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Perennia, in conjunction with Horticulture Nova Scotia, regularly administers a variety of research projects to assist farmers in exploring new varieties of crops, improving on existing crops, determining best management practices, and managing crop pests. Approximately every two years, berry and vegetable research priority selection sessions bring together berry and vegetable growers to determine what these projects should encompass. An online survey was administered to the berry growers December 2019 through February 2020 to determine research and industry priorities for vegetables.

In some cases, the selected priorities have been extensively researched. The fact that the industry still selects these as a priority could indicate several important points:

- 1. The research that has been conducted is not being communicated well to growers
- 2. The research that has been conducted is impractical in an applied setting
- 3. There is a need for greater depth and/or breadth of research of the selected priority

A summary is presented below of the findings as determined by this survey and through discussion with growers and industry stakeholders.

Methodology

Survey questions were formatted to determine specific crop needs and to address issues that pertain to each crop. Past industry survey responses were used to generate the questions for this survey, allowing for further refinement of industry and research priorities for Nova Scotia vegetable growers.

Respondents

The survey had 14 participants, representing over 18 vegetable crops. Separate sections addressed the priorities for crops grown in protected structures in both soil-based and soil-less systems. Approximately half of the respondents were either organic or used predominantly organic practices and farm smaller acreages. It is important to bear in mind that while conventional and organic research and industry priorities sometimes do overlap (prioritizing system resiliency and soil health for example), pest management strategies are often divergent priorities. For further clarification of any priority, it is recommended that you contact the relevant Perennia Specialist.





General agronomy and overarching priorities

There were many areas that were identified as priorities. The top 5 priorities across all vegetables are:

- Soil quality/health
 - Making production systems sustainable and regenerative
- Integrating cover crops
- System resiliency (in the face of extreme weather conditions, etc.)
- "Greener" production practices
- Improved fertility management



Other priorities mentioned at least twice as relates to <u>general agronomy</u> and other overarching priorities, in no particular order were:

- Erosion management
- Improved rotations for better weed management
- Improved crop rotation for better insect pest management
- Irrigation

Other general agronomy priorities mentioned by growers:

- Wireworm management
- Energy efficiency
- Carrot rust fly control





Production and Processing

There were many areas identified as priorities for production and processing. The top 5 across all vegetables are:

- System resiliency (in the face of extreme weather conditions, etc.)
- Sustainable packaging
- "Greener" production packages
- Food safety (irrigation and wash water quality)
- Shelf life enhancement (production, packaging, post-harvest handling, storage)



Other priorities mentioned at least twice as related to production and processing for vegetables, in no particular order were:

- Marketing
- Market research for new crops/products
- Consumer education
- Energy efficiency

Other production and processing priorities mentioned by growers:

• Tracking production to time, location, and person, for food safety





Brassicas

There are over 900 acres of Brassicas cultivated in Nova Scotia. The top priorities for Brassica crops are:

- Disease and insect modeling and forecasting
- Optimizing fertility
- Transplant production

Other Brassica crop priorities mentioned in no particular order:

- Foliar nutrition (micronutrients, tissue testing)
- Soil health
- Direct seeding (broccoli, cabbage)
- Shelf-life extension
- Cabbage maggot
- Novel products (minis, colours, etc.)
- By-products (uses for waste, etc.)
- Uniformity in harvest (variety, management, shorter harvest period)
- Reduced tillage

Carrots

There are over 1500 acres of carrots grown in Nova Scotia. The top priorities for carrots are:

- Weather based pest forecasting (Alternaria, carrot weevil, carrot rust fly, etc.)
- Fertility and soil enhancement
- Minimum-till systems
- Linuron replacement
- Cultivar evaluations
- Post-harvest storage
- Nematode management
- Crop rotations for pest management





Onions

There are over 570 acres of onions grown in Nova Scotia. The top priorities for onions are:

- Soil amendments (wood ash, compost, biochar)
- Organic matter enhancement
- Fertility research
- Cultivar evaluation
- Bio-fumigation (for wireworm and disease management)

Other onion priorities that were mentioned, in no particular order:

- Stemphylium
- Bacterial rot
- Weed management (chickweed, cleavers, etc.)
- Downy mildew
- Fusarium basal rot
- Weather based pest forecasting (thrips, foliar diseases)
- Wireworm management

Lettuce

There are over 250 acres of lettuce grown in Nova Scotia. The top priorities for lettuce are:

- Non-traditional market products (romaine hearts, wraps, leaf mixes, frisée, radicchio etc.)
- Cultivar evaluation
- Fertility management (losses during heavy rains)
- Weed control in salad mixes

Other lettuce priorities that were mentioned, in no particular order were:

- Bottom rot (Rhizoctonia) management
- Tarnished plant bug management

Cucurbits

There are over 580 acres of cucurbits grown in Nova Scotia. The top priorities for vine crops are:

- No-till cover crops (weed control)
- Cucumber beetle management
- Erosion control (strip cropping, wind breaks, mulching between rows on plasticulture)
- Cultivar evaluation
- Production system (plasticulture/season extension)
- Squash bug management





Potatoes

There are 1700 acres of potatoes in Nova Scotia. The top priorities for potatoes are:

- Skin set for early harvest
- Wireworm control
- Organic matter management
- Pesticide resistance management

Other potato priorities that were mentioned, in particular order were:

- Nematode management
- Cultivar/variety evaluation
- Post-harvest storage issues (disease, sprouting)
- Dealing with poor seed quality
- Soft rot

Beets

There are approximately 150 acres of beets grown in Nova Scotia. The priorities are:

- Uniform density
- Fertility (nitrogen management, foliar application of micronutrients, promoting strong top growth for mechanical harvest)
- Cultivar evaluation (new varieties, colours, disease resistance, etc.)
- Disease (scab, Cercospora greens)

Rutabaga/Turnip

There are approximately 150 acres of rutabagas and turnips grown in Nova Scotia. The top priorities for rutabagas and turnips are:

- Fertility and soil enhancement
- Cabbage maggot control
- Weed control
- Foliar product for enhancing top growth (ease of harvest, sunburn protection)





Tomatoes/Peppers

There are over 100 acres of field-grown peppers and field-grown tomatoes in Nova Scotia. The priorities for field-grown peppers and tomatoes are:

- Production systems in plasticulture/tunnels (season extension, pruning, staking, trellising)
- Disease management forecasting for bacterial speck, early/late blight
 - Bacterial disease control
- Cultivar evaluation
- Silica for disease management
- Weed and erosion control through strip cropping, wind breaks, mulching (between rows in plasticulture), cover crops
- Fertility in hoop houses/tunnels (organic and conventional)

Spinach

There are approximately 30 acres of spinach being grown in Nova Scotia. The top priorities for spinach are:

- Nutrient management (high density crop, foliar applications)
- Shelf-life enhancement production practices/packing materials/handling
- Food safety (irrigation water, wash water, handling)
- Cultivar evaluation

Other spinach priorities, in particular order were:

- Weed control (no viable herbicides PHI for baby spinach)
- Multi-harvest economics
- Consistent germination

Snap Beans

There are approximately 200 acres of snap beans in Nova Scotia. The top priorities for snap beans are:

- Cultivar evaluation
- Post-harvest storage
- Inoculants
- Season extension
- Packaging vs bulk





Radish

There are approximately 10 acres of radishes grown in Nova Scotia. The top priorities for radish are:

- Cabbage maggot control
- Pesticides (short PHI)
- Insect netting
- Timing for winter production
- Weed control
- Harvest technology
- Cultivar evaluation
- Seed production

Celery

There are over 10 acres of celery grown in Nova Scotia. The top priorities for celery are:

- Cultivar evaluation
- Celery leaf curl, blackheart
- Bacterial rot
- Production systems (overhead/drip, spacing, fertility, size, plastics, covers)
- Linuron replacement
- Shelf life extension (post-harvest handling/storage)

Garlic

There are currently approximately 10 acres of large-scale conventional garlic being produced in Nova Scotia, plus numerous smaller acreages spread among small-scale and/or organic farms. The top priorities for garlic are:

- Storage issues (post-harvest diseases)
- Good quality seed garlic (free from nematodes, fusarium basal rot, viruses)
- Weed control (mulches, plasticulture)
- Fusarium basal rot
- Fertility
- Nematode management
- Cultivar evaluation
- Market development
- Development of cloves (#)
 - Plant stress
 - Planting timing, depth
 - Winter weather





Swiss Chard

There are currently 2 acres of Swiss chard being grown by larger-scale conventional farms in Nova Scotia, plus numerous smaller acreages spread among small-scale and/or organic farms. The top priorities for Swiss chard are:

- Diseases (Cercospora leaf spot, other)
 - Leaf curling
- Cultivar evaluation
- Production systems (beds/tunnels/peat)
- Overwintering best practices
- Tarnished plant bug management

Asparagus

The top priorities for asparagus are:

- Weed management
- Production systems
- Fertility

Peas

The top priorities for peas are:

- Consistent germination
- Organic seed treatment

Specialty Vegetables

There are numerous types of specialty vegetables being grown in Nova Scotia with a wide-ranging number of acres. Current speciality vegetables range from 80 acres of Chinese cabbage to smaller acreages of eggplant, fennel, dandelion greens, celeriac, collards, ground cherries, etc. Priorities across all "speciality" vegetables are:

- Cultivar evaluation
- Production systems
- Shelf life enhancement (temperature, packaging/storage/handling)
- Weed control
- Spoilage organisms post harvest
- Market development



High tunnels, caterpillars, low tunnels (soil-based systems)

Numerous crops are grown in high tunnels, caterpillars, and low tunnels using a soil-based system in Nova Scotia. Across all those crops, the top priorities for these systems are:

- Disease management
- Reduced tillage

Other priorities for crops grown in high tunnels, caterpillars, and low tunnels, in no particular order were:

- Fertigation
- Phosphorus management
- Cultivar evaluation
- Pollination
- Insect management
- Weed management
- Salinity management
- Winter production

Greenhouses (soil-less systems)

Greenhouse production encompasses a variety of crops, with tomatoes, cucumbers, and peppers predominating. Across all greenhouse grown crops, the top priorities are:

- Sap testing
- Disease management
- LED lighting
- Fertigation
- Cultivar evaluation
- Integrating IPM practices

Other

There is also significant sweet corn (\sim 90+ acres), and sweet potato (\sim 40+ acres) in Nova Scotia, however, none of the growers responded to the survey. Should there be interest in conducting research on these crops, please contact Perennia.





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Perennia

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Operational since 2001, Perennia has a 94-member team including specialists with expertise in areas of horticulture, livestock, field crops, product development and commercialization, quality and food safety, as well as professional skills in such areas as facilitation, adult education, information technology and communication. Perennia offers a wide range of production and development services to farmers, agribusinesses, co-operatives, industry associations, universities, and government. From its offices in Kentville and Truro, Nova Scotia, Perennia provides advice through workshops, field days, in-depth projects, and one-on-one consultations.

Horticulture Nova Scotia

Horticulture Nova Scotia was formed in 1998 and is a not-for-profit association. Horticulture Nova Scotia works with other horticultural interest groups to further the needs and interests of the horticulture industry. Horticulture Nova Scotia aims to promote unity and cooperation within the research community and to facilitate the identification of research priorities that will benefit the horticulture industry.



