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Policy Brief #4: Okanagan Bioregion Food System Project

Manage Organic Waste and Improve Nutrient Cycling

Spring 2021

This policy brief is part of a series developed for the Okanagan Bioregion Food System Project. Each policy brief is connected to an area of local food policy development identified based on a review of local government comprehensive plans in the Okanagan bioregion. These briefs are designed to give context to the policy challenge and bring forth instructive examples to support local-level decision making.

To access all the policy briefs and get more information about the project visit: www.kpu.ca/isfs/okanagan-bioregion

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Introduction

In linear food systems, organic waste streams are seen as by-products and are managed to mitigate social and environmental impacts. However, these organic waste streams (incl. food waste, animal manure, crop residue, and human excreta) are also critical food system resources containing important nutrients needed to maintain crop production cycles and soil health (Ellen MacArthur Foundation, 2019). "Circular economy" and "bioeconomy" concepts are gaining popularity in local policy development because of the potential to mitigate the negative impacts caused by waste, such as pollution and excess GHG emissions, while reducing the need for new resources (Ellen MacArthur Foundation, 2019). Closing waste cycles within the food system also has the potential to generate energy (further mitigating GHG emissions and climate change), reduce reliance on synthetic fertilizers, create opportunities for new local businesses, and improve the health of agricultural soils (IISD, 2018).

Managing and regulating organic waste generated from the food system is a responsibility for local governments who invest in collecting, sorting, processing and safely disposing of organic wastes. The environmental cost of poor waste management also has local implications in the form of water contamination, degraded aquatic habitats and increased GHG emissions. Existing efforts to mitigate these negative impacts at the local level primarily focus on reducing food waste and diverting organic wastes from local landfills. Prevention strategies commonly include public education campaigns and regulatory reform across the supply chain to reduce the generation of avoidable food waste (ReFED, 2016). While these strategies can be effective in mitigating some of the negative impacts of organic waste, processes rarely include systems to recover and recirculate nutrients back into the food system. Local governments are important players in supporting organic waste management and nutrient recovery. Recognizing the impact of provincial, state and federal policies on climate mitigation some higher level policies are also highlighted.

Local Government Initiatives

- Adopting circular food/nutrient economy approches in policy directives
- Decentralized or community composting facilities
- Neighbourhood manure management and manure transfers
- Co-digestion of wastewater and food waste

Provincial, State and Federal Initiatives

- Funding for pilot projects and infrastructure
- Provide leadership in the development of circular economy approaches
- Ban or tax on organic waste in landfills
- Convene multi-stakeholder conversations and networks
- Educate the public

The Phosphorus Problem

Phosphorus is both an environmental pollutant and a scarce resource. Poor management and recovery of organic waste streams could have an impact on the long term sustainability of the food system (IISD,2018). Globally, phosphorus pollution in aquatic ecosystems is a growing concern. At the same time, failing to recover phosphorus from organic residuals causes a reliance on newly mined mineral phosphorus which is an increasingly scarce resource. New Fertilizing Products Regulation has been developed by the EU to promote the use of recovered nutrients in fertilizer manufacturing.

Policy and Planning Initiatives

Local Government Initiatives

Adopting circular food/nutrient economy approaches in policy directives

There is limited accounting for the true costs of poor waste management and nutrient pollution. This, in addition to a lack of public understanding of nutrient management challenges in the food system, impact policy development and advancement (Barquet et al., 2020). Understanding and integrating nutrient management considerations into policy across levels of government can impact the development of technology and the availability of funding to advance food system sustainability objectives.

At the local level, the City of Guelph and County of Wellington (Ontario), have integrated the circular economy language into their Community Plan, and are engaging in a project to establish a circular food economy with academic, non-profit and private sector partners (City of Guelph & County of Wellington, 2019). The City of Peterborough (United Kingdom), has also embraced the "circular city" framework across all municipal domains. Key strategies addressing food waste in Peterborough's "Circular City Road Map" include connecting businesses and organizations to waste recovery opportunities, and developing a closed loop demonstration farm. The City of Peterborough is also carefully tracking progress towards their circular city goals using a framework that includes both quantitative and qualitative measurement metrics.

Understanding Nutrient Flows in the Okanagan Bioregion

The challenge of closing nutrient cycles has been described as a “wicked problem” that requires unique policy development approaches, and coordination across scales (Bremmer, Leenstra, & Vellinga, 2020; Koppelmäki, Helenius & Schulte, 2021). The current scale of food import and export systems has created significant nutrient imbalances within the food system. In other words, nutrients that originate from crop production in one place, end up in organic waste streams in another. For example, urban areas which import most of their food end up with a concentration of nutrient rich organic waste, while more rural and food producing regions may have a nutrient deficit. Even in farming areas, the spatial separation of livestock and crop production have disrupted the natural nutrient cycling that occurs in agroecological systems (Jones et al., 2013; Moyer et al., 2020).

The Okanagan bioregion is a net importer of nutrients, which is primarily driven by the importing of livestock feed and food from other places (Harder et al., 2021). A study of nutrient flows in the bioregion in 2016 demonstrates that nutrient availability in organic waste streams in the bioregion exceeds the requirements for local crop production for three essential macronutrients, nitrogen (N), phosphorus (P), and potassium (K). While nutrient recovery will never be 100% efficient, even at a realistic recovery rate of 70%, the bioregion could meet all current crop nutrient needs for N and P, and up to 70% of K requirements. Currently, recovery of nutrients through composting and other processes is much lower, suggesting that these nutrients primarily exist as a pollutant and a lost resource.

Decentralized or community composting facilities

Centralized composting and waste management facilities for municipal waste can be costly and challenging to maintain at a large scale (Bruni et al., 2020). Unlike centralized composting facilities, a decentralized network deals with smaller volumes of waste at any one collection point, allowing for the use of simpler technologies (i.e. windrows, manual aeration etc.) and help reduce transportation fees associated with transporting waste to centralized facilities. Decentralized or community composting facilities often require more direct engagement from the community and have the potential to educate and build capacity (Bruni et al., 2020). The Institute For Local Self-Reliance has developed a guide for community composting to support the development of local level waste management projects. Santa Clara County operates a Master Composter Program to build community knowledge and capacity to support composting projects.

The New York City Composting Project supports a number of community scale composting operations in the city that aim to process food waste into compost to be used locally to build soil health and productive capacity. Each site is managed by the Department of Sanitation staff who also provide significant public engagement and education activities in addition to managing composting facilities. Food waste drop-off sites are managed by the DSNY, in partnership with GrowNYC, a local non-profit, and other community organizations.

Composting facilities exist in the Okanagan bioregion to address organic waste management challenges and generate compost for agricultural and horticultural uses. For example, Spa Hill Farm Compost collects food scraps and waste from residential and business clients in the Okanagan and Shuswap regions at decentralized collection points. Decentralized composting facilities can be an important part of diverse organic waste management infrastructure advanced and supported by local level governments and stakeholders. The City of Austin recognizes this in their Resource Recovery Master Plan noting that *“decentralized composting processes can reduce the carbon footprint of collection and transportation while consuming organics in more localized situations*

Food and Organic Waste Management in BC

In BC, 40% of the material currently sent to landfills is organic waste. This puts a stress on municipal waste management infrastructure and generates greenhouse gas emissions (BC Government, n.d.). As a result, provincial and local level government policy has primarily focused on prevention and diversion of organic waste products from landfills to avoid adverse impacts.

that do not require large organized collection programs...in addition to helping the City achieve its Zero Waste goals, composting also addresses the community's interest in enriching the region's soil, strengthening sustainable food production and completing the food cycle." Decentralized composting facilities also contribute to local economic development by creating new opportunities for new businesses, jobs and food system relationships (Platt, Bell and Harsh, 2013).

Neighbourhood Manure Management Planning & Manure Transfers

The specialization of agriculture has disrupted on-farm nutrient cycles. Concentrated livestock operations result in high volumes of manure in need of management. At the same time, crop-producing farms, who harvest and export nutrients in the form of feed and food, may lack the nutrients needed to replenish soil, becoming reliant synthetic fertilizers. In both instances, farmers face economic and environmental challenges caused by either nutrient surpluses or deficits on their farms. Neighbourhood, or community scale manure and nutrient management planning can be a strategy to address the nutrient supply and demand challenges facing farmers in different sectors. The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) is investigating proposed neighbourhood scale manure management where manure and nutrients can be transferred from where they are generated, to where they are needed. The strategy relies on the development of transfer agreements between farmers and are facilitated by increased soil and manure testing capacity. ManureLink, a program operated by a non-profit in Langley (British Columbia), connects individuals with excess manure with those looking for manure. The online platform facilitates connection and provides educational opportunities about proper manure management.

The concept of "manuresheds" is also being explored in lands surrounding animal feeding operations, with the goal of redistributing manure to meet environmental, food production, and economic goals (Spiegal et al., 2020). Soil and manure testing capacity, trucking and logistics remain challenges to overcome in advancing this concept, but research is underway particularly in the United States. Dutch legislation restricts the quantities of nitrogen and phosphorus that may be applied on the land as a way of reducing the environmental impacts of nutrient pollution. This requires on-farm surpluses to be transferred to regions that may be experiencing nutrient deficits. The high costs associated with manure transfer has incentivised processing manure into mineralized and granulated form to reduce transfer costs.

Co-digestion of Municipal Wastewater & Food Waste

Anaerobic digestion (AD) is used to process organic waste-producing methane gas, or biogas, into material that can be used as a soil amendment. Co-digestion leverages anaerobic processes to manage municipal wastewater and organic waste, thus optimizing the use of existing infrastructure, diverting food and organic waste from landfills, facilitating nutrient recovery, and producing renewable energy (Kanji et al., 2020). While technologies have been developed to facilitate co-digestion processes, addressing public perception and safety concerns around the use of digeste created from food and human waste is an ongoing challenge. A Handbook for Co-digestion Projects at Municipal Wastewater Treatment Facilities identifies co-digestion as a viable option for municipalities across the province with particular relevance for small and medium sized municipalities. Co-digestion has the potential to support a number of commitments made in Ontario's Food and Organic Waste Framework as well as environmental protection, climate change mitigation, and energy policies. Provincial support has led to the development of municipal co-digestion projects in Stratford and Petawawa.

An existing facility in the Okanagan was developed through a partnership between the City of Kelowna and City of Vernon to compost biosolids from wastewater treatment.

The Costs of Synthetic Fertilizer Dependence

Globally, it is estimated that less than 2% of nutrients in urban waste streams (i.e. food waste and human excreta) are recovered and recycled back into the food system (Ellen MacArthur Foundation, 2019). In the absence of nutrient recovery and recycling, agricultural systems rely on the use of synthetically derived nutrients to maintain crop production and soil health. In Canada, Nitrous Oxide (N2O) emissions have increased by roughly 30% since the 1980's, primarily due to the increased use of synthetic nitrogen fertilizers (Agriculture and Agrifood Canada, 2018). N2O is a greenhouse gas that is nearly 300 times more potent than Co2. This trend demonstrates how the linear management of waste, and failure to recycle nutrients in the food system is costly to society and has implications for long term food system sustainability.

This existing facility is nearing capacity and plans are being proposed for a new facility (Knox, 2020). Public perception, land access, technology and costs are all issues facing this proposal.

The primary drivers for development of co-digestion are diversion of organic waste to reduce GHG emissions, and the creation of renewable energy. Small-scale pilot projects can be an effective way to test co-digestion strategies that can help evaluate different waste inputs and establish markets for end products which include energy and nutrient rich digestate. In BC, a co-digestion pilot project was completed at the Annacis Island Wastewater Treatment Plant in Metro Vancouver. In New York, pilot projects at the Newton Creek Wastewater Treatment Plant focused on food collection logistics to ensure a flow of waste inputs for the digester. The pilot co-digested 2 tonnes of food waste per day, and used the source-separated organics to generate renewable energy.

The Costs of Synthetic Nutrient Dependence

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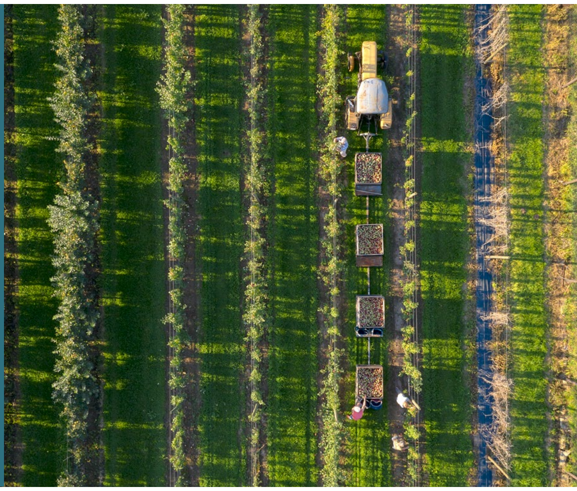

Provincial, State and Federal Initaitives

Funding for pilot projects and infrastructure

Research into new technologies for efficient recovery and recycling of nutrients is being advanced around the world. However, there is a need to continue research into more cost effective and regionally adapted technologies. Pilot projects are also needed to test the efficacy of these technologies. The EU-supported Run4Life project operates four demonstration sites testing source-separated collection of black water, grey water and food waste. Each of these sites highlight different technologies and processes for the recovery of resources such as nutrients, water and energy.

The development and operation of organic waste management and nutrient recovery infrastructure is very expensive. Provincial and federal governments can provide important access to funding to support the development of local organic waste management infrastructure. The CleanBC Organics Infrastructure and Collection Program, for example, provided funding to support communities in developing and expanding organic waste processing infrastructure, and residential organic waste collection programs. Intake for this program closed in February 2021. At the federal level, the new Food Policy for Canada has prioritized the reduction of food waste and will commit funds to infrastructure development. However, neither of these specifically recognize nutrient recovery as a priority.

Higher Level Support for Organic Waste Management and Nutrient

Organic waste management and nutrient recycling is an emerging area for local policy development. However, it must be recognized that the capacity and influence of local governments may be limited and policy action and reform at higher levels is necessary for advancing local level efforts. In addition, developing nutrient recovery technology and infrastructure can be costly and local governments may require support and investment. Support and policy development from federal and provincial/territorial governments will be critical to support local level actions.

Provide leadership in the development of circular economy approaches

Circular economy frameworks are being developed around the world. These policy initiatives can be critical to mobilize local action, encourage investment and support innovation in the sector. The Waste-Free Ontario: Building the Circular Economy Strategy uniquely includes regulations and incentives for the use of biofertilizers and extended commercial fertilizer producer responsibilities. Ontario's Food and Organic Waste Framework includes four guiding principles 1) reduce food and organic waste, 2) recover resources from food and organic waste, 3) support resource recovery infrastructure, and 4) promote beneficial uses of recovered organic resources. Sweden's Circular Economy Transition Plan includes a goal of decreasing marine pollution from sources including nutrient pollution. In taking action to advance this goal, Sweden is among the first jurisdictions to mandate phosphorus recovery from all nutrient rich waste streams, including sewage and slaughterhouse waste. The EU has also set aggressive food waste and nutrient recovery policies that require member states to take policy action.

Ban or tax on organic waste in landfills

Banning food and organic waste from landfills and incineration points is a way of incentivising the development and implementation of new recovery technologies. Germany, France, Italy and Japan all have national food and organic waste bans and are some of the jurisdictions where the most innovative nutrient recovery technologies have been developed. Other countries including the UK and Australia have introduced steep taxes on organic waste disposal in landfills to encourage organic waste recovery. These have helped incentivise the development of new recycling technologies (Nghiem et al., 2017). Nova Scotia was the first Canadian province to ban food and organic waste from landfills in 1998, which has supported the development of new waste-to-energy facilities in the province. However they have not developed the scale of infrastructure to effectively manage and recover nutrients from diverted waste. Ontario plans to institute a province-wide ban by 2022 under the Food and Organic Waste Framework. At the local level, Metro Vancouver introduced a food and organic waste ban in 2015.

Convene multi-stakeholder conversations and networks

In Canada, a National Nutrient Reuse and Recovery Forum was held in 2018 to connect stakeholders and align policy goals related to climate change mitigation, food security, agriculture viability and innovation. The forum resulted in a number of recommendations to support policy development, technology, data collection, research and communications to advance nutrient recycling in Canada.There are also a number of active innovation networks in Europe that address similar issues. These include the European Phosphorus Platform and the Swedish Nutrient Platform, which specifically address technology policy development. The Danish National Bioeconomy Panel supports knowledge sharing and technology development to promote and advance the bioeconomy.

Educate the public

Public understanding and perception of waste management and recycling is a significant barrier to advancing the circular economy, and nutrient recycling in particular. i. This is a particular challenge in development of processes and technologies to recover and utilize nutrients in urban waste streams (i.e. food waste and wastewater). Many provincial/territorial and local governments have engaged in public education campaigns to reduce food waste. However, few governments have developed public education campaigns outlining the importance of nutrient recovery and increasing awareness about the link between urban and rural food systems.

Conclusion

The linear nature of our contemporary food system has created waste management challenges all along the food supply chain. The social, economic and environmental costs of excessive waste and poor management are becoming increasingly evident and will negatively impact food system sustainability, environmental health and community well-being into the future. If we continue to see nutrient management as a problem to be addressed on the farm or the municipal wastewater plant alone, rather than across the whole food system, then these challenges will persist. As waste managers, regulators and policy makers, local governments have a role to play in shifting perspectives on waste management, nutrient recycling and food system sustainability more broadly.

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About the Okanagan Bioregion Food System Project

These research briefs were developed as part of the Okanagan Bioregion Food System Project. Communities and governments are increasingly looking to strengthen regional food systems as a way to address many complex agriculture and food challenges. This multidisciplinary research project, initiated by ISFS and regional partners, can guide conversations among communities and decision-makers seeking to advance their regional food system.

To access all the policy briefs and the full project report visit: www.kpu.ca/isfs/okanagan-bioregion

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