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Fresh Goat Meat (Chevon) in the Market: Tracing and Understanding the Supply Chain in Central Luzon Region, Philippines

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Abstract Examination of chevon supply chain from sourcing of goats for slaughter to the movement of goat meat to the market as well as value adding is necessary. This research aimed to assess the supply chain of fresh chevon in Central Luzon, Philippines and identify the areas for improvement. Nueva Ecija and Tarlac provinces in Central Luzon were selected as study locations on the basis of chevon being sold on daily basis, volume and goat population. Based on 2002-2013 data, Tarlac and Nueva Ecija ranked first and second, respectively in terms of goat population in Central Luzon.A total of 108 respondents composed of keyplayers in the supply chain were surveyed to gather necessary data coupled with key informants interview. Supply chain mapping was done and set of indicators were used to determine the performance of the identified supply chains. A total of five supply chains from Nueva Ecija (3) and Tarlac (2) were identified and assessed. Supply chain for fresh chevon in the region is simple and generally participated in by keyplayers which include the goat raiser, barangay agent or locator, assembler-wholesaler, meat vendor/retailer, institutional buyer and individual costumer. The supply chain generally follows a traditional supply chain where wet markets remain as the major destination of fresh chevon and continue to play a significant role as a primary retailer for the end consumers. The simple supply and demand analysis showed a gap in the volume requirement of the market which is indicative of unmet demand. The total gap is 1,720 heads (22,995 kg) in a year which is a welcome opportunity to intensify goat production in the supply chain. While acceptable net income, return on expenses and profit margin were generated in the supply chain, there are several logistical issues which denotes some degree of inefficiencies in the supply chain. The identified issues and concerns shall be addressed holistically taking stock of improving goat production system and the other activities and processes in the entire supply chain with important focus on sourcing (establishment of strategically located community-based goat production for slaughter), pricing, product handling and hygiene.

Keywords: supply chain management, fresh chevon, key players, logistical issues

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Introduction

Supply chain analysis aims to utilize and capitalize on strengths, improve weaknesses, search and benefit from opportunities, and mitigate threats in the supply chains (Brown and Aranas, 2011). This analytical tool is intended to find ways of integrating and coordinating various players in the supply chain and meeting the value expectations of the target market. The management of supply chains also seeks to achieve cost reduction and improved customer service by achieving greater efficiency, enhanced flexibility, and service enhancement (Van de Vorst, 2000 and Boyle, 1998 as cited by Brown and Aranas, 2011).

In 2010, goat production grew by 1.38% (BAS 2010) which was mainly driven by the sustained demand for chevon. Since goat production requires small capital investment, it has become a more lucrative enterprise over the other livestock enterprises and therefore an increase in the stocks for slaughter was noted. Moreoever, chevon is continuously gaining popularity because of the lower total fat, saturated fat, calories and cholesterol than the traditional meats such as pork, beef and chicken. Based on USDA Nutrient Database for Standard Reference Release 14 (July 2001) on per 3 oz. cooked chevon, it has lower calories at 122 cal compared to 162 cal for chicken, 179 cal for beef and 180,cal for pork. In the same manner that chevon has lower fat at 2.6 g compared to 6.3, 7.9 and 8.2 g fat for chicken, beef and pork, respectively. Saturated fat of chevon is similarly lower at 0.79 g compared to 1.7 g for chicken, 3.0 g for beef and 2.9 g for pork. Equally important is the lower cholesterol of chevon at 63.8 mg compared to 76.0 mg for chicken and 73.1 mg for both beef and pork. Lesser fat and cholesterol means a healthier red meat for consumers who are becoming more and more health conscious nowadays.

Anent to the gaining popularity of chevon is the fast thriving goat industry in Central Luzon. Corresponding to the increasing demand for goat meat is the need to develop a wide selection of goat products catering to a wide variety of uses. To date, chevon cutting schemes as well as chevon products canning processes have been developed to satisfy demand for exquisite local delicacies. Yet, there is a need for strategic planning and development for commercialization to assure compliance with strict standards and product requirements. The examination of chevon supply chain from sourcing of goats for slaughter to the movement of goat meat to the market as well as value adding is necessary.

Objectives: The research aimed to provide an overview of the goat/chevon industry in Central Luzon;to map out the supply chain for fresh chevon; to analyze the performance of the various supply chains in terms of

efficiency and effectiveness; and to identify areas for improvement of the supply chain.

Materials and methods

Study Sites and Respondents

Central Luzon served as the location of the project and is composed of the provinces of Nueva Ecija, Tarlac, Bulacan, Pampanga, Bataan and Zambales (Fig. 1). Key informants in the region were contacted to provide useful information in tracing the supply chain for fresh chevon in Central Luzon. A reconnaissance survey of the demand centers (major cities) in the six provinces of Central Luzon was then undertaken. Wet markets, supermarkets and meat shops were visited to determine and validate the availability of fresh chevon being offered for sale. Restaurants and eateries/carenderias were also visited to determine where they procure the chevon they used for their cooked chevon dishes.

Figure 1. Map of Central Luzon region showing the 6 provinces

Nueva Ecija and Tarlac were selected as the research locations on the basis of fresh chevon being sold on a daily basis, volume and goat population. Based on 2004-2013 BAS data, Tarlac and Nueva Ecija ranked first and second, respectively in terms of goat population.

The following shows the location and key players identified and interviewed in the supply chain:

AREA/PROVINCE	KEY PLAYERS						
	Goat Raiser	Bgry. Agent/locator	Assembler wholesaler	Assembler Retailer	Market vendor/ Retailer	End Consumers	
						Individual Costumers	Restaurants and carenderias
NUEVA ECIJA							
Science City of Munoz	5	2	2		2	13	4
San Jose City	5	1	1	1	1	12	5
Cabanatuan City	3	1			3	8	5
TARLAC							
Camiling Tarlac			2		3	10	4
Tarlac City				1	1	8	5
TOTAL	**13**	**4**	**5**	**2**	**10**	**51**	**23**
Overall Total	**108**						

Data Gathering

Actual survey and key informants interview were conducted to validate secondary data and to answer more specific questions related to supply chain mapping. Questionnaires were formulated and designed to answer the basic study questions as follows: 1) who are the key customers and what are their product requirements (quality standards)?; 2) How do product, information and money flow through the supply chain?; 3) What are the activities and services provided at each step in the supply chain?; 4) What are the roles of each key player involved in the chain?; 5) What are the critical issues related to logistics?; and 6) and what are some of the external influences affecting the members of the chain?.

Secondary data taken from the National Goat Farm Performance Project (Cruz, *et al*., 2012) were used in the analysis of cost and return in the Tarlac supply chain. The 2009 data were inflated to current prices using the Consumer Price Index. The research team was not able to interview goat farmers in Tarlac as per advise of the traders due to mountainous terrain, long distance and peace and order situation. Key informants were interviewed to this effect.

Supply Chain Mapping and Examination of Chain Performance, Effectiveness and Efficiency

A set of indicators were used to evaluate the performance in terms of effectiveness and efficiency of existing supply chains. The following are the standard indicators used in supply chain evaluation involving agribusiness products:

1. ***Effectiveness***: the ability of the chain to meet the requirements of key customers that include: Quality/Standards; Delivery Volume (Quantity); Delivery Schedule; Delivery Flexibility (flexibility of the chain to respond to changes in customer demands/requirements)

2. ***Efficiency***: Cost (production cost, distribution cost, transaction cost); Profit and Return on Expenses

Results and Discussion

Goat Industry Situation

Goat inventory in the Philippines shows an increasing trend in 2002-2009 and slightly decreased in 2010 until 2013 (Table 1). Goat production remains to be backyard in nature registering a more than 98.0% share to total inventory in the country. While an increasing trend is noticeable from 2002-2009, slight decrease ensued in 2010-2013. Commercial production of goat shows a consistent increasing trend with the highest increase recorded in 2010 till 2012 but decreased in 2013.

The marketing system of goats in the Philippines is as varied as the areas and location of goat farms (Jamandre, Sansano and Guiamal, 2011). The same research by Jamandre, *et al.*, indicated that direct buying, wholesaling and retailing through auction markets and abattoirs and trading through middlemen are the most common marketing system of goats in the Philippines. Further, buying and selling prices are largely based on weight and size of goat. The average yearly farm gate price per kg liveweight of goat increased from 2002-2011 in the Philippines and in Central Luzon. In 2011, the average price per kg liveweight was recorded at PhP99.04 and PhP 119.88 in the Philippines and Central Luzon, respectively, with a little over 1 percent change over time. The data reveals a rather stable farm gate prices through the years.

Table 1. Philippine goat inventory (head), 2002-2013

Year	Backyard	% To Total	Commercial	% To Total	Total
2002	3,248,184	99.53	15,253	0.47	3,263,437
2003	3,272,877	99.50	16,573	0.50	3,289,450
2004	3,431,245	99.40	20,816	0.60	3,452,061
2005	3,642,216	99.29	26,045	0.71	3,668,261
2006	3,960,430	99.19	32,294	0.81	3,992,724
2007	4,059,989	99.07	37,994	0.93	4,097,983
2008	4,086,816	98.96	42,911	1.04	4,129,727
2009	4,182,503	99.01	41,714	0.99	4,224,217
2010	3,874,478	98.42	62,118	1.58	3,936,596
2011	3,688,643	98.24	65,945	1.76	3,754,588
2012	3,650,411	98.19	67,126	1.81	3,717,537
2013	3,614,770	98.32	61,690	1.68	3,676,460

Source: Bureau of Agricultural Statistics

Based on the average of 2004-2013 data, Western Visayas topped the list of the top producing regions followed by Central Visayas, Ilocos Region, Davao Region and Central Luzon. Central Luzon showed an average growth rate of 2.02% in backyard goat production and a slightly high 9.61% in commercial production with an overall growth rate of 2.40%. Central Luzon contributes an average of 7.75% in the goat inventory in the Philippines (2004-2013). The average goat inventory in Central Luzon (Table 2) from 2004-2013 shows Tarlac with the highest percent contribution of 40.45% with Nueva Ecija in second registering 25.16% ,and Zambales came in third with 13.87%.

Table 2. Average inventory of goats (head) in Central Luzon by province, 2004-2013

Province	Backyard	Commercial	Total	% To Total In Cl
Aurora	15,118	58	15,176	5.07
Bataan	12,220	365	12,585	4.20
Bulacan	18,370	1,051	19,420	6.48
Nueva Ecija	72,283	3,082	75,365	25.16
Pampanga	14,051	208	14,259	4.76
Tarlac	119,444	1,711	121,155	40.45
Zambales	41,272	278	41,550	13.87

Source: Bureau of Agricultural Statistics

The growth of goat production in the Philippines is sustained by the demand for chevon. Based on chevon supply and utilization data (BAS, 2011), the supply of chevon consistently increased from 2002-2010 in the same manner that that the per capita consumption for goat carcass (from 0.32 in 2002 to 0.44 in 2010) and offals (from 0.10 in 2002 to 0.14 in 2010) also increased. This figures however, remain far from the per capita consumption of pork and beef (2009) recorded at 14.87 kg and 4.0 kg, respectively.

Key Players and Roles in the Fresh Chevon Supply Chain

Key Customers, Location and Product Requirement

The key customers in all the fresh chevon supply chains include the meat vendor/retailer, institutional buyer and individual costumer The meat vendor/ retailer in all chains sells goat meat in the wet section of the public markets. The individual customers and institutional buyers which include carenderias

and restaurants are generally within the premises of the city and the municipality and generally located near the road or highway.

As a representation of supply chain in Nueva Ecija (CHAIN 2 San Jose City), the quality requirements of the key customers (meat vendor/retailer, institutional buyer and individual customer) in the chain are similar in terms of meatiness, age (young) and freshness except with that of the assembler-retailer which does not have a quality requirement as long as the price is affordable. The required volume of the institutional buyer per day ranges from 1-6 kg carcass for the carenderias and 10 kg or 1 head for a local restaurant. The individual costumer on the other hand, purchases an average 1.5 kg carcass;and or 1.67 kg offals and 2.0 kg head. The chevon dishes (and required parts) prepared by the institutional buyer and individual costumer are similar with half and almost half of the customers preferring to cook caldereta (50.0%) and papaitan (42.0%). The other chevon dishes cooked are adobo, sinampalokan and kampukan. The required delivery schedule of goat meat at 4:00-4:30 AM is met by the suppliers in time for the product to be available for sale from 4:00-8:30 AM.

The volume traded in Chain 2 is 3 heads daily, 4 heads during Saturday and Sunday and 8 heads during holidays translated to 1,251 heads yearly while the yearly backorder totals 256 heads which is the unmet volume in Chain 2.

As a representation of the supply chain in Tarlac (CHAIN 4 Camiling Tarlac), the quality requirements of the key customers (meat vendor/retailer, institutional buyer and individual customer) are almost similar in terms of freshness, meatiness, age (young), except that individual customers added preference for female goats as these exhibit no foul odor. The requirement of the meat vendor is almost 45 kg from Monday to Friday and a high 89 kg of carcass on Saturdays and Sundays which can go as high as 148 kg during holidays like Christmas, New Year and local festivals. As to the volume, the institutional buyer requires a little less at 3-6 kg carcass per day, 3 kg head and 1-3 kg offals. The individual costumer on the other hand, purchases on the average 0.83 kg carcass per purchase; and or 1.89 kg offals and 3.0 kg head. The suppliers of goat meat observed the required delivery schedule as early as 4:30 AM in time for the product to be made available from 8:00-11:00 AM. The chevon dishes (and required parts) prepared by the institutional buyer and individual costumer are also similar with 90.0% of the customers preferring to cook caldereta; papaitan, 100.0%; sinampalokan (60%) and adobo (10.0%).

Individual Customers Reasons in Purchasing Fresh Chevon

The stated reasons in purchasing fresh chevon of the 51 interviewed consumer-respondents indicate that goat meat were tasty and more delicious (31.0%); nutritious and healthy as goat feeds on grass (29.0%); fresh (29.0%), with less cholesterol/fat (25.0%); and family favorite (24.0%). Other reasons cited in purchasing fresh chevon were such that various dishes can be prepared; sure quality; no foul smell; meaty; delicacy; do not eat pork; and for business. The reasons cited point to the fact that goat meat offers various advantages (Cruz, and Porciuncula, 2011) and can be a very good source of protein for other meat such as pork and beef with lesser cholesterol and fat. Lesser fat and cholesterol means a healthier red meat for consumers who are becoming more and more health conscious nowadays.

Willingness to pay for goat meat

The consumer respondents were also asked as to their willingness to pay for goat meat specifically the carcass part. The result showed that not all of the individual consumers are willing to pay higher price for carcass as indicated by the range of prices and the average price they are willing to pay, with the exception of consumers in CHAIN 2 (San Jose City) wherein the average price they are willing to pay at PhP 222.00 per kg is higher than the prevailing market price of PhP210.00 (Table 3). The average price that consumers are willing to pay in CHAIN 1 is PhP 213.00 which is lower than the prevailing price of PhP230.00 per kg; PhP 207.00 in CHAIN 3 which is also lower than the prevailing price of PhP230.00; PhP 208.00 viz a viz a much higher market price of PhP250.00 in CHAIN 4; and PhP 210.00 average price willing to pay in CHAIN 5 which is lower than the PhP240.00 prevailing market price. This indicates the desire of consumers for a lower priced goat meat.

Table 3. Willingness of individual costumers to pay for goat meat (carcass/kg)

ITEM	CHAIN 1 SCM	CHAIN 2 SJC	CHAIN 3 Cabanatuan City	CHAIN 4 Camiling	CHAIN 5 Tarlac City
Prevailing price/kg	230	210	230	250	240
Ave. price willing to pay/kg	213	222	207	208	210
Range	150-250	210-250	190-230	160-250	200-220

Product, Information and Payment Flow of Fresh Chevon

CHAIN 2 San Jose City, Nueva Ecija

CHAIN 2 represents the San Jose City fresh chevon supply chain in Nueva Ecija. Slaughter goats in CHAIN 2 are sourced from the goat raisers within the City and nearer towns in Nueva Ecija such as Science City of Munoz (16.3 km), Lupao (15.3 km). Farther towns where goats are sourced out, include Pantabangan (33.33 km) and Carranglan (36.5 km) and Umingan, Pangasinan which is 32.8 km away from the city.

As seen in Fig. 2**,** goats for slaughter (8-10 months old) sourced from the goat raiser (GR) either flows directly to the assembler wholesaler (AW), assembler retailer (AR) and to the institutional buyer without passing the barangay agent (BA). The more direct product flow with the involvement of all the key players is from the goat raiser to the BA, to the AW then to the AR and the meat vendor where institutional buyer and individual customer buy fresh chevon. The BA locates slaughter goats for the AW by scouting within his barangay and nearby barangays and being paid PhP 50.00 per head. The AW personally negotiates with the goat raiser the price and estimated weight of the animal. Upon agreement on both sides, the raiser is paid in cash and the AW transports the sold animals using a kolong kolong that can accommodate 3-4 animals at one time. The AW normally has PhP 10,000.00 as his capital in buying goats and in the event that more than 4 goats are available for sale as tipped by the BA, a financier is sought for the additional capital needed to buy the animals. In this case the financier joins the AW in the barangay to personally look and participate in the negotiation process.

From the AW, the animal is picked up by the AR, but delivered to the meat vendor, who both brings the goat to the local government owned abattoir for slaughtering by accredited butchers. Slaughtering starts as early as 2:00 AM in time for the delivery of the goat meat to the market vendor/retailer at 4:00-4:30 AM. Slaughter fee is PhP 65.00 per head for small animal like goat, broken down as follows: PhP 40.00, slaughter fee; PhP 15.00, veterinary health certificate; and PhP10.00, weight and measure. The LGU of San Jose has an ordinance that all animals to include goat, cattle and swine should be slaughtered in the abattoir.

Both the AR and the meat vendor own a stall in the market where transactions are being made with the individual customer and institutional buyer such as restaurants and carenderias who directly buy chevon from them. Goat meat in the San Jose City public market are generally sold starting at 4:00 AM and concluded as early as 8:30 AM and the latest is 11:00 AM. The strategically located restaurants and carenderias serve goat dishes 24 hours

daily as they serve viajeros and commuters going to and from the Northern part of Luzon. One of the institutional buyer (DACOCO) however, only operates from 6:00 AM to 1:00 AM. It should be noted that these carenderias also offer pork, chicken, beef and vegetable dishes.

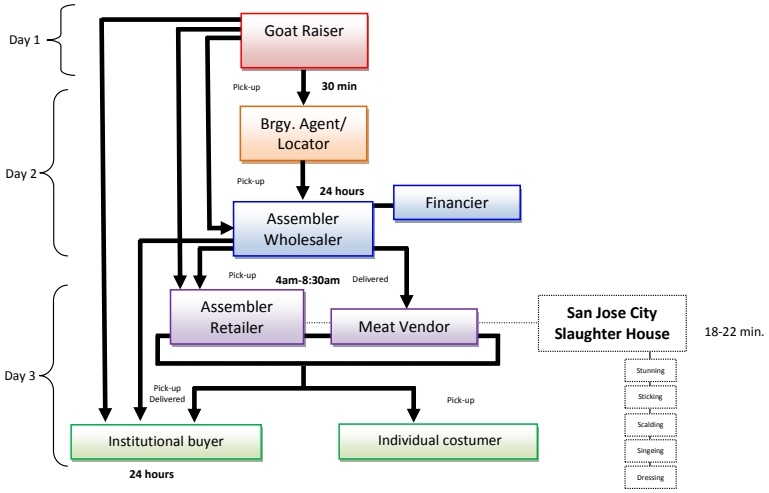

Figure 2. Product flow of fresh chevon in CHAIN 2 San Jose City

The flow of payment of Chain 2 as reflected in Fig. 3 indicates that payment transactions are done on cash basis except between the AW and one of the institutional buyers in San Jose City where the delivered chevon is paid on credit (3-4 days after delivery). The goat raiser is paid PhP 90.00-100.00 per kg liveweight. The BA is paid a commission of PhP 50.00 per head by the AW for his service. The selling price of slaughter goat traded to AR and meat vendor is PhP 120.00 per kg liveweight, but if sold by "tantyahan", PhP200.00 is added by the AW to the acquisition cost of the animal.

The transaction between the AW and the meat vendor/retailer (MV/R) is on cash basis wherein the latter pays the AW at a price of PhP 200.00 per kg for carcass and offals and PhP 110.00 per kg for head/feet. The payment to AW who delivers goat carcass directly to the institutional buyer is on credit, paid 3-4 days after delivery at the same selling price given to MV/R. The individual customers and the other institutional buyers pay the MV/R in cash at the following prices: PhP 220-230.00 per kg for carcass and offals; and PhP 150.00 per kg for head/feet.

The institutional buyer who sells a variety of chevon dishes are paid in cash, charging customers and diners, ranging from PhP60.00-70.00 per serving which is good for 1-2 persons per serving.

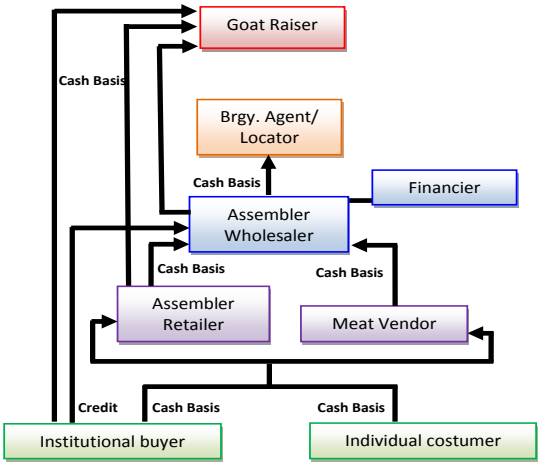

Figure 3. Payment flow of fresh chevon in CHAIN 2 San Jose City

The exchange of information between and among the supply chain members in CHAIN 2 is generally done face to face and through the use of mobile phones. Information about sources, availability and volume of goats for sale generally emanates from the BA who have direct contact with the goat raisers. There are also goat raisers who are directly contacted by AW and AR. Information on sources, volume and availability as well as delivery schedules were the major information requirements of the chain members. Farm gate prices and prices at the wholesale and retail levels are generally stable. Information on demand and product requirements emanate from the key customers such as the meat vendor, retailer, individual customers and institutional buyers which is exchanged face to face and through text messaging.

CHAIN 4 Camiling, Tarlac

CHAIN 4 Camiling represents the supply chain in Tarlac. Slaughter goats in CHAIN 4 are sourced from goat raisers in several municipalities in Tarlac such as Sta. Ignacia which is 9.2 km away from Camiling; San Jose, 38 km; Gerona, 26.2 km; and as far as Capaz, 65.5 km and La Paz, 50.8 km. Goats are also sourced in Bayambang, Pangasinan which is near Camiling (15 km away).

As seen in Fig. 4, goats for slaughter sourced from the goat raiser either flows directly to the AW, meat vendor/retailer and to the institutional buyer and individual customer without passing the BA. In this flow, the goats are picked up by either the AW and meat vendor/retailer from the goat raiser's farm after the conclusion of the negotiated buying agreement with particular reference to the agreed price and weight of the animal.

The other flow of the product is from the goat raiser to the BA, to the AW then to the MV/R where institutional buyer and individual customer buy fresh chevon. Similar to the other supply chain, the BA locates slaughter goats for the AW by scouting within his barangay and nearby barangays and being paid PhP 50.00 per head. The AW personally negotiates with the goat raiser the price and estimated weight of the animal. Upon agreement on both sides, the raiser is paid in cash and the AW transports the sold animals using a kolong kolong that can accommodate 3-4 animals at one time. The AW does its own slaughtering at home then delivers the carcass to the MV/R at 4:30 AM in the public market. The MV/R who sourced goat directly to the raiser also does its own butchering at home. The meat vendor/retailer owns a stall in the market where transactions are being made with the individual customer and institutional buyer such as restaurants and carenderias who directly buy chevon from them. Selling of fresh chevon in the Camiling public market generally starts at 4:30 AM and concluded at 11:00 AM. Similar with the other chains, goat meat are also immediately disposed because of limited supply.

The strategically located restaurants and carenderias (located near the highway) serve goat dishes from 8:00 AM- 11.00 PM. It should be noted that these carenderias also offer pork, chicken, beef and vegetable dishes as observed in the other chains.

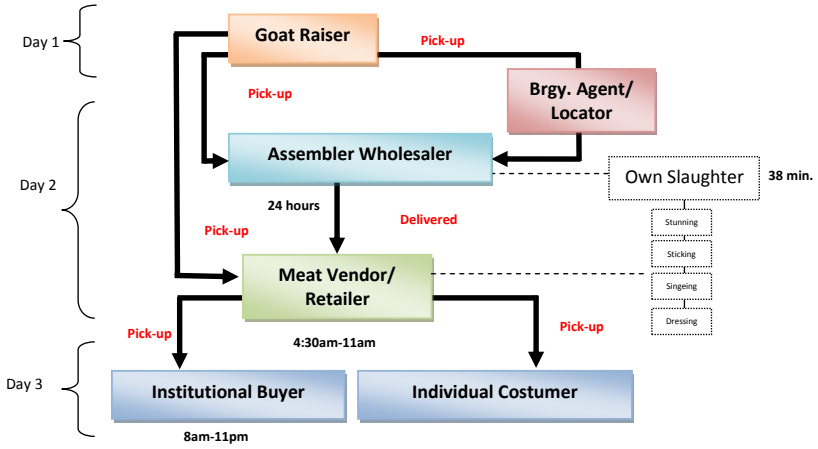

Fig. 4 Product flow of fresh chevon in CHAIN 4 Camiling, Tarlac

Payment transactions in CHAIN 4 (Fig. 5) are done on cash basis except between the AW and the MV/R, wherein it is on credit payable in the afternoon or paid the following day of delivery of the AW. The BA is paid a commission of PhP 50.00 per head for his services in locating goats for sale. The selling

price of slaughter goat traded is PhP 100.00 to 110.00 per kg liveweight. The AW sells carcass and offals to the market vendor/retailer at PhP220.00/kg; and head at PhP130.00 per kg. The market vendor on the other hand, sells carcass and offals to the institutional buyer and individual customer on cash basis, at PhP250.00 per kg and head at PhP150.00 per kg.

The institutional buyer who sells a variety of chevon dishes are paid in cash, charging customers and diners, ranging from PhP50.00-70.00 per serving which is good for 1-2 persons per serving.

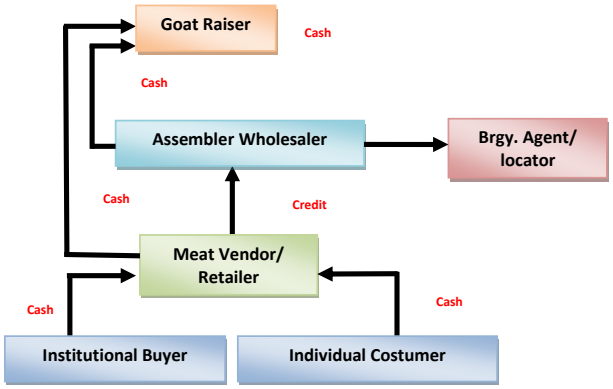

Figure 5. Payment flow of fresh chevon in CHAIN 4 Camiling, Tarlac

The exchange of information between and among the supply chain members in CHAIN 4 is similar with the other chain which is done face to face and through the use of mobile phones. The information about sources, availability and volume of goats for sale emanates from the BA who has direct contact with the goat raisers. Information on sources, volume and availability as well as delivery schedules were the major information requirements of the chain members. Similar with the other chains, farm gate prices and prices at the wholesale and retail levels are generally stable although higher. Information on demand and product requirements emanate from the key customers such as the individual customers and institutional buyers which is exchanged face to face and through text messaging.

Activities and Processes Along the Chain

Various activities are performed as chevon moves along the entire supply chain. For slaughter goats, the goat raisers perform several production/management activities which reflect the very nature of raising goats. Most of the goat producers raise native breeds of goats and house them in temporary sheds. Natural breeding is practiced and both tethering and free

grazing are also practiced. Daily grazing of goats is being done in mountain pasture or owned and communal pasture areas with the flocks returning late in the afternoon. The feeding of goats is thus largely dependent on available shrubs, grasses and leaves in the grazing land which defines the growth of goats and kids. Supplementary feeding of grains or mineral mixtures is totally not practiced which could have enhanced digestibility and nutrient availability from existing feed resources (Cruz and Porciuncula, *et al*, 2011). Salt which is very cheap is given to the goats and some of the raisers use veterinary medicines to help prevent health related problems.

The slaughter goats are being sold by the goat raisers when the animals are generally 8-10 months old, with weights ranging from 15-20 kg per head, indicative of native goats being traded in the supply chain. Upgraded goats which are generally cull and with some acquired infirmities (crippled) are however, reported to be traded as well. Before the goats are sold to traders, the barangay agent or locator assists the assembler wholesaler in locating and picking up the goat from the goat raiser's house or farm. The assembler-wholesaler transport the goats bought using a tricycle or a kolong kolong to a temporary holding pen located in their residence. Goats are generally butchered or slaughtered very early in the morning and done at home (residence) in most of the chains except in San Jose City where goats are slaughtered in government-owned abattoir.

The slaughtering process done at home (Tarlac City) starts with stunning the goat where the animal is held by two persons, head is pressed down, before the goat is hit at the center of the horn with an ordinary hammer or a big butchering bolo. Stunning makes the goat almost motionless. After stunning, sticking is done where the goat is first hanged in a branch of a tree, then the point of the knife is sticked to the throat behind the jaw, blade pointing out. By a single outward movement, the jugular vein is cut, including the windpipe, gullet and fleece. Sticking is done for thorough bleeding. After sticking, singeing is done using the blow torch method. The goat remains tied or hanged in a branch of a tree or any convenient hanger, where the hair is burned with a blow torch. Burning and scraping (using broom) of the hair is continued until the hairs in all parts are gone, leaving the skin intact. The goat is then removed from the hanger and put in a table where it is thoroughly washed with water and the remaining hairs are removed or shaved using a dull knife. Dressing the goat follows where a horizontal cut is made in the middle of the belly to remove the pouch and other internal organs of the animal. There are at least three major cuts derived from goat carcass such as the upper part with the head, cut into two in the middle and the lower part with the leg, sliced in the middle. The feet, legs, neck and head minus the horn are also cut.

The slaughtering process done at home in Tarlac City, is almost similar in Nueva Ecija, except that scalding is first done to remove the hairs using dull knife and then subjected to blow torch to remove the remaining hairs. Dressing in Nueva Ecija is different with that of Tarlac City, where a vertical cut is made in the middle of the belly to remove the pouch and other internal organs of the animal. There are at least five cuts derived from goat carcass such as the leg, loin, rib, shoulder and the neck.

The slaughtering process in the abattoir as practiced in the San Jose City supply chain starts with stunning the goat where the animal is first tied to a post outside of the abattoir, then hit at the center of the horn with an ordinary hammer. After stunning, sticking is done where the goat is placed on top of a table on its side, the head is pressed down and the point of the knife is sticked to the throat behind the jaw, blade pointing out. By a single outward movement, the jugular vein is cut, including the windpipe, gullet and fleece. After sticking and after thorough bleeding, the animal is submerged into a big vat of hot water of about 55-88 degrees centigrade to loosen the hair. The hair is scraped with hand (as done by the experienced accredited butcher of the abattoir) or by the use of a dull knife. Singeing followed using an open fire method where the slaughtered goat is placed above the open fire and the burned hairs are scraped, after which the goat is thoroughly washed inside the abattoir. Dressing the goat follows where a vertical cut (as practiced in Nueva Ecija) is made in the middle of the belly to remove the pouch and other internal organs of the animal. There are at least five cuts derived from goat carcass such as the leg, loin, rib, shoulder and the neck. Floor dressing is practiced in the San Jose City abattoir as well as vertical cutting in dressing is practiced. After the slaughtering process, the carcass placed in open container is transported to the meat vendors located in the public markets, using a tricycle or kolong kolong. The meat vendors own a stall in the market where individual customers and institutional buyers purchase their desired volume. The institutional buyers are generally the small carenderias and restaurants who cook chevon dishes for sale, such as caldereta, adobo, kilawen, papaitan, sinampalukan and kampukan.

The slaughtering process both done at home and in the slaughter house as well as the manner of transporting goat meat to the public market renders meat quality standards, handling and hygienic and inspection requirements as a concern. It was observed that the meat vendors are willing to buy the meat delivered to them without much worry about the process and the hygienic procedure undertaken.

Supply Chain Performance Analysis

Fresh Chevon Supply Chain Revenues, Costs, Income and ROEs

Revenues received, costs incurred, net income by the fresh chevon supply chain players and the respective return on expenses (ROE), computed in kg basis is shown in Table 4. The highest revenue received from all the chain was in CHAIN 5 Tarlac City which totaled PhP1,217.50, while the lowest revenue was obtained in CHAIN 3 Cabanatuan City totaling PhP812.50 from all the key players. Among the key players, the highest revenue was received by the institutional buyer as goat meat is converted into chevon dishes wherein 6 servings can be made out of the 1 kg meat and sold at a price ranging from PhP60-80.00 per serving. In terms of cost per kg, the highest incurred was by the institutional buyer as they cook goat meat into dishes for sale. The highest cost incurred among the institutional buyers is in CHAIN 5 amounting to PhP363.27 while the lowest cost is in CHAIN 1 amounting only to PhP285.93. The cost consists of expenses for ingredients, labor, rentals, water, electricity and packaging material. The lowest cost incurred considering all the supply chain players was among the goat raisers and CHAIN 2 reflects the lowest amounting to PhP55.56 which is indicative of the traditional way of raising goats by the raisers.

As to net income, the highest net income in CHAIN 1 was received by the assembler wholesaler amounting to PhP85.26 per kg, while the lowest was by the market vendor at only PhP26.64 per kg. The goat raiser managed to get a per kg net income of PhP41.25 which is higher than the income received by the meat vendor. The assembler retailer in CHAIN 2 obtained the highest net income at PhP98.24 since he directly gets his slaughter goat from the goat raiser. When the slaughter goat is sourced from the assembler wholesaler, a net income of only PhP 78.02 per kg is generated. The lowest income was received by the assembler wholesaler amounting only to PhP13.56 for every kg traded in CHAIN 2, while the goat raiser managed to generate a net income of PhP44.44 per kg. In CHAIN 3 Cabanatuan City, the institutional buyer received the highest net income of PhP159.26 for every kg dish cooked while the goat raiser from this chain received the lowest net income amounting to PhP30.63 for every kg live weight which is traded to assembler retailer. In CHAIN 4 Camiling Tarlac, the highest net income was generated by the assembler wholesaler at PhP115.88. The market vendor on the other hand, received the lowest net income of only PhP19.20 per kg of chevon meat. In CHAIN 5 Tarlac City, the institutional buyer generated the highest net income of PhP161.73 for every kilo of cooked chevon dish while the lowest was generated by the assembler wholesaler at PhP6.36 only.

Among all the chain players, the highest ROE was obtained by the assembler wholesaler in CHAIN 4 at PhP1.11, while the lowest was received by the institutional buyer as well but in CHAIN 5 at PhP0.06 ROE only.

Marketing Margin of Key Players in the Fresh Chevon Supply Chain

Table 5 summarizes the marketing and profit margins (carcass per kg) of the key players in the fresh chevon supply chain. In CHAIN 1, the institutional buyer got the highest marketing margin of PhP130.00 compared to the assembler wholesaler at PhP100.00 and the market vendor with a margin of only PhP30.00. However, the profit margin obtained by assembler wholesaler (PhP 85.61) was higher than that obtained by the institutional buyer (PhP 53.82) because of higher cost incurred in transforming goat meat into chevon dishes. The 51.53% to total profit margin of the assembler wholesaler, indicates a more efficient assembler wholesaler compared to the other key players in CHAIN 1. There are six key players in CHAIN 2 San Jose City and in this chain the assembler retailer sourcing goats directly from the goat raiser performed more efficiently than the other key players. Although the institutional buyer obtained higher marketing margin at PhP150.00 compared to other key players, the profit margin of Assembler Retailer-GR (PhP 98.73) was higher than that obtained by the institutional buyer (PhP63.84). This is due to higher marketing cost incurred by the institutional buyer in the chain. On the other hand, the assembler wholesaler got the lowest marketing and profit margins indicating the lowest efficiency in CHAIN 2.

There are only three key players in CHAIN 3 Cabanatuan City and both the marketing and profit margins obtained by the institutional buyer (PhP 250.00 and PhP 161.15, respectively) is higher than that obtained by the meat vendor (PhP 130.00 and PhP 119.35, respectively). Consequently, about 58.0% of the total profit margin is taken by the institutional buyer even though a higher marketing cost was incurred. In case of CHAIN 4 Camiling Tarlac, the meat vendor sourcing goat directly from the raiser operated more efficiently among the other key players. The meat vendor-GR derived a profit margin of PhP135.88. Meanwhile, the meat vendor sourcing goat meat from the assembler wholesaler got the lowest marketing margin at PhP 30.00, gaining the lowest profit margin of PhP 25.12. In CHAIN 5 Tarlac City, the institutional buyer achieved the highest marketing margin at PhP 285.00 and profit margin of PhP163.67 despite incurring the highest marketing cost of PhP121.33 compared to the other key players. On the other hand, the assembler wholesaler got the lowest marketing margin and marketing cost, thus, the lowest efficiency. In general, the matket/profit margin accrues to the traders responsible in bringing goat meat to the consumers. In a study by Jamandre, *et*

al., (2011), there is huge farm- to –market margin which only goes to the traders in the slaughter goat supply chain done in the Philippines.

Table 4. Fresh chevon supply chain revenue, costs, income and ROEs (kg)

PARTICULARS	CHAIN 1 SCM	CHAIN 2 SJC	CHAIN 3 Cab City	CHAIN 4 Camiling	CHAIN 5 Tarlac City
REVENUE (PhP)					
Goat Raiser	100.00	100.00	100.00	110.00	100.00
Assembler Wholesaler	200.00	120.00		220.00	110.00
Assembler Retailer (AW)		210.00			
Assembler Retailer (GR)		210.00			240.00
Market Vendor/Retailer	230.00		230.00	250.00	240.00
Institutional Buyer	360.00	360.00	480.00	406.00	525.00
TOTAL REVENUES	892.50	1,002.00	812.50	988.50	1,217.50
COSTS (PhP)					
Goat Raiser	58.75	55.56	69.37	64.90	64.90
Assembler Wholesaler	114.74	106.44		104.12	103.64
Assembler Retailer (AW)		131.98			
Assembler Retailer (GR)		111.76			122.19
Market Vendor/Retailer	203.36		113.75	230.80	129.74
Institutional Buyer	285.93	312.98	320.74	369.11	363.27
TOTAL COSTS	662.98	718.88	504.26	769.13	783.94
NET INCOME (PhP)					
Goat Raiser	41.25	44.44	30.63	44.53	44.53
Assembler Wholesaler	85.26	13.56		115.88	6.36
Assembler Retailer (AW)		78.02			
Assembler Retailer (GR)		98.24			117.81
Market Vendor/Retailer	26.64		116.25	19.20	110.26
Institutional Buyer	74.07	47.02	159.26	36.89	161.73
TOTAL NET INCOME	229.52	283.12	308.24	218.80	442.99
ROE (PhP)					
Goat Raiser	0.70	0.80	0.44	0.69	0.69
Assembler Wholesaler	0.74	0.13		1.11	0.06
Assembler Retailer (AW)		0.59			
Assembler Retailer (GR)		0.88			0.96
Market Vendor/Retailer	0.13		1.02	0.08	0.85
Institutional Buyer	0.26	0.15	0.50	0.10	0.45

Legend: AW – Assembler Wholesaler GR – Goat Raiser

Gap Analysis, Fresh Chevon Supply Chain

A simple supply and demand analysis was done to determine the gap in the supply chain which is indicative of the unmet demand. As shown in Table 6, the yearly volume requirement in kg and number of heads of goats is not satisfied in all the chains. A gap of 237 heads (4,745 kg) is apparent in CHAIN 1; 256 heads (5,110 kg) in CHAIN 2; 636 heads (7,300 kg) in CHAIN 3; 217 heads (2,190kg) in CHAIN 4; 374 heads (3,650 kg) in CHAIN 5. The total gap is 1,720 heads (22,995 kg) which is a welcome opportunity to intensify goat production in the supply chain.

Table 5. Marketing margin (carcass per kg) of key players in the fresh chevon supply chain

Key Players	Buying Price	Selling Price	Marketing Margin	Marketing Cost	Profit Margin	% Profit Margin
CHAIN 1 SCIENCE CITY OF MUÑOZ						
Goat Raiser		100.00 (LW/kg)				
Assembler Wholesaler (AW)	100.00	200.00	100.00	14.39	85.61	51.53
Market Vendor/Retailer	200.00	230.00	30.00	3.28	26.72	16.08
Institutional buyer	230.00	360.00	130.00	76.18	53.82	32.39
Total				93.85	166.15	100.00
CHAIN 2 SAN JOSE CITY						
Goat Raiser		100.00 (LW/kg)				
Assembler Wholesaler(AW)	100.00	120.00	20.00	6.44	13.56	4.07
Assembler Retailer-AW	120.00	210.00	90.00	11.49	78.51	23.57
Assembler Retailer-GR	100.00	210.00	110.00	11.27	98.73	29.64
Meat Vendor – AW	120.00	210.00	90.00	11.49	78.51	23.57
Institutional buyer	210.00	360.00	150.00	86.16	63.84	19.16
Total				126.85	333.15	100
CHAIN 3 CABANATUAN CITY						
Goat Raiser		100.00 (LW/kg)				
Meat Vendor	100.00	230.00	130.00	10.65	119.35	42.55

Institutional Buyer	230.00	480.00	250.00	88.85	161.15	57.45
Total				99.5	280.5	100
CHAIN 4 CAMILING, TARLAC						
Goat Raiser		110.00 (LW/kg)				
Assembler Wholesaler(AW)	110.00	220.00	110.00	4.12	105.88	35.86
Meat Vendor –AW	220.00	250.00	30.00	4.88	25.12	8.51
Meat Vendor –GR	110.00	250.00	140.00	4.12	135.88	46.02
Institutional Buyer	250.00	406.00	156.00	127.6	28.40	9.62
Total				140.72	295.28	100
CHAIN 5 TARLAC CITY						
Goat Raiser		100.00 (LW/kg)				
Assembler Wholesaler(AW)	100.00	110.00	10.00	3.53	6.47	1.25
Assembler Retailer – AW	110.00	240.00	130.00	11.17	118.83	22.91
Assembler Retailer –GR	110.00	240.00	130.00	11.17	118.83	22.91
Meat Vendor/Retailer – AW	110.00	240.00	130.00	19.19	110.81	21.37
Institutional Buyer	240.00	525.00	285.00	121.33	163.67	31.56
Total				166.39	518.61	100
Legend: LW – Live Weight						

Table 6 . Gap analysis, fresh chevon supply chain

Item	Volume (Kg And Head In A Year)		
	Demand	Supply	Gap
CHAIN 1 – SCM			
kg	15,071	10,326	**4,745**
Head	1,159	922	**237**
CHAIN 2 – SJC			
kg	20,748	15,637	**5,110**
Head	1,507	1,251	**256**
CHAIN 3 – Cab City			
kg	52,997	45,697	**7,300**
Head	2,845	2,209	**636**
CHAIN 4 – Camiling			
kg	23,940	21,750	**2,190**
Head	1,684	1,467	**217**
CHAIN 5 – Tarlac City			
kg	20,415	16,765	**3,650**
Head	2,122	1,748	**374**
TOTAL			
kg	133,171	110,175	**22,995**
Head	9,317	7,597	**1,720**

External Influences

In view of the importance of goat raising in Central Luzon, several government institutions in the region implemented R & D programs on goat to push for its development. The institutions include: Central Luzon State University (CLSU), Pampanga Agricultural College (PAC), Tarlac College of Agriculture (TCA), Ramon Magsaysay Technological University (RMTU), Bulacan Agricultural State College (BASC), Aurora State College of Technology (ASCOT), and the Department of Agriculture Regional Field Unit III (DA-RFU3). Based on the research conducted by Orden, Porciuncula, Carbonel, *et.al*, 2009, investment in goat R & D in the region totaled PhP 44.49 million since 1992 until 2009. As of 2009, the report also indicated that 69 R & D projects on goat were implemented in the region classified as research or development. Research projects constituted 67.0% undertaken in the following field: genetic improvement (19.0%), feed and nutrition (27.0%), health and diseases (12.0%), socio-economics (6.0%), and biotechnology (3.0%). Development represents 33.0% which pertains to either extension projects or applied researches aimed to promote goat technologies. It was stated in the same research that the goat R and D efforts in the region were generally productive. Relevant knowledge, information and technologies have been generated to include complete or partial confinement, multi-purpose tree specie, concentrate and urea molasses mineral block supplementation, use of tree leaves with anthelmintic properties, genetic improvement, controlled breeding, selection and artificial insemination. A number of these technologies are being adopted by backyard and commercial goat raisers.

Moreover, the same research indicated that through the years, the involved institutions in the region continue to conduct R and D on goats, generating technologies and providing expertise and agency fund in doing R &D works with the end view of promoting goat farming as a viable enterprise. It is important to note, the significant contribution of the Philippine Council for Agriculture and Natural Resources Research and Development (PCARRD), Department of Agriculure (DA) and its attached agencies, other local, national and international institutions in the region which is quite evident as found out in the same study, with PCARRD and DA as largely responsible in providing funding assistance. Moreover, the local, provincial, and regional government units provide complementary efforts and support in goat R and D in the region, reflecting interagency commitment and support; and networking to facilitate development and transfer of knowledge and technologies.

Logistic Issues/Concerns

1. Insufficient supply of goats for slaughter resulting to unmet demand. The estimated yearly volume requirement in kg and number of heads of goats is not satisfied in all the chains. The total gap is 1,720 heads (22,995 kg) which is a welcome opportunity to intensify goat production in the supply chain.
2. Difficulty in sourcing supply of goats. Most goats are sourced in distant, mountainous areas and more often with bad road condition which entails higher transportation cost. Moreover, the mode of transport appropriate for the terrain and road condition is through tricycle and or kolong kolong which generally are not efficient, with 3-4 heads of goats transported at a time.
3. Native breed of goats are generally raised by the goat raisers indicating traditional use of technologies (tethering and freely grazing). Feeding of goats is thus largely dependent on available shrubs, grasses and leaves in the grazing land which defines the growth of goats and kids.
4. Determination of the selling price of goat is generally based on ocular judgement of the locator and the assembler wholesaler, which may not be accurate and may prove disadvantageous to goat raisers.
5. Relatively high price of goat meat as indicated by the consumers. The average price that consumers are willing to pay in the supply chains except in San Jose City is lower than the prevailing market price of goat meat. This indicates the desire of consumers for a lower priced goat meat.
6. The slaughtering process both done at home and in the slaughter house as well as the manner of transporting goat meat to the public market renders meat quality standards, handling and hygienic and inspection requirements a concern.
7. In all the supply chains, fresh chevon meat is displayed and sold as it is and not sealed in primary packaging and not kept in required sanitary containers (made of appropriate materials preferable stainless steel or food grade plastic) as stipulated again in R.A. 9296 and A.O. No. 22 of the Department of Agriculture series of 2010.

Conclusion

Similar to the trend at the national level, goat production in Central Luzon remains to be backyard in nature registering an average growth rate of 0.37% (2004-2013 data). A high 12.33% in commercial goat production was noted in the region, the highest among the top five producing regions. Tarlac

had the highest percent contribution of 37.99% (106,269 heads) with regards to the average goat inventory in the region with Nueva Ecija in second place, contributing 27.64% (77,324 heads).

The supply chain for fresh chevon is simple and generally participated in by key players which include the goat raiser, barangay agent or locator, assembler wholesaler, meat vendor/retailer, institutional buyer and individual costumer. The supply chain generally follows a traditional supply chain where wet markets remain as the major destination of fresh chevon and continue to play a significant role as a primary retailer for the end consumers.

The quality of fresh chevon as required by the key customers (meat vendor/retailer, institutional buyer and individual customer) in all the supply chains are generally met by the other key players. Similar with the research results of Jamandre, *et. al* (2011), the key customers in the slaugther supply chain prefer goats that are young with age range from 8 to 10 months, in addition to meatiness. The simple supply and demand analysis showed a gap in the volume requirement which is indicative of unmet demand in all the supply chains. The total gap is 1,720 heads (22,995 kg) in a year which is a welcome opportunity to intensify goat production in the supply chain.

The general product flow of fresh chevon in all the supply chains is from the goat raiser to the barangay agent (BA)/locator to assembler-wholesaler (AW) or from the goat raiser directly to the AW then to the market vendor/retailer (MV/R) and finally to the institutional buyer and individual customer. Payment transactions in all the supply chains are done through cash basis and or credit. Various activities are performed as chevon moves along the entire supply chain. While acceptable net income, return on expenses and marketing/profit margin were generated in the supply chain, there are several logistical issues and concerns which denotes some degree of inefficiencies in the supply chain of fresh chevon. The identified issues and concerns should be addressed holistically taking stock of improving goat production system and the other activities and processes in the entire supply chain with important focus on sourcing, pricing, product handling and hygiene.

The establishment of strategically located community-based goat production enterprise for slaughter is recommended that will entail clustering of existing goat raisers willing to be capacitated to enhance their skills and practices in accordance with improved management system and needs/requirement of the market. The strategic location of the community-based production enterprise is intended to bring the source of goats near the market. Goat production in the community shall be treated as an enterprise, capacitating the producers with relevant management and entrepreneurship abilities with the end view of producers managing their own agribusiness with

further attention in acquiring knowledge on market assessment, opportunity identification and evaluation, simple financial planning, value adding and marketing. The goat raisers shall also be empowered to push for standardized price determination of live goats that is certainly not based on ocular judgement but on accepted measures.

Building capacities of the other supply chain members is also recommended in order to enhance their skills and abilities to meaningfully participate in the entire supply chain with particular attention on proper slaughtering and handling of goat meat products as well as the value adding activities that can be made as potential business.

In areas in the supply chain where abattoirs are present, it is recommended that such shall be dedicated as well in the slaughter of goats and that the observance of proper slaughtering, handling and certification procedures should be enforced so as not to compromise meat quality and food safety to the best interest of the buying public. The same is true with regards to the observance of acceptable handling of goat meat in the public wet markets where it is traded. Further development of the local market both for frozen and fresh chevon should be given due attention through effective supply chain organization and management with the inclusion of a consumers awareness campaign that will highlight the benefits derived from goat meat consumption. The campaign shall be addressed to the whole family members in the hope of encouraging them to eat chevon as a daily source of protein and as a healthy food, creating a niche in the market. An increase in consumption will increase demand as well as the volume of transactions which may profitably benefit not only the producers but the other members of the supply chain as well.

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