

CORE Organic Cofund



“SCOOP: Developing intercropping systems with camelina to increase the yield and quality parameters of local underutilized crops”

Deliverable report

D 2.4. Farmer guidelines for intercropping systems in organic farming

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Introduction

SCOOP aimed to develop intercropping systems including camelina and underutilized crops for organic farming in four different countries, i.e., Italy, Bulgaria, Poland and Turkey. Each country was characterized by different environmental conditions and so specific intercropping systems have been locally identified as the most promising to be taken up by local organic farmers. Technical guidelines reporting the main characteristics of the crops, as well all the agricultural tips for a successful establishment of the systems have been set up. In the present deliverable each of the national guideline is reported in English and also in local language of the country to better spread the gained knowledge within the farmers' community. In particular, for Italy camelina and pea, camelina and chickpea, and camelina and lentil intercroppings have been selected as the most promising, in Turkey camelina and fenugreek; in Poland camelina and spelt, camelina and lentil and camelina and pea; and in Bulgaria camelina and pea, and camelina and vetch.



DEVELOPING INTERCROPPING SYSTEMS WITH CAMELINA TO INCREASE THE YIELD AND QUALITY PARAMETERS OF LOCAL UNDERUTILIZED CROPS

Farmers' guidelines for camelina intercropping under organic farming
Key information for Italy

General info

Scientific name: *Camelina sativa* (L.) Crantz. Family: *Brassicaceae* or *Cruciferae*
Drought resistant oilseed crop: yield potential of 1-1.5 t/ha under organic farming
Pollinator friendly species
Small seed size: 1000-seed weight < 1g

Camelina advantages

Easy implementation & low input crop
Drought & frost tolerant
Catch Crop (Good N uptake)
Pest, weed & disease tolerant
Suitable for autumn, winter, and early spring sowing



Intercropping advantages

Growing pulses with camelina: good competition against weeds
Better use of resources: soil & water
N fertilization savings
Possible seed separation at harvest due to different seed size



SOWING

Camelina needs shallow sowing (< 1 cm), can be broadcasted. Pulses need deeper sowing than camelina.



NUTRIENTS

Camelina is a catch crop and improves N fixation on pulses. Pulses provide P to camelina.



WEEDS

Camelina is a fast growing species that competes well with weeds while pulses are slow in growth at early stage.

Technical key-points

SCOOP optimized agronomic guidelines

Possible combinations: camelina + field pea, camelina + chickpea, camelina + lentil
Sowing date: Autumn for intercropping with pea or chickpea, spring for intercropping with lentil
Camelina variety: choose a spring type and it will work in all the combinations
Sowing ratio: 50:50 of typical seeding rate of the 2 crops
Spatial arrangement: row seeding both crops with close interrow or row seed the pulse and broadcast camelina above
Ensure a good seed-soil contact (roll before sowing, if needed).
Fertilization: no fertilization is needed

Harvest tips

Moment: camelina + pea and camelina + lentil have contemporaneous maturity and can be harvested together and seed separated later. Chickpea is longer than camelina, but camelina is not suffering from shattering so they can be harvested together when chickpea is mature.
Seed separation: Seed cleaning and separation could be made at the processing plant. The great difference in size between camelina and pulses allow easy separation by sieves or optical devices





SCOOP
DEVELOPING INTERCROPPING SYSTEMS WITH CAMELINA TO INCREASE THE YIELD AND QUALITY PARAMETERS OF LOCAL UNDERUTILIZED CROPS

Linee guida per gli agricoltori
sulla consociazione della
camelina in agricoltura biologica

Informazioni Generali

Nome scientifico: Camelina sativa (L.) Crantz
Famiglia: Brassicaceae (o Cruciferae).
Cultura oleaginosa resistente alla siccità: può produrre 1-1,5 t/ha in agricoltura BIO
Specie amica degli impollinatori
Seme di piccole dimensioni: peso di 1000 semi < 1 g

Vantaggi di camelina

Facile da coltivare, richiede input minimi
Resistente a siccità e gelo
Cultura da copertura: ottima capacità di assorbimento dell'azoto
Resistente a parassiti, infestanti e malattie
Adatta per semina in autunno, inverno e inizio primavera



Vantaggi della consociazione

Possibilità di consociazione con leguminose
Miglior utilizzo delle risorse (suolo e acqua)
Minori esigenze di fertilizzazione azotata
Buona capacità di competizione contro le infestanti
Facilità di separazione dei semi al momento della raccolta



SEMINA

Camelina richiede una semina superficiale (< 1 cm) e può essere distribuita a spaglio.
 Leguminose: necessitano di una semina più profonda



NUTRIENTI

Camelina è una cultura da copertura e favorisce la fissazione dell'azoto nelle leguminose. Le leguminose apportano fosforo (P) a camelina



INFESTANTI

Camelina ha una crescita rapida e compete bene con le infestanti. Le leguminose crescono più lentamente nelle fasi iniziali, beneficiando della copertura di camelina

Linee guida agronomiche ottimizzate in SCOOP

Possibili combinazioni: Camelina + pisello, Camelina + cece, Camelina + lenticchia
Epoca di semina: Autunno → per la consociazione con pisello o cece
 Primavera → per la consociazione con lenticchia
Varietà di camelina: scegliere una varietà primaverile, adatta a tutte le combinazioni.
Densità di semina: rapporto 50:50 rispetto alle dosi tipiche delle due colture.
Disposizione spaziale: semina a file ravvicinate per entrambe le colture, oppure semina a file per la leguminosa e distribuzione di camelina a spaglio.
Garantire un buon contatto seme-suolo (se necessario, rullare prima della semina).
Fertilizzazione: non necessaria.

Consigli per la raccolta

Momento: camelina + pisello e camelina + lenticchia maturano contemporaneamente, quindi possono essere raccolti insieme; la separazione dei semi può avvenire dopo.
Il cece impiega più tempo di camelina, ma quest'ultima non è soggetta a deiscenza, quindi possono essere raccolti contemporaneamente quando il cece è maturo.
Separazione dei semi: la pulizia e la separazione dei semi possono avvenire nell'impianto di lavorazione. La differenza di dimensioni tra semi di camelina e leguminose consente una separazione facile mediante l'utilizzo di setacci o dispositivi ottici.








TURKEY (ENGLISH)

SCOOP^{TE}

DEVELOPING INTERCROPPING SYSTEMS WITH CAMELINA TO INCREASE THE YIELD AND QUALITY PARAMETERS OF LOCAL UNDERUTILIZED CROPS

TARM

Farmers' Guide



Camelina sativa (L.) Crantz., Brassicaceae Oil Seed Crop

Cold and Drought Resistancy
(Adaptable to Autumn and spring sowings)

Optimum seed and fix oil yield even in dryland conditions (≤1 t/ha)



Good competitive and fast grower
Low input

Pest/disease resistant
Pollinator friendly



Agronomic practices

& 17 cm row spacing by seeder, 10 kg camelina seeds and 25 kg fenugreek seeds for 1 ha. This will be the half at the 50:50 intercropping

& In autumn sowing: beginning to October til November

In Spring sowing: late February til early March

& For dryland conditions no irrigation/fertilization possibility

& No pesticides necessity

& Harvest with a combine harvester

& Easy separation

& Leaves a fertile field in its wake both in soil nutrients and beneficial microbials and fungi

& This system can serve as an alternative for the rehabilitation and assessment of marginal areas



Both has a similar life cycle



This combination enhances the mycorrhizal colonization of the soil



Since its a legume, it provides N fixation to camelina



Post-harvest separation is easy due to the different seed sizes.



High protein straw content



TURKEY (TURKISH)

SCOOP⁺

DEVELOPING INTERCROPPING SYSTEMS WITH CAMELINA TO INCREASE THE YIELD AND QUALITY PARAMETERS OF LOCAL UNDERUTILIZED CROPS

TARM

Çiftçi Rehberi



Camelina sativa (L.) Crantz., Brassicaceae *Yağ Bitkisi*

Kurağa ve soğuğa dayanıklılık (kış ve yaz ekimine uygunluk)

Kuru koşullarda dahi optimum tohum verimi (≥1 t/ha)



İyi bir rekabetçi, hızlı gelişim
Düşük girdi

Hastalık zararlılara karşı dayanıklı
İyi tozlayıcı



Neden ketencik ve çemen ara ekimi?

Aynı yaprak dengüsüne sahiptirler

Baklagil olması nedeniyle N fiksayonu sağlar

Bu karışım toprakta mikrobiyal kolonizasyonu artırır

Tahımlar farklı miktarda olduğu için hasat sonrası tohum ayrıştırması kolaydır

Sonları yüksek protein içermektedir

Agronomik Özellikleri

& 17 cm sıra arası, 10 kg ketencik tohumu ve 25 kg çemen tohumu hektara mibzerle. 50:50 karışık ekimde bu tohum miktarının yarısı kullanılacak.

& Kışlık ekimde: Ekim ayı başı-Kasım ortasına kadar

Yazlık ekimde: Şubat sonu-Mart başı

& Kurak alanlar için sulamasız ve gübresiz yetiştiricilik

& Pestisitsiz yetiştiricilik

& Biçerdöverle hasat

& Kolay harman ve tohum ayırma

& Kendisinden sonra gelecek bitkiye besin maddeleri ve yararlı mikroorganizma ve mantarlarca zengin bir tarla bırakma

& Marjinal alanların ıslahı ve bu tür alanların değerlendirilmesinde alternatif bir sistemdir.



POLAND (ENGLISH)

Farmers' guidelines for camelina intercropping under organic farming Key information for Poland



DEVELOPING INTERCROPPING SYSTEMS WITH CAMELINA TO INCREASE
THE YIELD AND QUALITY PARAMETERS OF LOCAL UNDERUTILIZED CROPS

About camelina

- Camelina is a crop from the Brassicaceae family, cultivated since the Bronze Age.
- Seed yield ranges from 1.0 to 2.0 t/ha, with an oil content of 30 to 45%
- The oil is rich in polyunsaturated fatty acids, including omega-3.

Camelina advantages

- Suitable for low-quality soils (e.g. class V) and achieves high yields from class IVa and IVb upwards.
- Resistant to frost and drought.
- Resistant to diseases and pests.
- Seed material with long-term viability and high germination capacity.
- High market price for seeds, especially those of organic origin.

Intercropping advantages

- Intercropping with camelina helps reduce weed occurrence.
- Improved use of water and nutrients.
- Better soil utilisation and coverage.
- Intercropping allows for greater crop diversity within the same farm area, without the need to acquire additional land.

Cultivation

- Shallow sowing (1 cm) at a seed density of 400–500 seeds/m² (5–6 kg/ha).
- In intercropping systems, seed rates can be reduced by approx. 20–25% for camelina and 20–30% for companion species.
- Companion crops should be sown in rows, while camelina is broadcasted (or sown in the inter-row spaces).
- Spring camelina should be sown at the beginning of April.
- NPK requirements for spring camelina: 40–50 kg/ha N, 20–25 kg/ha P₂O₅, 40–60 kg/ha K₂O.
- Camelina's strong allelopathic properties can reduce the need for mechanical weed control, particularly on fields maintained in good agricultural condition.
- No modifications to the combine harvester are required for harvesting with companion species.
- Post-harvest seed separation is necessary to remove impurities, such as camelina siliques or to separate seeds of camelina and the companion crop.



Examples of the intercropping with camelina

camelina + pea



camelina + lentil



camelina + spelt



Useful tips

- In the case of spring camelina, sowing can be delayed (even until early June), but this may result in a yield reduction of up to 35%.
- During intercropping, camelina tends to mature earlier than many companion species; however, its seeds do not shatter, so harvesting both species at the same time is possible.
- Seed separation can be carried out using simple on-farm cleaning equipment, such as screening machine or grain auger. Due to the difference in seed size between camelina and, for example, peas or cereals, separation is relatively straightforward. Standard mechanical cleaners can achieve a cleaning efficiency of up to 95%.

POLAND (POLISH)

Wytyczne dla rolników dotyczące upraw
współrzędnych z Inianką w rolnictwie ekologicznym
Kluczowe informacje



DEVELOPING INTERCROPPING SYSTEMS WITH CAMELINA TO INCREASE
THE YIELD AND QUALITY PARAMETERS OF LOCAL UNUSUALISED CROPS

O Iniance

- Inianka siewna jest rośliną z rodziny kapustowatych, uprawianą już w epoce brązu.
- Plony nasion wahają się od 1.0 do 2.0 t/ha, a zawartość oleju w nasionach od 30 do 45%.
- Olej jest bogaty w wielonienasycone kwasy tłuszczowe, w tym omega-3.

Zalety Inianki

- Nadaje się na gleby niskiej klasy (np. V), a od klasy IVa i IVb osiąga już wysokie plony.
- Odporna na przymrozki i susze.
- Odporna na choroby i szkodniki.
- Trwały materiał nasienny o wysokiej zdolności kiełkowania.
- Wysoka cena nasion na rynku, zwłaszcza materiału ekologicznego.

Zalety upraw współrzędnych

- Uprawa współrzędna z Inianką ogranicza występowanie chwastów.
- Lepsze wykorzystanie wody i składników pokarmowych.
- Lepsze wykorzystanie i pokrycie gleby.
- Możliwość zróżnicowania uprawianych gatunków bez potrzeby zwiększenia powierzchni upraw.

Uprawa

- Płytko siew (1 cm) w obsadzie nasion 400-500 szt./m² (5-6 kg/ha).
- W uprawie współrzędnej obsadę można zmniejszyć o ok. 20-25% dla Inianki i 20-30% dla gatunków towarzyszących.
- Siew gatunku towarzyszącego w rzędach a Inianki rzutowo (lub w międzyrzędziach)
- Termin siewu Inianki jarej na początku kwietnia.
- Zapotrzebowanie na NPK dla Inianki jarej: 40-50 kg/ha N, 20-25 kg/ha P₂O₅, 40-60 kg/ha K₂O.
- Z uwagi na wysokie oddziaływanie allelopatyczne Inianki, mechaniczne zwalczanie chwastów można wykonać na polach utrzymanych w niższej kulturze rolnej.
- Nie wymaga modyfikacji kombajnu do zbioru z innymi gatunkami towarzyszącymi.
- Wymagana separacja nasion po zbiorach. Dotyczy to zanieczyszczeń, np. łuszczyzny Inianki jak i nasion Inianki i gatunku towarzyszącego.



Możliwe uprawy współrzędne

Inianka + groch siewny



Inianka + soczewica



Inianka + orkisz



Porady

- W przypadku Inianki jarej siew można opóźnić (nawet do początku czerwca), lecz należy liczyć się ze spadkiem plonu nawet do 35%.
- W czasie uprawy współrzędnej Inianka dojrzewa szybciej od wielu gatunków towarzyszących, lecz łuszczyzny nie pękają i można spokojnie czekać do zbioru dwóch gatunków jednocześnie.
- Separacja nasion może odbywać się na prostych czyszczalniach rolniczych, np. sitowych lub tzw. żmijce. Dzięki różnicy w wielkości nasion Inianki i np. grochu czy zbóż ich separacja jest dość prosta. Na zwykłej czyszczalni mechanicznej można uzyskać wydajność czyszczenia do ok. 95%.

BULGARIA (ENGLISH)

 DEVELOPING INTERCROPPING SYSTEMS WITH CAMELINA TO INCREASE THE YIELD AND QUALITY PARAMETERS OF LOCAL UNDERUTILIZED CROPS	Farmers' Guidelines for Mixed Cultivation of Camelina in Organic Farming Key Information for Bulgaria
General info	Scientific name: <i>Camelina sativa</i> (L.) Crantz. Family: <i>Brassicaceae</i> or <i>Cruciferae</i> Drought resistant oilseed crop: yield potential of 1-1.5 t/ha under organic farming Pollinator friendly species Small seed size: 1000-seed weight < 1g
Camelina advantages	Easy implementation & low input crop Drought & frost tolerant Catch Crop (Good N uptake) Pest, weed & disease tolerant Suitable for autumn, winter, and early spring sowing 
Intercropping advantages	Growing pulses with camelina: good competition against weeds Better use of resources: soil & water N fertilization savings Possible seed separation at harvest due to different seed size
Technical key-points  SOWING Camelina needs shallow sowing (< 1 cm), can be broadcasted. Pulses need deeper sowing than camelina.  NUTRIENTS Camelina is a catch crop and improves N fixation on pulses. Pulses provide P to camelina.  WEEDS Camelina is a fast growing species that competes well with weeds while pulses are slow in growth at early stage.	
SCOOP optimized agronomic guidelines	Possible combinations: camelina + pea, camelina + vetch Sowing date: Autumn or spring sowing Camelina variety: Camelina variety: choose a variety that can be sown in fall and spring. Sowing ratio : 50:50 of the optimal rates for both crops in the crop. Spatial arrangement : sowing the legume crop first, rolling, sowing the camelina over it. Ensure good contact between seeds and soil: rolling is necessary. Fertilization: 30 kg a.s. organic Nitrogen/ha.
Harvest tips	Timing: Camelina + Pea and Camelina + Vetch ripen at the same time and can be harvested together and the seeds separated later. Seed separation: Cleaning and separation of seeds can be done with a seed cleaning technique. The large difference in seed size of camelina and legume crops allows for easy separation using sieves or optical devices.
   	

BULGARIA (BULGARIAN)



DEVELOPING INTERCROPPING SYSTEMS WITH CAMELINA TO INCREASE THE YIELD AND QUALITY PARAMETERS OF LOCAL UNDERUTILIZED CROPS

Насоки на фермерите за смесеното отглеждане на камелина при биологично земеделие
Ключова информация за България

Обща информация

Научно име: *Camelina sativa* (L.) Crantz. Сем.: *Brassicaceae* или *Cruciferae*
Сухоустойчиво растение: потенциал за добив от 1 до 1.5 t/ha
Медоносно растение
Малък размер на семената: маса на 1000 семена < 1g

Предимства на камелината

Лесно внедряване / отглежда се с малко разходи
Устойчива на студ и засушаване
Притежава много добро усвояване на азота
Устойчива на болести, неприятели и плевели
Подходяща за есенна, зимна и ранна пролетна сеитба



Предимства на смесеното отглеждане

Смесен посев с бобови: добра конкуренция срещу плевелите
По-добро използване на ресурсите: почва и вода
Намаляване на азотното торене
Семената се отделят лесно след жътва поради различния им размер



СЕИТБА

Камелината трябва да се засява плитко (< 1 cm), може и разпръснато.
Бобовите култури се засяват по-дълбоко от камелината.

Ключови моменти



ХРАНЕНЕ

Бобовите култури осигуряват азот за камелината.
Камелината подобрява усвояването на фосфор от бобовите култури.



ПЛЕВЕЛИ

Камелината е бързо растящ вид, който се конкурира добре с плевелите, докато бобовите растения растат бавно в началото.

SCOOP оптимизирана агротехника

Възможни комбинации: камелина + грах; камелина + фий.
Време за сеитба: есенна или пролетна сеитба.
Сорт камелина: изберете сорт, който може да се сее на есен и на пролет.
Сеитбени норми: 50:50 от оптималните норми за двете култури в посева.
Пространствено разположение: сеитба първо на бобовата култура, валиране, сеитба на камелината над нея.
Осигурете добър контакт между семената и почвата: необходимо е валиране.
Торене: 30 кг а.в. органичен Азот/ha.

Съвети за прибиране на реколтата

Време: камелина + грах и камелина + фий узряват едновременно и могат да се събират заедно, а семената да се отделят по-късно.
Отделяне на семената: Почистването и отделянето на семената може да се извърши със семепочистваща техника. Голямата разлика в размера на семената на камелината и бобовата култура позволява лесно отделяне чрез сита или оптични устройства.

