain.

Product distribution channels are long with many stakeholders involved. Almost 75% of the corn producing households sold their products to the traders in their communes and then resold to other stakeholders (district, province, retail) before the products arrived to the consumers. So, the profits for corn producers were lower than if they had sold directly to large district collectors. As market information is limited, people often sold corn to commune collectors and traders. Price extortion and involuntary selling to collectors in communes / villages has been happening in the mountainous communes, especially for a high proportion of ethnic minorities, and unstable prices are not good for corn producers.

Hybrid corn is used as raw materials for food processing for humans (corn products, cooking wine) and cattle. However, the corn must be transported to the lowland provinces of Hanoi, Hai Duong, and Hung Yen, and some Southern provinces such as Dong Nai and Ho Chi Minh for food processing, leading to high transportation costs. Currently, the link between corn farmers and other stakeholders is very loose, so the consumption of corn products is difficult and heavily dependent on the local traders and the China market.

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