

A recipe for baking better biscuits

A case for developing a nutritious biscuit and getting it ready for commercial launch in Ethiopia.



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BACKGROUND

Introduction

This report describes the process of developing Sunny, a nutritious protein rich biscuit, and preparing it for commercial production as a part of the Sustainable Food Partnership for Better Nutrition through Inclusive Value Chains in Ethiopia (hereinafter referred to as SFP). This report explains how the biscuit is different from current market offerings and brings additional nutritional qualities to Ethiopians that need it the most. With this writeup we seek to inform and inspire others in the industry to start similar initiatives to bring nutritious food products to market in Ethiopia or other countries.



A BISCUIT YOU MAY ASK?

Cookies and biscuits represent the largest category of baked snack items worldwide. They are a popular ready-to-eat snack and breakfast option across Ethiopia and contain nutritional ingredients such as carbohydrates, fats, and fibers. If done right, biscuits can help address a few critical nutrition issues in Ethiopia. The poor nutritional status of women and children especially, has been a consistent problem in Ethiopia. Undernutrition is an underlying cause of 53% of infant and child deaths. As per the Ethiopian Mini Demographic and Health Survey (2019)¹, 37% of children under five years of age are stunted (short for their age), 7% are wasted (thin for their height), and 21% are underweight (thin for their age). The government of Ethiopia has taken several steps toward reducing undernutrition in the country, such as endorsing the Food and Nutrition Policy (2018)² that aims to achieve an optimal nutritional status throughout the lives of Ethiopians via coordinated implementation of nutrition-specific and nutrition

sensitive interventions. To accelerate reductions in malnutrition, Ethiopia developed the National Nutrition Programme (NNP I, from 2008 to 2015, and NNP II from 2016 to 2020)³ with a focus on improving access to nutritious foods.



INTRODUCING THE SUNNY BISCUIT

DanChurchAid in collaboration with the P4G initiative, international commercial partners and local stakeholders, have worked on developing a nutritious biscuit, branded under the name Sunny, and produced by biscuit manufacturer Moya Food Complex. The result of the collaboration was a high-protein biscuit, blended with chickpea flour and other ingredients to provide an alternative ready-to-eat snack, that can be enjoyed by all but was designed specifically for pregnant women and children prone to malnutrition. The biscuit addresses protein shortages in this target group as it contains essential amino acids.

1. [Ethiopian Mini Demographic and Health Survey \(2019\)](#)

2. [Food and Nutrition Policy \(2018\)](#)

3. [National Nutrition Programme \(NNP I and NNP II\)](#)



POTENTIAL FOR BIG BUSINESS IN BISCUITS

Despite significant progress in Ethiopia, the local biscuit industry is still in its infant stage. There is much room for improvement to increase the variety of biscuits and cookies on sale, and the nutritional quality of these products can be significantly improved. There are only a few operational biscuit factories in Ethiopia and their collective capacity is low compared to the huge potential the population of 115 million Ethiopians has to offer.

PROCESS

The process for product development

To produce a new type of nutritious biscuit, a well-proven process for product development was needed (see the visual below). This process started with a market exploration, creating ideas for biscuits, and trying to validate the demand for nutritious biscuits. From there, the goal was to figure out which nutritious crop to use as a blending flour in the biscuit. Once the crop was decided upon, two rounds of prototyping were carried out, first to get consumer input and second to get the formula for production right. [Arla Foods Ingredients](#) and [Novozymes](#) sent their specialists to the production site to provide technical assistance. After two prototypes, the product was ready for production at scale.

PRODUCT DEVELOPMENT STAGES



STAGE 1 PROOF OF CONCEPT

The proof of concept stage started with collecting information on the market for biscuits. Various ideas for a new type of nutritious biscuit were discussed and the feasibility of the ideas was looked at. This was done to get to a proven concept for a new biscuit.



STAGE 2 RECIPE DEVELOPMENT

In order to develop the perfect recipe, various ingredients and sourcing options were researched and evaluated. Locally grown chickpea was ultimately found to be the best fit. Whey protein from Arla Foods Ingredients helps to ramp up the protein content of the Sunny biscuit.



STAGE 3 FIRST PROTOTYPE

With the recipe ready, the first biscuit prototype was developed. It was tested on consumers in focus group sessions and their feedback was collected to help improve the recipe of the biscuit and determine how to best go about the marketing and sales of the new product.



STAGE 4 SECOND PROTOTYPE

With feedback from the consumer in mind, remaining technical issues in the recipe and baking process were addressed resulting in a more refined product that better served the taste of the consumers and was ready for commercial production and market launch.



FINDING THE RIGHT FLOUR

Throughout this process, there were a few hurdles to overcome. For instance, it turned out the Ethiopian biscuit industry was entirely built around making cookies and biscuits from cereal flour made from wheat. The use of blending flours like pulses, fruits and other ingredients that can bring nutritious benefits to baked goods, was not common in the country. Therefore, it was hard to find a reliable, local supply of alternative ingredients to help improve the nutritional quality of the biscuit. Initially, it was planned to use quinoa as the blending component. However, as quinoa was only grown in trial projects in Waghemra and Bale areas, the supply remained limited.

Due to this challenge, the partnership decided to use chickpeas as a blending flour. Chickpea seeds were considered a suitable source of dietary proteins due to their high protein bioavailability and relatively low levels of anti-nutritional factors.

Another benefit of using chickpeas was that the crop could be grown locally, which lowered the need for wheat imports and helped to increase

the income of smallholder farmers and created employment opportunities. Lastly, chickpeas are considered a climate resilient crop that can better withstand the severe droughts that Ethiopia has been experiencing in recent years and can be grown in crop rotation systems thereby improving soil health and soil fertility.



INCREASING PROTEIN

Chickpeas alone do not make for a high enough protein content. [Arla Foods Ingredients](#) have helped improve the biscuit recipe by exploring how to add additional dairy proteins. Their whey protein Nutrilac® YO-7830 was selected as it provides superior nutritional quality. It is rich in all essential amino acids and branched chain amino acids. For consumers, this helps to ensure normal growth and development in malnourished children.



ADDING ENZYMES

Novozymes proposed the use of three of their enzymes to improve the biscuit in critical areas. Optiva LS introduced simple sugars from the starch that occurs naturally in wheat flour. This helped to reduce the addition of refined sugar without compensating on taste for the consumer. An Ethiopian market survey in 2020 pointed out that most biscuits have an added sugar content of 18 to 21%, for the Sunny biscuit this was only 10%.

Second, Sensea Biscuit SF was used to replace chemical ingredients to control the shape of the biscuit. The enzyme solution relaxes the dough and gave Moya the ability to produce biscuits of even shape and size without using chemicals. The use of chickpea flour in this project introduced some bitterness into the biscuit. Adding Flavourzyme 500 MG, a protease enzyme, improved the flavor characteristics of the biscuit product by reducing particular amino acids that caused the bitterness.



BAKING PROTOTYPES

The first prototype was developed using two different kinds of chickpea flour. The first flour was made from Desi chickpea, a local variety. The second flour was made from Kabuli chickpea, which is larger in size, comes in a red and white color and is grown in Ethiopia too. The Kabuli chickpea turned out to be preferable in taste, as the Desi variety made the biscuit taste too much like chickpea which might not be liked by consumers. The red coloured Kabuli chickpeas were preferred over the white variety, but both can be used. The SFP focused its value chain development on the Kabuli chickpea.

Based on the two prototyping rounds and continued iterations for adding flavors to the formulation, the recipe specified the baking formula described in the table below.

BAKING FORMULA

Percentages by volume

Wheat flour	50.00%
Chickpea flour	5.00%
Sugar	10.20%
Fat	13.00%
Nutrilac® YO-7830	7.50%
Salt	0.02%
Water	15.00%
Glucose	0.41%
Other	1.63%

NUTRIENT CONTENT

Percentages by volume

Protein	12.8%
Fat	14.6%
Carbohydrates	53.6%
Solids (total)	85.2%
Water	14.6%
Energy (in kJ per 100g)	1,669 kJ
Energy (in kCal per 100g)	400 kCal
Protein (percentage of the total energy)	12.9%
Carbohydrate (percentage of total energy)	54.2%



MIXING THE INGREDIENTS

The ingredients were mixed in four stages. After the mixing is done, the dough was removed from the mixer and allowed to rest for five minutes. Subsequently, the dough was sheeted, flattened, and cut into pieces, and then baked for 13 min at 190°C. After cooling down the biscuits were ready for packaging. Following this recipe, a 90% baking yield could be achieved. The nutrient content of the biscuit can be found in the table below.

The recipe for the biscuit was open source and made available free of charge for other biscuit manufacturers that were interested in producing a similar biscuit for their own brands.



SETTING A NEW STANDARD

In addition to the first prototype tests, using the second prototype product, microbiology, physical and chemical analysis, and toxicology tests were carried out by three laboratories in Ethiopia. The test results confirmed the product was safe to eat and met national standards.

The work to produce a healthier biscuit induced a policy change on the existing national biscuit standard. DCA in consultation with the Ethiopian Standards Institute and Ethiopian Food Beverage and Pharmaceuticals Industry Institute have initiated a systematic review of the national biscuit standard which was revised and later introduced to the biscuit industry. The revised standard, describes a minimum protein content in biscuits of 5%. For biscuits that want to claim a high protein content, the protein content should be 10% or over. The Sunny biscuit contains 15,25% protein. Furthermore, this project put the spotlight on chickpea farming, an orphan crop that was not given much attention by market actors, to be used as an industrial crop. It provided an opportunity for scaling up chickpea production and the use of it in the industrial production of baked goods and potentially other food categories.

MARKET DEVELOPMENT

Developing a winning proposition

The product has been carefully designed based on consumer insights and input from relevant stakeholders. In 2020, the first insights were collected by partner Bopinc through a range of focus group discussions, a survey with 260 target group members from different areas in Ethiopia, as well as retailer interviews and observations.

A wide range of themes were explored, such as daily behavioral patterns of consumers, purchasing habits, budget decisions, social networks and information provision, consumer aspirations, perceived and experienced health issues, healthy food decisions, and expected benefits of eating healthy. Based on all this research, the outlines for the value proposition, marketing and distribution strategy for the Sunny biscuits were created.



MARKETING MIX



PEOPLE

In order to develop a product and increase its chances of commercial success, it was crucial to tap into the needs and wants of the intended audience. In this partnership, and for the biscuit specifically, it was decided to focus on the relatively wide audience of pregnant women and children prone to malnutrition. As many of them show signs of protein deficiencies and would therefore benefit substantially from a nutritious high-protein biscuit.



PRODUCT

In a focus group discussion, four different concepts for the biscuit were presented. This allowed the partnership to test the product and marketing concepts on a list of pre-established metrics (i.e. taste, smell, color, size, shape). Ultimately, the concept for a biscuit that was primarily designed to be 'tasty and caters to the enjoyment of eating', was favored over other concepts. Secondly, it was found that a good proposition should explain the health benefits very concretely, for example 'boosts your energy'.



PRICE

To determine the price points for the biscuit, the relation to ability and willingness to pay were explored. In an exercise to gather insights, consumers were given a small amount of cash. They were asked to put their money where their mouth is by spending the cash on any of the four marketing concepts or on a few existing biscuit brands. The exercise helped close in on the final concept and triggered an interesting pricing discussion. Given the steep inflation, another focus group discussion

to evaluate the price point was organized in August 2022. It was concluded that a package of six biscuits should be sold for 15 Ethiopian Birr (ETB). This is in line with (or just above) other biscuit offerings yet considered very competitive due to the nutritional qualities of the product. Interestingly, consumers indicated the size and weight of biscuits could be lower than other biscuits in case it would help to keep the retail price down.



PLACE

An analysis of potential sales channels was carried out and two directions for sales were identified. Mom-and-pop stores and small supermarkets make a direct link with the intended target audience and were therefore considered most fitting for business-to-consumer sales. At an institutional level, the SFP explored the option to provide the biscuit through school feeding programmes as well as in emergency food aid provision in refugee settings.



PROMOTION

To introduce and promote the new biscuit to Ethiopian consumers, point-of-sales (POS) promotion directly at the shops was recommended. To further strengthen this, a combination with a mass media campaign to raise awareness about the biscuit was advised.



THE RIGHT PROPOSITION

To validate the above marketing mix and ensure a fitting value proposition, a combination of qualitative and quantitative studies were carried out in the final stages of development. Biscuit recipe, packaging and marketing strategy were with the second prototype, which resulted in the following value proposition.

“For mothers and children who are looking for a healthy treat, our locally sourced protein biscuits make you feel happy and full of power.”

Sunny offers a unique proposition to mothers and children due to its nutritional qualities. With a protein content of 15,25%, the biscuit fulfills the high-protein content standard for Ethiopian biscuits. A package of six biscuits, covers up to 40% of the daily protein needs of children aged 3 - 7. Particularly, young parents were triggered by the idea of having a treat that combined the taste of a biscuit with healthy protein, can be enjoyed by their children and themselves and therefore showed willingness to pay a slight premium for the product.

The high protein content may make the biscuit stand out from other offerings on the market. Two flavors that came out preferable in studies (chocolate and orange) will likely go into production first, other flavors (milk, strawberry, cinnamon etc) might follow later.



GET IN TOUCH

The Sustainable Food Partnership, and the many stakeholders that it represents, have proven that with the right recipe, it is possible to produce a nutritious high protein biscuit. The recipe is open source, other actors in the baked goods industry are welcome to build on our work and set up alike initiatives. If you wish to learn more or discuss starting a similar project, please reach out to privatesector@dca.dk.

