RELACS
IMPROVING INPUTS FOR ORGANIC FARMING

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Farm gate nutrient budgets for organic farming

Problem

Nutrient imbalances are often not noticed on organic farms. However, nutrient deficits can deplete the soil in the long-term and therefore reduce soil fertility.

Solution

Farm gate nutrient budgets are an easy and efficient tool to assess the main nutrient flows in and out of the farm. They can reveal whether there is a nutrient surplus or deficit.

Outcome

The outcome is a farm gate nutrient budget for one or up to three years. Nutrient inputs can be adjusted to achieve a balanced nutrient budget.

Applicability box

Input used

- ☐ Copper
- ☐ Mineral oil
- x Fertilisers
- ☐ Anthelmintics
- ☐ Antibiotics
- ☐ Vitamins

Geographical coverage
Temperate climate zones

Application time
After each cropping season / year

Required time 1-3 hours depending on quality of farm documentation

Period of impact
Future nutrient management

Equipment
Good farm documentation, computer

Best in
All types of organic farms

Practical recommendations

To calculate the farm gate nutrient budget, all nutrient inputs and outputs need to be quantified. The difference between them shows if there is an imbalance or not (Figure 1).

The following groups are classified as nutrient inputs: imported feed, fertilizer, soil amendments, seeds, and N-fixation by legumes. For all imported goods, the nutrients can be calculated by multiplying the amount with the given nutrient content. The N-fixation is calculated based on the yield of the leguminous crops. If yields are not available, typical N-fixation values per hectare are given for different cropping densities.

All sold products or by-products are classified as nutrient outputs. The nutrients can also be calculated by multiplying the amount with the given nutrient content.

The Excel tool (Figure 2) is an easy way to calculate a nutrient budget. It provides data on nutrient contents of common inputs and outputs, and it calculates the resulting N-fixation. The user only needs to enter the farm specific data. The tool will then calculate the farm gate nutrient budget. The Excel tool is available in English and German online on Organic eprints.

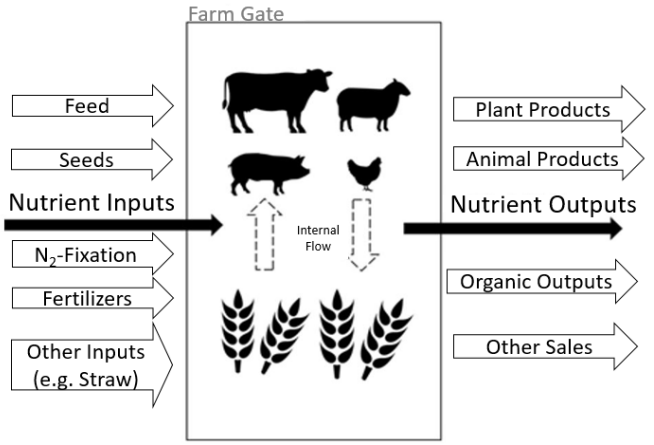

Figure 1: Scheme for calculating a farm gate nutrient budget (Source: Myles Oelofse, University of Copenhagen)

Products	Amounts sold: Either: Yield per hactar (in t) * cropped area (in ha) 2015 t/ha	2015 ha	2015 Total (t)	2016 t/ha	2016 ha	2016 Total (t)	2017 t/ha	2017 ha	2017 Total (t)	Or: Total mass for whole farm (t) 2015	2016	2017	2015 N kg/a	2015 P kg/a
Wheat (baking q	7.5	15	112.5			0			0		130	125	2092.5	393
Barley			0	5	8	40			0	30		44	405	
Oats	4.5	10	45	4.6	8.7	40.02	5	9	45				711	
Peas			0			0			0	50	58	49.3	1720	
Broad beans	3.1	5	15.5	2.7	6	16.2	2.5	5	12.5				646.35	6
Clover grass (30	25	7	175	28	8.5	238	24	7.8	187.2				752.5	
Potatoes			0			0			0	217	243	208	716.1	99
Carrots			0			0			0	131	119	140	183.4	36
			0			0			0				0	

Figure 2: Cut-out from the Excel-tool showing the nutrient calculations for plant output as an example of data input (Source: Marie Reimer, Hohenheim University)

On-farm application

System approach and evaluation

Farm gate balancing is a useful approach for understanding the farming system. If the farm gate nutrient budget results in a high nutrient deficit for any nutrient, this means that the soil will be mined on the long-term. High nutrient surpluses, on the other hand, can result in nutrient losses with a negative impact on the environment (e.g. leaching). However, nutrient budgets must also be seen in relation to the soil nutrient status, e.g. a positive budget may be desirable to raise nutrient status of a depleted soil.

Further information

Further readings

Bachinger, J., & Stein-Bachinger, K. (2004). *Nährstoffmanagement im ökologischen Landbau: ein Handbuch für Beratung und Praxis; Berechnungsgrundlagen, Faustzahlen, Schätzverfahren zur Erstellung von Nährstoffbilanzen; Handlungsempfehlungen zum effizienten Umgang mit innerbetrieblichen Nährstoffressourcen, insbesondere Stickstoff*. Darmstadt: Landwirtschaftsverlag (German).

Reimer, Marie. „Reducing the Use of External Fertilisers in Organic Agriculture RELACS Partners' University of Hohenheim', 'University of Copenhagen' and the 'Research Institute of Organic Agriculture' (FiBL) Investigate Current Need and Use in 7 European Countries". RELACS News Stories, 11. Juli 2019. Retrieved from https://relacs-project.eu/wp-content/uploads/2019/09/ifoameu_projects_RELACS_news_story_Uni_Hohenheim_farm_gate_balances_final.pdf.

Watson, C., Topp, C. F., & Stockdale, L. (2010). A Guide to Nutrient Budgeting on Organic Farms, 1–8. Retrieved from http://www.organicresearchcentre.com/manage/authincludes/article_uploads/iota/technical-leaflets/a-guide-to-nutrient-budgeting-on-farms.pdf.

Weblinks

Check the Farm Knowledge Platform for more practical recommendations.

The Excel tool is available in English and German online on Organic eprints.

About this practice abstract and RELACS

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RELACS: 'Replacement of Contentious Inputs in Organic Farming Systems' (RELACS) builds on results of previous research projects and takes far-advanced solutions forward. As a system approach to sustainable agriculture, organic farming aims to effectively manage ecological processes whilst lowering dependence on off-farm inputs. The RELACS partners will evaluate solutions to further reduce the use of external inputs and, if needed, develop, and adopt cost-efficient and environmentally safe tools and technologies.

Project website: www.relacs-project.eu

Social media: Facebook (RELACSeu) & Twitter (@RELACSeu)

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