CHAPTER 5: CHEVON PRODUCT DEVELOPMENT

5.1 Introduction

In South Africa's rural areas, the primary purpose of goats is meat production for local consumption, emergency cash flow and traditional use. However, limited market outlets for chevon in South Africa have inhibited its commercialisation. In the previous chapter it became clear that consumers have certain general reasons for not buying a meat product, and certain general reasons why they would be stimulated to buy a meat product. Furthermore, certain negative and positive perceptions regarding chevon in particular also exist. These "attractors" and "repellors" as well as the perceptions of consumers should be incorporated into the design of goat meat products for the retail market (Thus catering to the more market-oriented approach as suggested by ECAPAPA (2003)). This chapter investigates the quality characteristics of chevon and reports on the development of several goat meat products utilising the needs and perceptions of the potential consumer from the previous chapter.

5.2 Chevon quality and carcass characteristics

The nutritional value and other qualities of chevon, vary for the different goat types. However, across all breeds the compositional and structural characteristics of chevon are in rather close accord with the newly emerging consumers' preference for leaner, lower calorie meat. Thus, the continuing lack of demand for fresh chevon or processed products could be, as explained in Chapter 3, perceptions surrounding its traditional use, lack of availability, negative perceptions (exacerbated due to lack of availability), institutional arrangements that neglected its promotion and, limited research support

Chevon is relatively low in calories and has extremely low fat and saturated fat content. The meat also compares favourably with respect to protein and iron content. Goats possess little marbling and not much subcutaneous fat. Most of the fat is found around the internal organs (kidney, viscera and reproductive tract). Goat muscle is on

average lower in fat than beef or lamb. Chevon is 50 - 60% lower in fat than similarly prepared beef, but has similar protein content. The protein content of chevon is approximately 20%. Goat muscle has "high quality" protein and goat fat has approximately the same saturation as beef, but is lower in cholesterol than pork and beef fat (Casey, 1982; Casey & Naudé, 1992; Schönfeldt, 1989; Schöfeldt et al. 1993; Strydom & Tshabalala, unpublished; Tshabalala, 2000). USDA has also reported that saturated fat in cooled chevon is 40% less than that of chicken, even with the skin removed. Generally, the composition of chevon and mutton are comparable with respect to moisture and ash content.

Tough meat is the result of poor feeding and care. Thus, older animals do not necessarily have tougher meat (Schönfeldt, 1989; Schönfeldt et al. 1993). Bucks should be castrated to avoid the bucky taste in the meat or should at least be eaten before one year of age. Thus, young chevon is the most preferable chevon for consumption. In terms of quality, the best meat is produced from young goats with a live weight of 11 to 12 kg (although at this weight the dressed carcass yields small quantities of meat). At this weight and age the meat is tender with no bucky taste (Tshabalala, 2000).

It is very important that the animals are not stressed before slaughter, because this adds to meat toughness (Schönfeldt, 1989; Schönfeldt et al. 1993). Hot-processing of chevon could be considered as an alternative to the conventional method, if the goats are not to be slaughtered in a commercial abattoir. Hot-processing can be defined as the processing of meat prior to chilling. The economical advantages are: reduction of energy input, cooling space, chilling time and labour. Hot-processing also offers a number of functional advantages: improved water-holding and emulsifying capacity, a decreased cooling loss and improved meat yield.

The carcass of the goat is similar in appearance to a sheep (Tshabalala, 2000). The Australian method of dressing a goat carcass is shown in Figure 5.1. The carcass of a mature goat is divided in the same manner as lamb; into wholesale and/or retail cuts as shown in Figure 5.2 (No diagram showing the cuts of a goat carcass could be obtained).

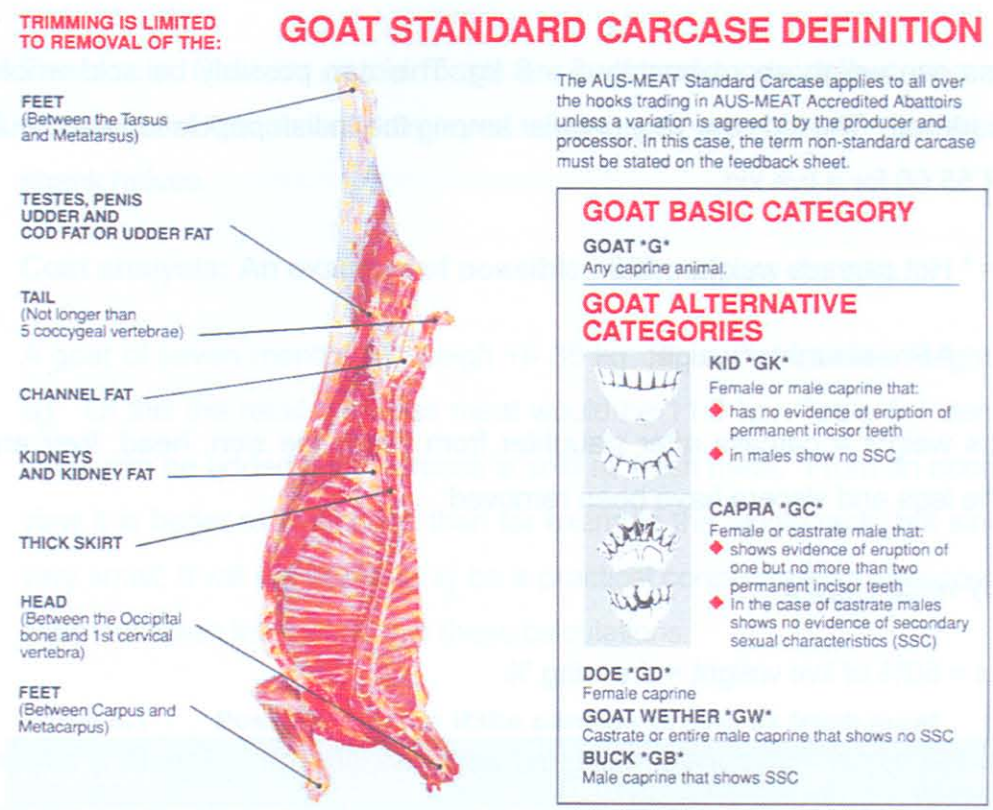

Figure 5.1 Dressing of goat carcass

Figure 5.2 Cuts of a goat carcass (done as shown for lamb)

A kid carcass can weigh approximately 5 - 8 kg. This can possibly be sold whole, halved or quartered. The kids are very popular among the Indian population and could be sold for R 55.00 for a live kid.

Dressing% = * Hot carcass weight x 100

Pre-slaughter weight

* Hot carcass weight = carcass after slaughter from which the skin, head, liver and portions of the legs and viscera have been removed

Empty body-weight figure

Goat carcass = 50% of live weight = dressing %

34% of live weight can be considered retail boneless chevon. The fore saddle, shoulder, rack, fore shank and breast make up approximately 24.5% of live weight, while the hind saddle, loin, leg and flank comprise the difference of 23.5%.

Leg: = 33% of carcass

- Whole - sirloin included, or 4 - 6 sirloin chops
- The rump, centre roast and shank

Loin: - Most valuable and most tender cut

- 4% of live weight = retail loin cuts
- double/single loin chops

Rack: - rib chops/whole

Shoulder: - less tender and palatable

- Stew/kebabs

Flank, fore shank, breast and neck:- Debone for mince meat.

Fresh cuts: Goat rib or loin roasts are preferred to chops because of the relatively small size of the rib and loin 'eyes'. Rear goat leg could be divided into sirloin and shank halves.

Cost analysis: An example of possible income from chevon.

A goat of seven months will weigh +/- 35 kg. Thus the carcass weight would be 17.5 kg. Of this the retail boneless meat would be 11.9 kg. Table 5.1 demonstrates how value can be added if the carcass is sold as fresh meat. From an economical point of view it is better to sell chops than for example the whole rack, but since the cuts are very small, it will not necessarily be a practical consideration. The costs of production were not taken into account in these calculations.

Table 5.1 Possible income if the carcass is sold as fresh meat

Fresh cuts	Retail meat (kg)	R/kg	* Income (R)
Leg: Whole or	**5.0**	**25.96**	**129.80**
Sirloin chops	2.0	22.9	45.80
Rump steaks	3.0	27.9	83.70
Loin chops	**0.8**	**34.2**	**27.36**
Rack: Whole or	**1.0**	**22.13**	**22.13**
Chops	1.0	34.94	34.94
Shoulder: Kebabs	**2.1**	**33.90**	**46.48**
Rest of fore saddle: Mince meat - fresh sausage	**3.0**	**17.97**	**53.91**
TOTAL	11.9		279.68**

* No costs were taken into account

** Rows in bold type face were used in the calculation

Several scientific studies preceded this investigation. The ground-breaking work of authors such as Casey (1982), Casey and Naudé (1992), Schönfeldt (1989), Schönfeldt, Naudé, Bok, Van Heerden and Smit (1993) paved the way for further work on this subject. As part of this study, work was conducted by Tshabalala (2000), Strydom and Tshabalala (unpublished), and Loretan (unpublished). The findings from these studies can be summarised as follows:

- Goats had proportionally larger feet, spleen and liver compared to sheep and therefore, dressed-off lower than sheep. Sheep breeds contained significantly more subcutaneous fat than goat breeds. The fore limb, ventral trunk and dorsal trunk of goat breeds were proportionally heavier than those of sheep

breeds while sheep breeds had proportionally heavier hind legs. The proportional lean content per cut of Boer goats was comparable to that of sheep breeds. The percentage carcass bone content was highest in Indigenous goat carcasses.

- The aroma intensity of Boer goat patties was significantly more ($P<0.05$) intense compared to that of Indigenous goat patties and Dorper and Damara sheep patties. The flavour intensity of sheep patties was stronger than that of goat patties. Boer goat patties were significantly more flavoursome ($P<0.05$) than Indigenous goat patties. Sheep meat patties were more tender, juicy and greasy than chevon patties as a result of differences in fat content. Indigenous chevon patties were more chewy and less tender and juicy than those of Boer goats.

- Both goat and sheep meat contained higher molar percentages of saturated than polyunsaturated fatty acid. Oleic acid was the most abundant fatty acid and its concentrations were highest in Damara sheep meat.

- The fatness of carcasses was influenced by species, breed and diet, which in turn affected the carcass composition and eating qualities. Sheep carcasses contain more subcutaneous fat and less bone than goat carcasses. Sheep meat is more juicy and more flavoursome than chevon. The high levels of fat in sheep meat mask the non-meat flavours that are often found in lean meat.

- An experiment was further designed to explore various factors that can affect the meat quality such as nutrition and feeding of a growth hormone like BST to the goat. In general it was found that while nutrition had a significant effect, growth hormone treatment in contrast had no significant effect on any of the important carcass characteristics.

5.3 Development of meat products for the retail market

Aside from the in-store repellors and attractors that were identified by respondents in the survey discussed in Chapter 4, some negative perceptions of goat meat that were

identified by potential consumers include toughness and smell. Positive perceptions included "correct farming practices applied" and nutritious. Thus, in the value-added product development these factors must be taken into account. Goat meat is indeed nutritious and low in fat and cholesterol. These factors should be emphasised. Goats should be produced humanely and slaughtered appropriately. Furthermore, only young animals or castrates should be utilised to avoid the bucky taste. To overcome the problem of toughness products such as biltong, salami, dried sausage and cabanossi could be developed that would be ideal for the delicatessen market or the tourist industry. In fact, negative perceptions were overcome when a chevon product (dried sausage) was tasted. In the previous chapter, propensity to purchase the product increased by more than 10% for both the consumer and retail respondents after a sample of chevon dried sausage was tasted. Products such as hamburger patties and sausage could further add convenience for the housewife to the product range, and fresh meat cuts may gain market ground later when the product is better established (most likely the whole leg for roasts or rolled ribs). However, it is clear that the introduction of chevon as a standard home consumption product will need to be accompanied by an active advertising and education programme.

It is important to add maximum value to chevon, since the meat yield of goats is different in comparison to sheep. This is because of the anatomical differences between goats and sheep. Sheep have more developed rumps and *Longisimus dorsi* muscles (which constitute the chops). The South African consumer is used to the large chops obtained from sheep, and may make a direct comparison between the size of the cuts instead of concentrating more on the taste and the positive nutritional attributes of chevon. It is thus better to process the meat, rather than selling it as fresh cuts. Table 5.2 demonstrates the potential for value-adding when chevon is processed. Again, the costs of production were not taken into account. However, personal communication with a butcher and two meat specialists have provided estimated production costs to the value of 24 to 35% of the direct ingredient costs for both carcass cuts and processed products even though the labour for processed products would be higher. This is because most operations do both fresh cuts and processed products and the cost of labour and other overheads is averaged across

both product types. Thus, in comparing Tables 5.1 and 5.2 an increase of 17 to 30% could be added to cover the production costs.

The highest potential value-adding would also be beneficial for non-commercialised producers if they were connected to the company manufacturing the products (through vertical co-ordination or vertical integration) and if the benefits of value-adding could be relayed back to them via the raw product price paid (Machethe, Reardon and Mead, 1997; Martinez et al. 1997; Rehber, 1998; Delgado, 1999; Gow et al. 2000; Holloway et al. 2000; Singh, 2002; ECAPAPA, 2003).

Table 5.2 Possible income if the meat is further processed to add value

Processed product	Retail meat (kg)	***Extend/loss = kg	R/kg	*Income (R)
Leg + Loin: Biltong	**5.80**	**- 50% = 2.90**	**68.90**	**199.81**
Rack: Marinated	**1.00**	**1.00**	**45.99**	**45.99**
Rest of carcass: Mince meat	5.10			
Hamburger patties	5.10	+ 20% = 6.12	19.90	121.79
Fresh sausage	5.10	+ 10% = 5.61	15.90	89.20
Dried sausage	5.10	+ 15% - 50% = 2.93	48.90	143.28
Cabanossi	**5.10**	**+ 20% - 40% = 3.67**	**59.40**	**218.00**
TOTAL	11.9	7.57		463.80**

* No costs were taken into account

** Rows in bold type face were used in the calculation

*** Increase in weight through addition of ingredients, and weight loss due to drying

The prices given in Table 5.1 and 5.2 are average prices for similar lamb and beef products obtained from a survey of four meat selling establishments in the Pretoria region in January, 1998. These prices were taken as estimates, because fresh chevon is not readily found in retail. Because fresh chevon will be difficult to market initially in the same class as lamb, because of the lack of consumer knowledge on the product, it will be a better proposition, from an economical and sensory point of view, to process the meat. Although the income of the processed products (Table 5.2) could be higher than that of the fresh cuts (Table 5.1), one must keep in mind that the processing costs could be slightly higher for the processed products, if only processed products were manufactured in the plant (but as explained above, where both types of products are produced the production costs are generally averaged over both types).

Also, deboning and processing meat (for example the drying process in biltong making) reduces the weight of the final product (although this is taken into consideration in Table 5.2). However, it is possible to further extend the processed products by including other meat and non-meat ingredients. It is advisable to bone the entire carcass of, especially, older goats for hamburger patties to which can be added goat kidney fat/fatty pork/beef tallow. Sausage from chevon, with or without meat from other species, is particularly a good choice, both nutritionally and economically. Manufacturing of sausages and other products provide convenience, variety, economy and nutritional value. However, if products are destined for the Muslim markets (as suggested by the Middle East market that exists for goat meat products) then no pork should be added to the products and no swine must be slaughtered in the same abattoir i.e. the abattoir and the product must conform to Halaal specifications – again demonstrating a market-oriented approach to product development.

Building consumer requirements into products

After finding that chevon is tougher and leaner, it was decided that reconstituted meat products would be far more appropriate for chevon than fresh cuts. The consumer also perceives that chevon is tougher, and thus this characteristic should be de-emphasized in developed products, and positive characteristics such as leanness should be emphasized. Therefore, keeping these factors in mind, it was decided to develop products such as salami (in combination with other meat types), cabanossi and dried sausage (Recipes for some of these products are shown in Appendix 3). All these products rely on deboned meat, which reduces the effect of toughness, and fat from other animals can be added to the recipe to make up for the lower "juiciness" of the chevon. However, the benefit to the consumer would be a tasty product with less fat than the normal cabanossi, salami and dried sausage products. Recipes for these products were developed and can be found in Appendix 3.

5.4 Encouraging the consumer to use chevon

It was further decided to compile and publish a book of recipes for chevon. The recipe book is to serve as a marketing tool for chevon especially among the upmarket South African consumer – the group that would pay a higher price for the meat. This type of development will encourage the use of chevon products since the consumer is supplied with tasty preparation alternatives.

Students from the second year course in Recipe Development at the Department: Food & Hospitality Management, of the Technikon Pretoria were given the task to develop and/or prepare recipes to be included in the recipe book. Firstly, the students were given some theoretical background on recipe development and emphasis was placed on the importance of taste, texture and smell when preparing recipes. The students were first given the opportunity to develop bread recipes using firstly baking-powder, then buttermilk and then yoghurt, proving that different ingredients produced different end products as regards texture and taste.

The students were then introduced to the chevon project, and specifications regarding the target market, suitability of using different cuts and different cooking methods, and using flavourings and ingredients to soften the meat were explained. A session on the scientific evaluation of a goat carcass was presented and students were given the opportunity of evaluating the different cuts for toughness and taste. A demonstration on cutting up carcasses into various cuts for various dishes was done. Techniques of deboning were explained and demonstrated, and the students were given the opportunity to practise these techniques.

The students then developed recipes for dishes using moist heat cooking methods. For these, cuts with large amounts of connective tissue (e.g. neck, thick rib and shank) were used. Recipes were evaluated and adapted where necessary before students started preparing them. Their dishes were evaluated by a panel of three lecturers who gave marks for taste, appearance, suitability (for inclusion in a recipe book) and serving possibilities. About 115 recipes were eventually evaluated. The recipes that were selected ranged from more conventional sounding recipes such as Spicy Goat

Pie (but with shredded spinach leaves, sliced mangoes and roasted almonds and covered with filo pastry) to Crumbed Peanut Goat Chops and Goat and Pear Stew. Each dish was photographed for possible inclusion in the recipe book. Several of the recipe photographs are reproduced in Appendix 3.

Some of the aspects that emerged from this exercise were that chevon is tougher than lamb, but the taste is similar. Chevon has much less fat and this needed to be kept in mind when developing recipes. Some carcasses such as the females and castrates were so lean that it was not possible to prepare any dish from them e.g. the ribs. These are findings from a consumer perspective that is corroborated by the scientific evidence that preceded it.

5.5 Discussion and Conclusions

In this chapter market-oriented chevon product development is described. The product development processes of idea generation, idea screening and concept development and testing were followed. Firstly, the perceptions of the consumer market were studied (Chapter 4) to determine the positive and negative attributes of the product. Then, goat meat was analysed for its chemical and physical attributes and preferable uses for the carcass were suggested that would lead to the highest value-added (which would be beneficial if non-commercialised farmers became more connected to the value-delivery network (or supply chain) or part of vertically co-ordinated or vertically integrated companies manufacturing these types of products). If the institutional arrangements were correct they could potentially gain a larger share of the value-added income stream as suggested in Chapter 1.

Taking the consumer perceptions (Chapter 4), the biological attributes and the most favourable value-adding options into account, value-added meat products were suggested, recipes developed and tested by consumer taste panels in laboratory settings. Following this, goat meat recipes were developed and tested by a chef school which further demonstrated the potential uses of goat meat by the general public as well as created a potential marketing tool (the recipes).

Furthermore, the products developed adhere to the requirements of the Muslim market (being free of pork products), and could effectively compete with overseas competitors because no other country applies this type of value-adding. New Zealand has added value through the packaging and presentation of fresh or frozen, whole and cut carcasses, and Brazil, India, Argentina and Somalia compete on price (also in the whole or cut carcass form), as discussed in Chapter 4. The products suggested here are new (some have a definite South African "feel" – for example the biltong and dried sausage), are high-value (due to the labour intensiveness of production, thus with higher job-creation potential), can conveniently be vacuum-packaged thus leading to a longer shelf-life (which may assist with the logistics of delivering the product to the market in the current situation of poor infrastructure in the rural areas) and could compete on price, variety and quality (whereas whole carcasses have little value-adding potential). A market for these value-added products has recently been established by the Kalahari Kid Corporation (Judith Weidemann, Marketing Manager, Kalahari Kid Corporation, personal communication, 2004).

This chapter thus describes effective market-oriented product development from an available indigenous resource to position the product as a high-value, nutritious, convenient alternative to other meat types for both the local and export market. Sub problem 3 questioned whether products of indigenous goats can be utilised commercially. Are there products of value from indigenous South African goats? Can products that fulfill the needs of the local or international marketplace be produced from indigenous South African goats? The answer to each of these questions regarding goat meat is shown to be "Yes".

If there are enough goat resources available in the non-commercialised sector (as shown in Chapter 2), and the time is right to change consumer perceptions about the product (Chapters 3 and 4), high value products can be manufactured (Chapter 5) and there are several markets for the products (Chapters 4 and 5), how can non-commercialised farmers be made part of this potentially lucrative market? To create an enabling environment in which non-commercialised farmers can operate requires attention to formal (contracts, organisations, markets) and informal (traditions, customs) institutions, both at macro (legal) and micro (organisational form) level (Chapter 1). Institutions should be kept in mind such as the legislative hygiene

requirements for perishable food products (e.g. the Public Health Safety Act), the requirements for Halaal certified products, and traceability and food labeling requirements of export markets.

The export of meat products requires that an abattoir and meat processing plant registered for export (i.e. with a ZA number) is used to manufacture the products. Also, this facility has to be specifically designed for Halaal products if swine are also slaughtered at the facility (preferably no swine should be slaughtered in the facility at all), and record-keeping of the origin of the goats must be at a high level and the products must be labeled in such a way that the point of origin can be determined. An abattoir and meat processing plant is an expensive facility, and the supply of raw product should be assured. This will not only ensure that the facility is effectively utilized, but will also ensure consistency of supply to the market, especially where bulk orders are exported overseas or required by local retailers.

The situation described here would create a method to link non-commercialised goat farmers with a processor through vertical co-ordination and ultimately to export markets with their high demands for safety, quality and consistency (Chapter 1). It thus becomes clear that a facility specific for this value-addition chain would be appropriate and best located in those regions where a high number of goats occur; for example the Eastern Cape (Chapter 2). This facility could be linked with goat producers within its area (thus reducing the transaction costs associated with transport), could specialize in the meat products developed in this chapter (allowing Halaal products to be manufactured), and can build a relationship with the goat producers in its immediate vicinity to ensure consistent supply of product. A long-term relationship with goat growers can also allow the facility to provide the growers with information relating to its raw product requirements. Thus, the structure of this collective action and the role of supply-chain governance structures become important (Chapter 1).

The operation of a goat meat facility and, to ensure its effective utilisation, its long-term relationship building with local goat producers, perfectly fits the creation of institutional arrangements involving interlocking transactions (an arrangement found in contract growing), the development and nurturing of producer groups, and can also include,

public private partnerships (due to cost of the facility), contract growing (to ensure consistency of supply), and co-operative development (to allow the farmers to work collectively to provide to the facility in an organised manner) as suggested by Kydd and Dorward (2001).

This arrangement would motivate goat farmers to improve their performance using the market as a lure (Chapter 1). It would describe a process where non-commercialised farmers become more connected to the value-delivery network (or supply chain) or part of vertically co-ordinated or vertically integrated companies (as suggested in Chapter 1). Vertical integration could lower the costs of transportation, information and marketing and the farmer could gain a larger share of the value-added income stream (Chapter 1). Through vertical co-ordination and collective action the farmers can achieve economies through size, bargaining power and elimination of duplication (Kotler, 2000) thus improving their collective consistency of supply to the market place. The benefit here for non-commercialised farmers is that no member of the chain has complete or substantial control over other members and, although they are all different companies (or legal entities) they work together for the common good. Factors such as quality of the product, consistency of supply and potentials for increasing the demand for the product (marketing) can be addressed. The design and implementation of these institutional arrangements will be further addressed in Part 3 of this thesis.