Berry Complete! A Balanced Diet

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Objectives:

Our first objective was to develop a balanced breakfast food that is high in both protein and fiber to prolong satiety. The product was to be tasty, portable, and competitively priced. Following kitchen-scale product development, our second goal was to scale our process up to a a manufacturing level capable of producing about 1.4 million kilograms annually.

Market Analysis:

- People eat breakfast 4.9 days/week
- 20% of people say they don't have time to sit down and eat breakfast
- Breakfast eaters:
  - 75% eat to satisfy hunger
  - 50% eat for good nutrition
- Baked goods are most popular for ages 25-34
- Major nutritional Concerns of consumers:
  Fiber, Protein, Low cholesterol, Low fat, Low sugar, Low salt
- There is no product on the market currently that is considered balanced

Product Design:

Our original idea was to create a vegetable-based bread with a complementary filling. We experimented with flavor pairings. We chose a berry, granola based filling to further develop.

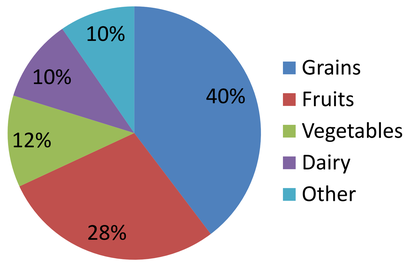
Filling iterations	
Changes	Comments
Plain yogurt to strawberry yogurt	Improved overall sweetness and berry flavor
Crunchy granola to cooked, hydrated oats	Smoother filling pairs better with bread Non-cooked oats gritty texture Cooked and blended: smooth
Honey to corn syrup	Corn syrup sweetened berry blend
Added strawberries	Increase overall berry flavor Helps hide the texture of seeds
Food mill berries	Reduced seedy texture
Substitute oat flour for oats	Created more uniform texture

Bread iterations	
Changes	Comments
Thickness	Not too dense or thin and crispy
Substituted ½ of spinach with zucchini	Improved color and texture
Added blackberries	Addition matches filling color and flavor
Lower salt content	Reduced amount of salt used in bread
Fermentation with juice	Provides nutrients for yeast fermentation
Proofing the dough	Used oven to allow bread to rise
Add soy flour and wheat bran	Increase protein and fiber content

Ingredients:

Blackberries, Whole wheat flour, Low-fat strawberry yogurt, Soy flour, All-purpose flour, Juice concentrate, Spinach, Strawberries, Oat flour, Zucchini, Wheat bran, Corn syrup, salt and yeast.

Food Groups in Berry Complete



Nutrition Facts

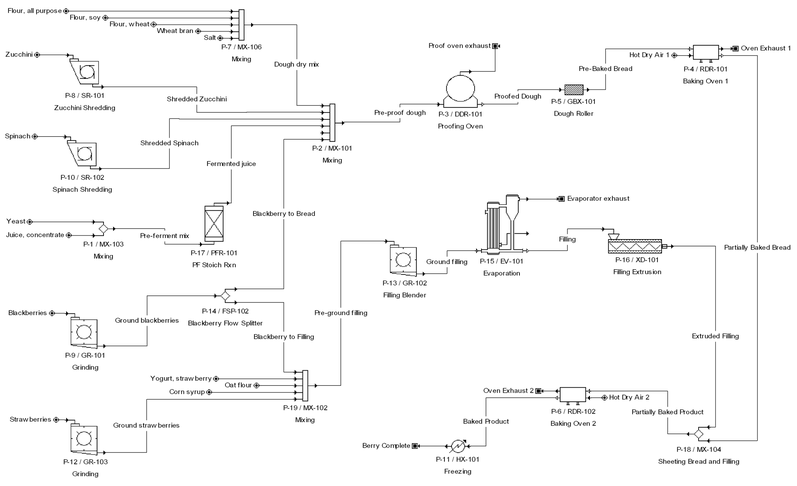
Serving Size 125 g

Amount Per Serving	
Calories 240	Calories from Fat 35
	%Daily Value*
Total Fat 4g	**6%**
Sodium 320mg	**13%**
Total Carbohydrate 43g	**14%**
Dietary Fiber 7g	**28%**
Protein 11g	
Vitamin A 20% •	Vitamin C 25%
Calcium 8% •	Iron 15%

Not a significant source of saturated fat, *trans* fat, cholesterol, sugars.

* Percent Daily Values are based on a 2,000 calorie diet.

Nutrients (based on a 2000 kcal diet)	Target Range 15% of RDI	Current Product (125 g)
Calories (kcal)	300	238.35
Fat (g)	9.75	3.68
Carbohydrates (g)	19.5	42.95
Fiber (g)	4.71	6.86
Protein (g)	7.67	10.35
Vitamin A (IU)	750	1010.33
Vitamin C (mg)	9	14.63
Sodium (mg)	360	319.95



Economic Summary	
Total Capital Investment	$ 6,368,000
Annual Operating Cost	$ 9,422,000/ yr
Annual Revenues	$ 15,790,000/ yr
Annual Production Rate	1,420,000 kg/yr
Return on Investment	68.10 %
Payback Time	1.47 yr

Fixed Capital Investment	
Equipment Purchase	$ 874,000
Installation	$ 437,000
Process Piping	$ 306,000
Instrumentation	$ 350,000
Insulation	$ 26,000
Electrical	$ 87,000
Buildings	$ 393,000
Yard Improvements	$ 131,000
Auxiliary Facilities	$ 350,000
Engineering	$ 738,000
Construction	$ 1,034,000
Contractor's Fee	$ 236,000
Contingency	$ 473,000

Annual Operating Cost	
Raw Materials	3,807,000
Labor	2,600,000
Facility	1,021,000
Waste treatment/disposal	1,590
Utilities	34,000
Advertising/Selling	1,917,000
Failed Product	40,000
Total	**9,420,590**

SuperPro Designer Assumptions:

- Simplified process
- Estimated total labor
- Advertising cost high variable
- Estimated failed product cost
- Equipment substitutions made due to equipment availability in SuperPro
- R&D costs not included

Future work:

- Research and Development
  - Develop product extensions for new flavors
  - Improve texture and mouthfeel
  - Tailor product to target audience acceptance through sensory tests
  - Substitute ingredients in order to comply with whole food market trends
  - Pilot plant trials
  - Shelf life and freezing studies
- Manufacturing Process:
  - Assess feasibility of current process scale up
  - Research proper equipment from suppliers
  - Product transport within facility
  - Include packaging equipment