Empowering Composting at Midori Farm

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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

<table>
<thead>
<tr>
<th>JAS Organic certified food in the Japanese market</th>
<th>FY 2015</th>
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<tbody>
<tr>
<td>Total Domestic Production</td>
<td>57.9%</td>
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<tr>
<td>Total Import</td>
<td>42.1%</td>
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<tr>
<td>Grand Total</td>
<td>100.0%</td>
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Organic Farming is Growing in Japan

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Number of Organic Farms</th>
</tr>
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<tbody>
<tr>
<td>2011</td>
<td>5,959</td>
</tr>
<tr>
<td>2012</td>
<td>6,273</td>
</tr>
<tr>
<td>2013</td>
<td>6,415</td>
</tr>
<tr>
<td>2014</td>
<td>6,821</td>
</tr>
<tr>
<td>2015</td>
<td>6,927</td>
</tr>
<tr>
<td>2016</td>
<td>7,003</td>
</tr>
<tr>
<td>2017</td>
<td>7,280</td>
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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
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

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<th>Objective</th>
<th>Task</th>
<th>Subtasks</th>
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<td>1</td>
<td>Background research</td>
<td>Literature review</td>
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<tr>
<td>2</td>
<td>Determine on-farm assets</td>
<td>Site survey, Interview with sponsor</td>
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<tr>
<td>3</td>
<td>Determine best renewable power source</td>
<td>Literature review, Site survey</td>
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<td>4</td>
<td>Develop an expandable power generation and storage system</td>
<td>Provide detailed design for power system</td>
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<tr>
<td>5</td>
<td>Develop power systems at Midori Farm</td>
<td>Prodive detailed design for compost and fence systems</td>
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Objective 1: Understand the Role of the Small Farm and Organic Farm Movements in Japan

- 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?

Literature Review
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
- Head height
- Average sun

Liters per Second

Vertical distance from water source

Hours of sunlight per day
Objective 3: Determine Best Renewable Power Source

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

Site Survey & Literature Review
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

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

Calculations & Product research
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
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