# CANADA

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## Pathway Narratives

| | A) CURRENT TRENDS | B) NATIONAL COMMITMENTS | C) GLOBAL SUSTAINABILITY | Justification |
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| **General description** | **We do not act differently than in the past decade / today** | **National actions/policies are aligned with national commitments** | **National actions/policies are aligned with global sustainability targets** | |
| **Country Narrative -** main elements that have guided the selection of the assumptions under each pathway | **Canada is not committed**: Agricultural expansion, increased deforestation, reduced crop yields, and people diets based on animal protein and ultra-processed foods | **Canada tries, but is not enough**: Limited agricultural expansion, no deforestation beyond 2030, some afforestation, and healthier diets. Crop yields remain similar than current levels | **Canada works harder**: Limited agricultural expansion and more organic production, no deforestation beyond 2030, higher afforestation and biodiversity protection (including Indigenous initiatives), healthier diets, and higher crop yield and exports (despite a reduced consumption of fertilizer) | Consumption of fertilizers and impacts of climate change on agriculture are key aspects to consider for Canada, as they determine future crop yields and exports. |

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| Pathway Assumptions | | | | | |
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| | | **A) CURRENT TRENDS** | **B) NATIONAL COMMITMENTS** | **C) GLOBAL SUSTAINABILITY** | **Justification** |
| **1. Macroeconomics** | **1.1)** GDP per capita | Canadian GDP would increase by 1,5% annual by 2050 (SSP1). | Same as CT. | Same as CT. | OECD (2021) |
| | **1.2)** Population | 49 million inhabitants in 2050 (UN_high). | Same as CT. | Same as CT. | Statistics Canada (2023). |
| | **1.3)** Inflation | Increase by 194% between 2020 and 2050, which equals to 3.8% of average annual inflation. | Same as CT. | Same as CT. | World Bank (2023) |
| | **1.4)** Inequalities | Inequality has remained stable in Canada in the last 25 years, we assume this will continue following the same trend in the coming decades. | Same as CT. | Same as CT. | Burkinshaw et al. (2022) |
| **2. Land** | **2.1)** Constraints on agricultural expansion / deforestation | No constraints for agricultural expansion beyond protected areas. Our estimates indicate that, under current land-use trends, agricultural land could expand by 2050, with 31% of new agricultural lands come from deforestation. | Agriculture expansion does not drive deforestation beyond 2030, as new policies ban land use changes that negatively affect forests. | Same as NC. | Using ESA (2010) and UNEP-WCMC & IUCN (2020) for current trend, and Canada's Protected Areas (2019) |
| | **2.2)** Afforestation, and forest plantations targets | By 2030, no afforested lands and naturally regenerated areas (restoration) are gained. No federal goals for afforestation. | By 2030, 1 Mha of commercial timber plantations and 1 Mha of naturally regenerated forests on abandoned | By 2030, 2 Mha of commercial timber plantations and 2 Mha of naturally regenerated forests on abandoned | Government of Ontario (2017), Habitat Conservation Trust Foundation (2020) and Tree Canada (2020). |

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| | | | agricultural lands and pastures are gained. Programs like the Caribou Habitat Restoration Project, Afforestation Ontario, and the National Greening Program are promoting afforestation on degraded lands as a way to recover ecosystem services, and timber production. | agricultural lands and pastures are gained. Programs like the Caribou Habitat Restoration Project, Afforestation Ontario, and the National Greening Program are promoting afforestation on degraded lands as a way to recover ecosystem services, and timber production. | |
| | **2.3)** Urban and settlements area | Urban areas represent about 0.13% of total lands in Canada by 2020, which could increase to 0.20% in 2050. | Same as CT. | Same as CT. | Angel et al. (2011). |
| | **2.4)** Protected areas | 11% of total area by 2030. The "other effective area-based conservation measure", which is considered in the Canadian strategy to reach the Aichi Biodiversity Target, could be ineffective to protect ecosystems, as national parks and other formal protected areas do. This would not increment the share of the terrestrial ecosystems under protection. | 23% of total area by 2030. New provincial and national protected areas, and Indigenous conservation areas will significantly increase the share of formally protected areas in Canada. | 30% of total area by 2030. New provincial and national protected areas, and Indigenous conservation areas will significantly increase the share of formally protected areas in Canada. | MacKinnon et al. (2015); Lemieux et al. (2019). |

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| **3. Productivity and management** | **3.1)** Crop productivity for the key crops | Between 2020 and 2050, a lower use of fertilizer and negative impacts of climate change will reduce main crops productivity:<br>-from 3.4 t/ha to 2.8 t/ha for wheat<br>-from 2.3 t/ha to 1.6 t/ha for rapeseed<br>-from 3.8 t/ha to 3,3 t/ha for barley<br>-from 3.0 t/ha to 2.5 t/ha for soybeans<br>-from 1.9 t/ha to 1.5 t/ha for pulses | Between 2020 and 2050, most main crop productivities remain:<br>-from 3.4 t/ha to 3.7 t/ha for wheat<br>-from 2.3 t/ha to 2.3 t/ha for rapeseed<br>-from 3.8 t/ha to 3.8 t/ha for barley<br>-from 3.0 t/ha to 3.0 t/ha for soybeans<br>-from 1.9 t/ha to 1.8 t/ha for pulses | Between 2020 and 2050, a lower fertilizer consumption but positive impacts of climate change (longer growing season and better temperatures), and improved agricultural practices, better seeds, etc. will increase main crops productivity:<br>-from 3.4 t/ha to 3.9 t/ha for wheat<br>-from 2.3 t/ha to 2.4 t/ha for rapeseed<br>-from 3.8 t/ha to 3,9 t/ha for barley<br>-from 3.0 t/ha to 3.4 t/ha for soybeans<br>-from 1.9 t/ha to 1.8 t/ha for pulses | Based on USDA (2023a) for current trend, and Hannah et al. (2020), Krishna et al. (2021) and Williams et al. (2021) for other scenarios; and expert consultations. |
| | **3.2)** Cropland under agroecological practices | 2% of total cropland under agroecological practices by 2030. In Canada, "organic farming" is the concept used to refer to more sustainable practices in agriculture. | Same as CT. | Same as CT. | Isaac et al. (2018). National commitment was assumed in order to achieve a net reduction of 3% on GHG emissions from agricultural practices by 2023. |
| | **3.3)** Livestock productivity for the key livestock products | Between 2015 and 2050, the productivity per head remains:<br>-from 438 kg/head to 438 kg/head for beef production<br>-from 100 kg/head to 100 kg/head for pork production | Same as CT. | Between 2015 and 2050, the productivity per head increases:<br>-from 438 kg/head to 480 kg/head for beef production | USDA (2023a, 2023b) |

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| | | -from 23.8 L/day by dairy cow to 23.8 L/day<br>-from 2.5 kg/head by chicken to 2.5 kg/head | | -from 100 kg/head to 112 kg/head for pork production<br>-from 23.8 L/day by dairy cow to 26.6 L/day<br>-from 2.5 kg/head by chicken to 2.8 kg/head | |
| | **3.4)** Pasture stocking rate | It remains from 0.76 head of grazed cattle/ha to 0.76 head of grazed cattle/ha of pasture between 2005 and 2050. | Same as CT. | Same as CT. | Statistics Canada (2005), Thorpe et al. (2008) |
| | **3.5)** Forest management | 85% of logged forests are clear-cut through the whole period (there are no tree crops in Canada). | Same as CT. | Same as CT. | Statistics Canada (2017), Thorpe et al. (2008) |
| **4. Trade** | **4.1)** Share of consumption which is imported for key imported products (%) | The share of total consumption which is imported stays constant for corn, sugar, orange, and vegetables | Same as CT. | Same as CT. | Assumed |
| | **4.2)** Evolution of exports for key exported products (1000 tons) | Exports will mostly<br>- decrease, driven by lower productivities in the agro-food sector.<br>-decrease from 26 Mt 2020 to 17 Mt in 2050 for wheat<br>-decrease from 11,8 Mt 2020 to 9,8 Mt in 2050 for rapeseed<br>-remain from 4,0 Mt 2020 to 4,0 Mt in 2050 for soybeans<br>-increases from 1,3 Mt 2020 to 2,1 Mt in 2050 for pork | Exports will decrease for some products, and increase for others:<br>-decrease from 26 Mt 2020 to 21,3 Mt in 2050 for wheat<br>-increases from 11,8 Mt 2020 to 16,4 Mt in 2050 for rapeseed<br>-increases from 4,0 Mt 2020 to 4,9 Mt in 2050 for soybeans | Exports will mostly increase, driven by higher productivities in the agro-food sector:<br>-Increase from 26 Mt 2020 to 29,6 Mt in 2050 for wheat<br>-increases from 11,8 Mt 2020 to 19 Mt in 2050 for rapeseed<br>-increases from 4,0 Mt 2020 to 5,4 Mt in 2050 for soybeans | Based on USDA (2023a) and FAOSTAT (2023) for current trends, and Advanced Biofuels Canada (2019), Beckman and Nigatu (2017), Taylor (2017b), and dos Santos et al. (2018) for other scenarios |

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| | | -increases from 3,1 Mt 2020 to 3,9 Mt in 2050 for pulses<br>-decreases from 3,3 Mt 2020 to 2,0 Mt in 2050 for barley<br>-decreases from 15,2 Mt 2020 to 15,0 Mt in 2050 for pulp<br>-decreases from 25,4 Mm3 2020 to 20,5 Mm3 in 2050 for sawn wood conifers | -increases from 1,3 Mt 2020 to 2,1 Mt in 2050 for pork<br>-increases from 3,1 Mt 2020 to 4,4 Mt in 2050 for pulses<br>-decreases from 3,3 Mt 2020 to 2,5 Mt in 2050 for barley<br>-decreases from 15,2 Mt 2020 to 13,2 Mt in 2050 for pulp<br>-decreases from 25,4 Mm3 2020 to 24 Mm3 in 2050 for sawn wood conifers | -increases from 1,3 Mt 2020 to 2,1 Mt in 2050 for pork<br>-increases from 3,1 Mt 2020 to 5 Mt in 2050 for pulses<br>-decreases from 3,3 Mt 2020 to 3 Mt in 2050 for barley<br>-increases from 15,2 Mt 2020 to 16,8 Mt in 2050 for pulp<br>-increases from 25,4 Mm3 2020 to 27,1 Mm3 in 2050 for sawn wood conifers | |
| **5. Food** | **5.1)** Average dietary composition | By 2050, the average daily calorie consumption per capita is 3310 kcal and composed as: 26% cereals, 13% dairy, 4% red meat, 14% other meat, 21% oil and fat, 10% sugar, 7% fruits and vegetables, 1% pulses, 3% others. | By 2050, the average daily calorie consumption per capita is 2,475 kcal and composed as: 29% cereals, 6% dairy, 1% red meat, 6% other meat, 13% oils and fat, 4% sugar, 20% fruits and vegetables, and 11% pulses, and 10% others. People reduce ultra-processed food consumption and red meat and increase seeds and vegetables. Educational programs and other initiatives to promote healthier lifestyles have a significant impact on Canadians. | Same as NC. | Based on Willett et al. (2019) for national commitments and sustainable pathway. |

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| | **5.2)** Share of food consumption which is wasted at household level | Remain by 2050 in comparison to 2020 level | Reduced by 30% in comparison to 2020 level. | Reduced by 50% in comparison to 2020 level. | Food Waste Reduction Challenge (2020) |
| **6. Biofuels** | **6.1)** Targets on biofuel and/or other bioenergy use | Biofuel demand (including renewable diesel) accounts for 27% corn production, and 2% of wheat, canola and soy production by 2025, and it remains increasing. | Biofuel demand (including renewable diesel) accounts for 27% corn production, and 2% of wheat, canola and soy production by 2025, and it stabilizes afterwards as a result of EVs. Ethanol use in cars will go down, but biofuel demand for aviation and marine shipping will go up sharply. | Same as NC. | Canada's Action Plan for Clean On-Road Transportation (2022) |
| | **6.2)** Targets on other non-food uses | The demand for non-food used products remains stable between 2020 and 2050. | Same as NC. | Same as NC. | Canada´s bioeconomy strategy (2019) |
| **7. Water** | **7.1)** Irrigated crop area | Increase by 90% between 2020 and 2050. | Same as CT. | Increase by 300% between 2020 and 2050. | Based on Statistics Canada (2021) |