Serve a Scoop to the Bajan Economy and Health:
Goat and Barbados Blackbelly Sheep Milk Bajan Ice Cream

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Jasraj Kaur with Toggenburg goat

Blackbelly ewe and her lamb from Greenland research station

INTRODUCTION:

Milk from monogastric ruminants and its processed products such as cheese, yogurt and butter have economic potential for small scale farms. Products such as these are still in the budding stages of high consumer appreciation, however they are slowly making an appearance in grocery stores. Ice cream from such animals is less available than the other dairy products yet holds great potential in serving the health and economy of Barbados. Currently, the only Barbadian company producing ice cream is BICO, while the most popular brands on the island are actually imported (pers. Obs, Kaur Watson, 2016). With Barbados blackbelly sheep being an indigenous species to the country, and with the escalation of the dairy goat industry, milk fromthese two sources can be used to develop an ice cream product made purely from domestic goods.

The blackbelly sheep breed was developed in Barbados, however the original sheep were most probably brought with the initial European settlers. For various reasons, it serves as a better source of milk and value added dairy products for consumers. Since the breed is native, it is well adapted in the tropics and thus does not require as much maintenance. Ewes are highly prolific. They can have twins and triplets, have a short gestation period of 5 months and can breed all year round (pers. Com. J. Vaughan, 2016).

As for the goats, there are three main types of goats imported from England, namely the Toggenburg, Saanen and Alpine. Unlike the sheep, these goats face greater challenges in being productive due to the difference in climate they must adapt to (Pers. Com. J. Vaughan, 2016).

GOALS AND OBJECTIVES:

The overall goal was to make a new Bajan ice cream product using goat's and blackbelly sheep's milk. This was divided into four main objectives:

1. Perform a market survey and determine what the Bajan population looks for in terms of health factors, flavors and domestic production.
2. Address the high prevalence of diabetes by creating an ice cream with less sugar.
3. Design an ice cream that only uses domestically produced goods.
4. Present the product to the public and release it for the 50th year of Barbados' independence.

MATERIALS AND METHODS:

Our first task was to apply for an ethics certificate, because only upon its approval could we conduct the survey and direct the production of our ice cream. Materials such as an ice cream maker, kosher salt and ice were required to set up the machine and start the churning process. The mixture included basic ingredients such as fruits bought from local markets, Barbadian sugar, flavor essences and milk provided by Greenland. These ingredients were blended and cooled for 2 hours before transferring to the ice

cream machine which simultaneously froze and aerated the mixture. The mixture was then transferred to the freezer, where it could solidify overnight. Due to the difficulty in collecting cream from these products, alternative means were used to thicken the product and obtain optimal texture. Initially, natural thickening agents were tested. This included cottage cheese (made easily from the milk using vinegar), using soft fruits like banana and canistel, using eggs and for some recipes even peanut butter. Finally, guar gum – a powder made from guar seeds that confers water binding and thickening properties was used (Hollowood et al., 2002). The optimal concentration was determined by testing a series of dilution concentrations.

For every batch made, the four major properties – taste, smell, texture and color were evaluated upon storage for 2 days and 1 week.

As the ice cream was being developed, surveys were also being conducted at two sites: University of The West Indies and Massy stores.

Interior and exterior of Hamilton Beach ice cream machine

Results and Discussion:

The goat and sheep milk have very different properties. While the goat milk is more fluid and has a strong bitter after taste, the sheep milk has a much sweeter taste and is very viscous in nature. The goat milk was available to us in the initial stages of developing the ice cream. To thicken the ice cream, cottage cheese was produced from the milk and though it provided a creamy texture, it added a strong goat flavor regardless of how much fruit and flavouring agent was added. Fruits such as banana were also selected to confer thickness, however they have a high water content and ice crystals emerged which ruined the texture entirely. The canistel fruit has 20% lower water content than bananas, but did not provide a desirable taste, especially after the ice cream was stored for more than 2 days (Artfarm, 2011). In addition, egg yolks were used as the base of the ice cream but due to their high fat and protein content, they seemed to separate from flavor essences that were more soluble in water by nature (Falcowitz, 2013).

By the time the sheep milk became available, the surveys were fully conducted. The preference of an ice cream made from goat milk was 70% and that made from sheep milk was 46%. It was interesting to see that the older generation in particular had a greater preference to the sheep milk. In terms of health factors, lower lactose, lower sugar content and less preservatives was preferred by most people. Greater concern was shown regarding the use of preservatives. Overall, coconut was the most attractive flavor and this information was subsequently used for further development of our product.

Even with the use of the creamy sheep's milk, thickness and the formation of ice crystals remained an issue and thus guar gum was tested. Three batches were prepared whereby there was no addition of guar gum, ½ tablespoon of guar gum for 2 cups of milk, and 1 tablespoon of guar gum for the same amount of milk. Out of the three batches, the middle concentration proved to be the most ideal for sheep's milk and the highest concentration was best for goat's milk. The students tasting the ice cream easily determined that a higher concentration of guar gum minimized the growth of ice crystals and provided thickness. Too great of a quantity would start masking the flavour and introduce a sticky mouth feel (Hollowood et al., 2002).

Conclusion:

Out of all the different thickening agents tried, guar gum was the best to confer a creamier product. The two final ice cream recipes were peanut butter banana and coconut cream delight. These products are healthier as they contain less sugar than commercial brands, have less lactose and have no preservatives. In addition, to benefit the small scale economies of Barbados and other countries in the CARICOM, only local goods were used, with the exception of the guar gum. The final objective of presenting the product was not met. While the

project did not reach near completion, the scope of this idea is broad and can benefit small scale farms and the local community in many ways.

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References:

Falkowitz, M. 2013. Do I Need to Use Eggs in Ice Cream (an how many?). Accessed 10 August 2016. http://sweets.seriouseats.com/2013/08/how-many-eggs-should-i-use-to-make-ice-cream.html

Hollowood T., Linforth R., Taylor, A. 2002. The Effect of Viscosity on the Perception of Flavor. Accessed 13 August 2016. http://chemse.oxfordjournals.org/content/27/7/583.full

Artfarm. 2011. Eggfruit - How to enjoy it? Accessed 13 August 2016. https://artfarmllc.wordpress.com/2011/06/29/eggfruit-how-to-enjoy-it/