The Pisticci Farm Project

The Pisticci Farm Project is a project of the Upper Manhattan restaurant Pisticci. The project has three elements:

- *engaging* the **restaurant** staff and patrons
- creating *zero waste* through **composting** within the city
- *producing* high-quality vegetables for Pisticci on the **multi-site farm**
- fully utilising available space through **mushroom production**

This document outlines the technologies and processes involved in the composting and farming elements of the project.

Compost

The discarded organic material from Pisticci restaurant are separated at source (ie. the kitchen, bar, etc.) from other 'waste'. These materials are composted using an oxygenated hot composting method to ensure rapid decomposition, no unpleasant odours and the creation of a high quality fertiliser and biological innoculum for the soil at the farm.

Aerated Static Pile (ASP) Composting

Pisticci is using the aerated static pile (ASP) method of composting as developed by Peter Moon of O2 Compost.

The Pisticci ASP system using includes three enclosed boxes which are bottem-fed pressurised air through *100 mm* (*4 in*) from a blower mounted above the bins.

Organic Material Collection Process

- Organic materials are collected in white plastic bags by the restaurant staff and deposited in wheelie-bins next to the compost bins.

Composting Processes On a week-by-week basis, the Pisticci ASP composting process incorporates the following steps:

Establishing a new Pile

1. Ensure that all pipes in the manifold in the bottom of the bin are present and properly fitted together.

2. Add woodchips to just cover the pipes and thoroughly moisten the woodchips.
3. Open the valve above the bin to ensure that air will flow into the pile while composting proceeds.

Organic materials may now be added.

Ongoing Addition of Organic Materials

1. Use the composting fork to mix through any previously added materials and add water from the hose to bring the moisture levels up to approximately 50% moisture.
2. Empty two or three white bags of organic materials into the bin currently in use. Attempt to mix bags which are mostly vegetable waste (high nitrogen materials) and bags which are mostly napkins / dry 'high carbon' materials.
3. Mix these materials together in the bin using the composting fork.
4. Use the bucket to carry several buckets of woodchips from the woodchip storge bin to the compost bin to cover the material from the bags.
5. Mix the woodchips into the other materials using the composting fork.
6. Allow the materials to sit in the bin until the next addition to absorb moisture before adding any additional water (see point 1 above).

When a Bin is Full

1. When a bin is full, make sure the moisture levels are appropriate (ie. 50% moisture), add a layer of woodchip over the top layer and cover with geotextile fabric / weed matting.
2. ensure the valve for the air is in the fully open position.
3. Leave to mature for as long as possible before the compost is taken up to the farm
4. Compost will be taken to the farm when two bins are full and one bin is one quarter to half-way full.

Transporting Compost to the Farm

When two bins are full and one bin is one quarter to half-way full, the most mature pile should be transported to the farm.

1. Position the truck somewhere near to the front of the restaurant which will allow for wheelbarrow access via the gate at the side of the building.
2. Lift the front panel of the bin to be removed so the the bolts which secure it are lifted from their holes and set the front panel aside.
3. Using a wheelbarrow, transport the compost to the truck until the bin is empty.
4. Clean all areas and close the bin by returning the front panel to its place.

System Specifications

- **The Bins** are 5' long, 4' high and 3' wide to fit within the small alleyway behind the restaurant.
- **The Blower**
- **The Timer** is set to be on for 2 minutes every 30 minutes to ensure the piles remain oxygenated.

Farm

The Pisticci Farm Project is a multi-site micro farm. At the time of writing the farm consists of two sites:

- 43 Old Post Rd South, Croton-on-Hudson, NY (OPRS); and
- 716 Kitchawan Rd, Ossining, NY (KITCH).

The **Old Post Rd South** site was developed and farmed in 2015. The **Kitchawan** site was secured at the end of 2015 and will be developed and farmed in addition to the OPRS site in 2016.

Old Post Rd South

The Old Post Rd South site is the flagship site of the Pisticci Farm Project. It consists of indoor and outdoor growing space. There are two large old glass greenhouses which have been restored and developed for all sesason production of vegetables. The 2015 growing season was used for diverse crop production with a focus on fast growing, high value crops, variety trials and winter greens production. In 2016, this site will be used primarily for all season greens production and greenhouse production of tomatoes, peppers, eggplant and cucumbers.

The Outdoor Growing Area The outdoor growing area consists of 27 beds of varying sizes in three blocks (Lower, Middle, Top). The beds are all 30 inches wide with 18 inch paths between them and vary in size from 10 to 40 feet with a total of 620 linear feet of bed space (1550 ft2).

The Greenhouses In 2015, the indoor space consisted of 12 beds across two greenhouses. The beds ranged in size from 29 to 60 feet with a total of 517 linear feet of bed space (1292 ft2). In early 2016, these indoor beds were delineated with 6" x 2" boards to create a total of 14 beds 29 inches wide with 11 inch intermediate paths. This new configuration has a total of 550 bed feet (1630 ft2).

Hydronic Heating is used in the greenhouses to allow for all season production. The original soil is separated from the imported soil and compost by 2 inches of foam insulation. PEX tubing runs over the top of the insulation at 12 inch spacing. The PEX tubing is covered with between 12 and 18 inches of topsoil mixed with compost. This soil is kept at a minimum of 50°F (10°C) to allow for ongoing plant growth during the cooler month.

Kitchawan

Kitchawan Farm is a diversified working farm with a focus on rough housing of horses. The Pisticci Farm project leases a small area for vegetable production. In Spring of 2016, this area will be developed into sets of 30 inch wide beds. This site will be used for crops which do not require the heat of greenhouses and take more time to mature and so require the extra space available at this site.

Crops

Type	Crop	Varieties	DTM	Location
green	***arugula***	astro	21-30	OPR
green	***kale***	toscano	35-40	KITCH
green	***lettuce***	salanova	55	KITCH
green	***mesclun mix***	5 star; all star	28-30	OPR
green	***dandelion***	clio, garnet stem	35-48	OPR
green	***escarole***	eros	45	OPR
green	***beet greens***	bulls blood; early wonder; red devil	35	KITCH
cucurbit	***summer squash***	zephyr; goldmine; safari; slik pik	50-54	KITCH
cucurbit	***pattypan squash***	sunburst; g-start	50-52	KITCH
cucurbit	***cucumber***	katrina	48	OPR
solanum	***pepper***	carmen; sprinter; sympathy; moonset	60	GH; KITCH
solanum	***tomato***	taxi; rebelski; manero; beorange	70-75	GH
solanum	***tomato (cherry)***	santorange; favorita; yellow pear	58-70	GH
solanum	***eggplant***	nadia; orient charm; jaylo	62-67	GH; KITCH
herb	***basil***	nufar; neopolitano	77	GH; KITCH
root	***beet***	baby beet; boulder; red ace	40-50	KITCH
root	***radish***	d'avignon	21	KITCH

Priority Crops for 2016

Crop Descriptions

The following includes cultivation notes on each of the above crops if they were successfully grown in 2015. If crops were not grown in 2015 or the cultivation description is well detailed elsewhere then references are given.

arugula

Propagation: Direct Sown
Seeder: Glasser (small bore)
Rows: 7-9 (more rows makes plants 'stemmy')
Harvest: Use `Serrated Greens Knife (blue handle)`
Store: Coolroom

basil

Propagation: 72 cell tray
Rows: 3
Spacing: 12"
Harvest: Cut stems down to node with `secateurs`
Store: Coolroom

beets Beets were not grown as a root crop in 2015. Refer to `The Market Gardener` or other reference for cultural details.

beet greens

Propagation: Direct Sown
Seeder: Earthway (chard plates)
Rows: 7
Harvest: Use `Serrated Greens Knife (blue handle)`
Store: Coolroom

cucumber Cucumbers were not grown in 2015. Refer to `The Market Gardener` or other reference for cultural details.

dandelion

Propagation: 72 cell tray
Rows: 5
Spacing: 6"
Harvest: Use `Serrated Greens Knife (blue handle)`
Store: Coolroom

eggplant

Propagation: 72 cell tray transplanted to 4" pot
Rows: 1
Spacing: 18"
Harvest: Cut stems above fruit with `secateurs`
Store: Basement

escarole

Propagation: 72 cell tray
Rows: 4
Spacing: 8"
Harvest: Use `Serrated Greens Knife (blue handle)`
Store: Coolroom

kale *baby leaf*

Propagation: Direct Sown
Seeder: Glasser (small bore)
Rows: 7
Harvest: Use `Serrated Greens Knife (blue handle)`
Store: Coolroom

large leaf

Propagation: 72 cell tray
Rows: 4
Spacing: 8"
Harvest: twist off mature leaves
Store: Coolroom

lettuce (salanova)

Propagation: 72 cell tray

Rows: 4

Spacing: 8"

Harvest: Cut off outside leaves with `lettuce field knife (yellow handle)`

Store: Coolroom

mesclun mix

Propagation: Direct Sown

Seeder: Glasser (large bore)

Rows: 9

Harvest: Use `Serrated Greens Knife (blue handle)`

Store: Coolroom

pattypan squash

Propagation: 72 cell tray transplanted to 4" pot

Rows: 1

Spacing: 18"

Harvest: twist off or cut off fruits at base of stem

Store: Basement

pepper

Propagation: 72 cell tray transplanted to 4" pot

Rows: 1

Spacing: 18"

Harvest: twist off or cut off fruits at base of stem

Store: Basement

radish Radishes were not grown in 2015. Refer to `The Market Gardener` or other reference for cultural details.

summer squash

Propagation: 72 cell tray transplanted to 4" pot

Rows: 1

Spacing: 18"

Harvest: twist off or cut off fruits at base of stem

Store: Basement

tomato

Propagation: 72 cell tray transplanted to 4" pot

Rows: 1

Spacing: 18"

Harvest: twist off or cut off fruits at base of stem

Store: Basement

Refer to `The Market Gardener` or other reference for details of trellising system and offset training.

Nursery

Pisticci Full Circle Farm produces all of its own seedlings. All seed to date has been purchased from Johnny's Selected Seed. Potting medium is made at the farm.

Potting Medium Potting soil is usually made up in batches of one wheelbarrow with the major ingredients being measured using a 5 gallon bucket. The **potting soil** consists of: * 2 buckets sifted compost * 2 buckets sifted coir * 1 bucket sifted bed soil * 3 tbsp fish hydrolysate * 1 tsp solu-kelp * 3 tbsp EM * 2 buckets water

Method

1. mix fish hydrolysate, solu-kelp and EM in water
2. add coir to water and let stand until expanded; add extra water if required
3. sift all other ingredients and mix together thoroughly
4. store in galvanised bin, preferably for a week or more before use.

Fertility

Soil is at the heart of any vegetable growing system with integrity. The Pisticci Farm project utilises a number of strategies for developing and maintaining a healthy soil for the production of healthy nutritios plants. These include:

- composting
- soil testing and ammending for mineral balance
- biological innocula / biofertiliser
- minimal tillage
- fertigation

Soil Testing and Ammending for Mineral Balance Soil testing has been carried out to determine how to ammend soil to achieve a balance of minerals for ideal plant health. The principal tool used to determine the 'ideal' is the set of worksheets created by Steve Solomon and Erica Reinheimer (available at http://www.newsociety.com/var/storage/blurbs/IntelligentGardener-Worksheets.pdf). This process is well described in `The Intelligent Gardener` by Steve Solomon.

Recommended Soil Treatments for 2016 Soil tests were aquired from Logan Labs to determine an ammendment regimen for 2016. The soil tests are available at https://github.com/harrywykman/pisticci_farm_project_documentation/tree/master/documents/soil_tests.

Minerals Required / ft2

Ammendment	OPRS OUT	KITCH	OPRS EGH	OPRS WGH
	oz/sq ft	oz/sq ft	oz/sq ft	oz/sq ft
feather meal	0.31	0.31	0.31	0.31
kelp	0.16	0.16	0.16	0.16
potassium sulfate	0.05	0.07	n/a	n/a
agricultural sulfur	0.04	n/a	0.03	0.04
borax	0.01	0.01	0.01	0.01
manganese sulfate	n/a	0.07	n/a	n/a
biomin copper	n/a	0.04	0.04	0.04
zinc sulfate	n/a	0.01	0.01	0.01

Minerals Desirable / Location Area

Ammendment	OPRS OUT	KITCH	OPRS EGH	OPRS WGH
	1550	6095	960	668
	lbs/area	lbs/area	lbs/area	lbs/area
feather meal	30	118	18	13
kelp	15	61	10	7
potassium sulfate	4.84	26.67	n/a	n/a
agricultural sulfur	3.88	n/a	1.80	1.67
borax	0.97	3.81	0.60	0.42
manganese sulfate	n/a	26.67	n/a	n/a
biomin copper	n/a	15.24	2.40	1.67
zinc sulfate	n/a	3.81	0.60	0.42

Biological Innocula The principal form of biological activation / innoculation of soil and leaf surfaces is through the use of EM; effective microorganisms.

Activated EM is created through the following process:

Ingredients and Equipment

1. EM • 1® — 1 gallon
2. Unsulfured Blackstrap Molasses — 1 gallon
3. water (preferably warm / ~ 110°F (43°C).
4. pH test papers with range to 3.5
5. airtight container and airlock

Method

1. Mix ingredients in the container.
2. Check the initial pH with pH paper.
3. Put on lid and airlock
4. Ferment at room temperature for 3-5 days.
5. Some time between days 3 and 5, remove the lid and check the pH of the liquid using pH paper. If the pH is 3.8 or below, allow the fermentation to complete for an additional 5-7 days. Toward the end of the fermentation, check the smell of the product. It should have some alcohol smell, some white flakes on it and look and smell similar to the original EM • 1®. If all these are true, it is ready to use.

Activated EM is used in a range of applications at Pisticci Full Circle Farm:

- **Foliar Spray** — 3 tbsp (1.5 oz) of *activated EM* to 1.5 gallons of water — apply to leaf surfaces with sprayer
    1. other soluble fertilisers (solukelp, fish hydrolysate, blood meal) may be added
- **Potting Media** – add 3 tbsp to the water used to hydrate the coir block or add to existing potting mix
- **Soil Drench** — 3 tbsp (1.5 oz) of *activated EM* to 1.5 gallons of water — apply to soil with sprayer or through venturi.

Fertigation A Mazzei venturi injection system has been installed in the water line that preceeds the solenoid valves which control each of the irrigation stations. This allows soluble nutrient and biological innocula to be applied through the irrigation water given to crops.

The ideal use of this system is still being worked out. The current regime is as follows:

Application Rate

- EM — (40 gallons / acre / year) **0.45 oz / 100 ft2 / 14 days**
- Solukelp — (312 oz / acre / year) **0.03 oz / 100 ft2 / 14 days**
- Neptune's Harvest Fish Fertilizer — (12 gallons / acre / year) **0.14 oz / 100 ft2 / 14 days**

Western Greenhouse (400 sq ft bed area)

- EM — 6 tbsp / 14 days
- Solu-Kelp — 1 tsp / 14 days
- Neptune's Harvest Fish Fertilizer — 2 tbsp / 14 days

Eastern Greenhouse (900 sq ft bed area)

- EM — 9 tbsp / 14 days
- Solu-Kelp — 1.5 tsp / 14 days
- Neptune's Harvest Fish Fertilizer — 2.5 tbsp / 14 days

Mushroom Production

Not all the space available on the Pisticci Farm Project sites is suitable for plant production. In particular, there remain underutilised indoor spaces. To begin to make the best use of these spaces mushroom cultivation in a controlled environment is being developed.

The Technology

The mushroom grow room is in the basement of the Old Post Rd South site and consists of a basic timber framed room insulated with 2" foam board. The roof is insulated with fibreglass insulation sealed from moisture with clear plastic.

The controls and monitoring for the room have been set up largely following the `mycodo` project created by Kyle Gabriel (http://kylegabriel.com/projects/2015/04/mushroom-cultivation-revisited.html).

A raspberry pi forms the core of the control system. The `pi` reads the temperature and humidity sensor and, using a PID controller, switches fans, a heater and humidifier depending on the environmental conditions.

Simple Oyster Mushroom Production We have aimed for the simplest (and dirtiest) production method that will still produce a product that is valuable to the Pisticci Kitchen. In the proof-of-concept stage we used a cold 'pasteurisation' method. The method currently under development will use heat pasteurisation where water heating is provided by an hydronic coil heated by an efficient gas water heater.

The Process

Cold Pasteurisation

1. Part fill a 20 gallon drum with water
2. add 10 oz (300 g) of hi calcium hydrated lime and mix well
3. add water to approximately 15 gallons
4. fill mesh sack(s) with straw and slowly push the sacks into the barrel until the barrel is holding as much straw as possible. The lime solution should cover the sack(s).
5. leave for 12 hours
6. remove sacks from barrel and allow to drain
7. remove straw from sacks and spread out to dry

Hot Pastuerisation

1. add water to barrel to fill to approximately 3/4 of the barrel's volume
2. turn on water heater and allow water to reach 160-170°F (70-75°C).
3. fill mesh sack(s) with straw and slowly push the sacks into the barrel until the barrel is holding as much straw as possible.
4. maintain the water temperature in the 160 - 170°F range for 1 hour
5. remove sacks from barrel and allow to drain
6. remove straw from sacks and spread out to dry

Our mushroom production system uses hepa-filtered polyethelene bags for the colonisation and fruiting stage.

Innoculation

1. Take a bag of fully colonised innoculated gri and break u te 'cake' into individual grains.
2. Add two hadfulls of straw to a hepa-filtered polyethelene bag.
3. Sprinkle a 'pinch' of innoculated grain onto the straw and repeat this process until the bag is full enough to still allow for heat sealing
4. heat seal the bag
5. repeat until all the pasteurised straw is used and store bags in a dark space for colonisation

Fruiting

After 5-6 weeks the bags should be sufficiently colonised to be moved to the fruiting room.

1. When the straw in the bags is fully colonised (covered in white mycelium) move the bags to the fruiting room
2. Cut cross-shaped slits into the bags using a razor knife.
3. Spray the bags with water if they appear very dry.
4. Leave in fruiting room until harvestable mushrooms develop.
5. Harvest fruiting bodies by twisting off the mature cluster (make sure to do this before the mushrooms release their spores to reduce the chance of creating unsafe conditions in the fruiting room).

Suppliers

Aloha Medicinals

url: http://www.alohamedicinals.com/

details: innoculated grain, mushroom growing supplies

Arbico Organics

url: http://www.arbico-organics.com/

details: EM • 1®

Central Irrigation (Elmsford)

url: http://www.centralirrigationsupply.com/

details: general irrigation supplies

Compostwerks

url: http://www.compostwerks.com/

details: soil ammendments, biofertiliser ingredients

contacts: *Gregg Twehues* (gregg@compostwerks.com); *Peter Schmidt* (peter@compostwerks.com)

Farmtek

url: http://www.farmtek.com/

details: general equipment

contact: *Virginia Daly* (vdaly@farmtek.com)

Growers Supply

url: http://www.growerssupply.com/

details: general equipment

Johnny's Selected Seeds

url: http://www.johnnyseeds.com/

details: seed, tools

Logan Labs

url: http://www.loganlabs.com/

details: soil testing

Nolts Produce

url: http://www.noltsproducesupplies.net/

details: row cover, irrigation supplies, tools

O2 Compost

url: http://www.o2compost.com/

details: composting support

contact: *Peter Moon* (peter@o2compost.com)

Shroom Supply

url: http://www.shroomsupply.com/

details: mushroom grow bags, mushroom growing supplies

Teraganix

url: http://www.teraganix.com/

details: EM • 1®, pH test papers

The Green Growler (Croton)

url: http://thegreengrowler.com/

details: airlocks

Glossary

50% moisture - Compost or composting materials with approximately 50% moisture will make your hand moist when squeezed of produce a drop or two of water.

high carbon materials - organic materials such as paper, napkins, cardboard, woodships, straw etc. which have relatively much more elemental carbon (C) than elemental nitrogen (N).

high nitrogen materials - organic materials such as manure, vegetable scraps, grass clippings etc. which have high levels of elemental nitrogen (N) relative to elemental carbon (C).