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Market Chain Analysis of White Corn in Abra

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Abstract

The study evaluated the market chain of white corn in Pidigan and Bangued, Abra in order to identify market-based solutions to constraints and opportunities in the market chain. A combined descriptive qualitative and quantitative research design was used in the study. Six major actors namely, farmers, assembler-agents, assembler-wholesalers, assembler-trucker-wholesalers, trucker-wholesalers, and processors, were identified in the white corn market chain. Buyers or traders have critical roles that are advantageous to the farmers. Production is mostly led by men while marketing is mostly performed by women. The farmer is the most disadvantaged actor compared to other actors in terms of profit received. The farmer has a lower profit share than the trader if the farmer sells their produce as dehusked. Pests, low price of corn, and low quality of farmer produce are the major problems encountered by the market actors. Farmers can sell their produce directly to the processor thru collective marketing but multi-disciplinary technical assistance is needed. Agro-enterprise opportunities in white corn production can be a) consolidation and marketing of white corn including value-adding activities such as shelling, drying, and transporting; and b) white corn seed production by seed producer groups comprised of farmer groups or progressive individual farmers.

Introduction

Corn production in the Philippines is categorized as yellow and white corn production. Most of the yellow corn produced are for feed production, while white corn which includes flint, glutinous and sweet corn are mainly for food consumption. Glutinous and sweet corn are usually boiled and sold as a snack. Glutinous corn is also processed as "cornick". Flint corn on the other hand is dried and milled to be consumed like rice. Some parts of the Visayas and Mindanao consume flint corn as a staple food.

At the national level, the total corn production in 2019 is 7.98 million metric tons (MT). The top-producing regions of white corn are BARMM, Northern Mindanao, and SOCCKSARGEN. The Cordillera Administrative Region (CAR) ranks second to the last with a production of 16,192 MT from an area of 6,465 hectares (ha). Out of the total, white corn production is 2.1 million MT or 26% and yellow corn is 5.9 million MT or 74% (Philippine Statistics Authority [PSA], 2019a). In the same year, the total area harvested for corn is 2.52 million ha wherein white corn covered 1.10 million ha while the yellow corn area was 1.42 million ha (PSA, 2019a). The yield for white corn is 1.88 MT ha^{-1} and for yellow corn, 4.17 MT

ha^{-1}. The country's overall average yield of corn is 3.17 MT ha^{-1}.

In the CAR, the area devoted to corn production is 61,428 ha with a total production of 232,351 MT in 2019. Ifugao has the widest area of production of about 28,732 ha. The second widest is Kalinga having an area of 13,256 ha; the third is Apayao with an area of 6,553 ha; and the fourth is Mt. Province with 6,421 ha area of production. Yellow corn production in the region is higher than white corn production. In the 2019 PSA data, the yellow corn area planted is 54,963 ha while 6,465 ha were planted with white corn. In total, the production is 216.2 million MT and 16.2 million MT, respectively. Abra is the major producer of white corn in CAR with an area of 6,092 ha and production of 15,343 MT in 2019. It accounts for about 95% of the regional production based on PSA data in 2019. Apayao ranks second with an area of 173 ha and production of 438 MT. Third is Kalinga with an area of 113 ha and 274 MT production, and fourth is Benguet with an area of 38 ha and 39 MT production. The least white corn producers are Ifugao with an area of 30 ha and production of 74 MT, and Mt. Province with an area of 19 ha and 25 MT production. The average productivity of corn in the region is 3.78 MT ha^{-1}. For yellow corn, the average productivity is 3.9 MT ha^{-1} while for white corn it is 2.5 MT ha^{-1}. Apayao and Abra have the highest yield of 2.52 MT ha^{-1} and 2.53 MT ha^{-1} on white corn production, respectively; while Benguet has the lowest yield of 1.0 MT ha^{-1}.

In general, interventions from the government are more concentrated on production such as the provision of inputs like seeds, fertilizers, and machinery, with less on marketing. Among the problems identified in the study of Gerpacio et al. (2004) are the socio-economic constraints related to marketing and support services such as lack of access to formal credit sources, insufficient access to fair market and price information, inefficient marketing system for farm inputs and products, and poor infrastructure. These services are needed to help the farmers. Looking into the market chain of a commodity is looking into the production and marketing aspects. To have a more fruitful intervention, a study on the industry as a whole is needed. One important objective of market chain analysis is to identify constraints and opportunities in the market chain. Thus, the study aimed to evaluate the market chain of white corn in the case of Abra, and to identify market-based solutions in relation to constraints and opportunities in the market chain. Specifically, the study aimed to 1) identify and describe the market actors involved and their roles in the market chain of unprocessed white corn; 2) determine profitability of production and marketing white corn; and 3) identify major problems of the market actors and recommend intervention in relation to their constraints.

Methodology

Conceptual Framework

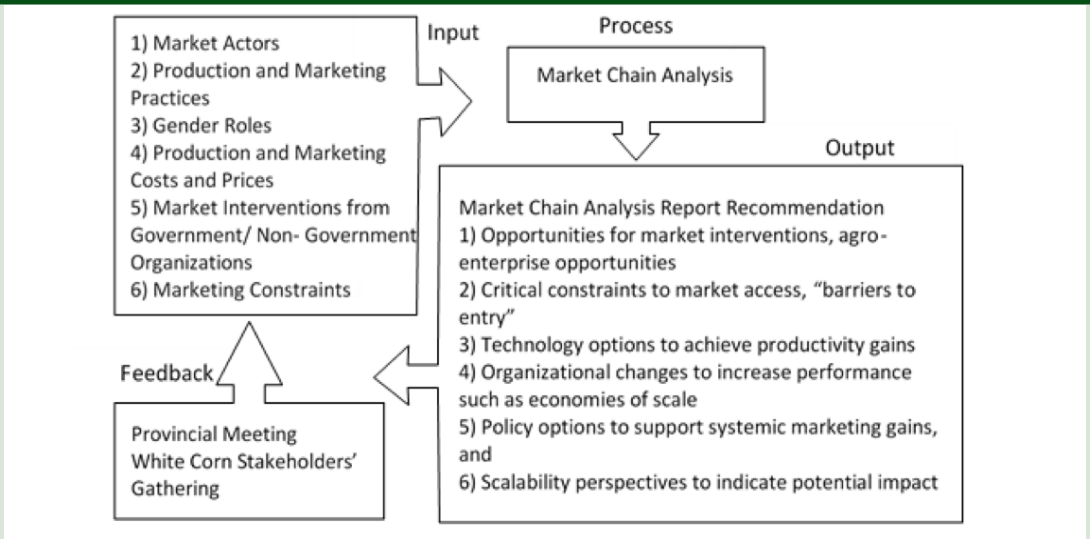
For years, government and other organizations' interventions have been centered on on-farm productivity which is on the production side that often has less effectivity on the issues being addressed (Lundy et al., 2008). While the production is the role of farmers who are part of the market chain, other aspects such as marketing were less considered in undertaking an intervention. To have a more appropriate intervention, an approach that includes the whole market chain of a commodity must be considered. An intervention that addresses the need of the whole chain and improves it is appropriate and fruitful. To generate an appropriate recommendation, a market chain analysis for a certain commodity was performed. Information on who the market actors are, practices, gender roles, costs and prices, existing interventions, and current constraints being experienced by the market actors are needed in conducting a market chain analysis. Recommendations generated from the analysis was communicated to the stakeholders for them to implement. Each of them have their own specific roles to perform in the improvement of the market chain. Figure 1 shows the paradigm used in the study which was adopted from the concepts and theory of Wandscheider et al. (2012).

Research Design

The study used a descriptive research design. It assessed the market chain of the commodity using the qualitative and quantitative responses of the different market actors.

Figure 1

Paradigm of the Study



Sampling

The study covered the major producing municipalities of the province of Abra which is the major producer of white corn in the region. The major producing municipalities selected were Pidigan and Bangued. The top three main producing barangays were sampled for each municipality. A total of 41 farmers were interviewed from the three barangays (Table 1). They were selected through snowball sampling method. Six buyers, among which are four assembler-wholesalers and two assembler agents, were interviewed out of the total 13 buyers identified by the farmers. The interviewed buyers were the only available respondents during the data collection period.

Table 1

Distirbution of Farmer Respondents per Barangay

Barangay	Frequency (n=41)	%
San Antonio, Bangued	5	12
Palao, Bangued	4	10
Sta. Rosa, Bangued	12	29
Lipcan, Bangued	6	15
Poblacion West, Pidigan	5	12
Garetta, Pidigan	4	10
Sulbec, Pidigan	5	12

Data Analysis

The data gathered were analyzed using descriptive statistics. Data on the cost and income were computed and analyzed using cost and return analysis. The economic benefit of the farmer using technology (e.g. use of sheller) was determined using the Partial Budget Analysis (PBA).

Results and Discussion

Major Actors, Roles, and Functions in the Market Chain of White Corn

Six actors were identified in the market chain of white corn based on the interview with the farmers and buyers within the province. The market actors are the farmers, assembler-agents, assembler-wholesalers, assembler-trucker-wholesalers, trucker-wholesalers, and processors. Figure 2 shows the actors, roles or functions, and their activities.

Farmers are the producers of the commodity. They decide when and what to plant, prepare the

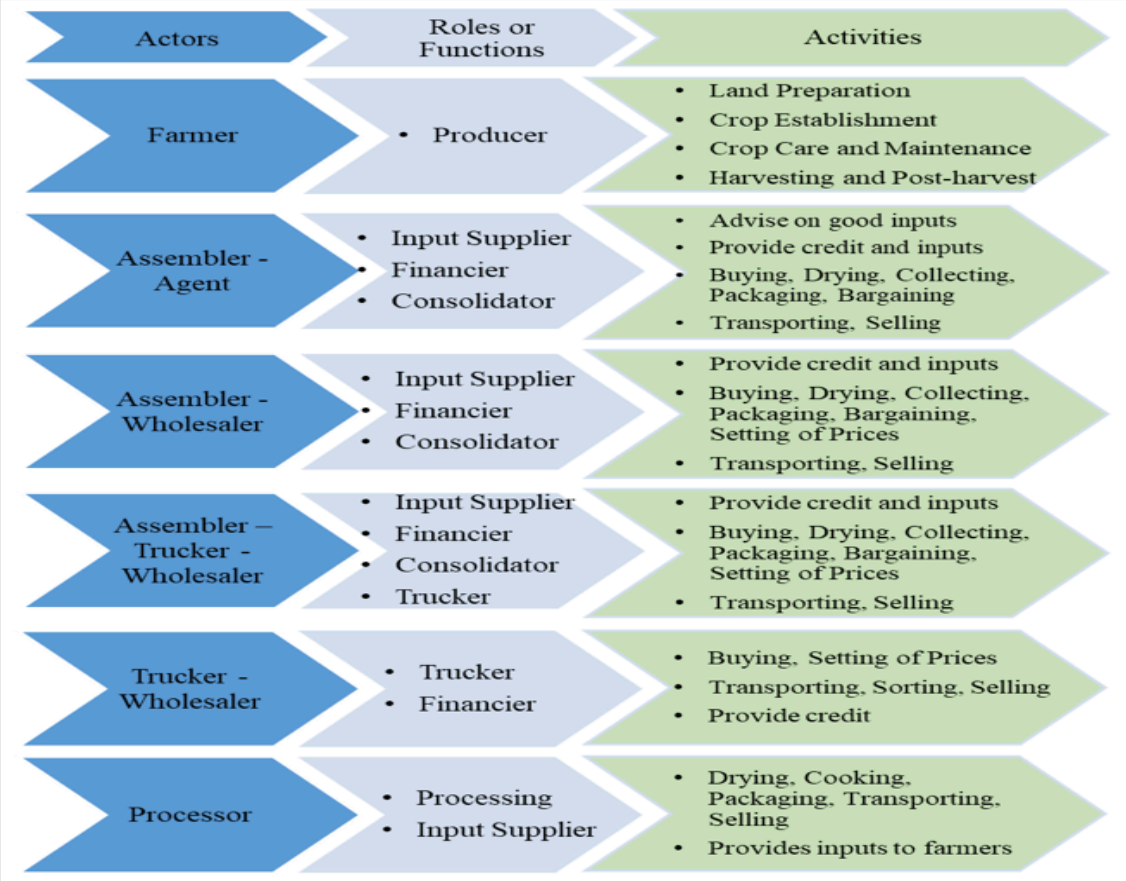
land, establish the crop, maintain and take care of the plant and harvest the crop. Assembler agents provide input and credit to their trusted farmers. They also advise them on good inputs especially better seeds which produce better harvests that suit buyer requirements. Most of the time, they buy the produce from the farmers' farms. They consolidate the product until it can load the capacity of their own or rented vehicle. They act as a consolidator and transporter of products to the assembler-wholesalers. In addition, they do other value-adding activities such as drying, packaging, and/or providing sacks to the farmers.

The assembler-wholesalers act the same as the assembler-agents. But in addition to their roles, they finance or provide credit to the assembler-agents in buying the product. They are also the ones who set the price which they base on the buying price of their buyers outside the province. The assembler-trucker-wholesaler has the same roles as the assembler-wholesaler except that they also deliver or transport the corn to the buyers.

Like the assembler-wholesalers and assembler-trucker-wholesalers, the trucker-wholesalers set the price, which they base as well on the buying price of their buyer. The trucker-wholesalers buy the corn in the assembler-wholesalers' residence and then deliver it to their buyers who are the processors. They know very well the product requirements of the processor, which they relay to the assembler-wholesalers. According to the respondents, product requirements include matured, milky-dried, and medium to large kernels. They do the sorting and return the corn that do not pass the product requirements. Returned corn is then used as feed for animals being raised by the farmers. Two

Figure 2

White Corn Market Actors and Their Roles, Functions, and Activities



trucker-wholesalers were identified according to geographical origin— Bulacan and Valenzuela buyers. Bulacan buyers are observed by the respondents to be stricter in terms of their product requirements. Trucker wholesalers also provide financing for buying corn as mentioned by the interviewed buyers in the province.

Processors in the province provide inputs to the farmers who intend to sell their produce to them. The processors do value-adding activities such as drying, cooking, packaging, and transporting their product which is the 'cornick' or processed corn.

In production, the farmers interviewed were mostly men. They lead the production operation on the farm while the wife manages the financial aspect of the operation. There were also women interviewed that manages both the production and financial aspect of farming. In labor, both men and women work together, especially during planting and harvesting. The interviewed traders were mostly women. Women lead the marketing function, but both men and women laborers perform marketing activities.

Market Chains

Seven market chains were identified based on the buyers of unprocessed white corn in the province of Abra, as mentioned by the farmer and buyer respondents interviewed (Figure 3). One to three market intermediaries or actors are involved between the farmer and the processor. Chains 1 and 3 have the longest chain with five actors, while chains 5 and 7 have the shortest chain with only three actors. Chain 1 has the biggest volume traded at 508MT while chain 7 has the least volume traded of 12MT. This result shows that chain 1 which is the farmer-to-assembler-agent to assembler-wholesaler to trucker-wholesaler to processor is the most dominant chain based on the volume traded. This could mean that this chain has more farmer suppliers than the other chains. The bigger volume traded in chains 1 and 3 could be attributed to the use of assembler agents by the assembler-wholesalers to buy more volume to be sold to the trucker–wholesalers. Chain 7 which is the farmer to assembler-agent to processor is the least traded volume because the cornick processors in Ilocos Sur and Norte only buy from Abra if there is no more supply of white corn in their province.

Volume of White Corn Traded by Buyers in the Province

Table 2 shows the volume traded by the interviewed traders during the wet and dry seasons. The majority (94.1%) of the declared traded quantity is during the dry season with a

Figure 3

Market Chains of Unprocessed White Corn and Volume Traded in Abra

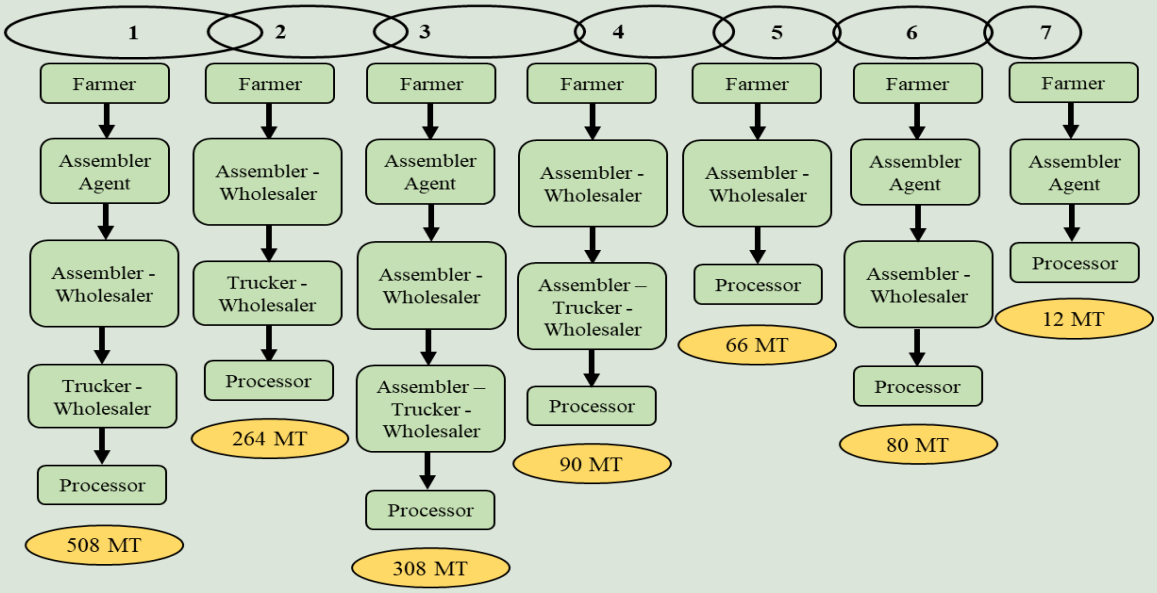


Table 2

Volume Traded by Intermediaries During Wet and Dry Season

Trader	Declared Traded Quantity (MT)		Volume (MT) Per Buyer		
	Wet Season	Dry Season	Processor	Assembler-Trucker-Wholesaler	Trucker-Wholesaler
1	-	120.0	30.0	90.0	-
2	5.0	10.0	-	15.0	-
3	30.0	250.0	-	280.0	-
4	40.0	60.0	20.0	80.0	-
5	-	330.0	66.0	-	264.0
6	-	500.0	100.0	-	400.0
Total	75.0	1,270.0	216.0	465.0	664.0
%	5.9	94.1	16.1	34.6	49.4

Source: Traders interview data, February 2020

value of 1,270 MT, and only 5.9%, or 75 MT for the wet season. This result is similar to the provinces of Ilocos Norte and Isabela wherein most months of peak trading of white corn is during the dry season (January to May) (Bureau of Agricultural Statistics, 2011). The lesser volume traded during the wet season could be attributed to the weather as it is difficult to dry corn. Also, the area to be planted is devoted not just to corn but also to rice and other commodities as shown in the 1st semester of 2018 (PSA, 2018).

Based on the data, a bigger proportion, or 49.4% of the total volume is supplied to the trucker–wholesalers in Bulacan and Valenzuela, 34.6% to the assembler-trucker-wholesalers in Ilocos Sur, and 16% to the processors in Ilocos Sur and Norte. This result implies that there is a bigger market for unprocessed white corn in Region 3 and the National Capital Region (NCR). These regions are the location of large-scale processing or manufacturing companies like the KSK Food Products - Boy Bawang.

Marketing Practices of the Different Actors and Cost Incurred in Their Activities

Marketing refers to activities such as selling, advertising, and transporting, which an entity undertakes to promote the buying or selling of a product or service offer (Twin, 2020). A more inclusive definition of marketing by Gaedeke and Tootelian, as discussed by Crawford (1997), is “a management orientation focusing all the activities of the organization on satisfying customer needs and wants, thereby helping achieve the organization's long-range objectives." It also covers the product, price, place, and promotion.

Form of Corn Sold

There are two forms of corn sold by the farmers, it is either dehusked or shelled. Dehusked corn is termed *si-ambuligan* by the actors, in which the husk is just removed manually by almost all of the farmer respondents. Shelled corn is just the kernel, which is removed from the cob through a sheller machine. The distribution of farmer respondents according to the form of corn sold is presented in Table 3. The majority (73.2%) of the farmers sell dehusked corn, while 24.4% sell shelled corn. The result confirms the statement of Gerpacio et al. (2004) that farmers sell their produce immediately. While the reason he stated is for the farmer to pay loans from trader-financiers, the respondents of the study reason that they will use the cash for immediate needs and to avoid additional labor and expenses. Selling shelled corn will require the farmer to dry the dehusked corn if harvested as not fully matured or wait for an available sheller machine which in this case delays the opportunity for the farmer to have an immediate cash-on-hand. In addition, the benefit of selling shelled corn compared to dehusked corn is just equal or nearly equal to the additional cost. In short, there is not much benefit according to some of the farmer

Table 3

Distribution of Farmer Respondents According to Form of Corn Sold

Form	Frequency (n=41)	%
Dehusked corn (just harvested) or "si-am-buligan"	30	73.2
Shelled corn	10	24.4
Both dehusked and shelled corn	1	2.4

Source: Traders interview data, February 2020

respondents. But to those who own a machine, they responded that they prefer to sell their corn as shelled.

Price Setting

Price is set by the traders who are assembler-wholesalers and have direct communication with the trucker-wholesalers. The average buying and selling price of shelled corn is higher by more than 200% compared to dehusked corn. As shown in Table 4, the average buying price of shelled corn is Php26.6/kg and Php12.75/kg for dehusked corn from farmers and other traders. Even if the price of shelled corn is higher than the dehusked corn, farmers usually do not sell in such form. Buying dehusked corn and selling in the same form is reported by only one among the six interviewed traders, who is an assembler-agent. She buys it for Php11/kg and sells it for Php12.50/kg.

Prices gathered differ depending on the time the traders buy and sell the products and the quality of the corn that the farmers or trader offered. Price range encountered by the traders for dehusked corn and shelled corn is Php11-15/kg and Php25-35/kg, respectively. Buying price for dehusked corn is higher during the onset of harvesting than at the time when many farmers already harvested their crops. For shelled corn, buying price tends to be higher by Php 2/kg if it is fully dried or milky dried than just skin to hard dried or crystal dried shown in Figure 4. Crystal dried appears to be shiny and clear. Milky dried seems to be creamy or white. Fully dried or milky-dried corn is said to be ready for processing.

Purchasing, Destination, and Source of Product

Generally, the product requirement of the

Figure 4

Crystal and Milky Dried Parts of White Corn

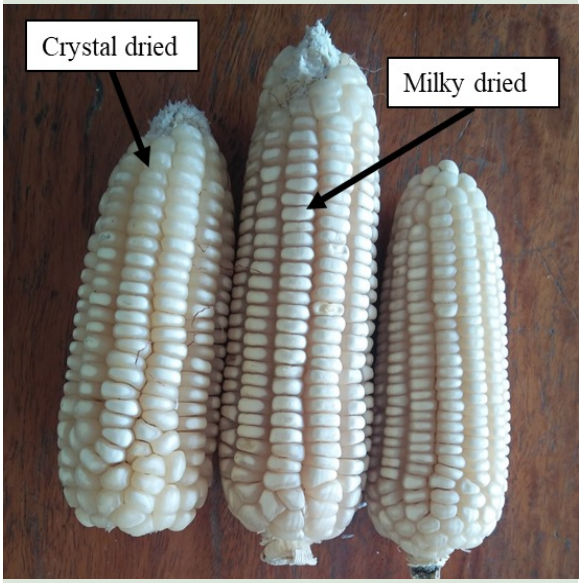


Table 4

Forms of Corn Bought by Traders and Prices

Form of Corn	Average Buying Price (Php/Kg)	Average Selling Price (Php/Kg)	Price Range Encountered by Traders (Php/Kg)
Dehusked corn (just harvested) or "si-ambuligan"	12.75	12.50*	11 to 15
Shelled corn and dried corn	26.6	29.00	25 to 35

**not average since only 1 seller*

Source: Traders interview data, February 2020

buyers is shelled corn which is dried and with medium to large kernels (Table 5). Milky dried corn is the product requirement of the trucker-wholesalers from Bulacan and Valenzuela, since their buyers are processors of corn. Bulacan is reported to be stricter in terms of kernel size than the Valenzuela buyers. Destinations of corn bought by the traders interviewed are in the province as well as from Ilocos Sur, Ilocos Norte, Bulacan, and Valenzuela. The corn is usually for pick-up by buyers from outside the province.

The traders interviewed buy all forms of corn from the different areas in the province, especially in their adjacent municipalities which are presented in Table 6. All of the buyers buy and sell corn during the dry season. And half of them purchase during the wet season. Their major suppliers are individual farmers. Some prefer to buy from farmers within their barangay of operation because of distance, trust already built, and the quality (as required by the buyers) of produce in their area.

Marketing Activities and Cost

Farlex Financial Dictionary (2009) defines value-added activity as an activity that increases the value of a product at a given stage in a production cycle or supply chain. Transforming the corn bought by the traders from one form to another requires labor. Since the transformed form (shelled corn) has a higher price than the original form (dehusked corn), the activity done to transform the product is called a value - adding activity.

Marketing activities identified are shelling, drying, hauling and transporting. Marketing activities done for dehusked corn to shelled corn include shelling, drying and transporting; while for shelled corn, it only includes hauling and transporting. Based on the averaged cost experienced by the traders interviewed, shelling costs Php0.52/kg, drying is Php0.53/kg and transporting is Php0.36/kg for dehusked to shelled corn as presented in Table 7. While the other form, hauling costs Php0.19/kg and transporting costs Php0.24/kg.

Table 5

Destination and Product Requirements of Buyers

Trader	Geographical Destination of Corn Handled	Priority Destination Market in Terms of Volume	Major Buyer*	Product Requirement of Buyer
1	Santiago, Narvacan, Ilocos Sur and Batac, Ilocos Norte	None	1 and 2	matured and dried
2	Narvacan, Ilocos Norte and Bulacan	None	1 and 3	white and dried, not shiny dried, milky
3	Suyo, Pidigan	None	1	color, bigger kernel
4	Suyto, Pidigan	None	1 and 2	dry, shelled
5	At Palao, Bangued for pick up by buyers from Bulacan, and San Nicolas, Ilocos Norte	Bulacan Buyers	2 and 3	good dry (milky) and large kernels
6	At Suyo, Pidigan for pick up by buyeres from Valuenza, Bulacan and Ilocos Sur and Norte	Valenzuela Buyers	2,3 and 4	medium to large kernel

**Legend:*
1-Assembler-Wholesaler/Assembler-Trucker-Wholesaler-Bangued and Ilocos Sur
2- Processer-Ilocos Sur and Norte
3- Trucker Wholesaler-Valenzuela
Source: Traders interview data, February 2020

Table 6

Source and Season of Purchase

Trader	Form of Corn Bought*	Sources of Corn	Season of Purchase	Major Suppliers	Preferred Supplier
1	1 and 3	Pidigan, Bangued/San Quintin/ Lagangilang Poblacion, West	dry season	individual farmers	none
2	2 and 3	Naguirayan, Suyo, Alinaya, Pidigan	dry season	individual farmers	none
3	1 and 3	San Antonio, Bangued/ Lapaz	dry and wet season	individual farmers	farmers within the barangay
4	1 and 3	Palao, Cusili, Bangued/ Tayum	dry and wet season	individual farmers	farmers within the barangay
5	1 and 3	Palao, Bangued/ Bangbangar/Penarubia/ San Quintin	dry and wet season	individual farmers	farmers within the barangay
6	1 and 3	Bangued/ Langiden	dry season	individual farmers	none

**Legend:*
1-dehusked corn (just harvested) or "si-ambuligan"
2- shelled corn (crystal dried)
3- shelled corn (milky dried) or ready for Cornick processing
Source: Traders interview data, February 2020

Table 7

Marketing Activities and Cost Incurred

Form of Corn	Marketing Activities	Average Cost (Php/Kg)
Dehusked corn (just harvested) or "si-ambuligan" to shelled corn good for processing	Shelling	0.52
	Drying	0.53
	Transporting	0.36
	Total	1.41
Shelled corn (milky dried) or ready for Cornick processing	Hauling	0.19
	Transporting	0.24
	Total	0.44

Source: Traders interview data, February 2020

Transporting costs for the dehusked corn are higher than shelled corn due to product form and distance differences of the traders interviewed. Dehusked corn is bulky as compared to shelled corn as it takes up more space in the transport vehicle but it has lesser weight. This makes the transport cost per unit higher for dehusked corn compared to shelled corn. The total cost of the enumerated marketing activities is higher for dehusked to shelled corn than just the shelled

corn which is Php1.41/kg and Php0.44/kg, respectively. The higher cost is due to the activities in transforming the corn into a more marketable form. These activities increase its cost as well as its value when sold.

Cost and Profit Sharing Among Actors in the Market Chain

Production Cost

The average production cost for dehusked corn is Php8.18/kg and Php13.87/kg for shelled corn. Regardless of the form sold by the farmer, the average production cost per kg is Php9.67/kg which is almost the same as the DA estimate of Php9.66/kg. The average production cost per ha for white corn in general is Php20,068.51 which is lower than the estimate of the Department of Agriculture (2019) indicated in the Corn Industry Road Map in the Cordillera Administrative Region of about Php 25,200/ha.

Marketing Cost and Profit

Table 8 shows the marketing costs and profits for the different forms of corn as previously mentioned, the cost for dehusked to shelled corn includes shelling cost and labor in drying which is Php0.52/kg and Php0.53/kg, respectively. The transport cost for dehusked corn is Php0.36/kg, which is higher compared to shelled corn which is Php0.24/kg. The higher cost is due to the bulkiness of dehusked corn occupying more space. Hauling labor cost is Php0.19/kg for shelled and dehusked corn. Shelling accounts for about an average of 25% loss from the original weight based on the 20-30% estimate indicated in the article of de Leon (2014). Drying accounts for about 8% loss to achieve the moisture content of kernels suitable for storage or processing of 12 to 14% (de Lucia & Assennato, 1994). The original moisture content at harvest of white corn bought by traders is usually 18 – 24% (Food and Agriculture Organization of United Nations, 1992). All in all, the total loss due to shelling and drying, which is also part of the marketing cost of the trader who bought dehusked corn and sold it as shelled corn, is 33%, or Php5.22/kg.

The total marketing cost for a trader who buys dehusked corn and sells it as shelled corn is the highest having a cost of Php6.96/kg compared to

Table 8

Marketing Cost, Profit, and Market Margin (Php/Kg) for White Corn, Abra

Particulars	Forms of Corn Traded		
	1-Dehusked to shelled corn	2-Shelled corn (milky dried)	3-Dehusked corn
Labor in Hauling	-	0.19	0.19
Shelling Cost (rented sheller)	0.52	-	-
Labor in Drying	0.53	-	-
Transport	0.36	0.24	0.36
33% loss due to shelling and drying	5.22	-	-
25% Contingecies	0.33	0.07	0.14
Total Marketing cost per kg	6.96	0.50	0.69
Gross profit (Gross income less cost of goods sold) per kg	16.25	2.40	1.50
Net Profit (less marketing cost) per kg	9.67	2.07	0.81
Buying Price (PhP per kg)	12.75	26.60	11.00
Selling Price (Php per kg)	29.00	29.00	12.50
Market Margin per kg (buying price selling price)	16.25	2.40	1.50

Source: Traders interview data, February 2020

shelled and dehusked corn having a cost of Php 0.50/kg and Php 0.69/kg, respectively. This difference in cost is due to the activities in transforming the product and the loss due to drying and shelling. While it is highest in terms of cost, it is also highest in terms of profit at about Php9.67/kg.

In terms of market margin, the dehusked to shelled corn is the highest with a margin of Php16.25/kg compared to Php2.40/kg for shelled corn and Php1.50/kg for dehusked corn. Market margin is the difference between the price of a product bought and the price of it sold. The market margin is higher if the corn is bought as dehusked from farmers and sold as shelled compared to the corn bought as shelled or just dehusked and sold in the same form. The high market margin could imply inefficiency in the marketing system (Aditya, 2016), not on the part of the trader but of the farmer who sells dehusked corn. Therefore, the farmer can still improve market efficiency through value addition by transforming his or her product into shelled corn. In this way, he or she can maximize his or her income.

From the data gathered from farmers, the return on expenses (ROE) of selling dehusked and shelled corn is 61% and 75%, respectively. This result shows that selling shelled corn gives a higher return. The analysis of the farmer's benefit, if he shifts from selling dehusked to shelled corn, is presented in Table 9. If the farmer who sells dehusked corn having a production cost of Php8.18 per kg will further transform his product, the additional cost for him is Php5.69/kg and he will earn an additional income of Php4.12/kg. Subtracting the added income and added cost, the difference would show that there is an income reduction of Php1.57/kg. This confirms the statement of a farmer respondent that shelling corn does not give much benefit. The two contrasting results can be benchmark data for further study on improving the income of farmers through value-adding activities using improved and advanced technologies. Improving the methods of drying to lessen the cost of production could be a way so the farmers will benefit from selling shelled corn, such as a more fuel-efficient dryer. In addition, a more efficient sheller can reduce production costs as mentioned by the farmer that they experience shellers that have different performances.

Cost, Profit, and Market Margin per Actor in the Major Market Chain

The production and marketing cost, profit, and market margin per actor in the major market chain of white corn, which is chain 1, is presented in Table 10. In terms of cost, the farmer has the highest with Php8.18/kg. This cost discussed in the previous topics is the production cost for dehusked corn. The second with the highest cost incurred is the assembler-agent amounting to Php6.96/kg, which is due to the shrinkage and value-adding activities such as drying, shelling, transporting, and other costs or contingencies. The marketing cost incurred by the assembler-wholesaler and the trucker-wholesaler is Php0.45/kg which comprises the transportation cost plus a 25% contingency cost. Contingency cost incurred includes depreciation cost and interest on money that they lend to their agents. The average selling price for a farmer is Php12.75/kg based on farmers' data. The average selling prices for the assembler-agent, assembler-wholesaler, and trucker-wholesaler are Php26.60/kg, Php27.85/kg, and Php29.00/kg, respectively, based on the data gathered from the traders. For the profit and market margin, the assembler-agent who performed value-adding activities has

Table 9

Partial Budget Analysis of the Farmer Shifting from Selling Dehusked to Shelled Corn

Form of Product	Cost of Production (Php/Kg)	Average Selling Price (Php/Kg)	Income (Php/Kg)	Added Income	Added Cost	Net Change
Dehusked	8.18	13.19	5.01	4.12	5.69	-1.57
Shelled	13.87	23.00	9.13			

Source: Traders interview data, February 2020

Table 10

Production and Marketing Cost, Profit, and Market Margin per Actor in the Major Market Chain of White Corn, Abra

Chain Actor	Average Production/ Marketing Cost (Php/Kg)	Average Selling Price (Php/Kg)	Profit (Php/ Kg)	Return on Expenses (%)	Market Margin
Farmer	8.18	12.75	4.57	56	-
Assembler-agent	6.96	26.60	6.89	100	13.85
Assembler-wholesaler	0.45	27.85	0.80	178	1.25
Trucker-wholesaler	0.45	29.00	0.70	156	1.15

Source: Traders interview data, February 2020

the highest compared to the different market chain actors with Php6.98/kg and Php13.85/kg, respectively.

In terms of return on expenses (ROE), the assembler-wholesaler has the highest return of 178% while the farmer has the lowest of 56%. In this data, the farmer is the most disadvantaged actor in the market chain. The farmer invests the highest cost but receives the lowest return among the other actors. While this can mean inefficiency in terms of production which can be improved through the adoption of advanced farming technologies, the farmer's return can also be improved through value addition by further transforming his product using advanced post-harvest technologies such as more efficient drying and shelling technologies.

Cost and Profit Sharing by Form of Corn Bought and Sold by the Actors

Sharing in the cost and profit for white corn sold in different forms by the farmer and trader is illustrated in Figure 5. The cost of producing and marketing dehusked corn and selling it in the same form is 69% of the price paid by the end-users, while 31% is the profit margin. A larger proportion (65%) is the farmers' share compared to the traders' share which is the marketing cost (4%). From the 31% profit margin, the share of the farmer is 23% and 8% for the trader. Looking at the proportion, the profit share for the farmer and the trader is fair enough. The farmer bears the higher cost but also receives a higher profit share. The trader bears a lesser cost and receives a lesser profit share compared to the farmer.

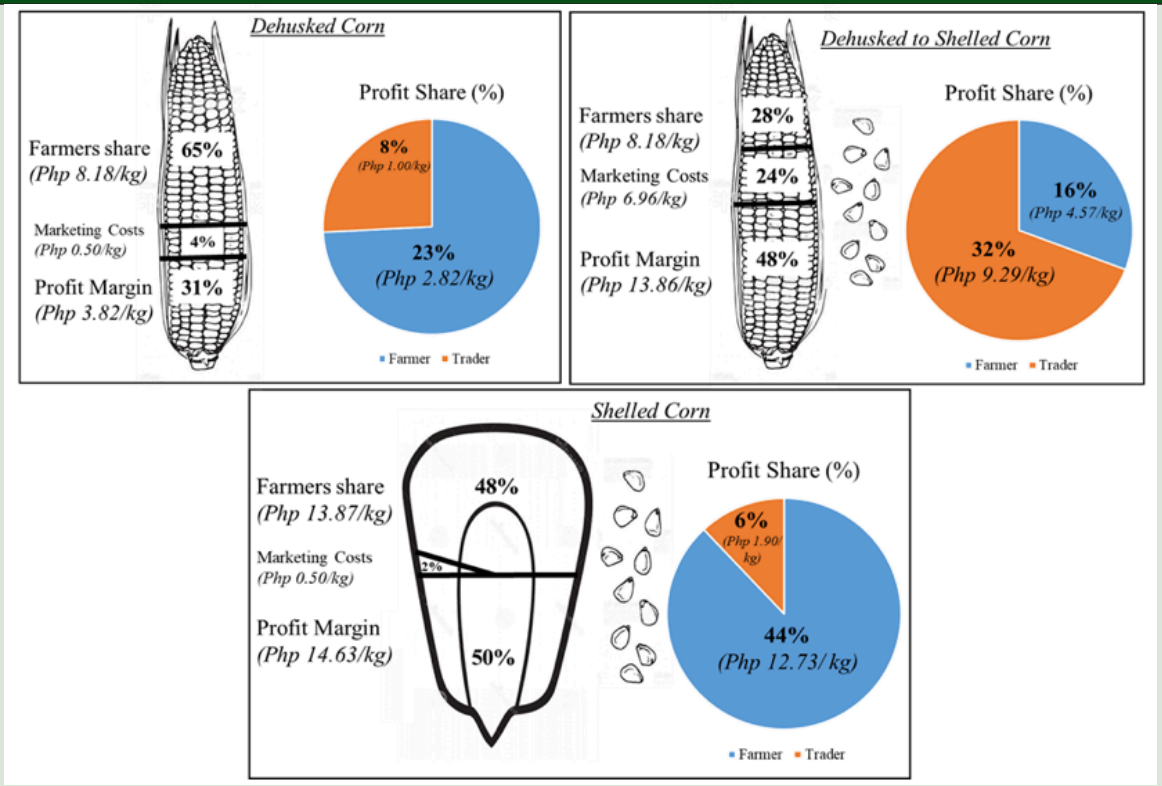
Figure 5 further shows that the cost and profit in producing and marketing dehusked to shelled corn is 52% : 48%. The 52% cost is divided between the farmers and the trader, where 28% is the share of the farmer and 24% of the trader. There is a small difference of 4% between the farmer and trader's share. From the 48% profit margin, the trader owns 32% while 16% is the farmers' share. There is a difference of 16%. Comparing the cost and profit sharing, there is unfairness in the profit sharing since there is a greater difference. The trader owns a bigger proportion (doubled) as compared to the farmers' share. There is a difference of 16%. Comparing the cost and profit sharing, there is unfairness in the profit sharing since there is a greater difference. The trader owns a bigger proportion (doubled) as compared to the farmers' share.

The sharing of cost and profit for white corn sold as shelled corn by the farmer and the trader (Figure 5) shows that fifty percent (50%) consists of the cost while 50% is the profit margin. Since the form of white corn sold by the farmer is shelled, his share in the cost is 48% while the trader or the marketing cost is only 2%. The profit margin is 50%, wherein the farmers' share is 44% and the traders' share is 6%. Same with the result previously shown in the white corn sold as dehusked by the farmer and the trader, there is fairness based on the cost-sharing and profit sharing for the farmer and the trader. The farmer shares a big pie in the cost but also shares a big pie in the profit.

Although it is the choice of the farmer to either sell his produce as shelled or not and to

Figure 5

Costs, Profit Margin, and Sharing for White Corn Sold in Different Froms by Farmer and Trader, Abra, 2020



either grab the opportunity of higher return or not, it is clear that there is room for the enablers (government and non-government organizations) to provide interventions that will reduce cost for the farmers to transform their produce into shelled corn. In this way, farmers will be encouraged to add value to their produce.

Constraints Encountered by the Different Actors in the Market Chain

Constraints Encountered by Farmers

Constraints encountered by the farmers include their production and marketing problems. But since they are the actors in the chain who are mostly in the production of the corn, most problems reported are in the production stage (Table 11). Most or 95% of them responded that pest is their problem (Table 11). Among the pests, the majority (69.2%) of the farmers mentioned the fall armyworm (FAW). They reported that the worm is a new pest encountered in the province and its first attack resulted in major damage to their corn in 2019. Corn weevil, grasshopper, white grub, and stem borer were also other pests encountered by the farmers. In the study of Gerpacio et al. (2004), the annual pest problems mentioned by farmers are Asian corn borer, corn earworm, and white grub which caused low seed germination and small kernels and cob at harvest. This problem of pests can be attributed to the quality of inputs being used by the farmers such as stored seeds from previous harvests instead of improved seeds or varieties.

The marketing and distribution constraints of farmers are shown in Table 12. The low price during the rainy season is the top constraint mentioned by respondents. As previously discussed, there are few buyers during the rainy season and they buy lesser quantities compared to the dry season. This low demand is because of fewer sunlight hours during the rainy season, which makes it difficult for farmers to dry the corn kernels. Problems related to low prices are unstable prices, buyers' dictating the price, and few buyers during the rainy season. The farmer respondents also mentioned that there are few consolidators or buyers. As they mentioned, they

Table 11

Problems Encountered by Farmers in Production

Problems Encountered	Frequency (n=41)	%
Pests	39	95.1
Corn Weevil	11	28.2
Grasshopper	5	12.8
White Grub	5	12.8
Stem borer	3	7.7
Worm (FAW)	27	69.2
Seed didn't Germinate	2	4.9
Weather-Typhoon	9	22.0
Windy during flowering stage	6	14.6
Source of Water	3	7.3
Drought	13	31.7
Small kernels and cob harvest	1	2.4
Lack of hose for irrigation	1	2.4
Flooding	4	9.8

Note: Multiple responses
Source: Traders interview data, February 2020

Table 12

Problems Encountered by Farmers in Marketing

Problems Encountered	Frequency (n=41)	%
Low price during the rainy season	28	68.3
Unstable price	4	9.8
Buyer dictates price	3	7.3
Few buyers during rainy season	3	7.3
Few consolidators/ buyers	3	7.3

Note: Multiple responses
Source: Traders interview data, February 2020

want more buyers so that the price will be higher. In the past, many buyers were coming into the province according to the farmers. But because of the influence of politicians who are also corn traders, the truckers are not allowed to come to the province.

Constraints Encountered by the Traders

The constraints encountered by the traders were in relation to the quality of corn they buy from the farmers: mixed with flint, small kernels due to the use of native varieties, and damaged kernels due to pests. Other problems that were mentioned are lack of sheller in the barangay; the available equipment cracks the corn kernels, which affects the quality of the corn; lack of drying pavement; and difficulty of drying corn during the rainy season.

Possible Interventions and Recommendations with Regard to the Constraints Encountered

The majority of the farmer respondents received interventions such as farm inputs, trainings or seminars, and crop insurance. The interventions mostly received were farm inputs (Table 13). While trainings or seminars attended by the farmers are more on pests, especially the FAW, seminars or information drives on how to manage other pests mentioned by the farmers are needed.

Other constraints that were mentioned such as drought, source of water, and lack of hose for irrigation are related to irrigation. This constraint is important to address since production loss due to drought is 10% to 30% (Heiniger, 2018). The provision of water pumps and hoses for those who have a source of water, and shallow tube wells (STW) can be a possible intervention for this constraint.

Relative to the problem mentioned by the buyers on the small kernels of corn bought from farmers, the provision of preferred commercialized varieties of white corn seeds with better quality than the native glutinous corn, which is

Table 13

Interventions Received by Farmer

Intervention Received	Frequency (n=41)	%
None	13	31.7
Farm Inputs	21	51.2
Trainings/ Seminar	16	39.0
Crop Insurance	12	29.3

Note: Multiple responses
Source: Traders interview data, February 2020

characterized by small kernels and low yielding, at a wider scope is a possible intervention. The farmers who will be provided with flint corn must follow recommendations in order to avoid cross-breeding of glutinous and flint corn. Corn farmers especially those who have been planting glutinous corn must also be informed about the flint corn as well as its uses.

Related to the constraint on low prices of corn during the rainy season is the problem of drying the produce. The recommended intervention is to provide more efficient (higher fuel efficiency in the heating system) mechanical drying equipment with proper training for a farmer group. If the farmers will sell their corn as dried to the local processors in the rainy season, they will fetch a higher price than the price of undried corn. In addition to providing value-adding equipment as an intervention, farmer groups can also be provided with more efficient corn shellers. The DA has already provided to some farmer groups but others have yet to avail.

Intervention in marketing can be market matching of the farmers directly to the buyers in Bulacan or Valenzuela for them to benefit from higher prices. The farmers can sell their produce to the processor through collective marketing. This option will entail a lot of activities that need to be well-planned before undertaking a long-term business agreement between the farmers and the buyer. Multidisciplinary technical assistance is needed for the farmers to undertake the opportunity. Agro-enterprise opportunities for white corn can be a) consolidation and marketing of white corn which will include value-adding activities such as shelling, drying, and transporting; and b) white corn seed production to be undertaken by farmer groups or progressive individual farmers, which can be organized as a seed producer group.

Conclusions

Based on the results, the study concludes first, buyers or traders have critical roles that are advantageous to the farmers. While the farmers benefit from the credit the buyer provides, the buyer or trader also benefits thru sure supply of corn during the harvest season. Second, in white corn production, the farmer is the most disadvantaged actor compared to other actors in terms of the profit received. Better technology that is adoptable to the farmer in drying and shelling corn is needed to help increase the economic benefit of selling shelled corn. Third, interventions mentioned to help address the major constraints encountered by the major actors in the market chain of white corn will improve more the performance of the chain in the province.

Recommendations

Based from the results, the study recommends first, the strengthening of farmer or farmer-group managed agro-enterprises engaged in 1) value-adding activities such as shelling, drying, and transporting; and 2) white corn seed production. The Local Government Units in partnership with the DA should strengthen the existing corn clusters and organize the unclustered areas. The groups should be strengthened through capability-building in terms of farm entrepreneurship and collective marketing to realize the opportunity of higher income and sustainable farmer group enterprise. If the farmers will operate in the market as a group, they can have access to buyers who offer a higher price as long as product requirements and quantity are met. With this as a prerequisite, market matching as a government intervention should be facilitated with the farmer group operating as an enterprise and the ultimate buyer. In terms of improving productivity at the farm level, the DA should promote more advanced technologies that lower the cost and increase the production of farmers. In addition, the DA should promote technologies that are adaptable to the specific target areas. Farmers should also be encouraged to participate in information drives or seminars on pest management for existing pests and emerging pests for corn. Adoption of quality seeds to be planted by the farmer will benefit them as well as the end-users of the produce. Second, the conduct of a further study on the benefit of the farmer selling shelled corn compared to dehusked corn is needed to prove if there is an economic benefit. The incorporation of more efficient technology in shelling and drying to decrease cost is recommended. Third, the conduct of further market chain study following the buyers outside the province is recommended, since the study is just limited within the province. To have a more focused study, there should be a separate market chain study for processed white corn. It is also recommended that strengths and weaknesses or

the constraints and opportunities be gathered and analyzed to further recommend best options to improve the welfare of the market actors.

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