Yoba for Life Probiotic Yogurt

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Food Science in Action:

- ✓ Food Processing
- ✓ Food Microbiology
- ✓ Food Fermentation
- ✓ Dairy Science
- ✓ Gut Health

Empowering women through probiotic fermented food in East Africa

The Yoba for Life Foundation is a not-for-profit international development organization that designed a probiotic yogurt starter culture specifically for resource-poor countries. The starter culture, which contains a generic variant *Lactobacillus rhamnosus* GG (LGG), is provided to small yogurt businesses in several African countries. Research has shown LGG provides many health benefits by inhibiting harmful bacteria growth and boosting the immune system. Beyond health, there have been many economic benefits. Over 50 dairy cooperatives provide milk to 250+ small businesses that started up in order to produce Yoba for Life yogurt for their local communities. Yoba also empowers women in these communities because about 50% of these small businesses are owned by women. In 2018, the Yoba probiotic yogurt school program was implemented, and over 20,000 children are consuming this beneficial yogurt beverage twice a week.

Introduction

The Yoba for Life Foundation was started in 2009 by Wilbert Sybesma and Remco Kort. Wilbert has a PhD in Food Biotechnology from Wageningen University & Research, and is currently working at DSM Nutritional Products as Innovation Manager Gut Health. Remco Kort has a PhD in Molecular Microbiology and is currently a Professor of Microbiology at Vrije Universiteit Amsterdam.

Wilbert and Remco saw the challenges developing countries face in public health, food safety and food security and wanted to have a positive impact.[1] Utilizing their personal connections with other individuals doing microbiology work in Uganda, they focused their efforts initially in Uganda. They then expanded the program to Tanzania, and Kenya. These countries have ample milk production, and Wibert and Remco were confident the Yoba for Life Foundation could grow and benefit the communities in these countries. The foundation aims at improving the health and wealth of people in these countries by catalyzing the local production of a probiotic yogurt, called Yoba.

Probiotics are live microorganisms that when administered in adequate amounts provide a health benefit to the host and are commonly consumed in yogurt or other fermented products. However, not all people have access to probiotics which are sold as premium products and are inaccessible in developing countries.[2,3] The starter culture in Yoba yogurt contains a generic variant of *Lactobacillus rhamnosus* GG (LGG): *Lactobacillus rhamnosus* yoba 2012 and *Streptococcus thermophilus* C106. Yoba probiotic yogurt has several proven benefits like reduction and prevention of diarrhea, common cold, allergies and skin conditions.[4]

Technologies to transform milk and process yogurt are considered high investments. Countries like Uganda have an underdeveloped milk market, which makes yogurt production even more challenging. The production of Yoba does not require high technology and has been adapted to African countries' process capabilities, helping to improve their economies and reduce hunger and malnutrition. The program is considered an excellent example of translational microbiology that is designed to improve health and create wealth in the form of economic activities and employment.[2]

In addition, Yoba runs a yogurt school program in collaboration with SNV (Netherlands Development Organization), which promotes probiotic yogurt consumption through a commercially sustainable model. Probiotic yogurt can help keep a child's body strong and fit, reduce allergies and skin rashes, reduce cough and flu, and reduce constipation as well as diarrhea. Yoba for Life yogurt helps suppress microorganisms like rotavirus that play a role in diarrhea, and Helicobacter pylori that can cause stomach and duodenal ulcers.

Response

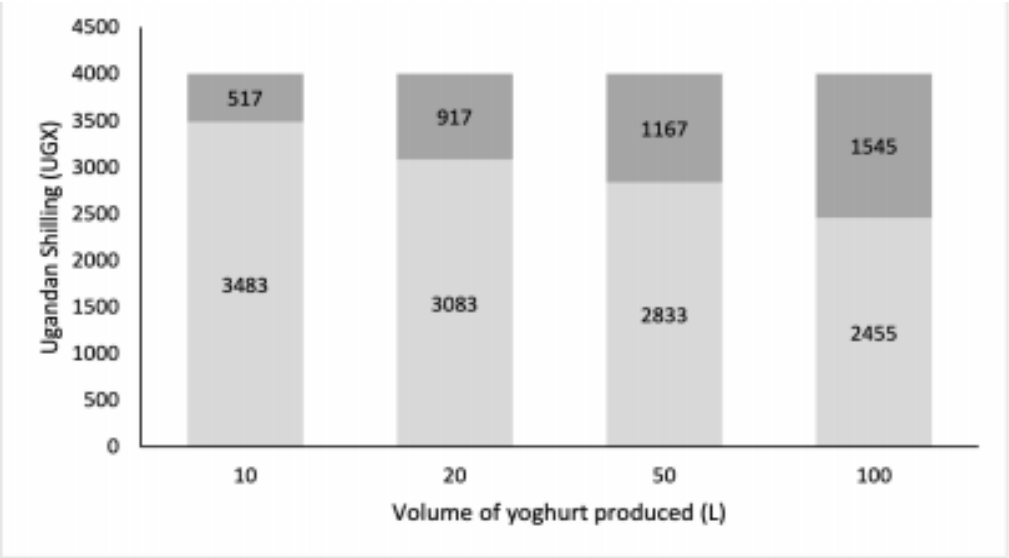
Various food science disciplines (food microbiology, food engineering, food fermentation, dairy science, food safety, and gut health) and food scientists were involved in the development of Yoba for Life.

Food microbiology was essential for developing the appropriate conditions for the culture. The bacteria in the culture are freeze dried, ground into a homogenous powder, blended with maltodextrin, and then filled under humidity controlled conditions in water tight sachets, which makes it shelf stable (unrefrigerated) for 6 months.5 Having a starter culture at room temperature is beneficial in developing countries where it can be difficult to access refrigeration.

Food microbiology was also used to assess the quality of the yogurt by evaluating the presence of coliforms, E. coli, yeast, and molds. This helped to ensure high quality and safe products for the end consumer.

This culture is also cost effective. It is estimated that 100 ml of yogurt contains $2.5X10^9$ CFU of L.

Ronald Kyeyune in the process of making Yoba yogurt (more captions here)



Average cost and profits per liter of probiotic yogurt in Uganda as a function of production volumes. Light grey bars: cost per liter of yogurt (UGX); Dark grey bars: Profit (UGX); Total bars: Sales price per liter probiotic yogurt.

Note: Sales price is set at 4000 UGX/L which resembles an average wholesale price when the yogurt is sold through external shops.

rhamnosus GG or GR-1 with a cost of USD $0.146 per 100 ml yogurt. The consumption of probiotics in tablets and capsules is more expensive in comparison to yogurt probiotics. The Yoba for Life model showed positive results and can be replicated in other developing countries.

Food engineers helped create an appropriate design for each facility. Yoba for Life uses simple but effective methods that make the probiotic yogurt accessible. For the incoming raw milk testing they have rudimentary methods such as lactometers and the spoon test, which are used as indicators for milk quality. If the milk passes the quality test, they heat the milk in a saucepan for pasteurization to kill pathogenic bacteria. The cultures and milk are added to large milk cans and the milk is fermented for 8 hours. Flavors are added, and the yogurt is packed and labeled for sale in retail stores.7 Employees from each production unit are trained in hygiene practices to avoid contamination.

Food fermentation and dairy science principles were utilized to achieve the optimum chemical and physical characteristics such as pH, probiotic concentration, and product viscosity. Food safety standards helped guarantee that the yogurt is optimum for human consumption.

Results

The Yoba for Life project started with dairy cooperatives, volunteers, women groups, and local entrepreneurs.

- By 2016, the Yoba for Life Foundation had grown to aid start-ups and trained 99 processing units in Uganda. Weekly production per unit ranged widely, between 20 and 1000 L.
- By 2016, the project grew to include Kenya and Tanzania.
- In Uganda in 2018, there were 116 production units producing a total of 26,000 L per week (20-2000 L/production unit).[1]
- Yoba for Life has currently expanded to:
  - 135 production units in Uganda, which produce a cumulative volume of over 40,000 L of probiotic yogurt per week.
  - 72 production units in Tanzania, which produce 11,000 L per week.
  - 18 production units in Kenya, which produce 5,000 L per week.
- The role of women in developing countries is restricted due to the lack of opportunities or confounding factors like education, patriarchy,

An example of Kashaka women entrepreneurs (more captions here)

malnutrition, inequitable gender environment and others. Yogurt production is a type of food preparation, so this business is a natural fit for women. Over 50% of these units are owned by women thus, Yoba for Life has improved the quality of life for Africans by empowering women, providing employment and incomes, giving access to nutritious food, and improving health conditions in consumers.[8,9]

- 22% of the units are owned by young adults (individuals below 35 years of age).
- Yoba for Life yogurt has been enjoyed by over 1 million consumers in East Africa.[10,11]
- Beyond individuals employed in the production units, employees from over 50 dairy cooperatives provide milk to the production units. Thus, a value chain is created.
- Yoba for Life established a school yogurt program in partnership with SNV (Netherlands Development Organization)/TIDE (The Inclusive Dairy Enterprise) project. By 2019 approximately 20,000 pre-primary children and 3,500 primary children were consuming probiotic yogurt on a weekly basis. Schools reported that students exhibited less allergies, rashes, cough and flu symptoms, constipation, and diarrhea. This leads to better performance in class and a reduction in absenteeism. A study conducted in Uganda with 245 children indicated that there was a statistical reduction in skin allergies and diarrhea after consumption of Yoba yogurt.[6] An observational study conducted in Uganda with 1166 comparing the effect of the consumption of probiotic yogurt vs milk. The parameters evaluated were skin infections, common colds, absenteeism and anthropometric. There was a reduction in common cold symptoms (P=0.09) and skin infections (P<0.0001) when kids consumed yogurt. However, anthropometric indicators and level of absenteeism did not show statistical differences between yogurt and milk groups.[4]
- In 2019 a collaboration with Child Development Centers was initiated. This is a special
- Saturday program for disadvantaged children. Over 4,500 children attend this program and now consume Yoba yogurt.
- In March 2020, operations expanded to Ethiopia, and in 2021, SNV began a grant program with a similar model as Uganda, to provide grants for up to two years.
- On average, production units make about UGX 1500 (USD $0.41) per liter of yogurt produced, with greater profits with economies of scale.[11]

Lessons learned

- Probiotic products have many benefits in human health but are considered premium products and are difficult to access in developing countries. Local resources were successfully adapted to create the probiotic yogurt.
- Getting the certifications for operating in each processing unit is challenging because most of the money from grants or donations is used for infrastructure and lab testing procedures. This remains the biggest challenge the SNV and Yoba production units face. Getting the certification allows the units access to different markets like schools and grocery stores.
- Another challenge was the implementation in schools because the parents had to pay for the yogurt. For this reason, the program was conducted in schools with children of higher economic status. In addition, there were some irregularities in collecting the information and gaps in reporting and analyzing the data.[4]
- The Yoba for Life project follows an effective business model that is able to increase household income and women's empowerment. This leads to children's education, poverty eradication, business establishment, gender equality, and improvements in school and society.[9]

Next steps / call to action

- Expanding the number of probiotic starter culture distribution units will help grow the number of production units. By the end of 2018, there were 12 distribution centers.
- Broader expansion of the probiotic yogurt to lower income individuals and families would be beneficial. It would be worthwhile for policy makers to allocate funds to promote consumption.
- In 2019, the Uganda National Bureau of Standards (UNBS) required all packed and marketed products to be certified. Certification is costly, at UGX 7.5 million per unit, and limits production units' compliance. Yoba, SNV, Heifer International, and Agriprofocus have raised these concerns and challenges to the deputy director of UNBS, but no compromise has been made. Yoba has reached out to UNBS ground level staff to gain a better understanding of certification requirements. Without certification, the production units are banned from selling their product in supermarkets, though they can continue to sell via roadside kiosks.
- In 2020, SNV provided the certification fee of UGX 7.5 million per unit to 10 units to assist with UNBS certification. Any additional fees (items found out of compliance during the UNBS audit that need to be addressed), will be managed by the production unit. Additional assistance is needed to help more production units gain certification.
- The matching grant program in Uganda ended in 2019. Producers are encouraged to get loans from local Savings and Credit Cooperative Organizations in order to stimulate the local economy and take on more ownership of their units.
- More awareness of Yoba yogurt and its benefits is needed. This has started with the training teams organizing workshops, coaching, and empowering production units to participate in shows and exhibitions throughout the country. At these events the probiotic yogurt producers promote and sell their products and create awareness around probiotics. A study conducted by Westerik and others in 20191indicated that some Ugandan consumers do not have a good understanding of probiotics. However, most people showed interest in probiotics after being educated, leading to an increase of yogurt consumption.

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