DIVINFOOD

Co-constructing interactive short and mid-tier food chains to value agrobiodiversity in healthy plant-based food

Deliverable D6.4
First set of practice abstracts

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Summary

The Deliverable 6.4 "First set of practice abstracts" reports a first collection of the DIVINFOOD's tested practices and approaches, as summarised by Partners.

This compendium of 20 practice abstracts (PAs) offers a glimpse of the DIVINFOOD's activities carried out in the partners' countries and across the 7 project's Living Labs, highlighting technical and conceptual approaches to the valorisation of neglected and underutilised crops (NUCs) in value chains and consumption.

The practices reported in the 20 PAs have been generated by DIVINFOOD in the first half of its journey and represent an initial assortment of suitable and replicable indications to breed, cultivate, process, market, cook and promote NUCs. Moreover, the PAs highlight the efforts made to increase the NUCs performance and presence in the food system as well as the relevant actors' know how and savoir faire, which needs to be properly capitalised.

This first set of 20 PAs is the result of a collective endeavour, benefitting from the contributions made by a broad group of Partners representative of virtually all DIVINFOOD's Work Packages and Living Labs. Basically, every geographical zone, crop, typology of actors and value chain link concerned by the project is represented in one or more PAs. Acknowledgment of their contributions is provided below and the authorship is appropriately reported in each PA.

Authors: Luca Colombo (FIRAB) and Samuel Feller (OFFr), with contributions of Chiffoleau Y., Kulti B., Desclaux D., Dourian T., Vaz Patto M.C., Pinto Correia T., Carlsson G., Ejlerskov K., Tedesco J.-F., Enderli G., Lascialfari M., Villard L., Levy G., Mattioni D., Galli F., Massari S., Jard G., Belahcen L., Wurtz A., Clair D., Svalebech J. Robin M.H., Veér Z., Attila Krall C., Cotillon C., Dani M., Veér Z., Kràll A., Horvàth J., Szabò Z., Mukankubana D., Crozat S., Borum A., Bertelsen I., Ejlerskov K., Bertelsen I., Borum A.

A special acknowledgement to Allison Loconto (INRAE) for the unvaluable proofreading of the practice abstracts included in this first set.

Internal reviewers: Allison Loconto (INRAE), Yuna Chiffoleau (INRAE).

Version	Date	Contributor(s)	Summary of changes
1		Luca Colombo, Samuel Feller	
2		Allison Loconto, Yuna Chiffoleau	Proofreading

Introduction

Research and innovation projects and initiatives in Europe are increasingly adopting Practice Abstracts (PAs) as a suitable means to disseminate technical indications to practitioners in a user-friendly and easy-to-read format. To this aim, several repositories collect, display and diffuse a broad range of knowledge materials that provide a first summarised information on useful advances to address barriers to development in the agrifood domain. This information is intended to be easily accessible and retrievable by farmers, advisors and any other practitioners, offering a first glance on replicable approaches that can be more in depth analysed through sources (websites, videos, podcasts, grey and scientific literature), in case of greater interest.

Different PA formats have been designed to fulfil this goal, generally tailored to specific research and innovation areas or to a targeted audience. In DIVINFOOD, a 2-page printable layout has been adopted, adapting existing formats already in use, to best suit its informative intention. In its customisation, DIVINFOOD also expanded the PA formula beyond the mere technical aspects to also respond to the need to disseminate conceptual approaches adopted by the project, i.e. in engaging consumers in short and mid-tier value chains or in valuing cultural events to draw citizens' attention to neglected and underutilised crops (NUCs).

As DIVINFOOD is still in its testing and expanding phase of its multifold activities, this first batch of practice abstracts presents an initial set of practices arising from the evidence and experience collected by Partners. Efforts have been made to provide an initial overview of activities ranging from breeding up to promotion and consumption: while this set collects evidence of solutions to socio-technical barriers, it also shows the magnitude of possibilities that NUCs present in enriching the farming system through agroecological approaches as well as in diversifying diets and increasing nutritional benefits in ways that value territories and people.

The DIVINFOOD's practice abstracts pool together the variety of expertise that is available in the project and - in most cases - are the result of co-writing endeavours: each of them addresses specific problems and reports the identified solution(s), indicating a number of practical recommendations for the scalability of the process or the approach. It also presents additional sources of information to better dig into a variety of experiences and solutions in relation to the addressed issue.

For some partners, this was their first experience of reporting results in an operational and replicable form. The production of the deliverable thus enabled some partners to be supported, and they will subsequently be better equipped to share their results. This support explains the one-month delay in delivering the deliverable.

The present deliverable illustrates the internal process adopted to identify topics and assign authorship. Similarly, it describes the implemented internal review procedure aimed at ensuring the highest possible informative quality. The whole set of PAs is exhibited in this deliverable in a rapidly visualising format. Nevertheless, each PA can be accessed in a more readable condition, as the PAs are uploaded both on Zenodo and on the DIVINFOOD's portal (accessible at https://divinfood.eu/practice-abstracts/). A few considerations and recommendations are also provided at the end of the document, to suggest possible ways ahead in producing and disseminating practice abstracts and to highlight the encountered difficulties, to draw lessons aimed at ensuring a proper capitalisation of the experience the DIVINFOOD collective made in this journey.

1. Methodology

1.1 DIVINFOOD's approach to develop and review practice abstracts

In 2023 the DIVINFOOD's practice abstracts team, composed by the D6.4 deliverable authors and reviewers, met to agree on a workable procedure that could value the experiences carried out by the project partners as well as maximise the dissemination potential. Based on the DIVINFOOD's work programme and its varied stage of implementation, the team sketched an indicative list of potential topics – and their tentative authors – further to outline the editorial process to review and edit the produced documents. Moreover, the team customised a template for practice abstracts already in use, particularly within the organic farming community, for which many examples are collected in the Organic Farm Knowledge platform[1]. However, merely reporting about technical issues was considered insufficient as DIVINFOOD is also developing concepts and speculative approaches functional to a more widespread adoption or promotion of NUCs by non-practitioners, e.g. public administrations and consumers, or to foster initiatives that may result pivotal in generating an enabling environment for NUCs espousal. This led to sketch a second template for 'conceptual' PAs to twin the 'technical' template.

The underlying assumption for a first batch of 20 PAs (out of 50 committed in the workplan) was that a wealth of indications arises within and across Work Packages and Living Labs, including in a relative early stage of their development. This led to an indicative list of practice abstracts, which was shared with Partners for validation.

Guidelines for the PA authors were also provided and a dedicated workshop was carried out during the 2024 DIVINFOOD's Annual Meeting to brief partners on the PA ambition and *modus operandi*. Authors were asked to sketch a first draft based on the indicative topic they were assigned or that they choose (as alternative subjects and titles could be proposed by the authors), making sure that the "Problem, Solution and Practical recommendations" elements were addressed.

Once the drafting phase was launched, a constant interaction between authors and the PA team aimed at granting harmonisation of intentions, content relevance and regularity of text distribution.

Finally, once the intended quality of the PAs was deemed satisfactory, the PAs were proofread to ensure English adequacy and were finally graphically edited. PAs were then uploaded on both Zenodo and the DIVINFOOD's website. Summaries in English and French were also provided based on the EIP-AGRI format to ensure their dissemination via that portal.

1.2. Elaboration of templates

As outlined above, two PA templates were provided to accommodate both technical and conceptual contents, as shown below. The follow a similar pattern, but are intended to address different targets: to this aim, the technical template reports a box to allow the provision of

[1] Organic Farm Knowledge is an online repository gathering practice-oriented material such as factsheets, calculation tools and videos on organic farming

technical information in a nutshell. Differently, the conceptual format aims at being more discursive. Both templates are designed to embed visual information as pictures, graphs and diagrams. Similarly, they include a section for further information and one on authorship.

Figure 1. Technical Practice Abstract template

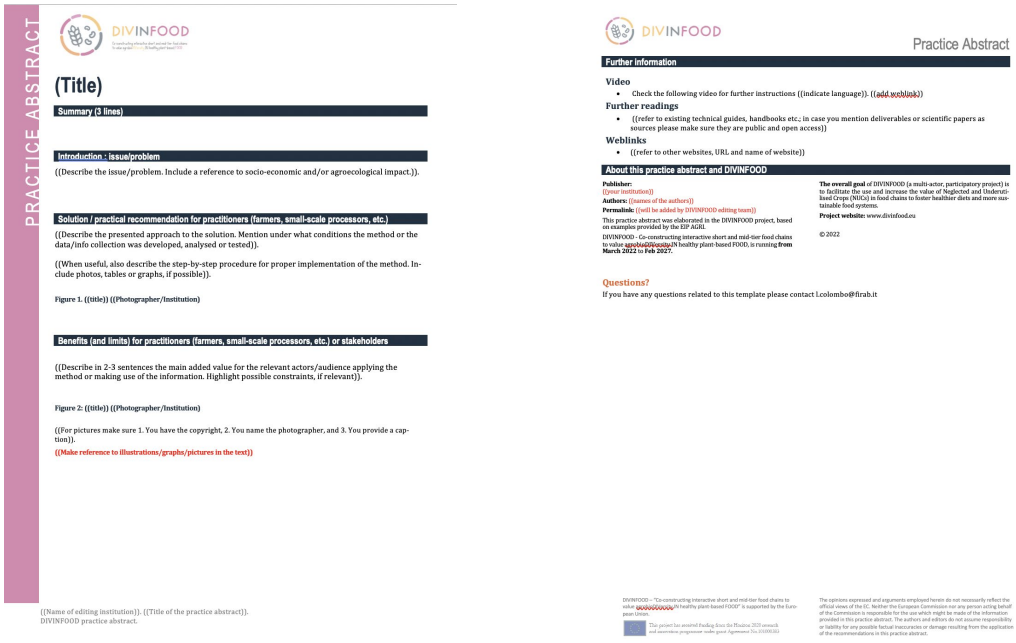

Figure 2. Conceptual Practice Abstract template

1.3. Tentative and consolidated PA lists

To represent virtually all Work Packages and Living Labs a first indicative list of PAs was proposed to partners by the PA team, totalling to 20 intended topics. This preliminary list (see below) was shared on Spring 2024, recommending co-authorship and timely feedback in order to meet deadlines and fulfil the projects obligations. As shown below, the tentative list was also meant to showcase activities carried out in all WPs to showcase a diversity of solutions and to fairly credit partners' work.

WP	Tentative topic
1	Consumers' expectations for NUCs-based food chains
1	Presentation of short and mid-tier food chains
1	Devices to involve consumers/citizens in the organisation of food systems (addressed to local authorities)
2	Mild-processing: definition, illustration
2	Fermentation of legumes: methods, and nutritional/health values
2	Fermentation of grass pea: methods, recipes adapted to small-scale processors
2	Production and processing of lupins
2	What is a community in practice, and how it is useful for small-scale processors?
2	Small-scale processing of cereals: general presentation, needed equipment, example of recipes
2	Introduction to the notion of sustainable cuisine, and examples of chefs
3	Presentation of grass pea
3	Debittering of white lupin
3	Presentation of minor cereals (einkorn, rivet wheat, emmer): farming aspects
3	Presentation of meat bean: farming aspects
3	The diversity of minor legumes
3	Problems and solutions in pre-processing of minor cereals and legumes
4	Interactive catalogue on varieties
4	Diversity of participatory breeding programmes in Europe and the role of farmers
5	Living labs for collective innovation, the role of farmers and other stakeholders
5	Organisation of training and demonstration days: practical issues
5-6	Tools for participatory activities (digital tools, world café, etc.)
6	Heritage days: an opportunity for farmers!

Table 1. Tentative list of PA topics

Based on the exchanges held with the invited authors and partners, some topics were redefined to better reflect the outcomes carried out by WPs and LLs and their related insights. This led to a reformulation of some topics and to more detailed titles, as illustrated below by the consolidated catalogue of delivered PAs. The list shows that all Divinfood's work packages are represented, yet with a greater emphasis on WP2 and WP3 on NUCs processing and cultivation, respectively, which have so far received a more substantial and intense project intervention.

WP	Title
1	Do consumers support farmers and food supply chains promoting agrobiodiversity?
2	Small- scale minor cereal processing into bulgur
2	How to build a National Sustainable Cuisine Contest including NUCs
2	How to train grass pea small-scale food processors on Asian type fermentations?
2	Alkaloid analysis and reduction in lupins
2	DIVINFOOD Community in Practice Webinar on Legume and Cereals Fermentation
2	Organisational solutions for pre-processing and processing
2	Introducing The Danish Legume Partnership
2	Legumes for the Plate of the Future
3	Weed control in organic chickpea production
3	Dry bean seed production by and for small scale farmers
3	Selecting the Right Sowing Time in the Arable Cultivation of Cowpea
3	Organisation of on-farm training and demonstration days: practical issues
3	Gardeners in participatory farming experiments
3-4	Crop association with legumes: which advantages with minor cereals?
4	Grass pea (Lathyrus sativus L.): An Evolving Model Crop for Sustainable Agriculture
4	How to improve Einkorn varieties?
5	Fostering stakeholder engagement and participation in Living Labs
5	Food design and agile prototyping to explore NUCs scenarios
6	European Heritage Days, an opportunity to promote farmers' contribution in cultivated biodiversity

Table 2. Final set of 20 DIVINFOOD's practice abstracts

1.4. EIP-AGRI format and process

Once the PA was finalised and validated in its 2-page format, an English summary, ranging between 1,000 and 1,500 characters, was prepared to feed the EIP-AGRI practice abstracts repository. Given that the EIP-AGRI PA team offers the possibility to provide the summary in a second language, French was chosen and all synopses were also provided in that language.

2. DIVINFOOD's first set of practice abstracts

The full set of 20 practice abstracts is displayed below. For their greater readability, readers can consult the DIVINFOOD's practice abstracts landing page at: https://divinfood.eu/practice-abstracts/. Practice abstracts can be both consulted or downloaded via that webpage.

PA #1 DIVINFOOD Community in Practice webinar on legume and cereals fermentation

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DIVINFOOD Community in Practice Webinar on Legume and Cereals Fermentation

Summary

The Vegetarian Society of Denmark (DVF) organised a webinar under the DIVINFOOD project Community in Practice, focusing on how fermenting legumes and cereals can promote the use of neglected and underutilised crops (NUCs) and support the transition to more plant-based diets. Three speakers were invited to share their experiences with fermentation.

Introduction

Wild and cultivated biodiversity is in rapid decline due to land use changes from agricultural industrialisation, the expansion of meat- and sugar-heavy food systems, and climate change. NUCs offer a solution to mitigate this decline by potentially creating new markets and enhancing the nutritional value of traditional products, thus diversifying diets.

There is growing consumer demand in Europe for local, minimally processed, nutritious plant-based foods. However, links between minor cereals or legumes and appealing, healthy food products are lacking, and high-quality plant-based products from NUCs are not yet well-established in markets.

The main goal of the multi-actor, participatory, DIVINFOOD project is to promote the use of NUCs in food chains to support healthier diets and more sustainable food systems. To support this, the project has established a Community in Practice focused on minimal or mild processing of NUCs, supported by a webinar series that was launched with a session on fermenting legumes and cereals.

Practical recommendations

During the webinar on the fermentation of legumes and cereals, three speakers were invited to share their experience with fermentation. The speakers were: 1) Mac Kroï, Founder of Nordic Koji Company (Denmark) producing miso, shoyu and other fermented products from legumes and grains and President of the European Miso Institute (International NGO); 2) Carlo Nesler, Founder of Nesler – Cibo Vivo (Italy) a company producing fermented condiments and other foods from legumes and cereals; and 3) Dennis S. Nielsen, Professor at the University of Copenhagen, and PROFERMENT project leader (Denmark). The vision of the PROFERMENT project is to build the scientific foundation for future development of a new category of proteinaceous, plant-based foods as clean-label alternatives for meat consumption. Using solid-state fermentation, the proteins in legumes and cereals will be nutritionally optimised and appealing structures and flavours created.

The main conclusions from the speakers were:

-Fermentation of legumes and cereals have many different applications and uses. From a culinary perspective, fermentation of legumes and cereals are used for condiments (e.g. gochujang chili paste), to flavour ingredients and dishes (miso, soy sauce etc.) and in pantry items. Fermentation for direct consumption is widely used in the production of alcohol, snacks (e.g. tempeh snacks) and fermented grain dishes.

-Fermentation of legumes and grains taps into current trends e.g., upcycling for food waste reduction. The Danish beer brewing company BRØL is an example, whereby it turns surplus bread into beer using fermentation. Another example of upcycling ingredients with fermentation is coffee ground shoyu (Japanese soy sauce) or stale bread soy sauce (amino sauces).

-Fermentation also taps into current trends in relation to the transition to plant-based diets. Several Danish start-ups are working with meat substitutes through fermentation of different legumes and cereals. The Matr company makes minced "meat" through fungal fermentation of oats, peas and lupins that are shaped into patties. The

Dansk Vegetarisk Forening and ITQB NOVA - DIVINFOOD Community in Practice Webinar on Legume and Cereals Fermentation.
DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

companies Contempehrary and Tæmpeh make tempeh as a meat substitute made from fermented Nordic fava beans, peas and lupins, respectively.

Fungi fermented patty from among other things lupins | Fava bean and emmer shoyu from Nesler Cibo Vivo | Pea miso from Nordic Koji Co.

Benefits and limits

Which value does fermentation add to legumes and cereals?

With fermentation we can increase the nutritiousness of our food. The microorganisms that are used in fermentation add nutrients to the final product, but also transform nutrients that are not digestible for us, into digestible ones. Fermentation is also a way of reducing the content of toxins or antinutrients in the products. In Africa, for example, fermenting Baobab seeds, which are inedible in their natural state, unlocks their 22 grams of protein per 100 grams of seeds. This process also produces the condiment Maari, enhancing the umami flavour and improving the amino acid profile with more of the essential amino acids.

Fermentation of legumes and cereals also brings value for gastronomy. Fermented products can enhance different cuisines in a positive way. Hence, many restaurants and kitchens are starting to use different types of fermented products (e.g., condiments and flavour enhancers) in their recipes.

A third aspect to value within fermentation of legumes and cereals, is the monetary value fermentation can add to rare varieties. Fermenting them into products like miso or shoyu can increase their market value and raise awareness of these lesser-known rare varieties. However, smaller companies face challenges such as higher pricing compared to large producers and supply chain instability, which affect their ability to meet consumer demand and build trust in their products.

While fermentation offers great potential for promoting legumes and cereals NUCs, there are some barriers and challenges to address. Consumer education on the use of fermented products needs to be expanded, as many people are unaware of how to incorporate these products into their diets beyond traditional uses, like miso soup. This lack of knowledge slows the transition to more plant-based diets. To overcome this, a stronger focus on educating consumers about the diverse uses of fermented legumes and cereals, along with their agricultural and health benefits, is essential.

Further information

Weblinks

Nordic Koji Company presentation: https://nordickoji.co/

Nesler - Cibo Vivo presentation: https://www.nesler.it/en_GB

Proferment project: https://food.ku.dk/english/research_at_food/research-projects/2022/solid-state-fermentations-for-protein-transformations-and-palatability-of-plant-based-foods-proferment/

About this practice abstract and DIVINFOOD

Publisher: Dansk Vegetarisk Forening and ITQB NOVA
Authors: Jeanne Foubrech and Marta Carleira Vaz Patto
Permalink: 10.5281/zenodo.12997938

This practice abstract was elaborated in the DIVINFOOD project, based on examples provided by the EIP AGRI.

DIVINFOOD - Co-constructing interactive short and mid-tier food chains to value agrobioDiversity IN healthy plant-based FOOD, is running **from March 2022** to **Feb 2027.**

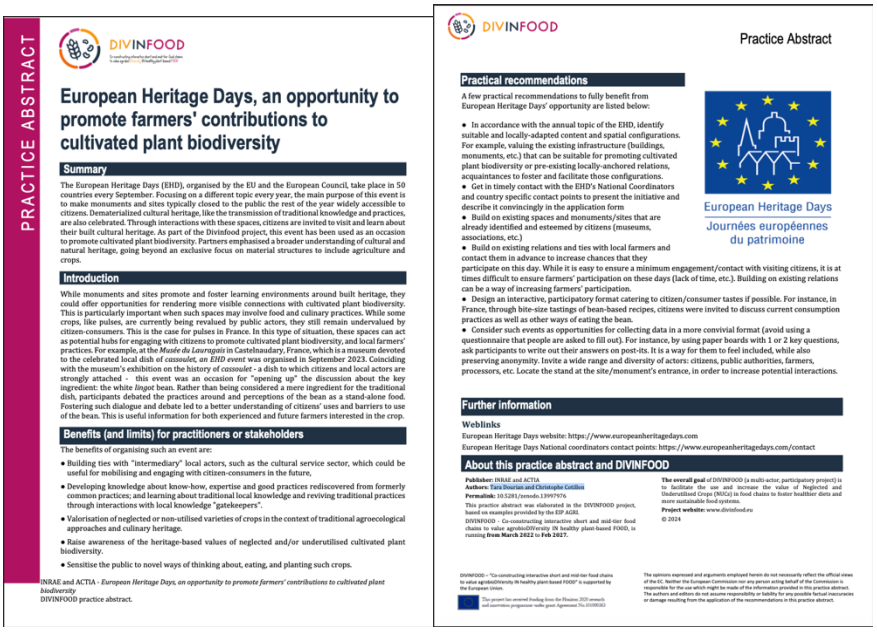
The overall goal of DIVINFOOD (a multi-actor, participatory project) is to facilitate the use and increase the value of Neglected and Underutilised Crops (NUCs) in food chains to foster healthier diets and more sustainable food systems.

Project website: www.divinfood.eu

DIVINFOOD – "Co-constructing interactive short and mid-tier food chains to value agrobioDiversity IN healthy plant-based FOOD" is supported by the European Union.

The project has received funding from the Horizon 2020 research and innovation programme under Grant Agreement No. 101060383

PA #2 European Heritage Days, an opportunity to promote farmers' contributions to cultivated plant biodiversity



PRACTICE ABSTRACT

DIVINFOOD

European Heritage Days, an opportunity to promote farmers' contributions to cultivated plant biodiversity

Summary

The European Heritage Days (EHD), organised by the EU and the European Council, take place in 50 countries every September. Focusing on a different topic every year, the main purpose of this event is to make monuments and sites typically closed to the public the rest of the year widely accessible to citizens. Dematerialized cultural heritage, like the transmission of traditional knowledge and practices, are also celebrated. Through interactions with these spaces, citizens are invited to visit and learn about their built cultural heritage. As part of the Divinfood project, this event has been used as an occasion to promote cultivated plant biodiversity. Partners emphasised a broader understanding of cultural and natural heritage, going beyond an exclusive focus on material structures to include agriculture and crops.

Introduction

While monuments and sites promote and foster learning environments around built heritage, they could offer opportunities for rendering more visible connections with cultivated plant biodiversity. This is particularly important when such spaces may involve food and culinary practices. While some crops, like pulses, are currently being revalued by public actors, they still remain undervalued by citizen-consumers. This is the case for pulses in France. In this type of situation, these spaces can act as potential hubs for engaging with citizens to promote cultivated plant biodiversity, and local farmers' practices. For example, at the *Musée du Lauragais* in Castelnaudary, France, which is a museum devoted to the celebrated local dish of *cassoulet*, *an EHD event* was organised in September 2023. Coinciding with the museum's exhibition on the history of *cassoulet* - a dish to which citizens and local actors are strongly attached - this event was an occasion for "opening up" the discussion about the key ingredient: the white *lingot* bean. Rather than being considered a mere ingredient for the traditional dish, participants debated the practices around and perceptions of the bean as a stand-alone food. Fostering such dialogue and debate led to a better understanding of citizens' uses and barriers to use of the bean. This is useful information for both experienced and future farmers interested in the crop.

Benefits (and limits) for practitioners or stakeholders

The benefits of organising such an event are:

- Building ties with "intermediary" local actors, such as the cultural service sector, which could be useful for mobilising and engaging with citizen-consumers in the future,
- Developing knowledge about know-how, expertise and good practices rediscovered from formerly common practices; and learning about traditional local knowledge and reviving traditional practices through interactions with local knowledge "gatekeepers".
- Valorisation of neglected or non-utilised varieties of crops in the context of traditional agroecological approaches and culinary heritage.
- Raise awareness of the heritage-based values of neglected and/or underutilised cultivated plant biodiversity.
- Sensitise the public to novel ways of thinking about, eating, and planting such crops.

INRAE and ACTIA - *European Heritage Days, an opportunity to promote farmers' contributions to cultivated plant biodiversity*
DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

Practical recommendations

A few practical recommendations to fully benefit from European Heritage Days' opportunity are listed below:

- In accordance with the annual topic of the EHD, identify suitable and locally-adapted content and spatial configurations. For example, valuing the existing infrastructure (buildings, monuments, etc.) that can be suitable for promoting cultivated plant biodiversity or pre-existing locally-anchored relations, acquaintances to foster and facilitate those configurations.
- Get in timely contact with the EHD's National Coordinators and country specific contact points to present the initiative and describe it convincingly in the application form
- Build on existing spaces and monuments/sites that are already identified and esteemed by citizens (museums, associations, etc.)
- Build on existing relations and ties with local farmers and contact them in advance to increase chances that they participate on this day. While it is easy to ensure a minimum engagement/contact with visiting citizens, it is at times difficult to ensure farmers' participation on these days (lack of time, etc.). Building on existing relations can be a way of increasing farmers' participation.
- Design an interactive, participatory format catering to citizen/consumer tastes if possible. For instance, in France, through bite-size tastings of bean-based recipes, citizens were invited to discuss current consumption practices as well as other ways of eating the bean.
- Consider such events as opportunities for collecting data in a more convivial format (avoid using a questionnaire that people are asked to fill out). For instance, by using paper boards with 1 or 2 key questions, ask participants to write out their answers on post-its. It is a way for them to feel included, while also preserving anonymity. Invite a wide range and diversity of actors: citizens, public authorities, farmers, processors, etc. Locate the stand at the site/monument's entrance, in order to increase potential interactions.

European Heritage Days
Journées européennes du patrimoine

Further information

Weblinks

European Heritage Days website: https://www.europeanheritagedays.com
European Heritage Days National coordinators contact points: https://www.europeanheritagedays.com/contact

About this practice abstract and DIVINFOOD

Publisher: INRAE and ACTIA
Authors: Tara Dourian and Christophe Cotillon
Permalink: 10.5281/zenodo.13997976
This practice abstract was elaborated in the DIVINFOOD project, based on examples provided by the EIP AGRI.
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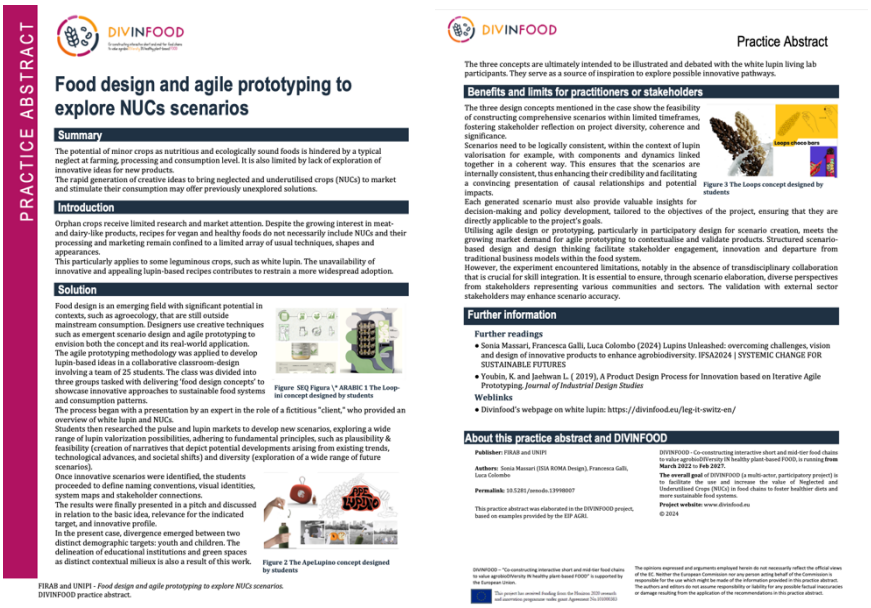
This project has received funding from the Horizon 2020 research and innovation programme under grant Agreement No 101000383

PA #3 Food design and agile prototyping to explore NUCs scenarios



PRACTICE ABSTRACT

DIVINFOOD

Food design and agile prototyping to explore NUCs scenarios

Summary

The potential of minor crops as nutritious and ecologically sound foods is hindered by a typical neglect at farming, processing and consumption level. It is also limited by lack of exploration of innovative ideas for new products.
The rapid generation of creative ideas to bring neglected and underutilised crops (NUCs) to market and stimulate their consumption may offer previously unexplored solutions.

Introduction

Orphan crops receive limited research and market attention. Despite the growing interest in meat- and dairy-like products, recipes for vegan and healthy foods do not necessarily include NUCs and their processing and marketing remain confined to a limited array of usual techniques, shapes and appearances.
This particularly applies to some leguminous crops, such as white lupin. The unavailability of innovative and appealing lupin-based recipes contributes to restrain a more widespread adoption.

Solution

Food design is an emerging field with significant potential in contexts, such as agroecology, that are still outside mainstream consumption. Designers use creative techniques such as emergent scenario design and agile prototyping to envision both the concept and its real-world application.
The agile prototyping methodology was applied to develop lupin-based ideas in a collaborative classroom-design involving a team of 25 students. The class was divided into three groups tasked with delivering 'food design concepts' to showcase innovative approaches to sustainable food systems and consumption patterns.
The process began with a presentation by an expert in the role of a fictitious "client," who provided an overview of white lupin and NUCs.
Students then researched the pulse and lupin markets to develop new scenarios, exploring a wide range of lupin valorization possibilities, adhering to fundamental principles, such as plausibility & feasibility (creation of narratives that depict potential developments arising from existing trends, technological advances, and societal shifts) and diversity (exploration of a wide range of future scenarios).
Once innovative scenarios were identified, the students proceeded to define naming conventions, visual identities, system maps and stakeholder connections.
The results were finally presented in a pitch and discussed in relation to the basic idea, relevance for the indicated target, and innovative profile.
In the present case, divergence emerged between two distinct demographic targets: youth and children. The delineation of educational institutions and green spaces as distinct contextual milieux is also a result of this work.

Figure SEQ Figura * ARABIC 1 The Loop-ini concept designed by students

Figure 2 The ApeLupino concept designed by students

FIRAB and UNIPI - *Food design and agile prototyping to explore NUCs scenarios.*
DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

The three concepts are ultimately intended to be illustrated and debated with the white lupin living lab participants. They serve as a source of inspiration to explore possible innovative pathways.

Benefits and limits for practitioners or stakeholders

The three design concepts mentioned in the case show the feasibility of constructing comprehensive scenarios within limited timeframes, fostering stakeholder reflection on project diversity, coherence and significance.
Scenarios need to be logically consistent, within the context of lupin valorisation for example, with components and dynamics linked together in a coherent way. This ensures that the scenarios are internally consistent, thus enhancing their credibility and facilitating a convincing presentation of causal relationships and potential impacts.

Figure 3 The Loops concept designed by students

Each generated scenario must also provide valuable insights for decision-making and policy development, tailored to the objectives of the project, ensuring that they are directly applicable to the project's goals.
Utilising agile design or prototyping, particularly in participatory design for scenario creation, meets the growing market demand for agile prototyping to contextualise and validate products. Structured scenario-based design and design thinking facilitate stakeholder engagement, innovation and departure from traditional business models within the food system.
However, the experiment encountered limitations, notably in the absence of transdisciplinary collaboration that is crucial for skill integration. It is essential to ensure, through scenario elaboration, diverse perspectives from stakeholders representing various communities and sectors. The validation with external sector stakeholders may enhance scenario accuracy.

Further information

Further readings

- Sonia Massari, Francesca Galli, Luca Colombo (2024) Lupins Unleashed: overcoming challenges, vision and design of innovative products to enhance agrobiodiversity. IFSA2024 | SYSTEMIC CHANGE FOR SUSTAINABLE FUTURES
- Youbin, K. and Jaehwan L. (2019), A Product Design Process for Innovation based on Iterative Agile Prototyping. *Journal of Industrial Design Studies*

Weblinks

- Divinfood's webpage on white lupin: https://divinfood.eu/leg-it-switz-en/

About this practice abstract and DIVINFOOD

Publisher: FIRAB and UNIPI

Authors: Sonia Massari (ISSA ROMA Design), Francesca Galli, Luca Colombo

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This practice abstract was elaborated in the DIVINFOOD project, based on examples provided by the EIP AGRI.

DIVINFOOD - Co-constructing interactive short and mid-tier food chains to value agrobioDIVersity IN healthy plant-based FOOD, is running **from March 2022** to **Feb 2027.**

The overall goal of DIVINFOOD (a multi-actor, participatory project) is to facilitate the use and increase the value of Neglected and Underutilised Crops (NUCs) in food chains to foster healthier diets and more sustainable food systems.
Project website: www.divinfood.eu
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DIVINFOOD – "Co-constructing interactive short and mid-tier food chains to value agrobioDIVersity IN healthy plant-based FOOD" is supported by the European Union.
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PA #4 Fostering stakeholder engagement and participation in Living Labs

PRACTICE ABSTRACT

DIVINFOOD

Fostering stakeholder engagement and participation in Living Labs

Summary

Living Labs (LLs) play a key role in bringing together the various actors involved in value chains that valorize agrobiodiversity. Yet, keeping a diverse range of stakeholders engaged and interested over time is not easy. This abstract illustrates some of the tools and strategies used by the DIVINFOOD LLs to do so.

Sustaining stakeholder engagement is a challenge for Living Labs

In the context of facilitating a transition towards more sustainable food systems, where agrobiodiversity is supported, LLs play a key role in bringing together the various actors involved in value chains that valorize agrobiodiversity. The European Commission's research investment in multi-stakeholder groups signals just how important LLs are for EU-funded projects that aim to foster innovation through a multi-stakeholder co-creation process .

Yet, while the objective is clear, actually setting up vibrant and active LLs is not an easy feat. Even though a variety of different stakeholders are identified and invited to participate in a LL, based on the interest they may have in the topic and their perceived benefits, keeping stakeholders engaged over time is an effort that cannot be overlooked. The potential problem this Practice Abstract wishes to look into, and shed some light on, concerns stakeholders' engagement. How can stakeholders' engagement and participation be stimulated in an LL? How is stakeholder fatigue avoided? We draw on the experience of the 9 LLs of DIVINFOOD to illustrate how they managed to keep stakeholders engaged and the tools they used to foster participation and avoid fatigue.

Using engagement activities and communication tools

In DIVINFOOD, LLs used a series of **engagement activities** and a mix of **communication tools** to foster engagement and participation. First and foremost, engagement activities that work are those that are closely tied with **project commitments** (for instance, participatory ecosystems assessments, recipe development, and field trials). Engagement here was high simply because what attracted stakeholders to the project to begin with were the themes explored during these activities. Secondly, the LLs organized **large events** open to a wide audience, such as festivals or contests, where the showcasing of the project's work through public display such as cooking demos and tastings strengthens stakeholder motivations and commitment. Lastly there are **field visits** and/or **thematic workshops** or **training courses**. There are various elements in these activities that help keep engagement of stakeholders high, such as the knowledge that stakeholders acquire and the ties they consolidate, and in some cases build, when there are newcomers. The convivial character of some of these activities, where there are shared meals and joint activities undertaken, helps to create a greater sense of team and engagement.

LLs can use a **mix of communication tools** to foster communication. The preferred methods, if possible, are face-to-face meetings, but when stakeholders belonging to an LL are more spread out geographically, virtual tools are more useful. Instant messaging service or video conference platforms are useful tools to use as they are well known to most and easy to use.

University of Pisa - *Fostering stakeholder engagement and participation in living labs*
DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

A strategy often used to strike the right balance between engagement and **avoiding fatigue**, is that of calibrating the timing and participation of meetings to avoid redundancy and excessive frequency.
Meetings can be staggered based on who is to attend or based on the stage of value chain to work on.
For example, if farming and processing activities are less connected in a given moment, LLs can decide to hold separate meetings with these two types of actors to avoid one group losing interest, if the meeting focuses on the topic of most interest to the other.

Field visit in Hungary with living lab stakeholders.
Credits: OMKI

Introducing new NUC recipes to the public in France
Credits: Biocivam

Regular engagements fosters learning and co-creation

The main benefit of carrying out activities that keep engagement levels high within LLs is that it allows for a diverse range and mix of stakeholders to engage regularly over time. This contributes to the development of increasing levels of mutual understanding and trust, which in turn leads to better co-creation and co-learning within LLs (Massari et al, 2022). Limits can be contextual, such as a country or economic context that does not provide incentives for certain stakeholders to participate, or personal, such as stakeholder fatigue as mentioned above.

Further information

Further readings

- Deliverable 7.5 "Mid-term review of Living Lab functioning", DIVINFOOD, 2024. Available at: ...
- Massari, S., Mattioni, D., Galli, F. (2022) *Framework for LL facilitation and Data Production*. Deliverable 5.1. DIVINFOOD H2020 project, September, 2022 [available at: https://zenodo.org/records/8382431]

Weblinks

- https://enoll.org/

About this practice abstract and DIVINFOOD

Publisher: University of Pisa
Authors: Dalia Mattioni and Francesca Galli
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Project website: www.divinfood.eu

PA #5 Gardeners in participatory farming experiments

DIVINFOOD

Gardeners in participatory farming experiments

Summary

Gardeners produce fruits and vegetables most often for their own consumption. When they are enlightened amateurs or retired farmers, they can concretely contribute to experimental processes approaching professional farmers' agroecological practices. Being involved in trials, with researchers who share clear objectives and simplified protocols, a gardener network enables the evaluation of a wide range of genetic resources (especially when few seeds are available). Such a network can thus enable the collection of a large amount of data with limited financial resources. Gardeners can also contribute to multiplying seeds before distributing them to farmers and they can contribute to participatory research approaches.

Issue

Farmers wishing to move towards more virtuous and agroecological practices often face a lack of suitable varieties. They have the possibility of making their own selection (seed saving) or of getting involved in participatory breeding processes to obtain "tailor-made" varieties adapted to their soil-climatic context but also to their cultural, social and economic context. When they begin this selection from genetic resources preserved in collections, the quantity of seeds provided to them is very small (few seeds). A significant multiplication work is then necessary, which requires a lot of time and meticulousness. One possibility is to work on this multiplication step with amateur gardeners who live in close geographic proximity to the farmers.

Practical recommendations for practitioners

In the Castelnaudary region (South of France), farmers are looking for varieties that consume less water and meet the expectations of their main market (i.e., as an ingredient in the traditional cassoulet recipe). As part of the DIVINFOOD project, a participatory breeding program started with a range of bean varieties selected from various collections. The quantities provided by the conservatories ranged from 10 to 40 seeds per variety. It was therefore decided to call on an association of amateur gardeners so that each one "adopts" sows, and tends one or more varieties, so that the quantities of seeds collected is enough to be grown commercially by farmers.
Although the ultimate goal is to find varieties that are suitable for farmers who cultivate with different equipment and conditions than do gardeners, the non-professional gardeners contribute to the experimental process by multiplying and evaluating several varieties.
Participatory evaluations are regularly conducted among amateur gardeners with farmers and researchers. When sufficient seed is available, the seeds are given to farmers who evaluate them at the field level.
In order to have an inclusive collaboration with gardeners and to set up the process, the following recommendations are suggested:

- Raise awareness among gardeners about the challenges that farmers face. For this purpose: the organisation of joint meetings grouping farmers, gardeners, researchers, and citizens such as consumers or food manufacturing companies.
- Co-design together (gardeners, farmers, researchers, consumers) simple and clear trial protocols.

BIOCIVAM11, INRAE - *Gardeners in participatory farming experiments*
DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

- Be accompanied by a facilitator who frequently visits and monitors the trials and is available for any questions.
- Involve gardeners in the analysis and interpretation of data/results.
- Maintain the interest and participation of gardeners at a high level between growing seasons and until the end of the experimental process, by inviting them to farm visits, field evaluations or regular informational meetings

Be careful, however, not to be too ambitious in the objectives and in the technical protocol. Working with amateur gardeners does not technically allow for experiments requiring precise technologies.

Figure 1. Building the experimental protocol with gardeners (Axel Wurtz / BIOCIVAM11)

Benefits (and limits) for practitioners or stakeholders

One of the main benefits of involving gardeners is that they can start with a very small quantity of seeds, sow them manually, tend to them and after 2 or 3 years harvest enough seeds for sowing on a commercial farm with an agricultural seeder.
Another advantage is that gardeners are numerous enough to represent a diversity of pedo-climatic contexts, capable of reflecting the diversity existing in the farming area.
The time and the daily attention that gardeners dedicate to their plants can produce a large quantity of data. Sometimes new criteria for selection can emerge from the gardeners' attention to detail.
Involving people who are not used to working with researchers (e.g., consumers, gardeners) raises awareness of the scientific approach. In addition, they discover the constraints faced by farmers and the challenges of applying agroecological practices. This knowledge can impact consumer choices and guide consumption towards purchasing agroecological products.
Finally, gardeners are often involved as volunteers (since all materials and inputs are provided by the project), which allows for practical activities to be carried out with limited financial resources.

About this practice abstract and DIVINFOOD

Publisher: BIOCIVAM11, INRAE
Authors: Axel Wurtz, Dominique Desclaux
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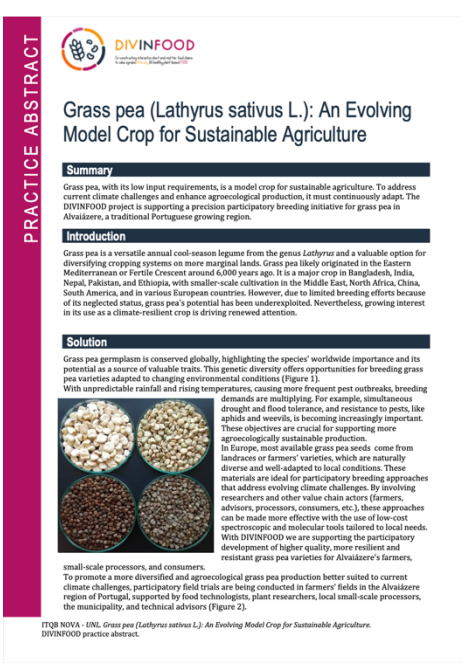
Project website: www.divinfood.eu

PA #6 Grass pea (Lathyrus sativus L.): an evolving model crop for sustainable agriculture



PRACTICE ABSTRACT

DIVINFOOD

Grass pea (Lathyrus sativus L.): An Evolving Model Crop for Sustainable Agriculture

Summary

Grass pea, with its low input requirements, is a model crop for sustainable agriculture. To address current climate challenges and enhance agroecological production, it must continuously adapt. The DIVINFOOD project is supporting a precision participatory breeding initiative for grass pea in Alvaiázere, a traditional Portuguese growing region.

Introduction

Grass pea is a versatile annual cool-season legume from the genus *Lathyrus* and a valuable option for diversifying cropping systems on more marginal lands. Grass pea likely originated in the Eastern Mediterranean or Fertile Crescent around 6,000 years ago. It is a major crop in Bangladesh, India, Nepal, Pakistan, and Ethiopia, with smaller-scale cultivation in the Middle East, North Africa, China, South America, and in various European countries. However, due to limited breeding efforts because of its neglected status, grass pea's potential has been underexploited. Nevertheless, growing interest in its use as a climate-resilient crop is driving renewed attention.

Solution

Grass pea germplasm is conserved globally, highlighting the species' worldwide importance and its potential as a source of valuable traits. This genetic diversity offers opportunities for breeding grass pea varieties adapted to changing environmental conditions (Figure 1).
With unpredictable rainfall and rising temperatures, causing more frequent pest outbreaks, breeding demands are multiplying. For example, simultaneous drought and flood tolerance, and resistance to pests, like aphids and weevils, is becoming increasingly important. These objectives are crucial for supporting more agroecologically sustainable production.
In Europe, most available grass pea seeds come from landraces or farmers' varieties, which are naturally diverse and well-adapted to local conditions. These materials are ideal for participatory breeding approaches that address evolving climate challenges. By involving researchers and other value chain actors (farmers, advisors, processors, consumers, etc.), these approaches can be made more effective with the use of low-cost spectroscopic and molecular tools tailored to local needs. With DIVINFOOD we are supporting the participatory development of higher quality, more resilient and resistant grass pea varieties for Alvaiázere's farmers, small-scale processors, and consumers.
To promote a more diversified and agroecological grass pea production better suited to current climate challenges, participatory field trials are being conducted in farmers' fields in the Alvaiázere region of Portugal, supported by food technologists, plant researchers, local small-scale processors, the municipality, and technical advisors (Figure 2).

ITQB NOVA - *UNL. Grass pea (Lathyrus sativus L.): An Evolving Model Crop for Sustainable Agriculture.* DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

Figure 2. Participatory evaluation at a grass pea comparative field trial, Alvaiázere, Portugal Credits: L. Gonçalves / ITQB NOVA

Figure 3. Grass pea comparative field trials at Alvaiázere Credits: L. Gonçalves / ITQB NOVA

Each season, breeding objectives and experimental trials are collectively defined, conducted and evaluated, and solutions seek through frequent and close collaboration between all the actors, each contributing with their particular expertise. In our collaborative experimental field trials, grass pea accessions from around the world are compared with local landraces at the agronomic level (Figure 3). Spectroscopic models for predicting nutritional quality and molecular markers for stress resistance are thus refined. These precision selection tools are now starting to be applied for segregating populations or for cross-breeding promising accessions so to address local climate challenges. Avenues to involve grass pea farmers are being explored so as to value their knowledge and accelerate adoption of pre-breeding materials. Historically important in the diets of the poorer classes, and once overlooked by the wealthy, grass pea is now finding a new niche in this region as a traditional delicacy. It has recently been featured prominently in local restaurants and celebrated at annual gastronomic festivals.

Benefits and limits

Grass pea is an appealing crop for drought-stricken, rain-fed areas with poor soil and extreme environmental conditions. Its hardy root system allows it to thrive in both drought and flooding environments. With a high nutritional value (25–30% protein), it serves both as human food and animal feed. Additionally, its symbiosis with rhizobia enhances soil nitrogen fixation, reducing input needs in crop rotations and making it suitable as green manure in sustainable farming systems. Grass pea can be consumed raw as a snack, cooked in stews, milled into flour for baking, or roasted. The DIVINFOOD project is also developing innovative fermented products, such as grass pea miso and tempeh, contributing to the diversification of its food usages.
All these traits make grass pea an excellent crop for ensuring nutritional security in more marginal regions. However, the continuous improvement of varieties through more efficient precision participatory breeding is essential to keep addressing current climate challenges. Sharing of selection tools such as traits associated with molecular markers and spectroscopy prediction models is an innovative approach being used in DIVINFOOD.

Further readings

Gonçalves L, Rubiales D, Bronze MR, VAZ PATTO MC (2022) Grass Pea (*Lathyrus sativus* L.)—A Sustainable and Resilient Answer to Climate Challenges. Agronomy 12:6 DOI: 10.3390/agronomy12061324

Weblinks

Divinfood's webpage on Grass Pea: https://divinfood.eu/grass-pea-en/

About this practice abstract and DIVINFOOD

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Authors: MC Vaz Patto
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Project website: www.divinfood.eu

PA #7 Introducing the Danish Legume Partnership

PRACTICE ABSTRACT

DIVINFOOD

Introducing the Danish Legume Partnership

Summary

The Danish Legume Partnership is a newly established partnership that aims to promote Danes' intake of pulses to support the target from the official dietary guidelines of 100 grams of prepared legumes daily. Legumes are a broad food group that embraces many species and varieties - and many of which we can profitably grow in Europe.

Introduction

In 2021, Denmark launched a new set of official dietary guidelines taking both health and climate into account[1]. With these guidelines, recommended intake of legumes was quantified to 100 grams of prepared legumes per day - twice the amount of meat. However, legumes currently play a minor role in the Danish food culture. There is a big knowledge gap among private operators and professionals regarding legumes, including a lack of kitchen and cooking skills for using pulses. The Danish Legume Partnership is one of several initiatives aiming to support a structural transition in dietary habits by bringing many different actors from the value chain together with a common goal. The efforts to enhance legume consumption in Denmark has enabled synergies with the focus of the Divinfood project: promoting European agrobiodiversity by promoting the local farming of neglected species of legumes and mild processing techniques.

Solution

Changing a food culture is a task that requires a united front from many stakeholders: companies from across the entire value chain (from farm to table), public and private organisations, and NGOs. In this case, quantification of a recommended intake of legumes in the official dietary guidelines from 2021 has been the levering creating a Danish Legume Partnership[2] (Figure 1).

Prior to the creation of the legume partnership, the Vegetarian Society of Denmark in 2020 established a Network for Future Plant Proteins.[3] The network organised regular knowledge sharing events relevant for different stakeholders in the value chain of legumes and other protein-rich crops from farm to table. While this network grew to more than 200 stakeholders, parallel work took place to engage key stakeholders in a legume alliance aiming to coordinate efforts that could promote the demand for legumes among citizens and food professionals. The legume alliance was coordinated first by the Danish Cancer Society and the Vegetarian Society of Denmark, later through assistance from the Danish Agriculture & Food Council.

None of the stakeholders involved in the alliance had a commercial aim with their engagement, as they were a mix of organisations working on health, sustainability or promoting local or organic food production. Meetings were held in the alliance and project funds were sought e.g., in the newly established Plant-Based Food Grant[4].

Figure 1 The logo for the Danish Legume Partnership. Created by the thinktank fre].

The Vegetarian Society of Denmark. Introducing the Danish Legume Partnership. DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

The Danish Whole Grain Partnership[1], a successful public-private partnership promoted since 2009, has facilitated a significant increase in the average daily intake of whole grains among Danes. Indeed daily intake increased from 36 grams/10 MJ in 2009 to 82 grams/10 MJ in 2019, which inspired the establishment of a Danish Legume Partnership. However, as the commercial market for legumes is yet underdeveloped in Denmark, a different economic model for the partnership was needed (e.g., private investments or grants). A real partnership with a secretariat only became possible when a private actor chose to invest 2 million Danish kroner in a partnership run by the *thinktank frej* in 2024 (figure 2). Within 3 months, 45 partners ranging from private food companies, wholesalers, municipalities and vocational schools have joined and committed to promote the market for legumes. Ideally, the financial model will be transferred to public funding or grants when the initial operating expenses have made a streng foundation for the partnership. In the long term, it is expected that the partnership can be run using membership fees. The work to increase the general demand for legumes, is a prerequisite for building a market for local farming of neglected species of legumes.

Benefits (and limits) for practitioners

Quantification of a recommended intake of legumes in the official dietary guidelines from 2021 has been a lever to create the Danish Legume Partnership. However, prior to the formalisation of the partnership, networks and alliances were made to bring the stakeholders from the entire value chain together. The partners in the Legume Partnership commit to promote the market for legumes, which in turn will lead to an increased demand for neglected species of legumes.

Figure 2: Launch of the Danish Legume Partnership, march 2024. (Photographer/Institution: ThinkTank frej)

Further information

Further readings

[1]Official Danish dietary guideline in English: https://en.foedevarestyrelsen.dk/food/nutrition-and-health/the-official-dietary-guidelines
[2] Webpage of the Danish Legume Partnership (in Danish): https://www.baelgfrugtspartnerskabet.dk/
[3]Description in Danish of the Network for Future plant proteins: https://vegetarisk.dk/planteproteiner/
[4] Description of the Danish Plant-Based Food Grant: https://plantefonden.lbst.dk/the-plant-based-food-grant
[5]Description of the Whole Grain Partnership: https://fuldkorn.dk/en/about-us

About this practice abstract and DIVINFOOD

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Authors: Katrine Ejlerskov & Jeanne Svalebech
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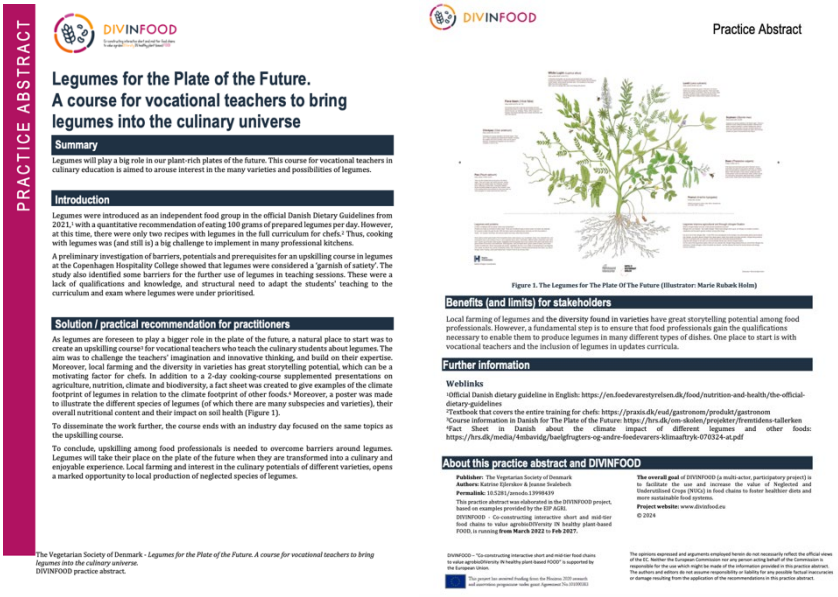
Project website: www.divinfood.eu

PA #8 Legumes for the Plate of the Future. A course for vocational teachers to bring legumes into the culinary universe



PRACTICE ABSTRACT

DIVINFOOD

Legumes for the Plate of the Future. A course for vocational teachers to bring legumes into the culinary universe

Summary

Legumes will play a big role in our plant-rich plates of the future. This course for vocational teachers in culinary education is aimed to arouse interest in the many varieties and possibilities of legumes.

Introduction

Legumes were introduced as an independent food group in the official Danish Dietary Guidelines from 2021,[1] with a quantitative recommendation of eating 100 grams of prepared legumes per day. However, at this time, there were only two recipes with legumes in the full curriculum for chefs.[2] Thus, cooking with legumes was (and still is) a big challenge to implement in many professional kitchens.

A preliminary investigation of barriers, potentials and prerequisites for an upskilling course in legumes at the Copenhagen Hospitality College showed that legumes were considered a 'garnish of satiety'. The study also identified some barriers for the further use of legumes in teaching sessions. These were a lack of qualifications and knowledge, and structural need to adapt the students' teaching to the curriculum and exam where legumes were under prioritised.

Solution / practical recommendation for practitioners

As legumes are foreseen to play a bigger role in the plate of the future, a natural place to start was to create an upskilling course[3] for vocational teachers who teach the culinary students about legumes. The aim was to challenge the teachers' imagination and innovative thinking, and build on their expertise. Moreover, local farming and the diversity in varieties has great storytelling potential, which can be a motivating factor for chefs. In addition to a 2-day cooking-course supplemented presentations on agriculture, nutrition, climate and biodiversity, a fact sheet was created to give examples of the climate footprint of legumes in relation to the climate footprint of other foods.[4] Moreover, a poster was made to illustrate the different species of legumes (of which there are many subspecies and varieties), their overall nutritional content and their impact on soil health (Figure 1).

To disseminate the work further, the course ends with an industry day focused on the same topics as the upskilling course.

To conclude, upskilling among food professionals is needed to overcome barriers around legumes. Legumes will take their place on the plate of the future when they are transformed into a culinary and enjoyable experience. Local farming and interest in the culinary potentials of different varieties, opens a marked opportunity to local production of neglected species of legumes.

The Vegetarian Society of Denmark - *Legumes for the Plate of the Future. A course for vocational teachers to bring legumes into the culinary universe.*
DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

Figure 1. The Legumes for The Plate Of The Future (Illustrator: Marie Rubæk Holm)

Benefits (and limits) for stakeholders

Local farming of legumes and the diversity found in varieties have great storytelling potential among food professionals. However, a fundamental step is to ensure that food professionals gain the qualifications necessary to enable them to produce legumes in many different types of dishes. One place to start is with vocational teachers and the inclusion of legumes in updates curricula.

Further information

Weblinks

[1]Official Danish dietary guideline in English: https://en.foedevarestyrelsen.dk/food/nutrition-and-health/the-official-dietary-guidelines
[2]Textbook that covers the entire training for chefs: https://praxis.dk/eud/gastronom/produkt/gastronom
[3]Course information in Danish for The Plate of the Future: https://hrs.dk/om-skolen/projekter/fremtidens-tallerken
[4]Fact Sheet in Danish about the climate impact of different legumes and other foods: https://hrs.dk/media/4mbavidg/baelgfrugters-og-andre-foedevarers-klimaaftryk-070324-at.pdf

About this practice abstract and DIVINFOOD

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Project website: www.divinfood.eu

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PA #9 Organisation of on-farm training and demonstration days: a roadmap

PRACTICE ABSTRACT

DIVINFOOD

Organisation of on-farm training and demonstration days: a roadmap

Summary

On-farm training and demonstration days are great opportunities to share experiences, increase knowledge and develop relationships among actors concerned by agriculture and food. This practice abstract introduces a generic and pragmatic route towards the organisation of such events, which can target various types of stakeholders.

Introduction

What better way to share knowledge about crops and farming systems than by visiting fields and farms? To complement classroom training, on-field and on-farm training provides great opportunities to demonstrate how particular practices are carried out; they let people interact and explore a range of subjects. However, organising such events requires careful preparation. Events can range from one-hour field meetings that gather, on short notice, participants from the local area; to large-scale all-day events for up to 500 participants involving many stakeholders.

Practical recommendations

As part of the DIVINFOOD project, a step-by-step procedure for the implementation of an on-field training or demonstration day has been developed based on the extensive experience of ICOEL in Denmark. This procedure can guide the organisation of successful events.

Step	Issues	Tips for greater impact
1. Brainstorming (before the event)	**What is the aim of the on-field training/demonstration? What do we want to demonstrate, to whom?**	**Consider co-organisation with stakeholders and local actors.**
2. Fixing the timeline	**Make a realistic plan for the event. Start in advance to be sure that crops can be demonstrated (e.g., so wing in due time).**	**Analyse the context to investigate whether there are any public holidays, other important events etc.**
3. Choosing the location	**Choose the right location for the on-field training or demonstration day.**	**Consider transportation, parking and accommodation offers, if relevant.**
4. Costs and budget	**Estimate costs and available budget.**	**Consider funding and resources from other projects and stakeholders sharing similar activities.**
5. Invitation	**Send invitations to targeted actors via various communication channels.**	**Use digital tools to facilitate registrations and payments if necessary.**
6. Develop a program	**Make a realistic and clear program about what will be demonstrated.**	**Incorporate timeslots for breaks, meals, and transportation. Share the final program with participants.**
7. Logistics of the event	**Order food, organise facilities, recruit staff (and/or volunteers) if needed.**	**Value local food issued from farms that are visited, to be consistent!**
8. Communication on the day	**Adapting presentations to participants.**	**Ensure that all contributing actors and organisations are credited and valued. Facilitate translation if needed.**

Innovation Centre for Organic Farming - *Organisation of on-farm training and demonstration days: a roadmap.*
DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

An example of a demonstration day about grain legumes being produced for food. Tasting event in the barn at the farm where the grain legumes are grown. Credits: Inger Bertelsen, ICOEL

Benefits (and limits) for practitioners or stakeholders

The proposed roadmap for organising on-field trainings and demonstration days has been formalised on the basis of examples from Denmark, covering a wide range of situations. It can be applied to other European countries, according to the relationship between farmers, advisory services and stakeholders.

Mutual understanding between farmers and other stakeholders, as well as the definition of new issues to be collectively explored, are fostered by organising meetings in the field. The real conditions and concrete problems of the field render this form of training more effective than holding a training in neutral premises. Time is always a limiting factor, which is why it is essential to plan the event carefully, taking into account the work schedules of the various stakeholders.

Further information

Further readings

DIVINFOOD_D6.3-Roadmaps to organize on-field training-VF.pdf (inra.fr)
https://zenodo.org/records/8379073

Weblinks

https://divinfood.eu/leg-nord-en/
https://divinfood.eu/faba-nord-en/

About this practice abstract and DIVINFOOD

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DIVINFOOD – Co-constructing interactive short and mid-tier food chains to value agrobioDIVersity IN healthy plant-based FOOD, is running **from March 2022** to **Feb 2027.**

The overall goal of DIVINFOOD (a multi-actor, participatory project) is to facilitate the use and increase the value of Neglected and Underutilised Crops (NUCs) in food chains to foster healthier diets and more sustainable food systems.

Project website: www.divinfood.eu

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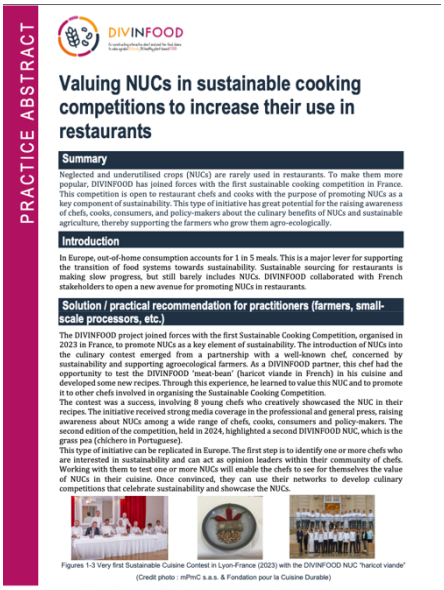
PA #10 Valuing NUCs in sustainable cooking competitions to increase their use in restaurants



PRACTICE ABSTRACT

DIVINFOOD

Valuing NUCs in sustainable cooking competitions to increase their use in restaurants

Summary

Neglected and underutilised crops (NUCs) are rarely used in restaurants. To make them more popular, DIVINFOOD has joined forces with the first sustainable cooking competition in France. This competition is open to restaurant chefs and cooks with the purpose of promoting NUCs as a key component of sustainability. This type of initiative has great potential for the raising awareness of chefs, cooks, consumers, and policy-makers about the culinary benefits of NUCs and sustainable agriculture, thereby supporting the farmers who grow them agro-ecologically.

Introduction

In Europe, out-of-home consumption accounts for 1 in 5 meals. This is a major lever for supporting the transition of food systems towards sustainability. Sustainable sourcing for restaurants is making slow progress, but still barely includes NUCs. DIVINFOOD collaborated with French stakeholders to open a new avenue for promoting NUCs in restaurants.

Solution / practical recommendation for practitioners (farmers, small-scale processors, etc.)

The DIVINFOOD project joined forces with the first Sustainable Cooking Competition, organised in 2023 in France, to promote NUCs as a key element of sustainability. The introduction of NUCs into the culinary contest emerged from a partnership with a well-known chef, concerned by sustainability and supporting agroecological farmers. As a DIVINFOOD partner, this chef had the opportunity to test the DIVINFOOD 'meat-bean' (haricot viande in French) in his cuisine and developed some new recipes. Through this experience, he learned to value this NUC and to promote it to other chefs involved in organising the Sustainable Cooking Competition.
The contest was a success, involving 8 young chefs who creatively showcased the NUC in their recipes. The initiative received strong media coverage in the professional and general press, raising awareness about NUCs among a wide range of chefs, cooks, consumers and policy-makers. The second edition of the competition, held in 2024, highlighted a second DIVINFOOD NUC, which is the grass pea (chícharo in Portuguese).
This type of initiative can be replicated in Europe. The first step is to identify one or more chefs who are interested in sustainability and can act as opinion leaders within their community of chefs. Working with them to test one or more NUCs will enable the chefs to see for themselves the value of NUCs in their cuisine. Once convinced, they can use their networks to develop culinary competitions that celebrate sustainability and showcase the NUCs.

Figures 1-3 Very first Sustainable Cuisine Contest in Lyon-France (2023) with the DIVINFOOD NUC "haricot viande"
(Credit photo : mPmC s.a.s. & Fondation pour la Cuisine Durable)

mPmC s.a.s. - *Valuing NUCs in sustainable cooking competitions to increase their use in restaurants.* DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

Benefits (and limits) for practitioners (farmers, small-scale processors, etc.) or stakeholders

There can be no sustainable cuisine without sustainable agriculture, and no sustainable agriculture without cultivated biodiversity. The solution proposed here highlights NUCs as a key element in the sustainability of cuisine and agriculture. It also highlights the role of NUCs as a quality ingredient for inventing sustainable, healthy and tasty recipes.
This type of initiative has the added benefit of raising awareness about the use and benefits of NUCs among chefs, cooks, consumers, future diners, and policy-makers. It is likely to encourage chefs and cooks to pay more attention to the cultivated biodiversity they work with and to make the best of it throughout their recipes. Such events can forge partnerships with farmers who are making great efforts to preserve NUCs and cultivate them in agroecology.
Organising a culinary competition takes time and money, and needs to be well publicised if it is to have any impact. Partnerships with chefs who are recognised in their region and with culinary training centres are keys to the success of such initaitives.

Further information

Weblinks

Events planning company: https://www.fondation-cuisinedurable.org/fr/projects
Opinion Chef leader: https://tetedoie.fr/
Initiator and go-between company: https://www.mesproducteursmescuisiniers.com/fr/

About this practice abstract and DIVINFOOD

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Authors: Jean-François Tedesco
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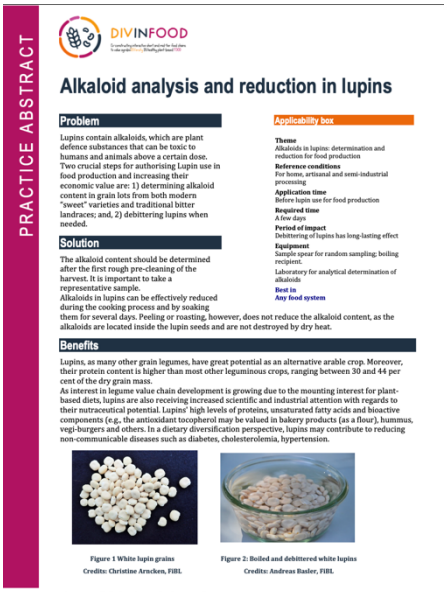
Project website: www.divinfood.eu

PA #11 Alkaloid analysis and reduction in lupins



PRACTICE ABSTRACT

DIVINFOOD

Alkaloid analysis and reduction in lupins

Problem

Lupins contain alkaloids, which are plant defence substances that can be toxic to humans and animals above a certain dose. Two crucial steps for authorising Lupin use in food production and increasing their economic value are: 1) determining alkaloid content in grain lots from both modern "sweet" varieties and traditional bitter landraces; and, 2) debittering lupins when needed.

Solution

The alkaloid content should be determined after the first rough pre-cleaning of the harvest. It is important to take a representative sample.
Alkaloids in lupins can be effectively reduced during the cooking process and by soaking them for several days. Peeling or roasting, however, does not reduce the alkaloid content, as the alkaloids are located inside the lupin seeds and are not destroyed by dry heat.

Applicability box

Theme
Alkaloids in lupins: determination and reduction for food production
Reference conditions
For home, artisanal and semi-industrial processing
Application time
Before lupin use for food production
Required time
A few days
Period of impact
Debittering of lupins has long-lasting effect
Equipment
Sample spear for random sampling; boiling recipient.
Laboratory for analytical determination of alkaloids
Best in
Any food system

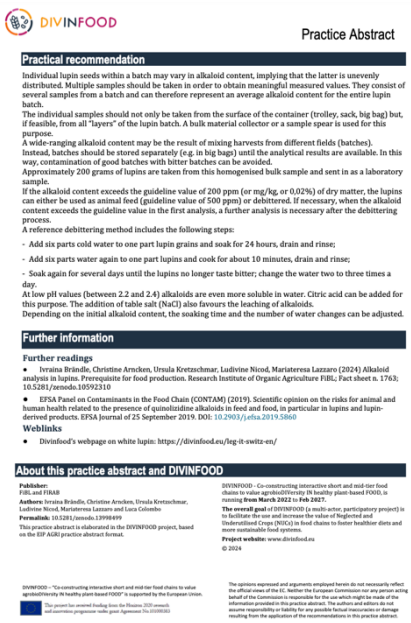
Benefits

Lupins, as many other grain legumes, have great potential as an alternative arable crop. Moreover, their protein content is higher than most other leguminous crops, ranging between 30 and 44 per cent of the dry grain mass.
As interest in legume value chain development is growing due to the mounting interest for plant-based diets, lupins are also receiving increased scientific and industrial attention with regards to their nutraceutical potential. Lupins' high levels of proteins, unsaturated fatty acids and bioactive components (e.g., the antioxidant tocopherol may be valued in bakery products (as a flour), hummus, vegi-burgers and others. In a dietary diversification perspective, lupins may contribute to reducing non-communicable diseases such as diabetes, cholesterolemia, hypertension.

Figure 1 White lupin grains
Credits: Christine Arncken, FIBL

Figure 2: Boiled and debittered white lupins
Credits: Andreas Basler, FIBL

FIBL and FIRAB - *Alkaloid analysis and reduction in lupins.* DIVINFOOD practice abstract.



DIVINFOOD

Practice Abstract

Practical recommendation

Individual lupin seeds within a batch may vary in alkaloid content, implying that the latter is unevenly distributed. Multiple samples should be taken in order to obtain meaningful measured values. They consist of several samples from a batch and can therefore represent an average alkaloid content for the entire lupin batch.
The individual samples should not only be taken from the surface of the container (trolley, sack, big bag) but, if feasible, from all "layers" of the lupin batch. A bulk material collector or a sample spear is used for this purpose.
A wide-ranging alkaloid content may be the result of mixing harvests from different fields (batches). Instead, batches should be stored separately (e.g. in big bags) until the analytical results are available. In this way, contamination of good batches with bitter batches can be avoided.
Approximately 200 grams of lupins are taken from this homogenised bulk sample and sent in as a laboratory sample.
If the alkaloid content exceeds the guideline value of 200 ppm (or mg/kg, or 0,02%) of dry matter, the lupins can either be used as animal feed (guideline value of 500 ppm) or debittered. If necessary, when the alkaloid content exceeds the guideline value in the first analysis, a further analysis is necessary after the debittering process.
A reference debittering method includes the following steps:

- Add six parts cold water to one part lupin grains and soak for 24 hours, drain and rinse;
- Add six parts water again to one part lupins and cook for about 10 minutes, drain and rinse;
- Soak again for several days until the lupins no longer taste bitter; change the water two to three times a day.

At low pH values (between 2.2 and 2.4) alkaloids are even more soluble in water. Citric acid can be added for this purpose. The addition of table salt (NaCl) also favours the leaching of alkaloids.
Depending on the initial alkaloid content, the soaking time and the number of water changes can be adjusted.

Further information

Further readings

- Ivraina Brändle, Christine Arncken, Ursula Kretzschmar, Ludivine Nicod, Mariateresa Lazzaro (2024) Alkaloid analysis in lupins. Prerequisite for food production. Research Institute of Organic Agriculture FiBL, Fact sheet n. 1763; 10.5281/zenodo.10592310
- EFSA Panel on Contaminants in the Food Chain (CONTAM) (2019). Scientific opinion on the risks for animal and human health related to the presence of quinolizidine alkaloids in feed and food, in particular in lupins and lupin-derived products. EFSA Journal of 25 September 2019. DOI: 10.2903/j.efsa.2019.5860

Weblinks

- Divinfood's webpage on white lupin: https://divinfood.eu/leg-it-switz-en/

About this practice abstract and DIVINFOOD

Publisher:
FiBL and FIRAB
Authors: Ivraina Brändle, Christine Arncken, Ursula Kretzschmar, Ludivine Nicod, Mariateresa Lazzaro and Luca Colombo
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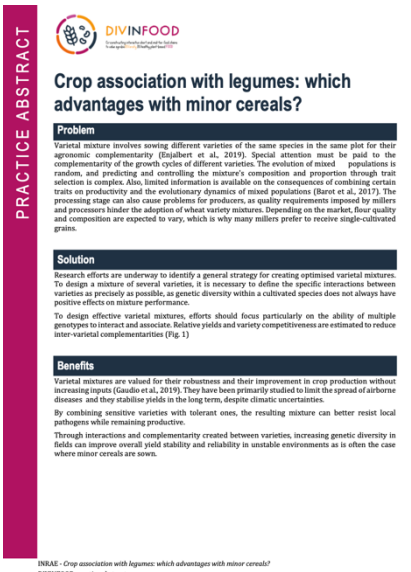
Project website: www.divinfood.eu

PA #12 Crop association with legumes: which advantages with minor cereals?



PRACTICE ABSTRACT

DIVINFOOD

Crop association with legumes: which advantages with minor cereals?

Problem

Varietal mixture involves sowing different varieties of the same species in the same plot for their agronomic complementarity (Enjalbert et al., 2019). Special attention must be paid to the complementarity of the growth cycles of different varieties. The evolution of mixed populations is random, and predicting and controlling the mixture's composition and proportion through trait selection is complex. Also, limited information is available on the consequences of combining certain traits on productivity and the evolutionary dynamics of mixed populations (Barot et al., 2017). The processing stage can also cause problems for producers, as quality requirements imposed by millers and processors hinder the adoption of wheat variety mixtures. Depending on the market, flour quality and composition are expected to vary, which is why many millers prefer to receive single-cultivated grains.

Solution

Research efforts are underway to identify a general strategy for creating optimised varietal mixtures. To design a mixture of several varieties, it is necessary to define the specific interactions between varieties as precisely as possible, as genetic diversity within a cultivated species does not always have positive effects on mixture performance.

To design effective varietal mixtures, efforts should focus particularly on the ability of multiple genotypes to interact and associate. Relative yields and variety competitiveness are estimated to reduce inter-varietal complementarities (Fig. 1)

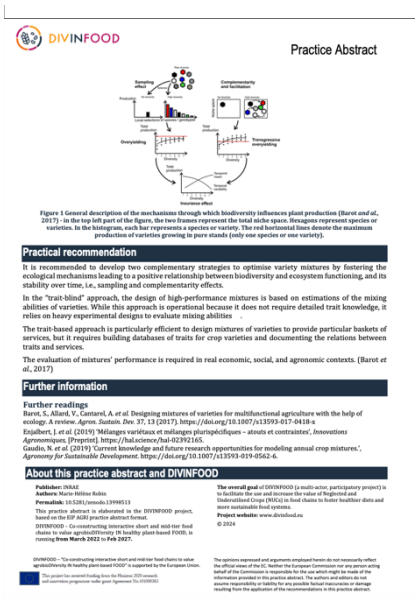
Benefits

Varietal mixtures are valued for their robustness and their improvement in crop production without increasing inputs (Gaudio et al., 2019). They have been primarily studied to limit the spread of airborne diseases and they stabilise yields in the long term, despite climatic uncertainties.

By combining sensitive varieties with tolerant ones, the resulting mixture can better resist local pathogens while remaining productive.

Through interactions and complementarity created between varieties, increasing genetic diversity in fields can improve overall yield stability and reliability in unstable environments as is often the case where minor cereals are sown.

INRAE - *Crop association with legumes: which advantages with minor cereals?*
DIVINFOOD practice abstract.



DIVINFOOD

Practice Abstract

Figure 1 General description of the mechanisms through which biodiversity influences plant production (Barot *and al.*, 2017) - in the top left part of the figure, the two frames represent the total niche space. Hexagons represent species or varieties. In the histogram, each bar represents a species or variety. The red horizontal lines denote the maximum production of varieties growing in pure stands (only one species or one variety).

Practical recommendation

It is recommended to develop two complementary strategies to optimise variety mixtures by fostering the ecological mechanisms leading to a positive relationship between biodiversity and ecosystem functioning, and its stability over time, i.e., sampling and complementarity effects.

In the "trait-blind" approach, the design of high-performance mixtures is based on estimations of the mixing abilities of varieties. While this approach is operational because it does not require detailed trait knowledge, it relies on heavy experimental designs to evaluate mixing abilities

The trait-based approach is particularly efficient to design mixtures of varieties to provide particular baskets of services, but it requires building databases of traits for crop varieties and documenting the relations between traits and services.

The evaluation of mixtures' performance is required in real economic, social, and agronomic contexts. (Barot *et al.*, 2017)

Further information

Further readings

Barot, S., Allard, V., Cantarel, A. *et al.* Designing mixtures of varieties for multifunctional agriculture with the help of ecology. A review. *Agron. Sustain. Dev.* 37, 13 (2017). https://doi.org/10.1007/s13593-017-0418-x

Enjalbert, J. *et al.* (2019) 'Mélanges variétaux et mélanges plurispécifiques – atouts et contraintes', *Innovations Agronomiques*, [Preprint]. https://hal.science/hal-02392165.

Gaudio, N. *et al.* (2019) 'Current knowledge and future research opportunities for modeling annual crop mixtures.', *Agronomy for Sustainable Development*. https://doi.org/10.1007/s13593-019-0562-6.

About this practice abstract and DIVINFOOD

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Project website: www.divinfood.eu

PA #13 Do consumers support farmers and food supply chains promoting agrobiodiversity?

PRACTICE ABSTRACT

DIVINFOOD

Do consumers support farmers and food supply chains promoting agrobiodiversity?

Issue

Agrobiodiversity, including all the plant species and varieties used for food, is in decline. Just three crops account for 60% of the calories consumed worldwide: wheat, maize and rice (FAO). Consumers are sensitive to the disappearance of insects and birds, but do they support the farmers and food supply chains that promote other crops, and, especially, neglected and underutilised crops (NUCs)?

Solution

As part of the DIVINFOOD project, a wide-ranging online survey was launched in June 2022 covering 7 European countries (Denmark, France, Hungary, Italy, Portugal, Sweden, Switzerland), in the national languages. Among other questions, respondents were asked to evaluate 'conventional' and 'alternative' options for using and promoting agrobiodiversity in food supply chains, using a scale ranging from 'excellent' to 'bad'. An important clarification is that respondents did not have to choose between the two options, but could like or dislike both. In addition, workshops of 8-15 consumers were organised in the different countries to better understand why they prefer particular ways of using or promoting agrobiodiversity in food supply chains, taking the minor cereals or legumes studied in DIVINFOOD as concrete examples of NUCs. Both in the online survey and in the workshops, alternative options, highlighted as favourable to agrobiodiversity in the scientific literature and by farmers themselves, have been better evaluated than conventional options (Fig.1).

Figure 1. How consumers evaluate options for using agrobiodiversity in food supply chains? (results of the online survey; 1,724 respondents, DIVINFOOD project, June-July 2022)

The workshops made it clear that different supply chains and venues were useful and complementary for valorising NUCs: farmers' markets and restaurants provide consumers an opportunity to discover some NUCs for the first time, short and local chains help to develop the reputation of NUCs. Supermarkets and collective catering were also found to be useful for city dwellers who are distant from farms and for developing the NUC market on a larger scale.

INRAE - *Do consumers support farmers and food supply chains promoting agrobiodiversity?*
DIVINFOOD practice abstract

DIVINFOOD

Practice Abstract

Benefits for farmers and other practitioners

Consumers support agriculture and food supply chains that promote agrobiodiversity: this result is very encouraging for farmers, small-scale processors and retailers who are making a great effort, or would like to commit, to ensuring that our future food does not depend solely on 3 plant species. However, beyond species or varieties, what matters for consumers is knowing the impact of using agrobiodiversity. They are seeking information from seeds to plates, particularly in terms of nutrition and health, and attenuation of climate change. It is also important for them that the products made from neglected and underutilised crops are tasty, convenient and accessible, both economically and in a variety of shops and restaurants.

Valorising NUCs-based food in a diversity of food supply chains (short, local, regional, etc.) and venues (farmers' markets, restaurants, collective catering, food fairs, supermarkets, etc.), and highlighting the impact of using agrobiodiversity to make food, are concrete ways for practitioners to both meet consumers' expectations for healthy and climate-positive plant-based food and to capture added value. Practitioners and consumers can collaborate to diversify food by diversifying crops, and thus to reverse the decline of agrobiodiversity. The latter is a common good that is essential for the future of everyone and the planet.

Figure 2. Farmers' market in France (© J.-P. Divet)

Further information

- **Access the summary of the study, in 8 languages**
  - Danish: https://divinfood.eu/divinfood/wp-content/uploads/2023/01/D1.1-Comm-Dios-Denmark.pdf
  - English: https://divinfood.eu/divinfood/wp-content/uploads/2023/01/D1.1-Comm-Dios-English.pdf
  - French: https://divinfood.eu/divinfood/wp-content/uploads/2023/01/D1.1-Comm-Dios-France-20230116.pdf
  - German: https://divinfood.eu/divinfood/wp-content/uploads/2023/01/D1.1-Comm-Dios-German.pdf
  - Hungarian: https://divinfood.eu/divinfood/wp-content/uploads/2023/01/D1.1-Comm-Dios-Hungarian.pdf
  - Italian: https://divinfood.eu/divinfood/wp-content/uploads/2023/01/D1.1-Comm-Dios-Italy.pdf
  - Portuguese: https://divinfood.eu/divinfood/wp-content/uploads/2023/02/D1.1-Comm-Dios-Portugal-.pdf
  - Swedish: https://divinfood.eu/divinfood/wp-content/uploads/2023/01/D1.1-Comm-Dios-Sweden.pdf
- **Access the full study report (in English)**
  https://divinfood.eu/divinfood/wp-content/uploads/2023/01/DIVINFOOD_D1.1-White-paper-for-food-chains-actors-for-using-agrobiodiversity.pdf
- **Access the scientific publication (open access)**
  Chiffoleau Y., Dourian T., Enderli G., Mattioni D., Akermann G., Loconto A., Galli F., Emese G., Perényi Z., Colombo L., Massari S., Descleux D., 2023. Reversing the trend of agrobiodiversity decline by co-developing food chains with consumers: A European survey for change. *Sustainable Production and Consumption*, 46, 343-354, https://doi.org/10.1016/j.spc.2024.02.032, https://zenodo.org/records/13620047

About this practice abstract and DIVINFOOD

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Project website: www.divinfood.eu

PA #14 Dry bean seed production by and for small-scale farmers

PRACTICE ABSTRACT

DIVINFOOD

Dry bean seed production by and for small-scale farmers

Problem

Dry beans (*Phaseolus Vulgaris L.*), and legumes in general, are relatively disregarded despite their role in nutrition. This neglected potential constrains their integration into cropping systems, thus preventing the exploitation of an abundantly available agrobiodiversity and its related knowledge.

Solution

To value bean landraces, and climbing ones in particular, seed multiplication through small plots at farm level can be key to spread diffusion of high-quality bean seeds and to increase bean production and consumption. Provision of technical support may further foster their adoption. A simple protocol can guide farmers to produce their own high quality seeds.

Applicability box

Theme
Seed production and multiplication
Reference conditions
Preference for light soils with neutral pH
Temperature: >2°C soil temperature at sowing; very sensitive to heat > 30°C
Application time
Spring (sowing) to summer (harvest)
Equipment
Threshing machine, aerated storage, humidity tester; irrigation necessary at flowering and with young pods (critical stage of plant development)
Best in
Small scale farming

Benefits

Beans, and pulses more generally, are an excellent source of plant proteins. In addition, they are rich in resistant starch, fiber, minerals, and B-vitamins, while they contain almost no sodium or fat. Hence, dietary consumption of pulses is associated with a reduced risk of obesity, weight loss, and improved satiety.
Legumes (including beans) are also good in crop rotations due to their nitrogen fixation capacity, contributing to soil fertility and reducing environmental impacts derived from industrial fertilizers.
Climbing bean varieties are generally more tolerant to the legume diseases (especially root diseases) and have a high yield potential; up to 4-5 t/ha versus 3 t/ha for bush beans under optimal conditions.
Plant residues are also useful by-products: in animal feed as a source of proteins when fresh, while dried they can be used as soil mulch. Be careful though, because fungal diseases can be preserved in bean mulch.

Figure1: plastic nets staking
D. Mukankubana, CRBA

Figure2: wood staking
D. Mukankubana, CRBA

Fig 3: Maize&Bean intercropping
J.F Tedesco, MPMC sas

CRBA and MpMc sas - Dry bean seed production by and for small-scale farmers.
DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

Practical recommendation

1. Select Site and Seeds
The optimum plant growth temperature is 25°C. Vegetative zero (the temperature below which plant growth stops) is 10°C. Germination starts from 12°C (minimum soil temperature) and it is very important to choose the right period for bean planting to avoid loss at germination stage.
Beans are particularly sensitive to wet soil, as excessive water may limit yields in several ways, such as nitrogen fixation reduction, chlorosis and reduction in crop growth. Insolation is a key factor in the successful growth of climbing beans: it is recommended to choose locations/sites that receive at least 6 to 8 hours of direct sunlight per day. The quality of the seeds used to multiply is very important, one must ensure a high germination rate (min. 85%), purity, cleanness, dryness (humidity rate <12%), freedom from diseases and no damage.
2. Staking, stakes length and staking period
Climbing plants need stakes, put at sowing time or at young age, allowing the plants to grow vertically, making growing and harvest easier. The optimum stake size is 2.5 m in height. In fact, very high stakes can lead to a delay in the flowering date, thus late maturing. Using wood or plastic nets (Fig.1&2) is a bean staking system commonly used (with optimum results) but requires a high labor cost. One of the options for reducing this cost is crops association (Fig. 3): beans intercropping with maize is the most widely used. Sunflowers can also be used (sunflower varieties having small leaves are recommended to reduce shade; they should be at least 2 m of height and preferably without branches, and have the same maturing period as the climbing bean variety). Note that farmers can adapt the technology with other species available.
3. Isolation distance recommended in bean seed multiplication
The isolation distances between two common bean varieties are not restrictive: to conserve variety purity, minimum distances are required to avoid hybridization, according to the type of bean.
Between 2 bush bean varieties (*Phaseolus Vulgaris*): 5 to 10 m. Between 2 climbing bean varieties (*Phaseolus Vulgaris*): 50 m. Between 1 bush variety and 1 climbing bean variety: 10 m
4. Crop rotation and disease management
To prevent varietal mixing and disease propagation, it is better to return beans to the same field only after two growing seasons. Three main diseases are transmitted by seeds: halo blight (bacteria disease), BCMV (Bean Common mosaic Virus) and anthracnose (fungal disease). Periodic field visits (before flowering and at physiological maturing) are very important in terms of disease control. It is recommended to use disease-free seeds and resistant varieties and to adjust the planting date (for BCMV) to minimize exposure to virus-spreading aphids.
5. Harvest and post-harvest
One of the challenges of climbing bean harvesting is that it cannot be mechanized until now. Bean seeds must be well dried and unbroken during threshing and sorting. Dry pods in case they are wet:. Proceed to conducting a humidity test before storage aiming at reaching 12% humidity. Protect seeds from rain, insects, animals and dirt in cool and dry storage. For the germination test: a minimum of 85 % germination rate is expected. .

Further information

Chambre d'Agriculture Vaucluse Chambre d'Agriculture du Rhône (2012) Tout savoir sur la culture du Haricot sous abris et en plein champ
Donald J. Hagedorn, D.A. Inglis (1986) Handbook of bean diseases. Editeur: University of Wisconsin –Extension, (Madison, Wis.)

About this practice abstract and DIVINFOOD

Publisher: CRBA and MpMc sas
Authors: D. Mukankubana, J.F. Tedesco and S. Croaut
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Project website: www.divinfood.eu

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PA #15 How to improve Einkorn varieties?

PRACTICE ABSTRACT

DIVINFOOD

How to improve Einkorn varieties?

Problem

Einkorn producers grow a limited number of varieties and are looking for a wider diversity. Seed companies are not yet interested in this crop due to the narrow niche market and the fact that few, if any, breeding programs are devoted to it.
A participatory einkorn breeding program can easily be implemented to meet the needs of actors in the value chain. If you're a farmer or a consumer: don't hesitate to integrate or to require a participatory breeding program in your territory! Here is the step-by-step program.

Applicability box

Theme
Breeding for einkorn in low input conditions
Reference conditions
Arable systems
Application time
Year-round
Period of impact
Long-lasting
Equipment
Pool of genetic resources
Best in
Organic and low-input systems

Solution

Participatory breeding programs are being implemented in some places (mainly as part of the DIVINFOOD project) to take into account not only the wishes of the producers, but also those of millers, bakers, other processors, and consumers at the territorial level.
There is also a huge diversity of genetic resources still stored in European einkorn genebanks.

Benefits

Einkorn is the oldest domesticated wheat and is prized for its rich nutritional profile, including higher protein and essential nutrient content than modern wheat. It is easier to digest and less likely to cause inflammation, making it a good option for people sensitive to gluten. What's more, einkorn's resistance to harsh growing conditions makes it a valuable crop for sustainable agriculture.
The interest of participatory breeding is that a collective may create their own varieties and select the best adapted to their local micro-climatic environment. The objectives may be diverse and sometimes contradictory. The interest of the participatory approach is to target a "custom breeding" program for a specific environment. The term "environment" recovers not only climate, soil and cropping systems, but encompasses the processing, marketing, economy, social, cultural and regulation components.
Breeding requires patience. To speed up the process, the collective may prefer mass selection to pedigree selection, in order to obtain a population that can evolve in the field. When comparing einkorn pure lines and populations, people say they prefer populations that are more resilient and robust than pure lines.

Photos 1 and 2 : French et Algerian farmers, researchers, students and citizens evaluating einkorn in south of France (left. © D. Desclaux, INRAE, right: © C.Ihbigo, INRAE)

INRAE - *How to improve Einkorn varieties?*
DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

Practical recommendation

The objectives of the breeding program must be participatory, meaning that all stakeholders can present their constraints and wishes, in order to jointly define relevant variety "ideotypes". In Southern France, participants are looking for varieties with high vigour and plant height to compete with and smother weeds. They are also looking for cold-resistant varieties that can grow quickly and achieve satisfactory yields. Some are interested in long-cycle varieties that can cover the soil for a long period and be harvested after the other cereals that are grown on the farm. Others prefer early maturing varieties that complete their cycle before the heat.
Concerning the sowing, farmers want varieties that can be sowed early (September), sprout quickly and cover rapidly the soil. Others prefer to sow later. Another important criterion is the grain size (big grains are required) and, above all, its ease of threshing. Indeed, einkorn grains are hulled and post-harvest dehulling is a very costly operation. Maintaining einkorn's nutritional properties, such as its high carotenoid and protein content, is also a key priority. As this species is not subject to pest attack and is very robust, it does not require specific pathogen resistance programs.
Creating variability requires access to relevant European einkorn collections.
The breeding scheme for self-pollinated crops generally involves several key steps:

- ***Choice of parent lines***: the aim is to choose two parents to cross that exhibit the desired traits. This requires first the evaluation of the collected genetic resources.
- ***Emasculation:*** the anthers are removed (by hand) from the flowers of one parent plant to prevent self-pollination.
- ***Pollination:*** pollen from the second parent plant is collected and transferred to the emasculated flowers of the first parent plant.

This step can be done in farmers' field by the farmers themselves, but it should be communicated that it takes time and requires patience. It is usually done by technicians or researchers.
Selection stage: Once pollination is successful, the seeds will be the first filial generation (F1) and will contain a mix of genetic traits from both parents. After growing the F1 generation, the following generations are made by self-crosses and the plants that best exhibit the desired traits may be selected at each generation. The selected plants can be backcrossed with one of the parent lines or crossed with other plants to further refine the traits.
Mass selection can also be done. In this case, a large number of plants are selected and their seeds are bulked together
Multiplication: Continuing the process of selection and crossing over several generations lead to the stabilization of the desired traits. This can take multiple growing seasons. This process is labour-intensive and requires careful planning and execution over several years to achieve the desired results.
Dissemination: Nowadays, einkorn is not listed in the European catalogue of varieties and seeds, meaning that no registration is needed for this species. Therefore, a selected variety that can be a pure line or a population may be easily disseminated through the selling or exchange of the seeds.

Further information

Further readings

- Hidalgo, A., & Brandolini, A. (2014). Nutritional properties of einkorn wheat (Triticum monococcum L.). *Journal of the Science of Food and Agriculture*, 94(4), 601–612.

Weblinks

- Interactive map to locate and access the main European einkorn collections: https://divinfood.gogocarto.fr/map#/carte/@50.93,0.09,6z?cat=all

About this practice abstract and DIVINFOOD

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Authors: Dominique Desclaux
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Project website: www.divinfood.eu

DIVINFOOD – "Co-constructing interactive short and mid-tier food chains to value agrobioDIVersity IN healthy plant-based FOOD" is supported by the European Union.
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PA #16 How to train grass pea small-scale food processors on Asian style fermentations?

PRACTICE ABSTRACT

DIVINFOOD

How to train grass pea small-scale food processors on Asian style fermentations?

Problem

Food trends are pushing processors to diversify their range of tasty and healthy plant-based products using minimal processing methods.
Fermentation offers a solution to this challenge. However, small-scale processors, working with minor cereals and underused legumes often lack the experience to implement these mild processing techniques on their own.

Applicability box

Theme
Processing of grain legumes
Required time
Less than 1 day workshop preparation; 1-2 hours for miso preparation
Equipment
Standard blender, standard cooking equipment
Best in
Grass pea, can be applied to other legumes with adaptations

Solution

A collaborative effort involving small-scale processors from Portugal's traditional grass pea production region, Alvaiázere (ADECA associates), along with food technologists (Cooking Lab) and plant researchers (UNL), led to a hands-on workshop on grass pea Miso production. The workshop provided both theoretical and practical training, equipping small-scale local processors with the skills to produce Eastern fermented foods from grass pea like Miso. This opened opportunities to start using grass pea Miso as a clean-label ingredient, helping to diversify traditional Western food products.

Benefits

Miso is a Japanese fermented paste, traditionally made from soybeans, and commonly used as a seasoning or in dishes like miso soup. To produce miso, soaked and boiled soybeans are mixed with water, salt, and inoculated with a starter - often an older batch of Miso, similar to how sourdough bread is made. Koji, which is typically made of soybeans, rice, or barley inoculated with the fungus *Aspergillus* sp., is also added to aid the fermentation process.
Prior to this workshop, a grass pea sweet miso was developed to increase this legume's usage and consumption, merging the benefits of both the grass pea and fermented foods. Compared to traditional soybean Miso, grass pea sweet miso contained less fat, slightly lower levels of sodium chloride, and ten times more antioxidants, making it a very interesting alternative to the traditional version.
The grass pea Miso used as a clean label ingredient (meaning no artificial colours or flavouring agents), is expected to enhance food diversity and increase legume consumption, while supporting environmentally sustainable local production of this neglected, yet traditional, crop. Indeed, the DIVINFOOD goal is to use this innovative fermented paste to develop new food products with added-value, aligned with the most recent food trends.

Figure 1: Grass pea Miso Hands On Workshop (E. Mecha/UNL)

ITQB NOVA/ UNL and Cooking Lab. How to train grass pea small-scale food processors on Asian style fermentations?. DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

Practical recommendation

Grass Pea Sweet Miso Ingredients:
Soaked and cooked grass pea seeds, Rice Koji, Salt, a sample from an older batch of unpasteurized miso, Water
Briefly, and during the workshop, a grass pea paste obtained from properly washed, soaked and cooked grass peas was mixed with rice koji and sea salt (10:9:1 mass ratio). The mixture was packed tightly into salt-coated glass jars, leaving a 1.5 cm head-space, and the top was covered with salt. The containers were closed and incubated at room temperature, for at least for three months. The miso was then ready to be added to recipes to make other food products (Figure 2).

Figure 2: Grass pea Miso production step-by-step (E. Mecha/UNL)

Further information

Further readings

Santos, R.; Mansidão, A.; Mota, M.; Raymundo, A.; Prista, C. Development and Physicochemical Characterization of a New Grass Pea (*Lathyrus sativus L.*) Miso. J. Sci. Food Agric. 2021, 101, 2227–2234.

Weblinks

Divinfood's webpage on GRASS PEA: https://divinfood.eu/grass-pea-nuc/

About this practice abstract and DIVINFOOD

Publisher:
ITQB NOVA / UNL and Cooking Lab
Authors: M Carlota Vaz Patto and Catarina Prista
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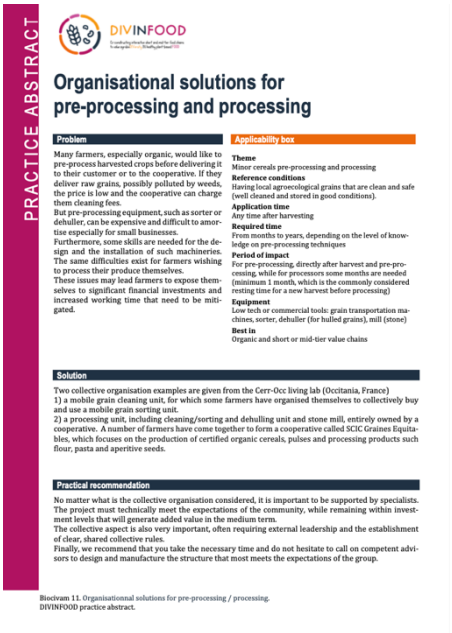
PA #17 Organisational solutions for pre-processing and processing



PRACTICE ABSTRACT

DIVINFOOD

Organisational solutions for pre-processing and processing

Problem

Many farmers, especially organic, would like to pre-process harvested crops before delivering it to their customer or to the cooperative. If they deliver raw grains, possibly polluted by weeds, the price is low and the cooperative can charge them cleaning fees.
But pre-processing equipment, such as sorter or dehuller, can be expensive and difficult to amortise especially for small businesses.
Furthermore, some skills are needed for the design and the installation of such machineries. The same difficulties exist for farmers wishing to process their produce themselves.
These issues may lead farmers to expose themselves to significant financial investments and increased working time that need to be mitigated.

Applicability box

Theme
Minor cereals pre-processing and processing
Reference conditions
Having local agroecological grains that are clean and safe (well cleaned and stored in good conditions).
Application time
Any time after harvesting
Required time
From months to years, depending on the level of knowledge on pre-processing techniques
Period of impact
For pre-processing, directly after harvest and pre-processing, while for processors some months are needed (minimum 1 month, which is the commonly considered resting time for a new harvest before processing)
Equipment
Low tech or commercial tools: grain transportation machines, sorter, dehuller (for hulled grains), mill (stone)
Best in
Organic and short or mid-tier value chains

Solution

Two collective organisation examples are given from the Cerr-Occ living lab (Occitania, France)
1) a mobile grain cleaning unit, for which some farmers have organised themselves to collectively buy and use a mobile grain sorting unit.
2) a processing unit, including cleaning/sorting and dehulling unit and stone mill, entirely owned by a cooperative. A number of farmers have come together to form a cooperative called SCIC Graines Equitables, which focuses on the production of certified organic cereals, pulses and processing products such flour, pasta and aperitive seeds.

Practical recommendation

No matter what is the collective organisation considered, it is important to be supported by specialists. The project must technically meet the expectations of the community, while remaining within investment levels that will generate added value in the medium term.
The collective aspect is also very important, often requiring external leadership and the establishment of clear, shared collective rules.
Finally, we recommend that you take the necessary time and do not hesitate to call on competent advisors to design and manufacture the structure that most meets the expectations of the group.

Biocivam 11. Organisationnal solutions for pre-processing / processing.
DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

Benefits

The initial motivation for this collective purchase and organisation is to enable organic farmers to add value to their produce through on-farm cleaning, while limiting investment costs.
The equipment purchased is a rotary drum sorter, which costs the CUMA (French acronym for "cooperative for the use of agricultural equipment") €100,000. Around thirty different sized screens are available to the farmers, allowing them to adapt to a wide range of crops.
Farmers have to pay €110 per hour to use it. With a grain flow of 3 to 5 tonnes per hour, the cost is between €22 and €37 per tonne, which is cheaper than a commercial facility (current price in commercial facilities range between 40 and 75€). Also, as the clean unit is mobile, there is very low transportation costs, limited to the unit transportation that pays for itself as soon as 3.5 tonnes of grain are sorted.
The cooperative's new sorting and storage facility is also a competitive tool for sorting agroecological seeds. Meaning that the farmers can increase agroecological practices such as intercropping and the different mixtures are separated on arrival. They benefit from low costs seeds and a valorisation above organic market standard prices.

Credit : "Dorez-trieur-TRIBIO" : Lafranceagricole

Credit : "trieur dorez" : Entraid

Credit : "stockage-laure-2" : SCIC Graines Equitables

Further information

Weblinks

SCIC Graines Équitables homepage: https://graines-equitables.fr

About this practice abstract and DIVINFOOD

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Authors: Dylan Clair
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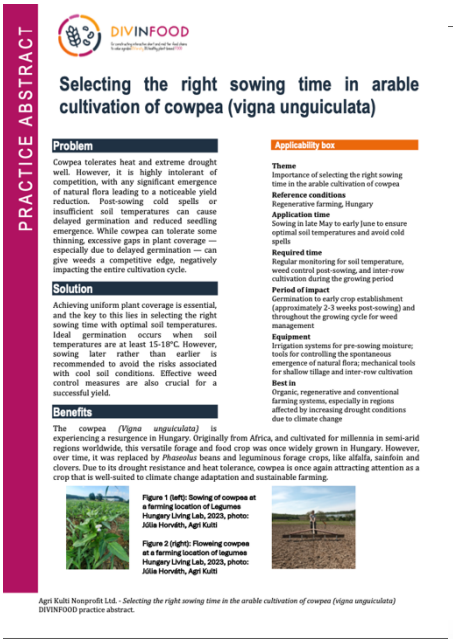
PA #18 Selecting the right sowing time in arable cultivation of cowpea (vigna unguiculata)



PRACTICE ABSTRACT

DIVINFOOD

Selecting the right sowing time in arable cultivation of cowpea (vigna unguiculata)

Problem

Cowpea tolerates heat and extreme drought well. However, it is highly intolerant of competition, with any significant emergence of natural flora leading to a noticeable yield reduction. Post-sowing cold spells or insufficient soil temperatures can cause delayed germination and reduced seedling emergence. While cowpea can tolerate some thinning, excessive gaps in plant coverage — especially due to delayed germination — can give weeds a competitive edge, negatively impacting the entire cultivation cycle.

Solution

Achieving uniform plant coverage is essential, and the key to this lies in selecting the right sowing time with optimal soil temperatures. Ideal germination occurs when soil temperatures are at least 15-18°C. However, sowing later rather than earlier is recommended to avoid the risks associated with cool soil conditions. Effective weed control measures are also crucial for a successful yield.

Benefits

The cowpea *(Vigna unguiculata)* is experiencing a resurgence in Hungary. Originally from Africa, and cultivated for millennia in semi-arid regions worldwide, this versatile forage and food crop was once widely grown in Hungary. However, over time, it was replaced by *Phaseolus* beans and leguminous forage crops, like alfalfa, sainfoin and clovers. Due to its drought resistance and heat tolerance, cowpea is once again attracting attention as a crop that is well-suited to climate change adaptation and sustainable farming.

Applicability box

Theme
Importance of selecting the right sowing time in the arable cultivation of cowpea

Reference conditions
Regenerative farming, Hungary

Application time
Sowing in late May to early June to ensure optimal soil temperatures and avoid cold spells

Required time
Regular monitoring for soil temperature, weed control post-sowing, and inter-row cultivation during the growing period

Period of impact
Germination to early crop establishment (approximately 2-3 weeks post-sowing) and throughout the growing cycle for weed management

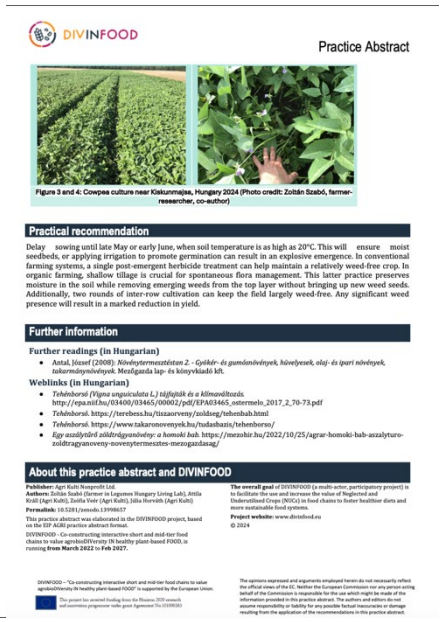
Equipment
Irrigation systems for pre-sowing moisture; tools for controlling the spontaneous emergence of natural flora; mechanical tools for shallow tillage and inter-row cultivation

Best in
Organic, regenerative and conventional farming systems, especially in regions affected by increasing drought conditions due to climate change

Figure 1 (left): Sowing of cowpea at a farming location of Legumes Hungary Living Lab, 2023, photo: Júlia Horváth, Agri Kulti

Figure 2 (right): Flowering cowpea at a farming location of legumes Hungary Living Lab, 2023, photo: Júlia Horváth, Agri Kulti

Agri Kulti Nonprofit Ltd. - *Selecting the right sowing time in the arable cultivation of cowpea (vigna unguiculata)* DIVINFOOD practice abstract.



DIVINFOOD

Practice Abstract

Figure 3 and 4: Cowpea culture near Kiskunmajas, Hungary 2024 (Photo credit: Zoltán Szabó, farmer-researcher, co-author)

Practical recommendation

Delay sowing until late May or early June, when soil temperature is as high as 20°C. This will ensure moist seedbeds, or applying irrigation to promote germination can result in an explosive emergence. In conventional farming systems, a single post-emergent herbicide treatment can help maintain a relatively weed-free crop. In organic farming, shallow tillage is crucial for spontaneous flora management. This latter practice preserves moisture in the soil while removing emerging weeds from the top layer without bringing up new weed seeds. Additionally, two rounds of inter-row cultivation can keep the field largely weed-free. Any significant weed presence will result in a marked reduction in yield.

Further information

Further readings (in Hungarian)

- Antal, József (2008): *Növénytermesztéstan 2. - Gyökér- és gumósnövények, hüvelyesek, olaj- és ipari növények, takarmánynövények.* Mezőgazda lap- és könyvkiadó kft.

Weblinks (in Hungarian)

- *Tehénborsó (Vigna unguiculata L.) tájfajták és a klímaváltozás.* http://epa.niif.hu/03400/03465/00002/pdf/EPA03465_ostermelo_2017_2_70-73.pdf
- *Tehénborsó.* https://terebess.hu/tiszaorveny/zoldseg/tehenbab.html
- *Tehénborsó.* https://www.takaronovenyek.hu/tudasbazis/tehenborso/
- *Egy aszálytűrő zöldtrágyanövény: a homoki bab.* https://mezohir.hu/2022/10/25/agrar-homoki-bab-aszalyturo-zoldtragyanoveny-sovenytermesztes-mezogazdasag/

About this practice abstract and DIVINFOOD

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Authors: Zoltán Szabó (farmer in Legumes Hungary Living Lab), Attila Králl (Agri Kulti), Zsófia Veér (Agri Kulti), Júlia Horváth (Agri Kulti)
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Project website: www.divinfood.eu

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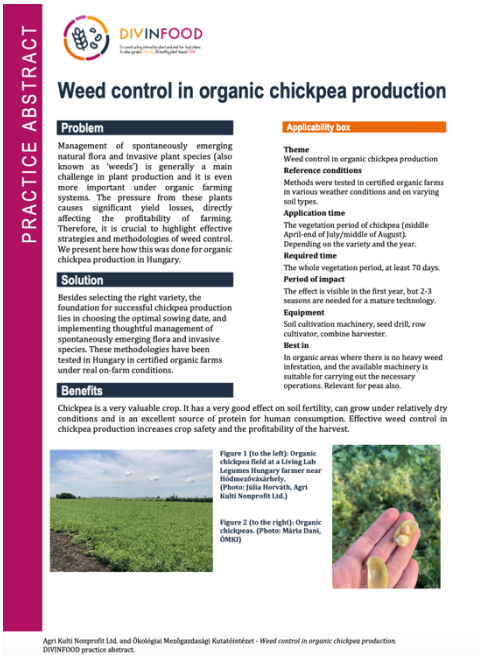
PA #19 Weed control in organic chickpea production



PRACTICE ABSTRACT

DIVINFOOD

Weed control in organic chickpea production

Problem

Management of spontaneously emerging natural flora and invasive plant species (also known as 'weeds') is generally a main challenge in plant production and it is even more important under organic farming systems. The pressure from these plants causes significant yield losses, directly affecting the profitability of farming. Therefore, it is crucial to highlight effective strategies and methodologies of weed control. We present here how this was done for organic chickpea production in Hungary.

Solution

Besides selecting the right variety, the foundation for successful chickpea production lies in choosing the optimal sowing date, and implementing thoughtful management of spontaneously emerging flora and invasive species. These methodologies have been tested in Hungary in certified organic farms under real on-farm conditions.

Benefits

Chickpea is a very valuable crop. It has a very good effect on soil fertility, can grow under relatively dry conditions and is an excellent source of protein for human consumption. Effective weed control in chickpea production increases crop safety and the profitability of the harvest.

Applicability box

Theme
Weed control in organic chickpea production

Reference conditions
Methods were tested in certified organic farms in various weather conditions and on varying soil types.

Application time
The vegetation period of chickpea (middle April-end of July/middle of August). Depending on the variety and the year.

Required time
The whole vegetation period, at least 70 days.

Period of impact
The effect is visible in the first year, but 2-3 seasons are needed for a mature technology.

Equipment
Soil cultivation machinery, seed drill, row cultivator, combine harvester.

Best in
In organic areas where there is no heavy weed infestation, and the available machinery is suitable for carrying out the necessary operations. Relevant for peas also.

Figure 1 (to the left): Organic chickpea field at a Living Lab Legumes Hungary farmer near Hódmezővásárhely. (Photo: Júlia Horváth, Agri Kulti Nonprofit Ltd.)

Figure 2 (to the right): Organic chickpeas. (Photo: Mária Dani, ÖMKI)

Agri Kulti Nonprofit Ltd. and Ökológiai Mezőgazdasági Kutatóintézet - *Weed control in organic chickpea production.* DIVINFOOD practice abstract.

DIVINFOOD

Practice Abstract

Figures 3 and 4: Chickpea from an LL Leghung farm in Baranya county, Hungary (Photo: Júlia Horváth, Agri Kulti)

Practical recommendation

Ensure that the soil temperature reaches at least 10-12°C before planting, as recent cold springs have often been too frosty. Exposure to cold can inhibit seed germination.
It is crucial to assess the predominant weed species in the selected sowing area. In fields heavily infested with perennial plants (e.g., creeping thistle, bitter dock, convolvulus species), organic chickpea production should be reconsidered or potentially avoided.
Pre-crops with strong weed suppression effects can significantly aid in weed control. Although crop rotation is often challenging to plan due to seasonal variability, cereals (e.g., winter wheat) are essential, and cover crops can also be beneficial.
The choice of row spacing and planting density should be adapted to the available row-cropping tools. Soil cultivation should be done carefully, considering the soil conditions and the drying effect of mechanical control.
In irrigated areas, a false seedbed can be prepared to promote weed emergence, followed by a single mechanical weed control using a harrow. Excessive soil disturbance can lead to compaction and drying, so it should be minimised .
Weed control strategies may also include mixed sowings (e.g., flax/wheat/mustard/chickpea) or planting chickpea in mulch (direct sowing of chickpea after rolling rye).

Further information

Weblinks
Chickpea as a species facilitating climate adaptation - https://ltz.landwirtschaft-bw.de/,Len/Arbeitsfelder/adaptation
Intercropping chickpea with flax increases yield stability - https://www.topcropmanager.com/intercropping-chickpea-with-flax/

About this practice abstract and DIVINFOOD

Publisher:
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Ökológiai Mezőgazdasági Kutatóintézet
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Project website: www.divinfood.eu

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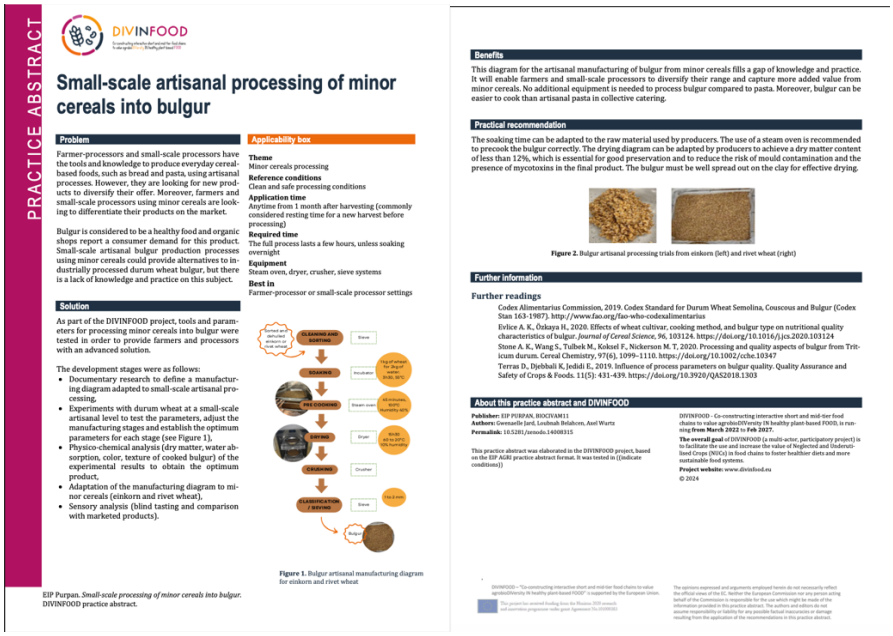
PA #20 Small-scale artisanal processing of minor cereals into bulgur



PRACTICE ABSTRACT

DIVINFOOD

Small-scale artisanal processing of minor cereals into bulgur

Problem

Farmer-processors and small-scale processors have the tools and knowledge to produce everyday cereal-based foods, such as bread and pasta, using artisanal processes. However, they are looking for new products to diversify their offer. Moreover, farmers and small-scale processors using minor cereals are looking to differentiate their products on the market.

Bulgur is considered to be a healthy food and organic shops report a consumer demand for this product. Small-scale artisanal bulgur production processes using minor cereals could provide alternatives to industrially processed durum wheat bulgur, but there is a lack of knowledge and practice on this subject.

Solution

As part of the DIVINFOOD project, tools and parameters for processing minor cereals into bulgur were tested in order to provide farmers and processors with an advanced solution.

The development stages were as follows:

- Documentary research to define a manufacturing diagram adapted to small-scale artisanal processing.
- Experiments with durum wheat at a small-scale artisanal level to test the parameters, adjust the manufacturing stages and establish the optimum parameters for each stage (see Figure 1).
- Physico-chemical analysis (dry matter, water absorption, color, texture of cooked bulgur) of the experimental results to obtain the optimum product,
- Adaptation of the manufacturing diagram to minor cereals (einkorn and rivet wheat),
- Sensory analysis (blind tasting and comparison with marketed products).

Applicability box

Theme
Minor cereals processing
Reference conditions
Clean and safe processing conditions
Application time
Anytime from 1 month after harvesting (commonly considered resting time for a new harvest before processing)
Required time
The full process lasts a few hours, unless soaking overnight
Equipment
Steam oven, dryer, crusher, sieve systems
Best in
Farmer-processor or small-scale processor settings

Figure 1. Bulgur artisanal manufacturing diagram for einkorn and rivet wheat

EIP Purpan. *Small-scale processing of minor cereals into bulgur.* DIVINFOOD practice abstract.

Benefits

This diagram for the artisanal manufacturing of bulgur from minor cereals fills a gap of knowledge and practice. It will enable farmers and small-scale processors to diversify their range and capture more added value from minor cereals. No additional equipment is needed to process bulgur compared to pasta. Moreover, bulgur can be easier to cook than artisanal pasta in collective catering.

Practical recommendation

The soaking time can be adapted to the raw material used by producers. The use of a steam oven is recommended to precook the bulgur correctly. The drying diagram can be adapted by producers to achieve a dry matter content of less than 12%, which is essential for good preservation and to reduce the risk of mould contamination and the presence of mycotoxins in the final product. The bulgur must be well spread out on the clay for effective drying.

Figure 2. Bulgur artisanal processing trials from einkorn (left) and rivet wheat (right)

Further information

Further readings

Codex Alimentarius Commission, 2019. Codex Standard for Durum Wheat Semolina, Couscous and Bulgur (Codex Stan 163-1987). http://www.fao.org/fao-who-codexalimentarius

Evlice A. K., Özkaya H., 2020. Effects of wheat cultivar, cooking method, and bulgur type on nutritional quality characteristics of bulgur. *Journal of Cereal Science, 96*, 103124. https://doi.org/10.1016/j.jcs.2020.103124

Stone A. K., Wang S., Tulbek M., Koksel F., Nickerson M. T, 2020. Processing and quality aspects of bulgur from Triticum durum. Cereal Chemistry, 97(6), 1099-1110. https://doi.org/10.1002/cche.10347

Terras D., Djebbali K, Jedidi E., 2019. Influence of process parameters on bulgur quality. Quality Assurance and Safety of Crops & Foods. 11(5): 431-439. https://doi.org/10.3920/QAS2018.1303

About this practice abstract and DIVINFOOD

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This practice abstract was elaborated in the DIVINFOOD project, based on the EIP AGRI practice abstract format. It was tested in [(indicate conditions)]

DIVINFOOD - Co-constructing interactive short and mid-tier food chains to value agrobioDIVersity IN healthy plant-based FOOD, is running **from March 2022** to **Feb 2027.**

The overall goal of DIVINFOOD (a multi-actor, participatory project) is to facilitate the use and increase the value of Neglected and Underutilised Crops (NUCs) in food chains to foster healthier diets and more sustainable food systems.

Project website: www.divinfood.eu

3. Final considerations

The full set of 20 practice abstracts reflects a collaborative effort carried out by the DIVINFOOD community. First and foremost, PAs are tangibly resulting from the authorial contribution of a significant number of partners, to whom goes our gratitude. But they also reflect the activities carried out in the project pooling together the expertise tacitly and explicitly offered by all those who animated the Living Labs initiatives.

Several practice abstracts epitomise the combination of the existing knowhow and *savoir faire*, which is significantly available in the DIVINFOOD's Living Labs, with the innovative explorations activated by the project. Acknowledgment should thus be credited to the here unmentioned, yet generous providers of ideas, experiences and experiments that have been involved by the project: farmers, gardeners, processors, consumers, activists, students, territorial development agents.

The diverse typology of information sources and holders is well reflected in this first set of practice abstracts, which covers a wide range of topics, territories, crops and practices at different value chain stages. The DIVINFOOD approach is thus well represented by this initial batch of PAs, having the intention to showcase the many possible angles of interventions that enable the popularisation of NUCs and the possibility to pull them outside a too narrow niche. In this respect, having both a 'technical' and 'conceptual' PA formula amplified the dissemination potential and also accommodated the possibility for partners to report activities as well as reflections.

It also needs to be acknowledged that the PA writing process is not necessarily an easy endeavour. Some partners were pushed outside their comfort zone as they were not necessarily familiar with its concise formula and hardly flexible template. This somehow required an accompaniment by the DIVINFOOD's PA team to support the identification of the relevant information to be provided and its provisional distribution. A sort of uneven informative quality inevitably arises from such a process. However, this also implies that the PA process resulted in a learning trajectory for all involved. Moreover, it also consolidated ties in the project, as the whole process evidenced a widespread availability to contribute to the common endeavour and responsiveness to comments and suggestions for improvement, which should not be taken for granted.

At the same time, it proved to be a relatively time-consuming journey: the Spring 2024 launch of the writing process was not timely enough as a few delays were accumulated in the writing and review routes. This was also due to the fact that templates and instructions were not necessarily easy to digest, notably by those with less familiarity with the process. On the same vein, it should be stated that the duplication of effort to feed the EIP-AGRI practice abstract repository does not seem to be sufficiently impactful as information has to be reduced and reformulated, the complementary visual integration is sacrificed (pictures or graphs cannot be integrated in the form), additional sources of information cannot be given and authorship may not be credited. In view of the more firmly establishment of the EU Farmbook, which aims at becoming a reference repository of all knowledge materials generated by research and innovation projects, it would be advisable to redesign the practice abstracts valorisation framework, possibly valuing the editorial effort carried out in their original formulation.

Finally, the DIVINFOOD PA team wishes to state that it is committed to draw lessons from all learnings generated by the compilation of this first batch of practice abstracts in view of the production of a new generation of PAs and other dissemination materials.