



TALMOND - An African Plant-based Beverage Initiative

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In 2018, Elie Marina-Lora Fink started Talmond in Ghana, setting out on a mission to innovate with the neglected tropical almond. Talmond has transformed the nut into environmentally sustainable, ethical, nutritious, and delicious plant-based beverage products, thereby making a considerable impact with a minor crop.

Food Science in Action:

- ✓ Plant-based Alternatives
- ✓ Product Development
- ✓ Food Processing
- ✓ Food Microbiology
- ✓ Food Packaging

Introduction

Ghana has an agricultural economy mainly based on cocoa beans, which are harvested and exported up to 16% of the national export to other countries for processing.¹ The farmers in Ghana and West African nations in general are making little money by producing and supplying cocoa beans to the world. Most of their agricultural harvests have been processed and consumed outside the countries of origin. Therefore, a native crop that can be locally processed, utilized, and nurture the population in Ghana is very important.

In 2018, Dr. Elie Fink rediscovered tropical almond (*Terminalia catappa*) in her homeland, Ghana, after receiving her Ph.D. in Olfactory Neuroscience in Barcelona, Spain. When she was conducting research in Ghana, she observed the abundance of tropical almonds that had been largely neglected as a food source. She then found out that the tropical almond, also known as Abofo-n'katie or Blofo Nkati in her language, is not only nutritious, but also local and environmentally sustainable (Figure 1). It was always her interest in finding solutions to build resilience and protect our planet through our food systems. Therefore, Elie began thinking about possibilities for native or naturalized plants like tropical almonds. "As a child, I had seen people cracking up the nuts [tropical almond] and eating it all the time," Elie shared her memories. "And yet, it is still the neglected nuts." The tropical almond is a food that has a hard and fibrous outer

shell, which is usually broken with rocks, and the sweet nutmeat is enjoyed. Since plant-based beverages have been growing in popularity, she explored the idea of a plant-based alternative to dairy beverages for people who have sensitivity to the components of dairy products. In sub-Saharan Africa, there are at least 60% of the population suffering from lactose intolerance and others who prefer vegan or vegetarian diets.^{3,4}

From there, Dr. Elie Fink decided to start a business to utilize tropical almonds. Her start-up



Figure 1. *Terminalia catappa* (Tropical Almond) nuts.² (Photo courtesy of Talmond)

Table 1. Proximate and physicochemical compositions of *Terminalia catappa* (Tropical Almond) as harvested.⁵

Compositions	Values (%)	Compositions	Values (%)
Moisture	6.23 ± 0.09	Sugar	
Ash	3.78 ± 0.04	Fructose	2.23 ± 1.89
Lipid	54.68 ± 0.14	Glucose	1.95 ± 0.99
Protein	17.66 ± 0.13	Sucrose	95.82 ± 0.90
Carbohydrate	7.68 ± 0.06		
Caloric value	593.48 ± 0.24		
Total dietary fiber	9.97 ± 0.08		
Reducing sugar	1.36 ± 0.16		
Starch	1.22 ± 0.15		

has received its first funding from plant-based investors in the US. Elie formed the company in 2019 and named the company Talmond.

Project Overview

Talmond developed an innovative tropical almond-based beverage. With help from food scientists, the formulation was modified for better mouthfeel and flavors based on the reviews that Elie received largely from the local market consumers. The physical stability of the beverage is another challenge due to the high oil content of the tropical almonds (Table 1). They have also worked to improve the shelf-life of the tropical almond drink. Hopefully, with advanced packaging technologies, the tropical almond drink can have an extended shelf-life for distribution to a larger region in Ghana and internationally.

Producing Talmond beverages requires a number of key steps. The harvesting of the almonds is done by local communities in Ghana. The nuts are collected after falling to the ground and are then sun-dried for about a week (Figure 2). This process is done manually. After drying, the nuts are cracked to remove the shell, either manually or by machine. A commercial cracking machine specifically for tropical almonds was built by a local engineer, since a normal cracking machine cannot crack the tropical almond due to the

chaffy, corky attributes of the outer shell and the hardness of the inner shell of it. After the shells are removed, the kernels are ready for grinding, drying, or freezing.

The manufacturing processes are done in a processing plant, which is equipped from secured investments. The raw kernels are rinsed, soaked,



Figure 2. Tropical Almond harvesting in Ghana. (Photo courtesy of Talmond)

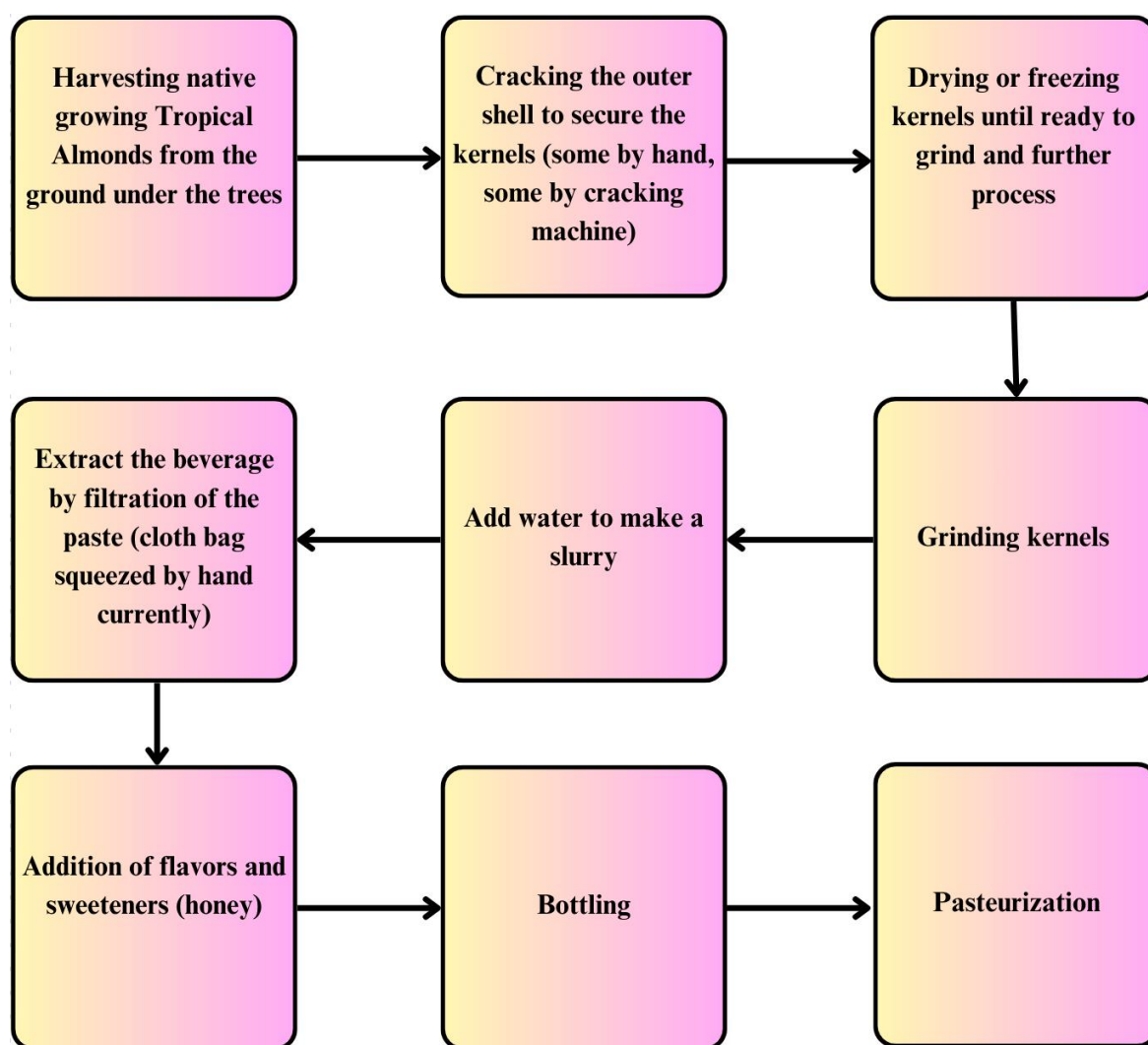


Figure 3. Flow chart of the process of producing tropical almond drink at Talmond.

and then ground with water in a colloid mill. The liquid is separated from solids through filtration with cloth bags to produce the final beverage. Flavor formulations are added before bottling. Each bottle is placed under a funnel and the beverage is poured into the bottle and caps placed on the bottles by machine. The finished product is pasteurized after bottling. Samples are regularly sent to an outside laboratory that is certified by the Ghana's Food and Drugs Authority (FDA), which is the equivalent of the US FDA for microbiological testing. The process is summarized in Figure 3.

Talmond only produces beverages as needed to restock the local markets. Since this is only a pilot plant operation the maximum production per day is roughly 50 liters.

The sweetener used is honey, which can be supplied locally and is preferred. Talmond is

focusing on a large-scale formulation for the current products and plans to develop other healthy fortified tropical almond products in the future.

Roasted tropical almonds are also sold by Talmond as a snack. Since tropical almond has a high content of trace minerals, it has a distinct, pleasant flavor and there is no need to add salt. Due to their 50% fat content tropical almonds will also be processed into oil as a side product of beverage production.

"As a child, I had seen people cracking up the nuts [tropical almond] and eating it all the time. And yet, it is still the neglected nuts"

Elie Marina-Lora Fink

Successes

Of all plant-based beverages consumed worldwide, conventional almond milk is among the most popular. Yet it is a water-intensive crop—the average water footprint of one bottle of unsweetened conventional almond milk is around 385 pounds of water, one of the highest water footprint values for a crop per unit weight.⁶

Tropical almonds, on the other hand, require no irrigation water to grow in Ghana. Impact assessments are currently being carried out to quantify the water footprint of tropical almonds cultivated in an agroforestry system on Talmond's nucleus farm. To grow the supply of tropical almonds in Ghana, Talmond has set up a systematic breeding program of tropical almonds, thereby investing into the R&D of improved tropical almond varieties with better yield and quality.

Talmond has introduced a novel, locally-produced milk alternative to the plant-based movement whose nutritional benefits are almost identical to those of the conventional almonds (Figure 4). And, the tropical almonds are much more environmentally friendly.

Talmond also brings about social justice in the area. Raw material and crop exportation are associated with both farmer exploitation and unemployment, especially among women and youth. It is reported in the third quarter of 2022 that 1.76 million persons were unemployed, among which two out of three people were females.⁷ As a women-owned company, Talmond aims to improve the situation by creating decent employment and entrepreneurial opportunities for women and youth, which in the end help transform rural communities (Figure 5).

Looking Ahead

Talmond will continue to refine the formulation to achieve better taste and improved shelf-life while looking into enhancing food safety and food regulations to meet U.S. and European standards in addition to the regulations in Ghana. This will help in accessing international markets, with the first one planned in Europe. Apart from that, Talmond beverages also need to tackle some challenges in order to expand the market locally and in other countries. Not only does the

AVERAGE NUTRITIONAL VALUE /100 g	
Energy	31.40kcal / 131.38kJ
Total Fat	2.40 g
Carbohydrate	2.01 g
Fiber	0.25 g
Protein	0.66 g
Minerals	0.29 g

Figure 4. Unsweetened Talmond beverage nutrition label.² (Photo courtesy of Talmond)

company face the current almond milk and other milk alternatives competitors, but it also must solve the issues of high prices, refrigeration, and especially packaging. While disposable packages are easier for long-distance distribution, Talmond currently packs in reusable glass bottles and caps, as shown in Figure 6, which are used for handling and distribution inside Ghana (refrigerated storage and returnable bottles). Talmond is working to overcome these hurdles in cooperation with industrial production partners to achieve economies of scale.

Talmond is still in the start-up phase and plans to be profitable in four years. In 2022 Talmond received new investments and is looking to further win enthusiastic long-term partners. New

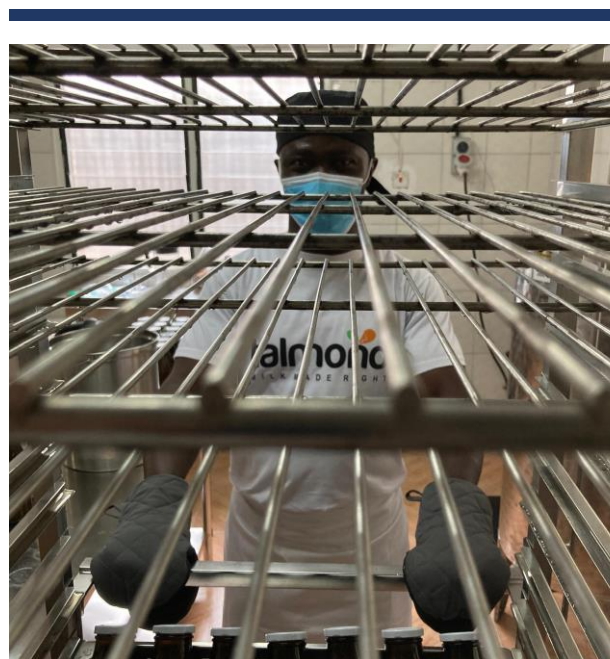


Figure 5. A young worker in Talmond's processing plant. (Photo courtesy of Talmond)

investments have led to further marketing of Talmond beverages.

Now, after going through its proof of concept and piloting phase, Talmond is working closely with communities in Ghana and scaling all of its activities from cultivation to supply chain and manufacturing to keep up with the planned increase in production for international expansion. In doing so they are pioneering a new tropical almond agroforestry industry in Ghana to create a major impact using a minor crop and generate valuable know-how to reimagine entire landscapes that are rooted in climate resilience and smallholder farmer inclusion with a locally-supported approach.

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Figure 6. Talmond products.² (Photo courtesy of Talmond)

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