Empowering Composting at Midori Farm

Gabriella Davis, Tim Giddings,
Camden Kulczyk, Dan Miller Minkel
Sponsor: Chuck Kayser

Introduction

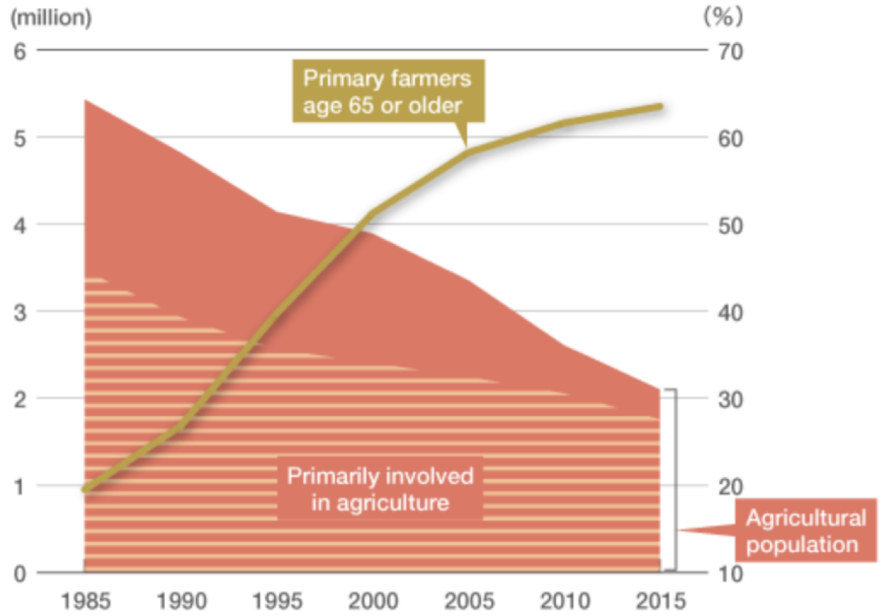
Farming in Japan

Midori Farm and their needs / goals

What we set out to do and how we did it

End product

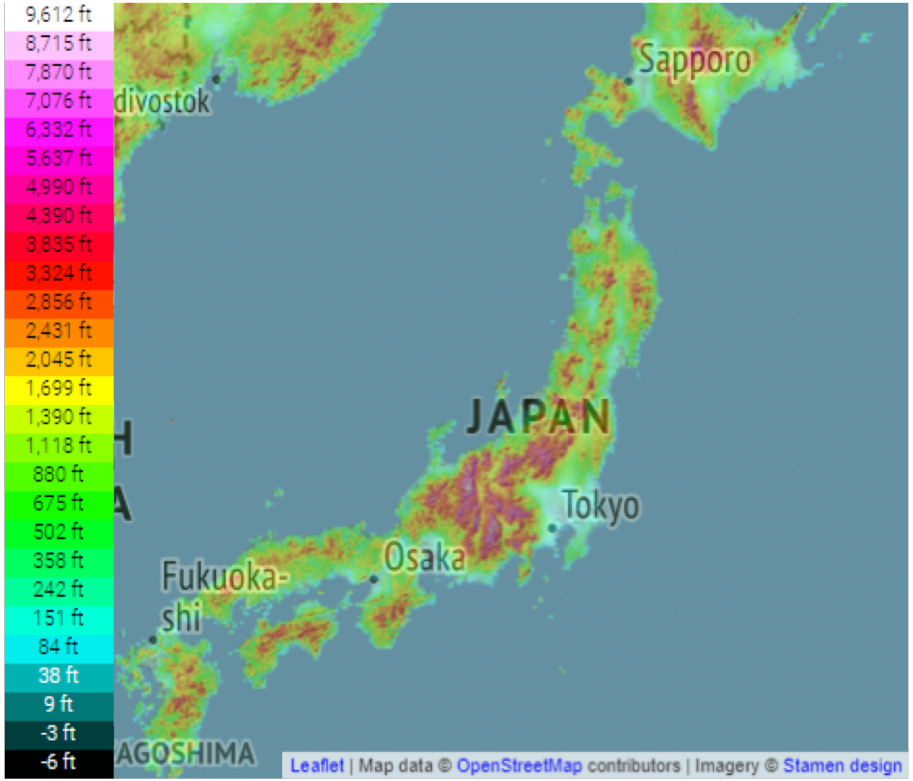
Japanese Agriculture is in Decline



Why Farming is in Decline

- Expensive to start
- Lack of help getting started
- Lack of money to be made
- Younger people are not interested

Geography and Urban Development Prevent Growth of Farming



Japan Struggles with Growing Organic Produce

JAS Organic certified food in the Japanese market	FY 2015
Total Domestic Production	57.9%
Total Import	42.1%
Grand Total	100.0%

Organic Farming is Growing in Japan

Year	Total Number of Organic Farms
2011	5,959
2012	6,273
2013	6,415
2014	6,821
2015	6,927
2016	7,003
2017	7,280

About Midori Farm

- Small farm
- North of Kyoto - Shiga Prefecture
- Teikei
- Volunteer based
- Bring attention to local farming

Midori Farm Seeks to Expand Composting Operation

Project Goal

To aid Midori Farm in expanding organic farming and educate the public about the benefits of organic farming and local produce, by developing and implementing a cost effective solar compost system, with potential for other farm systems.

Project Constraints

Midori Farm:

- Has a low budget
- Has limited manpower
- Has no electricity on site
- Is unable to produce compost during winter

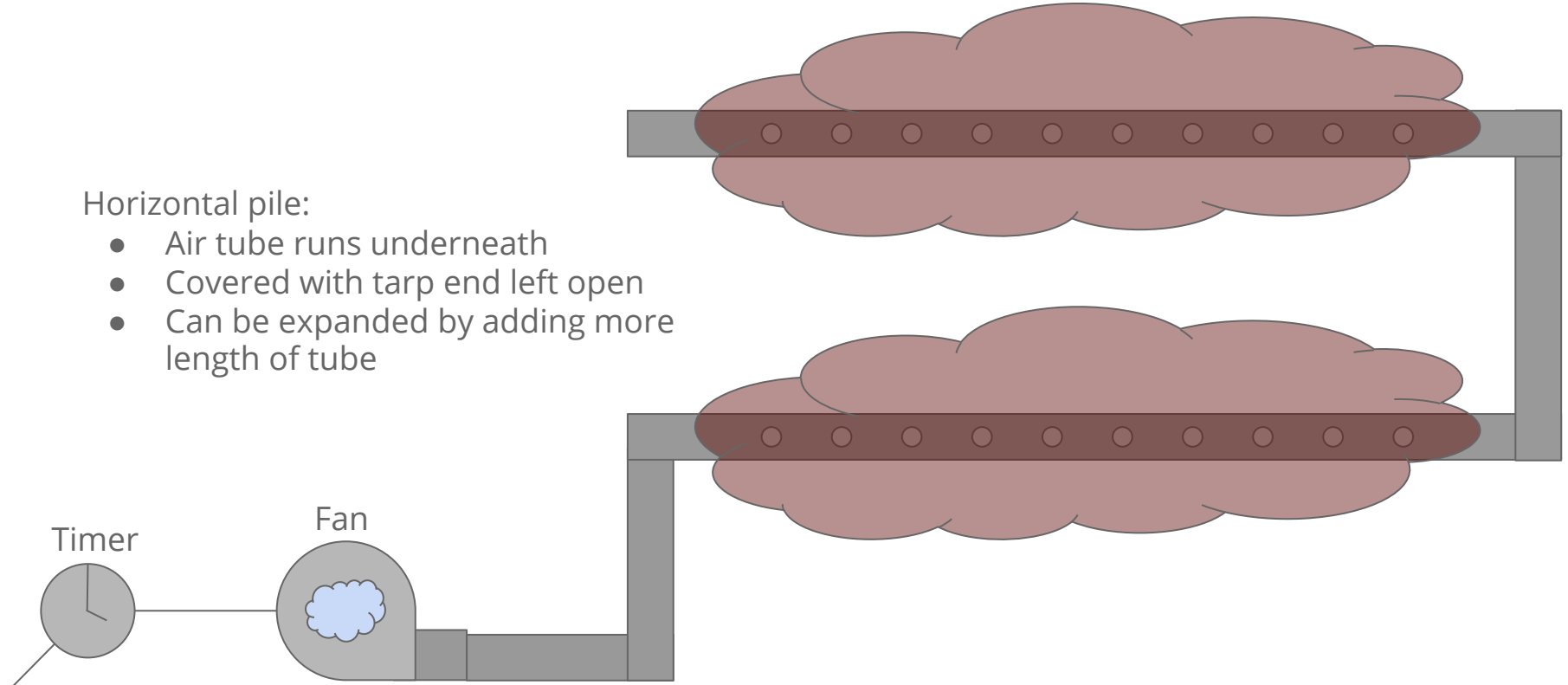
Our system must be:

- Cost effective
- Low maintenance
- Off the grid
- Capable of rapid production during the growing season

Composting Using the Forced Air System

Horizontal pile:

- Air tube runs underneath
- Covered with tarp end left open
- Can be expanded by adding more length of tube



Compost Tea and Electric Fence

Methods

Methods Overview

Objective 1	Background research	• Literature review
Objective 2	Determine on-farm assets	• Site survey • Interview with sponsor
Objective 3	Determine best renewable power source	• Literature review • Site survey
Objective 4	Develop an expandable power generation and storage system	• Provide detailed design for power system
Objective 5	Develop power systems at Midori Farm	• Prodive detailed design for compost and fence systems

Objective 1:
Understand the Role of the Small Farm and Organic Farm Movements in Japan

Literature Review

- Japanese farming culture
- Role of the teikei system
- Growth of organic produce in Japan
- Why are people interested in small-scale farms?
    - Why organic vs non-organic?

Objective 2:
Determine Midori Farm's Assets and Resources

Site Survey
&
Interview with Sponsor

Talk with sponsor about the farm

- What is there?
- What can we use?

Survey Midori Farm

- Size of field
- Water flow and pressure
- Amount of sun
- Compostable materials available

Our Tests:

What we did on the farm:

- Flow rate

Liters per Second

- Head height

Vertical distance from water source

- Average sun

Hours of sunlight per day

Objective 3:
Determine Best Renewable Power Source

Site Survey
&
Literature Review

Investigate each of the following:

- Sunlight at the farm
- Water flow at the farm

Determine potential for power generation

- Consistency of source
- Cost of system
- Complexity to install / maintain

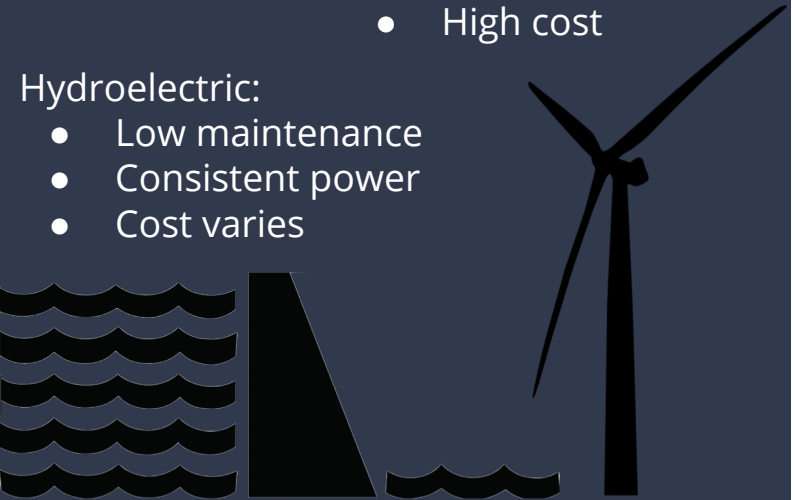
Electrical Solutions

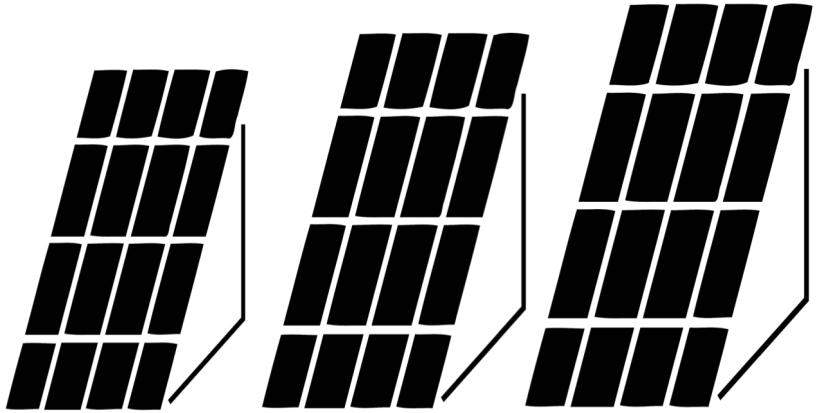
Wind:

- Low maintenance
- Inconsistent power
- High cost

Hydroelectric:

- Low maintenance
- Consistent power
- Cost varies





Solar:

- Low maintenance
- Inconsistent power
- Low cost

Objective 4:
Develop an Expandable Power Generation and Storage System

Calculations
&
Product research

- Calculate power usage (Watt Hours)
- Determine generation / storage requirements
- Select suitable components

Objective 5:
Develop Powered Systems at Midori Farm

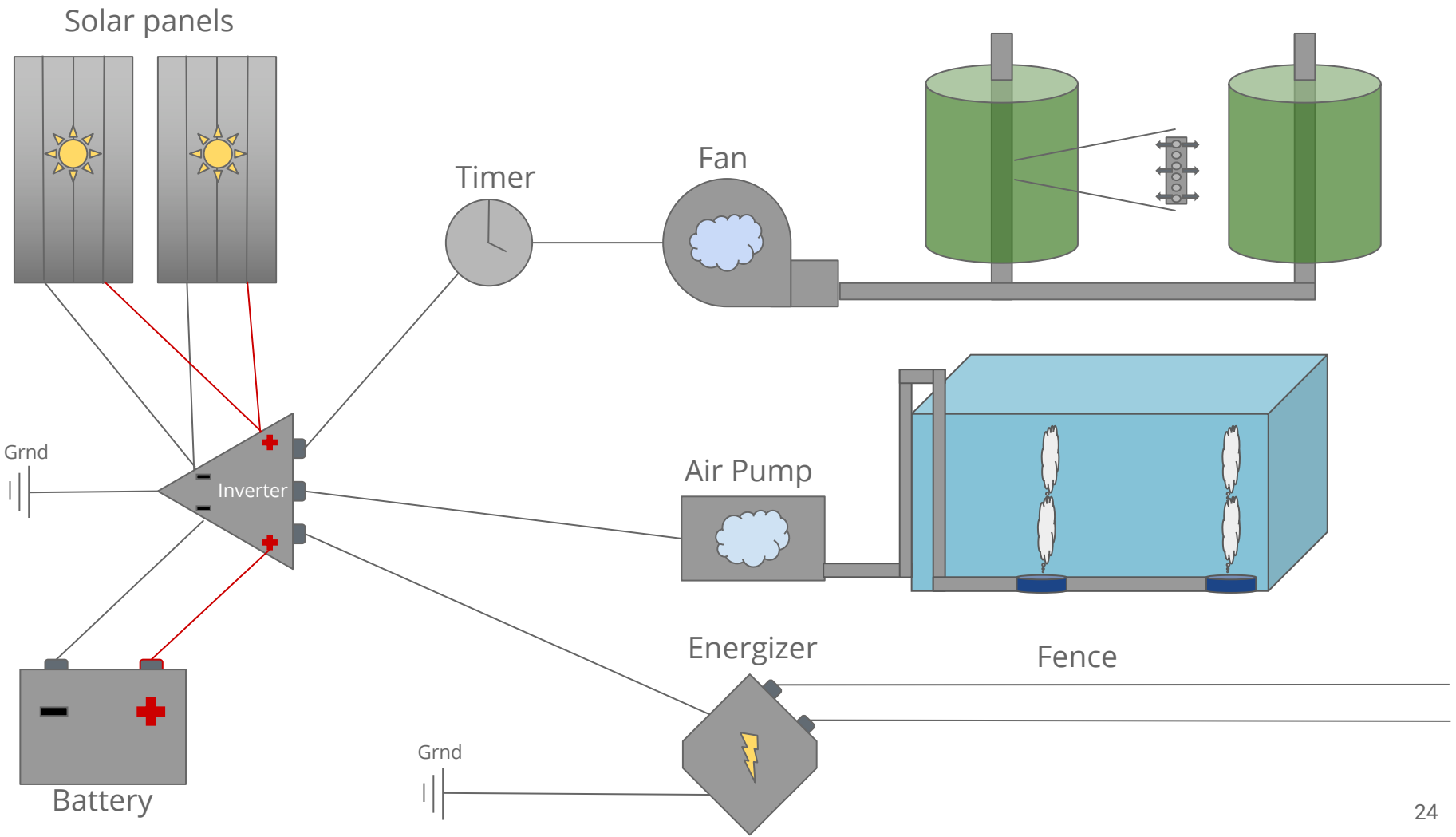
Calculations
&
Product research

Power draw calculations:

- Fan
- Air pump
- Electric fence energizer

Component selection:

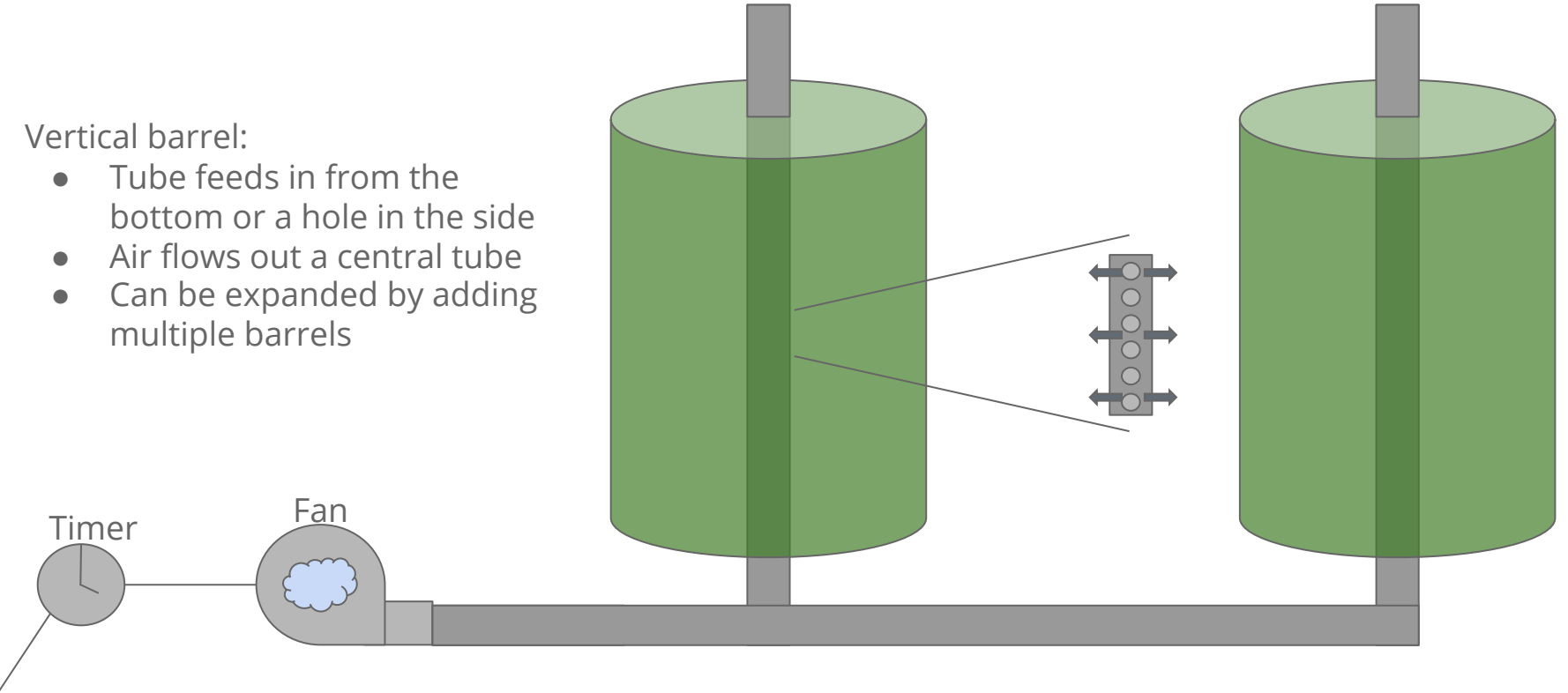
- Availability
- Cost
- Reliability


Solar panels
Timer
Fan
Grnd
Inverter
Air Pump
Energizer
Fence
Battery
Grnd

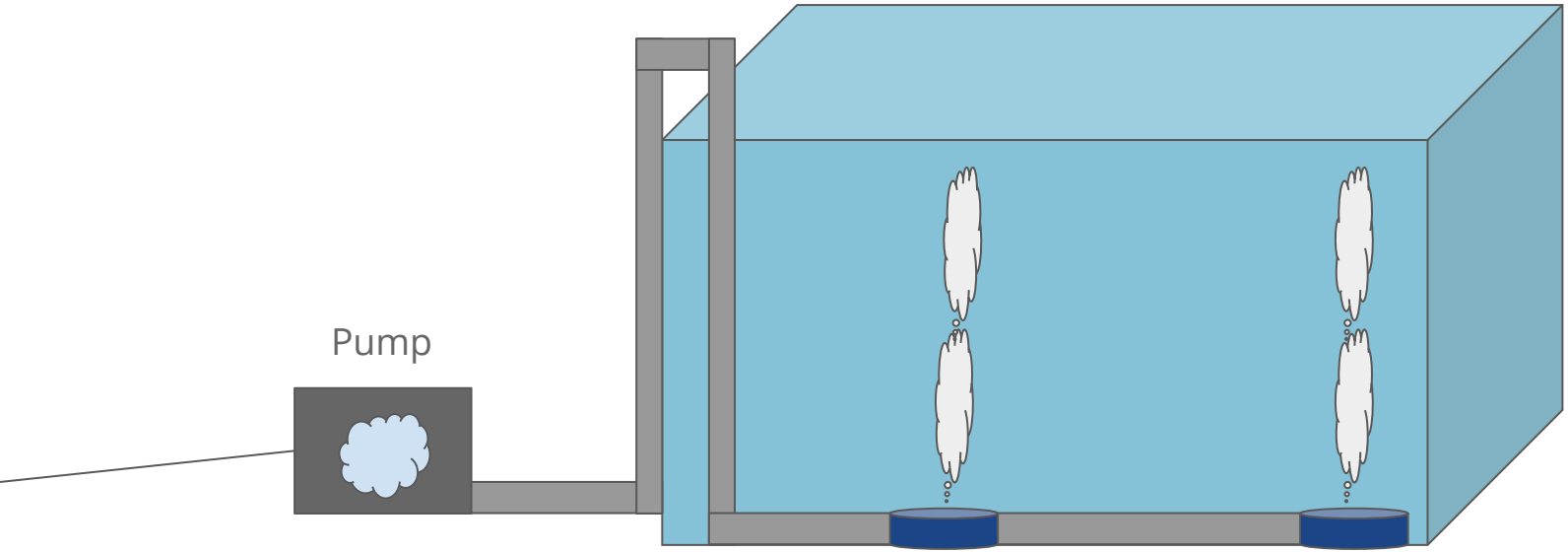
Composting Using the Forced Air System

Vertical barrel:

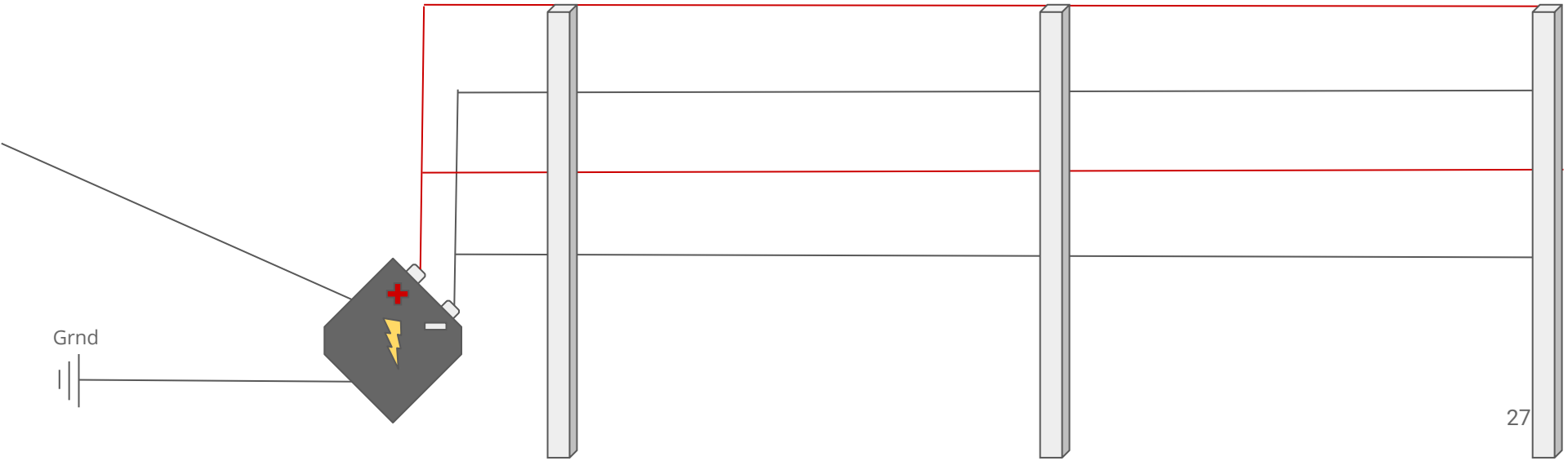
- Tube feeds in from the bottom or a hole in the side
- Air flows out a central tube
- Can be expanded by adding multiple barrels



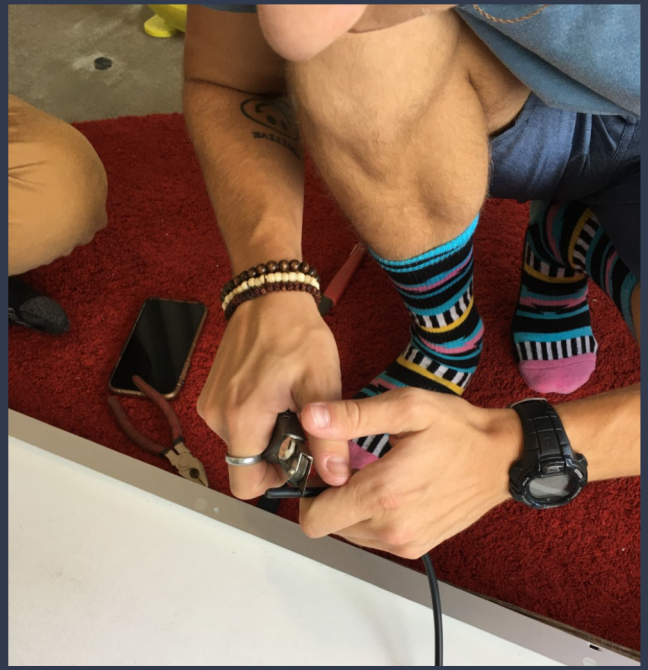
Compost Tea System



Electric Fence System



Setup of System



Conclusion

- The needs of Midori Farm have been identified and met
  - Rapid, scaleable composting
  - Production of compost tea
  - Electric fence for monkey deterrent
  - Off grid power for the above systems
- Midori Farm should see
  - Increased crop yields from compost enriched soil
  - A reduction in fungus and insect damage with the application of compost tea
  - Reduced crop loss from larger animals

Looking Forward

- System under construction
  - Guides for setup and maintenance provided
  - Assisted with wiring
  - Compost tea in production
  - First compost this fall

- Plans to expand
  - Field 3
  - Other farms/farmers

Thank you

ありがとうございました