



INTAB *Project results*

Exploratory project
2023-2024

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Drivers influencing the circularity of biogeochemical and energy flows in organic agriculture: An exploration of three types of territorial synergy

Organic farming is constrained by the limited availability of nutrients essential for plant growth. One of the levers for scaling up organic agriculture (OA) is to promote the circularity of nutrient, nitrogen and phosphorus flows in production systems at various organizational levels, ranging from the infra-farm level (plot, work unit) to the supra-farm level (group of farms, territory). IntAB set out to shed light on the patterns of matter and nutrient exchanges, as well as the energy input associated with these flows, between organic farms and with the territory, aspects that remain poorly documented to date.

In the first phase, IntAB characterized the circularity of nitrogen and energy flows for eight farms in Brittany: three vegetable farms, four mixed crop-livestock farms, and one cereal farm. In-depth studies have shown that the proximity of local nitrogen resources—in the form of manure and animal feed—shapes the management and circularity of nitrogen flows within these farms. This emphasizes the importance of mapping and promoting local nutrient sources to develop OA. However, interviews with farmers revealed that fertilization practice choices are influenced by other considerations such as animal welfare, land constraints and workload. In terms of energy, each farm requires an energy input ranging between 6 and 30 GJ



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per hectare, with wide variations depending on the type of farm, considering that mixed crop-livestock farms use the least energy.



The second phase of the project extended these findings to a broader sample including all organic farms within the same territory (a community of municipalities in northern Finistère) through a comprehensive quantification of flows and a qualitative online survey. The overall nitrogen use efficiency for the entire OA system was estimated at 38%, and only 60% of inputs were classified as “natural” (atmospheric deposition and symbiotic fixation), confirming the need to increase access to nutrient sources for OA. The expansion of biogas plants within the territory was identified as a source of nutrient competition that could disrupt the supply of nutrients for OA. This project also strengthened ties with the GAB-FRAB network, initiated as part of the Circul’AB project (Brittany Region, 2022–24), where expansion scenarios increasing OA from 10% to 30%—and increasing nitrogen self-sufficiency from 60% to nearly 100%—were jointly explored. To do this, four categories of drivers were identified:

1. More pasture and legumes;
2. Reduction in livestock density;
3. Optimization of fertilization practices;
4. Waste recovery at the territorial level.

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