TRansition paths to sUstainable legume-based systems in Europe

TRUE Deliverable 1.9 (D9), Report, Public

Practice Abstracts I

Last updated: 28th March 2019

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Deliverable Description & Contributors

- **Due date:** 31st March 2019
- **Actual submission date:** 28th March 2019
- **Project start date:** 1 st April 2017
- **Duration:** 48 months
- **Work package:** Knowledge Exchange and Communication (WP1)
- **Work package leader:** Alicia Kolmans (UHOH)
- **Deliverable Title:** Practice Abstracts I
- **Nature of deliverable:** Report
- **Dissemination level:** PU: Public

- **Deliverable description:** As a requirement of multi-actor approach, this first milestone for these products aims to deliver the first batch of formalised 'Practice Abstracts'. These will be delivered in the EIP common format (as an Excel file) and shall turn innovative knowledge resulting from the project activities into accessible easy-to-use material for end-users. The practical knowledge will be described in simple terms, easily understood by lay-persons and/or specific stakeholders. In total, we estimate conservatively that there will be a minimum total of 36 Practice Abstracts over the course of the project - with 18 abstracts to be delivered at this mid-term, month 24, stage.

- **Contributors:**
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Content

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Summary

Practice abstracts (PAs) are a common format of all EU multiactor projects to provide recommendations to end-users. They are uploaded to the data base of the EIP Agri Service Point. The EIP AGRI Service Point provides the criteria for writing PAs as follows:

> This summary should at least contain the following information:
>
> - *main results/outcomes of the activity (expected or final); and,*
> - *the main practical recommendation(s): what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?*

This summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). Research oriented aspects which do not help the understanding of the practice itself should be avoided.

The PAs are supposed to be written in the native language of the project partner as well as translated into English.

In this deliverable 19 PA are published, written by 13 different project partners. They are sorted by their focus with respect to the use of legumes within the supply chain. This leads to the chapters, "*Production of legumes for food and feed*" (6 PAs), "*Legumes used as green manure*" (4 PAs), "*Processing of legumes for food*" (4 PAs), "*Marketing of legumes for food*" (2 PAs) and "*Legume supply chains*" (3 PAs). The targeted end-users are growers, aquaculturalists, processors (*e.g.* brewer or bakers), chefs and consumers. For 11 PAs the native language is not English, so there is a translation into DE (4), GR (3), DK (2) and HU (2) (*see also in Table 1*).

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Table 1. Practice Abstract titles categorised according to their target 'supply chain sector', legume 'use', intended 'end-user', TRUE-Case Study ('CS') number, -Work Package ('WP'), and languages ('Lang.')

Supply chain sector	Use	Title	End-User	CS	WP	Partner	Lang.
production	food	Impact of varying inorganic nitrogen supply on growth and yield of common bean grown hydroponically	growers		2	AUA	EN,GR
		What are the best companion crops for lentil?	growers	13	2	UHOH	EN,DE
	feed	Lupin in shrimp diets reduces cost and promotes animal health	aquaculturalists	15	3	AWI	EN,DE
		How can greenhouse gas emissions in milk production be lowered?	growers	1	2	TEAG	EN
	food and feed	Effects of inoculated legumes in intercropping systems on weeds and soil fertility	growers	24	2	KEFRI	EN
		The profitable integration of grain legumes: barley in Scotland as a case study	growers			JHI	EN
	manure	Cultivating faba bean as green manure in the Mediterranean region	growers		2	AUA	EN,GR
		Transition to legume biofertilizers for sustainable agriculture	growers		2	AUA	EN,GR
		Why and how to grow into a living mulch of in-crop clover?	growers	6	2	STC	EN
		Using legumes as green manures in protected cropping	growers	8	2	CU	EN
processing	food	Legumes as an adjunct in beer production	brewers	3	3	Airbikie	EN
		Distilled spirit production can serve as a new legume market	brewers	3	3	Airbikie	EN
		Development and processing of protein rich vegetable foods	processors	-	3	IGV	EN,DE
		Extrusion as a way to develop new legume products	processors	-	3	IGV	EN,DE
		Use your network for successful product development - the case of legume-based flours for gluten-free baked goods	entrepreneurs	9	4	IFAU	EN,DK
		How entrepreneurs can benefit from consumer focus groups	entrepreneurs	11	4	IFAU	EN,DK
entire supply chain	food	How to re-introduce traditional Hungarian legume land races in short food value chains?	growers, chefs, consumers	17	2	AgriKulti	EN,HU
	food and feed	Re-diversifying agri-food systems: Growing soybean in Scotland	all			JHI	EN
		Opportunities of stakeholders for legume-based innovation. The case of Hungary	all		7	ESSRG	EN,HU

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Lists of practice abstracts

Production of legumes for food and feed

Impact of varying inorganic nitrogen supply on growth and yield of common bean grown hydroponically

Hydroponic cultivation of grain legumes such as common beans aims achieve a more sustainable and less costly production by reducing inorganic nitrogen (N) input and without compromising yield. This is possible in practice based on the unique capability of legumes to form symbiotic relationships with bacteria commonly called 'rhizobia'. Rhizobia reside within root nodules where they fix inert atmospheric di-nitrogen gas into forms that can be used by the plants. Hence, while in nature legumes plants can meet their entire N requirements from N fixation, we found that in hydroponic cultivation systems, provision of inorganic N helped the productivity. During growth inorganic N should be supplied at levels of up to 60% of requirement. However, from the flowering stage onwards, when nitrogen fixation begins to diminish, inorganic N-supply can be limited to approximately 25-30 % of the full requirement. This research has shown that such a reduction resulted in fewer larger nodules, that yield was not compromised (compared to plants supplied with 100% inorganic N (*i.e.* without rhizobia inoculation)). Thus, applying up to 60% of the grain legumes full requirements in inorganic N until the flowering stage, and 25-30% thereafter can be an effective strategy for the efficient hydroponic cultivation of common beans, and could reduce inorganic N fertiliser requirement.

Characters: 1169

Native Language: Greek

Επίδραση της διαφορετικής συγκέντρωσης αζώτου στην ανάπτυξη και την απόδοση υδροπονικά καλλιεργούμενου φασολιού

Στην υδροπονική καλλιέργεια ψυχανθών, όπως το φασόλι, η κύρια στρατηγική για βιωσιμότερη και οικονομικότερη καλλιέργεια είναι η μείωση του ανόργανου αζώτου στο θρεπτικό διάλυμα, χωρίς να μειωθεί η απόδοση της καλλιέργειας. Αυτό είναι πρακτικά εφικτό εξαιτίας της μοναδικής ικανότητας των ψυχανθών να σχηματίζουν συμβιωτικές σχέσεις με βακτήρια που ονομάζονται «ριζόβια». Τα ριζόβια βρίσκονται στη ρίζα σε σχηματισμούς που ονομάζονται φυμάτια, όπου μετατρέπουν το ατμοσφαιρικό άζωτο σε βιοαπορροφήσιμη μορφή. Ως εκ τούτου, ενώ στη φύση τα ψυχανθή καλύπτουν τις ανάγκες τους σε άζωτο δεσμεύοντάς το, διαπιστώθηκε ότι στα υδροπονικά σύστηματα καλλιέργειας η παροχή ανόργανου αζώτου αύξησε την παραγωγή. Κατά το στάδιο ανάπτυξης, τα φυτά θα πρέπει να τροφοδοτούνται με άζωτο που να καλύπτει το 50-60% των συνολικών αναγκών του φυτού. Ωστόσο, από το στάδιο της άνθησης και μετά, που η εγκατάσταση των ριζοβίων έχει σχεδόν ολοκληρωθεί και μέχρι το τέλος της καλλιέργειας, το άζωτο μπορεί να μειωθεί τόσο που να καλύπτει το 25-30% των συνολικών αναγκών. Η παρούσα έρευνα έδειξε, ότι η μείωση του αζώτου είχε ως αποτέλεσμα το σχηματισμό λιγότερων αλλά μεγαλύτερων

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φυματίων χωρίς μείωση της ανάπτυξης και της απόδοσης (σε σύγκριση με φυτά στα οποία καλύφθηκε το 100% των αναγκών τους σε άζωτο (π.χ. χωρίς να εμβολιαστούν με ριζόβια)). Έτσι, η εφαρμογή ανόργανου αζώτου σε ποσοστό που να καλύπτει το 60% των συνολικών αναγκών των φυτών μέχρι το στάδιο της άνθησης και σε ποσοστό 25-30% για το υπόλοιπο διάστημα, μπορεί να αποτελέσει μια στρατηγική καλλιέργεια ψυχανθών που μειώνει την παροχή αζωτούχων λιπασμάτων.

Characters: 1361

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Figure 1. Common beans in Hydroponically cultivation with different N-supply-strategies. *Photo credits ©: Vasiliki Vougeleka*

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What are the best companion crops for lentil?

Lentil cultivation is not easy in temperate climates, such as in Germany. Lentil plants have an indeterminate growth and small, weak tendrils. Under summer drought, as in the Mediterranean region, lentil growth stops due to water shortage, and plants do not lodge. Under humid conditions, the lentils continue to grow, and plants lodge easily due to stem instability. Hence, lentils need a companion crop to stabilize the plants in these climates. Since crop water content at harvest is often ≥20% in Germany, immediate drying is crucial. Lentils and the companion crop must then be separated using adequate technical facilities.
Farmers should consider the following issues when selecting companion crops for lentils:

- Is the growing season similar?
- Is the sowing depth similar?
- Is the leaf architecture of the companion crop suitable to reduce lodging?
- How does the companion crop compete with lentils *versus* weeds?
- Are facilities available to dry the harvested crop?
- Are facilities available to clean and separate lentil seeds from companion crop seeds?
- Is there a market and a satisfactory price for the harvested companion crop?

Similarity of growing seasons, suitable phenotype of the companion crop, and availability of facilities for drying, cleaning and separating are basic requirements. For sowing depth, a compromise can be achieved, or seeding carried out in two passes or with special seeders. Competition of companion crops with lentils and weeds can be adapted by the mixing ratio and number of plants m^{-2}. A mixed cropping system for lentils contributes to species diversity and thus to overall ecological requirements.

Characters: 1389

Native Language: German

Welche Stützfrüchte passen zu Linsen?

Im feucht-gemäßigten Klima ist der Linsenanbau nicht ganz einfach. Da die Pflanzen stetig weiter in die Länge wachsen und nur schwach ausgebildete Ranken haben, neigen sie zum Lagern. Das geschieht nicht in Regionen mit Sommertrockenheit, da hier die Pflanzen mit zunehmender Wasserknappheit das Wachstum einstellen und klein und standfest bleiben. Im feuchten Klima aber ist eine Stützfrucht erforderlich, um den Linsenpflanzen einen Halt zu bieten. Auch ist hier eine Trocknung des Ernteguts meistens zwingend erforderlich, da der Wassergehalt der Linsen oft mehr als 20 % beträgt. Eine weitere Herausforderung ist die Trennung der Samen von Linse und Stützfrucht.
Bevor Landwirte in den Linsenanbau einsteigen, sind für die Wahl der Stützfrucht folgende Kriterien zu berücksichtigen:

- Decken sich die Wachstumsperioden von Linsen und Stützfrucht?
- Ist die Saattiefe gleich?
- Ist die Stützwirkung ausreichend?
- Wie stark ist die Konkurrenz der Stützfrucht gegenüber Linsen und Unkraut?

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- Sind Trocknungs- und Reinigungsanlagen verfügbar?
- Gibt es einen Markt und einen hinreichenden Preis für das Erntegut der Stützfrucht?

Grundvoraussetzungen für den Gemengeanbau von Linsen mit Stützfrucht sind gleiche Wachstumszeiten, hinreichende Stützwirkung und die Verfügbarkeit von Reinigungs- und Trocknungsanlagen. Bei der Saattiefe muss entweder ein Kompromiss eingegangen werden, oder die Gemengepartner werden in getrennten Arbeitsgängen bzw. mit einer speziellen Sämaschine zusammen gesät. Die Konkurrenz der Stützfrucht kann über die Saatstärke angepasst werden. Insgesamt trägt der Mischanbau von Linsen im Gemenge zur Artenvielfalt bei und zur ökologischen Wertigkeit von Ackerflächen bei.

Characters: 1462

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Figure 2. Experimental field of lentils with barley as companion crop. *Photo credits ©: Sabine Zikeli*

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Lupin in shrimp diets reduces cost and promotes animal health

Fishmeal and fish oil still are traditional resources for feeds for fish and crustaceans grown in aquaculture. The fishmeal in particular contains readily digested protein and a complete amino acid profile. This provides all nutrients the animals, especially carnivores like salmon, trout, seabass, seabream, shrimps, need. The demand for fishmeal has risen as the aquaculture sector has expanded, which has driven up prices for fishmeal. Legumes are the main alternative to fishmeal: soya has been one of the main ingredients in fish diets besides fishmeal for more than 20 years. The use of other locally produced legumes such as lupin or faba bean, which are more suitable in terms of the digestibility and sustainability, is now a focus of research.
At the Alfred Wegener Institute, researchers tested dehulled lupin meal at high diet inclusion rates (10, 20 and 30%) in feeds formulated for white leg shrimp, which is the most produced shrimp species worldwide. Results showed that an inclusion rate of 10% lupin meal is more than recommendable as this boosted immune response, showed excellent growth and lowered diet cost by 7 %.

Characters: 954

Native Language: German

Lupine im Shrimpfutter reduziert die Futterkosten und stärkt das Immunsystem

Fischmehl und Fischöl sind nach wie vor traditionelle Ressourcen in Futtermitteln für Fische und Krebstiere in Aquakulturen. Fischmehl enthält insbesondere leicht verdauliches Protein, ein vollständiges Aminosäureprofil und liefert alle Nährstoffe, die die Tiere, insbesondere Fleischfresser wie Lachs, Forelle, Seebarsch, Goldbrasse, Garnelen, benötigen. Die Nachfrage nach Fischmehl ist durch das enorme Wachstum des Aquakultursektors stark angestiegen, und auch die Preise für Fischmehl steigen. Hülsenfrüchte sind die Hauptalternative für Fischmehl: Neben Fischmehl ist Soja seit über 20 Jahren einer der Hauptbestandteile der Fischdiät. Die Verwendung anderer lokal hergestellter Hülsenfrüchte wie Lupinen oder Ackerbohnen, die hinsichtlich Verdaulichkeit und Nachhaltigkeit besser geeignet sind, ist nun ein Forschungsschwerpunkt. Am Alfred-Wegener-Institut wurde geschältes Lupinenmehl mit hohen Anteilen (10, 20 und 30%) in Futtermitteln für den „White Leg Shrimp“, die weltweit am meisten produzierte Garnelensorte, getestet. Die Ergebnisse zeigen, dass ein Anteil von 10% Lupinenmehl im Futtermittel mehr als empfehlenswert ist, da so das Immunsystem angeregt, die Diätkosten um 7% gesenkt und ein hervorragendes Wachstum erzielt wird.

Characters: 1086

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How can greenhouse gas emissions in milk production be lowered?

Agriculture in Ireland is a major source of greenhouse gas (GHG) emissions and removal of the milk quota has stimulated a rapid increase in milk output. This has made it more difficult to meet GHG reduction targets, although several avenues for lowering GHG emissions from dairy farms while maintaining profitability exist. Available 'off the shelf' technologies include:

(1) significantly reducing fertiliser Nitrogen (N) input and rely on white clover nitrogen fixation in the paddocks to make up for the reduced N input;
(2) using protected (N-(n-butyl) triphosphoric triamide-treated) urea as a fertiliser instead of calcium ammonium nitrate and urea;
(3) using a trailing shoe instead of the commonly used downward-facing splash plate for slurry application; and,
(4) selecting high breeding index cows, resulting in an increased milk and milk solids output.

The current Irish national average emission is 1.23 kg CO_2-equivalents *per* litre milk. To reduce this number, while maintaining current levels of milk output *per* ha and profitability, at the Solohead Research Farm, a control group having standard farm practices is being compared with a Low Carbon (LC) group where the above-mentioned strategies were implemented simultaneously. Results to date show a 17% emissions reduction in the LC system, as well as higher milk and milk solids output with lower inputs. The decreased inputs and increased outputs also help to maintain or even improve farm profitability.

Characters: 1248

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Effects of inoculated legumes in intercropping systems on weeds and soil fertility in Kenya

Intercropping legumes and non-legumes is a widely used strategy that benefits low-resourced small-scale farmers to mitigate food insecurity by improving soil fertility, and hence crop yield. In sub-Saharan Africa, intercropping cereals, commonly maize, with legumes maximizes utilization of land and labour, and attains higher crop yields. Through the application of tacit knowledge to combat the impacts of climate change, farmers choose to grow a combination of non-legume crops such as maize, sorghum, millet, cassava with pulse legumes, namely common bean, cowpea, pigeon pea and/or N_2-fixing trees and shrubs such as calliandra (*Calliandra calothyrsus*), sesbania (*Sesbania sesban*), tephrosia (*Tephrosia candida*) and desmodium (*Desmodium uncinatum*) as a sustainable source of protein, and organic nitrogen through biomass transfer. In on-going trials carried out in Kenya, preliminary results have demonstrated that as well as being a source of biologically fixed nitrogen, legumes also deter or suppress germination of *Striga hermonthica*, a hemiparasitic plant that retards the productivity of cereal crops, especially in infertile soils. The trials also show that inoculation of the legumes enhances the growth and productivity of the legumes, especially the pulses. Embracing on the use of rhizobia-inoculated tephrosia as a fallow species can help eradicate *Striga hermonthica* and improves soil fertility.

Characters: 1214

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Figure 3. Spreading Tephrosia biomass in one of the experimental sub-plot in Nyabeda Primary School and carrying home fuel wood from a Tephrosia harvest. *Photo credits ©: Emmanuel Makatiani.*

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The profitable integration of grain legumes: barley in Scotland as a case study

Legume cropping is low across Europe, occupying 1-4 % of the arable farmed area. In Scotland, grain legume cultivation accounts for less than 1 % of the arable area. In contrast, barley occupies two thirds of the area and while half is used as animal feed, half serves whisky and beer production. Since these fermentation-based businesses account for £10 billion of UK tax revenue, any loss of barley production area needs careful consideration: especially since domestic barley production falls 20% short of demand. Therefore, a major challenge is: how may legumes be integrated into a barley dominated system? Intercropping barley with peas is an option and intercropped-barley yield can match that of monocropped-barley. However, pea-plant density needs to be controlled to 20% or less of barley plant numbers. Also, more-upright pea varieties should be sought (*e.g.* maple pea). To safeguard the nitrogen content of the barley to meet malting qualities, no more than 20 kg/ha ammonium sulphate may be added at seed-drilling, and direct-drilling of seed is preferred to help reduce pathogen incidence. Herbicide and pesticide applications can probably be avoided. Seed may be separated after harvest for different markets or used as a mixture for feed on farm. This approach can deliver 20% more yield *per* unit area and higher gross margins than conventional agronomy.

Characters: 1155

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Legumes used as green manure

Cultivating faba bean as green manure in the Mediterranean region

A major concern in organic farming is the availability of nitrogen in the soil. Legumes can provide nitrogen to the soil due to their symbiosis property with nitrogen fixing bacteria, which are spread in the soil. Therefore, legumes can be used in crop rotation schemes in organic agriculture, where they are cultivated for green manure to improve nitrogen availability and soil fertility for the subsequent crop. Legumes cultivated for green manure should be characterized by high nitrogen fixing ability, such as faba bean. Before sowing, a low-input basal dressing is added to the field. The typical plant density is 4.4*105 seeds*ha^{-1}. Then, during the flowering stage when 50% of the flowers are closed, *i.e.* the maximum nitrogen fixing activity is observed, the crop is incorporated into the soil. In addition, to maximize nitrogen fixing ability, seeds are inoculated with specific nitrogen fixing bacteria. During inoculation, the seeds are soaked in the solution of these bacteria and then sown in a high humidity soil. The inoculation process should be avoided during rainy days due to the high risk of bacterial leaching resulting in inoculation being unsuccessful.

Characters: 992

Native Language: Greek

Καλλιέργεια κουκιών για χλωρή λίπανση

Η μεγαλύτερη πρόκληση στη βιολογική γεωργία είναι η διαθεσιμότητα το αζώτου στο έδαφος. Τα ψυχανθή έχουν την ικανότητα να δεσμεύουν ατμοσφαιρικό άζωτο. Η ικανότητα αυτή είναι αποτέλεσμα της συμβίωσης των ψυχανθών με αζωτοδεσμευτικά βακτήρια που είναι διαδεδομένα στο έδαφος. Επομένως, μπορούν να χρησιμοποιηθούν σε προγράμματα εναλλαγής καλλιεργειών στη βιολογική γεωργία, όπου τα ψυχανθή καλλιεργούνται για χλωρή λίπανση με σκοπό την αύξηση παροχής αζώτου αλλά και γενικότερα την αύξηση της γονιμότητας του εδάφους για την επόμενη καλλιέργεια. Τα ψυχανθή που επιλέγονται να καλλιεργηθούν για χλωρή λίπανση πρέπει να χαρακτηρίζονται από υψηλή αζωτοδεσμευτική ικανότητα, όπως το κουκί. Πριν από την εγκατάσταση της καλλιέργειας προστίθεται στον αγρό βασική λίπανση χαμηλών εισροών. Στην συνέχεια, όταν τα φυτά φθάσουν στην ανθοφορία και το 50% των ανθέων είναι κλειστά, όπου και παρατηρείται η μέγιστη αζωτοδεσμευτική ικανότητα, η καλλιέργεια ενσωματώνεται στο έδαφος. Επιπλέον για να μεγιστοποιήσουμε την αζωτοδεσμευτική ικανότητα μπορούμε να εμβολιάσουμε τα σπέρματα με ειδικά αζωτοδεσμευτικά βακτήρια. Κατά τον εμβολιασμό, τα σπέρματα των ψυχανθών εμβαπτίζονται σε υγρή καλλιέργεια βακτηρίων και στην συνέχεια ακολουθεί η σπορά τους σε έδαφος με υψηλή υγρασία. Μετά την σπορά ακολουθεί παύση άρδευσης για τρεις μέρες ώστε να αποφευχθεί η έκπλυση του βακτηρίου.

Characters: 1172

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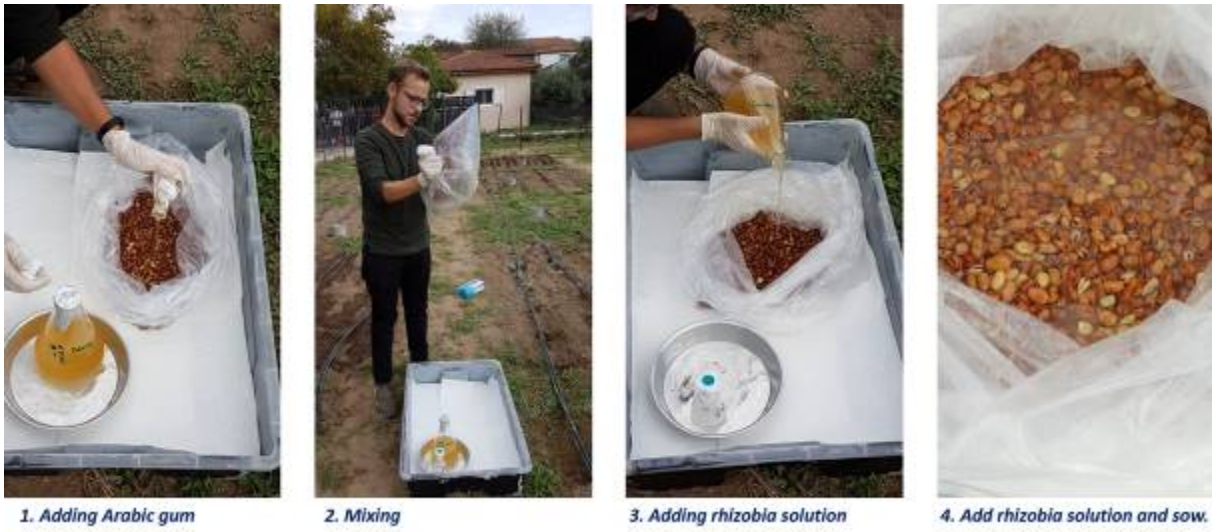

Figure 4. Procedure of inoculation. *Photo credits ©: Ioannis Karavidas*

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Transition to legume biofertilizers for sustainable agriculture

Conventional agriculture has played a significant role in increasing plant productivity to meet the food demands of a growing human population. However, this intensive farming has also led to an increasing dependence on chemical fertilizers, pesticides, herbicides, fungicides, and insecticides, which are expensive and harmful to human health and the environment. Considering the adverse effects of agrichemicals and the problems raised in the agriculture sector by climate change, modern agriculture needs to adopt eco-friendly approaches for food safety and sustainable crop production. One approach in organic farming is the use of microbial inoculants or biofertilizers. Biofertilizers are formulations containing living microorganisms which, when applied to seed, plant surfaces, or soil, colonize the interior of the plant and promote growth by increasing the availability of nutrients to the host plant or improving water uptake or acting as biocontrol agents. For field application, biofertilizers are applied either directly to the seeds (mixing seeds with carriers or stickers) or indirectly to the soil (as liquid or granular formulations). They are easy-to-use, environmentally friendly, renewable source of plant nutrients, cost-effective relative to chemical fertilizers and can increase crop yields by 20–30%.

Overall, the biofertilizers' benefits for farmers, the environment and bio-economy have led to the development of a new global market focused on the optimization of biofertilizers' effectiveness and the development of "tailor-made" inoculants addressing farmers' needs. This initiative is supported by many countries in Europe as evidenced by the increase number of existing government policies.

Characters: 1480

Native Language: Greek

Μετάβαση στα βιολιπάσματα ψυχανθώνογικά για βιώσιμη γεωργία

Η συμβατική γεωργία έχει διαδραματίσει σημαντικό ρόλο στην αύξηση της γεωργικής παραγωγής προκειμένου να ικανοποιήσει τις απαιτήσεις ενός ολοένα αυξανόμενου πληθυσμού. Όμως, η εντατική καλλιέργεια έχει επίσης οδηγήσει σε μια αυξανόμενη εξάρτηση από χημικά λιπάσματα, παρασιτοκτόνα, ζιζανιοκτόνα, μυκητοκτόνα και εντομοκτόνα, τα οποία είναι δαπανηρά και επιβλαβή στην ανθρώπινη υγεία και το περιβάλλον. Λαμβάνοντας υπόψιν τις αρνητικές επιπτώσεις των αγροχημικών και των προβλημάτων που ανακύπτουν στον γεωργικό τομέα από την κλιματική αλλαγή, η σύγχρονη γεωργία απαιτεί να υιοθετηθούν οικολογικά φιλικές προσεγγίσεις για την ασφάλεια των τροφίμων και τη βιώσιμη γεωργική παραγωγή. Μια προσέγγιση βιολογικής γεωργίας είναι η χρήση μικροβιακών σκευασμάτων ή βιολιπασμάτων. Τα βιολιπάσματα είναι τυποποιημένα σκευάσματα που περιέχουν ζωντανούς μικροοργανισμούς που προωθούν την ανάπτυξη των φυτών. Τα βιολιπάσματα εφαρμόζονται είτε άμεσα στους σπόρους (ανάμιξη σπόρων με κατάλληλα προσκολλητικά μέσα) είτε έμμεσα στο έδαφος (ως υγρά ή κοκκώδη σκευάσματα). Είναι εύκολα στη χρήση, περιβαλλοντικά φιλικά, ανανεώσιμη πηγή φυτο-θρεπτικών στοιχείων, λιγότερο δαπανηρά συγκριτικά με τα χημικά λιπάσματα και μπορούν να αυξήσουν την φυτική παραγωγή κατά 20-30%. Γενικά, τα οφέλη των βιολιπασμάτων για τους αγρότες, το περιβάλλον, και τη βιο-οικονομία έχουν οδηγήσει στην ανάπτυξη μιας νέας παγκόσμιας αγοράς που εστιάζεται στην βελτιστοποίηση της αποτελεσματικότητας των βιολιπασμάτων και στην ανάπτυξη "κατά παραγγελία" σκευασμάτων που να ικανοποιούν τις απαιτήσεις των αγροτών. Η πρωτοβουλία αυτή

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υποστηρίζεται και προωθείται από πολλές χώρες στην Ευρώπη όπως διαπιστώνεται από τον αυξανόμενο αριθμό πολιτικών δράσεων.

Characters: 1485

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Why and how to grow into a living mulch of in-crop clover

Living mulches, a permanent green crop understory, have potential as a sustainable means of arable production, particularly legumes such as clover. Demonstrated benefits include improved pest, weed and erosion control, reduced surface water pollution, improved soil structure, fertility, biota and organic matter content, and fixing of atmospheric nitrogen. Living mulches can also promote on-farm pollinators where appropriate flowering understories (such as clover) are used, and support carbon storage and nitrogen provision to the crop, potentially having a significant impact on pollinator conservation and climate change if widely adopted on large arable land areas. Living mulches therefore represent a potentially 'multifunctional' solution for production and the environment, with focus on the latter likely to be key to driving market competitiveness and achieving sustainable intensification in the future.

Establishment of crop into living mulches can, however, be problematic. Though direct-drilling can be used, main crop yield often suffers due to competition with the living mulch. Using modern machinery provides an opportunity to overcome this issue; for example, state of the art strip-tillage machinery allows crops to be established in cultivated bands through mulches. A high-powered Baertschi Oekosem ROTOR Strip Till has been shown to effectively perform this task across a range of soil types in the UK, even allowing clover and crop to be co-established in a single pass when a suitable drill is fitted. To date this approach has allowed spring barley yields to be maintained in white clover living mulch polycultures, with further work underway in oilseed rape, winter wheat, maize and a range of other broad-acre crops.

Characters: 1491

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Using legumes as green manures in protected cropping

The inclusion of leguminous green manures (also known as fertility building crops or cover crops) can bring many benefits, such as:

- adding nitrogen to the system (as a result of fixation by symbiotic Rhizobia bacteria);
- minimising losses of nitrogen by leaching;
- adding soil organic matter (thus improving structure and water holding capacity);
- reducing the risk of erosion; and,
- suppressing weeds and acting as a break crop to reduce the risk of pests and diseases.

They are therefore of value in both conventional and organic systems but remain underutilised. To get the best results the correct species need to be selected and integrated in the rotation with the cash crops. Protected cropping presents a particular problem due to the high value of the glasshouse or polytunnel infrastructure making it difficult to justify allocating space in the cropping schedule for fertility building crops. Fast growing species that can accumulate biomass rapidly are required, such as true clovers (*e.g*. crimson, Persian and berseem/Egyptian) or other legumes (*e.g*. fenugreek, vetch, forage peas and lupins). These could be grown either over the winter period (up to six months) or as much shorter break crops in the spring/summer (possibly between salad crops). Lower growing species (*e.g.* trefoil) may be suitable for intercropping, which could help with weed control. In colder climates, frost hardiness is an issue – under the protected conditions of a polytunnel the peas and lupins may produce 'softer' foliage, than those grown outside, which may be more susceptible to cold nights as the winter progresses. However, frost kill can minimise the need for cultivations to incorporate green manures into the soil, if it occurs after significant biomass has accumulated.

Characters: 1496

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Figure 5. Persian clover (*Trifolium resupinatum*) was found to be one of the best legume species for overwintering in an unheated polytunnel. *Photo credits ©: Francis Rayns*

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Processing of legumes for food

Legumes as an adjunct in beer production

In the production of any alcoholic beverage, the starch present and how to degrade it (*via* gelatinisation, liquefaction and saccharification through enzyme action) to simple sugars that are usable by yeast must be understood. This breaking down of starch occurs during the mashing step of beer making and typically involves a hold at 63-64°C. This temperature allows both starch gelatinisation and enzyme action to occur. For legumes, however, this temperature is too low. A cooking step is therefore required to pre-gelatinise their starch prior to adding in the barley and allowing enzymatic degradation to occur. A cooking temperature of 80°C has been identified, which allows the hydration and disruption of most legume starch granules, although variations between legume species exist. It has also been shown that, unlike some cereals, legumes do not have the necessary enzymes present naturally, hence the need to add commercially available enzymes.

Processing steps:

1) Precook milled legume at a minimum of 80°C for 1 hour in the presence of an alpha-amylase enzyme to avoid viscosity issues.
2) Mash the malted barley *etc*. as *per* normal procedures using the cooked legume slurry as a portion of the mashing in water. The temperature of the mashing in water should be adjusted to produce a final mash temperature of 63-64°C, as required for malt enzyme action.
3) Proceed *per* normal brewery procedures - mash, boil, cool & ferment.

Characters: 1210

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Distilled spirit production can serve as a new legume market

Distilled spirits are typically produced from cereals such as barley, wheat, rye or corn due to their relatively easiness of processing, and their large starch nutrient stores which, once broken down by the processes known as 'milling' and 'mashing', can be fermented with yeast to produce high yields of ethanol. Critical to this conversion process is understanding the characteristics of the starch present and the conditions required to break it down into smaller, simple sugars suitable for yeast conversion. In all cases the milled raw material must be heated, in the presence of water, to a material specific temperature. This allows the starch granules to become hydrated and ultimately, burst open exposing the starch and allowing it to be broken down in the presence of enzymes.

Legumes are no different, and studies are being completed to determine the conditions required to convert their native starch into simple sugars. A cooking temperature of 80°C has been identified, which allows the hydration and disruption of most legume starch granules, although variations between legume species exist. It has also been shown that, unlike some cereals, legumes do not have the natural and necessary enzymes, hence the need to add commercially available ones. A combination of high temperature tolerant alpha-amylase and glucoamylase has been shown to be effective in aiding this break down.

The successful conversion of legumes into distilled spirit, most likely to be a neutral base spirit for use in flavoured spirit production, for example gin, opens up a new, premium, high value market for legumes.

Characters: 1356

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Development and processing of protein rich vegetable foods

Legumes are extremely useful for high protein products such as pasta, snacks and so-called meat analogues (products that are similar to meat, but suitable for vegetarian or vegan consumers). The main technology used and suitable for various applications in this field, is called extrusion. During extrusion, starchy or proteinaceous foods with moisture content ranging from 15 to 35% are subjected to high temperature, high pressure and intensive mechanical shear forces. Under these conditions, the biopolymer-based raw materials are converted in a heated barrel into 'viscoelastic melts', which are further forced to flow through a die. Due to the pressure drop across the die and the subsequent conversion of high-temperature water to steam, the molten stream at the exit expands dramatically to give the desired expanded/cooked product. The resulting extrudates can be used in protein-rich cereals or as additives for chocolate and bars. Some of them have been successfully tested as meat replacement ingredients for sports nutrition products and as the basis for vegan meatballs, burger patties, cooked meatballs or sauce Bolognese. Preliminary results obtained within TRUE on the characterisation of the processing properties of protein-rich legume flours for extrusion demonstrated how certain raw material parameters influence the process parameters of extrusion. These findings could be used to develop legume-based protein products for consumers who pursue a healthy, nutritionally aware, sustainable lifestyle.

Characters: 1301

Native Language: German

Entwicklung und Herstellung von proteinreichen pflanzlichen Lebensmitteln

Leguminosen eignen sich hervorragend als Ausgangsmaterial für proteinreiche Lebensmittel wie Pasta, Snacks und sogenannte Fleischanaloga (fleischähnliche, aber dennoch vegetarische oder vegane Produkte). Die Haupttechnologie, die für verschiedene Anwendungen in diesem Bereich geeignet ist, nennt sich Extrusion. Bei der Extrusion werden stärkehaltige oder proteinhaltige Rohstoffe mit einem Feuchtigkeitsgehalt von 15 bis 35 %, hohen Temperaturen, hohem Druck und intensiven mechanischen Scherkräften ausgesetzt. Durch den Druckabfall über der Matrize und die anschließende Umwandlung von hocherhitztem Wasser in dem Rohstoff in Dampf dehnt sich der Schmelzestrom am Ausgang drastisch aus und ergibt das gewünschte expandierte bzw. gekochte Produkt. Diese Extrudate können in proteinreichen Cerealien oder als Zusatzstoffe für Schokolade und Riegel verwendet werden. Einige werden auch erfolgreich als Fleischersatz für Sporternährungsprodukte und als Basis für vegane Fleischbällchen, Burgerpasteten, Kochklopse oder Sauce Bolognese eingesetzt. Vorläufige Ergebnisse aus dem TRUE Projekt zur Charakterisierung der Verarbeitungseigenschaften proteinreicher Leguminosenmehle für die Extrusion zeigen, wie bestimmte Rohstoffparameter die Prozessparameter beeinflussen. Diese Ergebnisse können nun genutzt werden für die Entwicklung weiterer Leguminosen-Proteinprodukte für Verbraucher, die einen gesunden, ernährungsbewussten und nachhaltigen Lebensstil verfolgen.

Characters: 1291

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Extrusion as a way to develop new legume products

New products based on legumes have to appeal to potential customers in the supermarket. Extrusion is very well suited for the development and production of such foods. Starch or protein containing foods with a moisture content of 15 to 35 % are used for extrusion. High temperatures and pressure expose the mixture to mechanical shear forces in the extruder. Under these conditions, the raw materials are converted into "viscoelastic melts" in a heated cylinder, which are then forced to flow through the die at the end of the extruder. Due to the pressure drop above the die and the subsequent conversion of high-temperature water into steam, the mixture expands drastically at the outlet and results in the desired expanded product.

By means of twin-screw extrusion, expanded products such as snacks or crispies (both with up to 75% protein) can be produced from all types of legumes. Crispies are an excellent basis for meat analogues. Pea flakes (60% protein) can be produced by planetary roller extrusion, which can be used like corn flakes in mueslis or eaten directly. During extrusion, all products can be mixed with flavour carriers such as spices, herbs or cocoa and sugar, or these products can also be coated. This combines the healthy properties with the good taste. With another type of extrusion, the pasta technology, pasta can be produced from the legumes. Spices/herbs for different flavours can also be added, e.g. a lentil noodle with curry.

Characters: 1221

Native Language: German

Welche Technologien sind für die Entwicklung neuer Leguminosen-Produkte geeignet?

Neue Produkte auf Basis von Leguminosen müssen den potentiellen Kunden im Supermarkt ansprechen. Zur Entwicklung und Herstellung solcher Lebensmittel ist die Extrusion sehr gut geeignet. Stärkehaltige oder proteinhaltige Lebensmittel mit einem Feuchtigkeitsgehalt von 15 bis 35 % werden bei der Extrusion eingesetzt. Durch hohe Temperaturen und Druck wird das Gemenge im Extruder mechanischen Scherkräften ausgesetzt. Unter diesen Bedingungen werden die Rohstoffe in einem beheizten Zylinder in "viskoelastische Schmelzen" umgewandelt, die weiter gezwungen werden, durch die sich am Ende des Extruders befindende Matrize zu fließen. Durch den Druckabfall über der Matrize und die anschließende Umwandlung von Hochtemperaturwasser in Dampf dehnt sich das Gemenge am Ausgang drastisch aus und ergibt das gewünschte expandierte Produkt.

Mittels der Doppelschneckenextrusion können aus allen Leguminosenarten expandierte Produkte wie Snacks oder Crispies (beides mit bis zu 75% Protein) hergestellt werden. Die Crispies sind eine hervorragende Basis für Fleischanaloga. Mittels der Planetenwalzen-Extrusion können Pea-Flakes (60% Protein) hergestellt werden, die wie Corn Flakes in Müslis eingesetzt oder direkt verzehrt werden können. Alle Produkte können bei der Extrusion mit Geschmacksträgern wie Gewürze, und Kräuter oder Kakao und Zucker versetzt werden, bzw. können diese Produkte auch überzogen werden. Das vereint die gesunden Eigenschaften mit dem guten Geschmack. Mit einer anderen Art der Extrusion, der Pasta- Technologie, können aus den Leguminosen Nudeln hergestellt werden.

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Auch dabei können Gewürze/Kräuter für verschiedene Geschmacksrichtungen beigefügt werden, z.B. eine Linsen-Nudel mit Curry.

Characters: 1484

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Marketing of legumes for food

Use your network for successful product development - the case of legume-based flours for gluten-free baked goods

A food network is typically centred round a lead organisation, which coordinates the knowledge exchange and supports relationship building among the network participants. These initiatives can be extremely useful to local entrepreneurs willing to develop a new product. For example, a local food innovation network rooted in Denmark was involved in promoting and supporting product development with the specific aim of using more legumes. A local food entrepreneur (a baker) wanted to develop new recipes for a new gluten-free cake using legume-based flour but had no experience in sourcing suitable suppliers. The network proved its value by first identifying possible types of legume-based flours; and secondly by providing the baker with the contact details of potential suppliers. The baker could then start developing the new gluten-free cakes: brownies made with faba bean flour and dark chocolate. To test consumers' responses, the network invited the baker to showcase his products at a workshop on legume-based product development. This collaborative approach proved to be a win-win-win strategy for the food entrepreneur, the network and the consumers, who all enjoyed the outcome of a successful product development venture.

The key learning points for a network are to understand the practical needs of an entrepreneur and to make use of the network's stakeholder relationships. As for the entrepreneur the learnings are centred around being very specific in identifying in what way the network could be of use. This example demonstrates how collaboration with a food network can help a food entrepreneur. The learnings highlighted here are, however, applicable to other agri-food sectors and to networks in general.

Characters: 1466

Native Language: Danish

Brug dit netværk til en succesfuld produktudvikling – eksempel med glutenfrit bagværk

Et fødevarenetværk er oftest opbygget omkring en central organisation med relationer til mange aktører og arbejder for at fremme videndeling mellem netværkets medlemmer. Her illustreres hvordan samarbejde med et fødevarenetværk kan blive en fordel for en iværksætter, der ønsker at udvikle et nyt produkt: glutenfrit bagværk ved brug af mel fra bælgfrugter.

Netværket hjalp iværksætteren med at finde forskellige typer mel baseret på bælgfrugter og kontakter til leverandører af specialmel. Bageren kunne koncentrere sig om at udvikle opskriften på bagværket: brownies med hestebønnemel og mørk chokolade. For at teste om kagerne faldt i forbrugernes smag tilbød netværket, at bageren kunne fortælle om udviklingsforløbet og teste kagerne ved et workshop om bælgfrugter. Kagerne blev en succes. Læren af dette forløb er, at det er vigtigt for et fødevarenetværk at forstå de praktiske udfordringer og behov som en iværksætter står overfor i et udviklingsforløb, samt nyttiggøre de forbindelser som netværket har opbygget. Det

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er også vigtigt at en iværksætter kan formulere klart, hvordan netværket bedst kan hjælpe i en given situation.

Characters: 969

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How entrepreneurs can benefit from consumer focus groups

When developing new products invaluable insight can be gained by conducting consumer focus groups to gage consumers' acceptance of new product prior to the introduction in the retail market. Following this approach, feedback on how consumers like the new products, how packaging is perceived and, ideas for how to develop the products or marketing efforts can easily be gained.
If a focus group is well planned and executed, it can provide essential information that would support the product and market development efforts of entrepreneurial companies and other businesses. To organise a successful focus group:

- collaborate with staffs with experience in running focus groups *e.g.* from networks or consumer research businesses;
- clearly outline the questions that the consumers must answer; and,
- serve the products as they would be under real-life conditions, i.e. the soup must be heated and the bread toasted.

It is important to remember that the costs of introducing products that fail in the market are much higher than the costs for running a focus group. Therefore, it is recommended to gather consumers' feedbacks prior to market launch of a new product using consumer focus groups.

Characters: 1006

Native Language: Danish

Hvordan iværksættere kan få glæde af fokusgrupper i forbindelse med nye produkter i markedet

Iværksættere i fødevaresektoren udvikler f.eks. nye produkter, og i nogle anvendes ingredienser som f.eks. linser, ærter, bønner og kikærter. I mange tilfælde ville en iværksætter have fordel af at kende til forbrugernes reaktion på det nye produkt, før det er lanceret i markedet. Ved at introducere det nye produkt i fokusgrupper med forbrugere kan der indhentes meget viden om forbrugernes reaktion på produktets smag, emballering mv. Endvidere kan producenten få ideer til, hvordan produktet kan forbedres eller markedsføres. Ved fokusgrupper er det vigtigt at produktet præsenteres som det ville være i en virkelig situation, f.eks. skal suppen varmes og brødet ristes. Det er også nødvendigt, at der udarbejdes en liste med de spørgsmål, som producenten ønsker, at forbrugerne skal tage stilling til ved fokusgruppen. Når en fokusgruppe er vel planlagt og udført, kan arrangementet tilvejebringe meget brugbar information til en fødevareproducent eller iværksætter. Det anbefales iværksætteren at samarbejde med personer, som har erfaring med at organisere og gennemføre fokusgrupper som f.eks. innovationsnetværk eller virksomheder, der udfører forbrugerundersøgelser. Omkostninger til fokusgruppe er ofte langt mindre end det, som en uheldig produktlancering koster. Det kan derfor anbefales for en producent at samle så meget forbrugerinformation som muligt før et produkt lanceres, og her kan fokusgrupper være et relevant tiltag.

Characters: 1234

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Legume supply chains

How to re-introduce traditional Hungarian legume land races in short food value chains?

Hungary is very rich in traditional, local legume-varieties, which are valuable due to their genetic diversity and adaptability. In addition, they bear great yet unexploited gastronomic and market potential thanks to their varied appearance, taste and nutritional content. Despite these recognised benefits, both the registered growing area and the degree of consumption are rather low.

A recent innovation idea aims to assess the possibility of (re)introducing and enhancing traditional/heritage legume varieties and land races into premium gastronomy and to determine the conditions of such re-introduction from producers' and market's perspectives.

During the TRUE project, a number of selected traditional Hungarian pulse varieties will be tested in small-scale organic production, processed into different types of food products following traditional and new recipes, and tested by gastro-specialists and consumers at various scenes of urban gastronomy. The project will deliver practical knowledge for various players of the short value chain. For organic farmers, the practicalities of the organic cultivation of different legumes species will be collected. For chefs, cooks, food processors and other gastronomic professionals a set of fact sheets of all tested legume species will be provided, showing the nutrition profiles and kitchen usability. For the same stakeholder groups, recipes of meals and durable products will be collected/developed using the different species/land races. Meals and products will be pre-evaluated by professionals and consumers.

Characters: 1348

Native Language: Hungarian

Hogyan vezessük be újra a hazai hüvelyes tájfajtákat a rövid élelmiszer-értékláncokba?

Magyarország rendkívül gazdag tradicionális, tájfajta hüvelyesekben, amelyek egyrészt genetikai sokféleségük és alkalmazkodóképességük folytán értékesek, másfelől küllemi és ízbeli változatosságuk, beltartalmi értékeik okán feltételezhetően komoly – ma még kihasználatlan – gasztronómiai potenciállal, és piaci lehetőségekkel is rendelkeznek. Ezen elismert előnyök ellenére mind a regisztrált termőterület, mind a fogyasztás mértéke meglehetősen alacsony.

A közelmúltbeli innovációs ötlet célja, hogy felmérje a hagyományos/tájfajta hüvelyesek prémium gasztronómiába történő bevezetésének és megerősítésének lehetőségét, termelői és fogyasztói perspektívából is meghatározza újbóli bevezetés feltételeit.

A TRUE projekt során hazai tájfajta hüvelyeseket tesztelünk kisüzemi ökológiai termesztésben, ezeket új receptúrák alapján különböző típusú élelmiszerekké dolgozzuk fel, és a gasztro-szakemberek és a fogyasztók bevonásával teszteljük valós gasztronómiai értéküket. A projekt gyakorlati ismereteket nyújt a rövid értéklánc különböző szereplői számára. Az ökológiai

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gazdálkodók számára a különböző hüvelyes tájfajták ökológiai termesztésének gyakorlati tudnivalóit gyűjtjük össze. A szakácsok, séfek, élelmiszer-feldolgozók és egyéb gasztronómiai szakemberek számára valamennyi vizsgált hüvelyes fajta adatlapja lesz elérhető, amely információt szolgáltat a beltartalmi értékekről, esetleges kockázatokról, és a konyhai felhasználás lehetőségeit. Ugyanezen érdekcsoportok esetében recepteket gyűjtünk és fejlesztünk az ételek és a tartós termékek elkészítésére vonatkozóan. Az ételeket és a termékeket a szakemberek és a fogyasztók előzetesen értékelik.

Characters: 1469

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Re-diversifying agri-food systems: growing soybean in Scotland

Agri-food system diversity decreased from the early 20th century as mechanisation of food production and processing standardised the commodities grown and processed. Nitrogen fertilizer dependent small-grains (*i.e.* cereals mainly) became favoured on a large-scale for common baked- (*e.g.* bread), fermented- (*e.g.* beer and neutral spirit) and animal-products (*e.g.* dairy and meat). Consequently, legume-based agri-food systems in Europe declined despite the capacity of legumes for biological nitrogen fixation, high-nutritional quality and -crop rotation values. So, while legume-supported agri-food systems are sustainable, and Europe is heavily legume-reliant, these legumes (mainly soybean) are imported to meet 80 % of demand - and so the potential societal benefits are forfeited. Even where legumes are grown, only a small number of species (*e.g.* peas and beans) are cultivated. To help develop diversity of agri-food systems in cooler regions of Europe, scientists in Scotland experimented with early maturing (000 genotypes) of soybean. Good grain and whole-crop forage (animal) feed yields were achieved (up to 1.2 and 12 t/ha, respectively). However, this success was only possible where seed for sowing was pre-inoculated with the highest quality ('Rizoliq TOP') rhizobia. Good rhizobial seed inoculum is essential to optimise soybean yields. Rhizobia is the common name for soil bacteria that form a symbiosis with legumes to enable natural biological nitrogen fixation.

Characters: 1271

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Opportunities of stakeholders for legume-based innovation. The case of Hungary

In Hungary, the harvested area of beans, peas and lentils were the largest in 1989 within the whole arable land area (3.5%). However, since the 1990s, this has been declining continuously, now accounting for only 0.5% with production most likely occurring in farms below 1 hectare. During the same period of time, the harvested area of soybeans has doubled, mainly cultivated in large scale farm holdings. These production trends reflect the relatively weak profitability of legumes, the volatility of yields, and the small demand at the national level.
Key stakeholders along the Hungarian legume value chain identified four significant opportunities to overcome the downward spiral of legume production-consumption:

- *Research & Development*: national funds for R&D activities could be increased through strategic partnerships (*e.g.* Danube Soy) and EU based research projects.
- *Production*: GMO-free production is guaranteed at the national level which can result in price premiums. Area-based compensation and greening measures could be applied at a larger scale. Including a wide array of different varieties in production could also benefit climate change adaptation and contribute to new product development.
- *Processing*: Increasing demand in the healthy, vegetarian and vegan food market segments allowing for innovative product development.
- *Consumption*: legumes could be given a more substantial role in public food catering as a cheap and sustainable alternative to meat consumption.

Characters: 1274

Native Language: Hungarian

Innovációs lehetőségek a hüvelyes növények termesztésére Magyarországon

Magyarországon 1989 óta csökken a bab, borsó és lencse vetésterülete. 1989-ben a teljes vetésterület 3,5%-át tették ki e növények, napjainkban csupán 0,5%-át, melynek jelentős része 1 hektárnál kisebb gazdaságokban jelentkezik. A szója vetésterülete ugyanakkor folyamatos növekedést mutat – a ’70-es évektől kezdve megduplázódott – és elsősorban nagygazdaságokban jellemző. A termelési trendek a hüvelyes növények viszonylag alacsonyabb profitabilitását, a váltakozó termésátlagokat és a relatíve kicsi hazai keresletet tükrözik.
Kutatásunkban a hüvelyes növények értékláncának főbb magyarországi szereplőit kérdeztük arról, hogy milyen innovációs lehetőségeket látnak e negatív spirálból való kitörésre.

- Kutatás-fejlesztés: az innovációra fordítható források növelhetők a stratégiai partnerségeken (pl. Duna-Szója) és EU-s kutatási projekteken keresztül.
- Termelés: az ország teljes területén garantált a GMO mentes termelés, ami magas minőségű termelést és ár-prémiumot garantálhat. A területalapú és a zöldítést lehetővé tevő támogatások nagyobb mértékű kiaknázása javíthat a termelés profitabilitásán. Az országban fellelhető változatos fajták jó kiindulási alapként szolgálnak a klímaadaptációs termékinnovációkhoz.
- Feldolgozás: az egészséges, vegetáriánus és vegán termékek iránti növekvő kereslet piaci lehetőséget nyit innovatív termékek iránt.

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- Fogyasztás: a közétkeztetés számára a hüvelyesek viszonylag olcsó és fenntartható helyettesítői lehetnek a húsalapú élelmiszereknek.

Characters: 1311

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