Nutri-Fuel High Fibre Banana Biscuit

Research Team
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Name of Product
Nutri-Fuel

Background and Rationale
An estimated 40% of New Zealanders or ‘Kiwis’ struggle to keep food on the table (Smith, 2011). However, New Zealand (NZ) generates 103,000 tonnes of food waste per annum, much of which is still edible and could potentially feed 80,000 people annually if the initial waste is prevented or repurposed (Reynolds, 2016). Kiwiharvest is a NZ-wide charity that distributes unsold food donated by manufacturers and supermarkets to charitable agencies who then provide meals or redistribute it to the needy. Often, the donated food is in the form of unsold bread and second-grade bananas (e.g. overripe, imperfect); the total quantity is too large to be fully utilised and offers a limited range of nutrients to recipients. The aim of our project is to use this excess as raw material to produce a new food product that is affordable, offers additional nutrition and variation and is perceived as attractive for mothers in low-income families to purchase as snacks for their children.

Keywords
New Zealand, Food Insecurity, Food Waste, Design Thinking, Food Product Development, Bananas, Bread, Snack, Low-cost, Children.

Objectives
1. Identification of key target consumer needs - i.e. Fibre and vitamins
2. Development of suitable high-fibre snack prototypes containing the required nutrients for children in low-income NZ families that meet cost constraints and are accessible while meeting sensory expectations
3. The reduction of food waste by repurposing the raw ingredients available through Kiwiharvest.
4. Scaling successful prototypes into commercial production while ensuring that all quality, food safety, sensory, compliance and packaging requirements are met

Scope
While the availability of old bread and bananas is wide-spread, the scope of this project is limited to the development of a food-based solution that will suit and meet the recommended nutritional needs for children in New Zealand (Ministry of Health, 2017). The Australia and New Zealand food standards and relevant food safety requirements specified in the New Zealand Food Act 2014 must be compiled with during the development of this product. In addition to that, the NZ market is trending towards natural claims for children’s product in line with other western nations (Euromonitor, 2016). The product must also be relevant to the nutritional requirements of children to combat the malnourishment which they are currently experiencing (e.g. fibre deficiency). Other key constraints that apply to this project are consumer acceptability, an intended shelf life of at least 6 months and a retail price per serve of approximately NZD$1.

Literature Review
Hunger is a problem for a growing number of NZ families who are facing food insecurity. Children are affected by this problem; in 2016, 27% of dependent 0–17 year olds were living in households with equivalised incomes below 60% of the contemporary median income after housing costs (Duncanson et al, 2017). Limited food budgets cause parents to rely on cheap and ‘filling’ items such as white bread, plain biscuits and instant noodles (Graham et al, 2018). Consumption of these items plus an inability to meet the daily targets for more costly, healthier foods such as fruit and vegetables result in a diet that is high in refined carbohydrates, salt, sugar and saturated fat, while lacking essential nutrients such as fibre, vitamins and minerals. This contributes to poor health outcomes such as increased risk of nutrient deficiencies and obesity: children living in the most socio-economically deprived neighbourhoods were 2.5 times as likely to be obese as those living
in the least deprived neighbourhoods (Ministry of Health, 2017). In some income-restricted homes, children are sometimes forced to skip meals which can negatively impact on their learning (Utter et al, 2017), limiting their educational opportunities and so the cycle of poverty continues.

Design thinking is gaining popularity as a way of considering potential solutions to complex issues. As a human-centered approach, the focus is on empathizing with the consumer to gain an understanding of the user’s current situation (Veflen, 2015), helping developers create a product that is actually valuable to the consumer (Simons et al, 2011). Figure 1 summarises the key stages of design thinking. For this project, the team investigated the faces of hunger in NZ in the “Discover” phase before ‘Defining’ the main problems faced by the population of interest, i.e. kiwi kids. This included food-related deficiencies. An ideation session was then conducted by the team to generate ideas of products that could help to resolve these problems. “Develop” and “Deliver” respectively portray the development of prototypes before commercialisation of a final suitable solution as discussed in the methodology section.

![Figure 1](image)

Figure 1 : A summary of the design thinking approach using double diamond model adapted from Design Council (2007).

Parents, especially mothers, are usually responsible for food purchases within kiwi families. It is customary for kiwi families to prepare or purchase snack-sized foods for kids’ school lunch boxes. However, low-income families struggle to afford snacks or the snacks they can afford are generally unhealthy such as fried potato crisps. Currently on the market there are no nutrient-rich, high-fibre biscuits intended for school-going children. Other high-fibre items like muesli bars are present in the market but are not affordable for food insecure households.

At the same time, the high levels of food waste (bread, bananas) seen in the NZ retail environment by Kiwiharvest is unsustainable and not suitable in its current form for use as snacks for kids’ school lunches. The team proposes to use these readily available materials that would otherwise be wasted in a shelf stable biscuit-type product that will be very affordable, accessible (available in local supermarkets), nutritionally beneficial and acceptable to children in a convenient format. Both the flesh and peel of the banana will be used while bread is expected to provide bulk. The flesh of the banana will add sweetness to the product and will reduce the added quantity of added refined sugar. Banana flesh is also a significant source of potassium, dietary fibre (Ghag et al, 2018), and vitamin B-6 (Chandler, 1995). The peel of the banana has similar nutrients to that of the flesh but in even higher amounts. Another advantage is that the repurposing of this food prevents it going to landfill and reducing further environmental impact.

**Product Idea Concept Statement**

Nutri-Fuel is a biscuit with an unique formulation containing significant levels of skin-on old bananas and unsold commercial bread. Nutri-Fuel is rich in fibre and vitamin B6. Nutri-Fuel will have a soft, cakey-texture with a hint of banana flavour that is suitable for consumption by itself, added to lunchboxes or paired traditionally in NZ with a beverage such as milk or tea. Nutri-Fuel will be made available in local supermarkets and/or convenience stores with an intended pack size of 60g at NZD$1.00 and a minimum of 6 months shelf life. This biscuit will provide a satisfying experience to the target consumers of NZ kids and will be packaged in a manner attractive to this audience.
Expected Output and Outcome
The output of this project will be a ready-to-eat, affordable and convenient biscuit that is rich in fibre and Vitamin B6 and suitable as a snack for school-age children of 7-12 years old. The expected outcome would be that these children will choose Nutri-Fuel over other possible snacks due to the product’s superior taste while mothers will purchase the product for its affordability and additional nutritional benefits.

Methodology
As our product idea is a fortified, affordable and sustainable biscuit-type snack for kids made from repurposing food that is otherwise be wasted, we propose to use the following methodology:

INPUT

- Investigate the current hunger situation in New Zealand
- Determine target consumer

- Data analysis of target consumer
- Identify customer needs
- Market research

- Current market trend analysis
- Product feasibility analysis

- Raw materials and processing cost estimation to control affordability limit
- Research ingredient compatibility (e.g. banana flour to wheat flour ratio)
- Research packaging options

- Pilot plant scale production
- Sensory acceptability testing

- Research packaging options
- Shelf life testing by accelerated analysis under The Ministry for Primary Industries guideline

- Identification of possible risks in terms of food safety and quality
- Establish HACCP plan
- Cost research of processing, packaging and raw ingredients

- Confirmation of legal compliance’s (e.g. patent and copyright)
- Suitable production facility and environment
- Market strategy determination

OUTPUT

- Problem statement: Food insecurity among children of NZ. Current market lacks nutritional value
- Target consumer identified as children facing food insecurity

- Food products that are affordable and rich in nutrients
- Product idea generation

- Final product idea concept
- Product weakness and strengths

- Identification of suitable packaging
- Table formulation for fortified banana biscuit
- Sensory comparison with existing products in the market

- Product reformulation based on organoleptic acceptance testing
- Satisfactory acceptability

- Satisfy New Zealand’s government guidelines
- Suitable packaging and design that also extends product shelf life while maintaining quality
- Shelf life estimation

- Satisfy government requirements on food safety and food quality
- Cost estimation and selling price finalisation
- Feasible commercial plan

- Product launch
- Post launch evaluation
References


Design Council (2007). Eleven lessons: Managing design in eleven global companies. UK.


