Deloitte.

Municipality of South Bruce Agriculture Business Impact Study

Deloitte LLC

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Contents

Cover photograph source: Bruce Federation of Agriculture

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Land Acknowledgement

It is acknowledged that the lands and communities discussed in this report are situated on the Traditional Territory of the Anishinabek Nation:

The People of the Three Fires known as Ojibwe, Odawa and Pottawatomie Nations. The Chippewas of Saugeen and the Chippewas of Neyaashiinigmiing (Nawash), now known as the Saugeen Ojibway Nation, are the traditional keepers of this land and water. It is also recognized that the ancestors of the Historic Saugeen Métis and Georgian Bay Métis communities shared this land and these waters.

1. Executive Summary

The Agriculture Business Impact Study was commissioned by the Municipality of South Bruce to address specific objectives outlined in the Study Charter (Appendix A):

- Identify the existing agricultural/agribusiness profile of the local[1] area.
- Identify the potential for of the Nuclear Waste Management Organization (NWMO) Deep Geological Repository (DGR) Project to change the agriculture/agribusiness operations.
- Identify potential strategies for use of the NWMO lands to facilitate new agribusiness entrants.
- If needed, identify potential strategies to address a reduction in the value of the agricultural products.

The Agriculture Business Impact Study included agricultural stakeholder engagement in the municipalities of South Bruce and Huron-Kinloss, reviews of background materials, analysis of economic data for the Agricultural Study Area[2] (ASA) of South Bruce and Bruce County, and an international examination of similar projects.

South Bruce agriculture and agribusiness is primarily focused on grains and oilseeds, dairy, beef, and poultry.

South Bruce agriculture and agribusiness is primarily focused on grains and oilseeds, dairy, beef, and poultry. Most farms are run by sole proprietors and partnerships. Small farms and agritourism operations, focused on direct sales, co-exist with major cash-crop operations with large acreages, who are using more technology to remain competitive. Local and provincial agricultural organizations are there to support the farming community. Farm sizes are increasing in South Bruce, and the number of farms is decreasing, which aligns with County and provincial averages.

[1] Local means the geographic area of the Municipality of South Bruce and the Mennonite agricultural area of Huron-Kinloss
[2] Agricultural Study Area (ASA) is comprised of the Municipality of South Bruce and, where area municipal data is unavailable, Bruce County. See Project Methodology for more details.

There is considerable support within the community for agriculture, and a high degree of interest in developing value-added opportunities and agribusiness. Local people also see a future in food processing, culinary, and agriculture technology (agritech).

There is community support for developing value-added opportunities, and see a future in agriculture technology, valued-added agriculture, and culinary tourism.

The Municipality of South Bruce has also demonstrated its support for the agriculture and agribusiness sector, most recently in its Economic Development Strategy Update,[3] by hiring economic development staff, updating its Official Plan and Community Improvement Plan, and other initiatives.

The presence of an active nuclear facility in Bruce County since the 1960s has not diminished the area's prominence as one of Ontario's leading agriculture jurisdictions. A worldwide survey of storage facilities for used nuclear fuel discovered that most nations are siting their projects in agricultural regions and found no evidence of risks to agriculture yield, product safety, or commodity prices.

The presence of an active nuclear facility in Bruce County since the 1960s has not diminished the area's prominence as one of Ontario's leading agriculture jurisdictions.

The Project's potential to enhance South Bruce agriculture and agribusiness is heightened if the balance of lands owned by the NWMO near the DGR and the proposed Centre of Expertise are viewed as vehicles for opportunity to bring research and development, innovation, investment, and visitors to the area. Concepts are fleshed out for the industry-facing agritech facility near the DGR lands and the public-facing Centre of Expertise, and several examples of similar sites are discussed.

[3] Municipality of South Bruce Economic Development Strategy Update, September 2021, southbruce.ca

Recommendations are summarized at the conclusion of the report, related to:

- Tracking changes in agricultural commodity values and farmers' capacity to borrow.
- Exploring ideas about agriculture-related research and development facilities on NWMO lands and programs at the proposed Centre of Expertise.
- Continuing consultations with agriculture and agribusiness stakeholders.
- Attracting program funding and capital investments and developing collaborations between the agriculture and agribusiness sector, and other organizations and government.
- Expanding the economic impact of local agricultural experiences and local food in the regional tourism industry.

The NWMO Project has the potential to impact the agriculture and agribusiness sectors of South Bruce and surrounding region in positive and negative ways. Whether those opportunities are realized, or mitigations achieved, depends on the appetite, willingness, and resources to pursue them.

2. Introduction

2.1 Study Methodology

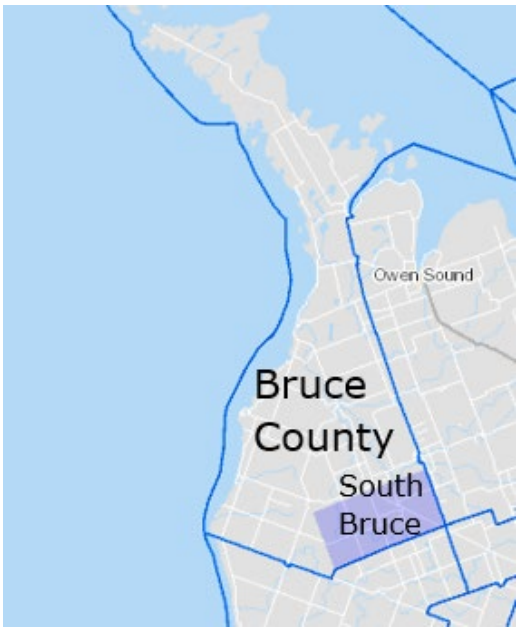
The intention of the Agriculture Business Impact Study was to identify the current state of the agricultural/agri-business sector within the Agricultural Study Area (ASA), comprised of the Municipality of South Bruce and, where area municipal data was unavailable, Bruce County (see Figure 1).

The Agriculture Business Impact Study also identified:

- the potential for the Nuclear Waste Management Organization (NWMO) Project to change agriculture/agri-business operations and the opportunities it could create,
- strategies for use of the NWMO lands to facilitate new agri-business entrants, and
- strategies to address a change in the value of the agricultural products, if needed.

Deloitte LLC undertook the process, including the development of research and analysis for the Agriculture Business Impact Study, and all stakeholder engagement.

Figure 1: Geographic Boundaries of Agriculture Study Area (ASA)



Source: Statistics Canada

The Agriculture Business Impact Study refers to economic development recommendations related to agriculture and agribusiness, as published in the Municipality of South Bruce Economic Development Strategy Update[4], which was completed in September 2021 and did not include the NWMO Project.

[4] Municipality of South Bruce Economic Development Strategy Update, 2021, southbruce.ca

Phases of the Study

The Agriculture Business Impact Study was completed in four phases.

Phase 1 (Project Initiation)

Project Initiation of the Agriculture Business Impact Study included a project launch meeting, and the preparation and approval of a Project Charter and workplan.

Phase 2 (Agriculture Economy Review/Stakeholder Engagement)

The Agriculture Economy Review included a review of the current state of the agriculture economy, a background document review (Appendix B), and a review of agriculture uses, farm operations, specialty operations, and site attributes. Additional effort was made to ensure that 2021 Census of Agriculture data (which was released near the deadline for the report) was included in the study. This phase also included a review of local networks, infrastructure, and training, as well as a benchmarking review analyzing international sites with agriculture. Local and regional agricultural enhancement programs were reviewed, as were agritech innovations, promotional enhancements, and, where available, mitigation measures. Stakeholder Engagement (see Appendix C) included a series of advanced reconnaissance interviews with key stakeholders in Agricultural Study Area. South Bruce agriculture stakeholders also participated in an agriculture business vision development workshop, and a responded to a survey. The Municipality of South Bruce requested that additional consultation with stakeholders in Huron-Kinloss Township (see Figure 2) be added to the project. This additional consultation included preparation of a survey for Huron-Kinloss Mennonite stakeholders, sent by mail and available at municipal offices, the facilitation of a workshop for Huron-Kinloss stakeholders, and a presentation to representatives of the municipalities of Huron-Kinloss and South Bruce.

Figure 2: Location of Huron-Kinloss Township

Source: Statistics Canada

Phase 3 (Vision/Options Development for Agriculture Economy)

This phase included an analysis of strengths, opportunities, aspirations, risks, and results of the Project on the agriculture business community. The findings to date were reviewed in context to other Project studies (see Appendix I), of which the following were most pertinent:

- Economic Development Project Effects & Strategy
- Effects on Community Safety
- Emergency Services Study
- Housing Needs and Demand Analysis Study
- Land Use Study
- Local Hiring Effects Study & Strategy
- Local Traffic Study
- Local/Regional Education Study
- Regional Economic Development Study
- Road Conditions Study
- Tourism Industry Effects & Strategy

Phase 4 Agriculture Business Impact Study

This phase included the development of draft agriculture business impact recommendations, integration with the Property Value Monitoring Program, and a feedback workshop with municipal staff. The Agriculture Business Impact Study was finalized, and changes were incorporated based on feedback. The final report was delivered and presented to the Community Liaison Committee.

Guiding Principles

The Municipality of South Bruce adopted 36 Guiding Principles[5] which focus on safety for people and the environment, ensuring the NWMO Project brings meaningful benefits to the community, and ensuring the municipality has a voice in decision-making. South Bruce is seeking NWMO commitments on how it would meet or address these 36 expectations and aspirations for the Project. This is a key step in determining whether the Project is right for the community and will help people make an informed decision when a public referendum is held to measure willingness to be a host community. The Municipality of South Bruce Agriculture Business Impact Study informs the following Guiding Principles:

#5. The NWMO must commit to implementing the Project in a manner consistent with the unique natural and agricultural character of the community of South Bruce.

#10. The NWMO will identify the potential for any positive and negative socio-economic impacts of the Project on South Bruce and surrounding communities and what community benefits it will contribute to mitigate any potential risks.

#13. The NWMO, in partnership with the Municipality, will develop a strategy and fund a program to promote the agriculture of South Bruce and the surrounding communities.

[5] Guiding Principles, southbruce.ca

#19. The NWMO will, in consultation with the Municipality, establish a Centre of Expertise at a location within South Bruce to be developed in conjunction with the Project.

#23. The NWMO will enter into an agreement with the Municipality providing for community benefit payments to the Municipality.

Peer Review Approach

Agriculture is a very important industry to the Municipality of South Bruce, so it set out scope and objectives of the Agriculture Business Impact Study. This study was completed by Deloitte LLC. The Municipality provided guidance. The study was also reviewed by GHD, as part of the Municipality of South Bruce Consultants Peer Review Protocol.

3. Agriculture Economy Review

This section identifies the existing agricultural/agribusiness profile of the Agricultural Study Area (ASA), comprised of the Municipality of South Bruce and, where area municipal data was unavailable, Bruce County. Statistics Canada's 2021 and 2016 Census of Agriculture[6] informs the farming profile of the ASA, while other sources of information complete the agriculture and agribusiness picture. The following information is an overview of all data collected.

3.1 In a Nutshell

South Bruce agriculture and agribusiness is primarily focused on traditional Ontario commodities of grains and oilseeds, dairy, and beef. Over the last decade, farmers in South Bruce grew fewer acres of crops in general. Very few farm operators grow fruit and vegetables. While there were more dairy cows in 2021 than 2011, there were considerable decreases in beef production. Most farms are run by sole proprietors, which are in decline, as well as partnerships, which have remained static. Small farms and agritourism operations, focused on direct sales, co-exist with major cash-crop operations with large acreages, who are using more technology to remain competitive. Local and provincial agricultural organizations are there to support the farming community.

3.2 Key Findings

Key findings of the agriculture economy review include the following:

- Total farm area of South Bruce was 70,657 acres in 2021, of which 54,139 acres (76%) was land in crops. South Bruce cropland dropped from 19% of Bruce County total in 2011, to 14.7% in 2021.
- There were 361 farms in South Bruce in 2021, a decrease of 55 farms since 2011.
- Since 2011, farms classified by NAICS[7] as "oilseed and grain farming" in South Bruce increased +31%. Farms classified as "cattle ranching and farming" decreased -36%.
- Farm sizes have changed since 2011, with increases in farms under 10 acres, farms 10-69 acres, and farms 2,240-2,879 acres in 2021. Reductions in farm sizes over the past decade were farms 70-129, 130-179, 180-239, and 760-1,119 acres.
- South Bruce recorded 515 farm operators in 2021, down 70 operators from 2016.
- There are 2.32 male farm operators for every female farm operator.
- Sole proprietorships dropped across South Bruce since 2011 (from 221 to 167). Partnerships remained static. Numbers of family corporations are up and down.
- Non-family corporations and other arrangements represent only 2% of farms.

[6] Statistics Canada, 2021 Census of Agriculture, statcan.gc.ca
[7] North American Industry Classification System (NAICS)

- Total farm capital in South Bruce was valued at $1.1 billion in 2021, a 91% increase in value over ten years. However, since 2016 the value increased by only 5%.
- The market value of land and buildings in South Bruce increased by 6% between 2016 and 2021. Livestock values declined 15% between 2016 and 2021.
- Farm revenues were $110.4 million in South Bruce in 2021, +34% from 2011. South Bruce farm revenues dropped from 21% of County total in 2011, to 15% in 2021.
- Farm expenses totalled $91.6 million in South Bruce in 2021, up 41% from 2011.
- 276 agricultural workers were employed at 47 South Bruce farms in 2021.
- Farms are using more agriculture technology, e.g., auto-steer, robotic milkers, GPS.
- 32% of South Bruce farms reported succession plans in 2021 (64% verbal).
- Soybeans, corn, wheat, and hay dominate acreage, but less of these crops were recorded in 2021, compared to a decade ago.
- Fruit and vegetables are not widely grown in South Bruce, but some farmers produce strawberries, grapes, pumpkins, beets, onions, cucumbers.
- South Bruce farms had 20% fewer cattle in 2021 (19,441 animals) compared to 2011, with increases only for dairy cows (5,062, +6%). Beef dropped 46%.
- There were 665,676 total hens and chickens in South Bruce in 2021, primarily broilers and roasters, up 24% since 2011.
- Sheep inventories declined since 2011 in South Bruce. There were 4,000 rabbits and 3,662 goats in 2021, and the number of farms raising them has declined since 2011.
- 40 farms in South Bruce reported direct sales to consumers in 2021, +21% from 2016. For 6 farms, direct sales generate 76% to 99% of their total revenues.
- Direct deliveries to consumers are the most popular method of sales. Sales via farm stands and farmers markets have declined over the last five years.
- Soil in South Bruce is high in organic matter and very efficient at draining water, qualities which are beneficial for agriculture.
- Local agribusiness includes milk powder production, meat butchering, goat milk marketing, feed mill, sale of fertilizer and pesticide, grain storage, tire service, maple syrup production, and wine/cider production.
- Several agricultural organizations exist within a network of supports for the South Bruce and Bruce County agriculture sector.
- Local and County economic development strategies identify a high degree of interest in developing industry supply chains for the agriculture, agribusiness, cleantech, and nuclear sectors.

3.3 Census of Agriculture

Definition of Farm

In 2021, Statistics Canada made changes to the definition of a census farm. Caution should be taken when comparing the 2021 Census of Agriculture data with data from previous censuses. The "census farm" concept of the Census of Agriculture refers to a unit that produces agricultural products and reports revenues or expenses for tax purposes to the Canada Revenue Agency.[8]

- **Crops:** grains, oilseeds, leguminous crops, potatoes, vegetables, fruits, berries, greenhouse products, mushrooms, sod, nursery, Christmas trees, maple tree taps, hay and fodder crops, cannabis, hemp, and other crops.
- **Livestock:** dairy and beef cattle (including feedlots), pigs, poultry and eggs (including hatcheries), turkeys, ducks, geese, sheep, goats, horses and other equines, bison (buffalo), elk (wapiti), deer, llamas and alpacas, rabbits, mink, bees, and other animals.
- **Not included are:** forestry and logging, hunting and trapping, fishing and aquaculture, support activities for agriculture and post-harvest activities, horse boarding and riding lessons, and operations producing products that are not for human consumption (e.g. genetic operations, insect farms for pet food).

Note on Standard Agriculture Terminology

Terminology used in the Census of Agriculture (e.g., "beef cattle ranching and farming," "vegetable and melon farming,") are standard terms of phrases used by Statistics Canada to categorize farming operations on a nation-wide basis. To preserve the accuracy of the information, terms have not been renamed.[9]

Farm Headquarters Rule

The Census of Agriculture "farm headquarters rule"[10] concept refers to the assignment of all data collected for an agricultural operation to a single main farm location, as reported by the census respondent. This methodology is applied to all agricultural operations in Canada, including those composed of numerous parcels of land located in different geographic areas (such as rural municipalities or counties). The application of the "farm headquarters rule" could result in some perceived inconsistencies related to the allocation of land and commodities to different Census Consolidated Subdivisions (CCS), from census to census.

[8] Statistics Canada, Dictionary, statcan.gc.ca
[9] Statistics Canada, Guide to Census of Agriculture, 2021, statcan.gc.ca
[10] Statistics Canada, Farm Headquarters Rule, statcan.gc.ca

Farmland

Total Farm Area and Land Tenure

The total farm area of South Bruce was 70,657 acres in 2021, of which 54,139 acres (76%) was land in crops. Figure 3 explains changes in total farm area, land in crops, and land tenure over the past decade.

- Total farm area in South Bruce decreased from 97,681 acres in 2011 to 70,657 acres in 2021, a loss of 27,024 acres (-28%).
- Total land in crops in South Bruce decreased from 73,276 acres in 2011 to 54,139 acres in 2021, a loss of 19,137 areas (-26%).
- There were also decreases in total farm area owned, and area rented or leased from others.

South Bruce total farm area decreased from 16.7% of the total for Bruce County in 2011, to 13.8% of the total in 2021.

Figure 3: Land Tenure, South Bruce and Bruce County, 2011, 2016, 2021

Land tenure		Bruce County			South Bruce		
		2011	2016	2021	2011	2016	2021
Total farm area[11]	Farms reporting	2,011	1,928	1,946[B]	416	399	361[B]
	Acres	583,239	558,356	510,477[A]	97,681	89,523	70,657[A]
Land in crops (excluding Christmas tree area) *	Farms reporting	1,823	1,754	1,763[B]	388	366	329[B]
	Acres	382,155	382,356	368,261[A]	73,276	65,476	54,139[A]
Area owned	Farms reporting	1,951	1,853	1,874[B]	403	381	342[B]
	Acres	430,233	422,190	394,246[A]	75,615	76,310	58,609[A]
Area leased from governments	Farms reporting	27	28	32[A]	9	5	7[A]
	Acres	3,131	3,188	[F]	378	115	[F]
Area rented or leased from others	Farms reporting	720	675	644[A]	150	129	118[B]
	Acres	173,970	153,881	135,093[A]	27,850	20,644	16,179[B]
Crop-shared land used by the operation	Farms reporting	54	84	93[B]	13	16	16[A]
	Acres	7,623	11,157	10,429[C]	1,920	1,267	1,553[E]
Land area used through other arrangements (2021)	Farms reporting	91	82	73B	13	22	8[A]
	Acres	5,987	6,520	5,454[B]	381	794	625[E]
Total area of land used by others	Farms reporting	427	373	342[B]	99	88	60[B]
	Acres	37,705	38,580	37,891[A]	8,463	9,607	6,478[C]

Source: Statistics Canada. Table 32-10-0407-01, Census of Agriculture, 2011, 2016, and 2021.
** Land in crops data sourced from Table: 32-10-0406-01 (formerly CANSIM 004-0203).*
Symbol Legend on 2021 data quality: [A] excellent / [B] very good / [C] good / [E] use with caution / [F] too unreliable to be published

Land Use

Decreases in land acreage in crops was noted in the previous section. Figure 4 explains other changes in land use. The number of acres in South Bruce in tame or seeded pasture dropped from 5,829 acres in 2011 to 2,491 in 2021. Statistics Canada also separated woodlands and wetlands from acreage planted in Christmas trees for sale. As a result, woodland and wetland now accounts for 9,686 acres of South Bruce's farm area, and no acres of Christmas trees for sale were recorded. South Bruce land in crops decreased from 19% of the total for Bruce County in 2011, to 14.7% of the total in 2021.

[11] Total farm area is the difference between the sum of all land tenures minus Total area used by others. The number of farms reporting does not equal the sum of the parts because farms reporting more than one category (or activity) are only counted once.

Figure 4: Land Use, Census of Agriculture, 2021

Land use		Bruce County			South Bruce		
		2011	2016	2021	2011	2016	2021
Total farm area*	Number of farms reporting	2,011	1,928	1,946[B]	416	399	361[B]
	Acres	583,239	558,356	510,477[A]	97,681	89,523	70,657[A]
Land in crops (excluding Christmas tree area)	Number of farms reporting	1,823	1,754	1,763[B]	388	366	329[B]
	Acres	382,155	382,356	368,261[A]	73,276	65,476	54,139[A]
Summerfallow land*	Number of farms reporting	20	20	17[B]	3	5	3[A]
	Acres	348	323	241E	31	33	65[D]
Chemfallow only	Number of farms reporting	2	0	0[B]	0	0	0[B]
	Acres	x	0	0[A]	0	0	0[A]
Summerfallow, tilled only	Number of farms reporting	15	16	10[A]	3	4	3[A]
	Acres	228	305	177E	31	x	65[D]
Chemical and tillage weed control on the same land	Number of farms reporting	3	4	7[B]	0	1	0[B]
	Acres	x	18	[F]	0	x	0[A]
Tame or seeded pasture	Number of farms reporting	874	766	572[A]	175	141	93[A]
	Acres	69,594	57,716	39,531[B]	5,829	4,748	2,491[D]
Natural land for pasture	Number of farms reporting	590	481	395[B]	103	84	70[A]
	Acres	45,093	28,214	25,385E	2,660	2,359	[F]
Woodlands and wetlands[12]	Number of farms reporting	1,451	1,381	1,199[B]	325	312	241[B]
	Acres	67,470	71,819	62,308[B]	x	x	9,686[B]
Area in Christmas trees, woodlands and wetlands (2011, 2016); Christmas trees grown for sale (2021)	Number of farms reporting	1,451	1,382	3[A]	325	312	0[B]
	Acres	67,517	71,910	[F]	13,471	14,201	0[A]
All other land[13]	Number of farms reporting	1,556	1,394	1,256[B]	337	295	238[B]
	Acres	18,532	17,837	14,735[A]	2,414	2,706	2,507[B]

Source: Statistics Canada. Table 32-10-0406-01, Census of Agriculture, 2011 and 2016.
Table 32-10-0249-01, Census of Agriculture, 2022.
** The "number of farms reporting" does not equal the sum of the parts because farms reporting more than one category (or activity) are only counted once.*
x *Suppressed to meet the confidentiality requirements of the Statistics Act.*
Symbol legend on data quality: [A] excellent / [B] very good / [D] acceptable / [E] use with caution / [F] too unreliable to be published

[12] Woodlands and wetlands acreage changes is partly due to the inclusion of integrated agricultural-forestry operations.
[13] In some jurisdictions, land reported as "too wet to seed" has been classified as "other land" instead of cropland or summerfallow.

Agricultural Operations

Farms by Industry Classification

A classification of farms by NAICS code[11] in Figure 5 is analyzed on the following page.

Figure 5: Farms classified by NAICS code, South Bruce and Bruce County, 2011, 2016 and 2021

Farms classified by NAICS[14]	Bruce County					South Bruce				
	2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Total number of farms	**2,011**	**1,928**	**1,946**	**1%**	**-3%**	**416**	**399**	**361**	**-10%**	**-13%**
Oilseed and grain farming [1111]	**512**	**599**	**712**	**19%**	**39%**	**112**	**130**	**147**	**13%**	**31%**
Soybean farming [111110]	145	168	295	76%	103%	25	27	49	81%	96%
Oilseed (except soybean) farming [111120]	3	2	2	0%	-33%	0	0	0		
Dry pea and bean farming [111130]	4	7	14	100%	250%	0	1	3	200%	
Wheat farming [111140]	50	76	78	3%	56%	11	13	17	31%	55%
Corn farming [111150]	69	84	102	21%	48%	20	22	27	23%	35%
Other grain farming [111190]	241	262	221	-16%	-8%	56	67	51	-24%	-9%
Vegetable and melon farming [1112]	**12**	**24**	**17**	**-29%**	**42%**	**1**	**6**	**3**	**-50%**	**200%**
Potato farming [111211]	2	1	2	100%	0%	1	0	0		-100%
Other veg (except potato) & melon farming [111219]	10	23	15	-35%	50%	0	6	3	-50%	
Fruit and tree nut farming [1113]	**13**	**9**	**9**	**0%**	**-31%**	**2**	**2**	**3**	**50%**	**50%**
Fruit and tree nut farming [111330]			9					3		
Greenhouse, nursery, floriculture production [1114]	**28**	**21**	**15**	**-29%**	**-46%**	**4**	**1**	**3**	**200%**	**-25%**
Mushroom production [111411]	0	1	1	0%		0	0	0		
Other food crops grown under cover [111419]	3	0	2		-33%	1	0	0		-100%
Nursery and tree production [111421]	15	15	12	-20%	-20%	2	1	3	200%	50%
Floriculture production [111422]	10	5	0	-100%	-100%	1	0	0		-100%
Other crop farming [1119]	**271**	**229**	**187**	**-18%**	**-31%**	**41**	**41**	**30**	**-27%**	**-27%**
Hay farming [111940]	158	143	119	-17%	-25%	24	27	19	-30%	-21%
Fruit and vegetable combination farming [111993]	7	3	0	-100%	-100%	2	0	0		-100%
Maple syrup and products production [111994]	9	11	6	-45%	-33%	1	1	1	0%	0%
All other miscellaneous crop farming [111999]	97	72	62	-14%	-36%	14	13	10	-23%	-29%
Cattle ranching and farming [1121]	**782**	**701**	**676**	**-4%**	**-14%**	**179**	**153**	**115**	**-25%**	**-36%**
Beef cattle ranching and farming, including feedlots [112110]	613	562	546	-3%	-11%	103	95	70	-26%	-32%
Dairy cattle and milk production [112120]	169	139	130	-6%	-23%	76	58	45	-22%	-41%
Hog and pig farming [1122]	**46**	**43**	**46**	**7%**	**0%**	**12**	**9**	**6**	**-33%**	**-50%**
Poultry and egg production [1123]	**38**	**49**	**72**	**47%**	**89%**	**12**	**16**	**21**	**31%**	**75%**
Chicken egg production [112310]	12	17	23	35%	92%	2	5	4	-20%	100%
Broiler and other meat-type chicken production [112320]	25	26	44	69%	76%	10	11	15	36%	50%
Turkey production [112330]	1	2	2	0%	100%	0	0	1		
Combination poultry and egg production [112391]	0	1	2	100%		0	0	0		
All other poultry production [112399]	0	3	1	-67%		0	0	1		
Sheep and goat farming [1124]	**86**	**56**	**55**	**-2%**	**-36%**	**22**	**11**	**15**	**36%**	**-32%**
Sheep farming [112410]	52	39	41	5%	-21%	14	8	12	50%	-14%
Goat farming [112420]	34	17	14	-18%	-59%	8	3	3	0%	-63%
Other animal production [1129]	**223**	**197**	**157**	**-20%**	**-30%**	**31**	**30**	**18**	**-40%**	**-42%**
Apiculture [112910]	12	13	12	-8%	0%	1	3	1	-67%	0%
Horse and other equine production [112920]	82	70	56	-20%	-32%	10	10	6	-40%	-40%
Fur-bearing animal and rabbit production [112930]	8	4	3	-25%	-63%	1	1	1	0%	0%
Animal combination farming [112991]	116	105	81	-23%	-30%	19	16	10	-38%	-47%
All other miscellaneous animal production [112999]	5	5	5	0%	0%	0	0	0		

Source: Statistics Canada. Table 32-10-0231-01, Census of Agriculture, 2021. Table 32-10-0403-01, 2011 and 2016.

[14] The farm type classification used by the Census of Agriculture is based on industry groups (four-digit codes) and Canadian industries (six-digit codes) from the North American Industry Classification System (NAICS). The Census of Agriculture typically makes significant refinements in the geographic assignment of agricultural operations and changes in census consolidated subdivision boundaries between censuses. In 2021, the main farm location's rule was used more stringently, meaning far fewer refinements were made. Due to these changes caution should be taken when comparing 2021 Census of Agriculture data with previous censuses. Changes in farm types over time do reflect a shift in farming activity but could also be influenced by changing commodity prices.

Over the past decade, the number of farms classified under "oilseed and grain farming" in South Bruce increased +31% to 147 farms in 2021. The most numbers of farms in this category were classified as other (51 farms, -9% between 2011 and 2021), soybean (49 farms, +96%), and corn (27 farms, +35%).

The number of farms classified under "cattle ranching and farming" in South Bruce decreased -36% to 115 between 2011 and 2021 broken out between beef (70 farms, -32% between 2011 and 2021) and dairy (45 farms, -41%).

Farm Numbers and Sizes

The total number of farms in South Bruce decreased by 55, from 416 farms in 2011 to 361 in 2021. This drop accounts for most of the decrease in farm numbers across Bruce County, where farm numbers fell from 2,011 farms in 2011 to 1,946 farms in 2021, a loss of 65 farms (see Figure 6).

Figure 6: Farms classified by total farm area, 2016-2021

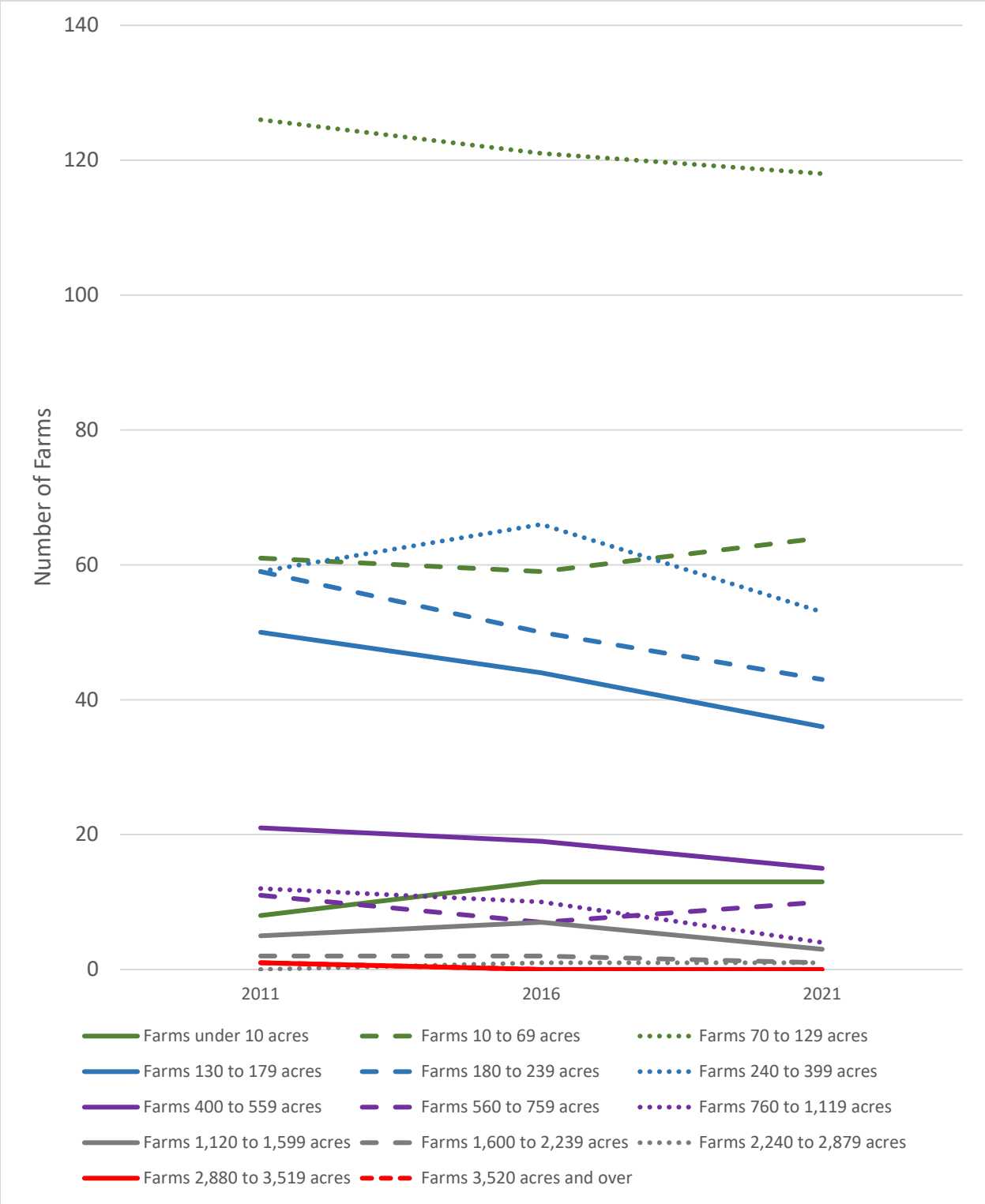
Farm Number and Sizes, 2016-2021	Bruce County			# Change	South Bruce			# Change
	2011	2016	2021	2011-21	2011	2016	2021	2011-21
Total number of farms	**2,011**	**1,928**	**1,946[B]**	**-65**	**416**	**399**	**361[B]**	**-55**
Under 10 acres	52	62	61[B]	9	8	13	13[C]	5
10 to 69 acres	320	326	376[B]	56	61	59	64[B]	3
70 to 129 acres	484	483	530[B]	46	126	121	118[A]	-8
130 to 179 acres	236	198	168[A]	-68	50	44	36[A]	-14
180 to 239 acres	236	205	197[A]	-39	59	50	43[A]	-16
240 to 399 acres	279	286	271[B]	-8	59	66	53[B]	-6
400 to 559 acres	155	136	140[A]	-15	21	19	15[B]	-6
560 to 759 acres	89	73	75[A]	-14	11	7	10[B]	-1
760 to 1,119 acres	85	81	70[B]	-15	12	10	4[B]	-8
1,120 to 1,599 acres	42	42	27[A]	-15	5	7	3[A]	-2
1,600 to 2,239 acres	17	15	14[B]	-3	2	2	1[A]	-1
2,240 to 2,879 acres	6	9	10[B]	4	0	1	1[E]	1
2,880 to 3,519 acres	6	7	3[A]	-3	1	0	0[B]	-1
3,520 acres and over	4	5	4[A]	0	1	0	0[B]	-1

Source: Statistics Canada, Table 32-10-0404-01, Census of Agriculture, 2011, 2016 and 2021
Symbol Legend on 2021 data quality: [A] excellent / [B] very good / [C] good / [E] use with caution

Over the past decade in South Bruce, there were increases in numbers of total farms of under 10 acres (+5 farms), farms 10 to 69 acres (+3), and farms 2,240 to 2,879 acres (+1). The largest reductions in farm sizes were farms 180 to 239 acres (-16 farms), 130 to 179 acres (-14 farms), 760 to 1,119 acres (-8 farms), and 70 to 129 acres (-8 farms). See Figure 7.

The total number of farms in South Bruce decreased from 20.6% of the total number of farms in Bruce County in 2011, to 18.5% of the total in 2021.

Figure 7: Change in Number of Farms by Size, South Bruce, 2011-2021



Source: Statistics Canada, Table 32-10-0404-01, Census of Agriculture, 2011, 2016 and 2021
Note: There are no farms in South Bruce 3,520 acres and over.

Farm Operators

Across all farms in South Bruce in 2021, 515 farm operators were recorded, down by 70 operators from 585 in 2016 (see Figure 8). Across all Bruce County farms, the number of operators increased in total by 5, from 2,720 in 2016 to 2,725 in 2021.

The number of farm operators on farms with one operator in South Bruce totaled 195 in 2021, -10 operators compared to 2016. The number of farm operators on farms with two or more operators totaled 320 in 2021, - 60 compared to 2016. For all of Bruce County, there were 1,115 farm operators on farms with one operator, -25 compared to 2016. There were 1,610 operators on farms two or more operators in 2021, +30 compared to 2016.

There are 2.32 male farm operators for every female farm operator on all farms in South Bruce, and in Bruce County. On South Bruce farms with one operator, the operator was male in 89% of cases in 2021, similar to all of Bruce County. On South Bruce farms with two operators or more, males and females shared leadership, 58% male / 42% female, similar to Bruce County, where the gender ratio was 56% male / 44% female.

Figure 8: Farm Operators, Bruce County and South Bruce, 2016-2021[15]

Farm Operators, 2016-2022		**Bruce County**		Change	**South Bruce**		Change
		2016	2021	2016-21	2016	2021	2016-21
Operators on all farms	All ages	2,720	2,725	+5	585	515	-70
	Sex - male	ǂ	1,905		ǂ	360	
	Sex - female	ǂ	820		ǂ	155	
	Age - under 35 years	350	260	-90	50	45	-5
	Age - 35 to 54 years	970	825	-145	220	180	-40
	Age - 55 years and older	1,395	1,640	+245	310	285	-25
	Age - average	54.4	55.7	+1.3	53.9	54.5	+0.6
	Age - median	ǂ	58.0		ǂ	57.0	
Operators on farms with one operator	All ages	1,140	1,115	-25	205	195	-10
	Sex - male	ǂ	1,000		ǂ	175	
	Sex - female	ǂ	110		ǂ	20	
	Age - under 35 years	150	120	-30	25	25	0
	Age - 35 to 54 years	375	310	-65	70	50	-20
	Age - 55 years and older	610	680	+70	110	120	+10
	Age - average	54.4	56.1	+1.7	53.9	55.7	+1.8
	Age - median	ǂ	59.0		ǂ	58.0	
Operators on farms with two or more operators	All ages	1,580	1,610	+30	380	320	-60
	Sex - male	ǂ	900		ǂ	185	
	Sex - female	ǂ	705		ǂ	140	
	Age - under 35 years	200	140	-60	25	25	0
	Age - 35 to 54 years	595	515	-80	150	130	-20
	Age - 55 years and older	785	960	+175	200	165	-35
	Age - average	52.8	55.4	+2.6	53.8	53.8	0
	Age - median	ǂ	58.0		ǂ	55.0	

Source: Statistics Canada, 2016 and 2021 Census of Agriculture
ǂ Data not available for 2016

Farm operators in South Bruce are slightly younger than their County-wide peers, especially on farms with two or more operators. The average age of single-operator-farm operators grew by 1.8 years to 55.7 years of age in South Bruce in 2021. The average age of all single-operator-farm operators in Bruce County grew by 1.7 years to 56.1 years. On farms with two or more operators, there was no change in average of age of operators in South Bruce (53.8 years), while Bruce County operators aged 2.6 years on average (55.4 years).

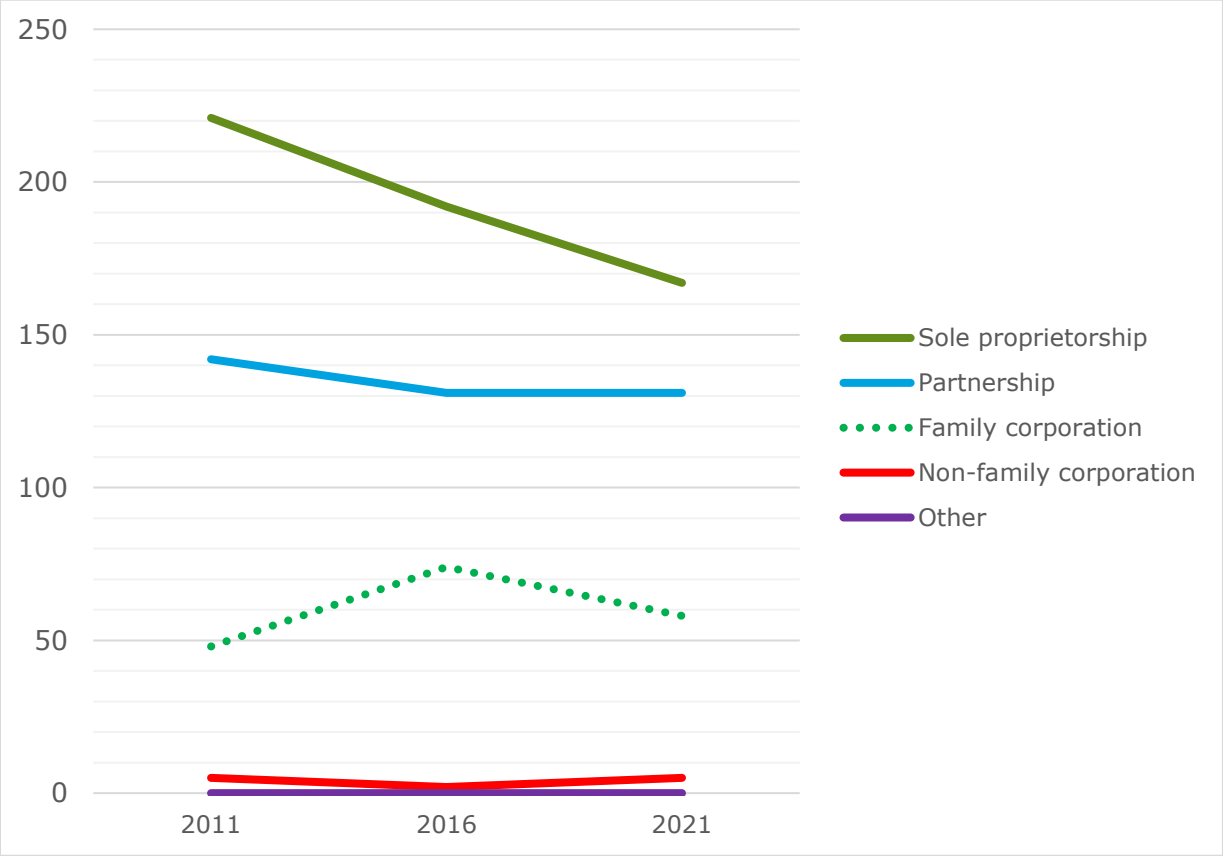
[15] Statistics Canada, 2021 Census of Agriculture, statcan.gc.ca

Operating Arrangements

There are three types of legal structures[16] for businesses, including farms: sole proprietorships[17], partnerships,[18] and corporations (further broken down into family and non-family corporations).[19] Definitions are outlined in footnotes below.

As illustrated in Figure 9, the number of sole proprietorships decreased across South Bruce over the past decade (from 221 to 167), while the number of partnerships has remaining static over the past five years (131). Family corporations increased from 48 in 2011 to 74 in 2016, then decreased to 58 by 2021. Non-family corporations have rebounded to 5 in 2021, since declining from 5 in 2011 to 2 in 2016. There are no other types of operating arrangements in South Bruce.

Figure 9: Change in Number of Farm Operating Arrangement Types, 2011-2021



Source: Statistics Canada. Table 32-10-0433-01, Census of Agriculture, 2011, 2016 and 2021

[16] BDC, bdc.ca
[17] Sole proprietorship: "The business and the operator are one and the same in the eyes of legal and tax authorities. Tax law treats a sole proprietorship as an income source for the proprietor and therefore requires that the business's financial details be listed in a separate section of the personal income tax form. In a sole proprietorship, the business's money and responsibilities are the proprietor's, and vice versa." Source: BDC
[18] Partnership: "A partnership is similar to a sole proprietorship, but instead of one proprietor there are two or more. As with a sole proprietorship, there is no legal structure for a partnership. However, partners usually have some type of contractual agreement that governs, in percentage terms, the sharing of revenues, expenses and tasks." Source: BDC
[19] Corporations: "Incorporating offers several advantages over sole proprietorships. Owners benefit from limited liability. Ownership interests are easier to transfer. The life of the corporation can extend beyond that of the founders. Credibility is boosted in the eyes of partners. Financing and grants are easier to access. Tax rates are lower." Source: BDC

Figure 10 offers a comparison of farm operating arrangements in Bruce County compared to South Bruce.

- Sole proprietorships made up 46% of all farm operations in South Bruce in 2021, down from 48% in 2016. The decrease in share is also evident across Bruce County where sole proprietorships made up 53% of all operators.
- Partnerships represented 36% of all farm operations in South Bruce, up from 33% in 2016. The 2021 value is slightly higher than the County average of 32%.
- Family corporations made up 16% of all South Bruce farm operations in 2021, down from 19% in 2016. The 2021 data for South Bruce is slightly higher than the County average (13%).
- Non-family corporations made up 1% of all farms in South Bruce in 2021, the same percentage as 2016. The 2021 data share is equal to the Bruce County average (1%).

Figure 10: Farm Operating Arrangements, South Bruce and Bruce County, 2016 and 2021

Farm Operating Arrangement	Bruce County						South Bruce					
	2011		2016		2021		2011		2016		2021	
	#	%	#	%	#	%	#	%	#	%	#	%
Sole proprietorship	1,175	58%	1,065	55%	1,037	53%	221	53%	192	48%	167	46%
Partnership	577	29%	543	28%	629	32%	142	34%	131	33%	131	36%
Family corporation	235	12%	298	15%	251	13%	48	12%	74	19%	58	16%
Non-family corporation	23	1%	21	1%	28	1%	5	1%	2	1%	5	1%
Other[20]	1	0%	1	0%	1	0%	0	0%	0	0%	0	0%

Source: Statistics Canada. Table 32-10-0433-01, Census of Agriculture, 2011, 2016, 2021

[20] Other could include co-operative, band farm, trust. Source: agriculture.canada.ca

Farm Capital Value

Total farm capital is the market value of all land and buildings, livestock and poultry, and farm machinery, equipment and vehicles owned or rented by farms, as reported by respondents. In Figure 11, according to the 2021 Census of Agriculture, total farm capital in South Bruce was valued at $1.1 billion, a 91% increase in value over ten years. However, the increase in value between 2016 and 2021 was only +5%.

The market value of total land and buildings in South Bruce doubled (+103%) between 2011 and 2021, from $487.8 million to $988.8 million. However, the market value increase recorded for land and buildings between 2016 and 2021 was only +6%.

The market value of total livestock and poultry in South Bruce recorded the smallest increase (+35%) between 2011 and 2021, from $28.2 million to $38 million respectively. Livestock and poultry values in South Bruce declined -15% between 2016 and 2021.

Figure 11: Farm Capital, South Bruce, 2011, 2016 and 2021

Farm capital		South Bruce				
		2011	2016	2021	Change 2016-21	Change 2011-21
Total farm capital[21]	# of farms reporting	416	399	361[A]		
	Market value	$578,285,619	$1,051,155,842	$1,104,733,768[A]	+5%	+91%
Value of farm machinery, equipment and vehicles[22]	# of farms reporting	..	..	342[B]		
	Market value	..	..	$77,910,508[A]		
Value of all farm machinery and equipment[23]	# of farms reporting	416	399	..		
	Market value	$62,211,118	$75,065,022	..		
Pick-ups, cargo vans, cars and other passenger vehicles used in the farm business	# of farms reporting	..	332	..		
	Market value	..	$7,510,000	..		
Value of livestock and poultry	# of farms reporting	331	288	226[A]		
	Market value	$28,209,044	$44,521,480	$38,006,904[A]	-15%	+35%
Value of land and buildings, total[24]	# of farms reporting	416	399	361[B]		
	Market value	$487,865,457	$931,569,340	$988,816,356[A]	+6%	+103%
Value of land and buildings, owned[25]	# of farms reporting	403	382	342[B]		
	Market value	$361,571,057	$706,059,840	$763,233,356[A]	+8%	+111%
Value of land and buildings, rented or leased from others[26]	# of farms reporting	173	155	134[E]		
	Market value	$126,294,400	$225,509,500	$225,583,000[C]	+0.03%	+79%

Data Quality Symbol Legend: [A] excellent / [B] very good / [C]good / [E]use with caution
.. = Data not available for a specific reference period
Statistics Canada. Table 32-10-0237-01, Census of Agriculture, 2011, 2016 and 2021

[21] All dollar values are based on the current dollar of the reference year.
[22] The number of farms reporting does not equal the sum of the parts because farms reporting more than one category (or activity) are only counted once.
[23] Value of farm machinery and equipment rented reflect present market values as reported by respondents.
[24] The number of farms reporting does not equal the sum of the parts because farms reporting more than one category (or activity) are only counted once.
[25] Value of land and buildings owned reflect present market values as reported by respondents.
[26] Value of land and buildings rented reflect present market values as reported by respondents.

Farm capital in Bruce County (see Figure 12) generally recorded larger increases in market value compared to South Bruce. In 2021, total farm capital in Bruce County was valued at $6.4 billion, a 128% increase in value over ten years. The increase in value between 2016 and 2021 was only +28%, over five times the rate of South Bruce.

The market value of total land and buildings in Bruce County increased almost 2.5 times (+141%) between 2011 and 2021, from $2.3 billion to $5.7 billion. The market value increase recorded in Bruce County for land and buildings between 2016 and 2021 was only +31%, five times the rate of South Bruce.

The market value of total livestock and poultry in Bruce County increased +45% between 2011 and 2021, from $158.7 million to $230.6 million respectively, a higher rate of increase than South Bruce. Livestock and poultry values in Bruce County declined -22% between 2016 and 2021, a higher rate of decline than South Bruce.

South Bruce farm capital values decreased from 20% of the total for Bruce County in 2011, to 17% of the total in 2021.

Figure 12: Farm Capital, Bruce County, 2011, 2016 and 2021

Farm capital		Bruce County				
		2011	2016	2021	Change 2016-21	Change 2011-21
Total farm capital[27]	# of farms reporting	2,011	1,928	1,946[A]		
	Market value	2,824,099,036	5,045,211,609	6,447,765,499[A]	+28%	+128%
Value of farm machinery, equipment and vehicles[28]	# of farms reporting	..	..	1,821[B]		
	Market value	..	..	469,306,616[A]		
Value of all farm machinery and equipment[29]	# of farms reporting	2,011	1,928	..		
	Market value	283,611,799	361,166,934	..		
Pick-ups, cargo vans, cars and other passenger vehicles used in the farm business	# of farms reporting	..	1,541	..		
	Market value	..	35,958,346	..		
Value of livestock and poultry	# of farms reporting	1,543	1,368	1,237[A]		
	Market value	158,777,585	296,712,855	230,602,878[A]	-22%	45%
Value of land and buildings, total[30]	# of farms reporting	2,011	1,928	1,946[B]		
	Market value	2,381,709,652	4,387,331,820	5,747,856,005[A]	+31%	141%
Value of land and buildings, owned[31]	# of farms reporting	1,954	1,857	1,862[B]		
	Market value	1,749,055,052	3,110,979,072	4,299,507,734[A]	+38%	146%
Value of land and buildings, rented or leased from others[32]	# of farms reporting	810	778	746[C]		
	Market value	632,654,600	1,276,352,748	1,448,348,272[A]	+13%	129%

Data Quality Symbol Legend: [A] excellent / [B] very good / [C] good / [E] use with caution
.. = Data not available for a specific reference period
Statistics Canada. Table 32-10-0237-01, Census of Agriculture, 2011, 2016 and 2021

[27] All dollar values are based on the current dollar of the reference year.
[28] The number of farms reporting does not equal the sum of the parts because farms reporting more than one category (or activity) are only counted once.
[29] Value of farm machinery and equipment rented reflect present market values as reported by respondents.
[30] The number of farms reporting does not equal the sum of the parts because farms reporting more than one category (or activity) are only counted once.
[31] Value of land and buildings owned reflect present market values as reported by respondents.
[32] Value of land and buildings rented reflect present market values as reported by respondents.

Total Operating Revenues

The 2021 Census of Agriculture reported $110.4 million in operating revenues on farms in South Bruce, +34% compared to gross farm receipts recorded in 2011 ($82.3 million), and +12% compared to 2016 ($98.8 million). See Figure 13.

Farms across Bruce County recorded $715.3 million in operating revenues, +86% compared to gross farm receipts recorded in 2011 ($566.1 million), and +26% compared to 2016 ($384.4 million).

South Bruce farm operating revenues decreased from 21% of the total for Bruce County in 2011, to 15% of the total in 2021.

Figure 13: Total Farm Operating Expenses, South Bruce and Bruce County, 2011, 2016, 2021

Total operating revenues[33]	**Bruce County**					**South Bruce**				
	2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Number of farms reporting	2,011	1,928	1,913[A]			416	399	356[A]		
Dollars ($)	384,427,884	566,137,883	715,350,201[A]	+26%	+86%	82,366,112	98,865,421	110,446,305[A]	+12%	+34%

Source: Statistics Canada. Table 32-10-0436-01, Farms classified by total gross farm receipts, Census of Agriculture, 2011 and 2016. Table 32-10-0240-01, Operating revenues, Census of Agriculture, 2021.
Data Quality Symbol Legend: [A] excellent

Total Operating Expenses

The 2021 Census of Agriculture reported $91.6 million in operating expenses on farms in South Bruce, +41% compared to operating expenses recorded in 2011 ($65.1 million), and +14% compared to 2016 ($80.2 million). See Figure 14.

Farms across Bruce County recorded $606.6 million in operating expenses, +86% compared to gross farm receipts recorded in 2011 ($326.2 million), and +25% compared to 2016 ($485.7 million). South Bruce farm operating expenses decreased from 20% of the total for Bruce County in 2011, to 15% of the total in 2021.

Figure 14: Total farm operating expenses, South Bruce and Bruce County, 2011, 2016 and 2021

Total farm operating expenses[31]	**Bruce County**					**South Bruce**				
	2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Number of farms reporting	2,011	1,928	1,914[A]			416	399	354[A]		
Dollars ($)	326,257,297	485,725,108	606,660,822[A]	25%	86%	65,133,859	80,249,777	91,682,837[A]	14%	41%

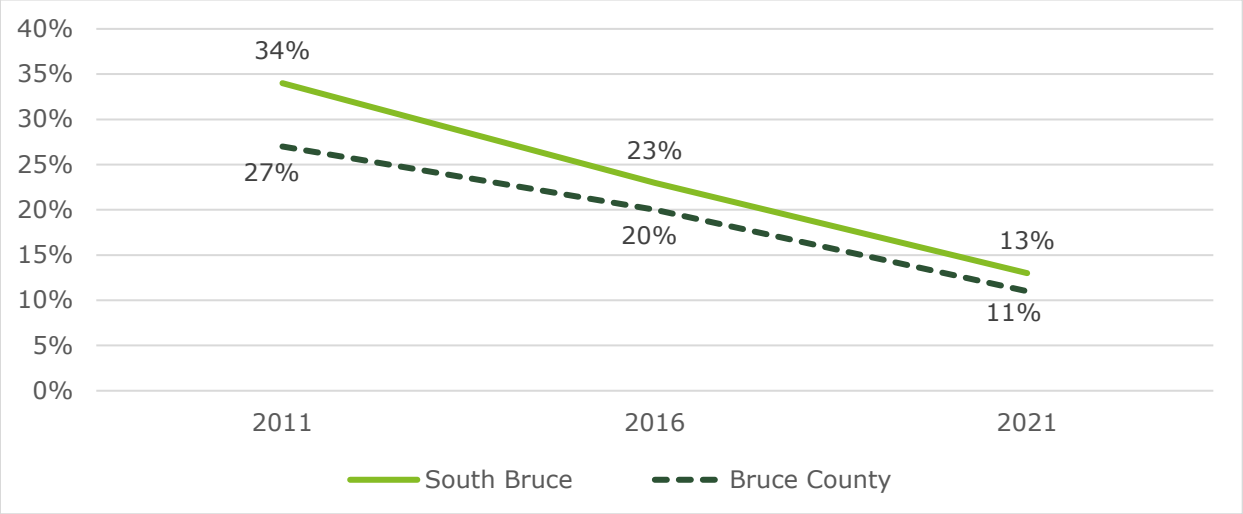
Source: Statistics Canada. Table 32-10-0438-01, Operating expenses, Census of Agriculture, 2011 and 2016. Table 32-10-0241-01, Operating expenses, Census of Agriculture, 2021.
Data Quality Symbol Legend: [A] excellent

[33] Excluding forest products. The data for 2020 total farm operating revenues and expenses use a different concept and a different source than previous Censuses of Agriculture. To reduce the burden on respondents, total farm operating revenues and expenses come from the Agriculture Taxation Data Program (ATDP) and reflect the tax revenues and expenses of farm businesses reporting to the Canada Revenue Agency (CRA). Previously, revenues and expenses for agricultural operations were reported to the Census of Agriculture. Caution should be taken when comparing the 2021 Census of Agriculture data with previous censuses. All dollar values are based on the current dollar of the reference year (2020).

Paid Labour

In 2021, 47 farms (13% of total farms) in South Bruce reported employing 276 agricultural workers, decreasing from 142 farms (34% of total) reporting 389 workers in 2011. The rate of decline is similar to Bruce County farms (see Figure 15).

Figure 15: Percentage of South Bruce Farms with Agricultural Workers



Source: Statistics Canada. Table 32-10-0243-01, Census of Agriculture, 2021. Table 32-10-0439-01, 2011 and 2016.

There were 98 full-time (year-round), 70 part-time (year-round), 109 seasonal or temporary workers in South Bruce in 2021 (see Figure 16). A total of 30 South Bruce farms (8% of total farms) reported employing 63 family members as agricultural workers in 2021.

Figure 16: Paid Agricultural Labour, South Bruce and Bruce County

Paid agricultural workers[34] (at farms reporting)		**Bruce County**					**South Bruce**				
		2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Full-time workers (year-round)	Farms	..	185	152[B]	-18%		..	38	34[B]	-11%	
	Workers	..	469	447[A]	-5%		..	79	98[A]	24%	
Part-time workers (year-round)	Farms	..	115	106[B]	-8%		..	28	25[B]	-11%	
	Workers	..	239	264[A]	10%		..	62	70[A]	13%	
Seasonal or temporary workers	Farms	361	212	62[B]	-71%	-83%	94	57	15[B]	-74%	-84%
	Workers	766	563	301[A]	-47%	-61%	217	155	109[A]	-30%	-50%
Ag workers, total[35]	**Farms**	**550**	**387**	**215[B]**	**-44%**	**-61%**	**142**	**92**	**47[B]**	**-49%**	**-67%**
	Workers	**1,386**	**1,271**	**1,012[A]**	**-20%**	**-27%**	**389**	**296**	**276[A]**	**-7%**	**-29%**
Ag workers, family members	Farms	..	262	144[B]	-45%		..	58	30[B]	-48%	
	Workers	..	535	312[A]	-42%		..	128	63[A]	-51%	

Source: Statistics Canada. Table 32-10-0243-01, Census of Agriculture, 2021. Table 32-10-0439-01, 2011 and 2016.
Data Quality Symbol Legend: [A] excellent / [B] very good

[34] Due to content conceptual changes, caution should be taken when comparing 2021 Census of Agriculture data with previous censuses. In 2021, respondents were asked to report agricultural workers to whom the operation issued any T4 slips for the 2020 tax year. Previously, employees who were paid any wages or salaries were reported.
[35] The number of farms reporting does not equal the sum of the parts because farms reporting more than one category (or activity) are only counted once.

Technology

South Bruce's farm operators have taken a hold of technology to support their operations (Figure 17). Use of auto-steer on South Bruce farms has increased 69% since 2016, with 115 farms using the technology in 2021. Farmers across South Bruce and Bruce County are also using soil sample tests, slow-release fertilizer, variable-rate input application, GIS mapping, and drones more frequently.

Figure 17: Technologies used on farms, Bruce County and South Bruce

Technologies used on farms	Bruce County			South Bruce		
	2016	2021	Change 2016-21	2016	2021	Change 2016-21
Automated guidance steering systems (auto-steer)	333	544[A]	63%	68	115[A]	69%
Geographic Information System (GIS) mapping	163	349[A]	114%	52	69[B]	33%
Variable-rate input application	..	361[A]		..	72[B]	
Drones	..	60[B]		..	[F]	
Soil sample test	..	666[A]		..	164[A]	
Slow-release fertilizer	..	707[A]		..	138[A]	
Robotic milking (2016)/Fully robotic milkers (2021)	14	39[B]	179%	5	11[C]	120%
Greenhouse automation (2016)/Robotic greenhouse equip (2021)	3	0[A]	-100%	0	0[A]	
GPS technology (2016)	579	..		111	..	
Automated environmental controls for animal housing (2016)	110	..		37	..	
Automated animal feeding (2016)	106	..		36	..	
Other technologies (2016)	9	..		0	..	

Source: Statistics Canada. Table 32-10-0379-01, Census of Agriculture, 2021 .. not available for a specific reference period
Symbol legend on data quality: [A] excellent / [B] very good / [C] good / [F] too unreliable to be published

Succession Plans

Succession planning involves strategies to transfer knowledge, skills, management control, decision making and ownership of a farm to the next generation.[36] As outlined in Figure 18, in 2021, an estimated 117 South Bruce farms (32% of total) reported a succession plan, either written or verbal, while 244 farms reported no succession plan. Across Bruce County, 31% of farmers reported a succession plan. Verbal succession plans are more popular among South Bruce farmers, with 64% of succession plans being verbal. The rate is slightly less informal than farmers across Bruce County, where 66% have a verbal agreement.

Figure 18: Succession plan for agricultural operation, South Bruce and Bruce County

Succession plan for the agricultural operation[37]	Bruce County		South Bruce	
Number of farms reporting	**2016**	**2021**	**2016**	**2021**
All farms reporting a succession plan[38]	124	.. 607‡	21	.. 117‡
Written succession plan	..	204[A]	..	42[B]
Includes 1 or more family members	120	202[A]	20	42[B]
Includes 1 or more non-family members	4	[F]	1	0[A]
Verbal succession plan only	..	403[A]	..	75[B]
No succession plan	..	1,339[A]	..	244[A]

Source: Statistics Canada. Table 32-10-0244-01, Census of Agriculture, 2021. Table 32-10-0448-01, Census of Agriculture, 2016.
Data Quality Symbol Legend: A excellent / B very good / C good / E use with caution
.. Data not available for a specific reference period
‡ total of 2021 "Written succession plan" and "Verbal succession plan only", calculated by Deloitte LLC

[36] Farm Succession Planning Guide, 2020, Ontario Ministry of Agriculture, Food, and Rural Affairs, ontario.ca
[37] In 2021, due to changes in content, caution should be taken when comparing 2021 data with previous censuses.
[38] The "number of farms reporting" does not equal the sum of the parts because farms reporting more than one category (or activity) are only counted once.

Crop Production

Field Crops and Hay

Soybeans, corn, wheat, and alfalfa are field crops with the highest acreage in South Bruce and Bruce County (see Figure 19). South Bruce farmers produced 15,472 acres of soybeans in 2021, despite a 12% drop in acreage since 2011. Corn dropped to second-largest crop, with 14,241 acres in 2021, down 27% since 2011. Wheat production decreased 2% from 2011, to 9,717 acres. Alfalfa crops dropped to 9,059 acres, a decrease of 45% since 2011.

Figure 19: Area of field crops and hay, South Bruce, 2016-2021

Field crops & hay		Bruce County					South Bruce				
		2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Wheat	Farms	591	677	689[B]	2%	17%	127	155	146[B]	-6%	15%
	Acres	57,984	67,730	62,373[A]	-8%	8%	9,962	11,007	9,717[B]	-12%	-2%
Oats	Farms	103	154	130[A]	-16%	26%	18	23	15[B]	-35%	-17%
	Acres	2,713	4,727	4,661[A]	-1%	72%	421	743	565[D]	-24%	34%
Barley	Farms	275	182	105[A]	-42%	-62%	103	61	29[A]	-52%	-72%
	Acres	9,708	6,571	3,057[B]	-53%	-69%	3,698	2,152	744[B]	-65%	-80%
Mixed grains	Farms	361	293	199[A]	-32%	-45%	62	46	28[B]	-39%	-55%
	Acres	11,202	8,805	6,091[A]	-31%	-46%	1,665	1,150	684[C]	-41%	-59%
Corn	Farms	820	824	841[B]	2%	3%	228	218	188[B]	-14%	-18%
	Acres	80,470	87,988	87,273[A]	-1%	8%	19,409	17,851	14,241[B]	-20%	-27%
Rye	Farms	10	36	51[A]	42%	410%	5	8	7[A]	-13%	40%
	Acres	165	1,093	1,888[D]	73%	1044%	33	203	392[E]	93%	1088%
Canola (rapeseed)	Farms	51	20	10[A]	-50%	-80%	6	2	0[B]	-100%	-100%
	Acres	6,380	1,489	635[E]	-57%	-90%	x	x	0[A]		
Soybeans	Farms	768	802	866[B]	8%	13%	161	184	173[B]	-6%	7%
	Acres	95,924	107,868	108,816[A]	1%	13%	17,589	16,407	15,472[A]	-6%	-12%
Flaxseed	Farms	3	3	2[C]	-33%	-33%	0	1	1[E]	0%	
	Acres	124	x	[F]			0	x	[F]		
Dry field peas	Farms	13	23	17[A]	-26%	31%	1	4	0[B]	-100%	-100%
	Acres	525	1,133	980[D]	-14%	87%	x	66	0[A]	-100%	
Lentils	Farms	1	0	0[B]		-100%	0	0	0[B]		
	Acres	x	0	0[A]			0	0	0[A]		
Dry white beans	Farms	33	35	33[B]	-6%	0%	5	4	3[A]	-25%	-40%
	Acres	2,898	3,233	3,474[D]	7%	20%	x	226	[F]		
Other dry beans	Farms	7	21	11[B]	-48%	57%	3	6	1[A]	-83%	-67%
	Acres	644	1,683	[F]			x	x	[F]		
Alfalfa and mixtures	Farms	1,191	1,017	840[A]	-17%	-29%	287	224	159[A]	-29%	-45%
	Acres	81,868	66,085	58,204[A]	-12%	-29%	16,341	12,289	9,059[A]	-26%	-45%
Other tame hay fodder	Farms	405	357	426[B]	19%	5%	50	57	59[B]	4%	18%
	Acres	26,967	19,743	25,850[A]	31%	-4%	2,555	2,429	2,126[C]	-12%	-17%
Forage harvested for seed	Farms	12	13	10[A]	-23%	-17%	3	3	1[A]	-67%	-67%
	Acres	786	622	675[D]	9%	-14%	168	x	[F]		
Potatoes	Farms	25	25	16[B]	-36%	-36%	3	1	1[A]	0%	-67%
	Acres	151	498	473[E]	-5%	213%	8	x	[F]		
Mustard seed	Farms	0	1	0[B]	-100%		0	0	0[B]		
	Acres	0	x	0[A]			0	0	0[A]		
Sunflower seed	Farms	5	6	3[A]	-50%	-40%	0	1	0[B]	-100%	
	Acres	146	261	214[E]	-18%	47%	0	x	0[A]		
Ginseng	Farms	0	1	1[A]	0%		0	1	0[B]	-100%	
	Acres	0	x	[F]			0	x	0[A]		
Buckwheat	Farms	8	8	1[A]	-88%	-88%	3	3	1[A]	-67%	-67%
	Acres	100	168	[F]			8	10	[F]		
Triticale	Farms	0	..	11[A]			0	..	2[A]		
	Acres	0	..	285[D]			0	..	62[E]		
Hemp	Farms	14	8	0[B]	-100%	-100%	7	5	0[B]	-100%	-100%
	Acres	272	208	0[A]	-100%	-100%	143	113	0[A]	-100%	-100%
Other field crops*	Farms	28	22	18[A]	-18%	-36%	3	5	4[A]	-20%	33%
	Acres	2,007	988	734[C]	-26%	-63%	x	x	[F]		

Source: Statistics Canada Census of Agricultures, 2016 and 2021, Deloitte LLP analysis
** Chick peas, Faba beans, Canary seed, and Sugar beets reported 0 farms and acres, were deleted to shorten the chart.*
Symbol legend on data quality: [A] excellent / [B] very good / [D] acceptable / [E] use with caution / [F] too unreliable to be published
.. not available for a specific reference period / [x] suppressed to meet the confidentiality requirements of the Statistics Act

Other crops also dropped in acreage: barley (744 acres, -80% since 2011) and mixed grains (684 acres, -59%). Oats and rye showed rebounds, +34% (565 acres) and +1,088% (392 acres) respectively since 2011. Farmers across Bruce County have been experimenting with dry field peas (980 acres, +87% since 2011), dry white beans (3,474 acres, +20%), and potatoes (472 acres, +213%), while South Bruce farmers have not. Hemp acreage zeroed out across South Bruce and Bruce County in 2021.

Crop Residue (Straw)

Farms in South Bruce generated 15% less crop residue (usually known as "straw", used for animal bedding) over the past decade, with 166 farms baling 10,693 acres of straw. Farms across Bruce County baled +6% more straw in 2021 across 54,320 acres of land, compared to 2011. See Figure 20.

Figure 20: Crop Residue, South Bruce and Bruce County

Crop residue baled	Bruce County					South Bruce				
	2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
# of farms reporting	859	876	729[B]	-17%	-15%	228	209	166[B]	-21%	-27%
Acres	51,394	61,814	54,320[A]	-12%	6%	12,541	12,405	10,693[B]	-14%	-15%

Source: Statistics Canada. Table 32-10-0366-01, Census of Agriculture, 2021
Symbol legend on data quality: [A] excellent / [B] very good

Fruits and Vegetables

South Bruce and Bruce County farms do not produce large volumes of fruits and vegetables. However, a small number of farms grew various fruit and vegetable varieties, indicating that the climate and soils of the area are suitable for such horticultural production.

Field Vegetables

The highest acreages of field vegetable crops in South Bruce include pumpkins (35 acres), beets (14 acres), dry onions (10 acres), and cucumbers (9 acres), as shown in Figure 21, on next page. According to the 2021 Census of Agriculture, 6 farms in South Bruce grew field vegetables, however data on total acreage is too unreliable to publish. In Bruce County, 71 farms grew approximately 846 acres of field vegetables in 2021, up 56% in acreage since 2011.

Figure 21: Field Vegetables, South Bruce and Bruce County

Field Vegetables		Bruce County					South Bruce				
		2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Total vegetables (excl. greenhouse)	Farms	**76**	**85**	**71[B]**	**-16%**	**-7%**	**10**	**13**	**6[B]**	**-54%**	**-40%**
	Acres	**534**	**794**	**846[E]**	**7%**	**58%**	**97**	**194**	**[F]**		
Sweet corn	Farms	29	27	22[B]	-19%	-24%	5	3	3[C]	0%	-40%
	Acres	163	145	[F]			14	x	[F]		
Tomatoes	Farms	30	26	24[B]	-8%	-20%	3	2	1[E]	-50%	-67%
	Acres	12	7	11[E]	57%	-8%	1	x	[F]		
Cucumbers	Farms	21	19	15[A]	-21%	-29%	3	4	2[A]	-50%	-33%
	Acres	13	14	13[E]	-7%	0%	x	10	9[D]	-10%	
Green peas	Farms	20	24	22[B]	-8%	10%	2	5	3[C]	-40%	50%
	Acres	32	88	[F]			x	x	[F]		
Green/wax beans	Farms	21	26	20[B]	-23%	-5%	3	4	3[C]	-25%	0%
	Acres	x	148	[F]			x	x	[F]		
Cabbage, regular	Farms	9	14	10[A]	-29%	11%	0	2	2[A]	0%	
	Acres	2	5	[F]			0	x	[F]		
Cabbage, Chinese	Farms	2	3	3[A]	0%	50%	1	0	0[B]		-100%
	Acres	x	x	[F]			x	0	0[A]		
Cauliflower	Farms	6	9	5[C]	-44%	-17%	0	1	1[A]	0%	
	Acres	2	7	[F]			0	x	[F]		
Broccoli	Farms	8	9	5[B]	-44%	-38%	1	1	2[C]	100%	100%
	Acres	x	3	[F]			x	x	[F]		
Brussels sprouts	Farms	4	5	1[A]	-80%	-75%	0	0	1[A]		
	Acres	1	x	[F]			0	0	1[E]		
Carrots	Farms	12	16	16[A]	0%	33%	0	3	2[A]	-33%	
	Acres	4	74	[F]			0	x	[F]		
Rutabagas and turnips	Farms	5	5	6[C]	20%	20%	0	1	0[B]	-100%	
	Acres	x	x	158[E]			0	x	0[A]		
Beets	Farms	23	26	12[A]	-54%	-48%	1	2	2[A]	0%	100%
	Acres	9	14	17[D]	21%	89%	x	x	14[D]		
Radishes	Farms	5	12	4[A]	-67%	-20%	0	2	0[B]	-100%	
	Acres	3	3	[F]			0	x	0[A]		
Onions, green/shallots	Farms	11	10	11[A]	10%	0%	1	0	2[C]		100%
	Acres	4	3	4[E]	33%	0%	x	0	2[D]		
Onions, dry	Farms	19	26	17[A]	-35%	-11%	2	5	3[A]	-40%	50%
	Acres	15	12	18[D]	50%	20%	x	5	10[C]	100%	
Garlic	Farms	..	..	32[B]			..	..	4[A]		
	Acres	..	..	[F]			..	..	[F]		
Celery	Farms	1	3	2[A]	967%	3100%	0	0	0[B]		
	Acres	x	x	[F]			0	0	0[A]		
Lettuce	Farms	15	13	8[B]	-85%	-87%	1	1	0[B]	-100%	-100%
	Acres	5	x	[F]			x	x	0[A]		
Kale	Farms	..	..	7[A]			..	..	0[B]		
	Acres	..	..	2[E]			..	..	0[A]		
Rhubarb	Farms	..	..	11[A]			..	..	0[B]		
	Acres	..	..	1[E]			..	..	0[A]		
Spinach	Farms	6	8	5[A]	0%	33%	0	1	0[B]	-100%	
	Acres	x	x	[F]			0	x	0[A]		
Peppers	Farms	11	14	16[B]	-50%	-36%	1	1	1[E]	0%	0%
	Acres	4	4	[F]	-50%	-50%	x	x	[F]		
Pumpkins	Farms	33	26	22[A]	-58%	-67%	4	3	2[C]	-33%	-50%
	Acres	34	31	80[D]	-97%	-97%	x	4	35[D]	775%	
Squash and zucchini	Farms	33	31	23[B]	-84%	-85%	3	6	3[C]	-50%	0%
	Acres	39	44	[F]			12	15	[F]		
Asparagus, producing	Farms	5	8	8[A]	100%	220%	0	0	0[B]		
	Acres	14	17	[F]			0	0	0[A]		
Asparagus, non-producing	Farms	3	2	1[A]	1000%	633%	0	0	0[B]		
	Acres	2	x	[F]		3900%	0	0	0[A]		
Other vegetables	Farms	35	48	12A	-52%	-34%	3	6	2[A]	-67%	-33%
	Acres	42	62	[F]			x	16	[F]		

Source: Statistics Canada. Table 32-10-0355-01, Census of Agriculture, 2021. Table 32-10-0418-01, Census of Agriculture, 2011 and 2016.
Data Quality Symbol Legend: [A] excellent / [B] very good / [C] good / [D] acceptable / [E] use with caution / [F] too unreliable to be published
X suppressed to meet the confidentiality requirements of the Statistics Act
.. not available for a specific reference period

Fruit Crops

The highest acreages of fruit crops in South Bruce include strawberries (28 acres) and grapes (12 acres), as shown in Figure 22. In total, 9 farms in South Bruce grew fruit crops in 2021, the same number as a decade ago. Data on total acreage at the area municipality level is too unreliable to publish. In Bruce County, 49 farms grew approximately 175 acres of field vegetables in 2021, down 29% in acreage since 2011.

Figure 22: Fruits, South Bruce and Bruce County

Fruits		Bruce County					South Bruce				
		2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Total area of fruits	Farms	**55**	**60**	**49[B]**	**-18%**	**-11%**	**9**	**7**	**9[B]**	**29%**	**0%**
	Acres	**245**	**204**	**175[E]**	**-14%**	**-29%**	**28**	**x**	**[F]**		
Apples	Farms	27	29	25[B]	-14%	-7%	4	3	4[B]	33%	0%
	Acres	122	88	[F]			5	13	[F]		
Pears	Farms	9	6	10[C]	67%	11%	1	0	0[B]		-100%
	Acres	10	5	3[E]	-40%	-70%	x	0	0[A]		
Plums and prunes	Farms	1	2	6[E]	200%	500%	0	0	0[B]		
	Acres	x	x	[F]			0	0	0[A]		
Cherries (sweet)	Farms	4	3	6[C]	100%	50%	0	0	0[B]		
	Acres	3	2	[F]			0	0	0[A]		
Cherries (sour)	Farms	1	3	4[B]	33%	300%	0	0	0[B]		
	Acres	x	2	2[E]	0%		0	0	0[A]		
Peaches	Farms	0	0	2[A]			0	0	0[B]		
	Acres	0	0	[F]			0	0	0[A]		
Apricots	Farms	0	0	4[E]			0	0	0[B]		
	Acres	0	0	0[E]			0	0	0[A]		
Grapes	Farms	2	2	9[C]	350%	350%	1	1	3[C]	200%	200%
	Acres	x	x	[F]			x	x	12[E]		
Strawberries	Farms	26	28	18[B]	-36%	-31%	3	2	3[C]	50%	0%
	Acres	61	44	65[E]	48%	7%	x	x	28[E]		
Raspberries	Farms	18	12	10[A]	-17%	-44%	2	1	1[A]	0%	-50%
	Acres	14	x	9[E]		-36%	x	x	[F]		
Cranberries	Farms	0	0	1[A]			0	0	0[B]		
	Acres	0	0	[F]			0	0	0[A]		
Blueberries, total	Farms	2	2	5[B]	150%	150%	0	0	0[B]		
	Acres	x	x	49[B]			0	0	0[B]		
Saskatoons	Farms	1	0	3[A]		200%	0	0	0[B]		
	Acres	x	0	[F]			0	0	0[A]		
Blackcurrants, redcurrants & whitecurrants	Farms	..	..	5[B]			..	..	0[B]		
	Acres	..	..	1[E]			..	..	0[A]		
Haskaps	Farms	..	..	4[A]			..	..	0[B]		
	Acres	..	..	1[E]			..	..	0[A]		
Other fruits, berries & nuts	Farms	7	10	10[A]	0%	43%	1	2	1[A]	-50%	0%
	Acres	9	x	11[D]		22%	x	x	5[E]		

Source: Statistics Canada. Table 32-10-0315-01, Census of Agriculture, 2011, 2016 and 2021.
Data Quality Symbol Legend: [A] excellent / [B] very good / [C] good / [D] acceptable / [E] use with caution / [F] too unreliable to be published
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.. not available for a specific reference period

Livestock Inventories

Cattle

Between 2011 and 2021, farms in South Bruce recorded 20% fewer head of cattle, totalling 19,441 animals in 2021 (see Figure 23). The only significant increases in numbers of specific types of cattle over the past decade was witnessed among dairy cows (5,062 animals in 2021, +6% from 2011). Beef cow numbers dropped 46% over the decade, to 1,988 animals in 2021. Bruce County livestock producers recorded similar trends.

Figure 23: Cattle Inventory, 2021, Bruce County and South Bruce

Cattle Inventory		Bruce County					South Bruce				
		2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Total cattle	Farms	1,224	1,039	944[B]	-9%	-23%	269	225	168[A]	-25%	-38%
	Animals	158,710	138,937	129,150[A]	-7%	-19%	24,355	21,023	19,441[A]	-8%	-20%
Calves (under 1 yr)	Farms	913	799	731[B]	-9%	-20%	229	191	132[A]	-31%	-42%
	Animals	35,283	32,256	30,200[A]	-6%	-14%	6,534	6,016	5,453[B]	-9%	-17%
Steers	Farms	498	421	379[A]	-10%	-24%	91	71	53[A]	-25%	-42%
	Animals	51,024	45,482	39,098[A]	-14%	-23%	3,869	1,985	1,352[E]	-32%	-65%
Heifers, total	Farms	714	649	575[B]	-11%	-19%	180	152	122[B]	-20%	-32%
	Animals	35,874	28,233	25,892[A]	-8%	-28%	5,230	5,497	5,456[B]	-1%	4%
Heifers, for slaughter or feeding	Farms	361	286	271[A]	-5%	-25%	72	55	57[A]	4%	-21%
	Animals	25,139	18,039	15,253[B]	-15%	-39%	1,882	2,567	2,126[C]	-17%	13%
Heifers, for beef herd replacement	Farms	302	304	270[A]	-11%	-11%	63	50	35[A]	-30%	-44%
	Animals	3,651	3,289	3,003[A]	-9%	-18%	363	315	208[D]	-34%	-43%
Heifers, for dairy herd replacement	Farms	200	181	156[B]	-14%	-22%	78	71	53[B]	-25%	-32%
	Animals	7,084	6,905	7,636[A]	11%	8%	2,985	2,615	3,122[B]	19%	5%
Cows, total	Farms	841	731	667[B]	-9%	-21%	216	176	124[A]	-30%	-43%
	Animals	35,255	31,795	32,786[A]	3%	-7%	8,489	7,357	7,050[A]	-4%	-17%
Cows, beef	Farms	627	542	518[B]	-4%	-17%	136	109	79[A]	-28%	-42%
	Animals	23,484	20,625	19,058[A]	-8%	-19%	3,694	3,041	1,988[B]	-35%	-46%
Cows, dairy	Farms	241	210	170[B]	-19%	-29%	84	70	49[B]	-30%	-42%
	Animals	11,771	11,170	13,728[A]	23%	17%	4,795	4,316	5,062[A]	17%	6%
Bulls	Farms	599	496	452[A]	-9%	-25%	142	101	64[A]	-37%	-55%
	Animals	1,274	1,171	1,174[B]	0%	-8%	233	168	130[E]	-23%	-44%

Source: Statistics Canada. Table 32-10-0370-01. Census of Agriculture, 2011, 2016 and 2021
Symbol legend on data quality: [A] excellent / [B] very good / [D] acceptable [E] use with caution / [F] too unreliable to be published

Pigs

Pig production (Figure 24) decreased in South Bruce between 2011 and 2021, with fewer farms and total pigs numbers dropping.

Figure 24: Pig inventory on farms, South Bruce and Bruce County

Pigs		Bruce County					South Bruce				
		2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Total pigs	Farms reporting	121	110	96[B]	-13%	-21%	28	20	17[B]	-15%	-39%
	# of animals	108,112	111,129	125,660[C]	13%	16%	29,109	19,026	15,002[E]	-21%	-48%

Source: Statistics Canada. Table 32-10-0372-01, Census of Agriculture, 2011, 2016 and 2021
Symbol legend on data quality: [B] very good / [C] good / [E] use with caution

Poultry

In South Bruce in 2021, 56 farms reported 665,676 total hens and chickens, +24% from 2011 (see Figure 25). Most (87%) of the poultry inventory was broilers, roasters, and Cornish (580,902 birds in 2021), down by 2% from 2016. South Bruce farms reported 5,174 turkeys in 2021.

Figure 25: Poultry Inventories on Farms, South Bruce and Bruce County

Poultry inventory		Bruce County					South Bruce				
		2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Total hens and chickens	Farms	305	329	294[B]	-11%	-4%	57	60	56[B]	-7%	-2%
	Birds	1,399,866	1,536,669	1,904,934[B]	24%	36%	538,359	685,671	665,676[B]	-3%	24%
Pullets intended for laying table eggs, under 19 weeks	Farms	32	32	35[B]	9%	9%	3	3	4[B]	33%	33%
	Birds	x	91,453	[F]			x	x	[F]		
Laying hens that produce table eggs, 19 weeks and over	Farms	234	270	215[B]	-20%	-8%	34	41	35[B]	-15%	3%
	Birds	x	222,054	279,824[D]	26%		x	x	[F]		
Layer and broiler breeders (pullets and hens), total	Farms	5	13	18[B]	38%	260%	2	3	3[C]	0%	50%
	Birds	x	628	[F]			x	210	53,032[D]	25153%	
Broilers, roasters and Cornish	Farms	105	86	112[B]	30%	7%	30	24	27[A]	13%	-10%
	Birds	1,017,467	1,222,534	1,478,986[B]	21%	45%	x	590,076	580,902[B]	-2%	
Turkeys	Farms	23	22	22[A]		-4%	4	3	4[A]		0%
	Birds	x	x	[F]			x	x	5,174[E]		
Ducks	Farms			34[A]					6[B]		
	Birds			7,937[E]					[F]		
Geese	Farms			9[A]					3[A]		
	Birds			[F]					[F]		
Other poultry	Farms	50	63	24[A]	-62%	-52%	8	8	6[A]	-25%	-25%
	Birds	1,519	18,047	[F]			284	384	[F]		

Source: Statistics Canada. Table 32-10-0374-01, Census of Agriculture, 2021, Table 32-10-0428-01, 2011 and 2016.
Symbol legend on data quality: [A] excellent / [B] very good / [C] good / [D] acceptable / [E] use with caution
x suppressed to meet the confidentiality requirements of the Statistics Act

Sheep and Other Livestock

Total sheep inventories declined over the past decade in South Bruce while remaining stable across Bruce County. Totals of rams and lambs increased in both South Bruce and the County (see Figure 26).

Figure 26: Sheep Inventory, Bruce County and South Bruce

Sheep Inventory		Bruce County					South Bruce				
		2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Total sheep	Farms	154	138	124[B]	-10%	-19%	40	32	26[A]	-19%	-35%
	# of animals	21,020	21,083	22,586[A]	7%	7%	5,560	5,308	4,087[B]	-23%	-26%
Rams	Farms	133	121	103[B]	-15%	-23%	34	29	21[A]	-28%	-38%
	# of animals	480	489	583[B]	19%	21%	101	88	121[C]	38%	20%
Ewes	Farms	149	135	118[B]	-13%	-21%	38	30	23[A]	-23%	-39%
	# of animals	11,691	11,673	11,595[B]	-1%	-1%	3,014	2,625	1,948[C]	-26%	-35%
Lambs, total	Farms	136	124	115[B]	-7%	-15%	36	28	25[A]	-11%	-31%
	# of animals	8,849	8,921	10,408[B]	17%	18%	2,445	2,595	2,018[C]	-22%	-17%

Source: Statistics Canada. Table 32-10-0371-01. Sheep inventory on farms, Census of Agriculture, 2021
Symbol legend on data quality: [A] excellent / [B] very good / [C] good / [D] acceptable

On South Bruce farms in 2021, there were approximately 4,000 rabbits and 3,662 goats were recorded, as the number of farms featuring them has declined over the past decade (Figure 27). The number of goats across Bruce County has stabilized at 11,336 in 2021, although the number of farms with goats has declined over the past decade. Chicken inventories also decreased (-3%) between 2016 and 2021.

Figure 27: Other livestock, South Bruce and Bruce County

Other livestock		Bruce County					South Bruce				
		2011	2016	2021	Change 2016-21	Change 2011-21	2011	2016	2021	Change 2016-21	Change 2011-21
Horses and ponies	# Farms	461	392	221[B]	-44%	-52%	65	47	24[B]	-49%	-63%
	# Animals	2,960	2,061	1,451[B]	-30%	-51%	393	172	128[E]	-26%	-67%
Donkeys and mules	# Farms	ǂ	ǂ	31[A]			ǂ	ǂ	6[A]		
	# Animals	ǂ	ǂ	51[C]			ǂ		12[D]		
Goats	# Farms	117	77	65[B]	-16%	-44%	27	15	14[B]	-7%	-48%
	# Animals	10,390	10,022	11,336[D]	13%	9%	3,954	2,799	3,662[E]	31%	-7%
Llamas and alpacas	# Farms	35	25	16[A]	-36%	-54%	10	5	3[C]	-40%	-70%
	# Animals	138	129	211[D]	64%	53%	28	15	31[E]	107%	11%
Bison (buffalo)	# Farms	2	2	3[C]	50%	50%	0	0	0[B]		
	# Animals	x	x	202[D]			0	0	0[A]		
Elk (wapiti)	# Farms	2	0	0[B]		-100%	0	0	0[B]		
	# Animals	x	0	0[A]			0	0	0[A]		
Deer (excluding wild deer)	# Farms	3	3	1[A]	-67%	-67%	0	0	0[B]		
	# Animals	138	182	F			0	0	0[A]		
Rabbits	# Farms	29	19	18[A]	-5%	-38%	10	3	1[A]	-67%	-90%
	# Animals	10,938	6,777	8,062[E]	19%	-26%	x	x	4,000[E]		
Mink	# Farms	2	1	0[B]	-100%	-100%	0	0	0[B]		
	# Animals	x	x	0[A]			0	0	0[A]		

Source: Statistics Canada. Table 32-10-0373-01, Census of Agriculture, 2011, 2016 and 2021. Symbol legend on data quality: [A] excellent / [B] very good / [D] acceptable / [E] use with caution / [F] too unreliable to be published / ǂ = data not provided in 2011 and 2016. x=suppressed to meet the confidentiality requirements of the Statistics Act.

Specialty Operations and Direct Sales

Specialty Crops

There were 18 farms in South Bruce in 2021 that collectively reported 16,930 taps in maple trees to harvest sap for maple syrup production. Statistics Canada did not provide data on other specialty operations. Anecdotally, it is known that there are lavender and sea buckthorn crops in South Bruce, the acreage of which is not tracked by Statistics Canada.

Direct Sales

Direct sales from farms may involve fruit, vegetables, eggs, meat, and other products. There are 40 farms in South Bruce that reported direct sales to consumers in 2021, +21% from 33 farms in 2016. The number of direct-to-consumer farms in Bruce County was 244 in 2021, +11% from 2016. For 6 farms in South Bruce and 17 farms in Bruce County, direct sales to consumers generate 76% to 99% of their total operating revenues.

Direct deliveries to consumers are the most popular method of sales, with 23 farms in South Bruce and 119 in Bruce County selling this way. Sales via on-site farm stands, farmers markets, and Community Supported Agriculture have declined over the last five years. Most farms in South Bruce (321 farms, 89% in direct sales in 2021. Across Bruce County in the same year, 1,702 farms (87% of total farms) also reported no direct sales. See Figure 28.

Figure 28: Direct sales of agricultural products to consumers, South Bruce and Bruce County

Direct sales	**Bruce County**			**South Bruce**		
	2016	2021	Change 2016-21	2016	2021	Change 2016-21
Total number of farms reporting direct sales[39]	**219**	**244[A]**	**11%**	**33**	**40[B]**	**21%**
Type - Unprocessed agricultural products	214	233[A]	9%	32	35[B]	9%
Type - Value-added products	27	27[B]	0%	3	7[C]	133%
Method - On-site farm stores, stands, kiosks, U-pick, farm gate	206	146[A]	-29%	31	21[C]	-32%
Method - Off-site farm stores or stands	..	21[C]		..	4[D]	
Method - Farmers' markets	36	29[B]	-19%	6	5[D]	-17%
Method - Direct deliveries to consumers	..	119[A]		..	23[B]	
Method - Community Supported Agriculture (CSA)	6	4[E]	-33%	1	[F]	
Method - Other	12	9[D]	-25%	2	2[E]	0%
Percentage of total operating revenues - 0%	**..**	**1,702[B]**		**..**	**321[B]**	
Percentage of total operating revenues - From 1% to 5%	..	85[B]		..	14[A]	
Percentage of total operating revenues - From 6% to 25%	..	68[B]		..	8[B]	
Percentage of total operating revenues - From 26% to 50%	..	27[B]		..	5[A]	
Percentage of total operating revenues - From 51% to 75%	..	17[B]		..	1[A]	
Percentage of total operating revenues - From 76% to 99%	..	17[B]		..	6[B]	
Percentage of total operating revenues - 100%	**..**	**30[B]**		**..**	**6[B]**	

Source: Statistics Canada. Table 32-10-0242-01, Census of Agriculture, 2021; Table 32-10-0447-01, Census of Agriculture, 2016
Symbol legend on data quality: [A] excellent / [B] very good / [D] acceptable / [E] use with caution / [F] too unreliable to be published
.. not available for a specific reference period

[39] The number of farms reporting does not equal the sum of the parts because farms reporting more than one category (or activity) are only counted once.

Soils, Water, and Land Use

Soils

South Bruce is located on the Cobourg Formation,[40] a sedimentary rock formation deposited 300-540 million years ago[41] suitable for a DGR, according to the Conceptual Design Report.[42] The Soil Survey[43] of Bruce County explains that the most common soil type is Grey Brown Podzolic, which is high in organic matter and very efficient at draining water, qualities which are beneficial for agriculture.

Initial site investigations including borehole sampling has begun, and more site investigations are underway in South Bruce. The DGR will be located at a nominal depth of 500 metres, which is well away from any surface agricultural operations.

A report by researchers at York University and the University of Edinburgh outlines the long-term conditions anticipated in the DGR, conceptual models of the processes affecting microbiologically influenced corrosion, and results of a newly developed Thermal-Hydraulic-Chemical (THC) diffusion model. The THC model[44] has been developed to aid in the performance assessment of the DGR and is designed to be flexible to accommodate additional processes and site-specific information as it becomes available.

Water

Aquifers, water, and irrigation are important assets for agriculture. At the depth of the proposed DGR, there is very little water, according to the NWMO. This rock has been disconnected from the water on the surface for millions of years and is one part of the multiple barrier system to contain and isolate the used nuclear fuel within the repository from the very limited amount of water in the rock and the surrounding environment.[45]

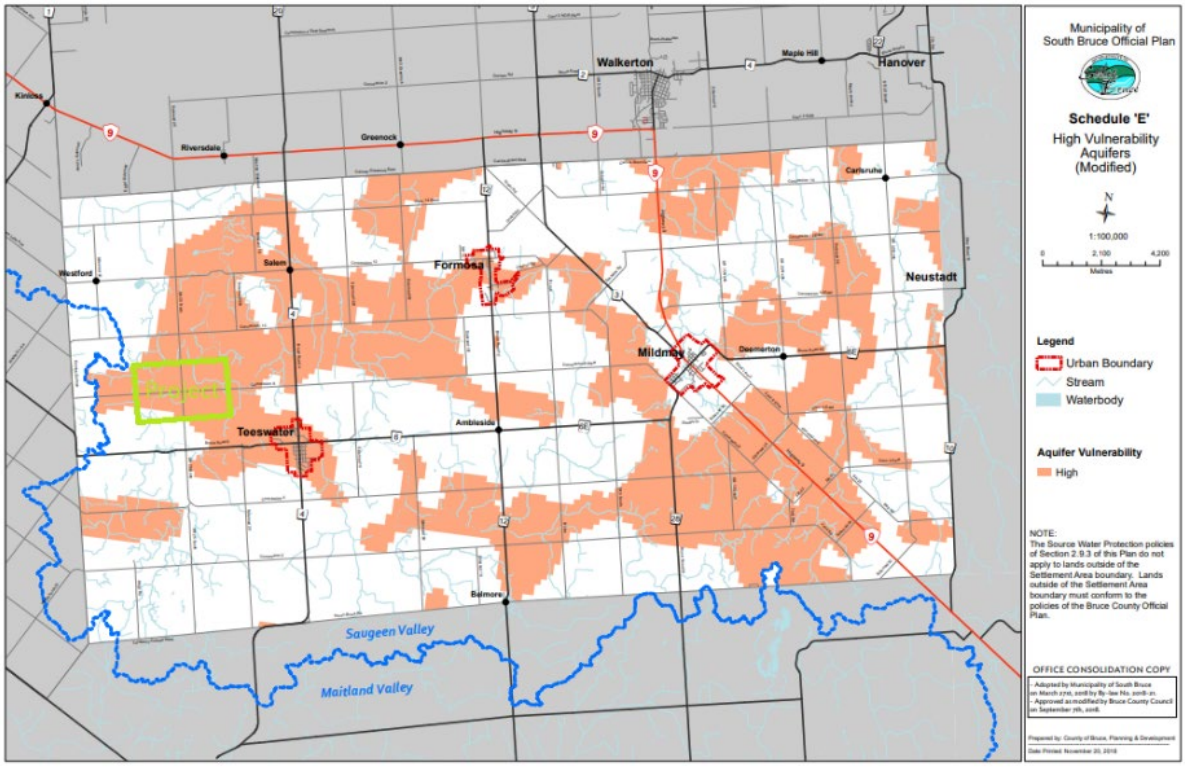
In two deep boreholes drilled in 2021, according to the Confidence in Safety – South Bruce Site Report[32], groundwater samples were collected from rock formations that were known to be permeable and are hundreds of metres above the proposed repository host rock formation. The deepest groundwater sample was collected at approximately 325 metres below ground surface. This is more than 300 m above the Cobourg Formation. No appreciable groundwater was able to flow into the borehole from the Cobourg Formation, or the overlying shales.

The NWMO has partnered with Saugeen Valley Conservation Authority (SVCA) to research water resources in the South Bruce area. According to the NWMO, the program will monitor water flow and collect surface water samples in rivers, lakes and wetlands. The samples will be submitted to certified laboratories for analysis of general water quality, existing local industries, and potential contaminants.[46]

[40] The Cobourg Formation is a geological formation found below the earth in South Bruce, dating back to the Late Ordovician geologic age, approximately 450 million years ago. Source: U.S. Geological Survey, usgs.gov
[41] Gierszewski and Parmenter, Confidence in Safety – South Bruce Site, March 2022, nwmo.ca
[42] Naserifard et all, NWMO, Deep Geological Repository Conceptual Design Report Crystalline / Sedimentary Rock, 2021, nwmo.ca
[43] Soil Survey of Bruce County, 1954, agr.gc.ca
[44] Asad et al, York University, University of Edinburgh, Modelling Bisulfide Transport through the Engineered Barrier System under Repository Conditions: Coupling Unsaturated Flow and Refining Boundary Conditions, NWMO, nwmo.ca
[45] Protecting Water from Contamination, NWMO, nwmo.ca
[46] Water Testing, NWMO, nwmo.ca

The Official Plan[47] for South Bruce, consolidated in 2019, indicates that the NWMO site area is within the High Aquifer Vulnerability Area as defined by the Ontario Water Act 2006 (Figure 29). The "Phase 1 Geoscientific Desktop Preliminary Assessment of Potential Suitability for Siting"[48] discussed aquifers in detail. The Environment Report[49] also discusses aquifers and source water protection in detail.

Figure 29: Waterbodies and Aquifer Vulnerability - Municipality of South Bruce



Source: South Bruce Official Plan (Schedule E), with overlay of approximate NWMO Project location (added by Deloitte)

Land Use

According to the Land Use Study Report prepared for NWMO and the Municipality of South Bruce, "adequate areas exist within the potential Project site to accommodate the proposed surface facilities required for the Project."[50] The proposed site decommissioning plan would suggest that the above-ground DGR facility and the related Excavated Rock Management Area (ERMA) are an interim land use – "albeit an interim use over many decades". Any land removed from agricultural production would presumably be returned to agriculture in the long term.

The proposed DGR facility will require approximately 111 acres (45 hectares) of land for the above ground facilities. There are approximately 711 acres (288 hectares) of Rural

[47] An Official Plan provides a land-use policy framework to guide the public and private sectors in making decisions concerning future development and investment within a municipality. The Province of Ontario mandates that all municipalities prepare and update their Official Plans.
[48] Geofirma Engineering, nwmo.ca
[49] Golder Associates, nwmo.ca
[50] DPRA, MHBC, NWMO, Municipality of South Bruce, Land Use Study Report, May 2022, nwmo.ca

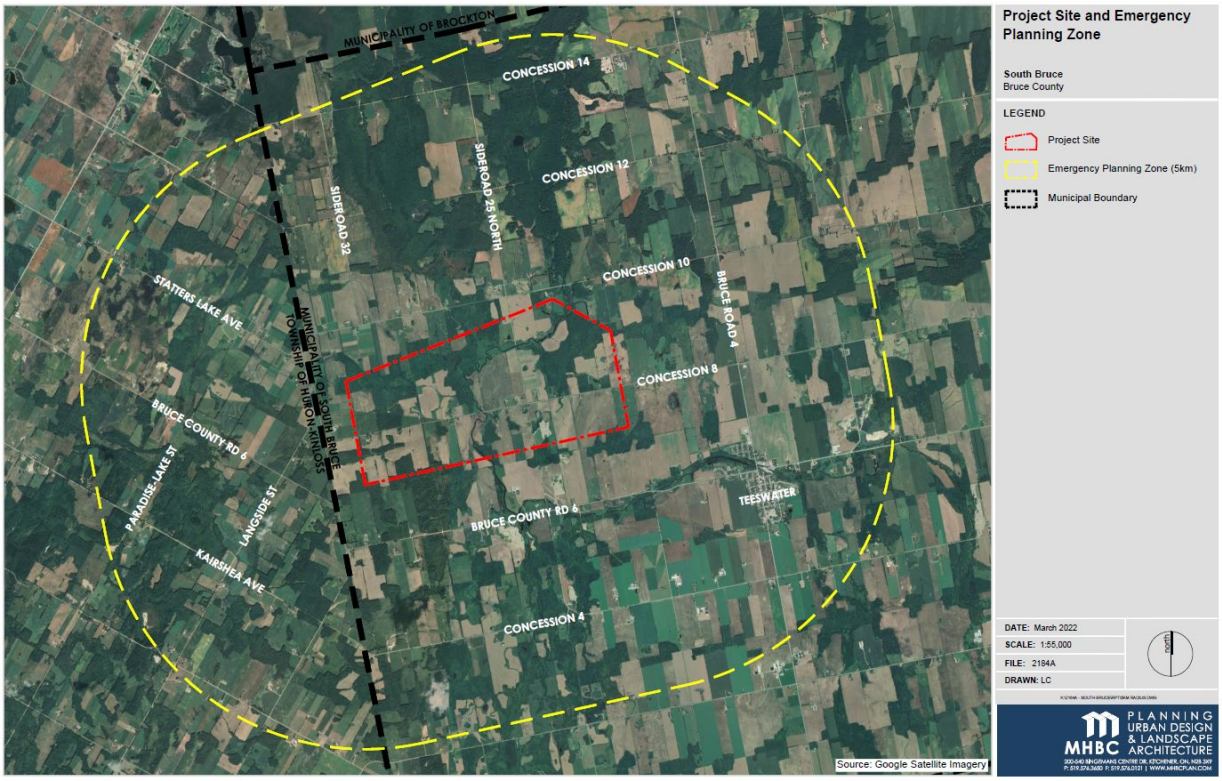
designated lands and 578 acres (234 hectares) of Prime Agricultural Lands within the potential Project site area (see Figure 30).

Figure 30: Project Site Area

Source: DPRA Land Use Study Report, May 2022.

The Land Use Study Report also states that the development of the Project does not directly result in any land use change to the lands within the 5 km Emergency Planning Zone (EPZ). The EPZ (Figure 31) is illustrated in the Emergency Services Study.[51]

Figure 31: Emergency Planning Zone



Source: Emergency Services Study, 2022

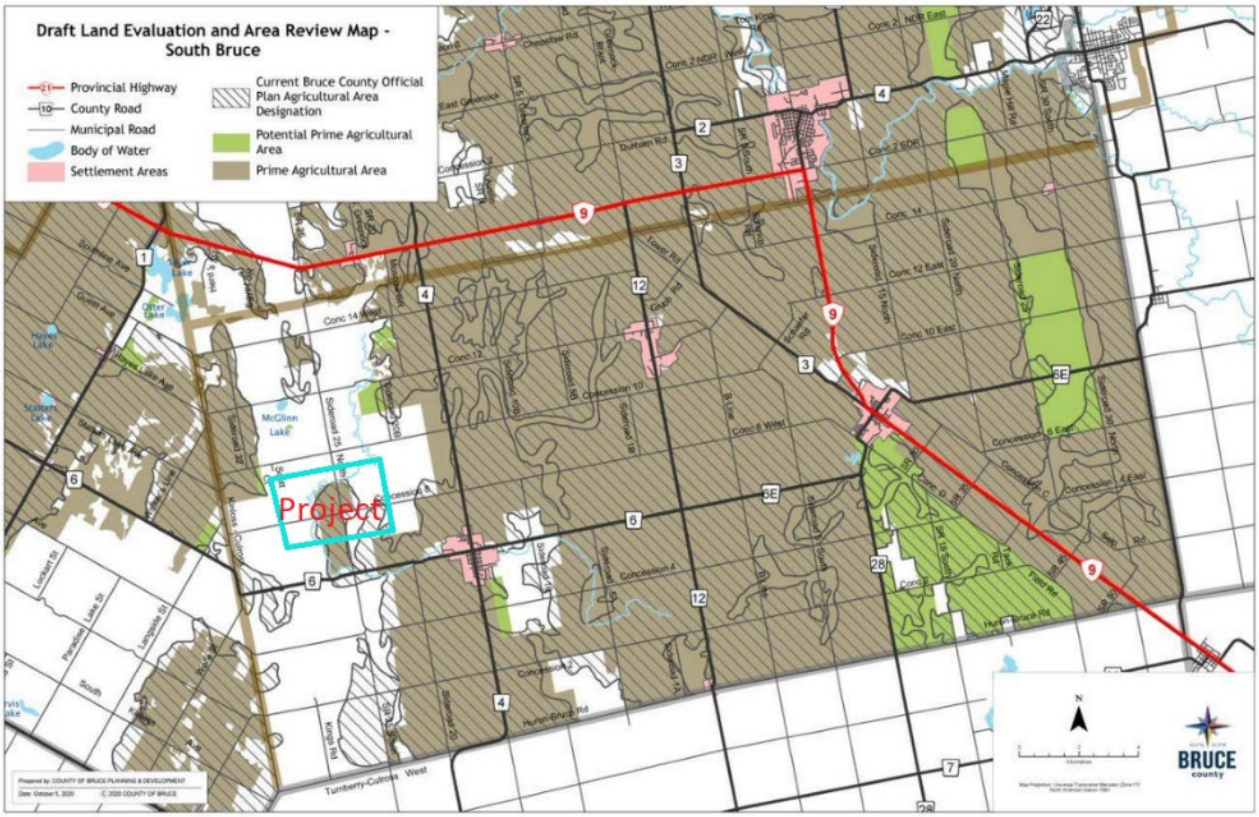
For more information on the land-use framework of Bruce County and South Bruce, and its implications related to the Project, consult the Land Use Study Report.

A Zoning By-law Amendment at the local municipal level and an Official Plan Amendment at the County level will be required to permit the proposed DGR facility and ERMA in the rural/agricultural zones. The planning application process will follow standard timelines and practices towards the implementation and development of the DGR facility and ERMA. Timelines for planning approvals are regulated by the Planning Act.

[51] DPRA Canada Inc., Independent Environmental Consultants, Emergency Services Study, 2022

Bruce County is currently updating its Official Plan and has published the draft Plan the Bruce: Agriculture Interim Report.[52] The draft land evaluation and area review map for South Bruce (Figure 32), contained in the report, indicates that area northwest of Teeswater has fewer acres of prime agricultural land than the remaining areas of the municipality.

Figure 32: Draft Land Evaluation - South Bruce, 2020



Source: Bruce County, Plan the Bruce Project, Agriculture Interim Report, with overlay of approximate NWMO Project location (added by Deloitte)

[52] Bruce County, Agriculture Interim Report, 2020, planthebruce.ca

3.4 Agribusiness in South Bruce

There is a strong connection between agriculture and other business sectors in the Municipality of South Bruce, including agriculture-related sectors and subsectors; value-added agriculture processing and business services; and agritourism.

Agriculture-related Sectors and Subsectors

Agriculture accounted for the highest proportion of business establishments by industry in South Bruce and employed 523 workers, just a few less than manufacturing, with 531 workers.[53]

- Animal production is the largest industry subsector, with 132 businesses representing 25% of total businesses for South Bruce. This subsector also has an extremely high concentration of businesses relative to the province, with a Location Quotient[54] (LQ) of 22.18.
- Crop production, real estate, and specialty trade contractors are also important subsectors, accounting for between 7-18% of the municipality's total businesses. Crop production and real estate also have a very high LQ of 12.23 and just above average LQ of 1.30, respectively.
- Other important subsectors with high and very high LQs are repair and maintenance (2.09) and support activities for agriculture and forestry (12.23).

Value-added Agriculture Processing and Business Services

The Municipality of South Bruce is host to several value-added agriculture businesses, food processing companies, and support services. These businesses are significant because they are primarily exporters and bring new wealth into the community.

Businesses include custom butchering, feed and animal health products, custom feed grinding and mixing, bulk feed delivery, poultry loading crews and poultry products and services, meat processing, milk powder production, consumer nutritional products, fertilizer, seed, crop protection products, petroleum, farm and consumer hardware supplies, milk marketing and shipping, licensed grain dealing and storage, maple products, wine, and cider.

Agritourism

A review of agritourism assets was prepared based on a variety of sources, including directories and local informants, since there is no central database. South Bruce has a limited number of agritourism assets, which could be developed as emerging assets of regional significance, according to the Municipality of South Bruce Tourism Industry Effects Study.[55]

[53] South Bruce Economic Development Strategy Update, September 2021
[54] Location quotient (LQ) is a way of discovering the industries or occupations that are truly unique and specialized in a local economy (compared to the national average). Industries with a high LQ are typically (but not always) export industries, which are important because they bring money into the region, rather than circulating local dollars around the economy. Source: Emsi, economicmodelling.com
[55] Deloitte LLC, Municipality of South Bruce Tourism Industry Effects Study, July 2022.

Businesses include tourist-oriented farms with tours, retail stores, and tourist accommodations; retail outlets with fresh dairy and cheese, preserves, meats, and maple syrup; a winery/cidery; and agriculture-related events.

The Tourism Industry Effects Study stated that the tourism industry in South Bruce has "the potential to leapfrog past traditional visits into the realm of monetized tourism experiences. By leveraging the food and drink of South Bruce, as well as the agritourism and outdoor experiences, entrepreneurs can begin to draw new audiences to the municipality."

The tourism study also states that the proposed Centre of Expertise could include authentic elements that are attractive to leisure visitors, such as a demonstration theatre explaining the DGR, agriculture and academic speakers, community gatherings, and culinary and local food talks. Among the top opportunities for tourism in South Bruce is "developing agri/culinary tourism in partnership with local farmer groups and restaurants."

3.5 Supports for South Bruce Agriculture and Agribusiness

Local Agriculture Networks

The Municipality of South Bruce is served by several local and regional agriculture networks, which are explored fully in Appendix F. The Bruce County Federation of Agriculture[56] (BCFA) is a large network associated with the Ontario Federation of Agriculture. BCFA represents 1,455 farm families across the County of Bruce. The Christian Farmers Federation of Ontario (CFFO) has a district association covering Grey-Bruce.[57] The National Farmers Union – Ontario (NFU-O) has Local 320 in Bruce County.

Other agencies, agricultural networks, marketing boards, and associations that South Bruce farmers can access include Agricorp, Beef Farmers of Ontario, Foodland Ontario, Ontario Dairy Goat Co-operative, Ontario Ministry of Agriculture Food and Rural Affairs, Ontario Soil and Crop Improvement Association, and the Organic Council of Ontario The Ontario Farm Products Marketing Commission oversees the activities of several marketing boards and associations, including the Dairy Farmers of Ontario, Grain Farmers of Ontario, Ontario Bean Growers, Ontario Canola Growers' Association, Ontario Pork Producers' Marketing Board, Ontario Sheep Marketing Agency, and the Seed Corn Growers of Ontario. Younger residents can get involved in the Bruce 4-H Association[58] or a nearby chapter of Junior Farmers Association of Ontario.[59]

[56] Bruce County Federation of Agriculture, brucefederation.ca
[57] Christian Farmers Federation of Ontario, christianfarmers.org
[58] Bruce 4-H, 4-hontario.ca
[59] Junior Farmers, jfao.on.ca

Local Support for Agriculture

During the preparation of the Municipality of South Bruce's Economic Development Strategy Update in September 2021, a background review of key documents uncovered the following perspectives:

- The community perceived South Bruce as having a strong agriculture sector.
- There is a high degree of interest in developing industry supply chains including those related to the agriculture and agribusiness sector, but also the cleantech[60] and nuclear sector.
- People see agribusiness opportunities in value-added goods, culinary, and agriculture technology.
- Stakeholders aspire for South Bruce to nurture a successful agriculture supply chain, including food and beverage manufacturing, meatpacking, cheese production, wholesale trade, transportation, and warehousing.
- There are concerns that the area will miss opportunities to leverage agriculture trends and keep local farms connected to the local economy.
- Stakeholders expressed a passionate desire to see the South Bruce farming way of life understood, respected, and reintegrated into the rest of the economy and the community.

Municipal Support

The Municipality of South Bruce confirmed its support for the agriculture and agribusiness sector when it approved the 2021 Economic Development Strategy Update. The following recommended actions, which were endorsed by Council, are evidence of the support:

- Add human resources to help increase the success of existing businesses and grow investment in agribusiness. (Outcome: Municipality hired an Economic Development Officer.)
- Consult with farmers, homebuilders, and small businesses to identify and reduce municipal bureaucratic burdens. (Outcome: Municipality has circulated survey.)
- Update the Official Plan and Zoning By-Law to enable on-farm agricultural diversification and incentivize a diverse mix of housing development in villages. (Outcome: Municipality updated Official Plan.)
- Adapt Community Improvement Plan (CIP) incentives to assist farmers and businesses to add value, diversify the economy, create jobs, grow entrepreneurship, and encourage infilling in villages. (Outcome: Municipality updated CIP in 2021, currently updating again to include all South Bruce in CIP, including rural areas. Building Better Futures Grant[61] for community groups to do infrastructure and programming.)
- Become the champion for value-added agriculture, diversified agribusiness enterprises, alternative crops, and farm innovation

[60] Cleantech is any technology, product, or service that uses fewer materials or energy, generates less waste, and causes less negative environmental impacts than the industry standard.
[61] South Bruce Building Better Futures Grant, southbruce.ca

In terms of supporting agriculture and agribusiness, the Economic Development Strategy Update's Strategic Direction entitled "Agribusiness Reboot", calls on the Municipality of South Bruce to lead the way in agricultural innovation, and enable investments in value-added, agritech, and culinary. Actions in the 2021 Economic Development Strategy Update specific to agribusiness included:

- Become the champion for value-added agriculture, diversified agribusiness enterprises, alternative crops, and farm innovation in Bruce County.
- Develop agribusiness alliances across Bruce County, Huron County, Wellington County, Grey County, and Perth County, and with agricultural organizations.
- Create an agribusiness innovation hub, leveraging educational institutions and business start-ups in adjacent urban centres along with the on-the-ground know-how of farmers and agribusiness owners.
- Activate Farm Enterprise Zones (agriculture and agri-food nodes clustered with small settlements) and On-Farm Diversified Uses for South Bruce, and ensure farming areas have access to high-speed broadband activity and reliable cell networks. (Outcome: Ongoing.)
- Collaborate with farmers, agribusinesses, entrepreneurs, and agency partners to develop incentives and initiatives to increase agriculture-related growth.
- Encourage farmers and village business owners to collaborate and develop matching on-farm and culinary experiences showcasing local food and drink products. (Outcome: Municipality supported Flavours of South Bruce Tourism Event.[62])

County Support

Bruce County acknowledges that agriculture plays an important role in the County's economy and rural identity. Agricultural lands are the foundation for food, fibre, the local food economy, agri-food exports and economic prosperity, the County stated during its Official Plan Review.[63] Among the initial policy directions to support agriculture are broadening permitted uses to reflect more flexible provincial policy and guidelines.

According to the Plan the Bruce Business Discussion Paper, Bruce County learned through public engagement that it should find ways to grow agriculture and explore connections with the local food movement and cleantech.[64] Focusing on where the nuclear/cleantech and agriculture sectors overlap may provide opportunities for economic growth. Municipalities could work with businesses and post-secondary schools (e.g., University of Guelph) to build synergies between nuclear and agriculture. The sectors are very similar – safety aspects, processes, and innovation.

The County is also considering how it can support/help diversify agriculture such as food processing, value-added enterprises, smaller-acreage farms, alcohol production, and culinary tourism.

[62] Flavours of South Bruce Tourism Event, southbruce.ca
[63] Plan the Bruce website, brucecounty.on.ca
[64] Plan the Bruce: Business Discussion Paper, planthebruce.ca/business

4. Agriculture Stakeholder Feedback

This section contains feedback from agricultural stakeholders about the potential for the NWMO Project to change agriculture and agribusiness operations in the Municipality of South Bruce, as well as the potential for continued agricultural use of the lands on or near the NWMO site. Feedback was also gathered from stakeholders on any potential change in the value of agricultural proceeds compared to market prices.

4.1 In a Nutshell

Agriculture stakeholders in South Bruce believe the current agriculture industry is strong, profitable, diverse, and progressive. It is the cherished backbone of the community and new opportunities are emerging. When asked how local agriculture might change if the NWMO project is built, some agriculture representatives were optimistic while others expressed concern. Opponents were eager to raise the spectre of a used nuclear fuel storage facility stigmatizing the community's future, potentially affecting customer perceptions and commodity prices. Some stakeholders said the DGR could be a windfall for local farmers, and that there may be more investment in local infrastructure and road maintenance. Other farmers pointed to Bruce Power, which has operated safely in the region for decades, in harmony alongside agriculture operations. The availability and cost of workers was raised consistently as a future concern, as was increased traffic, although disruption on roads was not mentioned as frequently. Agriculture stakeholders saw potential in using the surplus NWMO lands and Centre of Expertise for agriculture-related research, development, and training purposes. Bruce County is exploring where the nuclear and/or cleantech[65] and agriculture sectors overlap may provide opportunities for economic growth.

4.2 Key Findings

- Stakeholders felt the Project would have a massive impact for generations and across industries. They said decisions should be made strategically and developed in consultation with stakeholders from different groups and sectors.
- Most farmers expressed concerns about availability of workforce, if higher-paying low-skilled jobs become available because of the Project. Traffic congestion was also mentioned, especially as it related to increased truck traffic mixing with agricultural machinery and Mennonite horse and buggies on roads in South Bruce and Huron-Kinloss.
- Stakeholders suggested the NWMO surplus acreage could be donated for crop research, product development, experimental farming practices, and industry demonstrations. The land could become a model of land stewardship practices, among many other ideas and concepts that would benefit agriculture.

[65] Clean technology (cleantech) is any process, product or service that reduces environmental impacts through environmental protection activities that prevent, reduce or eliminate pollution or any other degradation of the environment; resource management activities that result in the more efficient use of natural resources, thus safeguarding against their depletion; or the use of goods that have been adapted to be significantly less energy or resource intensive than the industry standard. Clean Growth Hub, ic.gc.ca

- Missed opportunities were a key warning from some agriculture stakeholders. They saw the Project as a benign force in relation to farming in South Bruce, and – in a best-case scenario – accelerating local agricultural diversity and growth.
- A small vocal group of stakeholders pitched a doomsday scenario evoking a vast wasteland with no farming occurring for miles. They predicted radioactive contamination, consumer and business boycotts of products grown and processed in South Bruce, and severe losses in commodity values and livelihoods.
- Some stakeholders, who prefer to remain silent in public, recognized the difficult situation South Bruce Council is facing and the complexity of "the decision" on willingness. They felt Municipal Council should work hand-in-hand with businesses (including farms), to continue to encourage continued transparency and patience, to open the space for more fact-based conversation, and to base decisions on evidence and not perception.
- Stakeholders encouraged the Municipality to continue working with transparency and patience, dedicating efforts to open the space for conversation to base decisions on information and not perception. They felt Council should be proactive rather than reactive.

4.3 Background on Stakeholder Engagement

An engagement process was conducted – among agriculture stakeholders in South Bruce and among the Mennonite farming community of Huron-Kinloss – to learn about the perspective from the local agriculture industry on how the NWMO project may change agriculture and agribusiness operations, and possible strategies to address the potential change of the industry. A variety of channels (interviews, workshop, surveys, and media monitoring) were used to ensure opportunity was given to as many members of the agricultural community as possible to share their opinion. See Appendix C for more details on the engagement phase of this study. All agricultural stakeholders were encouraged to provide their feedback. Engagement consultations largely were one-on-one, or via individual survey, since vocal opponents to the Project dominated a virtual workshop and attempted to project their opinions onto others in attendance.

The following information was shared with stakeholders who participated in the engagement process. The proposed site for the DGR is north of Teeswater, one of two locations in Ontario being considered by the NWMO for the DGR operations. The NWMO also expects that much of the land directly above the DGR will remain productive farmland. About 250 acres of the overall 1,700-acre site will be taken up by surface facilities to support the placement of used fuel underground. The remaining 1,400 acres may continue to be farmed where feasible or used for other purposes. Once the surface facilities have been closed and decommissioned,[66] the 250 acres of land may be transitioned to other activities.

[66] The Canadian Nuclear Safety Commission regulates the decommissioning process. Radiological and non-radiological conditions are monitored throughout decommissioning to confirm that radiation risks to workers, the public and the environment are being adequately controlled. Surveys are performed throughout decommissioning to confirm the effectiveness of decommissioning activities used to reduce radiological and non-radiological risks (e.g., removal of excess radioactive material, decontamination of process equipment and immobilization of remaining contamination). Surveys of hazards are performed to support the safe performance of surveillance and maintenance activities during periods when decommissioning is deferred. Surveys should also be performed to demonstrate that adjacent uncontaminated zones remain unaffected by decommissioning activities. It understood that once the license is issued, rewilding or farming may be able to commence. Source: nuclearsafety.gc.ca

The NWMO has stated it will:

- Work closely with the agricultural community to ensure the DGR project will have added value to the agricultural sector, and to find opportunities to support and promote Ontario agriculture crops and products.[67]
- Establish a Centre of Expertise to house technical and research programs, and to become a hub for knowledge-sharing across Canada and internationally. The design and use of the Centre of Expertise will be developed collaboratively with those living in the area.[68]

The engagement process happened prior to NWMO signing a Memorandum of Understanding[69] (MOU) with the Municipality of South Bruce in June 2022. The document contained several items related to issues raised by the agricultural community. The MOU will be referenced as appropriate in this section.

4.4 Stakeholder Engagement

Stakeholder Views on Changes to Agriculture

Agriculture stakeholders identified the following strengths of the current agriculture industry in South Bruce: fertile soil, profitable, diverse, progressive, strong supply chain, community backbone, vibrant, important dairy production, new opportunities have emerged. When asked about the potential changes for the agriculture sector in South Bruce if the NWMO project is built, agricultural stakeholders identified common themes.

Potential Positive Impacts

Stakeholders said the Project could create higher paying jobs and expand the tax base. They also believe there will be more investment in the municipality's infrastructure and road maintenance, associated with the NWMO project, improvements which they feel are highly needed. They said well-maintained roads, broadband internet, and natural gas may help lower operating costs for farms.

Labour Force Disruptions

Stakeholders were concerned that farms and agriculture businesses would be competing for workers in the presence of higher-paying jobs. These concerns were echoed in the Local Hiring Effects Study and Strategy[70] (April 2022), which aimed to help South Bruce make informed decisions related to the workforce, in relation to the NWMO Project. The study points to the following challenges that need to be mitigated:

- **Competition for labour:** Farms and small businesses would compete with large industries for the same talent pool. Low availability of general labour locally, exacerbated by high competition between local industry for skilled, general, and temporary labour.
- **Wage disparity:** Difficulty for smaller businesses and farms to attract and retain local workers due to wage gap disparity between large and small industries in the

[67] NWMO FAQs, nwmo.ca
[68] NWMO Centre of Expertise, nwmo.ca
[69] NWMO / South Bruce Memorandum of Understanding, nwmo.ca
[70] MDB Insight, April 2022

same region. Small enterprises may not have the benefits, supports and workplace accommodations that employees prefer.

- **Limited housing, amenities, and infrastructure:** The ability of residents to live and work in South Bruce, Huron-Kinloss, and nearby areas may become problematic, due to limitations on housing, transportation, childcare, grocery stores, broadband connectivity, hospitals, and recreational facilities. Infrastructure improvements to support business and community priorities is a key goal of the Corporate Strategic Plan[71] (2021-2025).

The NWMO / South Bruce MOU (June 2022) states that NWMO will:

- Identify the potential for any positive and negative socio-economic impacts of the Project on South Bruce and surrounding communities and what community benefits it will contribute to mitigate any potential risks.
- Support local industries such as agriculture, manufacturing, tourism, and construction.

Traffic Disruptions

Stakeholders felt increased traffic related to the construction and operation of the Project have the potential to disrupt local traffic patterns. A number of reports have identified these factors:

- **Mix of commercial and agriculture-related traffic:** The Local Traffic Study Report[72] observed commercial trucks and agriculture-related vehicle traffic on almost every road in the Study Area (municipalities of South Bruce, Huron-Kinloss, Brockton, Morris-Turnberry, and North Huron).
- **Concerns about horses and buggies:** The Local Traffic Study Report also mentioned concerns about the Mennonite community, specifically mixing horses and buggies on country roads with increased truck traffic.
- **Potential for traffic congestion and impact on commuters:** In the report, Moving Forward Together: Planning Framework for the Transportation of Used Nuclear Fuel,[73] concerns were expressed about proximity of routes to towns and schools, and environmental areas. Conditions of the route during seasonal weather changes and inclement weather will need to be considered, as well as fluctuations in farm and tourist traffic.

The NWMO / South Bruce MOU (June 2022) states that NWMO will:

- Ensure considerations for farm vehicles and horse-and-buggy traffic are integrated into the project planning and appropriate mitigation provisions incorporated.
- Work with local farmers to manage trucking schedules around heavy traffic periods for the agriculture activities such as planting and harvesting.
- Identify approved transportation routes during construction and operation of the Project and ensures proper funding for maintenance and repair of municipal roads and bridges used for the Project.
- Identify potential effects of the increased traffic flow on residents, the Mennonite community, and the agricultural community.

[71] South Bruce Corporate Strategic Plan, September 2021, southbruce.ca
[72] Morrison Hershfield, "Local Traffic Study Report", June 14, 2022, Draft
[73] NWMO, 2021, nwmo.ca

- Develop a plan for the possible road upgrades and improvements to make the transportation system as safe as possible for all users.

Disruption to Agricultural Character of South Bruce

Stakeholders have expressed concern about dilution of the agricultural character of the community and the agricultural sector with the potential influx of people who are not familiar or respectful of the ways and needs of farmers and agribusinesses. Other stakeholders said that South Bruce already faces these challenges, as many rural and farming communities do, and that they are unrelated to the NWMO Project.

The NWMO / South Bruce MOU (June 2022) states that NWMO will:

- Engage with the local community to obtain input on project aesthetics around surface facilities to support local natural and cultural beauty.
- Maintain the surface and topography of the land in its current form (excepting the DGR surface facilities).

Uncertainty in Farming

Some stakeholders believed that farming is threatened, in turmoil, and subject to uncertainty. Other stakeholders saw uncertainty in farming as an ongoing systemic reality as a result of broader external factors that have nothing to do with DGR. Other stakeholders said the DGR could be a windfall for farmers: there will be money spent, and some of it should find its way into farmers' pockets.

Stigma

Some stakeholders feared customers may develop a stigma about food produced near the site, which may result in lost clients. An executive of Chapman's, an ice cream manufacturer, indicated that "a nuclear waste depository underneath farm country may erode confidence in the Ontario dairy industry. The perception of the safety of our food supply may not always be accurate, but it still effects the buying habits of Canadians".[74]

Other stakeholders said there will be no issues related to eating anything from around the DGR, just as people eat food grown near Bruce Power. Even the Chapman's executive told the Canadian Broadcasting Corporation (CBC): "I'm sure it will be safe".[75] Stakeholders said NWMO should work to reduce stigma by:

- **Safety Monitoring:** Providing ongoing evidence of no risks or health concerns from crops surrounding the project, such as the ongoing monitoring operations undertaken by Bruce Power.
- Although various used nuclear fuel disposal concepts have been investigated, deep geological disposal has been considered to be the most appropriate solution to deal with high level used nuclear fuel and other long-lived radioactive wastes with respect to technical practicality, safety, cost and environmental impact.[76]
- "All radioactive waste generated in Canada is safely managed," according to the Canadian Nuclear Safety Commission (CNSC).[77] The CNSC regulates all steps in the management of radioactive waste in order to protect the health, safety and security

[74] Email message from Chapman's to Deloitte LLC, July 2022.
[75] CBC News, February 2022, "Nuclear ice cream is not how this Ontario dessert maker wants to be known," cbc.ca
[76] Bodansky, University of Washington, AIP Press, 2004, gammaexplorer.com
[77] Canadian Nuclear Safety Commission, nuclearsafety.gc.ca

of persons and to protect the environment. The CNSC has published research specifically on DGRs on its public website, including research from other countries.[78]

- **Communications:** Highlighting how farming has co-existed beside Bruce Power for decades without any threat to crops or the people producing them.
- "Many local farmers have shared their meat, milk, eggs, grain, vegetables, honey, and soil so we can ensure our operations do not adversely impact local agriculture. This successful monitoring program has proven – year over year – that living next door to a nuclear facility has no negative impact on people, animals or agriculture." – Bruce Power website[79]
- **Consumer Education:** Supporting consumer education on the quality and safety of Canada's highly regulated food supply. In Finland, schoolchildren participate in education programs related to water quality near the Posiva nuclear power plant.[80]

Supply Chain Education: Educating industry partners and supply chains about the quality of products grown and produced in South Bruce.

Safety Risk

Some stakeholders feared a nuclear waste contamination incident would necessitate evacuations, and impact people and livestock.[81] Public safety reports and the Emergency Services Study will address these concerns, if they are justified.

GHD reported that the Radiation Safety Institute of Canada made the following statements in regard to safety risk to adjacent agricultural operations:

> "Foods grown around nuclear power facilities do not appear to have stigma even though operating nuclear power facilities have a higher risk for spread of radiological contamination off-site.
>
> While there is risk of spread of contamination from nuclear power facilities due to the volatile nature of radioactive material, plants are designed to limit spread of material within the plant and to the surrounding environment.
>
> Fuel will be out of the reactor core for at least 10 years before it is sent to the DGR. After 10 years of "cooling", the fuel contains very little of the volatile fission products that were of concern for contamination spread for the operating nuclear power facility.
>
> The DGR will be operated under the same regulatory environment as nuclear power facilities and will require a robust environmental release control and monitoring program."[82]

The following excerpt was provided from a Bruce Power report by the Municipality of South Bruce:

> "Each year Bruce Power gathers information in order to calculate the radiological dose to representative persons living near the site. This includes meteorological data,

[78] CNSC, Research on geologicval repositories, nuclearsafety.gc.ca
[79] Bruce Power, Protecting the Environment, brucepower.com
[80] Posiva (translated from Finnish): "Schoolchildren studying water samples in Olkiluoto", November 2009, posiva.fi
[81] The Emergency Services Study will identify the Project's potential impacts on local/regional emergency services. It will identify if any changes need to be made to the County Emergency Response plan, and whether there is a need for increased emergency response resources.
[82] Excerpts from Radiation Safety Institute of Canada report provided by GHD

analysis of the local environment and site radiological emissions and effluents that include all utilities near or within the Bruce Power site boundary. In 2021, and every year since Bruce Power's inception, our contribution to the annual dose of a member of the public is well below the regulatory limit. The maximum dose associated with Bruce Power operations in 2021 was 1.6 microsieverts/year. All other representative persons have a lower dose. This maximum dose is a small fraction (0.16 %) of the legal limit of 1,000 microsieverts/year."[83]

Agriculture Commodity Values and Borrowing Capacity

Some stakeholders expressed concerns about diminished values of agricultural commodities originating in South Bruce, while other stakeholders do not anticipate any changes. The importance of tracking changes in agricultural commodity values to inform compensation-related mitigation tools is explored in more detail in Section 7 under, "Impacts on Commodity and Borrowing Capacity."

Some stakeholders said compensation for property value losses were an option, while others said: "buy farmers out." A few proposed the concept of a fund to subsidize farmers and to compensate for lost income.[84] Some less optimistic stakeholders didn't see any options to address potential changes, openly voicing they didn't want to offer ideas that could support a mitigation strategy developed by the NWMO.

- The NWMO / South Bruce MOU states that NWMO will establish a property value protection program to compensate property owners in the event that property values are adversely affected by the NWMO's site selection process and the development, construction and/or operation of the Project.

Launched in February 2022, the NWMO developed a program to protect property values for owners in proximity to Canada's Deep Geological Repository (DGR). The Property Value Protection (PVP) program[85] will be activated should South Bruce be selected as the hosting site.

Stakeholder Feedback on Use of NWMO Lands

Agriculture stakeholders were asked how the lands around the DGR might be used to attract new or expanded agriculture or agribusiness operations. Agriculture stakeholders saw the potential in several areas.

Agricultural Research and Development

Ideas related to agricultural research and development were the most frequently mentioned response from agriculture stakeholders in South Bruce when asked about potential uses for the NWMO balance of lands near the DGR. Stakeholders suggested the surplus acreage could be donated for crop research, product development, experimental farming practices, and industry demonstrations. They thought the land could become a model for stewardship practices. There were many other ideas and concepts related to agricultural research and development:

[83] Statement from Bruce Power, provided by Municipality of South Bruce
[84] As consultations wrapped up for this study, the NWMO announced the Property Value Protection (PVP) program, aimed at protecting property values near South Bruce site, nwmo.ca
[85] NWMO Property Value Protection Program, February 2022, nwmo.ca

- Emphasize new technology development on the lands (e.g., artificial intelligence, autonomous vehicles, robotics).
- Test and showcase advanced farming practices to improve sustainability and soil health and water quality, carbon sequestration, and innovative biodigester for processing agricultural waste.
- Experiment with crops in collaboration with University of Guelph as potential uses for the lands.
- Expand technologies to ensure food safety of processed foods.
- Build partnerships to provide part of the project with in-house generated energy.

The NWMO / South Bruce MOU states that NWMO will:

- Support establishing a program for local farmers to access technical experts as well as funding to assist in adopting emerging technology.

Diversified Farming

Many agriculture stakeholders envisioned a more hands-on experiment of new agricultural models focused on supporting productive farmlands with diversified uses, crops, and operators. Examples that were mentioned include:

- Prioritize operations that utilize best practices for soil and water quality (e.g., cover crops, no-till, crop rotation).
- Develop crop- and tree-produced edible products.
- Explore insect and plant protein.
- Develop new types of forage grazing species and related animal production.
- Rent land to young farmers.
- Establish a community pasture.[86]

Incentives

Some stakeholders proposed that incentives be offered to support current businesses and/or to attract new agricultural businesses.

Woodlands and Native Species

Some stakeholders proposed restoring the woodlands to native species, and growing products for a small niche. Examples of land reclamation include rewilding of the Knepp farm in the United Kingdom.[87]

- The NWMO / South Bruce MOU states that NWMO will return any excess agricultural lands for agricultural use.

[86] Community Pastures, pastures.ca
[87] The Guardian, 2018, theguardian.com

Little or no change

Other stakeholders said they didn't see how the NWMO lands could support agriculture. Some said that current production levels on the lands should be kept as is, with others said that construction on the lands be prohibited.

Further discussion about the use of surplus lands adjacent to the DGR can be found in the next chapter, "Development of Vision and Options for the Agriculture Economy," under the section title "Industry-facing Strategies for the Balance of DGR Lands."

Stakeholder Feedback on the Centre of Expertise

Asked how the proposed Centre of Expertise could support agriculture and agribusiness, stakeholders envisioned several concepts, including:

Research, Training, Business and Agriculture Support Centre

Most stakeholders said that a variety of programs, initiatives, and features could be developed at the Centre of Expertise, related to research, training, business and agricultural supports, including:

- Product safety, best practices, agritech, etc., including:
- Partnerships with colleges and universities to promote trades and Science, Technology, Engineering, and Mathematics (STEM) professions to support local business.
- Home for a "committee of agriculture" with reps from universities, producer groups and agribusinesses.
- Venue to host events for agriculture businesses, space to improve collaboration.
- Offering business supports, such as a free farm consultancy to help local farmers with productivity, maximize government grant programs, etc.
- Promotion of agriculture and agritourism.

The NWMO / South Bruce MOU states that the "NWMO will provide funding to establish a local innovation and technology incubator hub[88] that would help support local entrepreneurs, small businesses, and start-ups." Key areas of support include:

- Business acceleration.
- Services to agricultural technology companies.
- Connecting local entrepreneurs and farmers with scientific and technical, industry knowledge, business savvy experts and influencers.
- Other services including PR, marketing, business development and sales, product management, HR and finance.
- Aiming at promoting and lifting local business community, creating jobs and growing companies beyond South Bruce municipal borders.

The MOU also states that the NWMO will obtain community input on the Centre of Expertise design and ensuring that it conforms to the standards for commercial buildings in the

[88] NWMO / South Bruce Memorandum of Understanding, 2022, nwmo.ca

Municipality of South Bruce. Under the MOU, the Municipality will develop a tourism plan based on the Tourism Industry Effects Study and strategic recommendations from local tourism providers. The plan will include the NWMO's Centre of Expertise becoming a tourist destination in the region.

A small number of stakeholders said they could not see how the Centre of Expertise would support agriculture. They said the community already has a sound support system in place for agriculture and does not need a Centre of Expertise. These same stakeholders also asserted they were not in favour of the NWMO Project.

Further discussion about the use of surplus lands adjacent to the DGR can be found in the next chapter "Development of Vision and Options for the Agriculture Economy" under the section title "Public-facing Strategies for the Centre of Expertise."

Huron-Kinloss Engagement

Additional consultation was extended to the Mennonite community in Huron-Kinloss. A very small number of stakeholders participated. In survey responses, Mennonites mentioned their preference for not influencing decisions. Some expressed concern that the Project would destroy agriculture in the community. Others saw benefits from increased profits, and advances for younger generations.

At the workshop, the following introduction was provided:

"The Township of Huron-Kinloss and its residents are significant stakeholders and will be directly affected if the DGR is located in South Bruce. Recognizing that the proposed site in South Bruce is in close proximity to the Township of Huron-Kinloss, the scope of the Agriculture Business Impact Study was adjusted so to allow agriculture/agri-business stakeholders from Huron Kinloss that live within a 5km radius of the South Bruce site, the opportunity to provide input that will inform this study."

Additional Perspectives

Agriculture stakeholders felt the Project would have a massive impact for generations and across industries. A number of self-described "silent voices" in the agriculture and agribusiness sector recognized the difficult situation municipal council is facing and the complexity of the decision. They encouraged continued transparency and patience, dedicating efforts to open the space for conversation to base decisions on information and not perception. Council should be proactive rather than reactive, they said.

See Appendix C, "Engagement Summary," for more details on the engagement phase of this study.

In Section 6, "SOARR Analysis, Impact Assessment, and Mitigation Measures Review," an assessment of perceived impacts expressed by stakeholders is provided.

5. Options for the Agriculture Economy

This section identifies potential strategies for use of the NWMO lands to facilitate new agribusiness entrants. It explores worldwide examples of similar facilities and potential agricultural enhancement programs that could be expanded in the local and regional study areas with input from existing and future stakeholders. The Study Charter (Appendix A) described areas of agricultural enhancement programs to be considered when facilitating new agricultural and agribusiness entrants: education and training, innovation and technology, investment, and promotional enhancements.

5.1 In a Nutshell

There are several agricultural enhancement programs available in Ontario and Canada, primarily for agriculture technology. Colleges and universities tend to focus on agriculture technology or culinary arts, but there are few programs for primary agriculture production. Atomic energy programs at Ontario Tech University in cooperation with the International Atomic Energy Agency (IAEA)[89] are largely aimed at non-farm applications. Meanwhile, the Canadian Agri-Food Automation and Intelligence Network (CAAIN) is centered around facilities at Olds College in Alberta. There are other types of research and development related to agriculture taking place in various jurisdictions, alongside financial investments from venture capitalists and other sources. Agriculture stakeholders in South Bruce identified the NWMO Project as a possible way to improve the agriculture sector. Some would like to see wheels set in motion to develop research and training facilities on the surplus DGR lands, and programs at the Centre of Expertise.

5.2 Key Findings

- Every year, Ontario colleges and universities are producing more graduates specialized in agriculture-related subjects.
- An existing relationship already exists in Ontario, through the IAEA, to collaborate on agricultural training and science programs.
- The best agricultural school in Canada is located in Guelph, a 90-minute drive from South Bruce, and the leading U.S. agriculture university is situated within a day's drive, in upstate New York.
- Two spin-off developments of the DGR could have positive benefits to the agriculture and agribusiness sector: the hosting of agriculture-related uses on the balance of lands adjacent to the DGR, and the proposed Centre of Expertise:

[89] International Atomic Energy Agency

- **Industry-facing initiatives** could involve the balance of DGR lands, including research and development initiatives, training, and demonstration sites for robotic harvesting, autonomous agricultural machinery, vertical farming, livestock programs, etc.
- **Public-facing initiatives** could involve the Centre of Expertise, including a campus in a South Bruce town with an agricultural and business accelerator or incubator, offices or coworking spaces for agritech start-ups, crop research, commercial kitchens, venues for agricultural events, education for next-generation farmers, visitor centre and demonstration theatre, and housing for employees or students.

The hosting of agriculture-related uses on the balance of lands adjacent to the DGR, and the proposed Centre of Expertise could be two spin-off benefits of the Project.

5.3 International Trends

In other countries, farming continues near existing and proposed used nuclear fuel facilities. Below is an outline, nation by nation, of several projects under development and any related agriculture discourse, such as local agriculture production, research and education.

Australia

In January 2021, the Australian Radioactive Waste Agency chose the Napandee site on the Eyre Peninsula of the State of Southern Australia to dispose of low-mid level radioactive waste.[90] Napandee is located 21km west of Kimba (population 629). Australia's Federal Resources Minister said over 60% of people in the area supported the Napandee project in a ballot run by the nation's electoral commission.[91] Forbes said: "Many want it for economic development, knowing the risks are so low they can't even be measured. A petrol station has more impact on human health and the environment than this waste site ever could."[92]

This rural region produces 40% of South Australia's wheat, 24% of barley, and 22% of canola, and is home to the Minnipa Agricultural Centre (95 km west of Napandee), which coordinates research on grains and lentils.[93] In November 2021, the state government announced it would establish a new agritech demonstration site[94] at Minnipa. It will provide a two-way digital marketplace for providers to match their products closely to on-farm challenges, and will provide farmers with visibility of technology solutions, including key information on product cost and performance.[95]

A new agritech demonstration site will be established near the used nuclear fuel storage facility.

[90] Australian Government, November 2021, industry.gov.au
[91] Forbes Magazine, October 2021, forbes.com
[92] Forbes Magazine, October 2021, forbes.com
[93] Minnipa Agricultural Centre, pir.sa.gov.au
[94] SA Government announces new agritech research site, January 2021, agritechcentral.com
[95] Government of South Australia, Products for AgTech demonstrations, Expressions of Interest, pir.sa.gov.au

Finland

The ONKALO® Spent Nuclear Fuel Repository[96] is a deep geological repository under construction by Posiva on Olkiluoto Island in the municipality of Eurakjoki, 10km north of the town of Rauma (population 39,006). In 2015, Posiva received the disposal facility construction licence from the Finnish Government. The repository in ONKALO® will be constructed to a depth of 400 to 430 metres. The encapsulation plant is a final piece in the disposal facility complex, and construction was completed in June 2022.

ONKALO® is located with Satakunta region, which grew over 78,000 acres of oats, 72,000 acres of barley, and 45,000 acres of wheat in 2021. Sugar beets and fodder grassland are also important to the area.[97] Livestock production includes sheep, beef cattle, llamas, and broiler chickens. Two agriculture-related organizations are located near ONKALO®:

- Novarbo (55km east) is a leading expert in the field of professional horticulture and greenhouse technology. In addition to domestic sales, they export to more than 60 countries.[98]
- KVVY Tutkimus Oy (55km north) has received the Finnish Food Authority's approval as testing laboratories for food, fertilizer, feed, and by-product examinations.[99]

France

ANDRA[100] is responsible for used nuclear waste in France. A new deep underground repository is scheduled to open in 2025. For over two decades, ANDRA has operated an Underground Research Laboratory (URL) in the village of Bure, straddling the Meuse district (population 189,055) and Haute-Marne district (pop. 172,512). The Mayor of the village of Fresnay (pop. 2,889) said no harm has been done to any residents in his region since the URL was established 22 years ago. He said the facility has not affected the production of wheat, canola, grapes, or dairy, adding that local populations, farm output, and tourism numbers have all increased in this time.

> "Our facility in France is in the middle of a region where they do cabbage, milk and of course a very well-known champagne. All of those activities can easily cohabit with our [used nuclear waste] facilities without any problem." - *Pierre Jobard, Mayor of Fresnay.*[101]

Several ANDRA projects have assisted the local agriculture sector: energy savings on 116 farms, methanization facilities on 15 farms, and performance testing benefiting more than 550 tractors in the two districts.[102]

According to Agreste (France's Statistical Service), Meuse and Haute-Marne feature over 55,000 acres of polyculture,[103] 20,000 acres of grains and oilseeds, as well as beef and dairy cattle,[104] within a 50-km radius of the facility in Bure. There has been opposition[105] to

[96] Posiva, posiva.fi
[97] Natural Resources Institute Finland, statdb.luke.fi
[98] Novarbo, novarbo.fi
[99] KVVY Tutkimus Oy, kvvy.fi
[100] Andra, meusehautemarne.andra.fr
[101] News item, Port Augusta Transcontinental, February 7, 2017, transcontinental.com.au
[102] EDF, Accompagnement économique de Meuse et de Haute-Marne, edf.fr
[103] Polyculture or intercropping is the practice of growing more than one crop species in the same space, at the same time.
[104] Agreste, 2020, stats.agriculture.gouv.fr
[105] Translation of report, "Nuclear waste: In Bure, Andra wants to stifle the peasant struggle", reporterre.net

the development of a repository in the Bure area, including an illegal occupation of the project site.[106]

The region also has several agriculture-related training organizations, including:

- The EPL Agro de la Meuse in Bar-le-Duc (36km northwest) trains an average of 300 adult trainees per year in the agricultural, food, canine-feline, and equine fields.
- Centre Formation Professionnelle Agricole de Meurthe et Moselle in Toul (55km east) has 40 years of experience in training in the agriculture and agri-food sectors.[107]
- ALPA Ferme in Haroué (75km east) is a 370-acre farm with a dairy operation and "farm school" training centre.[108] ALPA trains employees of farms or agricultural companies in the agri-food sector and future farmers.
- Lycée Agricole et Forestier near Epinal (78km east) has training courses in agricultural, agronomy, and forestry sectors, as well as agricultural equipment.
- GREEN in Nancy (80km east) is a laboratory specializing in green research in the field of electrical engineering.[109]

Germany

Since 2017, BGE[110] (mandated to dispose of used nuclear fuel) has operated the Konrad repository project in Salzgitter (population 45,178) in Lower Saxony (Niedersachsen). The former iron ore mine is being converted into a repository for the storage of used nuclear fuel. The repository is scheduled to go into operation in 2027.[111]

Agriculture is diversified and growing in this area of Germany. Farmers in the region grow 50% of Germany's potatoes, as well as kale, asparagus, blueberries, and sugar beets.[112]

The region also has several agriculture-related educational institutions, including:

- The Faculty of Agricultural Sciences at Georg-August-Universität Göttingen (89km south) has several programs under its departments of crop sciences, livestock sciences, and agricultural economics and rural development.[113]
- State Institute for Agriculture and Horticulture Saxony-Anhalt (96 km east), including the Technical School of Agriculture, offers programs on crop production, animal breeding and husbandry, horticulture, plant nutrition, and more.
- AGRAVIS Future Farm in Suderburg (106km north) is a 642-acre facility investigating new technologies and methods in agricultural engineering and crop production and the networking of digital concepts and modules. The focus is on precision-farming techniques as well as new methods that facilitate the work of farmers.

[106] ANDRA, "End of the illegal occupation of the Lejuc Wood", andra.fr
[107] CFA – CFPPA, pixerecourt.fr
[108] ALPA Ferme, alpa-is4a.fr
[109] GREEN, green.univ-lorraine.fr
[110] Bundesgesellschaft für Endlagerung, bge.de
[111] BGZ, Konrad Repository, bgz.de
[112] Hannover Marketing & Tourismus GmbH, visit-niedersachsen.com
[113] Georg-August-Universität Göttingen, uni-goettingen.de

Japan

The Nuclear Waste Management Organization of Japan[114] (NUMO) is selecting a DGR site that will open by 2040. NUMO is assessing two municipalities – Suttsu (pop. 3,113) and Kamoenai (pop. 904) – in Hokkaidō Prefecture, for their suitability to host. Nearby municipalities have passed bylaws opposing the plans of the villages.[115]

Hokkaidō has nearly one fourth of Japan's total arable land, used mainly for rice, dairy, and beef. It is Japan's leading grower of wheat, soybeans, potatoes, sugar beets, onions, pumpkins, and corn.[116] In 2013, the average farm size in Hokkaidō was 60 acres per farmer, ten times larger than the national average.[117] The area, which has cold winters, also produces hothouse vegetables. Agriculture research and technology in the area includes:

- IHI in Chitose (95km east) is a major heavy machinery maker conducting demonstration tests with farmers in Hokkaidō on agritech applications.[118]
- The Hokkaidō Agricultural Research Centre in Sapporo (75km east) develops new cultivars adapted to cold regions, conducts research on animal feed production, and creates functional food products.

Slovakia

DECOM Slovakia[119] provides engineering and consultancy services in the nuclear area for customers in Slovakia and abroad. In a presentation to a workshop by IAEA, the author said: "Financial and other benefits should be seen as reasonable re-compensation to the community [hosting a used nuclear fuel storage facility] for loss of comfort, in line with common business practice, but not for accepting a risk. This is a very reasonable baseline for providing compensation, since there may be real local losses associated with reductions in property values, in agricultural efficiency and, in some areas, in tourist routes."

"There may be real local losses associated with reductions in property values, in agricultural efficiency and, in some areas, in tourist routes." – DECOM Slovakia

[114] NUMO, numo.or.jp
[115] The Asahi Shimbun, Neighbors in Hokkaido object to plans to store nuclear waste, December 2020, asahi.com
[116] Hokkaido Government, pref.hokkaido.jp
[117] Nikkei Asia, nikkei.com
[118] IHI Star Machinery Corp., ihi.dga.jp
[119] IAEI, Proceedings of a workshop held in Vienna, 2005, "Public involvement issues of radioactive waste management in Slovakia", p105, J. Prítrský, iaea.org

South Korea

The Wolseong Waste Disposal Centre is used to house low to intermediate level used nuclear fuel at Gyeongju (population 264,091) in South Korea's North Gyeongsang Province. It acquired approval to use the first phase of the facility in December 2014.[120] Public debate on storing nuclear waste in Korea restarted in 2020. Environmental groups as well as many citizens in Wolseong and nearby cities have opposed the construction of additional storage facilities.[121]

Agriculture is a key industry for the local economy, primarily rice production (41,900 acres), as well as button mushrooms, radish, napa cabbage, apples, and pears. Local food is featured prominently in Gyeongju tourism promotion, particularly bulgogi, featuring native Hanwoo beef,[122] similar to the farm operation in South Bruce.

Kyungpook National University in Daegu (53km west) has a Department of Agricultural Industry providing opportunities for higher education to farmers, focused on crops, horticulture, livestock, and agricultural economics. The university acknowledges that as the number of trade agreements between countries increases, the expansion of agricultural market openness is inevitable. Improving the competitiveness of agriculture is more important than ever.

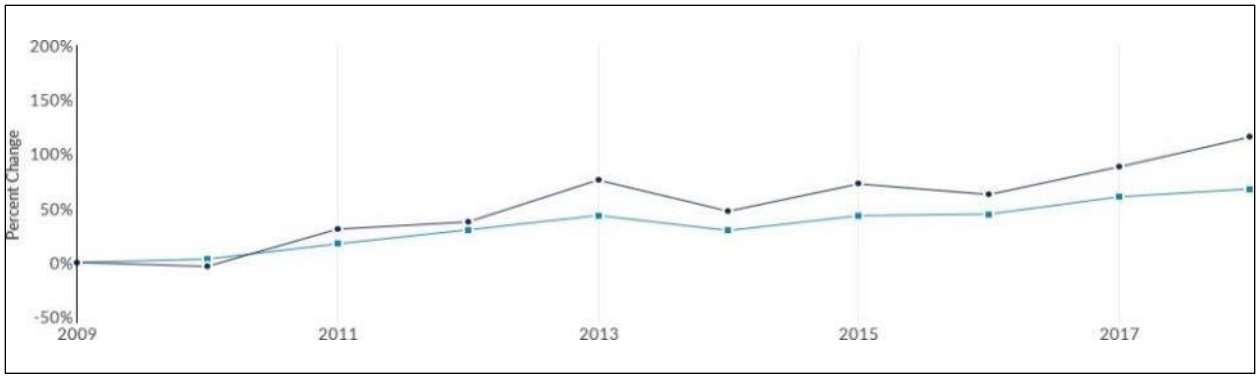
[120] Korea Radioactive Waste Agency (KORAD) History, korad.or.kr
[121] Aju Business Daily, July 2020, ajudaily.com
[122] Hanwoo beef, wagyuinternational.com

5.4 Agricultural Enhancement Programs

Education and Training Institutions in Ontario

Across Ontario, 29 educational institutions offer programs related to agriculture, agriculture operations, and agriculture-related sciences. In 2018, 20 of those colleges or universities graduated 1,323 students.[123] The growth in graduations since 2009 has been phenomenal – they have more than doubled (Figure 33). That 115% growth is much higher than similar graduations in other provinces whose graduations have grown at an average of 68%.

Figure 33: Trends in Agriculture Graduate Completions, Ontario and National, 2009-2018



Source: EMSI Analyst, 2022. ***Black line = Ontario data; Blue line = National Data***

Colleges

Algonquin, Boréal, Durham, Fanshawe, Fleming, and La Cité offer college programs in agriculture, animal, and related practices.[124] Robotics, automation and electromechanical engineering programs are available at Algonquin, Cambrian, Canadore, Centennial, Conestoga, Durham, Fanshawe, Georgian, Humber, La Cité, Loyalist, Niagara, Sault, Seneca, Sheridan, and St. Clair. Numerous colleges in Ontario offer culinary, hospitality, and tourism-related programs.

Universities

The Ontario Agricultural College at the University of Guelph (including the Ridgetown Campus) is considered the top agricultural science university in Canada and ranked 14th in North America.[125] Other universities offering agricultural science programs in Ontario include Toronto, Waterloo, Western, and Queen's. Cornell University is considered the best agricultural school in North America and is in upstate New York.[126]

[123] EMSI, 2022.
[124] OCAS, ontariocolleges.ca/en/programs
[125] EduRank, edurank.org
[126] GradReports, gradreports.com

Agriculture Innovation and Technology Centres

IAEA Collaborating Centres

The International Atomic Energy Agency's (IAEA) Collaborating Centres[127] Program is involved in for agricultural training and science programs. The IAEA is the world's central inter-governmental forum for scientific and technical co-operation in the nuclear field, created in 1957 under the Atoms for Peace organization within the United Nations family. The total budget for the program is €380 million (2020), and total membership countries equal 173 (April 2021). Key initiatives include:

- 15 international laboratories
- 11 multilateral conventions focused on nuclear safety, nuclear liability, and nuclear security
- 46 active IAEA Collaborating Centres designated Member State institutions supporting Agency activities.
- 1,139 active technical cooperation projects completed (2020), and 124 active coordinated research projects to develop new technology

The IAEA designated Ontario Tech University in Oshawa[128] as a Collaborating Centre to support IAEA activities on advanced nuclear power technology including small modular reactors (SMRs) as well as the non-electric applications of nuclear energy. The institution is the first in Canada to receive such a designation and will tap into deep international energy research expertise at the university's faculties of Engineering and Applied Science, and Energy Systems and Nuclear Science.

The IAEA programs at Ontario Tech University offer potential for education, research, and development collaborations with the NWMO Project, if relationships are developed.

Canadian Agri-Food Automation and Intelligence Network (CAAIN)

CAAIN[129] aims to develop exportable farming solutions. It recently received an investment of up to $49.5 million from the federal government. The project, which is being led by Alberta Innovates and the Vineland Research and Innovation Centre in Ontario, along with Alberta's Olds College and Lakeland College, is expected to begin with eight partners from British Columbia, Alberta, Saskatchewan, Ontario, and Quebec. The project will specifically look at technologies using artificial intelligence, robotics, and precision agriculture.

CAAIN hopes to bring together the private sector, academia, and research institutions to accelerate automation and digitization in Canada's agricultural sector. It will use the Olds College Centre of Innovation and Smart Farm in Alberta as a hub to develop and test the new technologies, as well as support the development, acceleration, and integration of technology into the global agri-food value chain. The solutions will be focused on reducing reliance on temporary labour, increasing global competitiveness, and improving profitability for Canadian farmers.

[127] International Atomic Energy Agency Collaborating Centres, iaea.org/about/overview
[128] Ontario Tech University, news.ontariotechu.ca
[129] Canadian Agri-Food Automation and Intelligence Network, caain.ca

"The Olds College Smart Farm is essentially a giant lab that provides the agriculture sector a venue for commercial scale applied research. It is attracting investment and engagement from companies ranging from multi-national ag and tech companies to SMEs (small and medium enterprises). It also provides our students with a learning environment centred on the future of ag and technology, setting the learning experience apart from other programming in the country.

The philosophy and principles guiding the development and operation of the Olds College Smart Farm are centred around engaging producers and industry on addressing real-world problems by utilizing and integrating technology and data. The Smart Farm is also focused on teaching students how to integrate, manage and leverage ag technology for the enhancement and sustainability of agri-food production." – *Olds College website*[130]

Olds College Smart Farm is a "giant lab that provides the agriculture sector a venue for commercial scale applied research" … attracting investment and engagement from companies ranging from multi-national ag and tech companies to small businesses

Nuclear Technology improving Agriculture and Food

This study examined other examples of international nuclear and agricultural partnerships and support agencies to identify potential opportunities South Bruce can leverage to assist local farmer networks. The projects and initiatives are detailed in Appendix D. They include:

- Nuclear-derived techniques to improve cattle productivity and milk quality
- Sterile insect technique for environmentally friendly pest management
- Isotopic technique and applications for improved soil and water balance
- Nuclear-derived crossbreeding program for climate change adaptation Opportunities to collaborate with international agencies, with the support of NWMO and its peers, can provide options for programs related to developing agricultural technology at the proposed facilities in South Bruce.

[130] Olds College Centre of Innovation and Smart Farm, oldscollege.ca

5.5 Agritech Investment

There are many examples of venture capitalists and other investment organizations that are focused on agritech investment.

Launched in 2011, Greensoil Investments[131] is the first venture capital fund with an exclusive focus on Israeli agriculture and food technologies. Their property tech ventures office is located in Toronto.

In 2022, CropSafe[132] secured $3 million in seed funding in the U.S. with plans to see their AI-enabled technology adopted by farmers across the globe. The app creates alerts to monitor the health and condition of a farm, all monitored remotely via satellite. The company plans to provide financing and insurance for farms to scale their operations which will be approved and available instantly.

OMNiDRIVE technology by Raven[133] is described by the company as an "easy-to-integrate" aftermarket system that a farmer may install on a current tractor, operated via a tablet-based user interface. The portal can be used to create boundaries and operational tasks, including offloading at defined staging and unloading areas. It allows the farmer to monitor and operate a driverless tractor from the cab of the harvester so the harvester can offload on-the-go in the field, then return the tractor to a predetermined unloading area. The company has received an AE50 Award from the American Society of Agricultural and Biological Engineers (ASABE) for innovations that improve agriculture production. The company is actively seeking validation support partners and diverse implement prospects for its other product, OMNiPOWER, a self-propelled power platform that interchanges farm implements, allowing the machine to perform multiple farm tasks in any season.

Agritech investment is also extending into food production and food services. Future changes in food production and consumption were highlighted at Expo 2020 Dubai.[134] For example: the global food sector is under pressure to produce more in the next 50 years than it did in the past 500, to nourish a projected global population of 11 billion by 2050. A United Nations report stated that 931 million tonnes of food were wasted in 2019 at the consumer level, attributed to individual households. New technology is already helping restaurants, cruise ships, hotels, and casinos. For example, Winnow Solutions Ltd has developed a product that recognizes and measures food waste, connecting the kitchen to the diner's habits.[135]

[131] Greensoil Investments, greensoil-investments.com/greensoil-agro-food/
[132] CropSafe, cropsafe.io/products
[133] Raven, ravenprecision.com/driverless-ag/omnidrive
[134] Future of Food, thenationalnews.com
[135] Winnow Solutions, winnowsolutions.com/food-waste-solutions

5.6 Promotional Enhancements

The review of the South Bruce Agriculture economy provided evidence that, in general, the number of farms has decreased, farms have gotten larger, less acres of field crops have been grown, and less animals have been raised. The traditional wholesale-oriented agricultural economy is shrinking. This phenomenon is present in many industrialized countries with a farming sector, and is not related to the NWMO Project.

Some existing farmers – and new entrants to the agricultural economy – are transitioning to a retail-oriented model. Some farms, typically smaller in size, have focused on direct-to-consumer marketing, which requires a more complex marketing plan. There are several ways to enhance promotional efforts to boost awareness and increase revenue.

In the past, farms with roadside stands, farm markets/shops, pick-your-own operations, and community-supported agriculture allowed for direct-to-consumer sales. However, those methods are being replaced by direct deliveries to consumers.

In the future, South Bruce farmers who choose to transition to direct-to-consumer sales will need to develop unique and authentic experiences on-farm. Off-farm activities, such as selling at farmers' markets or through online sales and direct delivery,[136] often have more restrictions and stipulations on how and where farmers can sell their goods. Joining a local agriculture-focussed cooperative can leverage marketing dollars and also access venues, exhibitions, and stores.

For many farms, having an online presence is critical in generating off-farm sales and even online ordering and payment systems. Social media is an important aspect to online sales and is an excellent way to engage with customers and the broader community. However, the use of effective visuals, consistent and active messaging, and the act of developing a distinct brand 'voice' are all important considerations for utilizing social media.[137]

The NWMO Project has the potential to enhance promotional capacity for agricultural stakeholders in South Bruce, if programs are established for farmers and other small business owners at the Centre of Expertise.

The NWMO / South Bruce MOU states that NWMO will:

- Develop a strategy and fund a program, in partnership with the Municipality, to promote the agriculture of South Bruce and the surrounding communities, promote local commodities, and help local farmers adopt emerging technology.
- Support establishing a program to build partnerships between small and niche farmers, locally grown, farm-fresh produce, natural, and organic businesses, and marketing agencies to support and promote their crops and products.

[136] Direct Farm Marketing Primer, www.omafra.gov.on.ca/english/busdev/facts/16-025.htm
[137] Farm Social Media Tips, www.lgpress.clemson.edu/publication/10-tips-for-farm-social-media

5.7 Industry-facing Strategies for the Balance of DGR Lands

This section of the report identifies the potential for continued agricultural use of the lands above or near the NWMO site, include an examination of facilities in Canada and other countries.

As previously mentioned, the NWMO has stated that it will work closely with the agricultural community to ensure the DGR project will have added value to the agricultural sector, and to find opportunities to support and promote Ontario agriculture crops and products.[138] How the NWMO chooses to realize this statement is yet to be determined.

Agriculture stakeholders engaged in this study preferred that the balance of lands on the NWMO site continue to be used for agricultural purposes, with several suggesting opportunities to focus on research and development, and agriculture technology testing.

The exact location of the above-ground facilities at the DGR site within the assembled lands is not yet determined, according to the Land Use Study Report. There is also opportunity to mitigate land use compatibility issues between the DGR facility and nearby sensitive land uses as part of the siting process.

The Olds College Centre of Innovation and Smart Farm was described in the previous section (a hub to develop, test, accelerate and integrate new agriculture technologies). If the local agriculture sector requested it, the NWMO and the Municipality of South Bruce could support a collaboration between a potential new organization locally or existing organizations with CAAIN and Vineland, potentially replicating the Olds College model on the lands adjacent to the DGR, for agriculture in Eastern Canada.

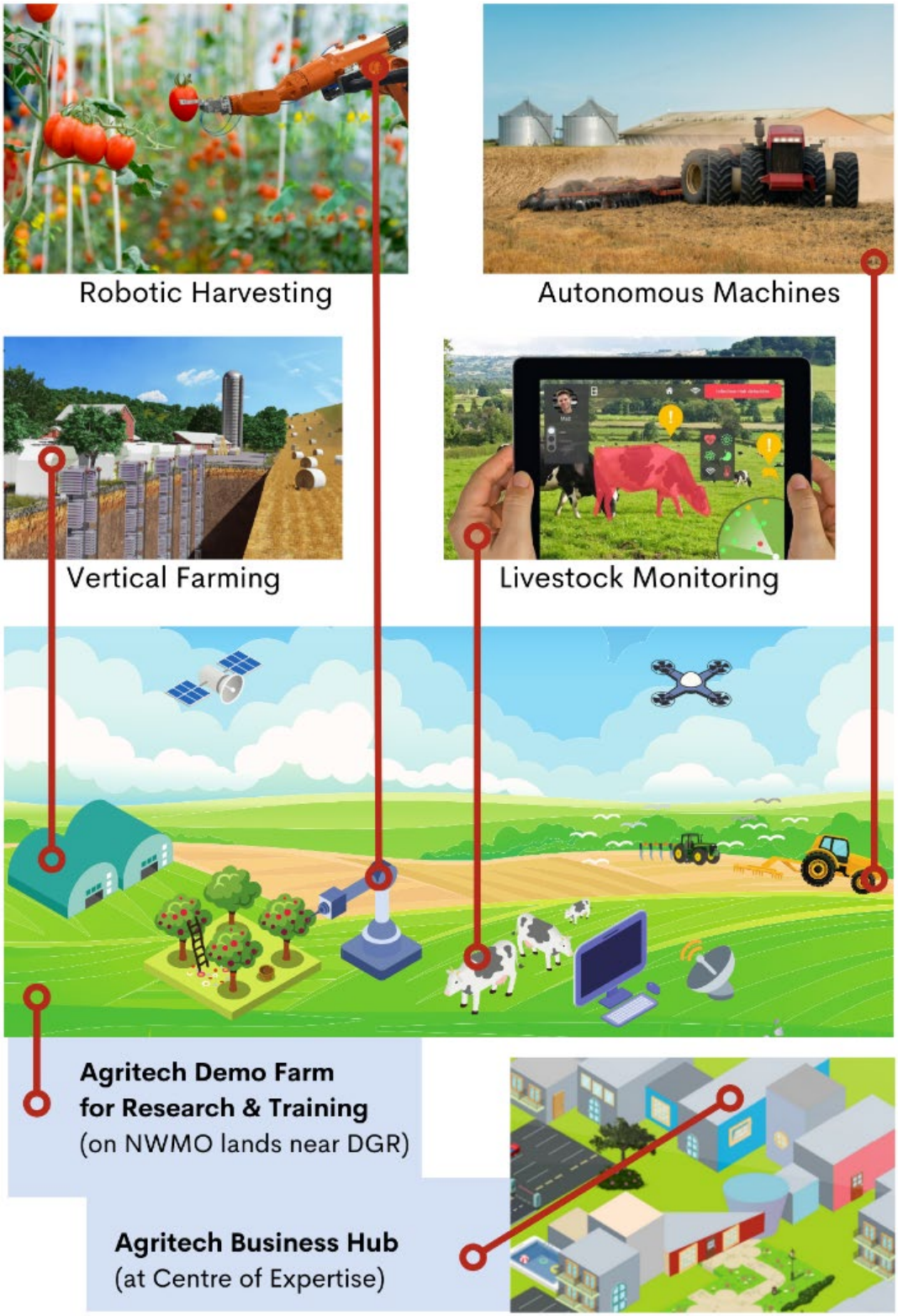
In Figure 34, a variety of potential agritech applications and projects are showcased as possible hosting opportunities on the balance of NWMO lands near the DGR. They include potential research and development initiatives and demonstration sites for:

- Robotic harvesting
- Autonomous agricultural machinery
- Vertical farming
- Livestock monitoring, etc.

This facility could be termed the "Agritech Demo Farm for Research and Training" and could be connected with programming to the NWMO Centre of Expertise, located in a nearby town. Appendix G outlines examples of industry-facing agriculture innovation parks that could be considered, similar to what is envisioned by South Bruce agriculture stakeholders on the NWMO land.

[138] NWMO FAQ: nwmo.ca

Figure 34: Concept for uses at NWMO Balance of Lands - Agriculture



Source: Concept prepared by Deloitte LLC based on stakeholder feedback; images sourced form GreenForges, Sagentia Innovation, Canva.

5.8 Public-facing Strategies for the Centre of Expertise

This section includes details and concept images of the proposed NWMO Centre of Expertise, with specific reference to features of the facility or property that have the potential to promote and support agriculture and agribusiness in South Bruce and the region.

The NWMO has stated that: "A Centre of Expertise will be established at, or near, the [DGR] site. Its initial purpose is to support the multi-year testing and assessment of the site with a focus on safety and community well-being. The centre will be home to a technical and social research program, and a technology demonstration program, involving scientists and experts from a wide variety of disciplines. An engineering test facility will develop materials and equipment to be used in the repository. The centre will also house demonstration equipment that displays the entire packaging and container placement process. In later phases of the project, it will become a hub for knowledge-sharing across Canada and internationally. The design and use of the centre will be developed collaboratively with those living in the area. It could, for example, be a focal point for the community to learn about the project. It could also become a destination that welcomes visitors from the region and beyond."[139]

The Centre of Expertise will include:

- Technical and social research program
- Technology demonstration program, involving scientists and experts
- Engineering test facility
- House demonstration equipment that displays the packaging and container placement process
- Hub for knowledge-sharing across Canada and internationally
- Focal point for the community to learn about the project
- Destination that welcomes visitors from the region and beyond

The NWMO is yet to confirm concepts (Figure 35) or locations for the Centre of Expertise, although the building would be located in the Municipality of South Bruce if the community agrees to host.[140] Agriculture and community stakeholders in South Bruce suggested a wide range of ideas about how the Centre of Expertise could relate to agriculture, as a stand-alone facility, or linked with potential facilities on the NWMO balance of DGR lands. Among the ideas were:

- Offering business supports, such as a free farm consultancy to help local farmers with productivity, maximize government grant programs, etc.
- Research, training, and education centre, connected to universities
- Development of robotics and product safety
- Activities that complement the rich agriculture area
- Venue to host functions for agriculture businesses, improving collaboration

[139] NWMO Centre of Expertise, nwmo.ca
[140] Project Description, Memorandum of Understanding, nwmo.ca

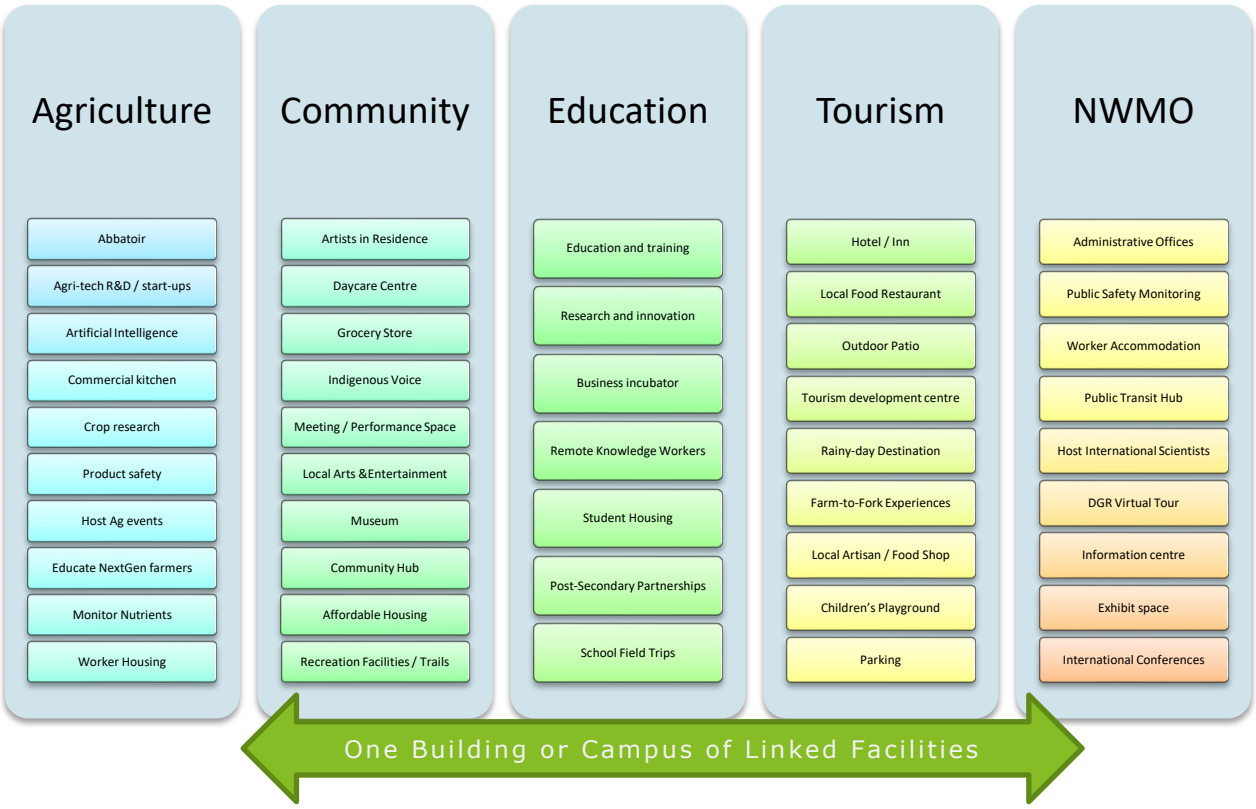
Figure 35: Artistic Concept of Centre of Expertise

Source: NWMO website

Ideas gathered through the community engagement process are summarized in Figure 36. The various uses, grouped into five areas, could be housed in one building or in several buildings on a campus of land. Agriculture functions could include:

- Facilities, accelerators, incubators, or coworking spaces for agritech start-ups
- Artificial intelligence research and demonstrations
- Crop research
- Commercial kitchens
- Agricultural events
- Education for next-generation farmers
- Housing for employees or students

Figure 36: Ideas for functional Centre of Expertise



The agricultural aspects of the Centre of Expertise programming menu could dovetail with other initiatives related to community, education, tourism, and NWMO administrative operations at the facility.

The illustration in Figure 37 showcases how a hotel and conference centre, demonstration theatre, visitor centre, restaurant, gift shop, and park could be incorporated into the campus design.

The South Bruce Tourism Impact Study provides economic impact scenarios for the proposed Centre of Expertise. If positioned as a core attractor for the municipality's tourism industry, the Centre of Expertise could create jobs and boost new spending.

Examples of other "centres of expertise" are outlined in Appendix H.

Centre of Expertise could include:

- Agritech business hub
- Training centre
- Leasable commercial and office space
- Hotel and conference centre
- Demonstration theatre
- Visitor centre
- Restaurant
- Local food shop

Figure 37: Concept for Centre of Expertise campus

Source: Concept prepared by Deloitte LLP based on stakeholder feedback

6. SOARR Analysis, Impact Assessment, and Mitigation Measures Review

This section includes a Strengths, Opportunities, Aspirations, Risks and Results (SOARR) Analysis of the South Bruce agriculture economy, an assessment of perceived impacts expressed by stakeholders, as well as a review of international used nuclear fuel sites and mitigation measures.

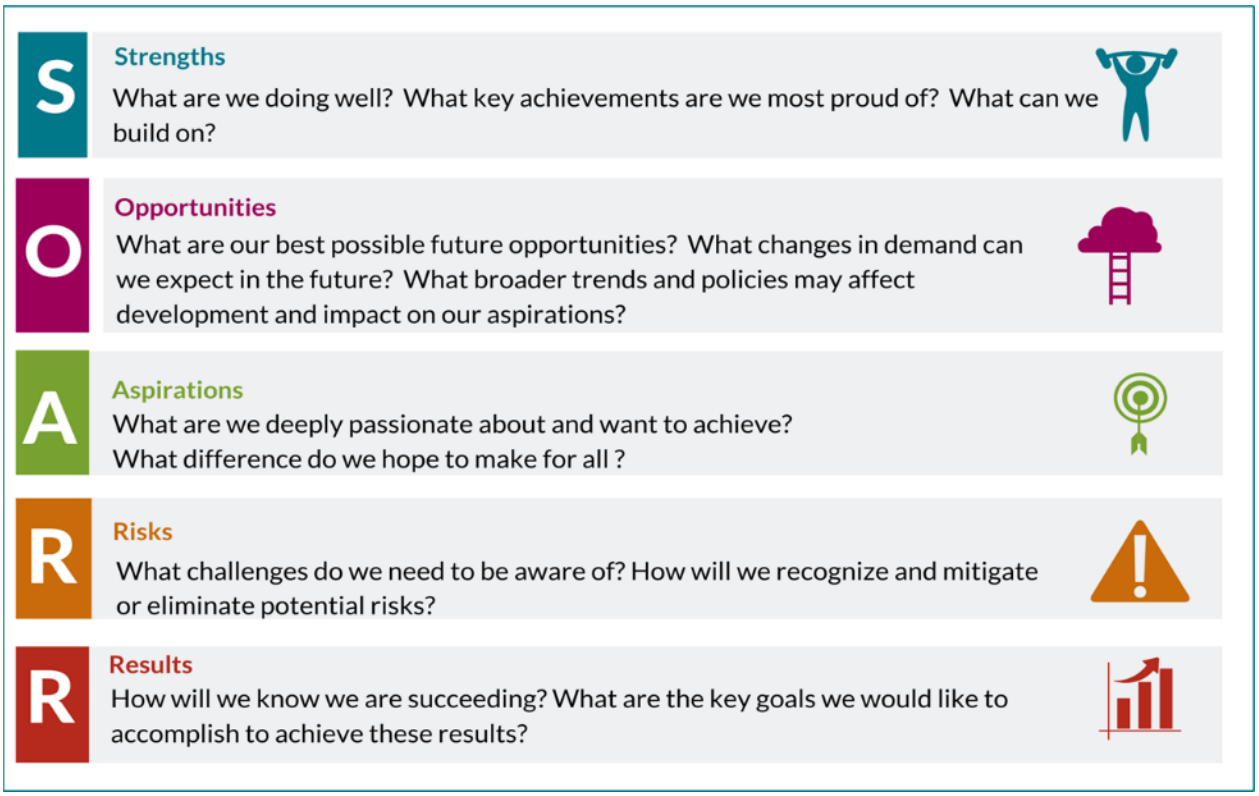
6.1 SOARR Analysis

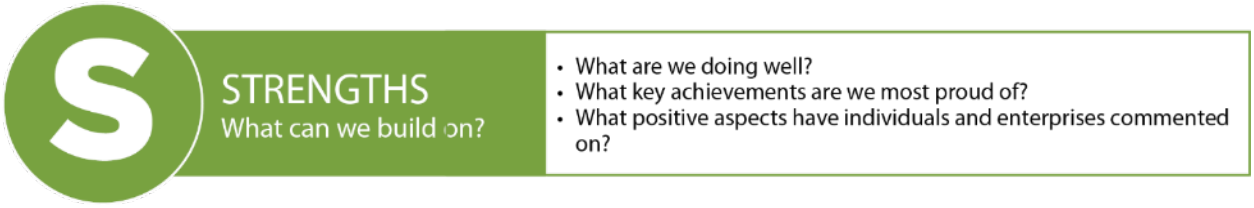
A SOARR Analysis is a forward-looking model for reflecting on strategic planning. It assembles the research, consultation, and stakeholder feedback insights and serves as the pivot between *'what has been learned'* and *'what needs to happen'* to address impacts to agriculture in South Bruce.

The SOARR takes elements of what would traditionally be affiliated with a Strengths Weaknesses, Opportunities and Threats (SWOT) analysis and, through the Appreciative Inquiry (AI) approach, focusing on the Results – thereby building on what works best to ensure continued success.

The concepts underpinning the SOARR model are outlined in Figure 44.

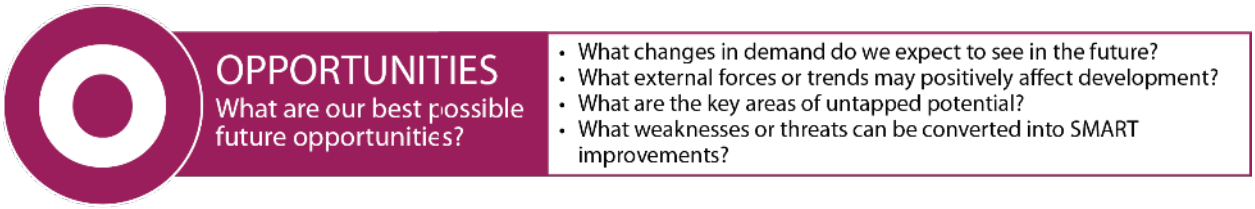
Figure 44: Questions explored in SOARR Analysis





- **Strong agriculture sector** – Stakeholders believe the current agriculture industry in South Bruce has the following attributes:
    - Fertile soil
    - Profitable
    - Diverse
    - Progressive
    - Strong supply chain
    - Community backbone
    - Vibrant
    - Dairy production
    - New opportunities have emerged
- **Strong economic base for year-round employment** – Leading local cooperative businesses like Gay Lea and Ontario Dairy Goat Cooperative and recent investments by Bruce Power and Kinectrics enable opportunities to maximize local employment. Farming and agriculture continue to be the economic mainstays. Other major sectors include construction, manufacturing, real estate, retail trade, and professional services.
- **Entrepreneurial spirit** – Farms, small enterprises, and medium-sized businesses call South Bruce home across multiple industries and sectors.
- **Location and quality of life attributes** – South Bruce is connected to Ontario's most populous regions through well-maintained highways, including Highway 9, which runs through Mildmay. As the "Gateway to the Bruce," South Bruce connects to Lake Huron's eastern shores and cottage country further north. Residents benefit from the natural open spaces, recreational opportunities, and historic charm of Mildmay, Teeswater, and Formosa's centres. The locational and quality of life attributes put South Bruce in an enviable position for talent retention and attraction.
- **Relative affordability** – Allows the local workforce to live and work directly in South Bruce. This can be leveraged to encourage the existing workforce within Bruce County to relocate to South Bruce.
- **Invested community –** South Bruce boasts a healthy sense of community stability and pride, backed by a supportive environment bolstered by local government, service clubs, volunteer groups, and dedicated, philanthropic citizens.

- **Growing population** – As per *metroeconomics*[141], South Bruce showed a population of 6,250 people in 2021[142]. By 2031, South Bruce is projected to reach 7,420 people. Long-term projections to 2046, show the Municipality will grow to 8,760 people[143]; an additional 1,340 residents. When considering the Impact Case, South Bruce's population is projected to grow to 9,460 people, which translates to an additional 700 residents as a direct result of the Project.

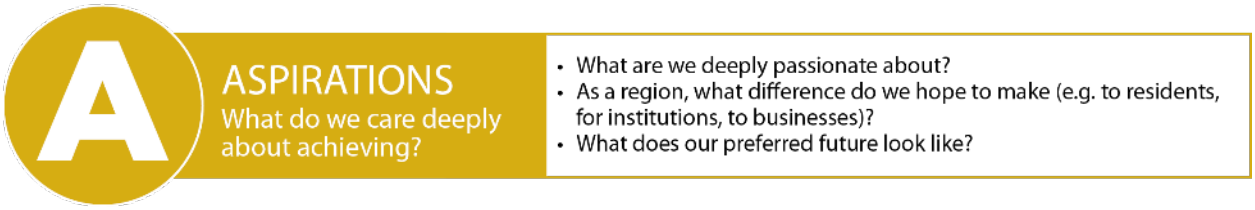


- Investments in infrastructure
- Well-maintained roads
- Broadband internet
- Natural gas
- Lower operating costs for farms
- General economic improvements
- Higher paying jobs
- Expansion of the tax base
- **Research, development, and training –** If the NWMO chooses to utilize the balance of DGR lands for a public purpose, agriculture stakeholders envision an opportunity for research, development, and training:
    - New technology development (e.g., artificial intelligence, Autonomous vehicles, swarm farming, robotics).
    - Testing area to showcase advanced farming practices to improve sustainability and soil health and water quality, carbon sequestration, innovative bio-gestor for processing agricultural waste, etc.
    - Crop testing in collaboration with University of Guelph.
    - Expanding technologies to ensure food safety of processed foods and building partnerships to provide part of the project with in-house generated energy.

- **Centre of Expertise** – Public-facing facility that could highlight:

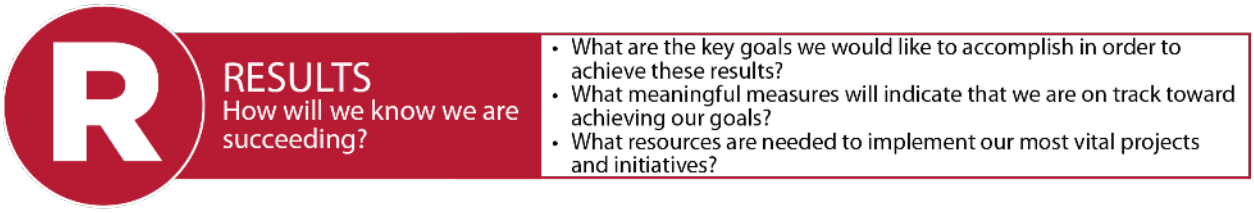
[141] *metroeconomics* specializes in developing assessments of the economic and demographic potential of metropolitan areas and individual communities.
[142] It should be noted that *metroeconomics* data has been used to inform this study in lieu of the 2021 Statistics Canada, Census of Population. metroeconomics uses Post-censal 2021 estimates released January 13th and have been adopted by South Bruce.
[143] *metroeconomics*, South Bruce and Area Growth Expectations.

- Product safety, best practices, agritech, etc., including:
- Partnerships with colleges and universities to promote trades and Science, Technology, Engineering, and Mathematics (STEM) professions to support local business.
- Home for a "committee of agriculture" with reps from universities, producer groups and agribusinesses.
- Venue to host events for agriculture businesses, space to improve collaboration.
- Offering business supports, such as a free farm consultancy to help local farmers with productivity, maximize government grant programs, etc.
- Promotion of agriculture and agritourism.
- **Agriculture Strategy and Plan –** Help develop agriculture of South Bruce and the surrounding communities, promote local commodities, and help local farmers adopt emerging technology a strategy
- **Promotion -** Build partnerships between small and niche farmers, locally grown, farm-fresh produce, natural, and organic businesses, and marketing agencies to support and promote their crops and products.



- **Diversified farming –** Further, subject to NWMO support, many agriculture stakeholders envisioned a more hands-on experimental or new models that focused on:
- Supporting productive farmlands with diversified uses, crops, and operators.
- Prioritizing operations that utilize best practices for soil and water quality (e.g., cover crops, no-till, crop rotation).
- Renting land to young farmers.
- Developing of crop and tree-produced edible products, exploring insect and plant protein.
- Developing new types of forage grazing species and related animal production.
- **Strong, diversified economy** – Maintain economic diversity to support local workforce opportunities. Continue to strengthen the broad base of economic sectors and activity occurring in South Bruce (in manufacturing, agriculture, forestry, retail, resident support services, tourism, and professional industries), as a strategy to create additional local workforce opportunities.
- **Retain local culture** – Keeping the agricultural DNA in South Bruce is an important aspiration for stakeholders.

- **Labour force availability –** Concern that farms and agriculture businesses would be competing for workers in the presence high-paying nuclear jobs.
- **Changing training requirements** – The required re-skilling needed due to technological advancements/automation may be cost-prohibitive for local employers to have their employees participate in.
- **Limited access to general labour** – Low available general labour locally, exacerbated by high competition between local industry for skilled, general, and temporary labour.
- **Export of workers** – Currently, South Bruce exports more workers daily out of the community than into it. Continued out-community of the workforce will negatively impact the community, environment, and economic business opportunities available locally.
- **Vulnerable business sector** – Difficulty for smaller businesses to attract and retain local workers due to wage gap disparity between large and small industries in the same region. Small businesses are competing with large industries for the same talent pool. They may not have the supports and workplace accommodations that employees prefer.
- **Traffic disruptions –** Worry there will be more residents and traffic which is not necessarily good for farmers and creating safety concerns on roads.
- **Investment uncertainty -** Fears that customers may develop a stigma regarding food produced near the nuclear industry and this will deteriorate how their products are perceived. Worries that farming is threatened, in turmoil, subject to uncertainty, and may need to stop. Stakeholders were also concerned about increased national and international regulations that may apply locally if the Project is sited in South Bruce. Some predicted decreases in land value and less diversity.
- **Reduction in commodity values** – Concern about contamination around the DGR, loss of clients, restrictions on selling products.



- Multi-generation farm families can continue pursuing their way of life.
- Provide evidence of no risks or health concerns from crops surrounding the project.
- Educate consumers on Canada's highly regulated food quality.
- Educate industry partners and supply chains to not reduce the value of products.
- Labour supply needs of farms and businesses are addressed, resulting in increased employment at local businesses, increased profits, and the ability to re-invest and expand South Bruce businesses.
- Increased utilization rates and sales of local agricultural commodities and services.

6.2 Stakeholder Feedback Impact Assessment

Figure 38 contains an assessment of perceived impacts expressed by agriculture stakeholders in Section 4, "Agriculture Stakeholder Feedback".

Figure 38: Stakeholder Feedback Impact Analysis

Impact	Is the Concern Unique to the NWMO Project?	Is the Concern Valid?	Could the NWMO Project Accelerate the Impact?	Can Interventions Mitigate the Impact?	Further References
Labour Force Disruptions	No. Other new developments, business expansions, or other unexpected economic challenges (e.g., pandemic) could disrupt the labour force in South Bruce and area.	Yes. In general, labour force disruptions are expected to impact the agriculture and agribusiness sectors.	Yes.	Yes. Workforce organizations and government policies are in existence that can help to mitigate labour disruptions if resourced and planned properly. Through mechanization and automation that is proven to be occurring, farmers will also be self-mitigating the challenge.	• Local Hiring Effects Study & Strategy • Workforce Development Study • Labour Baseline Study • Local/Regional Education Study • Housing Needs and Demand Analysis Study

Impact	Is the Concern Unique to the NWMO Project?	Is the Concern Valid?	Could the NWMO Project Accelerate the Impact?	Can Interventions Mitigate the Impact?	Further References
Traffic Disruptions	No. Other new developments, business expansions or changes in tourism corridors could disrupt traffic in South Bruce.	Yes. In general, traffic disruptions are expected to impact the agriculture and agribusiness sectors at points in time during construction.	Yes.	Yes. Governments and businesses can work together to plan for road improvements, route options, and other measures to mitigate traffic disruptions.	• Local Traffic Study • Road Conditions Study • Effects on Community Safety
Disruption of the Agricultural Character of South Bruce	No. Changes in global markets, agricultural practices, other new developments, changes in tourism, or changes in resident population may disrupt the agricultural character of South Bruce.	Yes. Members of the community have every right to voice their concerns.	No, but it could serve to slow it down. The DGR is expected to be a low-profile operation. It is less disruptive than other types of industrial development. The proposed Agritech Research and Innovation Farm and the Centre of Expertise could help retain the agricultural character of the community and enhance the sector's prosperity in the region including diversifying with highly paid agriculture jobs.	Yes. Agricultural education and awareness programs, supported by farm organizations, government, and targeted heritage and culture programs can help to preserve the agricultural character of an area.	• Effects on Recreational Resources Report • Local/Regional Education Study • Land Use Study • Social Programs Study
Uncertainty in Farming	No. Changes in the economy, global markets, agricultural practices, and weather are accepted as being the major factors in uncertainty in farming.	Yes. Farmers have every right to voice their concerns.	No, but it could help provide certainties in other areas. The proposed Agritech Research and Innovation Farm and the Centre of Expertise could help farmers and agribusinesses prepare for the future.	Yes. Financial and mental health supports for agriculture businesses and farmers could help individuals manage the stresses of uncertainty.	• Social Programs Study • Vulnerable Populations Study • Community Health Programs and Infrastructure Study

Impact	Is the Concern Unique to the NWMO Project?	Is the Concern Valid?	Could the NWMO Project Accelerate the Impact?	Can Interventions Mitigate the Impact?	Further References
Stigma	Yes.	No. The Bruce Power facility has operated next to farmers for decades with no concerns. An international review of DGRs uncovered no evidence that other communities have encountered these impacts.	Yes. If effective monitoring and reporting of food and crop safety is not implemented, incorrect information will continue to circulate.	Yes. Stigma can be combatted with information, transparency, communications, objective third-party auditing, and education programs.	N/A
Safety Risk	No. Other safety risks could include crop failure due to weather, plane crash, livestock-related pandemic, etc.	Yes. Any safety risk could have an impact on agriculture in South Bruce.	It is unlikely the NWMO Project will cause a safety risk. Bruce Power has operated in the area for decades without incident and used nuclear fuel is less prone to a safety risk than an active nuclear generating station.	Municipalities are mandated by the Province to put an Emergency Preparedness Plan in place and active an Emergency Management Organization, should any form of safety risk occur.	• Radiation Safety Institute of Canada Report
Farm Commodity Values	No. Farm commodity values can be affected by global markets, government policy, weather, supply chain disruptions, war, inflationary pressures, and other factors.	Yes. Producers and consumers of farm commodities have every right to voice concerns about changes in commodity values and prices if changes affect their economic situation or health and wellbeing.	It is unlikely that the NWMO Project will create changes in farm commodity values, according to an international review. Bruce Power has been operating in the area for decades, without affecting commodity values.	Changes in commodity values can be monitored and government can make policies and announce programs to address those who are adversely affected by them. Farm subsidies, supply management, price controls, and other initiatives could be put in place to mitigate the impact.	N/A

Impact	Is the Concern Unique to the NWMO Project?	Is the Concern Valid?	Could the NWMO Project Accelerate the Impact?	Can Interventions Mitigate the Impact?	Further References
Effects on Borrowing Capacity	No. Farm property values and borrowing capacity are affected by many factors, including supply and demand pressures related to agriculture, as well as value changes in other jurisdictions.	Yes. Owners, sellers and buyers of farmland have every right to be concerned about changes to farm property values if it affects their ability to secure loans and mortgages to finance their operations.	Yes. The NWMO has optioned and/or purchased land in South Bruce, so it is already a participant in the real estate market. If NWMO purchases more land or sells its holdings, it will have an impact on local property values. Employees at NWMO who move to South Bruce may also impact property values and availability of property.	Yes. The NWMO has already announced it will offer a Property Value Protection Program if South Bruce be chosen as the site and agree to host the Project. However, the PVP program does not apply to effects on borrowing capacity. Mitigation tools could be created to deal with the impacts of lower borrowing capacity.	N/A

6.3 Mitigation Measures Analysis

The following analysis of international sites outlines examples of any negatives (agricultural constraints, traffic constraints, trade or consumer constraints, or buffer areas) that may require mitigation. The assumption was made that mitigating measures needed to specifically address agriculture and agribusiness.

Key Findings

In all instances, there was detailed evidence of how each nation is addressing its used nuclear fuel management programs, including monitoring and emergency response. Some communities have experience specifically related to agricultural communities. Mitigation measures specific to agriculture-related issues were explored, and NWMO outlines its responses to agricultural concerns in its NWMO Farming Backgrounder (Appendix E).

International Review

International Atomic Energy Agency

Canada and many other nations are Member States of the International Atomic Energy Agency (IAEA). In 2014, the IAEA published "Monitoring and Surveillance of Radioactive Waste Disposal Facilities" Specific Safety Guide No. SSG-31.144 Annex I of the guide provides an in-depth example of monitoring and surveillance information collected for a geological disposal programme, including:

- Establishment of baseline trends
- Monitoring of the condition of emplaced waste packages
- Monitoring of the structures and engineered barriers of the disposal facility
- Disturbances created by the disposal facility
- Monitoring of the release of radionuclides
- Changes to the geosphere
- Development of an environmental database
- Alternative methods of data collection

The IAEA's safety services encompass design, siting and engineering safety, operational safety, radiation safety, safe transport of radioactive material and safe management of radioactive waste, as well as governmental organization, regulatory matters and safety culture in organizations. These safety services assist Member States in the application of the standards and enable valuable experience and insights to be shared.

> "Safety is not an end in itself but a prerequisite for the purpose of the protection of people in all States and of the environment — now and in the future. The risks associated with ionizing radiation must be assessed and controlled without unduly limiting the contribution of nuclear energy to equitable and sustainable development.

[144] IAEA, Specific Safety Guide, iaea.org

> Governments, regulatory bodies and operators everywhere must ensure that nuclear material and radiation sources are used beneficially, safely and ethically. The IAEA safety standards are designed to facilitate this, and I encourage all Member States to make use of them." – IAEA Director General Yukiya Amano

The European Commission Joint Research Centre for Radioactivity Environmental Monitoring provides hourly gamma dose rate averages at 5,500 stations, available and public online.[145]

Australia

- **Project:** Australia National Nuclear Waste Storage Facility, Napandee, Kimba, South Australia
- **Opposition:** There are media reports of opposition from local Indigenous groups, environmental groups, and community members.[146] Friends of the Earth Australia identified several issues of key concern.[147]
- **Government Response:** According to the Australian Government's Agriculture Factsheet related to their nuclear waste facility, "there is no credible evidence, in Australia or anywhere else in the world, that well-managed radioactive waste facilities such as the one proposed for Australia have any impact on market access or land or commodity prices." Australia's Federal Resources Minister said more than 60% of people in the area supported the facility in a ballot run by the nation's electoral commission.
- **Mitigation Measures:** Australia is a member if the IAEA. "The facility will have numerous state-of-the-art, defence-in-depth systems to ensure it is entirely safe for the surrounding environment, communities and workers. These include:[148]
- All waste, low and intermediate level, will be solid and immobilised in an appropriate matrix (glass, synroc or concrete) and will contain nothing liquid, corrosive or gaseous.
- All waste will be packaged in shielded cells or containers, ensuring radiation meets the requirement of the regulator and falls below their stringent acceptable safety levels. There will be no measurable radiation above background levels at distances well within site boundaries.
- Site design and construction will be to recognised national radiation and building standards and assessed against all plausible risks such as fire, flood or seismic events. Site design will feature impermeable barriers, traps and inspection points.
- This will be supported by real-time, publicly available radiation monitoring, along with regular independent environmental testing and reporting to further demonstrate that there are no contaminants of any kind entering the environment from the facility.
- To ensure these systems are effectively implemented, the facility will be assessed and overseen by independent regulators. The facility will include public reporting,

[145] EURDEP Gamma Dose Rates Maps, europa.eu
[146] The Guardian, theguardian.com
[147] Friends of the Earth Australia, australianmap.net
[148] How can we be sure it is safe for farming and the environment, industry.gov.au

open days and community representatives to ensure full transparency for local communities.

- These measures will ensure that there is no way that radioactive materials will enter the environment or pose a risk to farms or the community No further risk mitigations were discovered

China

- **Project:** Underground Research Laboratory, Gobi Desert. The Beijing Research Institute of Uranium Geology (BRIUG) is constructing an underground research laboratory.[149] As of July 2021, no specific site had been chosen. The lab will determine the area's suitability for future geological disposal of high-level radioactive waste (HLW), including spent nuclear fuel, generated in China's 51 operational nuclear power plants. Its construction follows more than three decades of research with the support of the IAEA. Scientists will use the laboratory to characterize and assess the geological, hydrological, geochemical, and engineering characteristics of the rocks at the site.
- **Mitigation Measures:** China is a member of the IAEA. No risk mitigation studies were discovered. In 2021, IAEA and China signed an agreement to cooperate in the provision of expertise to support the development of technical infrastructure in the peaceful uses of nuclear applications in developing countries.[150]

Czechia

- **Project:** Deep Geological Repository Shortlist. Sites are proposed in Horka, Březový potok, and Janoch near the Temelín nuclear power station in the Southwest Czechia.
- **Mitigation Measures:** Czechia is a member of the IAEA. The Czech Radioactive Waste Repository[151] (SÚRAO) indicates that the release of radioactive substances from the repository is prevented by:
- A system of barriers that complement but are independent of each other. Even if one of the barriers fails, others are in place that prevent the escape of radionuclides.
- The safe operation of nuclear waste repositories is verified several times per year by inspectors from the State Office for Nuclear Safety and inspectors from the relevant mining authority.
- Samples of water from both the mine complexes and the surrounding environment are taken, as well as from the air in the repository itself.
- Everyone who enters the repository must be equipped with a personal dosimeter for the monitoring of the received radiation dose.
- The limits and conditions for the safe operation of the repositories are approved and updated by the State Office for Nuclear Safety.

[149] IAEA report, iaea.org
[150] IAEA and China's Development Agency Sign Groundbreaking Agreement to Support Developing Countries, iaea.org
[151] The Czech Radioactive Waste Repository, surao.cz

- The radionuclides and their quantities to be monitored as well as the sampling rates and locations are set separately for each repository.
- Each repository has its own physical protection system which is operated in cooperation with the police authorities.

Finland

- **Project:** Onkalo Spent Nuclear Fuel Repository, Olkiluoto, Eurajoki. Onkala is a deep geological repository for the final disposal of spent nuclear fuel, operated by Posiva Oy, which calls itself the "leading final disposal operator in the world."[152] In April 2022, a project was launched for modelling the groundwater chemistry in the bedrock of the site. The goal of the project is to verify the balancing of long-term safety with economic sustainability. It is expected to begin operations in 2024.
- **Opposition:** According to a 2008 survey study, Eurajoki residents outlined various reasons why they opposed the repository and perceived it to pose the greatest threat to future generations.[153]
- **Mitigation Measures:** Finland is a member of the IAEA. A presentation about the ONKALO monitoring programme is available on the IAEA website.[154]

France

- **Project:** Andra[155] operations at several sites. The Industrial Centre for Geological Disposal, or Cigéo, is a deep geological disposal facility for radioactive waste to be constructed in 2025.[156] The Meuse/Haute Marne Underground Research Laboratory is a laboratory located 500 metres underground in Bure.[157] Centre de l'Aube is low level and short-lived intermediate level radioactive near-surface repository built in 1992.
- **Government Response:** According to the Agriculture Factsheet[158] published by the Australian Government in relation to planning for its National Radioactive Waste Management Facility, a delegation from France visited South Australian communities in 2017. The delegates explained that the ANDRA Aube used nuclear fuel facilities have not affected the production of wheat, canola, grape or dairy, adding that local populations, farm output and tourism numbers have all increased in this time.
- **Mitigation Measures:** A study conducted in 2007 by the Association for the Control of Radioactivity in the West concluded that the centre had no significant impact on health.[159] In 2019, a study looked at changes in the number of births and changes in the sex ratio. The presented findings corroborated earlier observations and call for intensifying bio-physical research in exposure mechanisms and pathways of natural or artificial ionizing radiation.[160] France is a member of the IAEA, which was asked in 2016 to review the "safety options file" for the Cigéo project. Suggested

[152] Posiva, posiva.fi
[153] Survey, inis.iaea.org
[154] Role of Monitoring in Posiva's Programme for Spent Fuel Repository, 2004, iaea.org
[155] Andra, andra.fr
[156] Cigeo, andra.fr/solutions-long-lived-waste/cigeo
[157] Meuse, meusehautemarne.andra.fr
[158] Australian Government, February 2021, industry.gov.au
[159] Association pour le Contrôle de la Radioactivité dans l'Ouest, acro.eu.org
[160] Reproductive Toxicology, sciencedirect.com

improvements to ANDRA's R&D planning and monitoring programme development were made.[161]

Germany

- **Project:** Deep Geological Repository Shortlist: Bundesgesellschaft für Endlagerung (BGE) is mandated by the German government to perform tasks in the final disposal of radioactive waste. BGE is currently looking for a suitable DGR site in Germany. The company says it needs to find a location by 2031 and hopes to begin storing containers of radioactive waste at the site by 2050. Since April 2017, BGE has operated the repository projects Konrad[162] (in Salzgitter, Lower Saxony) and Morsleben[163] (in Saxony-Anhalt).
- **Opposition:** A salt mine in Gorleben was the previously planned location for a DGR for used nuclear fuel. It has attracted frequent protests from environmentalists since the 1970s.[164] In September 2020, BGE announced that the mine did not meet geological criteria for a nuclear repository.
- **Mitigation Measures:** Germany is a member of the IAEA. In 2019, an IAEA team of experts said Germany is continuing to manage its radioactive waste and spent fuel in a safe and responsible manner.[165]

Hungary

- **Project:** Bátaapáti Repository, oversight by Public Limited Company for Radioactive Waste Management (PURAM).[166] The search for a site for a high-level waste repository is ongoing. Since 2012, low and intermediate-level waste has been placed in crystalline rock at a depth of around 250 metres.
- **Mitigation Measures:** Hungary is a member of the IAEA. In 2015, an IAEA team of nuclear and radiation safety experts reviewed the regulatory framework for nuclear safety in Hungary.[167]

Japan

- **Project:** The Nuclear Waste Management Organization of Japan[168] (NUMO) is responsible for selecting a permanent DGR site, as well as the construction and operation of the facility for waste emplacement by 2040. A Nationwide Map of Scientific Features for Geological Disposal was published in July 2017, information which needs to be taken into consideration when selecting a geological disposal site.[169] The Nuclear Energy Agency carried out an independent peer review of

[161] IAEA Reviews France's Project for High and Intermediate-Level Radioactive Waste Disposal, 2016, iaea.org
[162] Konrad site, bge.de
[163] Morsleben site, bge.de
[164] Deutsche Welle, dw.com
[165] IAEA Mission Says Germany Committed to Safe, Responsible Waste Management, Sees Areas for Further Enhancement, iaea.org
[166] PURAM, rhk.hu
[167] IAEA Expert Mission Reviews Hungary's Regulatory Framework for Nuclear Safety, iaea.org
[168] NUMO, numo.or.jp
[169] NUMO, numo.or.jp/en/faq

Japan's siting process and criteria for the geological disposal of high-level radioactive waste in 2016.[170] As of November 2020, NUMO began the initial stage of assessing two municipalities in Hokkaidō Prefecture for their suitability to host a final disposal facility for high-level radioactive waste.

- **Mitigation Measures:** Japan is a member of the IAEA. In 2021, the IAEA and the Japan Atomic Energy Agency (JAEA) agreed to work together to help countries strengthen technical capacities in decommissioning, radioactive waste management, and nuclear security.[171]

South Korea

- **Project:** Wolseong Low and Intermediate Level Radioactive Waste Disposal Centre, Gyeongju. The site was chosen after nine unsuccessful attempts to secure a waste facility. When fully built out, the facility will house 800,000 barrels of low to intermediate-level radioactive waste.[172]
- **Community Support:** In 2005, the new site received a 90% approval rating by voters (70% voter turnout).
- **Mitigation Measures:** South Korea is a member of the IAEA, and has documented emergency preparedness laws and response regimes related to nuclear facilities, including storage/processing/disposal facilities for radioactive waste.[173]

Spain

- **Project:** El Cabril Nuclear Waste Disposal Facility, Hornachuelos, Córdoba. Enresa was created in 1984 as a public, non-profit organization responsible for the management of radioactive waste in Spain.[174] In 1992, the El Cabril site opened to store very low, low and intermediate-level radioactive waste.[175] A new centralized storage facility (CSF) with an operating life of 60 years is to be built in the Municipality of Villar de Cańas. It could be operational as early as 2024. The preferred option for spent fuel and high-level waste in Spain is deep geological disposal, and it is estimated that the definitive disposal facility could start operation in 2068.
- **Support and Opposition:** In the 1990s, local officials welcomed the El Cabril jobs which the nuclear waste facility would create. At the time, environmental groups including Greenpeace lobbied against the project.[176]
- **Mitigation Measures:** Spain is a member of the IAEA. The planning and preparation for nuclear emergencies is regulated by Spain's Basic Nuclear Emergency Plan.[177]

[170] Nuclear Energy Agency, oecd-nea.org
[171] IAEA and Japan Atomic Energy Agency to work together in Decommissioning, Radioactive Waste Management, and Nuclear Security, iaea.org
[172] Stimson, stimson.org
[173] Republic of Korea Profile, iaea.org
[174] Enresa, enresa.es
[175] Enresa, enresa.es
[176] AFP, yahoo.com
[177] Spain Nuclear Profile, iaea.org

Sweden

- **Project:** Forsmark Spent Fuel Repository, Östhammar Municipality. In January 2022, the Swedish Government approved Swedish Nuclear Fuel and Waste Management Company (SKB) to build spent nuclear fuel DGR in Forsmark and an encapsulation plant in Oskarshamn.[178] SKB will be investing approximately SEK 19 billion (CDN$2.5 billion), mainly in the construction sector and for excavation and installations. Construction of the DGR is estimated to take about ten years.
- **Mitigation Measures:** Sweden is a member of the IAEA. During all phases of the facilities' life cycle, the Swedish Radiation Safety Authority are to conduct inspections on radiation safety during operation and on long-term safety aspects. For each facility, it will also be necessary that the municipality decide on a detailed development plan and building permit. Sweden's emergency management system distinguishes between authorities having jurisdiction in a specific region and authorities having mandates within specific areas of expertise, for instance Swedish Radiation Safety Authority in the fields of nuclear safety and radiation protection.[179]

Switzerland

- **Project:** Deep Geological Repository Shortlist: The project is led by Nagra, the National Cooperative for the Disposal of Radioactive Waste.[180] Three site regions are under consideration, Jura-Ost, Nördlich Lägern, and Zürich Nordost. A site is to be selected in 2022.[181] The repository should be operational around 2050. Zwilag is an interim storage facility in Würenlingen for all categories of radioactive waste in Switzerland, in operation since 2001.
- **Mitigation Measures:** Switzerland is a member of the IAEA. The assessment and monitoring of nuclear facilities is the responsibility of the Swiss Federal Nuclear Safety Inspectorate, based on laws, guidelines and underlying technical and scientific documentation, which transparently set out the safety requirements and criteria that ENSI applies for its assessments.[182]

United Kingdom

- **Project:** Deep Geological Repository Shortlist: Sellafield in Cumbria, England, currently houses about 75% of the United Kingdom's current nuclear waste. As of August 2020, activities at the site included nuclear fuel reprocessing, nuclear waste storage, and nuclear decommissioning. It is a former nuclear power generating site. The government of the United Kingdom announced in 2022 the launch of Nuclear Waste Services.[183] The new organization brings together site operator Low Level Waste Repository Limited, geological disposal facility developer Radioactive Waste

[178] SKB News Release, www.skb.com
[179] Sweden Profile, iaea.org
[180] Nagra, nagra.ch
[181] Nagra, nagra.ch
[182] Switzerland profile, iaea.org
[183] Nuclear Newswire, ans.org

Management Limited, and the Nuclear Decommissioning Authority's Integrated Waste Management Program.

- **Opposition:** Twelve regions in England are currently being assessed.[184] There has been opposition from some communities selected as they were not aware that were being considered.[185]
- **Mitigation Measures:** The U.K. is a member of the IAEA. The Scottish Government has a distinct policy for higher activity radioactive waste (HAW). In 2016, it published an implementation strategy to allow waste management decisions to be taken to ensure the policy is implemented in a safe, environmentally acceptable and cost-effective manner. The strategy also includes a research statement on projects to be initiated to underpin and support the safe management of higher activity radioactive waste in Scotland.[186]

United States

Yucca Mountain, Nevada

- A deep geological repository storage facility was proposed within Yucca Mountain for spent nuclear fuel and other high-level radioactive waste in the United States. However, due to lobbying groups and lack of political support, construction of the facility has not begun. The project has encountered many difficulties and was highly contested by the public, local Indigenous populations, and politicians. Reopening the repository is currently under federal and state review.[187]

Waste Isolation Pilot Plant[188] (WIPP), Carlsbad, New Mexico

- WIPP is licensed to store transuranic radioactive waste from the research and production of United States nuclear weapons only.
- The plant started operation in 1999, and the project was estimated to cost $19 billion. In 2014, there were accidental fires at the facility leading to a radiation leak. The cost of the 2014 accident was expected to exceed $2 billion and disrupted other programs in various nuclear-industry sites. In 2017, the plant was formally reopened after three years of clean up.
- **Mitigation Measures:** The U.S. is a member of the IAEA. Each State is responsible for providing, by itself or in cooperation with other states, for the disposal of waste generated within the State. Each nuclear plant is responsible for developing on-site and off-site emergency response plans.[189]

[184] Nuclear Waste Services, gov.uk
[185] The Guardian, theguardian.com
[186] United Kingdom Profile, iaea.org
[187] Federal Register, federalregister.gov
[188] WIPP, energy.gov
[189] USA Profile, iaea.org

7. Recommendations to Address Agriculture Business Impacts

This section identifies potential strategies to address impacts on agriculture business in the Municipality of South Bruce. The scope of this study does not include analysis of forces unrelated to the NWMO Project which may influence values (e.g., global commodity market pressures, real estate market pressures related to the pandemic, concerns about increased foreign ownership of farmland,[190] supply chain issues related to war, etc.).

7.1 In a Nutshell

Agriculture stakeholders are concerned about the impacts on the agriculture sector if the Project proceeds, and they are looking for leadership from the Municipality of South Bruce and support from the NWMO and others. Recommendations include monitoring and mitigating commodity value changes, leveraging the DGR surplus lands and the Centre of Expertise to expand opportunities for agriculture and agribusiness, and make every effort possible to develop local and County-level economic development programs that are relevant and outcome-oriented for the agriculture sector.

7.2 Key Findings

The NWMO "is using best environmental practices to ensure the project is implemented in a way that protects people, agricultural lands, and sensitive environmental areas,"[191] and that "there will be a continuous monitoring of the natural environment throughout all phases of the project, including open and transparent reporting and information sharing."

Commodity value protection is a key concern to South Bruce agriculture stakeholders. The Municipality of South Bruce and NWMO should explore how Project-induced changes in commodity values for agricultural producers may be monitored and / or addressed through a program to mitigate losses to business owners.

There is a need to establish monitoring programs for commodity value changes related to the Project.

The Property Value Protection Program does not address any effects on financial borrowing capacity of agricultural stakeholders, as the program only relates to land sales. There may be a need to establish a borrowing-capacity monitoring program and /or a borrowing-capacity protection program.

Community effort should focus on establishing an Agritech Demonstration Farm for Research and Innovation on the balance of NWMO lands adjacent to the DGR, as well as programs at the Centre of Expertise related to agritech innovation, agricultural awareness, agritourism, culinary and local food. The opportunities and challenges of the agriculture

[190] Standing Senate Committee on Agriculture and Forestry- A Growing Concern: How to Keep Farmland in the Hands of Canadian Farmers, 2018, sencanada.ca
[191] NWMO FAQs, nwmo.ca

sector should continue to be address through local and regional economic development programs, as well as advocating for improved funding and capital investments.

To assist farmers and agricultural stakeholders in making informed decisions about their operations, there is a need to update and publish detailed agricultural data for South Bruce and the Core Study Area. This will also help to expand the prominence of local agricultural experiences and local food in the regional tourism industry and to make decisions about public infrastructure investments to meet the needs of South Bruce farmers and agribusiness stakeholders.

7.3 Impacts on Commodity Values and Borrowing Capacity

Some agriculture stakeholders within South Bruce have expressed concern about the potential for commodity values to decrease if the NWMO Project proceeds. History, however, indicates that agricultural operations have co-existed without problems beside nuclear power plants for decades, as well as near used nuclear waste storage facilities.

> "Farms have been operating next to Bruce Power where big blocks of nuclear waste sit in a shed. You can sit down next to these blocks and eat your lunch. It is safe where it is now but it's not a long-term solution. All of these farms have been operating around these nuclear facilities for decades – literally half a century or more – without any threat to the crops and to the products being developed on farms, or the people producing them."." – Pat Jileson,[192] Bruce County farmer, Past Provincial Director, Ontario Federation of Agriculture; Past President, Bruce County Federation of Agriculture

According to the Australian Government,[193] "there is no credible evidence, in Australia or anywhere else in the world, that well-managed radioactive waste facilities such as the one proposed for Australia have any impact on market access or land or commodity prices."

> "These facilities – internationally and around South Australia – have resulted in no impact on local or regional farming products, prices or reputations, and the new facility will be no different."

The Australian Department of Agriculture[194] told farmers near the Napandee DGR site: "The Department does not expect any implications for domestic or export products originating from these farms. In particular, the Department notes that products such as grains have radiation standards, and the regulatory requirements imposed by Australia's independent nuclear regulator will ensure these standards are not exceeded. More importantly, they protect the safety of workers, public health, and the environment. Given that the main buyers of Australian livestock and grain products also have advanced nuclear and radioactive waste management programs, it is not evident why there would be discrimination against Australian products where there is no where there is no evidence of actual contamination."

[192] Willing to Listen Podcast, August 2021, anchor.fm
[193] Australian Government's Agriculture Factsheet, Government of Australia, Myths and Misconceptions, February 2021, industry.gov.au
[194] Australian Department of Agriculture, October 2017

Commodity Value Protection

No examples could be found to substantiate concerns that commodity values will be affected by the construction of a DGR in an agricultural area. In Ontario, Agricorp is the provincial government agency that delivers risk management programs and services to the agricultural industry. Its mandate is to administer plans of crop insurance (or any other duties) under the Agricultural Products Insurance Act, 1996. Agricorp says it works closely with the agricultural industry to understand and respond to industry needs. It operates the AgriStability Program and publishes Fair Market Values for crop and livestock inventory.[195] For example, the Fair Market Value for Grade 2-4 Soybeans in February 2022 was $19.75 per bushel.[196] It is unclear if current Agricorp programs would protect against Project-induced losses, if they were substantiated.

With an abundance of caution to address the concerns of opponents of the DGR, the Municipality of South Bruce and NWMO could explore potential commodity value monitoring programs with Agricorp and / or establishing a program to mitigate losses to business owners if their business is adversely affected by the NWMO's site selection process and the development, construction and/or operation of the Project, as per Principle 12 of the Project. An objective auditing organization could be retained to insure transparency and accountability. Commodity value protection is a program that could be established by NWMO and referenced in the Hosting Agreement with the Municipality of South Bruce.

Effects on Borrowing Capacity

In February 2022, the NWMO announced the development of the "Property Value Protection (PVP) Program"[197] to protect property values for owners near the DGR. The program was developed in response to community feedback and is expected to be activated should South Bruce be selected as the hosting site, according to a letter to property owners.[198] The PVP Program will commence on the date of the Site Selection Announcement – if the Municipality of South Bruce is selected as the municipal host for the Project. Claims of loss will not be considered before the PVP Program start date. The NWMO states it will review the PVP Program when the DGR construction phase starts. At that review, the PVP Program will undergo an examination to determine whether its design is suitable to meet its objectives based on the "economic and Real Property landscape" at that time. Full details about the program are available on the NWMO website.

While the Property Value Protection Program is outside the scope of the Agriculture Business Impact Study, potential impacts on agricultural stakeholders are within its scope. The PVP Program only applies to properties where a real estate transaction has closed. It does not address how declines in property values may affect a property owner's ability to borrow from a lender. Farm operators and other businesses routinely obtain loans and mortgages

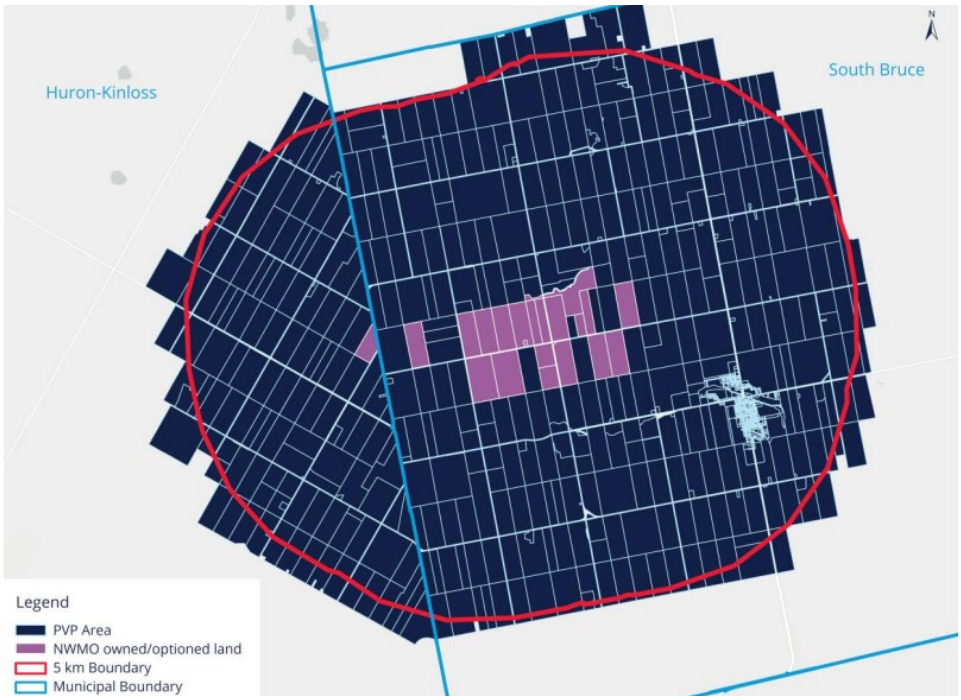
If appraised values decline, property owners could be financially affected if their lenders restrict borrowing capacity.

[195] Agricorp, agricorp.com
[196] 2022 AgriStability Fair Market Values, agricorp.com
[197] NWMO PVP Program, nwmo.ca
[198] NWMO letter to property owners, February 17, 2022, nwmo.ca

from banks and other financial institutions, with a property appraisal acting as a primary driver of the amount that can be borrowed. If appraised values decline, property owners could be financially affected if their lenders restrict borrowing capacity. The PVP Program does not provide a remedy for that situation. A monitoring program could bring any property value declines to light, to help develop mitigation measure or compensation tools.[199]

Figure 39 depicts the general geographic location of the properties within the PVP Area with red line highlighting a five-kilometre radius from the potential DGR location. The development of a monitoring program and / or a borrowing-capacity protection program should take this area into consideration. Neighbouring municipalities such as Huron-Kinloss would likely wish to be a part of any mitigation measures, considering that they are included in the five-kilometre radius.

Figure 39: NWMO Property Value Protection Area Map



Source: NWMO

[199] FCC, fcc.ca

7.4 Economic Development Opportunities

South Bruce stakeholders have expressed optimism that agriculture research and development could be enhanced locally and regionally by leveraging the surplus DGR lands for opportunities to improve the agriculture and agribusiness sectors. Several potential agritech applications and projects include demonstration, research, and sharing information on, for example, robotic harvesting, testing of autonomous agricultural machinery, advances in vertical farming, livestock management, and other possibilities.

The Centre of Expertise also presents opportunities to enhance agriculture and agribusiness sectors. These include agriculture functions such as facilities, accelerators, incubators, or coworking spaces for agritech start-ups; artificial intelligence research and demonstrations; crop research; commercial kitchens; agricultural events; education for next-generation farmers; housing for employees or students; and other possibilities.

7.5 Recommendations

The following recommendations are a summary of the key considerations to mitigate the business impacts on the agriculture sector and to capitalize upon aspirations and opportunities if South Bruce is a willing host and if the NWMO selects South Bruce for the Project. Each of these recommendations should be addressed in a Joint Hosting Agreement, if one is executed between the Municipality of South Bruce and the NWMO.

1. **Commodity Safety Monitoring:** The Municipality of South Bruce should advocate for the NWMO to provide safety monitoring of the Project to provide ongoing evidence of the level of risks or health concerns (or lack thereof) associated with food, crops or livestock commodities produced surrounding the project, such as the ongoing monitoring operations undertaken by Bruce Power, and to retain an independent auditing organization to review the commodity safety monitoring reports.

2. **Property Value Monitoring:** The Municipality of South Bruce should advocate for the NWMO to retain an independent auditing organization to monitor changes in real estate property values (fair market and actual transaction) for the purposes of assisting eligible property owners in the Core Study Area to participate in the NWMO Property Value Protection Program, as well as to mitigate the effects that declines in property values may affect property-owners' ability to borrow from a lender.

3. **Commodity Value Monitoring:** The Municipality of South Bruce should advocate for the NWMO to work with Agricorp and other appropriate agencies to monitor and report on changes in agricultural commodity values (or lack thereof) in the Core Study Area, and to retain an independent auditing organization to review the commodity value monitoring reports.

4. **Compensation Tools:** The Municipality of South Bruce should advocate for the NWMO to explore compensation tools for farmers and businesses in the agriculture and agribusiness sector, to mitigate Project-related labour force disruptions, traffic disruptions, commodity value reductions, borrowing-capacity restrictions, and other impacts.

5. **Agritech Demonstration Farm for Research and Innovation:** The Municipality of South Bruce should advocate for the NWMO, the Province of Ontario, the Government of Canada, and others to consider funding the establishment of an Agritech Demonstration Farm for Research and Innovation on the balance of NWMO lands adjacent to the DGR, specifically related to research and development initiatives, technology and innovation, education and training, demonstrations for the agriculture, agribusiness, and agritech sectors, linked with the Centre of Expertise, regional post-secondary education institutions, and other organizations.
6. **Centre of Expertise:** The Municipality of South Bruce should advocate for the NWMO, the Province of Ontario, the Government of Canada, and others to consider funding the design, construction and operation of the Centre of Expertise to house programs related to agritech innovation, agricultural awareness, agritourism, culinary and local food, linked with programs at the Agritech Demonstration Farm for Research and Innovation, regional post-secondary education institutions, and other organizations in the community.
7. **Economic Development Programs:** The Municipality of South Bruce and Bruce County should include agriculture and agribusiness stakeholders and associations in ongoing business retention and expansion initiatives, to help in addressing the concerns, opportunities, and challenges of the sector through modifications to local and regional economic development programs.

8. **Program Funding for Agriculture and Agribusiness:** The Municipality of South Bruce and Bruce County should advocate for improved program funding and capital investments for the agriculture and agribusiness sector, by developing collaborations and leveraging relationships with others, including NWMO, post-secondary educational institutions, neighbouring communities and Counties, senior levels of government, First Nations, and other organizations.

9. **Agricultural Data Sharing:** The Municipality of South Bruce and affected Counties should update and publish detailed agricultural data for South Bruce and the Core Study Area to assist farmers and agricultural stakeholders in making informed decisions about their operations.

10. **Prominence of Agriculture Experiences and Local Food in Tourism Programs:** The Municipality of South Bruce, Bruce County, RTO7, and Destination Ontario should expand the prominence of local agricultural experiences and local food in the regional tourism industry, by maximizing opportunities to collaborate with other local businesses, chefs, tourists, tourism organizations, and others.

11. **Public Infrastructure:** The Municipality of South Bruce and Bruce County should financially collaborate with NWMO, the Province of Ontario, and the Government of Canada to consider the public infrastructure needs of South Bruce farmers and agribusiness stakeholders are met, in terms of road maintenance, water supply, power, highspeed broadband connectivity, and other services.

8. Conclusion

The Agriculture Business Impact Study has identified the existing agricultural and agribusiness profile of South Bruce and the potential for the NWMO Project to change South Bruce agriculture/agribusiness operations. The Study has identified potential strategies for use of the NWMO lands and the Centre of Expertise to facilitate new agriculture and agribusiness opportunities in South Bruce. The Study has also identified potential strategies to address a reduction in the value of the agricultural commodities and land.

Appendix A: Study Charter

Introduction

The Study Charter is a reference document to be used throughout the creation of an Agriculture Business Impact Study for the Municipality of South Bruce. The charter confirms the scope of the study and tracks progress towards the achievement of deliverables. The charter indicates:

- Project sequencing and staging of tasks
- Key decision points
- The expected completion date of the project deliverables
- The roles and responsibilities of both the consulting team and client

The Study Charter contents include a brief description of the engagement plan and a detailed work plan and timeline.

Study Description

Key deliverables include the development of the Agriculture Business Impact Study, which will identify:

- Existing agricultural/agribusiness profile of the local area.
- Potential for the Nuclear Waste Management Organization (NWMO) Project to change the agriculture/agribusiness operations.
- Potential strategies for use of the NWMO lands to facilitate new agribusiness entrants.
- Potential strategies, if needed, to address a potential change in the value of the agricultural products.

The deliverables will reflect the Municipality's Project Principles, specifically:

- #5. The NWMO must commit to implementing the Project in a manner consistent with the unique natural and agricultural character of the community of South Bruce.
- #10. The NWMO will identify the potential for any positive and negative socio-economic impacts of the Project on South Bruce and surrounding communities and what community benefits it will contribute to mitigate any potential risks.
- #13. The NWMO, in partnership with the Municipality, will develop a strategy and fund a program to promote the agriculture of South Bruce and the surrounding communities.
- #19. The NWMO will, in consultation with the Municipality, establish a Centre of Expertise at a location within South Bruce to be developed in conjunction with the Project.
- #23. The NWMO will enter into an agreement with the Municipality providing for community benefit payments to the Municipality.

Stakeholder Engagement Plan

A strong communications plan is essential in supporting the successful execution of the work plan. The communications plan includes a definition of key messages and an engagement plan.

Key Messages

The following key messages will guide our communication updates.

- The Municipality of South Bruce is developing an Agriculture Business Impact Study, which will identify the existing agricultural/agribusiness profile of the local area, the potential for the Nuclear Waste Management Organization (NWMO) Project to change the agriculture/agribusiness operations, potential strategies for use of the NWMO lands to facilitate new agribusiness entrants, and potential strategies, if needed, to address a potential change in the value of the agricultural products.
- Assisting in this process is Deloitte LLC, an experienced and respected consulting firm that will be involved throughout the development of research and analysis for the Agriculture Business Impact Study, including all stakeholder engagement aspects of the project.

Engagement Plan

Figure 40 below outlines all stakeholder engagement activities anticipated for the Agriculture Business Impact Study and their respective planning and implementation considerations.

Figure 40: Engagement Plan

Activity	Deloitte LLC Responsibilities	Municipality of South Bruce Staff Responsibilities	Target Audience	Rationale /Question(s)	Timing/ Status
Project Launch Meeting	Create agenda Draft Charter, Work plan, Comms Strategy Host meeting	Invite attendees Provide feedback	Municipal staff leads	Clarify the objectives of the project Outline information needs Identify barriers to implementing work plan Approve Project Charter	Completed
Project Updates - ONLINE	Host meeting Update Work plan Report on progress Analyze feedback	Provide feedback Provide updates on any project supports	Municipal staff leads	Update Client on progress Ensure Client supports are in place where needed	Completed
Information Inputs **-EMAIL or DROPBOX**	Detail resource needs required	Provide background documents, data, information,	For Deloitte review and analysis	Ensure client communicates input	Completed

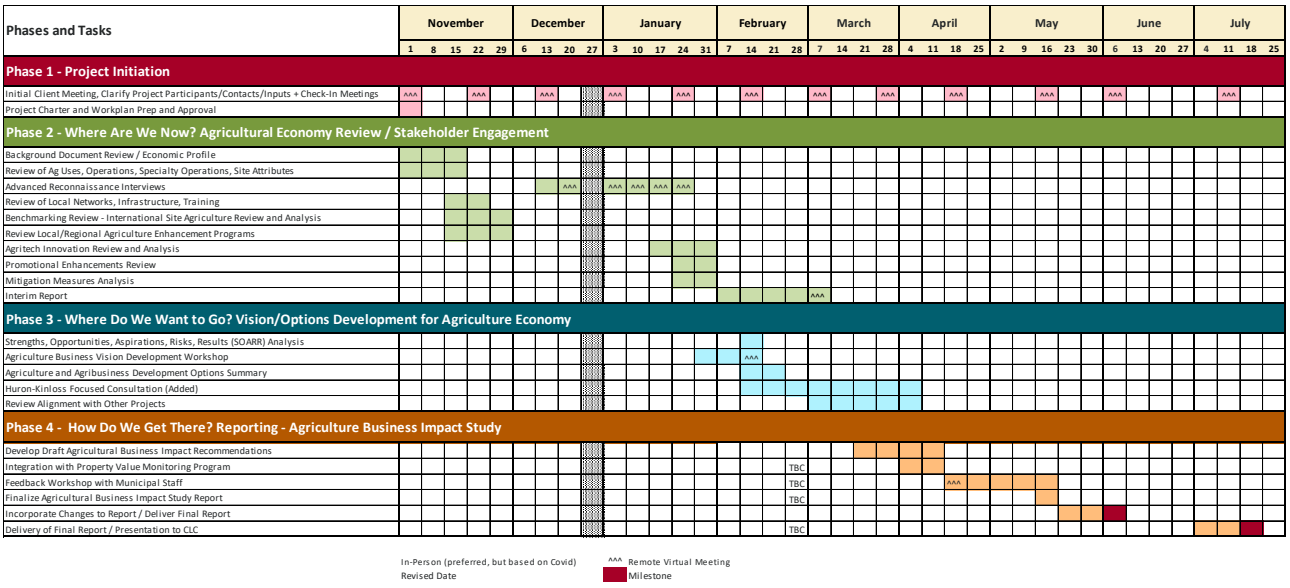
Activity	Deloitte LLC Responsibilities	Municipality of South Bruce Staff Responsibilities	Target Audience	Rationale /Question(s)	Timing/ Status
		feedback, direction, as requested Request information from NWMO and other consultants		for consideration by Deloitte	
Input - Benchmarking Review **- EMAIL**	Detail resource needs required	Provide feedback Request information from NWMO and other consultants	For Deloitte review and analysis	Identify potential for continued agricultural land use above or near NWMO site; examine existing nuclear facilities in Canada, U.S., U.K. and potentially in other countries to confirm agricultural activities continue to be pursued adjacent to nuclear facilities. Consider any specific changes in nature of agricultural activities due to establishment of nuclear facilities, or any reduction in value of agricultural proceeds compared to overall market prices.	Completed
Advanced Reconnaissance Interviews (increased from 3 to 10) **- PHONE**	Create an interview script Conduct interviews via telephone or online Analyze results	Approve script Provide list of stakeholders and contact information Provide introduction to target audience	Specific contacts with Bruce County Federation of Agriculture	Understand enhancement opportunities (use of lands for ag training or science programs, innovations in ag-tech, and promotions enhancing agriculture) Understand local agribusiness/agri-food networks and infrastructure	Completed
Workshop - Agriculture Business Vision Development – VIRTUAL (afternoon and evening, 60 minutes)	Prepare presentation Invite participants Facilitate workshop Analyze feedback	Approve presentation Provide feedback	To be determined	Develop a draft vision for agriculture business in South Bruce and the region taking NWMO into consideration	2 workshops Completed. Feb 15, afternoon and evening
Presentation – Interim Report **- VIRTUAL**	Present findings Analyze and incorporate feedback	Provide feedback	Municipal staff leads	Present findings to date and receive feedback Inform the SOARR Analysis Inform the Agriculture and Agribusiness Options Summary	The Interim Report will be folded into the presentation to include Huron-Kinloss Added Activity and other additional stakeholder feedback.

Activity	Deloitte LLC Responsibilities	Municipality of South Bruce Staff Responsibilities	Target Audience	Rationale /Question(s)	Timing/ Status
				Inform potential alignments with other projects Prepare the process to develop a draft vision for agriculture business in South Bruce and the region taking NWMO into consideration	
Huron-Kinloss Focused Consultation (Added Activity)	Analyze feedback from Huron-Kinloss Mennonite stakeholders Facilitate Huron-Kinloss workshop Provide analysis to Huron-Kinloss and South Bruce	Coordinate with Huron-Kinloss Distribution and collection of questionnaires	Mennonites in Huron-Kinloss Huron-Kinloss municipal staff South Bruce municipal staff	Provide another channel of feedback for opinions and ideas for the project	Workshop completed March 10. Responses received.
Submission – Draft Recommendations **- VIRTUAL**					To be included in Draft Study
Meeting with Municipal Staff - VIRTUAL	Develop presentation Conduct presentation Analyze and incorporate feedback	Invite Huron-Kinloss Provide feedback	Municipal staff from South Bruce and Huron-Kinloss	Gather feedback	Completed.
Draft Agriculture Impact Study	Draft report	Provide feedback	Municipal staff GHD	Incorporate feedback into Final Draft Intake for peer review	Completed.
Peer Review Input from GHD	Receive Peer Review Input	Provide Peer Review Input	GHD	Input for final draft	Completed.
Final Submission – Agriculture Study	Provide final report	Receive report	Municipal staff	Delivery of Final document	Completed.
Presentation to CLC – Final Agriculture Study	Develop presentation Conduct presentation	Approve presentation Provide meeting logistics Provide feedback	Community Liaison Committee	Complete project	Wed., Aug 4, 2022

Work Plan and Gantt Chart

A detailed work plan based on the Gantt Chart below (Figure 41) will be prepared and monitored for change at each progress update.

Figure 41: Gannt Chart



Resource Needs

Deloitte requested the following resources.

Information needed from South Bruce or Bruce County

- Access to EMSI Analyst Data for two months
- Details of most recent agricultural property values in South Bruce and Bruce County (summarized by lower-tier municipality) and percent change in value over past 3-5 years
- Copies of any agriculture studies or strategies undertaken by South Bruce or Bruce County
- Copies of any Community Improvement Plans and incentive details related to agriculture-related in South Bruce or Bruce County
- Copies of third-party strategies or reviews of South Bruce or Bruce County agriculture by e.g. Bruce County Federation of Agriculture, Agri Corp, MPAC, or other organizations or consultants
- List of agriculture/agribusiness networks, associations or non-profit groups in South Bruce or Bruce County
- List of agriculture and agribusiness education/training programs in South Bruce or Bruce County
- Details about any agriculture or agritech innovations in South Bruce or Bruce County, or any organizations and case studies undertaken
- List of key agriculture infrastructure/operations in South Bruce or Bruce County
- Number, location, and employment - grain elevators
- Number, location, and employment - food/meat packing and processing facilities

- Number, location, and employment - auction barns
- Number, location, and employment - farm equipment, chemical, pesticide businesses
- Number, location, and employment – agricultural-related financial institutions/lenders
- Number, location, and employment – other agriculture infrastructure/operations
- Details of any marketing or promotional plans undertaken in South Bruce or Bruce County to promote investment in the agriculture or agribusiness sector
- Details of sections within current emergency preparedness plans that address emergency measures and economic recover measures related to nuclear-related damage to agriculture and agribusiness in South Bruce or Bruce County

Information needed from other sources

- Latest Census of Agriculture farm, operator, crop, livestock and financial data for South Bruce and Bruce County
- Latest supply chain data for agriculture for South Bruce and Bruce County
- Copies of studies, reviews, or reports on the impact on agriculture and agribusiness by a Deep Geological Repository, nuclear power plant, or other major industrial intervention from any other jurisdiction in the world
- Copies of any mitigation (emergency preparedness and business recovery), investment or marketing strategies for agriculture or tourism, prepared for communities near Deep Geological Repositories, nuclear power plants, or other major industrial interventions from any other jurisdiction in the world
- Details and concept images of the proposed NWMO Centre of Expertise, with specific reference to features of the facility or property that will promote and support agriculture and agribusiness in South Bruce and the region
- Details about any other Centres of Expertise or centres of excellence anywhere in the world that are similar to what is proposed by the NWMO
- Details of any agricultural constraints, traffic constraints, trade or consumer constraints, or buffer areas that will be created anywhere in South Bruce or Bruce County related to the NWMO Deep Geological Repository
- Details of any agricultural constraints, closed roads, trade or consumer constraints, or buffer areas that were considered or created when a Deep Geological Repository, nuclear power plant, or other major industrial intervention was established anywhere else in the world
- Copies of any Agriculture Business Impact Studies related to the development of a Deep Geological Repository, nuclear power plant, or other major industrial intervention was established anywhere else in the world
- Examples of agriculture and agribusiness operations that opened, expanded, downsized, or closed adjacent to a Deep Geological Repository, nuclear power plant, or other major industrial intervention established anywhere else in the world

Appendix B: Document Review

Background Document Review

A review of the background documents provides insight into the management of nuclear waste worldwide and context for potential impacts to the agricultural industry within the Municipality of South Bruce. The Municipality of South Bruce is one of two sites in Canada that are being considered for a deep geological repository for the storage of nuclear waste. According to NWMO, "deep geological repositories use a combination of engineered and natural barriers to safely contain and isolate used nuclear fuel from people and the environment." Globally, deep geological repositories are currently operating as well as being planned for the storage of spent nuclear fuel.

There are five sites worldwide that are currently conducting site selection investigations to determine whether to proceed with a deep geological repository in the next three years. Worldwide, there are an additional six countries that are developing site selection processes and siting activities for similar underground nuclear waste storage.

Other countries have progressed much farther and are expected to commence construction in the early 2020s. Eight countries have decided to build a deep geological repository and one country has construction underway. Sweden, France, and Russia have identified sites and are planning to begin construction of deep geological repositories.

There is also extensive information sharing between the NWMO and eight counties through established co-operation agreements and memorandums of understanding. The intention of these agreements is to share best practices, conduct experiments and to "keep abreast of developments in repository design and safety case development for various host rock formations."

Several documents were reviewed that have a more localized perspective on agriculture and used nuclear fuel storage within Ontario. Specifically, the NWMO "Farming Backgrounder" speaks directly to the proposed location within the Municipality of South Bruce (see Appendix E). The latter document notes that the land above the proposed site will remain productive farmland and "once the surface facilities have been closed and decommissioned, the remaining land can be returned to agricultural activities."[200] The report also notes that there have been no adverse effects to land or agricultural products as a result of underground storage of nuclear waste. The report states that "the NWMO is using the best environmental practices to ensure the project is implemented in a way that protects people, agricultural lands and sensitive environmental areas such as watershed and sensitive ecological environments."

As mentioned above, the NWMO has access to best practices from other jurisdictions worldwide through the agreements and memorandum of understanding that would inform the site location determination and potential build of the facility in the Municipality of South Bruce.

The Municipality itself has also established, through a Council resolution, Guiding Principles for NWMO's site selection process. The 36 Principles are organized by seven comprehensive categories that include safety and the natural environment; people, community and culture;

[200] NWMO "Farming Backgrounder" (2020)

economics and finance; capacity building; services and infrastructure; governance and community engagement; and regional benefits. The 36 Principles serve to determine how the future project will contribute to community well-being and also the community's willingness to host the project.

The Municipality will also reference OMAFRA's "Guidelines on Permitted Uses in Ontario's Prime Agricultural Areas" (2016) to evaluate the agricultural impacts of the project and how the project aligns with permitted uses in prime agricultural areas. This document is designed to "help municipalities, decision makers, farmers and others interpret the policies in the Provincial Policy Statement, 2014 (PPS) on the uses that are permitted in prime agricultural areas."[201] Potential permitted uses include agricultural, agriculture-related and on-farm diversified uses. The guidelines within the OMAFRA report also address the removal of land for new and expanding settlement, limited non-agricultural uses, and mitigation of impacts from new or expanding non-agricultural uses.

Figure 42 presents a common threads matrix, showing the association between each theme relative to the documents it has been identified in. A single check mark (✓) indicates the document has some content relating to the theme, but it is not a primary focus of the document, while a double check mark (✓✓) indicates there is a primary focus on the theme.

Figure 42: Common Threads Analysis

Document	Agriculture	Job Creation	Nuclear Waste	Housing	Tourism
The Nuclear Waste Management Organization "Programs around the world for managing used nuclear fuel" (May 2020)		✓	✓✓		
Ministry of Agriculture, Food and Rural Affairs "Guidelines on Permitted Uses in Ontario's Prime Agricultural Areas" (2016)	✓✓	✓		✓✓	
The Nuclear Waste Management Organization "Farming Backgrounder"	✓✓		✓✓		
Municipality of South Bruce Council *Resolution for South Bruce Guiding Principles for NWMO's Site Selection Process* (2020)	✓		✓✓		✓✓

[201] Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), "Guidelines on Permitted Uses in Ontario's Prime Agricultura Areas" (2016)

Appendix C: Engagement Summary

Agriculture Stakeholder Feedback

South Bruce residents responding to the 2021 survey were asked to indicate their level of interest in learning about the findings of various studies and topics. Agriculture ranked fourth on the list of studies and topics of most interest to residents, after the environment, impact on property values, and safety assessments.

An engagement process was conducted to learn about the perspective from the local agriculture industry on how the NWMO project could change agriculture/agribusiness operations and possible strategies to address the potential change of the industry. In view of the different opinions across the community with respect to the project, different channels were used to ensure opportunity was given to as many members of the community as possible to share their opinion.

There were 12 interviews completed with agriculture industry stakeholders in the region in December 2021, January 2022, and April 2022, drawn from a list provided by the South Bruce Nuclear Exploration Team. Analysis of the interview responses also helped to shape the workshop sessions.

Two workshops focused on agriculture stakeholders in South Bruce were organized and promoted via social media, direct emails, and other means. Interested stakeholders were asked to indicate their preferred time of day for the workshops from a series of proposed times. Based on the highest number of selections, two workshop times were selected: one in early afternoon, and another in the evening of February 15, 2022. During the promotion period of several weeks, 31 stakeholders expressed interest in the workshops. In the end, 15 people attended. Most workshop attendees monopolized the conversation during the sessions, repeatedly expressing a desire for the NWMO project not to happen in South Bruce. While the participants were respectful, it would be intimidating for any agricultural stakeholder to express a positive perception of the NWMO project in relation to the farming sector. After the workshop, email messages were sent to stakeholders who had registered, but who did not attend the workshop sessions.

Survey questionnaires were also distributed through the community to over 110 stakeholders who live or have operations near the potential location of the project, 16 completed surveys were received. Those responses, along with those from the interviews and the workshops, are summarized below.

Common Themes

When asked about the potential changes for the agriculture sector in South Bruce if the NWMO projects is built, common themes were identified:

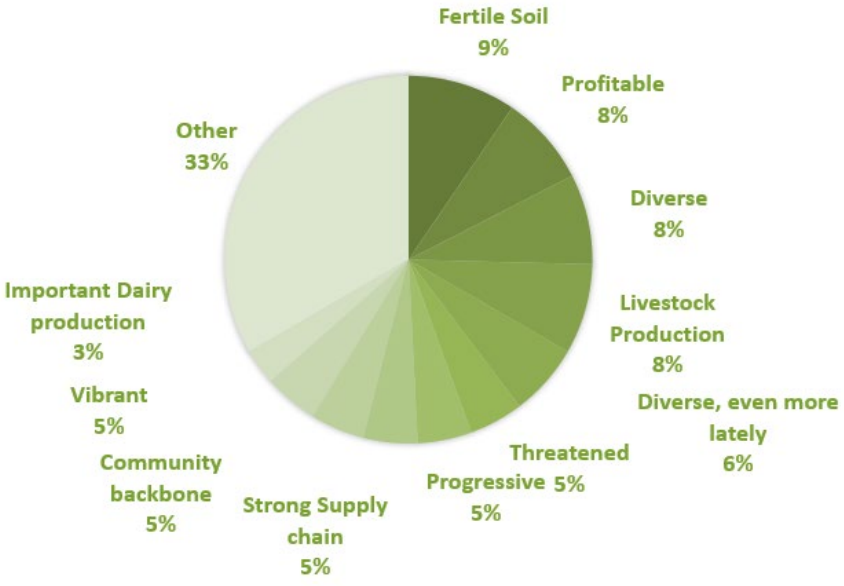
- **Customer's Perception:** Stakeholders fear that customers have a stigma regarding food produced near the nuclear industry and this will deteriorate how their products are perceived.
- **Infrastructure:** Stakeholders believe with the NWMO project there will be a higher investment in the municipality's infrastructure and road maintenance which were identified as highly needed.
- **Research and Training:** Both the Centre of Expertise and the land near the project are seen with the potential to be used to develop partnerships and focus on research and training for the industry innovation.
- **No effect:** The DGR site would not have major or any effects on local agriculture, a few stakeholders said.

South Bruce Stakeholder Interviews / Survey

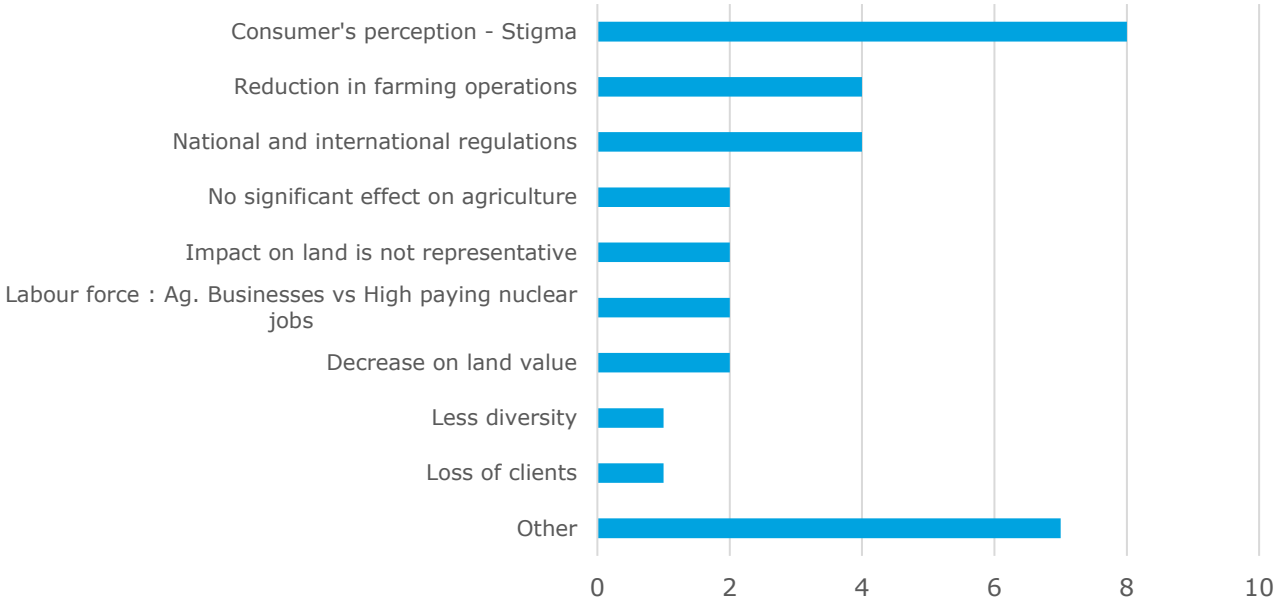
Strengths of the current agriculture industry in South Bruce

Comments that indicated "other" include:

- Transitioning
- Overtaxed
- Highly competitive
- Uncertain
- Sustainable
- New opportunities have emerged (lavender, vegetables, maple syrup, vineyard, cannabis)



How agriculture/agribusiness operations will change if the project is built in South Bruce



Other comments include:

- No issues eating anything around DGR; no different than eating food grown near Bruce Power
- Farming is threatened, in turmoil, and subject to uncertainty; farming would need to stop
- Difficult for farmers to get financing, only big companies would be able to work in the area
- Infrastructure investments
- DGR could be a windfall for local farmers: there will be a lot of money spent, and some of it should find its way in farmers' pockets
- Farming may remain largely unchanged, but there would still be more residents and traffic - not necessarily good for farmers

How could NWMO lands around the DGR be used to attract new or expanded agriculture or agribusiness operations

Research and Development - 26%

- Emphasis on new technology development (Artificial intelligence, Autonomous vehicles, swarm farming, robotics)
- Testing area to showcase stewardship advanced farming practices to improve sustainability and soil health and water quality, carbon sequestration etc
- Crop testing in collaboration with U of Guelph
- Use expanding technologies to ensure food safety of processed foods
- Create an innovative bio-gestor for processing agricultural waste
- Build partnerships to provide part of the project with in-house generated energy

Provide productive land for local farmers – 21%

- Sharecropping
- Prioritize operations that utilize best practices for soil and water quality (Cover crops, no-till, crop rotation)
- Land renting to young farmers by lottery
- Development of crop and tree produced edible products
- New types of forage grazing species and related animal production
- Explore insect and plant protein

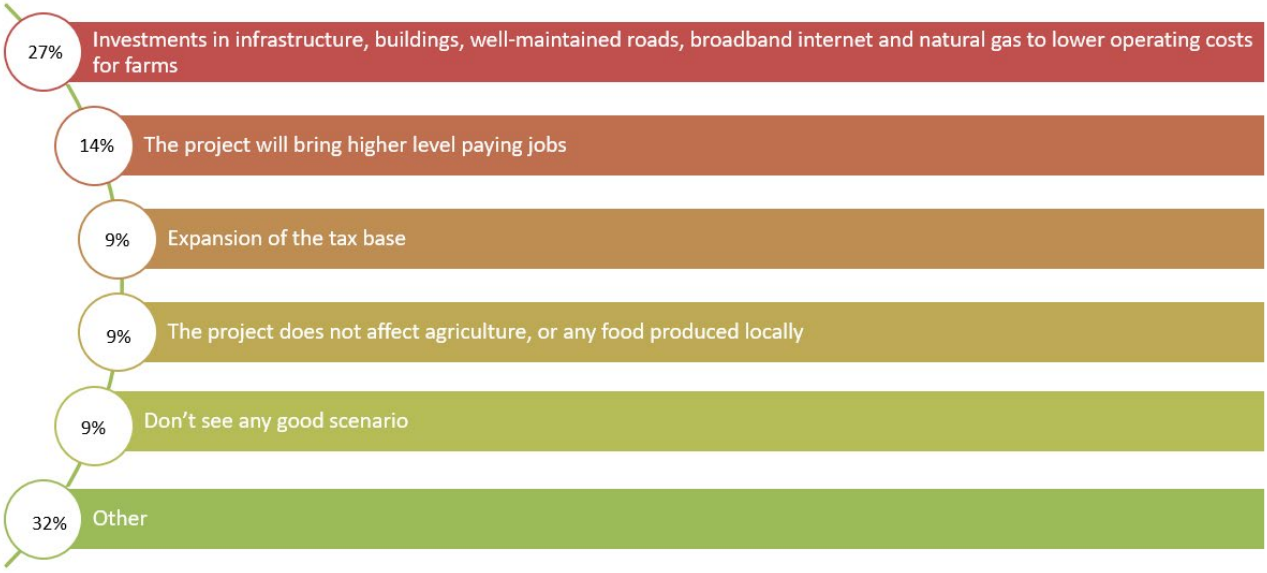
Other - 32%

- Offer incentives to attract agricultural businesses
- Restore woodland-Native, long-lived species (maple and cedar)
- Keep the current production in those lands
- There is opportunity to grow products for a small niche but nothing significant
- Support current businesses, need for investment in infrastructure, review of restrictive water policies
- Farm the land but prohibit construction
- Don’t change its use - By keeping the production it had before there would be no change in agriculture

Don’t see how it could support agriculture - 21%

- No specific comments

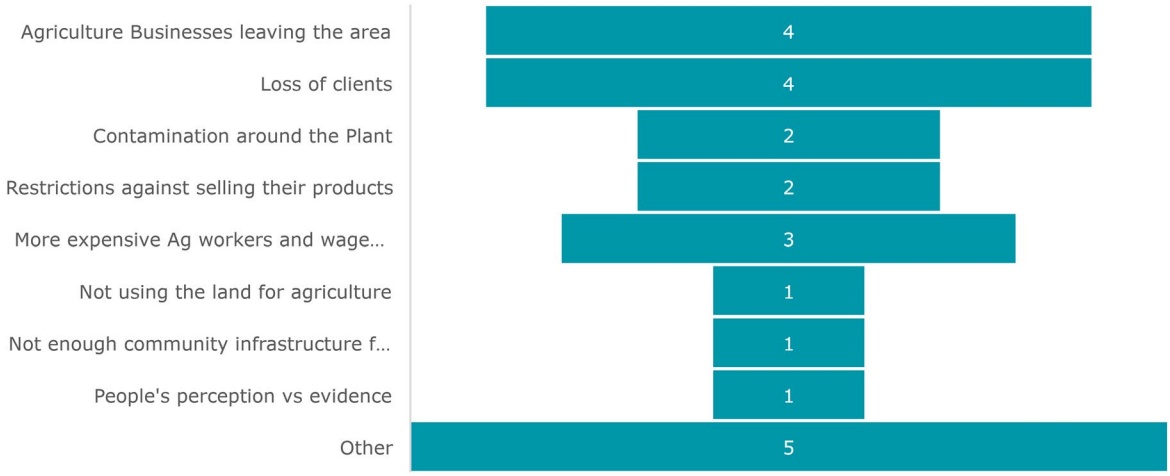
Best-case scenario for agriculture if the DGR is built in South Bruce



Other comments include:

- Create pro-business community mindset, vision for the community which then attracts additional business/operations
- South Bruce maintains a vibrant community and becomes a place where people want to live and farm
- The opportunity for younger generations who currently don't have the resources to enter in agriculture
- Farmer should be offered funding opportunities to make improvements to the farms
- Improvements in technology

Worst-case scenario for agriculture if the DGR is built in South Bruce



- Finding labour force because there are higher-paying jobs in the nuclear and that puts pressure on Agriculture
- One stakeholder referred to government opposition in Texas to a federal nuclear waste project, however the project is a consolidated interim storage facility (CISF), not a DGR
- A South Bruce farmer claimed Chapman's, an Ontario ice cream manufacturer in Grey County, is "against milk coming from a nuclear waste dump area because the consumer can have second thoughts if the ice cream and desserts are safe to eat."[202]
- When asked by the author of this study to confirm the comments, Ashley Chapman, Chief Operating Officer of Chapman's, responded:[203] "Yes, I did say that. The whole context of the statement was that through the last 20 years the Canadian Dairy Industry has seen a decline in consumption of fluid dairy, and many other dairy products. A nuclear waste depository underneath farm country may erode confidence in the Ontario dairy industry. The perception of the safety of our food supply may not always be accurate, but it still effects the buying habits of Canadians. In our opinion as one of the largest processors of Canadian Dairy in Canada, this is a lose-lose scenario for consumers, processors and dairy farmers."
- "I'm sure it will be safe," the same Chapman's executive told CBC News[204] in 2020. "But really it's the average consumer people like me have to worry about. Public perception is everything and I can't criticize the public with associating bad things with nuclear and milk in this instance."
- Another stakeholder didn't think losing clients would be any problem; his family farms near Bruce Power and no one has ever said they won't buy his product.

[202] FarmView Magazine, July 2022, farmviewonline.com
[203] Email message, July 6, 2022, from ice cream manufacturer to Deloitte LLC
[204] CBC News, February 2022, "Nuclear ice cream is not how this Ontario dessert maker wants to be known," cbc.ca

- Pat Jileson is a Bruce County Hog Farmer; Past Provincial Director, Ontario Federation of Agriculture; and Past President, Bruce County Federation of Agriculture. He was interviewed on a podcast in August 2021:[205]
    - "I take great comfort in knowing that the Project is going to leave a lot of the farmland in use. Farms have been operating next to Bruce Power where big blocks of nuclear waste sit in a shed. You can sit down next to these blocks and eat your lunch. It is safe where it is now but it's not a long-term solution. All of these farms have been operating around these nuclear facilities for decades – literally half a century or more – without any threat to the crops and to the products being developed on farms, or the people producing them."
    - "The stigma concern is very well addressed through science. It's also addressed pragmatically just through observation. It's not anecdotal because it has been going on for 60 years next to a couple of these facilities in Ontario. I believe the stigma is addressed easily."

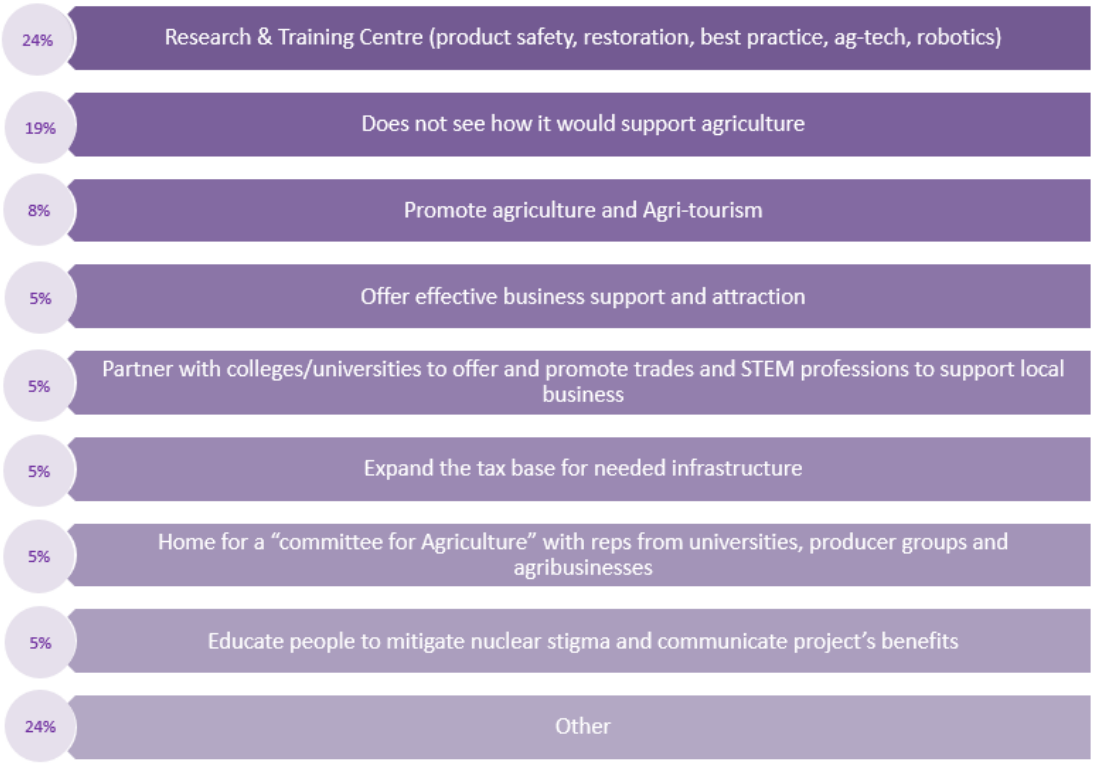
Addressing potential change in value of agricultural products or land

- Work to reduce nuclear stigma: 26%
- Provide evidence of no risks or health concerns from crops surrounding the project
- Educate consumers on Canada's highly regulated food quality
- Have marketing campaigns extend beyond ag into tourism and manufacturing
- Educate industry partners/supply chain to not reduce the value of products
- Don't see any options: 23%
- Offer compensation for property value: 14%
- Buy farmers out: 6%
- Establish a "well being fund" to subsidize farmers and compensate lost income: 5%
- Other: 26%
- Don't see any impact on the value of agricultural land
- Establish a "ring of influence" for traffic increase, property value, and indirect influence
- The project has positively increased the land value since announced, and NWMO has already announced a compensation package
- Establish grant programs for landowners around the project to make the area more environmentally sustainable
- Prioritize mitigation of dust resulting from the construction phase

[205] Willing to Listen Podcast, August 2021, anchor.fm

- Ag land is already too expensive, focus on talent attraction, schools and health care
- Establish a local marketing agency that helps farmers get top dollar for their products
- Risk management programs
- Has NWMO considered, not just the scientific lack of effects on South Bruce, but how the DGR will affect South Bruce's appearance? Are people going to automatically be less likely to move here and farm here if they know that there is a DGR?
- Traffic, land prices (rising because of project), competition for local, low pay farm labour, dilution of ag character with influx of non-ag people - all will have a negative impact.

How the Centre of Expertise could support agriculture and agribusiness



Other comments include:

- Free farm consultancy to help local farmers maximize government grant programs
- Free advice to farmers (e.g., comparison shopping service to ensure best price on farm machinery)
- Venue to host events for agriculture businesses, space to improve collaboration
- Community has a sound support system and doesn't need a facility to support agriculture

Huron-Kinloss Stakeholder Consultation

The Township of Huron-Kinloss and its residents are significant stakeholders and will be directly affected if the Deep Geological Repository (DGR) is located in South Bruce. Recognizing that the proposed site in South Bruce is in close proximity to the Township of Huron-Kinloss, the scope of the Agriculture Business Impact Study was adjusted to allow agriculture/agribusiness stakeholders from Huron Kinloss who live within a 5km radius of the South Bruce site, the opportunity to provide input to inform this study.

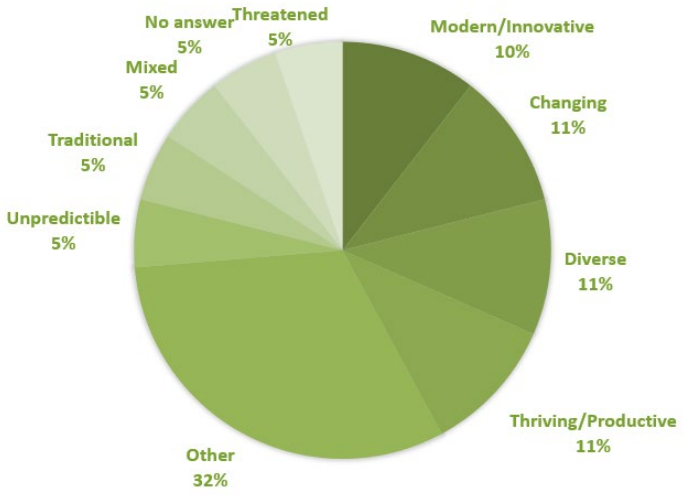
Workshop

One workshop was conducted, and no stakeholders from the Huron-Kinloss Mennonite agricultural community participated. Another stakeholder in attendance stated: "Mennonites don't want to be seen as influencing decisions – they don't take sides."

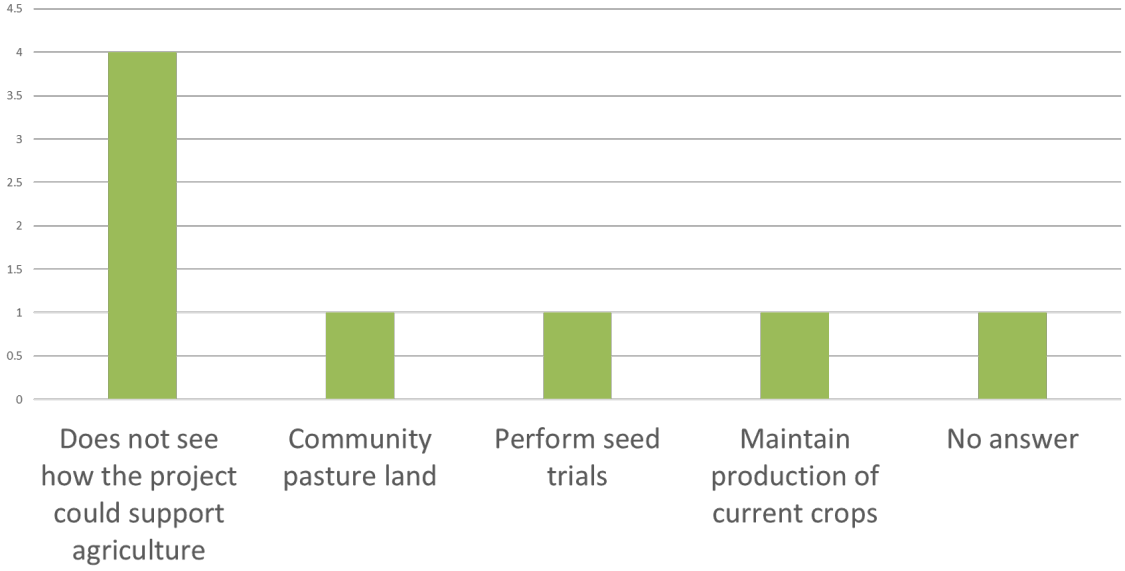
Surveys

84 survey questionnaires where distributed, 8 were received completed. Input is summarized below.

Stakeholder's perception of Huron-Kinloss's agriculture industry:



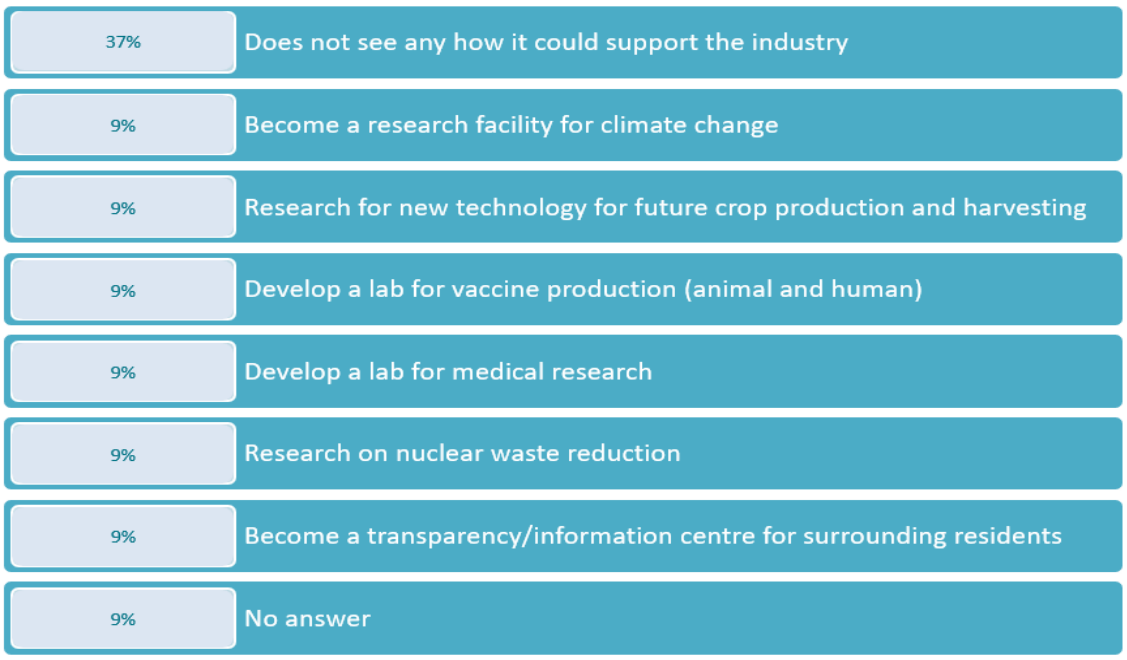
How could the 1,400 acres of land surrounding the project be used to expand Agriculture/ Agribusiness?



What could be done to address potential changes in the value of ag products or agricultural land in Huron-Kinloss, South Bruce, and the surrounding area?

- Compensation at current values 37%
    - Proposed also not for 10 years but entire time the project is in South Bruce
- Focus on green energy projects 12.5%
- Not sure 12.5%
- Will not provide an answer/take sides 12.5%
- Nothing could mitigate the terrible impact on agriculture 12.5%
- Farmland should be protected exclusively for Agriculture 12.5%

How might the Centre of Expertise (CoE) support agriculture and agribusiness in Huron-Kinloss, South Bruce and the surrounding area?



What would agriculture look like 10 years after operations begin and how would the project change agriculture/agribusiness in Huron-Kinloss?

- Does not see anything positive, would destroy agriculture in the community 30%
- As a close neighbor Huron-Kinloss would benefit from research and advances in agriculture 10%
- Benefit from the increase in profits in the area 10%
- This is a move forward for ag and for newer generations in the industry 10%
- Uncertainty for honey producers as bees could pick up radioactive particles 10%
- Possibility of the Mennonite community moving out 10%
- Does not anticipate any significant change 10%
- Will not provide an answer/take sides 10%

Appendix D: Nuclear Applications to Agriculture

There are numerous agricultural applications of nuclear technology, including the control of pests and insects,[206] improving animal health, increasing crop production,[207] and improving food processing,[208] traceability,[209] and certification.[210] See Figure 43.

Figure 43: Nuclear Applications to Agriculture

Project / Organization	Overview	Key Initiatives	Potential Implications for South Bruce Agriculture Business Impacts
Joint Programme of Nuclear Techniques in Food and Agriculture[211] **Leads:** IAEA, Food and Agriculture Organization (FAO) of the United Nations Established 1964	Mission to support and promote the safe and appropriate use of nuclear and related technologies by the FAO/IAEA Member States in food and agriculture and so contribute to peace, health, and prosperity throughout the world, especially to global food security and sustainable agricultural development.	Over 500 research institutions and experimental stations in Member States that cooperate on more than 30 coordinated research projects (CRPs) annually. The Joint Centre is currently responsible for over 200 national and regional technical cooperation projects (TCPs) with an annual expenditure of some US $14 million channelled to recipient countries for the purpose of technology transfer and capacity building. Activities are carried out through two major delivery mechanisms: (1) Coordinated research projects – funded by FAO/IAEA joint budget; (2) Technical cooperation research projects – funded through voluntary contributions from Member States.	As a member country, Canada is already involved in the FAO/IAEA joint partnership. Opportunities exist for South Bruce to leverage this relationship to improve local food security and enhance technology integration.
Nuclear-Derived Techniques Improve Cattle Productivity and Milk Quality[212] **Leads:** IAEA, FAO Cameroon 1990s – present	Use nuclear and nuclear-derived procedures such as radioimmunoassay (RIA) and enzyme-linked immunosorbent assay (ELISA), molecular diagnostics and genetic screening in reproduction and breeding, artificial insemination and	Leverage innovative, nuclear and nuclear-derived techniques, to control and prevent diseases among livestock, and boost cattle and milk production. The application of progesterone RIA in artificial insemination helps identifying 20-40% more cows for breeding than conventional methods that involved watching behavioural signs.	The project demonstrates the potential in adapting nuclear technologies to support local agricultural sector. Partnership with IAEA should be prioritized.

[206] Canadian Nuclear Association, cna.ca
[207] Land planted with improved cotton varieties doubles as farmers see increased yields and income, iaea.org
[208] A. Waltar, The Medical, Agricultural, and Industrial Applications of Nuclear Technology, 2003, stanford.edu
[209] Vinegar producers suspect food fraud in their industry – isotopic testing proves them right, iaea.org
[210] Slovenia protects and promotes local dairy products with "Selected Quality-Slovenia" certification branding, iaea.org
[211] Food and Agriculture Organization (FAO) of the United Nations with a mission to lead international efforts to defeat hunger. Since 1945, Canada and FAO have worked together with total contributions of $71 million CAD between 2018 and 2019.
[212] https://www.iaea.org/newscenter/news/nuclear-derived-techniques-improve-cattle-productivity-and-milk-quality-cameroon

Project / Organization	Overview	Key Initiatives	Potential Implications for South Bruce Agriculture Business Impacts
	disease control programmes for livestock.	It can subsequently increase the conception rate by between 5% and 50%, depending on the effectiveness of the traditional method and management previously used.	
Sterile Insect Technique for Environmentally Friendly Pest Management **Leads:** IAEA, FAO Guatemala, Mexico, Ecuador, and the United States 60+ years	The sterile insect technique is an environmentally friendly insect pest control method involving the mass-rearing and sterilization, using radiation, of a target pest, followed by the systematic area-wide release of the sterile males by air over defined areas, where they mate with wild females resulting in no offspring and a declining pest population. [213]	Sterile Insect Technique has successfully controlled several high-profile insect pests, including fruit flies; tsetse fly; screwworm; moths (codling moth, pink bollworm, false codling moth, cactus moth, and the Australian painted apple moth); and mosquitoes. In several countries where the technology has been applied, retrospective economic assessment studies have shown a very high return on investment. Weekly, Ecuador imports three million sterile Mediterranean fruit flies and releases them in target areas to mate with wild females. Ecuador has continued exporting these fruit species to the US (valuing USD$22 million, 2019).	The technology demonstrates the positive agriculture benefits of nuclear technology via a pest management lens. Opportunities for South Bruce to collaborate with IAEA/FAO and local nuclear operators and educators to adapt this technology.
Isotopic technique and applications for improved soil and water balance [214] [215] **Lead(s):** IAEA, FAO Benin, Kenya, Sudan 2017	The project focused on the use of isotopic and nuclear-derived techniques to measure and properly increase the amount of nitrogen necessary for plant growth.	In Benin, a scheme involving 5,000 rural farmers increased the maize yield by 50% and lowered the amount of fertilizer used by 70% with techniques that facilitate nitrogen fixation. Farmers in Benin saw their soybean production increase from 57,000 tonnes in 2009 to 220,000 tonnes in 2019. Nuclear techniques allow farmers in Kenya to schedule small-scale irrigation, doubling vegetable yields while applying only 55% of the water that would normally be applied using traditional hand watering. In Sudan, nuclear technology helped hundreds of women farmers move out of poverty by introducing a fertigation system to grow vegetables. The amount of water and nitrogen fertilizer needed by the crops was optimized using nuclear and isotopic techniques.	The project illustrates the potential for agricultural innovations to occur leveraging nuclear science.

[213] https://www.iaea.org/topics/sterile-insect-technique
[214] https://www.fao.org/fao-stories/article/en/c/1390726/
[215] https://www.iaea.org/newscenter/news/isotopic-technique-helps-benin-farmers-triple-yields-and-improve-livelihoods

Project / Organization	Overview	Key Initiatives	Potential Implications for South Bruce Agriculture Business Impacts
Climate change adaptation – Nuclear-derived crossbreeding programme [216] **Leads:** IAEA, FAO Burkina Faso, Sudan 2021	Nuclear and related techniques are used to develop climate-smart agricultural practices and technology packages to enhance resource use efficiency, improve soil fertility, curtail farming costs, and increase crop and livestock productivity in a sustainable manner.	Researchers have determined both the nutritional value of several local available feeds and the nutritional requirements of sheep and goats, and the team developed a programme to produce "multinutrient mineral blocks" (MMBs) – lick blocks that contain urea, minerals along with local crop residues that can cover part of the animal requirements. The farmer's cooperative is now making and selling the blocks to farmers on a full-cost recovery basis.	Nuclear research has the potential to identify new natural food sources, which could be adapted to South Bruce farmer needs, particularly during winter months.
Nuclear Techniques lead to drip irrigation training for farmers [217] **Lead(s):** IAEA, FAO Nigeria 2012-present	Using nuclear technology, the IAEA – in partnership with the FAO – has developed techniques for cultivating crops with minimal water use under an approach that is called climate-smart agriculture. Scientists in Nigeria have been working with the IAEA and the FAO since 2012 to help farmers use drip irrigation systems to grow food despite harsh climate conditions and their changing life circumstances.	This innovation has benefitted farmers in many countries. In Nigeria, the new irrigation systems have helped increase yields of crops such as cucumber, watermelon and okra by 60%, while decreasing water use by 45% compared to other methods. The assistance began with training 60 national agricultural experts, providing expert advice as well as laboratory and field equipment. More than 680 students have been trained so far.	The initiative shows the potential for South Bruce to implement agricultural training for local farmers that leverage cutting edge nuclear/ag technologies.
Nuclear technologies and animal health [218] **Lead(s):** IAEA, FAO Belize, Central America 2021	Nuclear technologies helped in detecting, controlling, and preventing transboundary animal and zoonotic diseases within Belize in Central America.	In Belize, veterinary officers used to have to send samples to laboratories abroad to detect outbreaks of diseases. However, the Belize Agricultural Health Authority teamed up with the Joint FAO/IAEA Centre to establish its own Animal Health Molecular Diagnostic Laboratory. With the proper equipment and training, lab technicians used real-time Polymerase Chain Reaction (PCR) tests, a molecular nuclear technique, to rapidly detect diseases. The laboratory also assisted the government with COVID-19 PCR tests in humans – a great example of how	Potential for South Bruce to focus the Centre of Expertise on exploring innovative health technologies for remote and Indigenous communities.

[216] https://www.fao.org/3/i6180e/i6180e.pdf
[217] https://www.iaea.org/newscenter/news/growing-food-in-the-face-of-hardship-in-nigeria-nuclear-techniques-help-people-fleeing-terrorism-make-the-most-of-a-hostile-terrain
[218] https://www.fao.org/fao-stories/article/en/c/1390726/

Project / Organization	Overview	Key Initiatives	Potential Implications for South Bruce Agriculture Business Impacts
		tackling animal health threats can also support human health.	
Food Irradiation Secures Vietnam's Fruit Exports [219] **Leads:** IAEA, FAO Vietnam 1990s – today	Nuclear techniques can improve food safety and quality control by detecting or eliminating harmful residues and contaminants in food products. Ionizing radiation applied to food, for example, can kill potentially harmful microbes, preventing foodborne illnesses.	Experts in Vietnam began research on food irradiation in the late 1990s, and the country now hosts 11 facilities. Gamma rays are most commonly used and can treat around one tonne of fruit per hour. Last year an average of 200 tonnes of fresh export fruits were irradiated per week in Vietnam using gamma and x-rays.	Illustrates potential for South Bruce to focus the Centre of Expertise on food irradiation technologies.
Nuclear Technologies for Plant Mutation Breeding Case Study[220] **Lead:** Vienna Centre for Disarmament and Non-Proliferation (VCDNP) Bangladesh 2020	Examine the benefits of nuclear technologies used for plant mutation breeding and how the use and access to these technologies can be sustained, and demonstrate the important role of the IAEA in making these technologies available, supporting their safe, secure and sustainable use by its Member States.	Nuclear technologies such as gamma-ray or x-ray irradiation provide valuable tools to develop new crop varieties As the impact of climate change increasingly threatens crops and livelihoods globally, nuclear technology could become more important given the ability of radiation to produce mutations and create novel genetic diversity and to pave the way for the identification of genes contributing to specific traits.	Illustrates potential for South Bruce to focus the Centre of Expertise on research and development of crop varieties to respond to climate change.

[219] https://www.iaea.org/newscenter/news/irradiation-secures-viet-nams-fruit-exports
[220] VCDNP

Appendix E: NWMO Farming Backgrounder

The NWMO is responsible for implementing Canada's plan for the safe, long-term management of used nuclear fuel in a manner that safeguards people and respects the environment, now and in the future. We are committed to meeting or exceeding all applicable regulatory standards and requirements for protecting the health, safety, and security of people and the environment.

In South Bruce, that also includes continued success and sustainability in agriculture and protection of our water resources. There cannot be any credible risk to people and the environment for the project to move forward.

Q: Will a deep geological repository in South Bruce affect the agricultural community?

Canadian farmers have for decades safely farmed near nuclear facilities. Their crops and livestock are routinely monitored by partners and federal agencies such as the Canadian Nuclear Safety Commission. There have been no adverse effects to their land or agricultural products.

The NWMO will work closely with the agricultural community to ensure the deep geological repository project will have added value to the agricultural sector, and to find opportunities to support and promote Ontario agriculture crops and products.

Q: Will farming be able to continue in the area around the deep geological repository?

The deep geological repository is designed to be safe, and we expect much of the land directly above will remain productive farmland. Approximately 250 acres of the overall 1,500-acre site will be taken up by surface facilities to support the placement of used fuel underground. The remainder of the 1,500-acre site can continue to be used for agricultural production. Once the surface facilities have been closed and decommissioned, the remaining land can be returned to agricultural activities.

Q: Will the project impact property values in South Bruce?

As responsible landowners, the NWMO is committed to develop, in consultation with the Municipality of South Bruce, a program to provide financial compensation to property owners if property values are adversely affected by the project. The property value protection program will be developed through a series of well-being studies that we plan to complete with the involvement of the community in 2022.

Q: How will the NWMO protect people, the environment, farmland, and local watersheds?

The NWMO is using best environmental practices to ensure the project is implemented in a way that protects people, agricultural lands and sensitive environmental areas such as watersheds and sensitive ecological environments.

We are partnering with landowners, conservation authorities and other interested organizations to lead baseline and research studies to understand the natural ecological system in the area, including surface water, groundwater, soil, air, wetlands, and animals and species at risk. These studies will inform our work as we mitigate or eliminate potential adverse impacts of the project using technologies and operational best practices.

There will be a continuous monitoring of the natural environment throughout all phases of the project, including open and transparent reporting and information sharing.

This project will also be subject to a thorough regulatory review process, including an environmental assessment and a licensing review to ensure that it is implemented in a manner that protects people and the environment. In our planning timelines, we are currently anticipating that the regulatory review process will take approximately 10 years.

Q. How are you engaging the agricultural community in South Bruce?

The NWMO is working with farmers to ensure the agricultural character of the region is preserved in our long-term plans.

We are working with South Bruce and agricultural partners to develop health, environmental, production, and market studies with trusted third-party experts to provide fact-based responses to questions and concerns we have heard in the community.

Appendix F: Local Agriculture Networks

Bruce County Federation of Agriculture

The Ontario Federation of Agriculture (OFA) represents 38,000 Ontario farm families.[221] It advocates on issues such as innovation and entrepreneurship, invasive species, mental health and wellness, wetland conservation, skilled workforce, value-added agriculture, and pollinator health. The Bruce County Federation of Agriculture (BCFA), a chapter of the OFA, represents 1,455 farm families across Bruce.[222] The objectives of the BCFA include:

- Promoting and supporting initiatives which benefit the agricultural industry and the community.
- Maintaining an affiliation with the OFA and cooperating with organizations throughout Ontario in furthering the interests of farmers.
- Supporting and encouraging co-operation between and within adult and youth educational organizations.
- Encouraging and supporting co-operative development and enterprises in Bruce County.
- Encouraging and building understanding between rural and urban people.

The BCFA offers awards and scholarships, including the Building Careers and Futures in Agriculture and a financial assistance program for students pursuing a post-secondary education with an emphasis on agriculture.

Christian Farmers Federation of Ontario

The Christian Farmers Federation of Ontario (CFFO) represents over 4,000 farm families across the province. It has 12 District Associations, including one for Grey-Bruce.[223] The CFFO promotes economic, social and environmental sustainability through our farming policies, basing their work in Christian stewardship principles. Four key policy issues are the focus: farmland preservation, soil health, water stewardship, and agri-food sector success.

National Farmers Union – Ontario

The National Farmers Union – Ontario (NFU-O) is committed to ensuring family farms are the primary unit of food production; promoting environmentally-safe farming practices; giving farm women equal voice in shaping farm policy; working for fair food prices for both farmers and consumers; involving, educating and empowering rural youth for a better future; building healthy, vibrant rural communities; and ensuring an adequate supply of

[221] Ontario Federation of Agriculture, ofa.on.ca
[222] Bruce County Federation of Agriculture, brucefederation.ca
[223] Christian Farmers Federation of Ontario, christianfarmers.org

safe, nutritious food for Canadians.[224] The NFU-O has 22 Locals across Ontario, including Local 320 in Bruce County.

Other Organizations

Other agencies, agricultural networks, marketing boards, and associations that South Bruce farmers can access include:

- Agricorp
- Agricultural Research Institute of Ontario
- Beef Farmers of Ontario
- Canadian Meat Goat Association
- Canadian Organic Growers
- Ecological Farmers Association of Ontario
- Farm and Food Care Ontario
- Farm Fresh Ontario
- Foodland Ontario
- Innovative Farmers Association of Ontario
- Ontario Agribusiness Association
- Ontario Association of Agricultural Societies
- Ontario Business Risk Management Review Committee
- Ontario Dairy Goat Co-operative
- Ontario Food Terminal
- Ontario Fruit and Vegetable Growers Association
- Ontario Goat
- Ontario Grain Financial Protection Board
- Ontario Livestock Alliance
- Ontario Livestock Financial Protection Board
- Ontario Ministry of Agriculture Food and Rural Affairs
- Ontario Normal Farm Practices Protection Board
- Ontario Rabbit
- Ontario Rural Economic Development Advisory Panel
- Ontario Soil and Crop Improvement Association
- Organic Council of Ontario
- Organic Federation of Canada

[224] National Farmers Union – Ontario, nfuontario.ca

The Ontario Farm Products Marketing Commission oversees the activities of the following marketing boards and associations:

- Asparagus Farmers of Ontario
- Berry Farmers of Ontario
- Chicken Farmers of Ontario
- Dairy Farmers of Ontario
- Egg Farmers of Ontario
- Flowers Canada (Ontario) Inc.
- Grain Farmers of Ontario
- Grape Growers of Ontario
- Ontario Apple Growers
- Ontario Bean Growers
- Ontario Broiler Hatching Egg and Chick Commission
- Ontario Canola Growers' Association
- Ontario Flue-Cured Tobacco Growers' Marketing Board
- Ontario Fresh Grape Growers' Marketing Board
- Ontario Ginseng Growers' Association
- Ontario Greenhouse Vegetable Growers
- Ontario Pork Producers' Marketing Board
- Ontario Potato Board
- Ontario Processing Vegetable Growers
- Ontario Sheep Marketing Agency
- Ontario Tender Fruit Growers
- Ontario Tomato Seedling Growers' Marketing Board
- Seed Corn Growers of Ontario
- Turkey Farmers of Ontario
- Veal Farmers of Ontario

Younger residents can get involved in the Bruce 4-H Association[225] or a nearby chapter of Junior Farmers Association of Ontario.[226]

[225] Bruce 4-H, 4-hontario.ca
[226] Junior Farmers, jfao.on.ca

Appendix G: Examples of Agriculture Innovation Parks

There are examples of industry-facing agriculture innovation parks that could be considered, similar to what is envisioned by South Bruce agriculture stakeholders on the NWMO land.

Cornell Agritech and Technology Farm

Figure 38: Cornell Agritech

Established in 1880 and rebranded in 2018, Cornell Agritech[227] is operated by the New York State College of Agriculture and Life Sciences at Cornell University (Figure 38) in Geneva. The 850-acre complex contains more than 20 major buildings. There are 700 acres devoted to test plots, orchards, and vineyards, and 65,000 square feet of greenhouse space. Cornell Agritech develops and releases new fruits and vegetables, including apples, apple rootstocks, grapes, berries, cabbage, beans, broccoli, and tomatoes. The facility also supports the hop industry for the state's burgeoning craft beer sector. Cornell Agritech pursues a vigorous research agenda for digital agriculture through the use of new and advanced technologies that autonomously collect, integrate, and transmit information, improving effective, real-time decision-making on farms and at many points throughout agricultural systems. Digital technologies include sensors, robotics, unmanned aviation systems, communication networks, artificial intelligence, machine learning, and other advanced systems and devices.

Figure 39: The Technology Farm

Nearby, the Cornell Agriculture and Food Technology Park[228] (known as "The Technology Farm," Figure 39) is a 70-acre research, development, and production park designed to foster the creation of innovative technologies related to agriculture, bio-based industries, and food. Inside the 20,000-square-foot technology incubator building, start-up companies, small businesses, and large multinational companies can leverage resources and intellectual capital. The facility is a public/private sector initiative to accommodate the needs of food and agriculture companies, including the lease and purchase of space and access to college faculty and facilities.

[227] Cornell Agritech, cornell.edu
[228] The Technology Farm, thetechnologyfarm.com

Ontario Agri-Food Venture Centre

Figure 40: Ontario Agri-Food Venture Centre

Located in eastern Ontario, the Ontario Agri-Food Venture Centre[229] (OAFVC), Figure 40, offers production support to food entrepreneurs and farmers. Businesses best suited to launching production at the OAFVC include those looking for economic sustainability through shared pay-to-play production and storage spaces, and those seeking a way to continue scaling-up production while working out the details of moving into a built-to-purpose facility or partnering with a co-manufacturer. Northumberland County built the not-for-profit small-batch food processing facility with farmers in mind. The facility is accompanied by the necessary infrastructure and support for value-added production, processing, and business services to existing and emerging businesses and organizations in our surrounding communities. By acting in partnership with supporting agencies, the OAFVC aims to enhance and educate individuals regarding food preparation and availability. Since 2018, OAFVC has assisted with 74 business launches and helped bring more than 195 new products to market.

Vineland Research and Innovation Centre

Figure 41: Vineland

Vineland Research and Innovation Centre or "Vineland" (Figure 41) is dedicated to horticulture science and innovation, delivering products, solutions and services through a collaborative cross-country network to advance Canada's research and commercialization agenda. Vineland is an independent, not-for-profit organization, funded in part by the Canadian Agricultural Partnership, a five-year federal-provincial-territorial initiative. Vineland's 218-acre campus in Niagara Region showcases 35 buildings including research laboratories, farms, and greenhouses and is maintained by the Agricultural Research Institute of Ontario (ARIO).[230]

[229] Ontario Agri-Food Venture Centre, northumberland.ca
[230] Vineland Research & Innovation Centre, vinelandresearch.com

Appendix H: Examples of Centres of Expertise

The following paragraphs include examples of other "centres of expertise" or centres of excellence that could be considered similar to what is envisioned in a town near the DGR.

Frederik Meijer Gardens and Sculpture Park

Figure 42: Frederik Meijer Gardens and Sculpture Park

Opened in 1995, the Frederik Meijer Gardens and Sculpture Park[231] (Figure 42) is a 158-acre botanical garden, art museum, and outdoor sculpture park located in Grand Rapids, Michigan. It includes a large tropical conservatory, an eight-acre Japanese garden, major works of modern and contemporary sculpture on the grounds and indoors, along with a series of outdoor gardens and nature trails. Pre-Covid, the facility attracted 750,000 visitors annually. The 30-acre outdoor sculptural park opened in 2002 and, as of May 2015, the permanent collection contained over 300 pieces of artwork. Among the many highlights for visitors is The American Horse, a 24-foot-tall sculpture. The farmhouse, barn, gardens, and animal pens located within Michigan's Farm Garden are reminders of a 1930s family farm. Livestock are represented by bronze sculptures throughout the garden. Vegetables grown there end up in food served in the Park's café. There is also an orchard, sugar shack, produce stand, and windmill.

New York Kitchen

Figure 43: New York Kitchen

Originally called the New York Wine and Culinary Centre when it opened in 2006 in Canandaigua, New York, New York Kitchen[232] (Figure 43) hosts a variety of exhibits, programs and classes related to New York State wine and agriculture products. New York Kitchen is a non-profit organization, originating from the collaboration of Constellation Brands, Wegmans Food Markets, Rochester Institute

[231] Frederik Meijer Gardens and Sculpture Park, meijergardens.org
[232] New York Kitchen, nykitchen.com

of Technology, and the New York Wine and Grape Foundation. These dynamic forces came together with a shared passion and mission to create a gateway for people around the world to experience New York's incredible agriculture and viticulture industries. New York Kitchen hosts educational hands-on cooking and craft beverage pairing classes and programs, industry certification courses, and a 100% New York State Tasting Room. Through partnerships with area farmers, wineries, breweries, distilleries, producers, and entrepreneurs, New York Kitchen offers an array of inviting experiences which proudly highlight and promote the quality, diversity, and economic impact of food and beverages that originate in New York State.

Cornell Lab of Ornithology

The Cornell Lab of Ornithology[233] (Figure 44) is housed in the Imogene Powers Johnson Centre for Birds and Biodiversity (opened in 2003) in 226-acre Sapsucker Woods Sanctuary in Ithaca, New York. There are more than 6 km of trails taking visitors around Sapsucker Pond, on boardwalks, through wetlands and forest. More than 230 species of birds have been recorded in the sanctuary. Pre-Covid, approximately 55,000 people visited the sanctuary and public areas of the Cornell Lab each year, which is open daily. Approximately 250 scientists, professors, staff, and students work in a variety of programs devoted to the Lab's mission: interpreting and conserving the Earth's biological diversity through research, education, and citizen science focused on birds.

Figure 44: Cornell Lab of Ornithology

[233] Cornell Lab of Ornithology, birds.cornell.edu

Appendix I: List of Studies and Reports

Study #	Report / Study Name	Study Proponent	Lead Consultant
N/A	Economic Development Strategy (2021)	MSB	MDB Insight
E01	Economic Development Project Effects & Strategy	MSB	Deloitte LLC
E02	Economic Development Program - Youth	MSB	Deloitte LLC
E03	Local Hiring Effects Study & Strategy	MSB	Deloitte LLC
E04	Demographics	MSB	Deloitte LLC
E05	Agriculture Business Impact Study	MSB	Deloitte LLC
E06	Fiscal Impact and Public Finance	MSB	Watson & Associates Economists
E07	Tourism Industry Effects & Strategy	MSB	Deloitte LLC
E08	Housing Needs and Demand Analysis Study	NWMO, MSB	Keir Corp.
E09	Labour Baseline Study	NWMO	Keir Corp.
E10	Workforce Development Study	NWMO	Keir Corp.
E11	Regional Economic Development Study	NWMO	Keir Corp./Navigate STI
S13	Effects on Recreational Resources	MSB	Tract Consulting
S14	Local/Regional Education Study	NWMO, MSB	DPRA
S15	Land Use Study	NWMO, MSB	DPRA/MHBC
S16	Social Programs Study	NWMO, MSB	DPRA
S17	Emergency Services Study	NWMO	DPRA/IEC
S18	Vulnerable Populations Study	NWMO	DPRA
S19	Effects on Community Safety	MSB	GHD/RISC
S20	Community Health Programs and Infrastructure Study	NMWO	DPRA (TBC)
I21	Aggregate Resources Study	NWMO, MSB	Keir Corp./Palmer Environmental Consultants
I22	Infrastructure Baseline and Feasibility Study	NWMO	Morrison Hershfield
I23	Local Traffic Study	NWMO	Morrison Hershfield
I24	Road Conditions Study	NWMO	Morrison Hershfield

Deloitte.