foodsense

Week 1 - 2040 World

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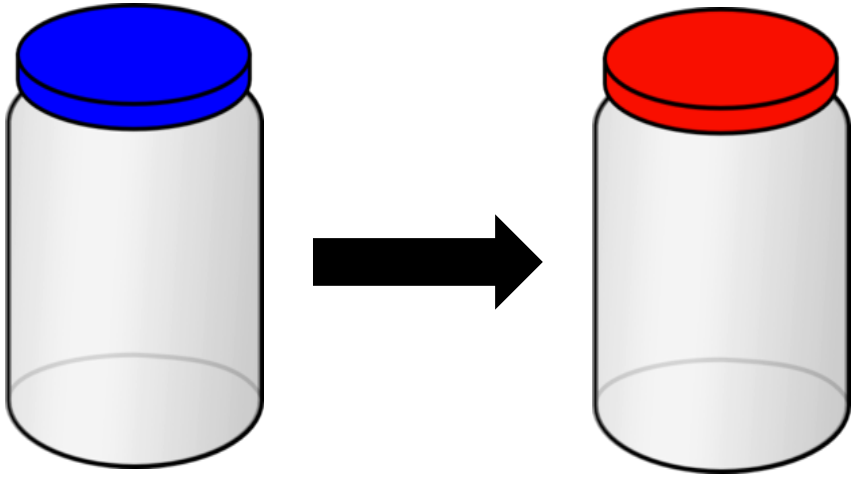
Agenda

We wanted to help developing-world farmers, but we soon realized we could make a better impact right at home

Present Day Problem

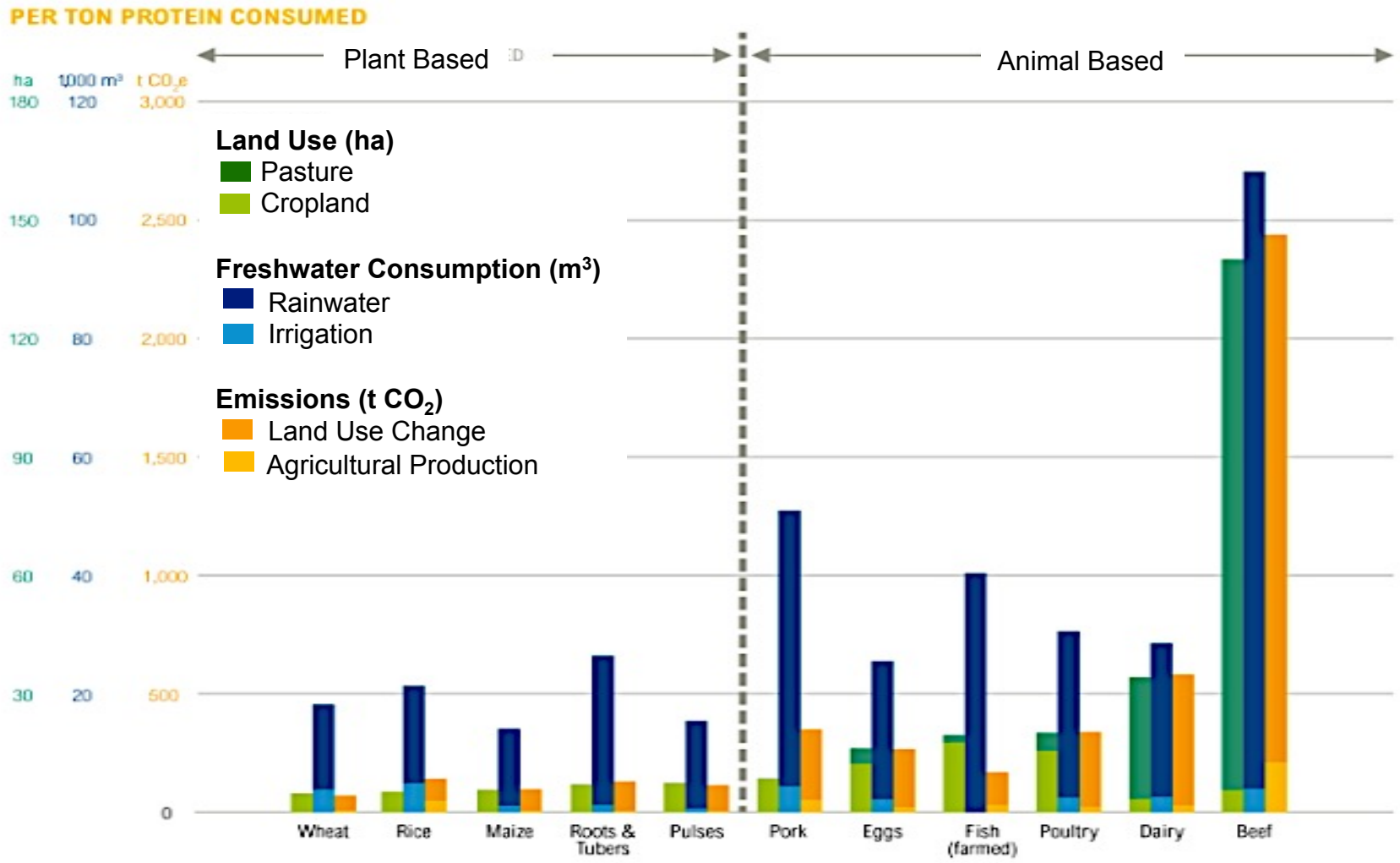
- American families throw out 25% of the food they purchase.
- Consumer and foodservice waste is the largest source of food loss in the marketing chain.
- There is a lack of technology at the consumer level to help prevent food waste

Present Day Solution



74% of survey respondents were bothered by amount of food they waste

The resources required for animal based products are dramatically higher than those of plants



Our expected outlook for 2040 includes higher value placed on meat, the Internet of Things and continued emphasis on eliminating waste.

Macroeconomic Drivers

- Older population – lower birth rate and increased healthcare
- Data tracking and mining
- Rise of urban farming
- Alternative energy accessed by the mass market
- Diet transitions from protein-centric to plant-centric

Food Specific

Predeterminеds

- Continued consumer focus on knowledge of healthy food and where food comes from
- Ubiquitous, inexpensive particle, sensor, and detector technologies
- Market for food storage/preservation still exists
- GMOs are widely used

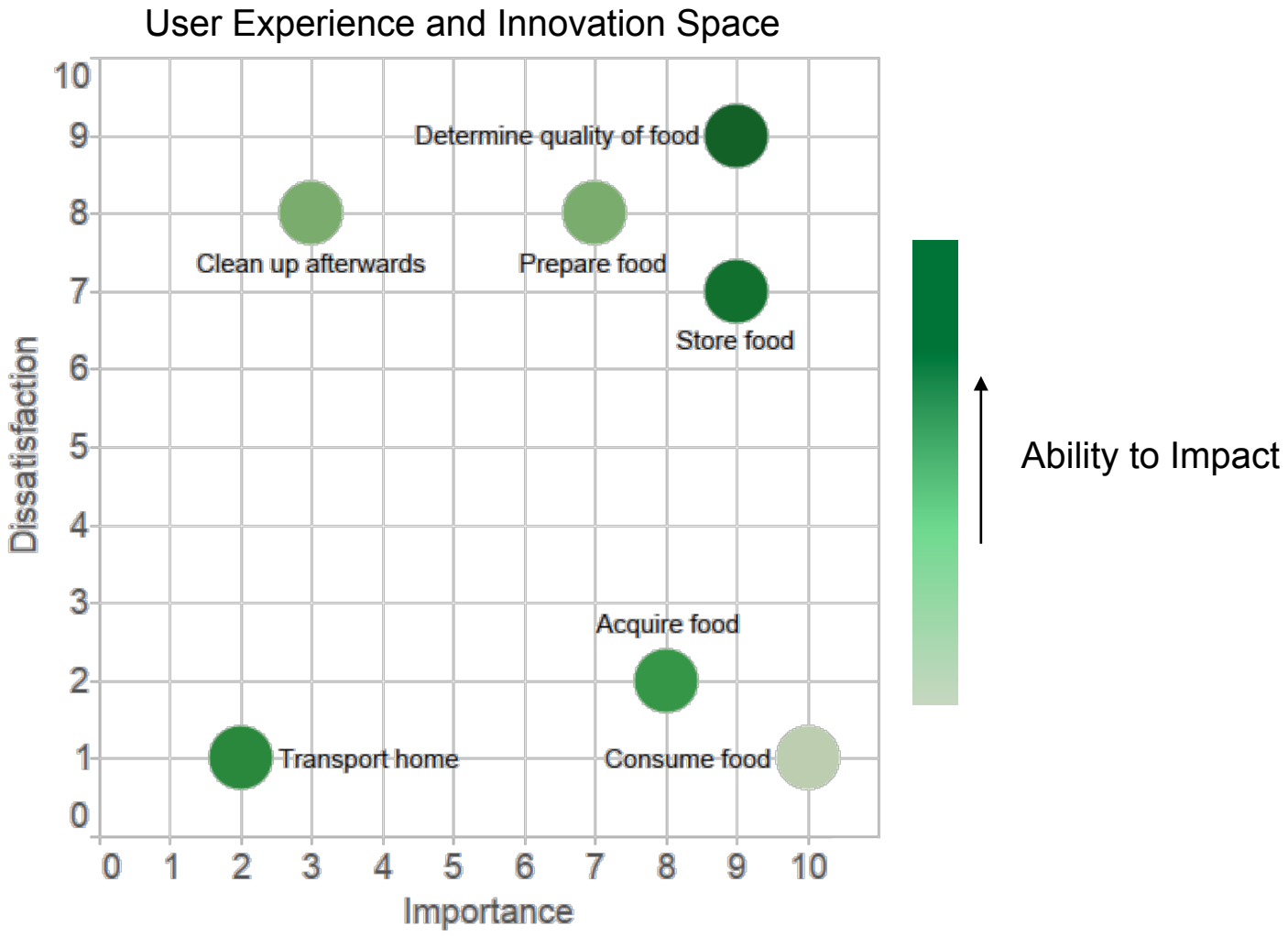
Risks & Gaps

- Are consumers willing to trust technologically purified food?
- Have GMOs eliminated the need to preserve food?

"The protein-centric dinner plate, which America created and now exports to the rest of the world, is a culinary anomaly. By 2050, it will be obsolete."*

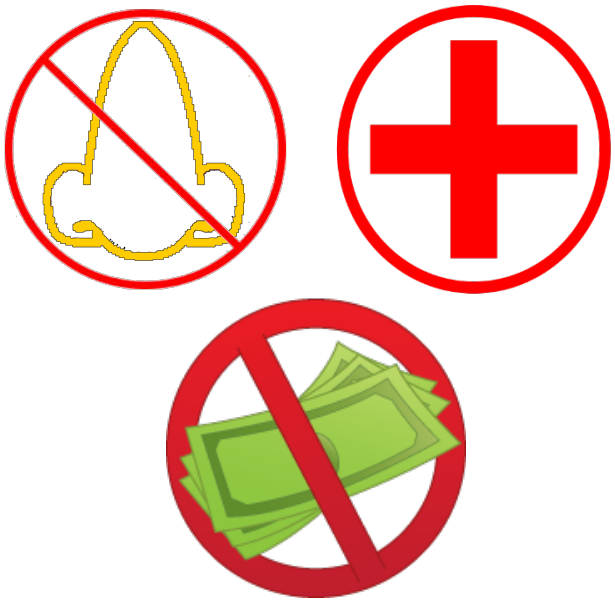
*Source: Barber, The Third Plate.

Based on a focus group of middle-aged housewives, determining the quality of food is the most important and dissatisfying job-to-do.



Detecting the food quality is improved with our product by preserving it and displaying the spoilage level.

Before



After

1. **CO2 detector** is accurate and reliable
2. **Irradiation** preserves food to reduce waste

   e.g. Chicken lasts 2 weeks longer
3. Food is safe to eat

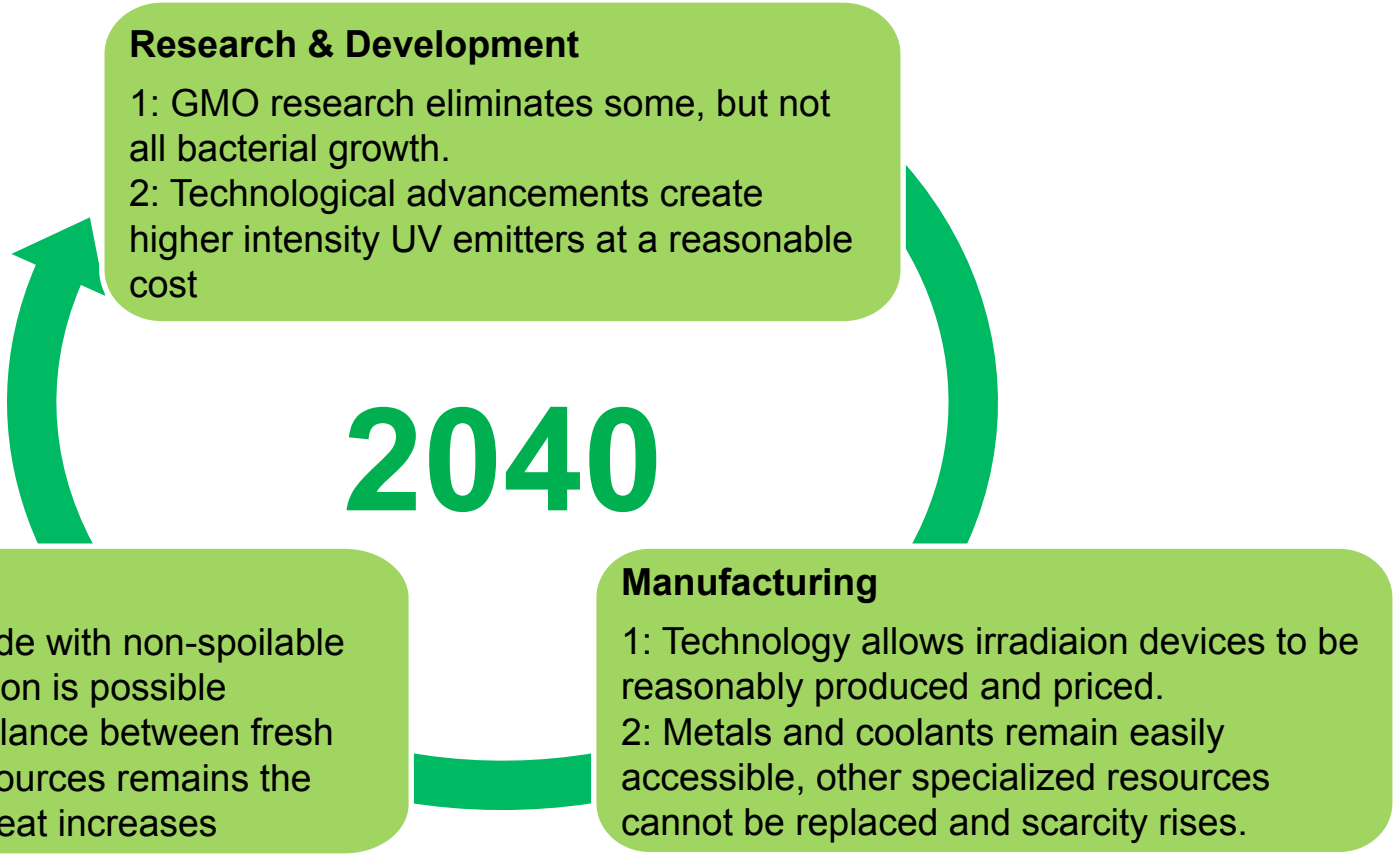
   Approved by the US FDA

Hypothesis

If a refrigerator is capable of automatically sanitizing all foods and lengthening their lifespan, then consumers will purchase this product based on their desires to reduce waste, save money, and eat safely.

Uncertainties have helped us frame our strategic choices and production cycle.

Uncertainty 1: What if non-spoiling meats/produce have been developed?
Uncertainty 2: Have consumers shifted away from purchasing, preparing, and storing their own food?

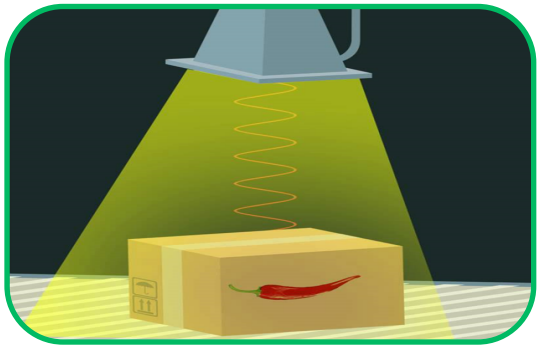


There will be a future need for food preservation, and a sanitizing refrigerator will successfully penetrate the markets for home appliances and food distribution.

Societal Impact

- Reduce wasted income on spoiled food in developed countries (average family of four wastes **$1,365 to $2,275*** annually)
- Reduce the **128,000**** Americans hospitalized with foodborne illness each year

Implementation



Product: Fridge that sanitizes food with X-ray irradiation

Geography: Developed-country large businesses

Market: Partner with fridge manufacturers, then target contractors

*Source: Bloom, American Wasteland, 187
**Source: Center for Disease Control

FoodSense has developed a physical prototype to test on end consumers (households) to prove the need to contractors.

Features

- Automatic X-ray irradiation only when refrigerator door is closed
- Thin layer of lead surrounding shelves to contain radiation
- CO2 detection and “days until spoilage” readout
- Powerful imaging sensors to target bacteria growth sites
- AI interface that tracks radiation dosages per food item

Customer Response to Measure

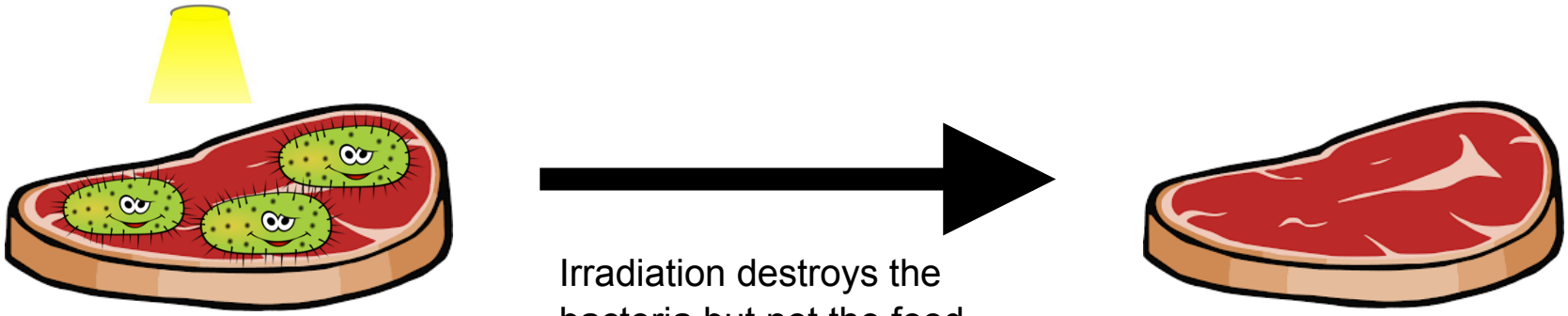
- Comfort level with irradiation in home fridge
- Sensitivity to spoilage date
- Value saved by consuming food that would have otherwise been spoiled

Ties to CERN IP

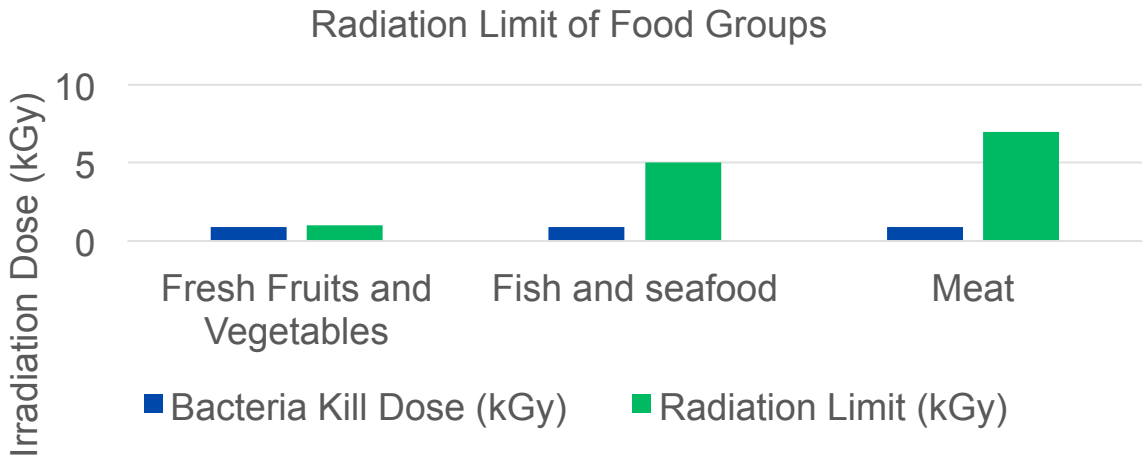
- Multifunctional Detector
- High Efficiency Optical Imaging
- Small-scale particle accelerator to energize x-ray

Demonstration

Mechanism



Dosage Summary



Business Model: Key Components

Key Partners

Key Activities

- Manufacturing
- Product integrations
- Potential replacement program
- B2B & customer marketing
- Quality assurance

Key Resources

- Patents
- B2B sales staff
- Partnerships
- X-ray devices
- Refrigerators
- Thin lead coating

Business Model: Customer Focus

Customer Relationships

- Acquisition
  - Ads online with food-related social media
- Retention
  - Extended warranty, FAQ
- Value-based marketing
  - Benevolent; high rated customer service

Customer Segments

- Middle-upper-class homeowners
  - Create value in order to gain requests
- Contractors
  - Primary purchaser and installer
- Retirement homes
- Restaurants and catering services

Channels

Sysco

Toll Brothers
America's Luxury Home Builder™

sears

Walmart

THE HOME DEPOT®

Business Model: Value Proposition

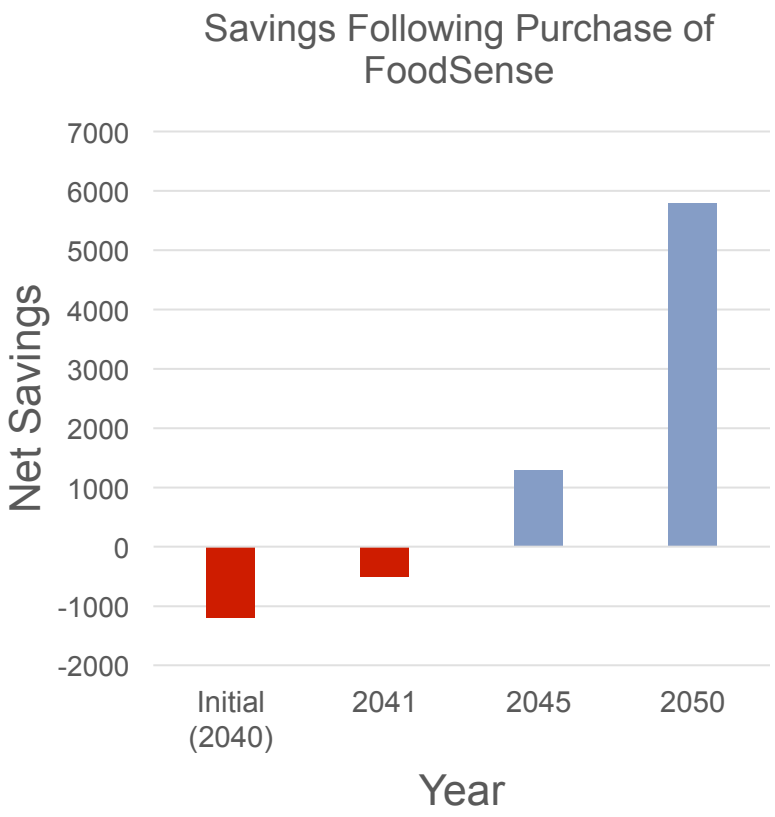
Qualitative

- Allows for **automatic** and effective sanitation
- Substantially increases life spans of food products
  - Minimum: doubling time to spoil
- **Reduces food waste**
- Eat what you want, when you want it
- Decrease chances of contracting foodborne illness

Quantitative

- Family of four food spoilage: **$1201**
- Family of four foodborne illness cost: **$196**
- Assume 50% savings
- Total value to customer per year: **$698**

Savings per Customer

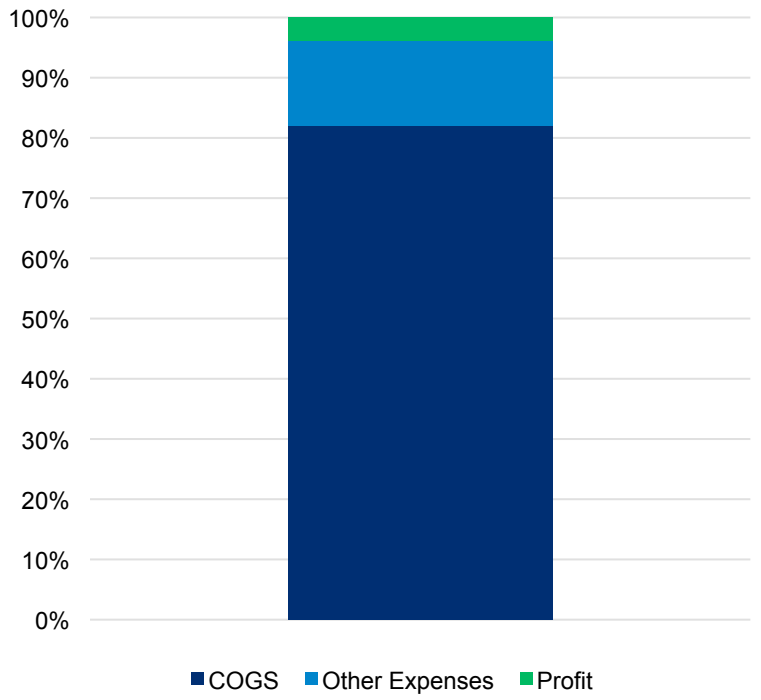


Business Model: Financials

Cost Structure and Revenue Streams

- Price per Unit: **$1200**
  - Based on capturing 1/3 of 5 year amortized value delivered to customer
  - Comparable to other high-end fridges in current market
- Top-Down Approach
  - Profit margins of appliance manufacturers averages at 4%
  - **82% COGS** ($984)

Price Allocation



10M refrigerators are shipped every year;
if we can capture 5% of the market, we will generate **$24M in profit**

FoodSense is grateful for this invaluable experience in the past week.

Most Challenged by

- Dividing and conquering, timely decisions

Most Proud of

- Finding the best solution through group discussion and utilization of our various inputs

Skillset Needed

- Electrical Engineer

Most Helped by

- Collin Stipe (Power Team)

With More Time

- We would add an auto-targeting sensor and functioning CO2 readout

Questions?

Appendix

Predeterminеds - Scenario Table

- Meat is a more valuable commodity, shift to majority plant based diets
- Trend towards healthy food and knowing what you eat continues
- There is ubiquitous, cheap availability of UV lightbulbs

	Uncertainty # 1: What if non-spoiling meats/produce have been developed?	**Uncertainty #2:** Have consumers shifted away from purchasing, preparing, and storing their own food?	**Scenario summary: key issues & business implications**
Big change	GMO developers create food that does not spoil	Consumers do not store perishable food at home. Pre-packed foods, meal replacement products, and restaurants are prioritized	Smallest new product opportunity - look into sustainable meal replacement products and consider a change in focus to mass logistics and distribution
Least change	Food still needs to be preserved	Consumers buy, cook, and store fresh meat and produce.	Largest new product opportunity - identify market segments and go all in for food spoilage detection and preservation
Most likely	Shelf life time has increased, but still spoils	Alternative food sources exist in niche markets, while a majority still purchase and store fresh food and eat at restaurants	Large opportunity for success - monitor scientific research and global food trends

The Ohio State University

Strategic Givens: Sales & Marketing

- Our marketing team successfully brands our refrigerator as healthy and non-wasteful, appealing to consumers
- Consumers purchase refrigerators similar to how they do today (Retail and online).

	Are non-spoilable foods ubiquitous and economically viable in the consumer market?	**Does a consumer market exist for fresh produce and meat?**	**Strategic Options**
Threat scenario	Popular foods will not spoil or the market for food stored at home will be obsolete. We will not produce sales	Consumers almost exclusively prefer meal replacement products and pre-cooked meals. No perishable food storage required.	Change scope to target restaurants. Market for large scale restaurant food storage. Additional product line to to purify food prior to serving customer
Best case scenario	No progress has been made in developing non-spoilable food and we capture majority market share.	The existing market for fresh meat produce is present and experiences growth due to consumer focus on health.	Market through online networks to heads-of-households shopping for potentially spoilable food. Partner with a fridge manufacturer.
Likely scenario	Some progress is made with non-spoilable food. We are able to penetrate the market and be profitable	The present day balance between fresh and alternative food sources remains the same.	Conduct trials and focus groups to determine market interest in the product

Strategic Givens: Research & Development

- GMOs or other methods are unable to completely eliminate food spoilage
- Our refrigerator is able to accurately identify spoilage without false negatives and effectively kill organisms causing spoilage

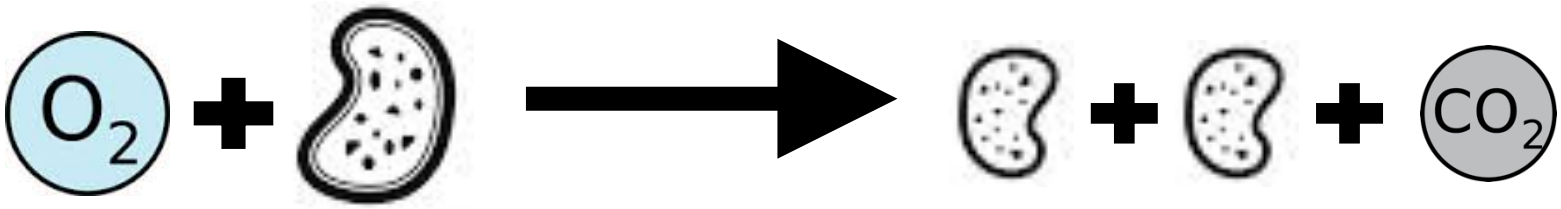
	What is the status of leading edge GMO research?	How expensive will it be to develop high-powered UV light rays?	Strategic Options
Threat scenario	GMO research leads to achievements in non-spoiling foods.	High-power UV light rays will continue to be very expensive, liming ability to scale the product.	Look into alternative detection/ preservation methods for niche markets and industries
Best case scenario	GMO research focuses on farming crops in harsh climates.	Technological advancements lead to lower cost, higher intensity UV light emitters. Allowing reasonable sale price.	Develop consumer and industrial level products using cutting edge UV technology. Leverage influx of crop yield.
Likely scenario	GMO research eliminates certain, but not all bacterial growth.	Technological advancements create higher intensity UV emitters at a reasonable cost.	Look to achieve economies of scale through developing consumer products with UV technology

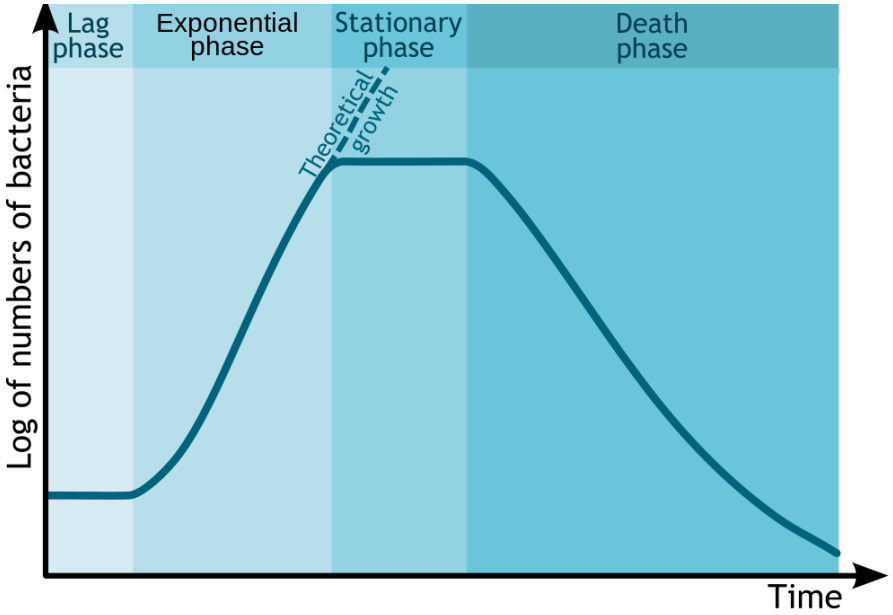
Strategic Givens: Manufacturing

- The UV lights necessary for our product are within legal specifications
- Current manufacturing facilities are inexpensively adapted to production of our refrigerator

	How expensive will it be to manufacture UV lights?	**How accessable are all necessary resources?**	**Strategic Options**
Threat scenario	UV lights become too expensive to produce on a mass scale.	Resources such as mercury, metals, and coolant are scarce and costly, located in remote locations.	Manufacture as a luxury good refrigerator.
Best case scenario	UV lights are very cheap to produce	Potentially scarce resources are replaced by lower cost, abundant materials.	We mass produce multiple product derivatives at a low cost, realizing economies of scale.
Likely scenario	Technology allows UV lights to be reasonably produced and priced.	Metals and coolants remain easily accessable however other specialized resources cannot be replaced and scarcity rises.	Manufacture market demand amounts of standard issue refrigerators, aim to dominate smart fridge market, but not total refrigeration market.

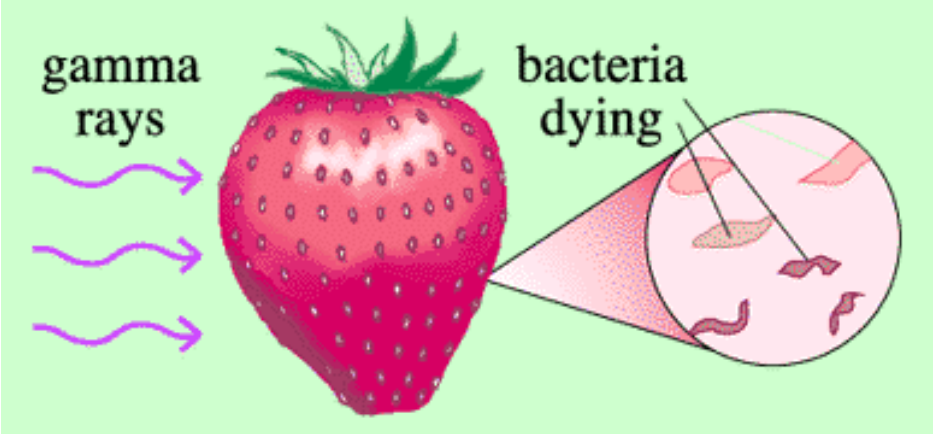
Bacteria Growth Mechanism





Irradiation Kill Mechanism

- Irradiation from a variety of different sources (UV, x-ray, gamma) can be used to kill bacteria on food
- Energized photons destroy the structural piece of bacterial DNA, preventing them from reproducing
  - This energy is not enough to alter the foods structural integrity



Widespread Irradiation Approval

- The below graph displays the approved doses of irradiation on food by the USFDA

Use	Year	Dose
Control of insects in wheat and flour	1963	≤ 0.5 kGy
Inhibiting spouting in potatoes	1964	≤ 0.15 kGy
Pork carcasses for *Trichinella spiralis*	1986	≤ 1 kGy
Culinary herbs, seeds, spices, vegetable seasonings	1986	≤ 30 kGy
Delay ripening of fruit and disinfesting fruits and vegetables of insects	1986	≤ 1.0 kGy
Fresh or frozen, uncooked poultry products	1990	≤ 3 kGy
Frozen, packaged meats used solely in NASA space flight programs	1995	Minimum dose 44 kGy
Refrigerated or frozen, uncooked meat products	1997	≤ 4.5 kGy (refrigerated) ≤ 7.0 kGy (frozen)
Fresh shell eggs for *Salmonella*	2000	≤ 3.0 kGy
Seeds for sprouting	2000	≤ 8.0 kGy
Fresh or frozen molluscan shellfish for *Vibrio* bacteria	2006	≤ 5.5 kGy
Iceberg lettuce and spinach	2008	≤ 4.0 kGy

Irradiation at our levels do not affect the taste of the food

Table 1—The threshold dose for each animal protein food investigated, determined at flavor intensity score of 2.0 (slight irradiation flavor)

Animal food	Threshold dose Krad
Turkey	150
Pork	175
Beef	250
Chicken	250
Lobster	250
Shrimp	250
Rabbit	350
Frog	400
Whale	400
Trout	450
Turtle	450
Halibut	500
Opossum	500
Hippopotamus	525
Beaver	550
Lamb	625
Venison	625
Elephant	650
Horse	650
Bear	875

*100 Krad = 1 KGy

Sources

http://www-pub.iaea.org/MTCD/publications/pdf/TRS409_scr.pdf

https://books.google.ch/books?id=gXj4CwAAQBAJ&pg=PT884&lpg=PT884&dq=Lactobacillus+kill+dose+irradiation&source=bl&ots=7l_0Xw19gu&sig=rBqj7agCB3a36xtIGq8Vttko5nI&hl=en&sa=X&ved=0ahUKEwjjyPnq6dHMAhWGHpoKHf_IBPg4ChDoAQgqMAI#v=onepage&q=Lactobacillus%20kill%20dose%20irradiation&f=false

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