

Background Briefing Document

# **Organic Science Prioritization Process, Including Results of the Strategic Research Prioritization Process**

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## Acknowledgements

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*Agriculture and Agri-Food Canada (AAFC) is pleased to participate in the production of this OACC Canadian Organic Needs Assessment Survey. AAFC is committed to working with our industry partners to increase public awareness of the importance of the agriculture and agri-food industry to Canada. Opinions expressed in this document are those of OACC and not necessarily those of AAFC.*



## The Strategic Science Development Process

Beginning in July 2007, the OACC initiated a national process for determining strategic areas for organic research in Canada. The process included the following components:

1. Trend analysis
2. Opportunities and Threats; Strengths and Weaknesses
3. Farmer survey
4. Prioritization process
  - a. List of potential research questions
  - b. Establishing criteria for success
  - c. Rating the impact of research questions against criteria

- d. Prioritizing based on impact, likelihood of success and cost/time

### 5. Inventory of organic research(ers) in Canada

This process was conducted with the input of the Expert Committee on Organic Agriculture. This document presents the results of the prioritization process shown in part 4 above. The results shown below were used primarily as supporting documentation for identifying priority research areas in a proposal for a national strategic research initiative in organic agriculture. The results herein were one component considered, and are not intended to be the definitive priorities for determining strategic research areas.

## Methods for Determining Science Categories, Impact Criteria, and Weighting

This step of the organic research prioritization process was intended to build on the farmer survey that was conducted. In summary, a variety (11-25) of research topics were identified for each of 9 subject categories. The potential impact of these research topics were then ranked against up to 9 criteria which the Expert Committee on Organic Agriculture identified as important areas where impact was needed. Researchers, professionals, farmer groups, and other stakeholders were then asked to participate in ranking the potential impact of different research topics, along with identifying the likelihood of success and the time to carryout such the projects. Further details are described below.

The following table shows 3 items relating to the research prioritization process we went through:

1. In the first column we see the list of research categories (soils, plants, sustainability, etc). In each of these categories we had 12-25 research questions that were derived from a combination of the survey of farmer research needs, a review of research needs in organic in other geographic regions and conventional groups, ideas obtained through exposure to the sector over the past few years.
2. The top row shows the criteria for success that were established by the Expert Committee on Organic Agriculture (ECO). Each of the research

questions shown above were rated on a scale of 1-10 for the impact that the research question would have on the criteria (10 being highest).

3. The numbers in the table indicate the weighting of the research criteria which varied depending on research category. The higher the number, the higher the weighting that was placed on a criteria. The ECOA had recommended a weighting system to allow more emphasis to be placed on selected criteria (example production, profitability and capacity building for example).

The impact factor of a research question was calculated from all of the respondents, and accounted for the weighting in table 6. The results of the process are shown by category in tables and graphs beginning with "Soils". In the results part of the document, the first column of the table within the category shows a project identifier. Then it shows the Farmer Survey result. The ECOA had asked that we show how the results of the prioritization process reflected the results of the farmer survey. The questions were not the same across the two surveys, and in some cases the questions were consolidated in the prioritization survey. As a result you may see for example FR 1,2,5/20. This means the farmer needs survey identified ranked needs relating to the prioritization question as 1,2, and 5 out of 20 research needs in that category of the farmer survey.

In some cases "QC" is shown, which indicates priorities identified in a separate process in Quebec.

The last column in the tables of the results section, shows the numerical impact factor. This is the value that was calculated from the prioritization ratings and the weighting process. The projects are listed from largest

impact to smallest. The bubble graphs show the likelihood of success of the projects, and the estimated amount of time to complete the project on the axes. The size of the bubbles represent the amount of impact. This is a way to visually assess the project for their potential. Large bubbles in the top left, for example, represent projects that are likely to succeed in a shorter time frame and will have large impact.

**Weighting of impact criteria for each research subject area. Higher numbers have higher weighting and therefore will have a larger influence on the impact factor shown in the following sections.**

	<b>Farmer gross margin</b>	<b>Increase capacity for sales</b>	<b>Increase production</b>	<b>Animal Welfare</b>	<b>Reduce envir. risk</b>	<b>Char. &amp; support EG&amp;S</b>	<b>Inform policy makers</b>	<b>Positive social climate</b>	<b>Evol. of organic</b>
<b>Soils</b>	4	4	4		3	3	1	1	1
<b>Plants</b>	4	4	4		3	3	1	1	1
<b>Animals</b>	3	3	3	5	2	2	1	1	1
<b>Ecol. Systems</b>	2	2	2		6	6	1	1	1
<b>Sustainability</b>	2	2	2		6	6	1	1	1
<b>Policy</b>	1	1	1		3	3	4	4	4
<b>Market</b>	2	2	2		6	6	1	1	1
<b>Health and Food</b>	2	2	2		6	6	1	1	1
<b>General</b>	1	1	1	1	1	1	1	1	1

## Identifying Strategic Research Areas – Considerations

1. Must increase **Profitability** and **Competitiveness** of Canadian agriculture (through **Transformative Innovation**)
2. Must be able to show **progress and impactful results** by 2013 (but some research can be longer term)
  - a. Addresses **barriers**:
    - i. Limiting transition
    - ii. Limiting productivity/efficiency
    - iii. Limiting market access
  - b. Captures **opportunities**
    - i. New markets
    - ii. Trends in social, technological, economic, environmental, political
  - c. Potentially **measurable** impact on indicators of profitability and competitiveness
    - i. Retail sales
    - ii. Farmer number, size, sales, costs, net return
  - d. Note: impact extending beyond organic is very helpful
3. Must consider **feasibility**:
  - a. Time
  - b. Cost
  - c. Likelihood of Success
  - d. Scientists available
  - e. Building on existing research programs

### Recommendations:

A balance of projects is needed that produce short-term impactful results while also exploring and capturing the values (environmental, health, ethical, and social) that drive organic.

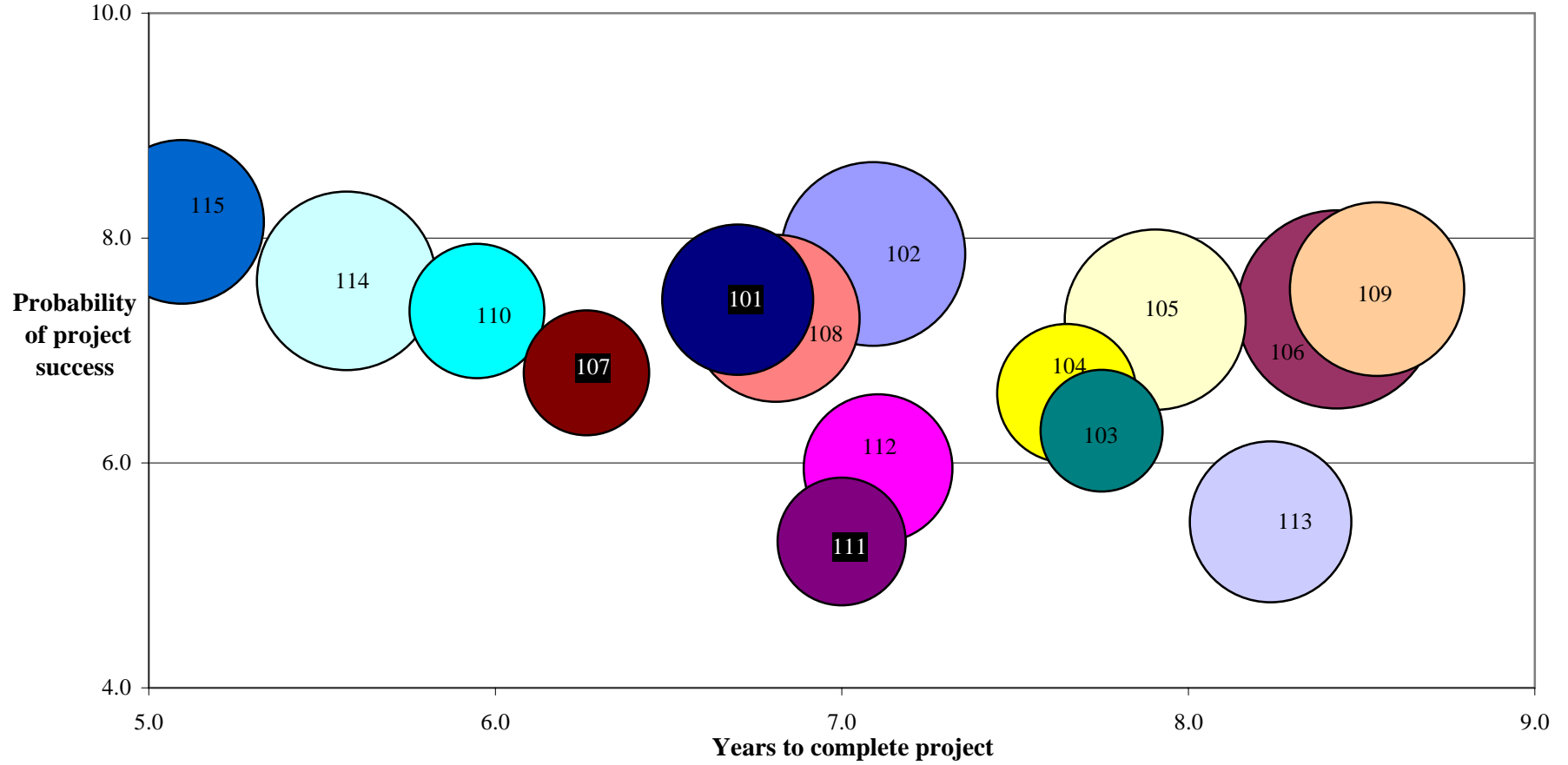
Need to identify:

1. Short-term high-impact projects that specifically address barriers with high likelihood of success (30%)
2. Innovative projects developing or testing products or tools that will increase competitiveness and profitability (lower likelihood of success) (20%)
3. Short-term projects which characterize environmental goods and services and efficiencies in production (higher likelihood of success) (15%)
4. Integrated projects which link management with ecological interactions among soil, plants and animals (longer term, lower likelihood of success) (35%)

## General Project Areas

Identifier	Project	Impact
106	Develop integrated production systems that reduce pest pressure from weeds, insects, disease and parasites.	6.7
102	Reduce the risk of transitioning to organic production through the development of new management systems or production aids.	6.3
105	Develop integrated production systems that increase yield and yield stability.	6.1
114	Identify key characteristics of the organic production system that are of value to the consumer.	6.1
109	Develop and/or identify livestock breeds and/or crop varieties that are adapted to organic management.	5.9
108	Identify practices that reduce energy requirements on the farm.	5.7
115	Identify key characteristics of the organic production system that are of value to the farmer.	5.6
113	Further our understanding of the complex interactions in organic production systems.	5.5
101	Attract and support new entrants to agriculture	5.1
112	Extend the length of time that the organic sector can supply high quality Canadian produce to retail markets.	5.1
104	Develop and/or identify substances that reduce pest pressure from weeds, insects, disease and parasites.	4.7
110	Identify ways to reduce losses or reductions in quality during the storage and handling of organic agricultural products.	4.6
111	Identify and/ or develop organic products with novel traits of interest to consumers of organic products.	4.4
107	Identify practices that reduce labour requirements on the farm.	4.3
103	Develop and/or identify substances that increase yield and/or the potential for yield stability.	4.1

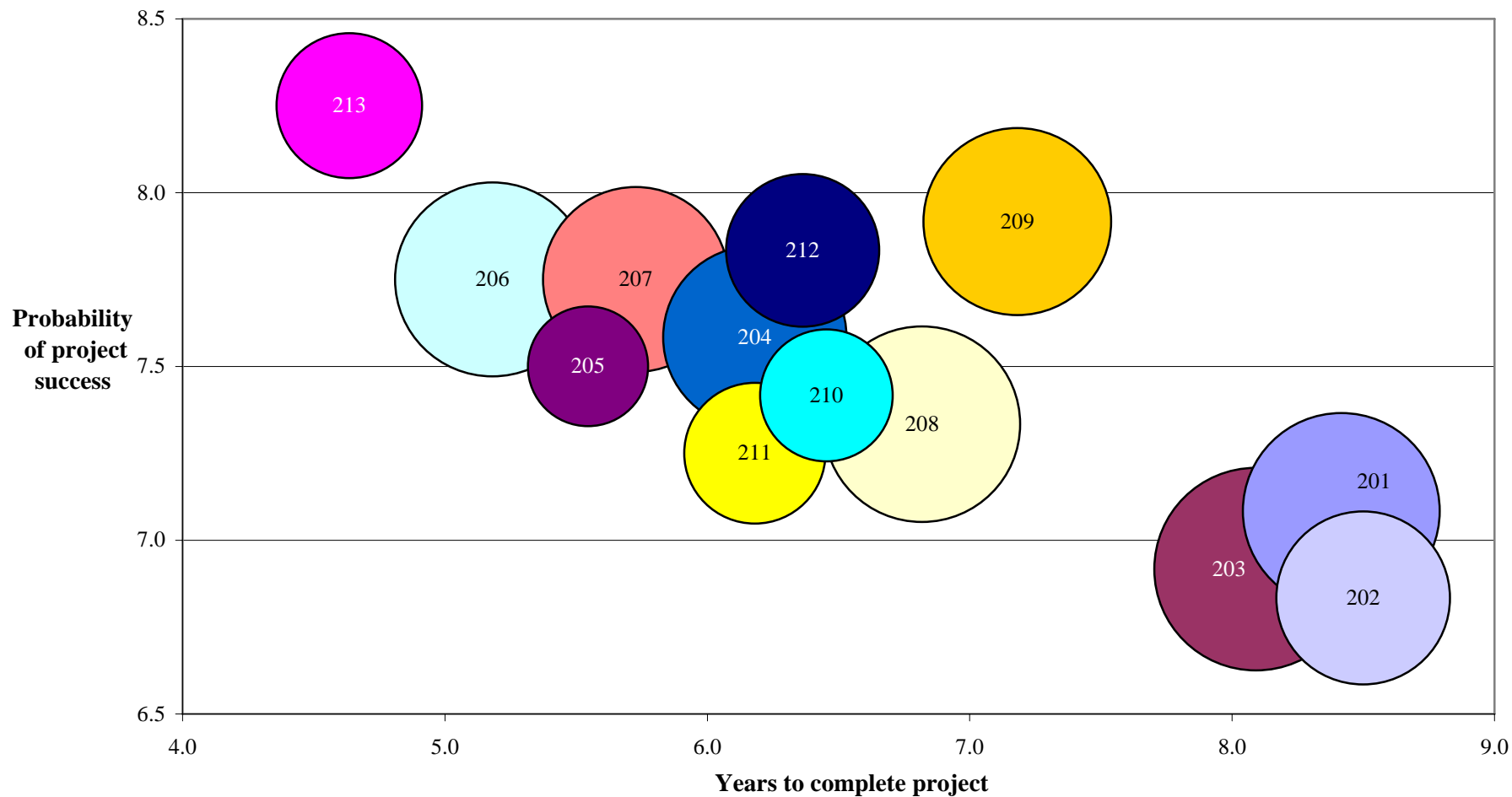
### Prioritization of organic sector projects- General (n=45)



## Soils

Identifier	Farmer Rating	Project	Impact
203-	FR 2/8	Identify integrated management practices to optimize soil quality as a substrate for crop growth	18.0
201-	FR 1/8	Identify or develop crop rotations that sustain soil fertility and meet overall regional yield averages	17.4
208-	FR 1/8	Identify integrated management practices for optimizing soil nitrogen in order to maximize economic crop yields	17.3
206-	FR 3/8	Develop nutrient budgeting tools that account for whole farm nutrient flows and/or nutrients contributed by different crops and amendments	17.2
209-	FR 3/8	Identify the risk of soil phosphorus depletion under regionally specific organic management systems and potential solutions for organic producers	16.6
207-	FR 7/8	Develop fertilization strategies for crops with high nutritional requirements while minimizing the environmental risk of applying excess nutrients	16.4
204-	FR n/a	Identify or develop organic farming techniques that can maintain soil quality and build soil organic matter with routine mechanical weed control	16.2
202-	FR 2/8	Explore specific cover crop sequences or mixtures interact with soil biota to stimulate plant resistance mechanisms and influence nutrient uptake	15.3
212-	FR n/a	Determine the amount and timing of nutrient release from different soil amendments and their efficacy in terms of improving plant nutrition	13.5
213-	FR n/a	Identify viable growing mediums and nutrient sources that are suitable for organic greenhouse and transplant production	12.9
211-	FR 6/8	Determine the nature and extent of deficiencies of macronutrients as possible links to the nutritional quality of foods	12.5
210-	FR 6/8	Determine the nature and extent of deficiencies of micronutrients and possible links to the nutritional quality of foods	11.7
205-	FR 4/8	Conduct efficacy testing on products marketed as soil microbial stimulants or biological enhancers	10.6

### Prioritization of organic sector projects- Soils sector (n=27)



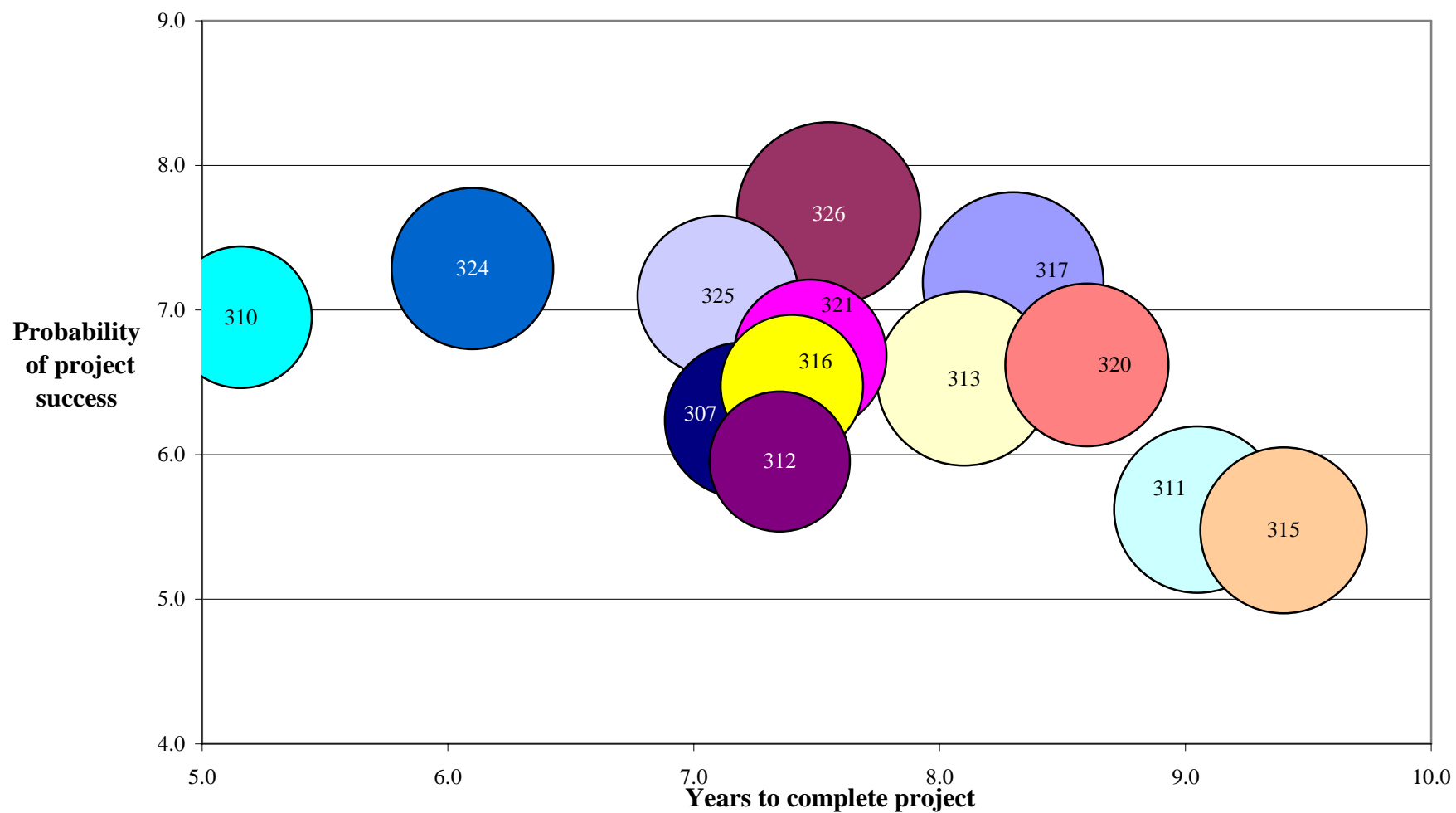
\*FR entries in the legend refer to farmer ranks identified by the Final Results of the First Canadian Organic Farmer Survey of Research Needs in 2008

† QC entries in the legend refer to priority projects identified by the Organic Agriculture Committee of the Quebec Agriculture and Agri-Food Reference Centre

## Plants

Identifier	Farmer Rating	Project	Impact
326-	FR 1,2,3/20 (QC)	Identify and/or develop integrated approaches to weed management	17.7
317-	FR 1,2,7,8 & 18/20 (QC)	Integrated approaches to insect management to reduce yield losses due to disease by >80%.	17.5
313-	FR 9/20 (QC)	Integrated approaches to disease management to reduce yield losses due to disease by > 80%.	16.9
311-	FR 12/20 (QC)	Identify and/develop crop cultivars to reduce harvestable yield losses due to disease by >80 %.	16.2
315-	FR 12/20 (QC)	Identify and/or develop crop cultivars to reduce yield losses due to insects by at least 80 percent.	16.1
320-	FR 6,12/20 (QC)	Identify and/or develop crop cultivars with a competitive advantage against weeds.	15.8
324-	FR 10/20	Identify and/or develop mechanical, thermal or other weed controls to reduce losses by >80%.	15.6
325-	FR 10 and 16/20 (QC)	Develop reduced- and no-tillage organic systems of weed control & design suitable machinery.	15.6
307-	FR n/a	Develop marketable products and/or markets for cover crops used in organic management.	15.1
321-	FR 6,12/20 (QC)	Identify and/or develop cover crops with weed suppressive abilities.	14.8
316-	FR 20/20 (QC)	Identify and/or develop insect control products to reduce yield losses due to insects by >80%.	13.8
310-	FR n/a	Identify and/or develop organically acceptable means of reducing post-harvest storage losses.	13.7
312-	FR 18/20 (QC)	Identify and/or develop control products to reduce yield losses due to disease by at least 80 %.	13.6
318-	FR 5/20	Develop cultural practices to activate induced systemic resistance in crops.	13.4
327-	FR 2/20 (QC)	Refine soil fertility management systems to minimize weed pressure.	13.1
323-	FR 19/20 (QC)	Identify or develop weed control products with at least 80 percent efficacy.	12.7
319-	FR n/a	Develop insect pest thresholds for organic management systems.	12.7
314-	FR 18/20 (QC)	Analyze the risk of overuse of copper or sulphur fungicides and explore potential alternatives.	12.4
308-	QC	Determine the cost of production associated with different organic vegetable farming practices.	11.0
322-	FR 3/20	Investigate weed seed bank dynamics under organic management systems.	10.5
309-	FR n/a	Determine the effectiveness and economics of seed coatings including micronutrients, growth promoters and/or mycorrhizae.	9.5
304-	FR 4/20	Identify long-term cropping systems and/or rotations with higher yield and economic stability under variable climatic situations.	6.7
305-	FR 1/20	Develop intercropping systems, crop sequences & cropping practices with pulse crops & other legumes to increase N fixation.	6.2
306-	FR n/a	Conduct a detailed analysis of legumes in organic farming systems RE: strengths, weaknesses opportunities and threats.	6.0
301-	FR 12/20	Identify or develop crop cultivars and/or crop traits for organic management with a five percent yield advantage.	5.5
302-	FR 12/20	Develop perennial grain varieties for organic management systems.	5.4
303-	FR 1/20	Develop cultivars and/or rotations that reduce phosphorus requirements by 20 % but remain viable.	5.2

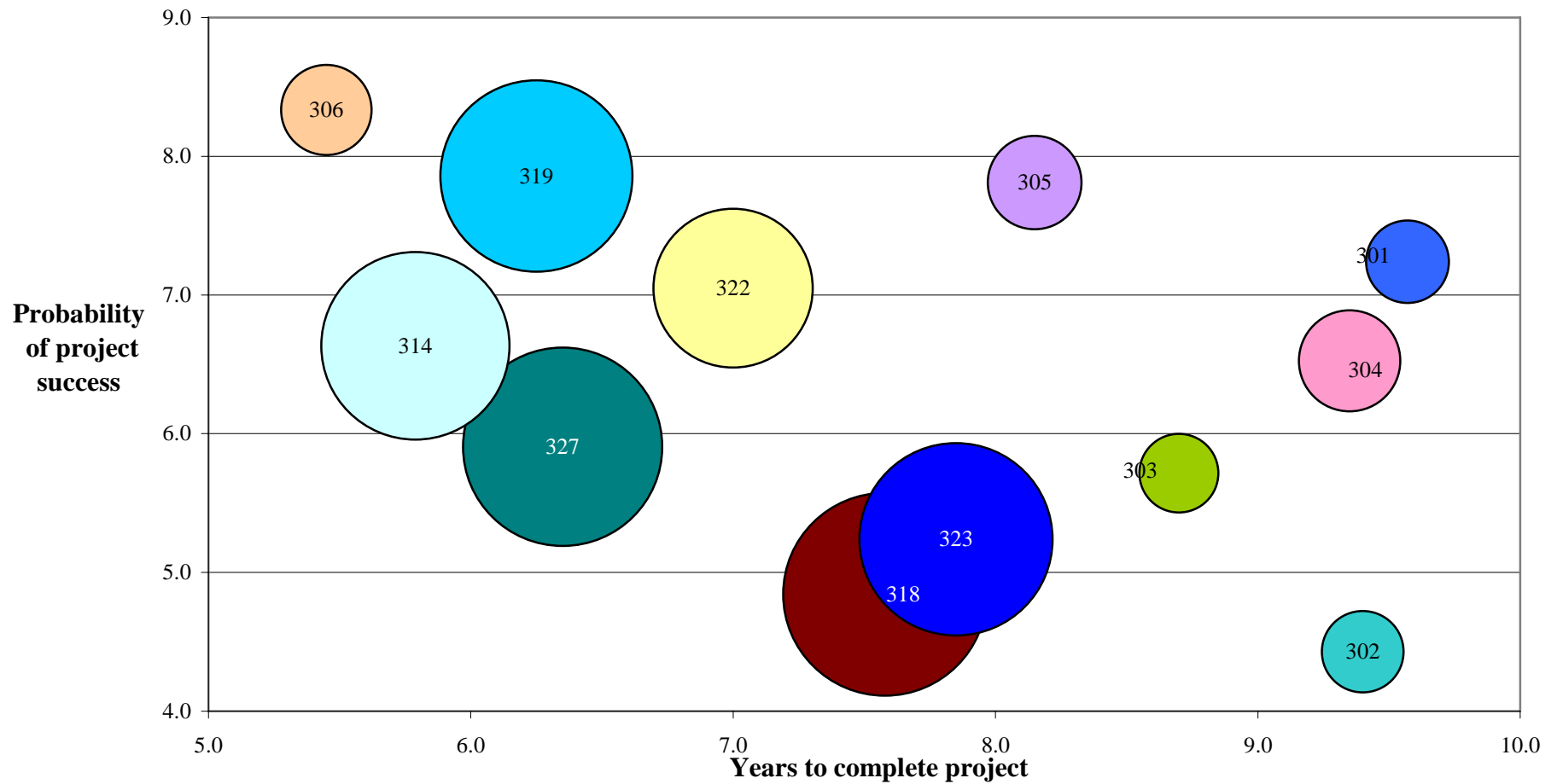
## Part 1: Rank 1-13: Prioritization of organic sector projects - Plants (n=37)



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**Part 2: Rank 14-27, Prioritization of organic sector projects - Plants (n=37)**



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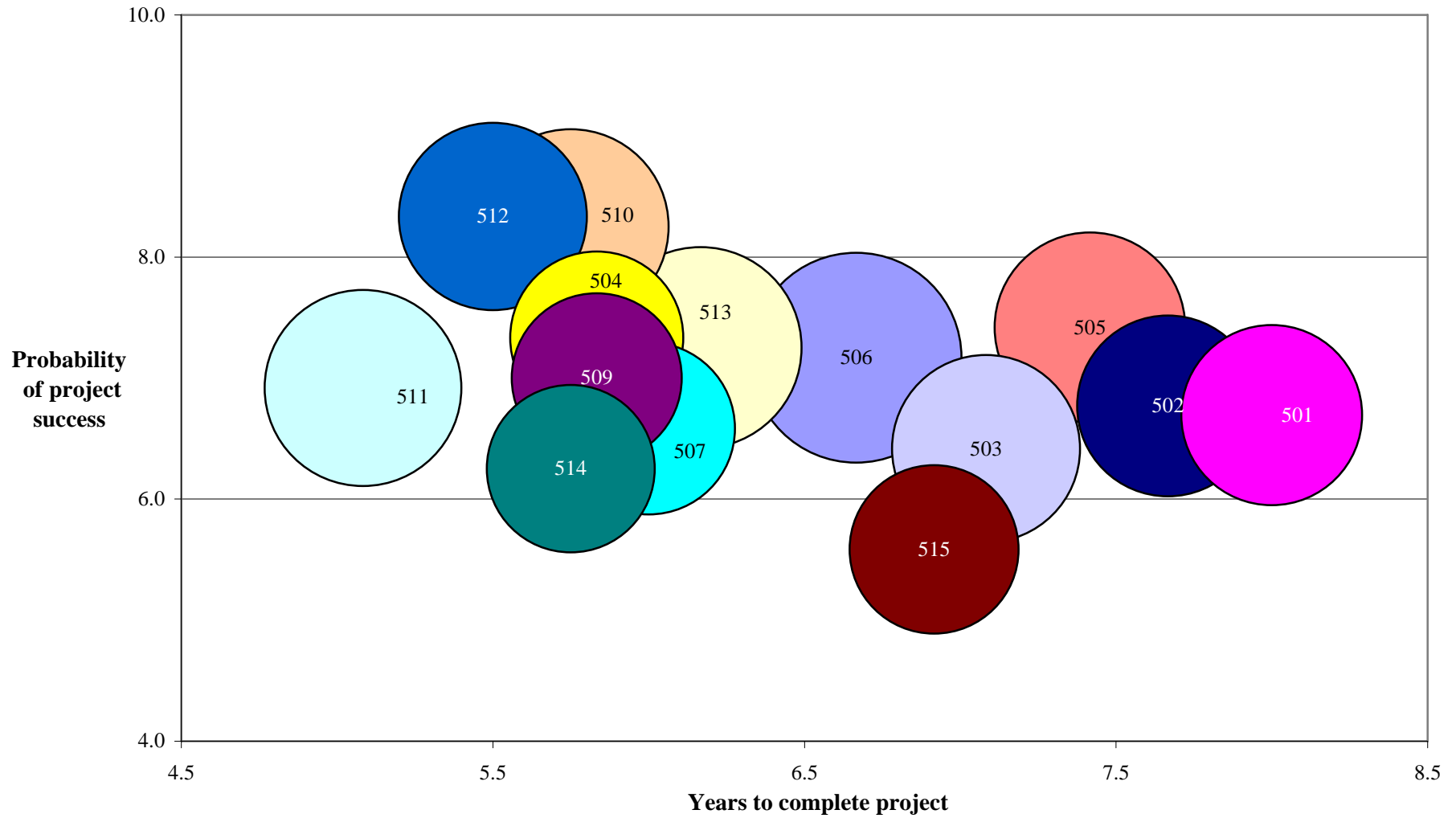
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## Ecological Systems

Identifier	Farmer Rating	Project	Impact
508	FR 1/5	Investigate long term effects of organic systems on crop yield, environmental impact, soil quality, nitrogen fixation, crop quality, and economic stability.	17.8
506	FR 5/5	Determine the impact of organic production practices on greenhouse gas emissions from farms and identify ways to reduce emissions by at least 20 %.	17.8
513	FR 4/5	Identify means of reducing the energy required to produce each calorie of food by at least five percent.	17.1
511	FR n/a	Compare the external costs of organic and non-organic production systems on natural capital.	16.6
510	FR n/a	Identify current management practices in organic systems that affect sustainability in terms of productivity, environment and economic return.	16.6
505	FR 1/5 and 3/5	Determine the impact of organic practices on soil quality, health, production capability and/or other biological properties.	16.1
512	FR 4/5	Determine the effect of scale and type of farm on energy use efficiency in organic systems.	15.9
503	FR n/a	Compare the ecological, physical and societal impact of organic production systems on water quality to high input non-organic agricultural systems.	15.9
502	FR 4/5	Develop a mechanism for increasing water use efficiency in organic crop production by at least 10 percent.	15.3
501	FR 2/5	Compare the biodiversity of wildlife, flora, microfauna and macrofauna above and below ground in organic and high input non-organic systems.	15.3
504	FR 1/5	Determine the ecological impact of manure, compost and green manures used in organic systems compared to synthetic sources of nutrients.	14.7
507	FR 5/5	Determine the amount of soil carbon captured by different organic production systems compared to that captured in high input non-organic systems.	14.6
509	FR 3/5	Assess the role of pollinators and level of risk to pollinators in organic systems compared to pollinator roles and risk in high input non-organic systems.	14.4
515	FR 2/5	Contrast long term cumulative and interactive impacts of synthetic pesticides applied at minimal rates with few products to high rates and many products.	14.3
514	FR n/a QC	Assess the optimal use of classes 1, 2, 3 and 4 land on organic farms for sustainable production of food, feed, fuel and fibre.	14.2

## Prioritization of organic sector projects- Ecological Systems (n=22)



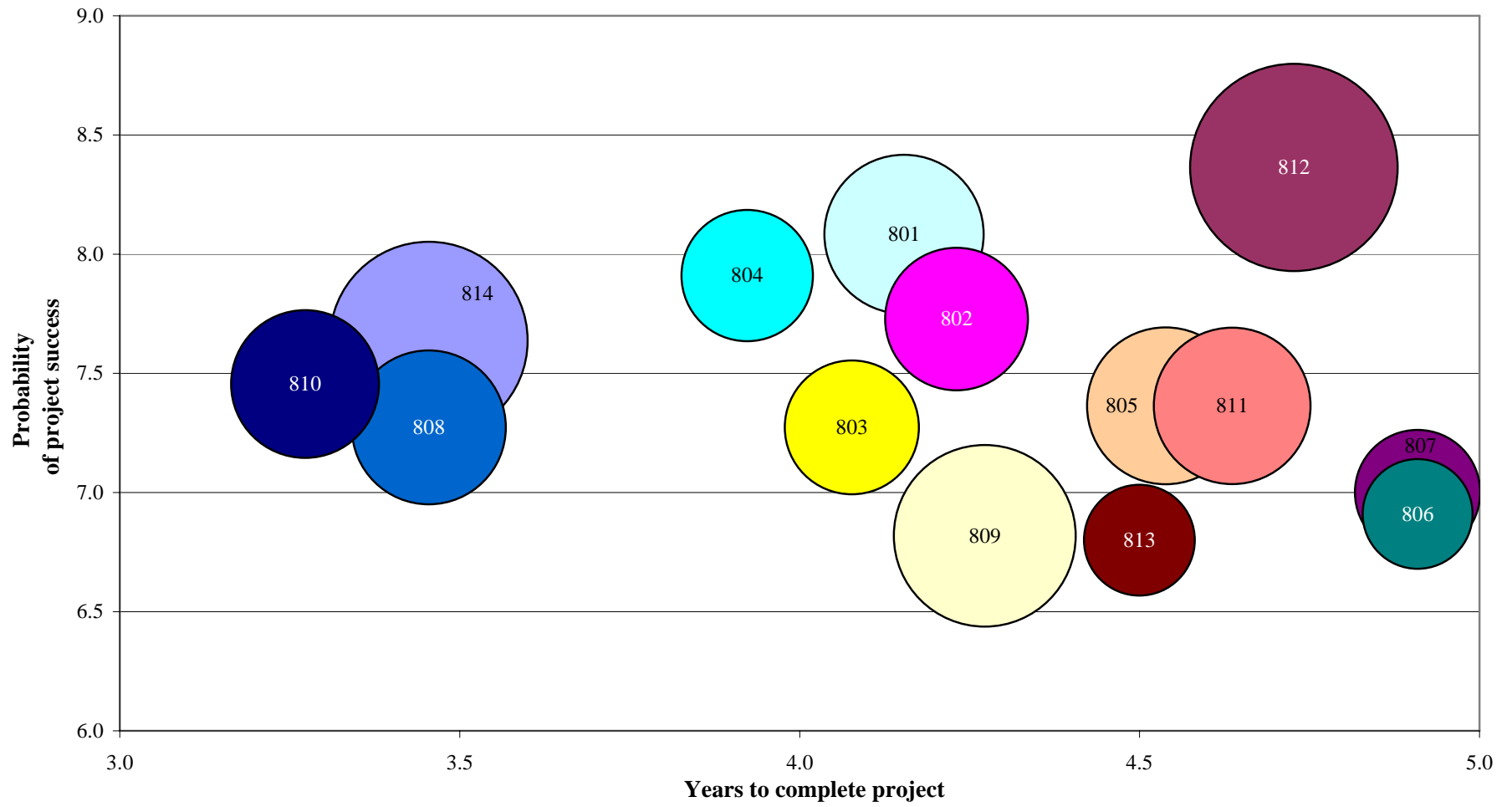
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## Sustainability

Identifier	Farmer Rating	Project	Impact
812	n/a	Investigate and identify opportunities for increasing Canadian processing of Canadian products.	14.8
814	n/a	Examine threats to the future of organic agriculture such as genetic engineering and nanotechnology.	14.2
809	n/a	Determine the feasibility of urban organic agriculture.	13.0
801	n/a	Determine the economic constraints and opportunities relevant to the viability of small- and medium-scale organic farms.	11.4
805	n/a	Develop transition and extension strategies based on a demographic analysis of Canadian organic farmers.	11.2
811	n/a	Identify ways to use organic agriculture to strengthen the relationship between rural and urban communities.	11.2
808	n/a	Determine the amount of vacant agricultural land by region and determine the potential for organic production of food, feed, fuel and fibre in these areas.	11.1
815	n/a	Create linkages with researchers in developing countries to support organic agriculture as a sustainable livelihood within each of a variety of biological regions.	10.9
810	n/a	Analyze consumer behaviour to determine the extent to which producer integrity has been affected in organic and high input non-organic agriculture.	10.6
802	n/a	Determine cost of production for both organic and non-organic production systems for crops and animals.	10.2
803	n/a	Determine if organic farms are more profitable than high input non-organic farms when there is no price premium.	9.6
804	n/a	Determine local and global trends in organic price premiums by product and region and the implications for organic farmers supplying these different markets.	9.4
807	n/a	Impact of new entrants to the market and supply trends in domestic and international organic products to determine the level of risk associated with downward price pressure.	9.0
813	n/a	Determine organic agriculture's potential risk of losing government support by comparing the GDP with the Genuine Progress Index.	7.9
806	n/a	Analyze rural population demographics and the resilience in order to determine if population trends in rural communities could affect organic production capacity.	7.9

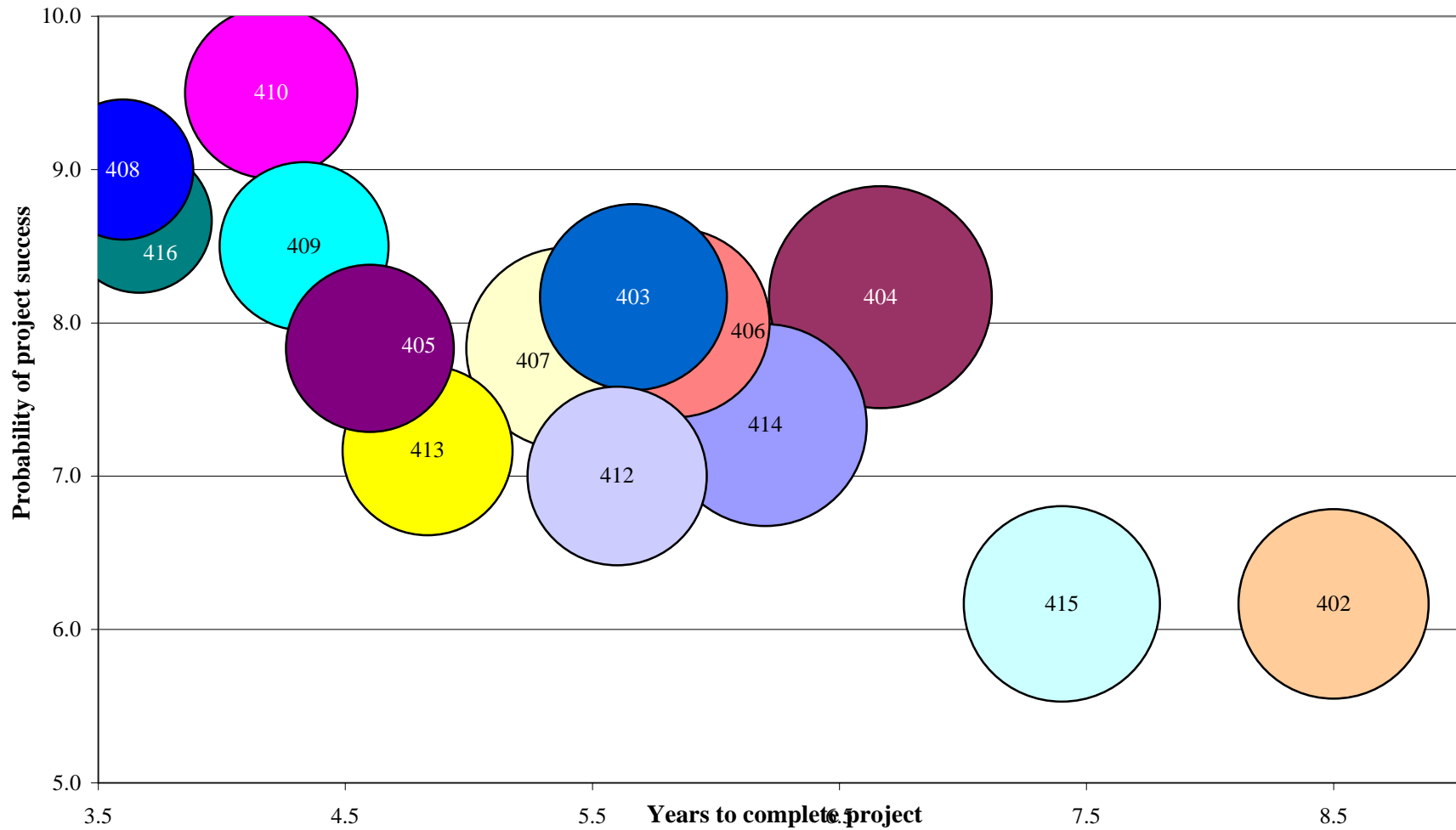
### Prioritization of organic sector projects- Sustainability (n=21)



## Animals

Identifier	Farmer Rating	Project	Impact
404	FR n/a	Identify and/or develop integrated management systems that optimize health, welfare, productivity, quality and profitability.	18.8
414	FR 1/7	Develop a pork, cattle and/or sheep management systems that reduce the incidence of parasite productivity losses.	17.2
407	FR 3/7	Optimize the nutritional balance of pasture and/or grain-fed livestock to improve their productivity and/or specific attributes.	17.2
415	FR 1/7	Identify products within the management system that are effective for controlling parasites, suppressing illness/disease and promote health.	16.6
402	FR 2/7	Identify and/or develop livestock breeds that are suited to organic management.	16.1
406	FR n/a	Identify opportunities for realizing greater efficiency and profit margins in livestock operations.	16.1
403	FR 1 and 5/7 (QC)	Identify and/or develop organically permitted substances that are effective in managing parasites and/or disease.	15.8
412	FR 5/7	Identify methods and/or systems to consistently reduce somatic cell counts in dairy systems to within acceptable limits.	15.2
401	FR 2/7	Identify and/or develop livestock breeds that are resistant to parasites and/or diseases.	15.0
410	FR 6/7	Identify the land area required per animal unit for sustainable production, optimum animal welfare and manure management.	14.6
413	FR 7/7	Develop an outdoor poultry management system that reduces the risk of avian flu to 'negligible' levels.	14.4
409	FR n/a	Identify organic forage and grain feeding systems that optimize the feed conversion ratio without jeopardizing animal health or welfare	14.3
405	FR 5/7	Identify and/or develop emergency health care treatments for poultry and livestock that are compliant with the Canadian Organic Standards.	14.2
411	FR n/a	Develop a welfare index for farm animals raised in organic systems that is compatible to that used in non-organic livestock management.	12.4
416	FR n/a	Develop methods of organic management to optimize the finishing of beef cattle.	12.3
408	FR 3/7 (QC)	Identify or develop feed and/or ingredients that contain organically acceptable vitamins and amino acids for livestock rations.	11.9

## Prioritization of organic sector projects- Animals (n=10)



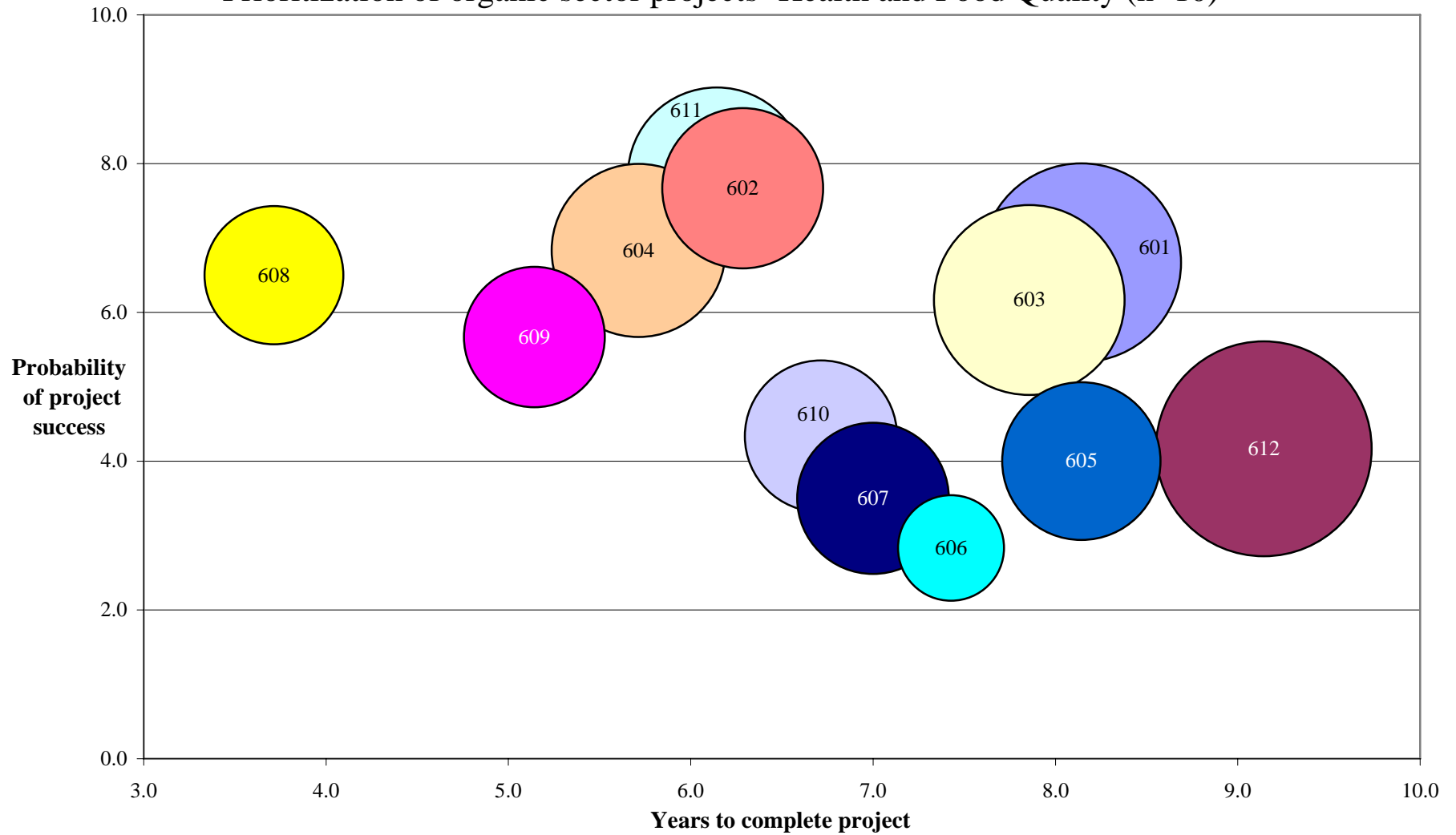
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## Health and Food Quality

Identifier	Farmer Rating	Project	Impact
612	FR 4/5	Determine the health risk associated with agricultural pesticide use as well as occupational, environmental, and/or food exposure to pesticides.	17.9
601	FRn/a	Identify key factors linking organic food quality with the quality of soils, amendments, plants and animals in the organic production system.	16.6
603	FR 1/5	Identify production practices that optimize the concentration of nutrients, antioxidants and other bio-constituents in food products.	15.8
611	FR n/a	Analyze post-harvest food storage and handling practices; develop mechanisms to increase shelf life and reduce the risk associated with post-harvest storage systems.	14.8
604	FR n/a	Determine the effects of organically permitted pesticide use on crop physiology and product quality.	14.4
602	FR 1/2	Determine the nutritional value, including the concentration of nutrients, antioxidants and other bio-constituents of Canadian organic food products.	13.4
605	FR 1/5	Determine if consumers with at least 75 percent of their food coming from organic sources are more resistant to illness or disease.	13.2
610	FR n/a	Investigate disease transmission risks from animals to humans and determine how disease transmission can be affected, controlled and managed.	12.7
607	FR 1/5	Determine the level of health risk reduction associated with the consumption of organic foods compared with non-organic food products.	12.6
609	FR 5/5	Determine the degree of risk associated with the level of microbiological activity in Canadian organic meat production when antimicrobial agents are not used.	11.7
608	FR n/a	Analyze food safety practices and determine whether or not the development of special safety practices would be required for organic food production systems.	11.5
606	FR 4/5	Determine the health risk associated with the consumption of natural secondary metabolites produced by plants in response to stress from insects and diseases.	8.8

Prioritization of organic sector projects- Health and Food Quality (n=10)



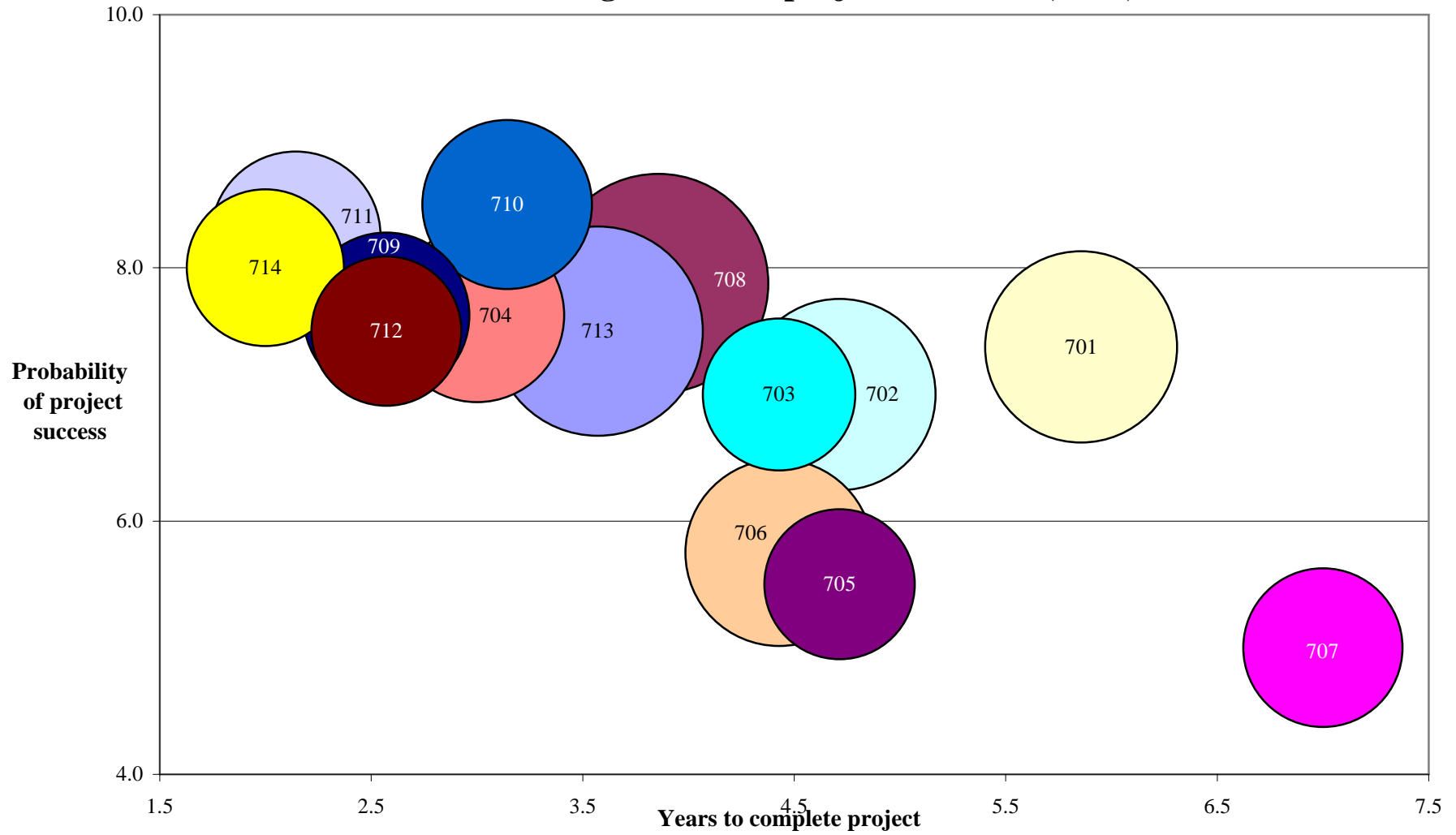
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## Marketing and Market Development

Identifier	Farmer Rating	Project	Impact
708	FR 4/19	Determine the impact and opportunities for alternative marketing models such as cooperatives, local marketing and fair trade goods.	16.1
713	FR n/a	Identify key opportunities for import replacement and sector development in Canada.	15.3
701	FR 8/19	Develop innovative approaches to processing or marketing organic products.	14.0
702	FR 14/19	Determine the feasibility of developing micro-processing facilities as opposed to accessing existing infrastructure (ie.access to value-added markets).	14.0
706	FR 6 and 7/19	Determine the market potential for organic fibres, fuels and pharmaceuticals and the making specific adjustments these current standards.	13.7
704	FR 4/19	Determine the potential for organic beverage production and/or processing in Canada.	12.7
710	FR 4 and 7/19	Identify trends and purchasing behaviour for Canadian organic markets: imports and exports markets and the nature of organic food distribution channels.	12.4
711	FR 13/19	Identify the best marketing strategies for Canadian organic products, impact of a Canada Organic Logo and emerging "branded production or labeling systems".	12.4
709	FR 4 and 5/19	Conduct a real-time analysis of organic market conditions that would include an analysis of products for import and export.	12.1
707	FR 8/19	Analyze novel substances for compliance with organic standards and the potential to use these substances as productions inputs.	11.6
714	FR n/a	Analyze the export of organic goods from Canada in order to create strategies for the development of the organic sector in Canada.	11.5
703	FR n/a	Develop practices for extending the shelf life of organic produce and assess the associated trade-offs.	11.1
705	FR 6 and 7/19	Determine the feasibility of developing a line of Canadian organic nutraceuticals and/or functional foods.	11.0
712	FR 15/19	Determine the potential for all Canadian organic production to meet the minimum standards for a "Fair Trade" designation.	10.9

### Prioritization of organic sector projects- Market (n=13)



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# Policy

Identifier	Farmer Rating	Project	Impact
903		Conduct a holistic analysis of organic agriculture in terms of social investment, employment, environmental impact economics and social well being, among other factors.	18.3
904		Analyze global initiatives in Ecological Goods and Services (EG&S) payment programs and determine their applicability to and impact on organic agriculture.	18.2
906		Make public policy recommendations for organic agriculture as a form of sustainable agriculture that is environmentally, socially and economically responsible.	18.1
902		Identify policies that increase organic production with the goal of increasing production by at least 25 percent.	17.7
905		Compare external costs of organic and high input non-organic production on natural capital (ie. off-farm costs and societal costs, etc).	16.3
910		Investigate the impact of different land use models and/or programs on land values and the availability of land for organic farming.	16.0
901		Investigate models for programs for new entrants to organic agriculture with the goal of increasing the number of entrants by at least 25 percent.	15.8
907		Assess the impact of Genetically Engineered (GE) crops on organic systems (i.e. GE threshold levels, contamination pathways, effects on pollinators and legislative models).	14.6
909		Assess the impact of nano-technology on organic systems.	14.3
908		Investigate alternative models of intellectual property ownership to ensure public access to genetic diversity in crop varieties used in the organic sector.	14.2

### Prioritization of organic sector projects- Policy (n=14)

