

Effect of gardening space increase on domestic food production in Montreal

Main results and methodology replication in Belgium

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Issues and objectives

We define **domestic food gardening** as the production of food (vegetables, fruits, berries, herbs, mushrooms, etc.) by one or several household's members in or not far from their dwelling. Inside the residence area, domestic gardening activities are represented by outdoor cultivation on soil in front or back yards, but also on pots, balcony, rooftops, etc. Outside of the residence area, in Montreal, they occur in community or collective gardens, or in neighbor, family, friends, or secondary residence areas. Domestic garden activities are maintained by the household's members and they contribute first and foremost to their own needs. These activities can be completed by fruits harvest on trees, hives' production or livestock breeding, as chicken for meat, laying hens or rabbits (Penvern, 2024).

Many research evaluate **gardening food production** at the territory level from production yields (kg/m²) extrapolated to potentially cultivable land in cities. (Marie, 2019 ; Pulighe & Lupia, 2019 ; Edmondson et al, 2020; Duchemin et McClintock, 2021)

However :

- Average production yields are neither representative of gardening activities diversity nor of their production
- These estimations are independent from gardeners' and their households' food consumption (i.e production on remote land far from the housing, or on inaccessible rooftops, etc.)

The original method presented in this poster aims at estimating domestic gardening food potential in Montreal Metropolitan Area (MMA) considering :

- **Gardening activities diversity** → Gardening on balcony, pots or soil, in houses' yards, community or collective gardens, etc.
- **The household scale** → In estimating global food production from :
 - The harvests' contribution to households Fresh Fruits and Vegetables (FFV) intake in summer = **Gardening Food Contribution**
 - Gardeners' proportion in the global population

Results

Table 1 : Sociodemographic data and survey results about gardening in Metropolitan Montreal Area

Sociodemographic Data (2016 Census and 2019 Survey)		
Montreal Metropolitan Area (MMA)	1 006 hab./km ² 15% of low income households 25% of immigrants 31% of individual housing	37% of gardeners 77% on outdoor soils 24% on balconies 6% outside of the residential area

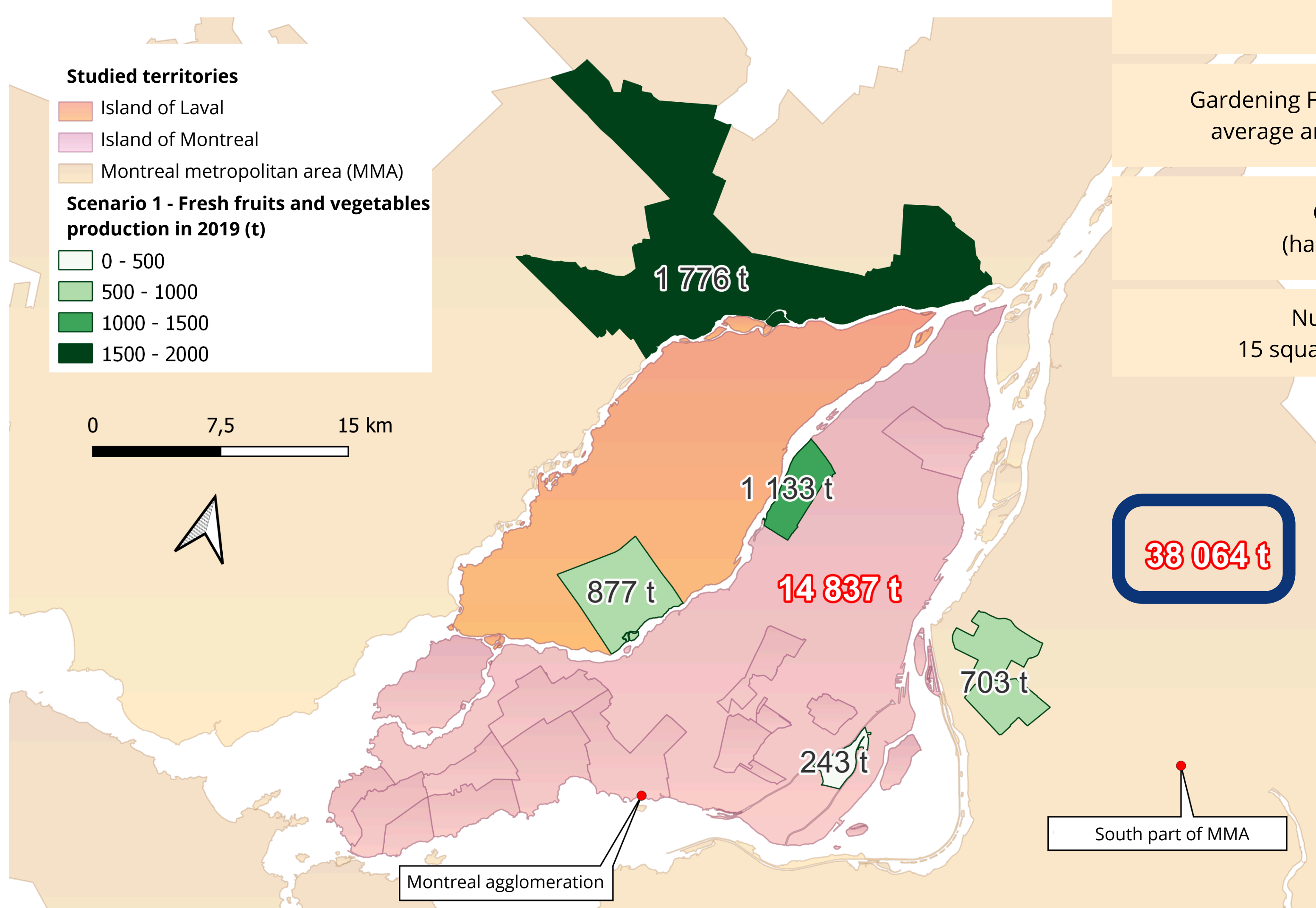


Figure 1 : Gardening Food Production estimation in 2019 at different territory level (Scenario 1)

Study replication in Belgium (Arlon, Atttert, Messancy)

From february to may 2025, Camille Leclercq made an internship copromoted by Logan Penvern (Arlon Campus Environnement - University of Liège) and Magali Tielemans (GAL Arelerland)

Her internship's objectives were :

- Conceive and administer a survey in three municipalities of the Arelerland territory (Arlon, Atttert, Messancy)
- Strengthening the initial methods by detailing produce category and Gardening Food Contribution at the household scale

Preliminary results

- The survey has been administered to **96 gardeners**
- A grid of **produce category** has been suggested (See lists on the right)
- Gardening food Contribution has been detailed thanks to the **Food Frequency methodology** for each produce category
- Sample data about food frequency will be compared to the Belgium National Food consumption study 2014-2015 data and, when available 2022-2023 data.

Results to come

- Sample data will be **extrapolated to the Arelerland territory** thanks to Belgian census Data and Food Consumption studies

Methods

Random phone survey administered in 2019 in five territories from MMA chosen for their sociodemographic heterogeneity From north to south :

- Terrebonne municipality
- Montréal-Nord borough in Montreal city
- Chomedey borough in Laval city
- A limited zone of Longueuil city
- Côte-Saint-Paul and Ville-Émard boroughs in Montreal city

275 respondents per territory = 1375 answers in total

Gardeners : cultivated fruits or vegetables in or outside their residence area in the last 12 months = 502 (37%)
Non Gardeners = 873 (63%)

Gardeners estimation of **Gardening Food Contribution** :

- Proportion of the harvests in total FFV consumption during production season : [10% ; 10-25% ; 25-50% ; 50-75% ; >75%]

Gardening Food Production at the household scale :

- Average annual FFV consumption per person in Quebec = 146,7kg (Robitaille, 2017)
 - FFV consumption during production season (mid-may to mid-october) = consumption during 20 weeks out of 52 = 56,42kg
- Intervals' median values of gardeners' estimations on Gardening Food Contribution = [5% ; 17,5% ; 37,5% ; 62,5% ; 87,5%]
- Median values correspondence to FFV average consumption during production season = [2,82kg ; 9,87kg ; 21,16kg ; 35,26kg ; 49,37kg]
=> **We estimate Gardening Food Production depending on Gardening Food contribution**

Gardening Food Production at the territory scale :

- Adjusted Gardening Food Production = Gardening Food Production multiplied by sample's average household size and an adjustment factor depending on the territory average household size (Statistique Canada, 2017)
- Adjusted proportion of gardeners in the territory population = Sample's housing type distribution adjusted from territory average housing type (Statistique Canada, 2017)

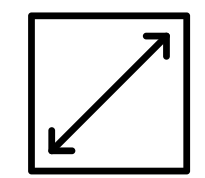
Gardening Food Production at the territory scale =

- **Adjusted Gardening Food Production at the household scale x Adjusted proportion of gardeners in the territory population**

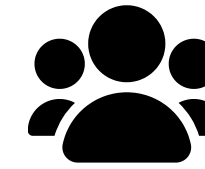
Three scenarios to evaluate effect of gardening space increase on domestic food production :



Scenario 1 = Data extrapolation from the sample of the fives territories located in MMA (Figure 1)



Scenario 2a = All gardeners access at least to 15 square meters plots



Scenario 2b = Respondents who lacks space to garden access to 15 square meters plots

Table 2 : Effect of gardening space increase in domestic food production in Montreal Metropolitan area according to the three scenario

Montreal Metropolitan Area (MMA)	Scenario 1	Scenario 2a	Scenario 2b
Production (t FFV)	38 064 t	60 750 t	75 862 t
Gardening Food Contribution to territory average annual FFV consumption (%)	7%	11%	13%
Cultivated spaces (ha - % of territory area)	389 ha - 0,1%	845 ha - 0,2%	1 434 ha - 0,4%
Number of additional 15 square meters plots required	0	303 587	1 311 964

Discussion

Gardening Food Production represents **thousands of metric tons of FFV produced each year** in MMA and :

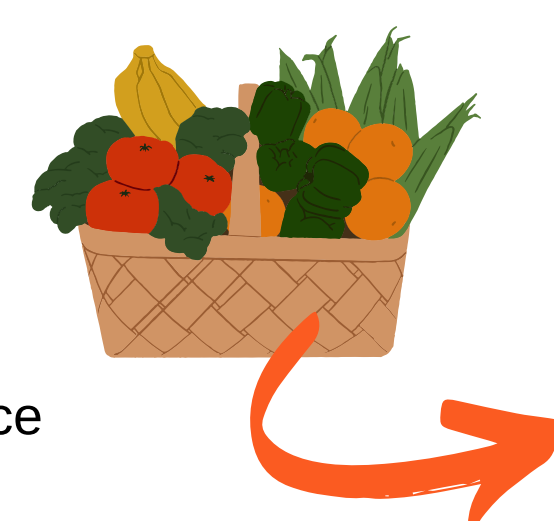
- Many gardeners would like to garden in bigger plots
- Some respondents can't garden because they face several barriers, especially the lack of space

It requires a **huge numbers of additional plots** to reach scenario 2a and 2b objectives :

- Such spaces lack in more dense urban areas
 - Rooftops can be a promising avenue, but they are often restricted to professional and private activities (Appolloni et al., 2021 ; Sanyé-Mengual et al., 2017) and are not easily accessible to city dwellers
 - Agricultural and food production function must be integrated to the conception of real estate project (Deslais, 2020 ; Scheromm et Cretin, 2021)
 - More gardening spaces can be created in public or private areas :
 - For example, Montreal city's community gardening program represented 8 459 plots in 98 community gardens in 2008 (Duchemin et al. 2010)
 - Gardening inside the residential area is the preferred option of Montreal's gardeners :
 - Some initiatives link yards' owners and gardeners to enhance gardening on private residential spaces as *Partage ta Terre* in Rosemont-La-Petite-Patrie district in Montreal (from 2015 to 2022) or *Plantez Chez nous* in France

Reference

- Appolloni, E., Orsini, F., Specht, K., Thomaier, S., Sanyé-Mengual, E., Pennisi, G., & Gianquinto, G. (2021). The global rise of urban rooftop agriculture : A review of worldwide cases. *Journal of Cleaner Production*, 296. Scopus. <https://doi.org/10.1016/j.jclepro.2021.126556>
- Deslais, C. (2020). Raisonner un projet d'agriculture urbaine sur toiture dès la conception de l'ilot bâti [other. Cultures en Villes, 13 avenue de la Division Leclerc, 94230 Cachan]. <https://dumas.ccsd.cnrs.fr/dumas-02971686>
- Duchemin, E., & McClintock, N. (2021). L'apport alimentaire de l'agriculture urbaine sociale aux villes en temps de crise : Le cas de Montréal [Billet]. *Carnet de recherche AULAB, AgriUrbain*. <https://agriurbain.hypotheses.org/4739>
- Duchemin, E., Wegmüller, F., & Legault, A.-M. (2010). Agriculture urbaine : Un outil multidimensionnel pour le développement des quartiers. *Vertigo - la revue électronique en sciences de l'environnement*, Volume 10 numéro 2. Article Volume 10 numéro 2. <https://doi.org/10.4000/vertigo.10436>
- Edmondson, J. L., Cunningham, H., Densley Tingley, D. O., Dobson, M. C., Grafius, D. R., Leake, J. R., McHugh, N., Nickles, J., Phoenix, G. K., Ryan, A. J., Stovin, V., Taylor Buck, N., Warren, P. H., & Cameron, D. D. (2020). The hidden potential of urban horticulture. *Nature Food*, 1(3), 155-159. <https://doi.org/10.1038/s43016-020-0045-6>
- Marie, M. (2019). Estimation de la contribution de la production potagère domestique au système alimentaire local. Enseignements à partir de l'étude des cas de Rennes, Caen et Alençon. *Vertigo - la revue électronique en sciences de l'environnement*, 19(2). <https://doi.org/10.4000/vertigo.26215>
- Penvern, L. (2024). Étude du jardinage domestique et de son potentiel alimentaire dans la région de Montréal [Thèse ou essai doctoral accepté, Université du Québec à Montréal]. <https://archipel.uqam.ca/17703/>
- Pulighe, G., & Lupia, F. (2019). Multitemporal Geospatial Evaluation of Urban Agriculture and (Non)-Sustainable Food Self-Provisioning in Milan, Italy. *Sustainability*, 11(7), Article 7. <https://doi.org/10.3390/su11071846>
- Robitaille, J. (2017). Botin, consommation et distribution alimentaires en chiffre (2017' éd.). Bibliothèque et Archives nationales du Québec.
- Sanyé-Mengual, E., Oliver-Sola, J., Montero, J. I., & Riera-Sevill, J. (2017). The role of interdisciplinarity in evaluating the sustainability of urban rooftop agriculture. *Future of Food: Journal on Food, Agriculture and Society*, 5(1), Article 1.
- Scheromm, P., & Cretin, L. (2021). Agriculture urbaine et promoteurs : Vers de nouvelles modalités de l'aménagement des espaces verts des résidences ? - *Cahiers ESPi2R*. In I. Maleyre, C. Veil, C. Cantuarias-Villesuzanne & A.-C. Chardon (dir.), *Immobilier durable. De la ville d'aujourd'hui à la cité de demain*. (p. 78-89). *Cahiers ESPi2R*. <https://www.cahiers-espi2r.fr/168>
- Statistique Canada. (2017, février 8). Profil du recensement, Recensement de 2016. <https://www12.statcan.gc.ca/census-recensement/2016/dp-dp/profil/index.cfm?lang=Fr>



Produce category

- Herbs (aromatic or medicinal)
- Berry bushes (raspberry, currant, blackcurrant, strawberry)
- Fresh fruits from trees (cherry, plum, fig)
- Lasting fruits (apple, pear)
- Dry fruits (nuts, hazelnuts, chestnut)
- Sun and greenhouse vegetables (tomato, eggplant, pepper)
- Summer squash (zucchini, cucumber, squash melon)
- Summer cabbage (cauliflower, broccoli, Romanesco cabbage)
- Leafy vegetables (lettuce, spinach, chard)
- Potato
- Legumes (bean, peas, lentil, soybean)
- Alliacea (onion, garlic, shallot)
- Winter vegetables (leek, autumn squash, winter cabbage)
- Perpetual, perennial and others (artichoke, sprout, endive)