

## Key Findings of the French BioNutriNet Project on Organic Food-based Diets and Sustainability (Diet, Nutrition, Health and Environment)

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Few studies have investigated the relationships between organic food consumption, dietary patterns, monetary diet cost, health, and the environment. A first study on 54,300 adults (77% women) belonging to the French nation-wide prospective NutriNet-Santé adult cohort was performed and published in 2013. This pioneer large-scale investigation, based on 24h food intake record and a dedicated organic food questionnaire, allowed to observe that regular organic food consumers, compared to non-consumers, have a plant-based diet and a significantly lower probability of overweight and obesity (about – 50 %). To address more in depth all these issues, a consortium of French epidemiologists, nutritionists, economists, and toxicologists launched the prospective BioNutriNet project in 2013 that was financially supported by the French national research agency. In 2014, an FFQ (food frequency questionnaire) collected the usual organic and non-organic (conventional/industrial) food consumption for 260 items with five levels (from never to always organic source) of approximately 35,000 NutriNet-Santé adult participants. Then, individual organic and conventional food intakes were merged with retail price, environmental, and pesticide residue data sets, which distinguished between conventional and organic farming methods. Many studies were conducted and published to characterize organic consumers and their organic food consumption motives and impacts on health as well as environmental impacts (i.e., greenhouse gas emissions, energy demand, and land use).

We observed that organic consumers had diets that were richer in plant-based food than nonorganic consumers and overall more nutritive and healthier. Their diets were associated with somewhat higher monetary costs (up to + 26%) and reduced exposure to chemical pesticide residues as calculated from food pesticide residues levels and measured in participant urine samples. In 30 to 70,000 participants and after adjustments for confounders, regular consumption of organic food (about 60-70% share of organic food) was found prospectively associated with reduced risks of overweight (-23%) and obesity (-31%), type 2 diabetes (-35%), postmenopausal breast cancer in women (-34%), and lymphoma (-80%). Recently, two prospective studies with the NutriNet-Santé cohort have demonstrated that a high exposure to a mix of chemical pesticide residues provided by foods is associated with a significantly increased risk of having type 2 diabetes (+ 47%) or postmenopausal breast cancer in women (+ 73 %) after adjustments for confounders. Some observations have been confirmed by several other studies conducted in other countries. Finally, increasing the share of organic food in a plant-based diet up to 60-70% is associated with significantly reduced impacts for diet production on resources (- 23% for agricultural land, - 25% for energy use) and GHG emissions (-37%). A recent modelisation study showed the feasibility of an organic, plant-based diet with high nutrition value and markedly reduced negative impacts. Overall, the main finding of the BioNutriNet project is that dietary shifts toward plant-based diets can provide positive externalities on human health and the environment, while organic foods should base plant-based diets to allow for better planetary and human health.

Review article : Kesse-Guyot, E., Lairon, D., Allès, B., Seconda, L., Rebouillat, P., Brunin, J., Vidal, R., Taupier-Letage, B., Galan, P., Amiot, M.J., Péneau, S., Touvier, M., Boizot-Santai, C., Ducros, V., Soler, L.G., Cravedi, J.P., Debrauwer, L., Hercberg, S., Langevin, B., Pointereau, P. and Baudry, J. (2022) Key Findings of the French BioNutriNet Project on Organic Food-Based Diets: Description, Determinants, and Relationships to Health and the Environment. *Adv. Nutr.*, 2021;00:1–17. DOI: 10.1093/advances/nmab105

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