Workshop Title: Field layout considerations for vegetable seed production

Speaker: Kim Delaney, Hawthorn Organic Farm

Executive Summary
Kim gives the layout that she recommends using for a seed saving garden through the use of mapping crops on Excel. The difference between selfers and crossers, in terms of pollination style, must be carefully planned to ensure that each variety stays true. Population size is also a determining factor to ensure that genetic diversity is retained and no in breeding occurs.

1. **Determine the climate in which you live**
   - Cool season, dry seeded crops
   - Warm season, dry seeded crops
   - Hot season, dry seeded crops
   - **Hot season, wet seeded crops** - in Atlantic Canada we're going to excel in this field

2. **Make a wish list**
   - Make a note of what you will excel in, what may be good, and what is iffy

3. **Make a field layout on a blank spread sheet in Excel**
   - Make a North arrow
   - Note where the prevailing winds are coming from

   Know your crops mating systems
   - **Selfers** - also known as in-breeders; they self-fertilize and are very similar to their parents
   - **Crossers** - also known as 'out-breeders'; another plant fertilizes the plant and are genetically different to the parents
     - This is more of a continuum
       - Strongly inbreeding - lettuce, pea, tomato
       - Strongly outbreeding: radish, beet, kale

4. **Make a note of which are crossers and selfers**
   a. Figure out the Latin name of the genus and species of the plants
   - For example, carrot and Queen Anne's Lace is the same - *Daucus carota*
     - Note this, and make sure that they will not cross
     - Organic Seed Alliance has a publication system that shows the Latin names and what you can expect will cross

- Determine how you will plant your wish list - only plant one plant with the same name or else it will not exhibit true traits

5. Isolation requirements

- Isolation is necessary to ensure that your seed crop is true
- Typically this is done by ensuring distance between plants
  a. **Crossers** need huge distance
  b. **Selfers** don't need significant distance
  - See isolation distance chart on Kim's presentation

  - Kim believes that modern and heirloom tomatoes only need the maximum distance if the stigma has a sticky bit sticking out of the tomato flower as it will allow bees to cross pollinate, however if the stigma is not sticking out of the flower you do not need to observe the maximum distance between plants for isolation

6. Map the vegetables on the spreadsheet

a. **Beans** – Kim recommends to start with selfers
   - Note the distance of the cells
   - Plant on a trellis

b. **Peas** - peas need so little isolation that they can add them in at the end if there is any space left
   - Plant on a trellis so that they don't fall over and rot
   - Even if the pea crop is only 2 feet high, still stick it up with chicken wire

c. **Lettuce** - needs a cool space, so plant between climbing crops (peas and beans)

d. **Tomato** - plant two half rows
   - Ensure that they're planted 20' - 260' apart

e. **Beets and chard** - both are crossers so they need a lot of isolation
   - They're biannual so alternate between them each year
   - Plant beets one year, let them overwinter
   - While the roots are lying dormant in the field, plant chard
   - 110' row of chard in year 1
   - 110' of beet in row 2
   - Ensure there's enough separation!

f. Squash
   - 1 winter, 1 summer, 1 pumpkin
   - All of these are of the Curcurbita species so they will all cross - they need to be separated!
   - Hard-shelled gourds will not cross

- Also watch out for patty pans, zucchini, and anything that comes out of the compost pile because it will not be apparent what species is growing
- Give them 10ft beds
- Ensure that the curcurbitas are planted a distance apart

g. Peppers

- The hot gene is dominant in peppers - if more hot peppers are being planted ensure that there is a distance between hot and sweet peppers
- Capiscum annuum produces both a hot and sweet pepper - ensure that there is significant distance between them
- Put the hot pepper in a tunnel – it is a self-pollinator and does not need insects to pollinate it
- Put the sweet pepper next to the tomato - this helps with cultivation because the tomato and pepper need the same care

h. Carrot

- You can plant it in an isolation tunnel otherwise don't do it if there is any Queen Anne's Lace
- It's too difficult to pollinate by hand
- The pollen of carrots is very sensitive to heat, so it's hard to grow under row covers

i. Corn

- It enjoys growing in blocks
- Can grow over time by planting an early and late variety
- Contamination is an issue - neighbours grow GMO corn
    - Talk with neighbours about when they're corn will peak - if neighbours are growing a mid-season corn, do not grow a mid-season corn
    - If the corn crosses, all of the kernels will be shriveled except a few

7. Make physical barriers

- Low rows of sunflowers, runner beans
- This encourages bees to hang out on them as opposed to crossing between plants

a. **Bagging** - put over the pepper flowers and mark that the flowers within the bag are true

- Available from Agribon
- This is beneficial for people with rooftop gardens that have neighbours with gardens too

b. Caging

- Selfers are the best to put into because they do not need insects

- Crossers need pollination so you will need to add bees/flies
- Can also do alternate day caging - this allows the wind to pollinate the plants as well as allows insects to roam on them for short periods of time

c. Tunnels

- Peppers are great to do this with

d. Hand pollination

- In the evening before hand-pollination, identify the ovaries and tape up all of the flowers that will open the next day
    - She says you can tell this because the flowers are turning orange
    - Tape the males too - they have no bulging bit under the flower
    - Go out at 9am the next day
        - Cut all of the males
        - Unwrap the flower
        - Take the male pollen and unwrap the female and brush the pollen into the female flower
        - Re-wrap the flower in tape and row covers
        - You'll know that it's successful if the flower falls off

8. Population size

- Ideally a tomato will look like it's supposed to - it retains genetic diversity, and runs true to type
- With climate change, it's necessary to pick the best plants that adapt to conditions

a. Selfers

- Adapt well to self-fertilization
- Deleterious genes are weeded out over time

b. Crossers

- Suffer from inbreeding depression
- Need higher populations to plant to ensure that genetic diversity is maintained
- 80 plants for most crossers
    - Plant more because some may die

c. The required number of plants to ensure that the population has sufficient genetic diversity:

Beans - need 10-20 plants

Use a trellis - T-bar, 8 foot lengths every 9 feet. Run wire from the top and bottom and run strings in-between

Squash - 10-20 plants, but 80 is ideal

Chard - need at least 80

Tomato - 10-20 plants

Pea - 10-20 plants
Lettuce - 10-20 plants
Runner beans - 40 plants
Corn - 200 plants
Beets - 80 roots (plant 120 so that the best can be selected)

9. Re-check wish list to make a note of what has been planted

10. Considerations

- Consider what is growing nearby - if your neighbour is growing squash 60 feet away then you need to know this
- Use wide seed spacing
- Plant rows in line with prevailing winds - crops for saving seed are in the ground much longer than normal so they need to be resilient to weather conditions
- Protection from fall rain
- Pollinator habitat
- Refugia - have space for pollinators and insects that like to hang out

Q & A

Q: Is it possible for one plant to have both hot and sweet peppers on the same plant due to crossing?

A: No, there can be varying degrees though. This happens with the pepper 'Lipstick'.

Q: Is there any risk of taping the flowers a day or two before?

A: No, not much of a problem, but the flowers are growing so it may unravel the tape.

Q: When should zucchini seed be harvested?

A: Summer squash need to ripen right to the end – if you knock on them they should sound like wood

Q: Is there any downfall of letting things pollinate and not wanting populations to stay true?

A: Plant breeders often do this and begin to select neat varieties. A land race can be created where you take the varieties that have created, the ones that are sold in stores (i.e. Red Russian Kale). Kim plants all of the seeds that were selected that created this variety. Having a large gene pool can have benefits such as finding great new plants, however sometimes the plants can taste horrible.