Nutri2Cycle

D7.4 Practice Abstracts of ongoing work

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1. Table of content

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773682.

2. Why EIP Abstracts?

The Nutri2Cycle project is committed to ensuring a continuous exchange of knowledge with interested stakeholders through different channels and this throughout all stages of the project and well beyond project-ending.

As a H2020 multi-actor innovation project Nutri2Cycle's projects objectives, ambitioned results and outcomes are highly orientated towards demand driven, practical knowledge for rapid implementation in the field. For this reason the project cooperates very closely with farmers, farmers 'groups, EIP operational groups in the different EU member states, etc. To also reach broad dissemination of the results the project has also committed to feed the results into the EIP-AGRI website.

The agricultural European Innovation Partnership (EIP-AGRI) works to foster competitive and sustainable farming and forestry. Through the EIP-AGRI's website, users can share innovative project ideas and practices, information about research and innovation projects, including projects' results. To facilitate knowledge flows on innovative and practice-oriented projects from the start till the end of the project, the EIP-AGRI set a common format, the so-called "practice abstract" to European projects. The use of this format also enables farmers, advisors, researchers and all other actors across the EU to contact each other. "Practice abstracts" are short summaries of max 1500 characters according to a fixed format, describing a main information/recommendation/practice that can serve the end-users in their daily practice.

A target number of 23 Nutri2Cycle practice abstracts of the ongoing work will be submitted to the EIP-AGRI website.

In the period M1-M18 in total 11 practice abstracts were submitted to the EIP-AGRI website.: 5 are dedicated to the major research lines that will be managed within Nutri2Cycle, while the other 6 are dedicated to the early research results of work package 2.

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The table below lists the 11 practice abstracts as submitted and their publication status on the EIP AGRI website.

PA title	Status	Target audience
Reducing EU's dependence on protein import (e.g. soy bean) by local production of novel animal feeds from agro-residues	Published	All stakeholders
Substituting primary resources by biobased products for a more sustainable European agriculture	Published	All stakeholders
Solutions for more nutrient efficient plant production as investigated by the H2020-NUTRI2CYCLE project	Published	All stakeholders
Innovative solutions for optimized nutrient & GHG in animal husbandry	Published	All stakeholders
Enhanced recycling of (organic) carbon within European agricultural systems	Published	All stakeholders
Short term N-effect of recycling-derived fertilisers focusing on crop yield and N losses to the environment	Published	Arable land farmers, advisors, researchers, policy makers
Nitrogen and phosphorus recovery from pig manure via struvite crystallization and design of struvite based tailor-made fertilizers	Published	Animal Husbandry, (pig) farmers, researchers
Use of an inoculate of microbiota and enzymatic precursors to reduce ammonia emissions and optimize nutrients use efficiency	Published	Animal husbandry rarmers, researchers
A study case on the use of digestate as bio fertilizer: characterization and environmental assessment	Published	Biogas operators ; arable land farmers, researchers, policy makers
Closing the loops at farm scale : using livestock manure to fertilize feeding crops on agroforestry plots	Published	Farmers in general yet with interest toward mixed farming systems in particular
Substituting mineral inputs with organic inputs in organic viticulture	Published	Viticulture farmers

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3. Compilation of practice abstracts

Practice abstract 1

Short title (native language): Reducing EU's dependence on protein import (e.g. soy bean) by local production of novel animal feeds from agro-residues

Short summary for practitioners (native language)

Introduction

The Nutri2Cycle project aims to enable the transition from the current suboptimal nutrient household in European agriculture to the next-generation of agronomic practices, characterized by an improved upcycling of nutrients and organic carbon. Developing local protein sources from nitrogen containing waste & waste water streams to reduce import dependency, is one of the strategies investigated within the Nutri2Cycle project.

Research focus

The animal husbandry sector is characterized by massive intercontinental import of soy bean products. Substitution of these products by locally produced alternatives could greatly improve nutrient stewardship within this economically important sector. Within Nutri2Cycle an important research line is the production of novel animal feeds. One the one hand we will focus on direct replacement by exploring the possibility of domestic cultivation of protein crops. However, another important research aspect will be to search for novel sources of proteins such as insect breeding, floating wetland plants and algae. Interestingly these novel sources could be grown on solid or liquid agro residues. Successful implementation of this approach could not only reduce the import of external protein sources but at the same time prevent nutrient loss by recuperating the nutrients from these otherwise low value side streams. The most promising pathways as compared to the common practice will be demonstrated in an operational environment and the transferability in the EU will be assessed.

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Practice abstract 2

Short title (native language): Substituting primary resources by biobased products for a more sustainable European agriculture

Short summary for practitioners (native language)

Introduction

Intensified European agriculture is crucial for the EU food supply and self-sufficiency, but it also generates environmental challenges related to GHG emissions and nutrient related pressure (eutrophication). In addition, European agriculture is under economic pressure due to its high dependency on import of primary nutrients and energy. The Nutri2Cycle project aims to enable the transition from the current suboptimal nutrient household in European agriculture to the next-generation of agronomic practices, characterized by an improved upcycling of nutrients and organic carbon. In this respect a great opportunity lies within the use of biobased fertilizers and soil enhancers from agro residues as a substitute for primary resources.

Research focus

Within Nutri2Cycle we want to further enhance nutrient recovery technologies at farm level such as struvite crystallization, stripping/scrubbing etc with the goal of replacing mineral fertilizers. At the same time the efficiency of the resulting novel fertilizers will be tested in comparative field trials to evaluate their performance, stability towards composition, contribution to soil fertility and nutrient use efficiency in comparison with their mineral counterparts. This will be an important step towards tailor designed fertilizers The most promising pathways as compared to the common practice will be demonstrated in an operational environment and the transferability in the EU will be assessed. This should ultimately lead to a higher soil quality, more efficient use of resources, and a reduction of nutrient losses to the environment. As a result, significantly less synthetic N and P fertilizer inputs will be needed.

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Practice abstract 3

Short title (native language): Solutions for more nutrient efficient plant production as investigated by the H2020-NUTRI2CYCLE project

Short summary for practitioners (native language)

Introduction

The Horizon 2020 project Nutri2Cycle aims at implementing optimized management systems to realize better nutrient stewardship and mitigation in European agriculture. Contemporary plant production has increasingly required nutrients in directly available form such as mineral fertilizers to obtain the highest possible productivity and economic efficiency. The major challenge now is to maintain this high productivity and product quality at lower environmental impact. A key element in this will be reconnecting the two classical pillars of plant production and animal husbandry through a third pillar of agro-processing. This leads to a range of processed residues or so called bio based fertilizers that now need to be aligned with plant production requirements

Research focus

Different tools, techniques and systems for higher precision fertilization could play an important role in this, not only for the application of classic fertilizers, both definitely for novel bio based fertilizers which are characterized by a higher variability in nutrient content. Within the Nutri2Cycle project research will be conducted on precision fertilization tools such as the use of drones, optical sensing technology and nitrate sensoring to cope with the heterogeneity of bio based fertilizers and better alignment of fertilizer dose with actual crop demand (tailor made products). The most promising pathways as compared to the common practice will be demonstrated in an operational environment and the transferability in the EU will be assessed.

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Practice abstract 4

Short title (native language): Innovative solutions for optimized nutrient & GHG in animal husbandry

Short summary for practitioners (native language)

Introduction

The Horizon 2020 project Nutri2Cycle aims at implementing optimized management systems to realize better nutrient stewardship and mitigation in European agriculture. Contemporary animal production has been characterized by upscaling and increased animal concentrations. This has been crucial for the European Union food supply and self-sufficiency, but has also lead to nutrient related pressure and greenhouse gas emissions. The challenge now is to drastic reduce emissions through combinations of emission abatement and manure treatment technologies.

Research focus

Within Nutri2Cycle different strategies will be examined to achieve these goals. To reduce ammonia emissions and optimize nutrient use efficiency the use of inoculation of microbiota and enzymatic precursors will be investigated in poultry manure, while for animal slurry the effect of acidification on reduction of NH3 volatilization will be examined. Also, the project will investigate innovative stable construction schemes, which intend to source-separate feces and urine into separate flows (as opposed to mixed slurry). Processing these flows separately can result in more optimal energy and N-P-C cycles than conventional manure handling. Different anaerobic digestion strategies for optimized nutrient and energy recovery from animal manure will also be investigated and the option to make tailor made digestate products will be explored. The most promising pathways as compared to the common practice will be demonstrated in an operational environment and the transferability in the EU will be assessed.

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Practice abstract 5

Short title (native language): Enhanced recycling of (organic) carbon within European agricultural systems

Short summary for practitioners (native language)

Introduction

European agriculture is characterized by a high overall contribution to greenhouse gas (GHG) emissions and inefficient recovery and re-use of major plant nutrients such as nitrogen and phosphorus. In this respect, carbon has been insufficiently by policy makers as a key component of soil fertility and health. The Nutri2Cycle project wants to address the current gaps in the cycles of mineral nutrients as well as organic carbon for different European agricultural systems through implementation of technologies which enhance recycling from (agro)residues.

Research focus

An important research line will be investigating innovative soil, fertilization and crop management systems and practices that could lead to maintaining and increasing organic carbon (OC). This will for example include (i) field trials to assess the use of catch crops to reduce nitrogen losses and incorporate additional OC, (ii) field investigation in Northern Italy on using digestate derived products to supplement soils lacking OC and doing so in a balanced (precision fertilization) manner so that mineral nutrient supply also remains in balance with crop requirement, (iii) an assessment of Dutch farming practices for increasing soil OC, (iv) utilization of a combination of manure and dairy processing residues in crop farming. The most promising pathways as compared to the common practice will be assessed for transferability in the EU.

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Practice abstract 6

Short title (in English): Short term N-effect of recycling-derived fertilisers focusing on crop yield and N losses to the environment

Introduction

Large surpluses of on-farm nitrogen (N) and phosphorus (P) are processed or exported out of Flanders in the form of animal manure, while tonnes of synthetic N-fertilisers are being used. The use of recycling-derived fertilisers (RDFs) from manure could counter this. Currently, RDFs derived from manure still need to comply with the legal application constraints of animal manure and are thus not often used. That is why five RDFs: ammonium nitrate, ammonium sulphate, digestate from co-digestion of pig manure, liquid fraction of digestate and pig urine, are compared with mineral fertiliser CAN, pig manure and a blank treatment in a 3-year field trial focusing on short term N-effects of the RDFs. The main goal of the trial is to establish a clear relationship between the amount of N applied by RDF and dry matter production. Each RDF was applied in 4 doses. Currently we are one year into the 3 year trial. Weather conditions during the summer months 2019 were extremely dry and hot. Therefore water availability became the principal factor determining crop growth. Lab analysis showed that N and P content could vary up to 50% in different samples in time of pig manure, digestate, liquid fraction from digestate or pig urine. In these extreme conditions the agricultural value of ammonium nitrate and ammonium sulphate appears to approach that of CAN. Furthermore, no significant differences with respect to residual nitrate in the soil profile at harvest are observed for treatments with high Nmin/Ntot ratio when good practices are adopted towards applied dosage based on initial available nitrogen in the soil, good knowledge of composition (considering higher variability of biobased fertilizers as compared to synthetic fertilizer), timing of application etc.

Short title (native language): Korte stikstof termijneffect van herwonnen meststoffen met focus op gewasopbrengst en stikstofverliezen naar het milieu

Short summary for practitioners (native language)

Het mestoverschot in Vlaanderen wordt verwerkt en geëxporteerd in de vorm van dierlijke mest, terwijl kunstmest grootschalig wordt aangekocht. Nochtans kan het gebruik van herwonnen meststoffen dit oplossen. Deze herwonnen meststoffen dienen echter te voldoen aan de wettelijke toepassingsvereisten van dierlijke mest en worden dus niet vaak gebruikt. In een 3 jaar durende veldproef werden de korte stikstof termijneffecten van vijf herwonnen meststoffen: ammoniumnitraat, -sulfaat, digestaat van co-vergisting van varkensmest, dunne fractie van digestaat en varkensurine, uitgetest en vergeleken met KAS kunstmest, varkensmest en een blanco behandeling. Hierbij wordt getracht een verband te leggen tussen de hoeveelheid N die door de meststof wordt aangebracht en de droge stofproductie. Elke meststof werd in 4 dosissen aangebracht. Momenteel is het eerste jaar van de veldproef afgerond. De weersomstandigheden in de zomer van 2019 waren extreem droog en warm. Daarom bepaalde voornamelijk de waterbeschikbaarheid de gewasopbrengst. Labo-analyses toonden dat het N- en P-gehalte tot 50% kan variëren in verschillende stalen van varkensmest, digestaat, dunne fractie van digestaat of varkensurine. Onder deze omstandigheden lijkt de bemestingswaarde van ammoniumnitraat en ammoniumsulfaat die van kunstmest te benaderen. Bovendien konden geen significante verschillen voor het nitraatresidu in het bodemprofiel bij de oogst worden waargenomen voor de behandelingen met een hoge Nmin/Ntot ratio wanneer goede praktijken werden gehanteerd voor dosering in functie van de initieel beschikbare stikstof in de bodem, exacte samenstelling (hogere variabiliteit bij biogebaseerde meststoffen), tijdstip van applicatie enz.

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Practice abstract 7

Short title (in English): Nitrogen and phosphorus recovery from pig manure via struvite crystallization and design of struvite based tailor-made fertilizers

Short summary for practitioners (in English):

Anaerobic digestion (AD) technology promotes the bioconversion of livestock waste, apart from other organic waste streams (such as those from the agrifood industry), into methane and carbon dioxide, allowing its energetic valorization. However, AD does not significantly reduce the concentration of nitrogen or phosphorus, and it is essential in all cases to carry out a nutrient balance before applying the digestate to farmland in order to minimize the environmental impact and, in many cases, it is essential to resort to techniques for reducing or recovering these nutrients. The crystallization of nitrogen and phosphorus in the form of struvite ($MgNH_4PO_4 \cdot 6H_2O$), is one of the possible techniques used to eliminate and/or recover nutrients from the digestate, obtaining a product that can be applied as a base for high quality ecological fertilizers. Several factors influence the struvite precipitation: the chemical composition of the residual effluent, the pH, the molar ratio of Mg:N-NH_4:P-PO4 (Mg:N:P), the degree of supersaturation, the temperature and the presence of foreign ions (such as calcium). In the investigated pilot struvite reactor, the reaction takes place at room temperature or similar (25-30 ºC), so there is no large energy consumption and there is no need to add water. As raw materials the following were used: pig slurry digestate, magnesium salt (usually $MgCl_2 \cdot 6H_2O$) and NaOH. The technology has been demonstrated at a sufficiently relevant scale (crystallization reactor with a capacity of 50 L), so that the results can be used for subsequent implementation on an industrial scale. Phosphorus removal yields of over 95% have been obtained.

Short title (native language): Recuperación de nitrógeno y fósforo del purín de cerdo mediante la cristalización de estruvita y síntesis de fertilizantes a medida basados en estruvita

Short summary for practitioners (native language):

La tecnología de digestión anaeróbica (DA) promueve la bioconversión de los residuos agroganaderos, además de otros residuos orgánicos (como los de la industria agroalimentaria), en metano y dióxido de carbono, permitiendo su valorización energética. Sin embargo, la DA no reduce significativamente la concentración de N o P, y es esencial en todos los casos realizar un balance de nutrientes antes de aplicar el digestato a las tierras de cultivo para minimizar el impacto ambiental y, en muchos casos, es esencial recurrir a técnicas de reducción o recuperación de estos nutrientes. La cristalización de nitrógeno y fósforo en forma de estruvita ($MgNH_4PO_4 \cdot 6H_2O$), es una de las posibles técnicas utilizadas para eliminar y/o recuperar nutrientes del digestato, obteniendo un producto que puede ser aplicable como base en fertilizantes ecológicos de alta calidad. Varios factores influyen en la precipitación de la estruvita: la composición química del efluente residual, el pH, la relación molar de Mg:N-NH_4:P-PO_4 (Mg:N:P), el grado de sobresaturación, la temperatura y la presencia de iones extraños (como el calcio). En el reactor piloto utilizado para la obtención de estruvita, la reacción se produce a temperatura ambiente o similar (25-30 ºC), por lo que no hay un gran consumo de energía y no es necesario añadir agua. Como materias primas se utilizaron las siguientes: digestato de purines de cerdo, sal de magnesio (normalmente MgCl2·6H2O) y NaOH. La tecnología se ha demostrado a una escala suficientemente relevante (reactor de cristalización con una capacidad de 50 L), para que los resultados puedan ser utilizados para su posterior implementación a escala industrial. Se han obtenido rendimientos de eliminación de fósforo superiores al 95%.

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Practice abstract 8

Short title (in English): Use of an inoculate of microbiota and enzymatic precursors to reduce ammonia emissions and optimize nutrients use efficiency

Short summary for practitioners (in English)

This practice aims to balance the nutrients in manure (especially C:N ratio) so that a fertilizer is produced that is better useable by plants and also reduces nutrient loss through leaching. Manure is inoculated with microorganisms that have been selected to perform specific functions. The product is a liquid suspension of microorganisms based on phototropic and lactic acid bacteria and yeast in a natural environment of sugarcane molasses. These microorganisms act directly on the slurry first, and on the soil later, reducing nitrogen losses by enhancing the biodegradation of manure. When these additives under investigation are added to the manure, they are anticipated to improve the hygienic conditions in facilities (barns, coops, pens…) reducing ammonia emissions (at least 65%) and also moving carbon sources and nutrients in manure to forms easily assimilated by the plants (from ammonium to nitrate in the case of nitrogen, residual proteins converted into amino acids and solubilisation of solids and phosphorus). The microorganisms contained in this additive constitute is the ideal environment for plant growth, directly affecting the quality of the crops and the soil (the product progressively inhibits the attack of other bacteria and microorganisms that cause pathologies by having a colonizing effect on the soil).

Short title (native language): Uso de un inóculo de microbiota y precursores enzimáticos para reducir las emisiones de amoníaco y optimizar la eficiencia del uso de nutrientes

Short summary for practitioners (native language)

Esta práctica tiene por objetivo el equilibrar los nutrientes del estiércol (especialmente la relación C:N) para que, de esta manera, se produzca un fertilizante que se aproveche mejor por las plantas y además se consiga una reducción de la pérdida de nutrientes por lixiviación. El estiércol es inoculado con microorganismos que han sido seleccionados para realizar funciones específicas. El producto es una suspensión líquida de microorganismos basada en bacterias y levaduras fototrópicas y de ácido láctico en un entorno natural de melaza de caña de azúcar. Estos microorganismos actúan directamente sobre el estiércol primero, y sobre el suelo después, reduciendo las pérdidas de nitrógeno al aumentar la biodegradación del estiércol. Se prevé que cuando estos aditivos objeto de investigación se añadan al estiércol, mejoren las condiciones higiénicas de las instalaciones (granjas, cooperativas, corrales...) reduciendo las emisiones de amoníaco (como mínimo un 65%) y también desplazando las fuentes de carbono y los nutrientes del estiércol a formas fácilmente asimilables por las plantas (de amonio a nitrato en el caso del nitrógeno, proteínas residuales convertidas en aminoácidos y solubilización de sólidos y fósforo). Los microorganismos contenidos en este aditivo constituyen el entorno ideal de crecimiento de las plantas, afectando directamente a la calidad de los cultivos y del suelo (el producto inhibe progresivamente el ataque de otras bacterias y microorganismos causantes de patologías al tener un efecto colonizador sobre el suelo).

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Practice abstract 9

Short title (in English): A study case on the use of digestate as bio fertilizer: characterization and environmental assessment

Short summary for practitioners (in English)

In Lombardy (Italy) an anaerobic digestion (AD) plant is situated that treats 70.000 t/y waste (mainly sewage sludge) producing digestate, used as fertilizer, and biogas. An innovative stripping system reduces ammonia inhibition in the reactor while also producing ammonium sulphate, a fertilizer. Both digestate and ammonium sulphate comply to the legal limits for fertilizers. To evaluate the effect of digestate fertilization a 2 ha field test was set up. Digestate, mineral fertilizer and non-fertilized control treatment were compared in triplicate for the cultivation of wheat, rice, and corn following the principles of minimum tillage and precision agriculture. Field trials started in 2018 and will continue for three years. We observed that corn yields are statistically higher in digestate treatments, while rice yields are not statistically different between treatments. Odour emissions from digestate distribution are similar to those from mineral fertilizer, if injection in soil is used, instead of spreading. Ammonia emissions are higher in digestate treatments and lower in chemical treatments. Digestate treatments show higher cumulative emissions of N_2O and lower cumulative emissions of CH_4, compared with mineral fertilization treatments. During crop season there's a risk of nitrate leaching only after fertilizations, but nitrate concentrations at 100 cm depth are very low (< 20 mg kg^{-1}), with no differences between digestate and mineral fertilization.

Short title (native language): Un caso di studio sull'utilizzo del digestato come bio fertilizzante: caratterizzazione e valutazione ambientale

Short summary for practitioners (native language)

L'impianto di digestione anaerobica, situato in Lombardia, tratta 70000 t/anno di rifiuti, principalmente fanghi, producendo digestato, usato come fertilizzante, e biogas. Un sistema di strippaggio innovativo riduce l'inibizione da ammoniaca nel reattore, producendo solfato ammonico; entrambi soddisfano i requisiti legali per i fertilizzanti. L'effetto della fertilizzazione con digestato è stata valutata con una prova in pieno campo (2 ha) dove vengono confrontati in triplo trattamenti con digestato, fertilizzante minerale e un controllo non fertilizzato, sulle colture di frumento, riso e mais, seguendo i principi di minima lavorazione e agricoltura di precisione. Le prove di campo, iniziate nel 2018, durano tre anni. Le rese del mais sono statisticamente maggiori nei trattamenti con digestato, mentre le rese del riso non hanno mostrato differenze significative tra i trattamenti. Le emissioni di odori allo spandimento del digestato sono risultate simili a quelle del fertilizzante minerale, nel caso in cui viene utilizzata l'iniezione nel suolo invece dello spandimento. I trattamenti con digestato mostrano maggiori emissioni cumulate di N_2O e minori emissioni cumulate di CH_4, e maggiori emissioni di ammoniaca rispetto alle fertilizzazioni minerali. Durante l'anno c'è rischio di lisciviazione dei nitrati solo dopo le fertilizzazioni, ma le concentrazioni a 100 cm di profondità sono molto basse (< 20 mg kg^{-1}), senza differenze tra fertilizzazione minerale e digestato.

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Practice abstract 10

Short title (in English): Closing the loops at farm scale : using livestock manure to fertilize feeding crops on agroforestry plots

Short summary for practitioners (in English):

An agricultural holding in Charente-Maritime, France produces arable crops (wheat, triticale, pea, corn, and rapeseed) to breed goose livestock. The farmers decided to plant trees on an arable plot to develop an agroforestry system combining energy biomass and feeding crops while simultaneously improving animal welfare. Using its livestock effluents – slurry and manure – to fertilize the crops , this farm already engages into circular economy. However, the farmers wanted to optimize the efficiency of the effluents use, and decrease their synthetic fertilizer input. The Chamber of agriculture proposed a demonstration action on the agroforestry plot to analyze the effluents behavior as fertilizers and to assess carbon storage and soil fertility in 2019-2021, using soil analysis, remote sensing and modeling tools. The feeding crops are commonly fertilized using synthetic Nitrogen fertilizer. In the first year (2019), this was partially substituted by livestock slurry : 15% of the crop requirement was provided by soil stock nitrogen, 20% from animal manure and 65% by synthetic fertilizers. Considering climatic conditions it is too early to make firm conclusions on comparison of nutrient efficiency from effluents against that of mineral fertilizer. In the following growing seasons, we aim to systematically increase the use of biobased fertilizer sources and reduce the dependency on mineral fertilizers. As results of this demonstration, it is expected to draft possible scenarios to increase the substitution of synthetic fertilizers by farm effluents and assess the increases of soil fertility and carbon storage in this agroforestry system. When the results are positive, the farmers will extend the agroforestry system to a wider area.

Short title (native language): Fermer les cycles élémentaires à la ferme : fertiliser les cultures fourragères par les effluents d'élevage en parcelle agroforestière.

Short summary for practitioners (native language):

Une exploitation agricole de Charente-Maritime produit les cultures (blé, triticale, pois, maïs et colza) pour alimenter son élevage d'oies. Les agriculteurs ont décidé d'implanter des arbres sur une parcelle pour installer un système agroforestier combinant production de biomasse énergétique, cultures alimentaires et amélioration du bien être animal. Utilisant ses effluents d'élevage pour fertiliser les cultures, cette ferme propose un haut niveau d'économie circulaire. Mais les agriculteurs veulent optimiser l'utilisation des effluents d'élevage et ainsi diminuer les engrais synthétiques ou d'extraction en assurant la circulation des nutriments NP et en assurant un haut niveau de captation du carbone pour une bonne production agroforestière. La Chambre d'agriculture a proposé de conduire une démonstration de suivi des effluents sur la parcelle agroforestière pour évaluer le stockage de carbone et la fertilité du sol sur la période 2019-2021, à partir de l'analyse du sol et à l'aide d'outils de télédétection et de modélisation. Les cultures sont habituellement fertilisées avec des engrais synthétiques. Pendant la première année (2019), la substitution partielle par du lisier fournit 20% des besoins en N contre 15% par le sol et 65% par les engrais synthétiques. Actuellement, il n'y a pas le recul nécessaire pour comparer l'efficacité des effluents à celle des engrais minéraux, sachant qu'elle dépend fortement des conditions climatiques. Par la suite, nous visons à augmenter la substitution par les effluents agricoles avec évaluation de la fertilité des sols et du stockage du carbone. En cas de retour positif, les agriculteurs pourraient étendre la solution agroforestière à une plus grande surface de leur exploitation.

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Practice abstract 11

Short title (in English): Substituting mineral inputs with organic inputs in organic viticulture

Short summary for practitioners (in English)

A farm in Charente Maritime, France, combines field crops with a vineyard. Crop production is done through organic farming for the past 5 years, whereas the vineyard already for ten years. With this progressive change into organic farming, the farmers had to change their fertilization practices towards organic fertilizers. However, an important problem to face in organic farming is the lower efficiency in NP inputs, because of the more unpredictable behavior of organic fertilizers without appropriate monitoring. The farm cultivates about ten species including Rapeseed, Hemp, Sunflower and Camelina for oil. After treating the oilseed crops, the farm gets oil-cake as residue. Until now the oil-cakes are used as livestock feed for a neighboring farm, but the farmers would like to recover their residues. To decide whether the oil-cake could be used as fertilizer, or soil enhancer with biostimulating effects for the vineyard, they need to monitor the synchronization between NP release from residues and the grapevine uptake and optimize the balance between C storage and organic fertility in the soil of grapevine plots. A demonstration essay has been designed to follow up and assess the fertilizing efficiency of the farm residues alone or combined with a commercial organic fertilizer on the plot with vineyard, from 2019-2021. With the characterizations of the oil-cake and the plot soil, the grapevine development will be monitored with a manual sensor and remote sensing to assess the biomass and nitrogen status, and will be explained with the properties of the organic inputs. The results provided by this demonstration should provide key information to decide on the best way for recycling their residue and whether this is the right way to go.

Short title (native language): La substitution des intrants minéraux par les intrants organiques en viticulture biologique

Short summary for practitioners (native language)

Une ferme en Charente Maritime associe grandes cultures et viticulture. Avec le passage progressif à l'agriculture biologique, vignoble puis grandes cultures, les agriculteurs ont dû changer leurs pratiques de fertilisation et doivent utiliser des engrais biologiques. La moindre efficacité des apports en NP, du fait du comportement des fertilisants organiques plus difficile à évaluer, est un enjeu. La ferme cultive une dizaine d'espèces en grandes cultures dont le colza, le chanvre, le tournesol et la cameline pour l'huile. Après l'extraction de l'huile, la ferme recycle les tourteaux comme aliments pour bétail donnés à une exploitation voisine. Les agriculteurs s'interrogent sur le meilleur moyen de valoriser leurs résidus. Pour décider l'utilisation du tourteau comme fertilisant ou amendement pour la vigne, ils doivent vérifier la bonne synchronisation entre la libération de nutriments des résidus et l'absorption par la vigne, et optimiser l'équilibre entre le stockage de C et la fertilité organique dans le sol des parcelles de vigne. Un essai de démonstration a été conçu pour suivre et évaluer l'efficacité fertilisante des résidus de ferme seuls ou combinés avec un engrais organique commercial sur la parcelle avec vignoble, de 2019 à 2021. Avec les caractérisations des tourteaux et du sol de la parcelle, le développement de la vigne sera suivi par capteur manuel et télédétection pour évaluer la situation de la biomasse et de l'azote. Il sera expliqué par les propriétés des apports organiques. Les résultats de cette démonstration d'essai devraient fournir aux agriculteurs les informations clés pour décider de la meilleure façon de recycler leurs résidus et, si le recyclage agronomique est le bon moyen.

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