Selecting Brassicas for Winter-Hardiness, Flavor, and Yield

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Even’ Star Organic Farm

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Across the globe, winter cropping already grosses billions of dollars annually for northern farmers. They grow winter wheat, barley, and canola.
Canola = rapeseed = **Brassica napus** and **Brassica campestris**.

So why not vegetable growers? Are we too far north? Ask the canola, wheat, and barley growers in Canada, Sweden, or the Dakotas.
For Us, Winter Crops are:

- OPERATIONS standpoint: the crops sown from late August to early October, both in the fields and in the greenhouses. Are harvested from October to May and generate about half of total farm income in the “off season”.
Winter Cropping Is:

- **Realm of MARKETING**: that time of year when we are essentially alone. No quality competition from far away, and local growers are few.

- the warm-grown competition lacks the deep flavors of our frost-kissed, freeze-challenged greens.
Winter Cropping is . . .

In the PRODUCTION sense, when we grow both:

- freeze-hardy, adapted crops in open fields, with no protection. Mostly Brassicaceae.
- and less adapted crops grown in the greenhouses. Mostly lettuces and herbs.
Our Typical Winter Cropping: 20-24 Acres

- Kales: 2 kinds
- Collards: 2 kinds
- Mustards: 4 kinds
- Mild Asian brassicas: 5 kinds
- Turnips, Rutabagas, Radishes: 7 kinds
- Arugula. Too much arugula.
- Outdoor Lettuces: through Christmas only
- Experimentals
Even’ Star Organic Farm Details

- USDA zone 7b. Deep winter: coldest days are 5°-6° F, average nights 18°-22°. Winds are brutal (close to Chesapeake Bay); wind chill very real.
- Ice storms common. We don’t get enough snow.
- We use minimal fertilizer. Plants have to scrounge for every N and P molecule.
- 20-24 acres planted to winter brassicas in beds alternating with leguminous cover crops.
How we cope with limited time:

- Figure out the 2 months when income is lowest, and plan projects and vacations for those (for us, January and June), and
- Don't try to be everything for everyone. We don't attempt the summer diversity that conventional farms do.
More northern growers could:

- Open field: use adapted brassica varieties to harvest more in early winter, and resume earlier with spring harvests.

- Under Remay or in greenhouses: minimize heating costs and still get good to very good yields. **Quickest return in the winter game.**

- Maybe, just maybe, breed brassicas that can fully handle your winters. Extremely valuable.
WINTER CROPPING IS HARD ENOUGH. WHY BREED AS WELL?

- Because most brassica seed for sale is bred for the Sunbelt and is not as winter-hardy as we need for good winter success.

- Nor is most purchased seed as adapted to our local diseases, soils types, etc.

- And because using our own seed saves us money.
OUR BREEDING APPROACH

- RECURRENT MASS SELECTION, one of the oldest and best established breeding techniques in history. The most farmer-friendly approach.

- Best recurrent mass selection game has:
  1. Large initial populations
  2. Harsh real-life screens, eg. winter, drought, flooding, disease
  3. Intentional mortality of the weak and unfit.
RECURRENT MASS SELECTION

- AND THEN WHAT’S LEFT STANDING/YIELDING ARE THE WINNERS. THESE GET TO BREED.
- We then plant the seed of these survivors/winners next season
- The harsh screens return, and the cycle continues
- This recurring cycle hones the population into an *adapted land race*
The Practice Detailed

1. Get your fields ready by late August. Sowing window (8/20-9/20) is tighter than in spring.

2. Choose seed from reliable source.

3. Choose appropriate varieties, eg. kales, turnips, or Even’ Star lines (see Fedco Seeds, Southern Exposure Seeds, etc.).

4. Direct sow as large a population as you possibly can. Minimal or zero transplanting.
Cold-bred seeds con.

5. Treat normally with irrigation, soil fertility, etc.: don’t baby these crops

6. Subject the plants to non-destructive or destructive harvesting, but NEVER high-grade breeder areas


8. Let winter happen
Cold-bred seeds con.

9. Come spring, kill as many surviving runts as possible before any flowering starts (paternal selection)

10. Let the remaining superior plants form your new breeding population

11. Harvest superior mother plants from these (maternal selection)
Four Other Winter Forces in Breeding the Winter Crops

1. **Rhizoctonia** (wirestem) and **Phoma** (blackleg) are insidious adversaries in cold waterlogged fields. Especially bad with collards, kales, cabbages, and the other waxy-leafed brassicas. **SOLUTION:** Actively destroy susceptible individuals, and solve soils’ drainage problems.
2. Insect outbreaks in August or September can ruin your seedlings, way before you and winter can select for freeze hardiness. Consider Remay or chemical protection. Example: our frequent loss of Brussels and cabbage seedlings, late August and September.
Pitfalls con.

3. Our overall winter cropping system and superior genelines will **not** help you for spring-sown brassicas. We do no more than 3 Ac of these, as our Aprils are often really hot and flea beetles frequently reappear in late March. And we haven’t selected against warm-season pests.
Pitfalls con.

4. Ice is a killer, much more so than snow. Ice coatings of greater than \( \frac{3}{4} '' \) can doom many an early-generation breeding project. Population sizes need to be much higher than for summer crops. The absolute minimum number of plants per brassica geneline that we start with before the real cold begins is 2000 (maybe a bed 4’ x 80’) and typically is 40k-80k.
The minimum harvested for seed after winter has rogued out the weak is 50 mother plants, and we preferably harvest 200 – 10,000 superior mother plants per line, come the spring seed production phase. *Recurrent Mass Selection.*
Superb CSA box, January ’05: forced quince, Chantenay carrots, cilantro, many greens
Chinese-Thick Stem Mustard

One of our best survivors. Outstanding flavors, versatile in salad and cooking mixes, very fast re-growth and heavy leaves. Pretty purple scarring, so great for cut-and-come-again.
Just lovely. And to sell 'em, you better feel that way too.
Our Brassica Breeding Failures

From Utter Death or Premature Bolting:

- Brussels sprouts
- Cauliflower
- Bok choy (contrast with our pac choi)
- Large-heading Broccoli
- Piricicaba (an heirloom rapini/broccoli)
Exciting New Successes

To keep our wholesale and CSA customers from getting bored, we have bred winter hardiness into:

- Pac choi
- American Rapa
- Michihili
- Coletto Viola and White Egg Turnips
Recent Even’ Star Successes

- Heirloom Rutabaga
- Maruba Santoh

And Borderline But Promising Gains In:

- Mizuna
- Fun Jen
- Italian Rapini
**The Flavors**

- **Our own genelines:**
  - **LAND**
  - **RACE COLLARDS**
  - **CHINESE THICK STEM MUSTARD**
  - **ICE BRED ARUGULA**

*(Fedco Seeds will offer more next year)*
Role of Hybrids in Even’ Star Breeding

More central role in summer tomato breeding for disease tolerance (the blights and *Septoria*)

**Winter:**

1. One very intentional hybridization stage: our arugula, to prevent inbreeding depression
2. A second intentional: Purple Fire Mustard
3. A fortuitous unintentional: New Star Mustard
To Jump-Start Your Own Freeze-Hardy Breeding

- Buy ours from Fedco Seeds
- Buy directly from Even’ Star, but need 1 lb/variety minimum orders. Suggestion: an hoc buyers’ co-op, then split up the seed. Must order before April 30th for Aug./Sept. plantings. Email us at: evenstarfarm@evenstarfarm.org, with “ wholesale seed list” in the subject line.

- QUESTIONS?