



# COULD WE EAT LOCALLY GROWN FOOD ALL WINTER IN QUÉBEC?

Our monthly science question: A series that demystifies complex topics with simple, effective answers.

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## PRODUCING LOCALLY: A REAL NEED

Food production is, by definition, a vital issue for any population. In an era marked by climate change, complex supply chains, and international trade challenges, the issues of food autonomy and local economies are becoming increasingly important. This is why Québec must find ways to diversify its agriculture and extend its growing season throughout the year.



## ALL YEAR LONG... EVEN IN WINTER?

There's no escaping the reality of Québec's cold winters. Québec already produced crops in winter greenhouse, but given the harsh winter conditions, hydroelectricity alone is not sufficient to meet greenhouses' energy demands. As a result, many are heated with natural gas, a method that is far from sustainable. Researcher Jasmin Raymond, a professor at INRS, proposes an alternative solution: heating greenhouses using... the heat stored in the ground.



## IS THAT REALLY FEASIBLE?

Absolutely. Professor Raymond is a geothermal energy specialist and has dedicated his research to these questions. But first, what is geothermal energy? It is a field of science that studies the Earth's internal temperatures and the various ways of using this heat as a renewable energy source. Geothermal heat pump systems are used in commercial, institutional, and residential buildings to extract heat from the ground. They use a heat transfer fluid, which circulates through underground pipes, to redirect heat into the building. Although these systems require some electrical input to operate, they can achieve energy savings of up to 70%.



## WHAT WOULD SUCH SYSTEMS LOOK LIKE IN AGRICULTURE?

This technology could be adapted for greenhouse farming by burying heat exchanger pipes beneath the greenhouse itself. Other geothermal alternatives are also possible, such as installing air-based heat exchangers underground below the structure, or partially burying the greenhouse to take advantage of the ground's natural heat.



## IF SOLUTIONS EXIST, WHAT'S THE CATCH?

There are currently a few barriers to widespread adoption. First, installation costs can be significant, particularly if the system must heat a greenhouse year-round —and these costs could ultimately affect consumers. There is also limited awareness of geothermal solutions, which remain underused in agriculture. Finally, a deeper understanding of plant needs is essential in order to design systems tailored to specific crops, with the initial goal of extending growing seasons at a lower cost.



## BENEFITS FOR AGRICULTURAL PLAYERS BIG AND SMALL

Despite these challenges, Professor Raymond has developed projects in recent years that are adapted to the realities of various types of organizations. By developing traditional approaches (such as earth-sheltered greenhouses) and advanced technologies (like geothermal heat pumps), adaptations can benefit both large agrifood players and community groups by offering sustainable solutions at various cost levels. This demonstrates that geothermal principles can be applied at every scale.