



**Camelina:**  
a Cash Cover Crop Enhancing  
water and soil conservation  
in MEDiterranean  
dry-farming systems

## D1.2. Compilation of national diagnostic

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## Abstract

The general objective of WP1 is to foster a multi actor approach at national level, gathering high level. Information requirements for conducting 4CE-MED activities, with special attention to solutions for overcoming the barriers, such as agronomical, societal and economical. One of the tasks under this WP is 'Characterisation and diagnostic of playground.' Under this task, this report had been developed with information of situation on each country, from agronomical, societal and economic point of view collected by literature search and the response of stakeholders to the questionnaire circulated within the second consultation of the local multi-stakeholder platforms (LMSPs), in order to provide significant information to WP3 national members to work with statistical and relevant knowledge, confronting it with expert opinions of LMSPs.

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The general objective of WP1 is to foster a multi actor approach at national level, gathering high level. Information requirements for conducting 4CE-MED activities, with special attention to solutions for overcoming the barriers, such as agronomical, societal and economical. One of the tasks under this WP is 'Characterisation and diagnostic of playground.' Under this task, a proper report had been developed with information of situation on each country which has been summarized below:

## 1 Conservation Agriculture in 4CE-MED Countries: Compilation of national diagnostic

### 1.1 Conservation agriculture and Camelina as an oil seed crop

Conventional farming (CONV) refers to mono-cropping, inversion tillage and residue removal, which is often, although not always, associated with contributing to adverse effects on soil functions. Conservation Agriculture (CA) practice constitutes no-till combined with residue retention and crop rotation (Hobbs 2007; Hobbs et al. 2008; Knowler et al. 2007), as an alternative to optimize the provision of soil functions. Conservation agriculture (CA) practices offer the opportunity to conserve natural resources, cut down production cost while reducing yield fluctuation and associated risk. However, adaptation of conservation agriculture practice is still low in many countries in Europe and Mediterranean region. Therefore, there is need to diagnose reasons associated with low adaptation in different 4CE-MED countries.

In EU and many other countries in West-Asia and North Africa regions, several wheat- based cropping systems are in vogue, namely, (1) continuous wheat (2) wheat -fallow, (3) wheat - legume, (4) wheat -corn-fallow, and (5) wheat -forage-fallow. The first two are more predominant in Mediterranean South and many developing countries. However, continuous wheat is not common in EU. Use of legumes in the crop rotation under CA is not predominantly followed because of their susceptibility to biotic and abiotic stresses, weed menace and consequential labour intensive control, and other labour intensive agronomical practices. Thus, there is a need for an alternative crop for deployment in cereal-based cropping system for crop diversification and improve soil health.

Mediterranean dry-farming systems mostly relay on cereal production, often on sole crops, due to a lack of alternatives. Camelina (*Camelina sativa* (L.) Crantz) well adapts to a wide range of environments and different sowing times, being a rapidly maturing short-season species, with both spring and winter forms. These features make camelina suitable to replace fallow periods.

Camelina or false flax, is an ancient minor oilseed crop belonging to the Brassicaceae family. It has recently gained an increasing interest due to its good agronomic features and its promising industrial and healthy food applications (Schulte et al. 2015). Camelina has been cultivated in Europe for centuries as a source of oil for human consumption, cosmetic and industrial uses. After 1950s, it has been replaced with more productive oil crops Ghaley et al. (2014a and 2014b). Recent years, camelina as an oil seed crop become popular in North America and mainly used for biodiesel production for aviation fuel in North America (Coyle et al. 2016; Lemanceau et al. 2016; Holland 2004). However, in north Africa, Europe and many other countries, the crop is new and many farmers are not aware of this crop, its cultivation, its use, its importance to replace fallow in cereal-based cropping systems.

Several agronomic characteristics have conferred advantages to camelina, over other oilseed crops, contributing to its recent widespread expansion. It has, in fact, low agricultural input requirements, adapted to conservation agriculture system (no-till) and a good tolerance and resistance to cold and drought, as well as to diseases that commonly affect oilseed Brassica crops (Van den Putte 2010; FAO 2017; Hobbs 2007). Camelina can also be grown profitably on poor and marginal lands and it is considered to be suitable for 96% of the marginal lands in the Mediterranean regions, where high valued crops may not be viable economically (Hobbs et al. 2008). Camelina well adapts to a wide range of environments and different sowing times, being a rapidly maturing short-season species, with both spring and winter forms. These features make camelina suitable to replace fallow in cereal-based cropping systems. However, this crops' awareness, cultivation, use and popularity among farmers and stakeholders varied across different countries in the Mediterranean region.

## 1.2 Conservation agriculture in Europe

Adaptation of CA in Europe varies from country to country (Table 1). Farmers' interest in CA systems varies also with time (Fig. 1). Farmers in UK and the Scandinavian countries seem to have been among the first adopters of CA practices. By 1978, 8-10% of the winter cereals in the UK were performed under no-till (NT) or reduced tillage (RT); however, by 1990, there was a strong move of farmers back to mouldboard ploughing because of a number of unforeseen problems of weed and crop residue management (Soane and Ball, 1998). The same scenario occurred in the Scandinavian countries between the 1970s and the late 1990s (Rasmussen, 1999); whereby the reasons given were residue management problems; grassy weeds infestations and excessive topsoil compaction (Munkholm et al., 2003). According to Håkansson (1994) in Scandinavian areas where CA practices have been advocated without having previously carefully investigated all consequences, farmers who had started using these methods sometimes returned to traditional methods. In erosion risk area in Norway there is a clear tendency of shifting from RT with no ploughing to spring ploughing. In Italy the no-tillage trials started in 1968, but CA expansion began only in the 1990s; it was driven by the need to reduce crop costs and, the availability on the Italian market of sowing equipments and adequate herbicides (De Vita et al., 2006; Chiodini 2019).

**Table 1 Adoption of Conservation Agriculture in Europe (ECAAF 2020)**

Country	Arable land and permanent cropland (ha Thousands)	Source	Conservation Agriculture (ha Thousands)	Source	CA %
Austria	1411	(3)	28,3	(1)	2,01
Belgium	872	(3)	0,3	(2)	0,03
Bulgaria	3637	(3)	16,5	(1)	0,45
Croatia	944	(3)	18,5	(1)	1,96
Cyprus	111	(3)	0,3	(1)	0,24
Czech Republic	2540	(3)	40,8	(1)	1,61
Denmark	2378	(3)	38,5	(2)	1,61
Estonia	699	(3)	42,1	(1)	6,03
Finland	2249	(3)	480	(2)	21,34
France	19348	(3)	300	(2)	1,55
Germany	11963	(3)	146	(2)	1,22
Greece	3254	(3)	91	(2)	2,79
Hungary	4500	(3)	5	(2)	0,11
Ireland	447	(3)	15,66	(2)	3,50
Italy	9054	(3)	283,9	(2)	3,14
Latvia	1296	(3)	11,3	(3)	0,88
Lithuania	2177	(3)	19,3	(3)	0,89
Luxembourg	63	(3)	0,4	(3)	0,69
Moldova	2096	(3)	60	(3)	2,86
Netherlands	1066	(3)	7,4	(3)	0,69
Poland	11199	(3)	403,2	(3)	3,60
Portugal	1738	(3)	32	(2)	1,84
Romania	9000	(3)	583,8	(3)	6,49
Slovakia	1365	(3)	35	(3)	2,56
Slovenia	238	(3)	26	(2)	10,92
Spain	17033	(3)	746,83	(2)	4,38
Sweden	2580	(3)	15,8	(3)	0,61
Switzerland	424	(3)	20,86	(3)	4,92
Turkey	23710	(3)	45	(3)	0,19
United Kingdom	6073	(3)	562	(2)	9,25

Sources: <https://ecaf.org/adoption-of-conservation-agriculture-in-europe/>

(1) Eurostat (2018)



(2) Data provided by ECAF members (General Assembly, 2020)

(3) FAOSTAT (2018)

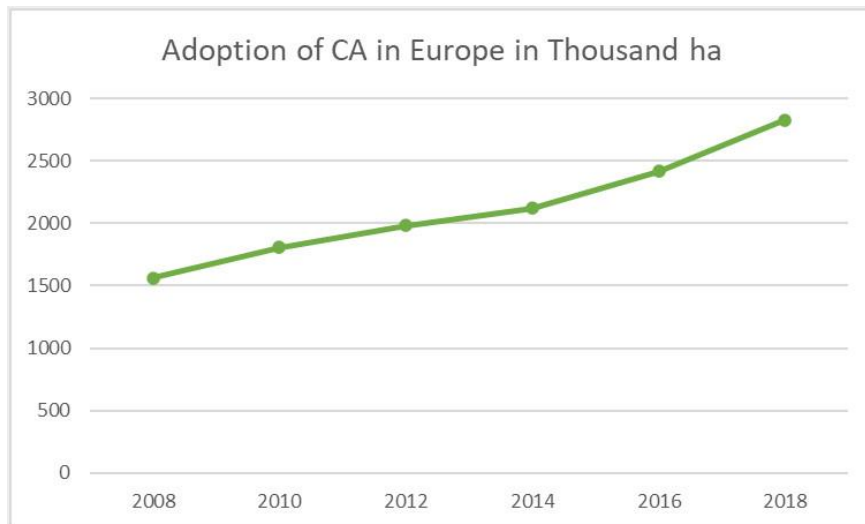


Figure 1. Adoption of CA in Europe in thousand ha. <https://ecaf.org/adoption-of-conservation-agriculture-in-europe/>

Soil and its protection and restoration represents one of the environmental (and climate) objectives of the Common Agricultural Policy (CAP) of EU. The CAP objective of sustainable management of natural resources, and more specifically the provision of environmental public goods and the pursuit of climate change mitigation and adaptation, are actually clearly relevant to the soil protection and improvement. CAP cross-compliance originated in requirements for good farming practice first introduced in the 1990s.

### 1.2.1 Conservation agriculture in Italy

Conservation of agricultural soils is a major challenge in Italy. Degradation, erosion, loss of fertility, compaction are relevant issues affecting the agricultural as well as the environmental value of this natural resource. Hence, conservation agriculture is currently playing an important role in Italy, and under the frame of EU agricultural policies, it is playing an ever-increasing role in consideration of the positive impacts it can produce, in terms of sustainable use of natural resources as well as of Climate Change mitigation and adaptation. At farm level, moreover, CA represents a way to combine environmental and sustainability concerns with profitability and competitiveness aspects, in a variety of agroecological zones and farming conditions of Italy, including mitigation of soil erosion, increase in soil organic matter, enhancement of aggregation and aggregate stability, reduction of energy consumption and carbon dioxide emissions, preservation of wildlife habitat and soil biodiversity, and savings in labour and time (Ruisi et al., 2014). Experiments performed during the 1991-2012 period

in Sicily, Italy on the applicability of conservation tillage techniques in cereal-based farming system, suggest that NT is a valuable tillage option in the cereal-based systems of dry Mediterranean environments characterised by low and erratic rainfall patterns during the growing season. Indeed, NT guaranteed superior wheat grain yield compared with CT when water stress during the crop cycle was high (Ruisi et al., 2014; Varia et al. 2017).

Soil conservation is one of the main priorities of 2014–2020 Rural development in Italy where 15 out of 21 Rural development programmes (RDPs) funded by the European Agricultural Fund for Rural development (EAFRD) are currently granting support to farmers to adopt soil-friendly practices such as NT, with a provisional budget of 280 million euro targeting 192,000 ha of Utilized Agricultural Area (UAA). As showed in the Table 1, 15 out of 21 RDPs in Italy have scheduled a dedicated payment tool for farmers within the frame of Measure 10 (Agro-environmental-climate payments scheme) (National Rural Network 2014-2020, 2017). However, in Italy the extend of CA is limited to about 283.9 thousand hectares, mostly in the Northern regions (Data provided by ECAF members, ECAF General Assembly, 2020).

Table 1: Schemes dedicated to CA practices in Italian RDPs

Regional	RDP Name of the support scheme
Abruzzo	10.1.3 - Soil conservation
Basilicata	10.1.4 - Support to conservation agriculture techniques
Calabria	10.1.5 - Soil conservation and increase of soil organic matter
Campania	10.1.2 - Agronomic practices to increase soil organic matter
Emilia Romagna	10.1.4 - Conservation agriculture and soil organic matter
Friuli Venezia Giulia	10.1.1 - Conservation agriculture for arable crops
Lazio	10.1.5 - Conservation agriculture techniques
Lombardia	10.1.4 - Conservation agriculture
Molise	10.1.2 - Conservation agriculture techniques
Piemonte	10.1.3 - Conservation agriculture techniques
Puglia	10.1.3 - Conservation agriculture
Sardegna	10.1.1 - Soil protection actions
Sicilia	10.1.f - Adoption of conservation agriculture techniques

Toscana	10.1.1 - Soil conservation and soil organic matter
Veneto	10.1.1 - Agronomic practices with reduced environmental impact

Varia et al. (2017) showed that in a long-term dynamic context the environmental support payment scheme provided by Measure 10 did not represent the only driving force in the system to guide farmers towards the expected shift from conventional to CA agriculture. What is needed is a deeper integration with other policies (innovation policies) and other interventions, e.g. schemes promoting precision farming, collective investments, advice, training and information.

Adoption on NT in CA seems to be a localized phenomenon in Italy. Central and northern regions of Italy tend to adopt NT than the Southern regions. Large farmers tend to adopt NT in CA than small farmers. The adoption is also related to age groups (young farmers more likely prefer NT), production specialization and the presence of local networks between farmers and other stakeholders (Chiodini et al. 2019). Therefore, there is a need to focus more on small farmers and young farmers for training, capacity building and dissemination activities to popularize and enhance adoption of CA.

Furthermore, analysis of response of the partners to a questionnaire regarding CA and Camelina (see Annex 1 and Summary Table) revealed that the conventional planters (seed drills, mostly Damax 17) are good enough for planting fields with conservation tillage as they are simple, rapid and easy to use for cereals and also for others small seeded crops like Camelina, since farmers already had experience with such conventional seeders. However, for broadcasting, they had some difficulties, because the machinery was not adjusted for broadcasting. A surplus of seeds was sown and sometimes emergence rate was higher than 100%. Moreover, in broadcasted plots seeds were sown only in the length of the hopper causing inhomogeneity in emergence. This inhomogeneity problem can be solved next time by adjusting the seeder settings, based on the current experience. With respect to harvesting, cereal harvesters were good enough for Camelina as well, with minor adjustments. The harvesting was done at two stages: Swathing was carried out using a GS mower with 1.80 m working width. Cutting height was set up at 0.25 m, in order to ensure proper drying of the swathed plants. Harvesting was performed in two phases, mowing/swathing and thrashing, and both treatments with a combine harvester equipped with a 3 m wide cereal header. These experiences of this year will be shared with other stakeholders during next on-farm demonstration and training.

### 1.2.2 Conservation agriculture in Spain

In Spain, where about 80% of its surface is devoted to extensive agriculture, mostly under dryland conditions. In general, most of the soils are low in soil organic matter content. Besides limited water availability for agriculture and other uses, the worst environmental issue facing the Spanish agriculture is soil erosion. The average soil loss by water impact in Spain has been estimated in

about 34 t ha<sup>-1</sup> year<sup>-1</sup>, with low rates in North-Western areas and high rates in Eastern and Southern Spain, especially in Andalusia, where annual soil losses can reach 60–80 t ha<sup>-1</sup>. On the basis of the knowledge available, conservation agriculture appears to be the most important sustainable alternative system to conventional agriculture based on intensive tillage to cope with negative agro-environmental problems like the loss of fertile soil in areas prone to erosion processes and low soil organic matter content (Moreno et al. 2010).

According to Fernández-Quintanilla (1997), it was in the 1970s when the concepts of tillage reduction and the use of conservation agriculture practices for annual and perennial crops were first introduced in Spain mainly through knowledge gathered in the USA. The release on the market of new herbicides, as paraquat and glyphosate, for a full control of volunteers and weeds before sowing was also a key factor. Currently 746.83 thousand ha of land is conservation agriculture (Data provided by ECAF members in General Assembly, 2020). Further studies were based on the comparison of conventional primary tillage (i.e., mouldboard ploughing with soil inversion) with two forms of conservation agriculture, (i) minimum or reduced tillage, in which the conventional primary tillage is replaced by a vertical or surface tillage with different ploughs (e.g., chisel or cultivator) and (ii) no-tillage or direct drilling (Moreno et al. 2010). These studies considered various aspects of adoption, including (1) socio-economic aspects such as energy use and consumption, (2) soil quality and water saving, (3) environmental issues, and (4) crops and crops protection.

According to Spanish team of KASSA (Lahmar et al. 2010), most of the studies carried out in Spain concluded that yields are generally 10-15% higher under no-tillage, especially in dry years. The change in yields does not appear critical in the decision of farmers whether to adopt CA or not (Lahmar et al. 2010). The conservation agriculture has been proven to be highly efficient for water storage, to increase moderately the organic matter in the soil top layer, and to improve soil physical properties and aggregation. However, no-tillage may induce greater soil compaction in some cases (Moreno et al. 2010). Here, an occasional tillage had been advised. Furthermore, conservation tillage can reduce soil CO<sub>2</sub> emissions, mobility and persistence of herbicides. In general, conservation tillage enhances biodiversity compared to conventional tillage (Moreno et al. 2010).

Results of KASSA show clearly that RT and especially NT greatly reduce the cost of labour and fuel. However, the amount of the reduction depends on many factors i.e. the type of soil, crop and machinery; some of these results have been reported by Lahmar et al. (2006). Data on socio-economic aspects of CA at the country level remain scarce and do not allow drawing a comprehensive picture and a realistic comparison between other countries, cropping systems and the farming conditions. Labour saving in particular had allow developing other agricultural or non-agricultural activities generating additional benefits as emphasised by the Mediterranean team of KASSA. Also, the savings may be offset by additional costs induced by plant pest control; and it is reasonably arguable that the rise of the cost of pesticides and/or heavy infestations of weeds, pests and diseases may lead farmers to favour specific crops or to go back to conventional practices (Lahmar 2010).

At the beginning, the main driving forces for conservation agriculture development in Spain were based on labour simplification and savings of fuel and costs for machinery required for tillage and other kind of inputs. Later, the advantageous agronomic and environmental aspects of conservation agriculture practices (soil water conservation, soil protection, and increase of soil organic carbon and soil biological activity) were recognised by farmers. Substantial cost savings have been reported for minimum tillage and zero tillage in Spain, compared with conventional tillage. Reduction in fuel consumption can range between 30% (minimum tillage) and 60% (no-tillage); time saving for tillage operations, derived from reduction of the number of labours, can reach up to 45% (no-tillage) (Hernanz et al. 1998; Sombrero et al. 2001b; Sánchez-Girón et al. 2004).

However, the acceptance of conservation agriculture technologies in Spain is still low, especially in those areas where these technologies were not initially well introduced. As pointed out by Cantero-Martínez and Gabiña (2004) and Angás et al. (2004), this low degree of adoption is a consequence of inadequate extension and technology transfer systems and lack of access to specific inputs, machineries and equipments. Therefore, these factors need to be addressed during dissemination, capacity building and training to enhance adoption of CA in Spain.

The survey with the partners in Spain revealed that over 10-25% area of cereals under CA, depending on the region. However, Camelina is not grown under CA. Camelina is grown in around 50,000 ha under conventional tillage and seeds are used for oil extraction, which will further used for biodiesel production. The locally available conventional seeder and harvesters are being used with minor difficulty. However, farmers are not happy with cereal harvester, because there could be loss of seeds 10-25% when used with camelina. Therefore, proper communication and technical support needed to select right kind of seeder by the farmers. Further strengthening communication and extension services with farmers would be useful. All these issues will be considered while conducting on-farm demonstration trials and training programs for the stakeholders.

### 1.2.3 Conservation agriculture in France

In France, from the end of the 1980s, geographers (Auzet, 1987) and agronomists (Papy and Boiffin, 1988) analyzed the erosive processes in the silt plains of the north of the Paris Basin, and reported the relationship with the cultivation systems and practices, particularly to conventional tillage. Subsequently, Wicherek (1990) identified certain key factors of erosion in the Paris Basin and reported that conventional tillage and cropping patters are responsible for soil erosion and low organic matter which made soils poor. Using modelling, Delahaye (1996) demonstrated the extent of erosive processes in agricultural areas subject to conventional tillage practices.

In France, conservation agriculture is based on three larger principles, which are to be applied simultaneously: reducing or eliminating tilling, covering the soil and diversifying and lengthening crop rotations. The main driving forces for CA in France are reduced working hours, reduced fossil

fuel consumption, improved biological life and biodiversity in soil. These CA systems on average reduced erosion, help to increased soil organic matter content, especially at the surface, reduced soil evaporation to less than 10% to 50%, depending on the quantity of plant residue, lower mechanisation costs, increased the mineralisation rates in the soil's organic matter and increase nitrogen available for crop uptake, reduced water requirements (hence preserves water resources), preserved soil fertility and greater biodiversity (Schaller 2013).

In France, considerable research is still required to understand the interactions between agricultural practices and the cycles of the various natural resources (Schaller 2013). No-tilling cropping systems generally see more weed infestation than conventional ones. Surveys by Pratiques-culturales in 2006 concluded that no-tilled crops require a 0.3 additional measure of herbicide on average, all crops combined, than tilled ones. The figures in 2011 also similar: a 0.2 additional measure of herbicide for bread wheat and sunflower, and respectively 0.3 for-durum wheat and corn, 0.6 for barley, 0.7-for protein peas, 0.8 for rape and 1.3 for-sugar beet (Schaller 2013).

Despite advantages of CA, France is not a country where soil conservation is widely used. Conservation Agriculture had been introduced since the 2000s and remains very much in the minority. However, techniques that are part of the principles of conservation Agriculture are used, the plant covers which have been imposed most often by the regulations with the protection against nitrate pollution, but whose additional agronomic interests are now being recognized (Laurent 2015). Permanent soil cover is compulsory in vulnerable areas (to pollution by nitrates). The diversification of crops, associated with rotations, is one of the clauses of the aid eco-conditionality of the Common Agricultural Policy (CAP). In this context camelina as an oil seed crop fits well as well. Currently, tillage practices are neither regulated nor funded by national or territorial policies. Therefore, they are developed for agronomic and economic reasons (Schaller 2013).

Lower adoption of CA can be attributed to the local traditions and to the strength of lobbies who oppose conservation agriculture (Laurent 2015). In France, soil conservation techniques are not associated with each other as shown by the spatial analysis of the techniques; no-tillage is not accompanied by plant cover or maintenance of residues, nor by long rotations and diversified. The integration of practices into a more holistic approach is still a minority, but the recently established of professional networks (e.g. BASE-Biodiversity, Agriculture, Soil and Environment) and the APAD- Association pour la Promotion d'une Agriculture Durable) in Conservation Agriculture are disseminating information, organizing open days/demonstrations and imparting training to enhance the capacity of farmers to adopt CA (Laurent 2015).

Response to questionnaire by French stakeholders revealed that for planting and harvesting camelina, locally available seeders and combiners were used with existing settings. Camelina has market opportunities, since France has Camelina oil extracting company and there is demand from cosmetic and other industries. Constraints during harvesting varied depending on seed maturity status.

### 1.2.4 Conservation agriculture in Greece

Conservation agriculture in Greece has been tested on a limited scale by a minority of farmers on an empirical basis or on an experimental basis by research institutes. Research thus far has shown that, despite some disadvantages in certain cases, conservation tillage can be attractive to farmers because it can provide equal or even greater yields than conventional tillage and also because of its potential for reduced production costs, and to protect soils from erosion and compaction, and to conserve soil moisture. Significant savings in fuel, labor, and machinery costs are realized with conservation tillage, mainly because fewer trips over the field are required during seedbed preparation (Lithourgidis et al. 2009). From this view point, conservation tillage should receive more attention among Greek producers, becoming a viable alternative to conventional tillage and gaining wide acceptance because of its multiple benefits for both the farmer and the environment. Education, technical assistance, and financial assistance to farmers will play a dominant role in this effort.

Since, conservation agriculture in Greece has been practiced on a limited scale by a small number of farmers, there are no sufficient statistical data available to get sufficient information on its cultivation practice adopted by farmers, its benefits and limitations under Greek farming systems. In most cases, farmers apply-conservation tillage in cereal cultivation aiming to minimize substantially the cost of cultivation. Often, farmers try to combine conservation tillage practices with the reduction or elimination of other inputs such as irrigation, fertilization, and pesticide application, as well as with a decrease in seed quantity at planting.

In Greece, conservation tillage has been studied by many researchers with various crops such as wheat (Lithourgidis et al. 2004, 2006), barley (Dhima et al. 2006), corn (Lithourgidis et al. 2005), cotton (Karamanos et al. 2004) and many other crops at an experimental level. At this level, there are some encouraging data on the use of minimum or no-tillage methods for crop cultivation. Many of these studies have shown a major reduction in production costs with conservation tillage practices compared with conventional tillage. For example, Lithourgidis et al. (2004) and (2006) showed that in wheat, labour and fuel inputs lower by 50% and 53% with minimum tillage and by 43% and 48% with reduced tillage, respectively (Lithourgidis et al. 2004, 2006). Dhima et al. (2006) found that barley yield components were not affected by tillage system, and that minimum or reduced tillage systems could be used for economical and environmentally friendly barley production. Lithourgidis et al. (2005) concluded that no-tillage or reduced tillage corn following winter wheat could be successfully implemented under favourable soil conditions at sowing with the advantage of reducing considerably labour requirement and fuel consumption compared with conventional tillage. Karamanos et al. (2004) reported that cotton crop yield and gross margin were higher for NT, while the direct cost was lower compared with that of the other two treatments and particularly with conventional tillage.

Lack of knowledge and information about the conservation agriculture practice, the requirements for its use, and its multiple-benefits causes uncertainty among Greek farmers and consequently limits adoption (Lithourgidis 2009). On-farm demonstration, information campaigns in print and electronic media, and meetings can be effective for the promotion of conservation tillage in

Greece. Involvement of all stakeholders including farmers, researchers, technicians, extensionists, pesticide-dealers, and crop consultants is critical for knowledge dissemination, training and capacity building of farmers.

Response to the questionnaire showed that the conventional planting and harvesting machines were also used for planting and harvesting Camelina. These machines were easy to use. However, needs experience, since seeds are small and depth of the planting is shallow. The soil preparation should be done accordingly.

### 1.2.5 Conservation agriculture in Algeria

In Algeria, conservation agriculture (CA) is considered as an alternative to the conventional tillage (CT) for rainfed -drylands as it avoids soil tillage, saves time, energy and labor while conserving water and nutrients in the soil to support crop production (ICARDA 2020). Many research reports suggests that CA gives at least the same yields as CT in the arid areas, often more, with less time and energy input and better environmental sustainability. For examples, Labad R. and Hartani T. (2015) reported that wheat's yield had been improved under CA compared to the traditional technique of seeding in addition to some improvements in organic matter, water retention, biological activity and especially limiting erosion. However, they observed that the use of chemical herbicides (glyphosate) has adverse effects on soils, crops and even humans. Rouabhi et al. (2016) showed that all farmers adopted DS had the commitment of continuing to adopt and expanding this technique. Indeed, they consider that DS acts positively on the economic return of the farm and other technical aspects. Kouadria et al. 2017 showed that water parameters studied such as moisture equivalent (He), of holding capacity (Cr), wilting point (Pf) and AWR (UK) were higher in the useful range in case of direct seeding than in the case of conventional seeding. However, the adoption of CA technology is very limited in Algeria compared to the other developed countries. The hindrances to the adoption of CA is the limited availability of appropriate and affordable seeding machinery for small to medium sized land-holding farmers, lack of training on used of the machines, weed problems, high cost of pesticides (Rouabhi et al. 2016).

To develop appropriate and affordable seeding machinery, ICARDA in collaboration with national and private partners through different projects (including the ACIAR -CANA and the IFAD CLCA-I) at different stages put its efforts to design, testing, development and scaling out the low-cost seeders (ICARDA 2020). With this effort, the seeder prototype "Boudour" was developed in 2016 by the Agricultural Machinery Construction - Sidi Bel Abbes (CMA) in collaboration with Technical Institute of Field Crops (ITGC), National Company of Agricultural Equipment Production & Trading (PMAT) and the Spanish Company -SOLA exclusively represented by CMA in Algeria (ICARDA2020). Together, ITGC and PMAT were able to convince the Algerian government about the relevance of the technology for small -field crop farmers in Algeria and to include the seeder into the national nomenclature of subsidized agricultural machines. With this effort, the "Boudour" ZT seeder is now subsidized at 30% when the seeder is purchased individually and 40% when missions/associations. However, there is a need of further field demonstration,



training and capacity building of farmers and other stakeholders necessitated to popularize CA in Algeria (ICARDA 2020).

Camelina is a new crop and not known in Algeria. In the region of eastern Algeria, there are 39 direct seeders for CA. These seeders are heavy and needs heavy tractors for planting. The harvesting of Camelina was carried out by mowing and threshing by hand, using locally available conventional combiners. The models of harvesting machines which are working with low airflow would suitable to reduce loses.

### 1.2.6 Conservation agriculture in Tunisia

In Tunisia, based on the experience available worldwide, the French Agency of Development (AFD) and the French Fund for World Environment (FFEM) engaged in Tunisia since 1999 a process of support for the development of conservation agriculture (Angar et al. 2012). This process of support for CA was conducted in four successive steps during 1999-2012. Through this support, the combined research, experimentation and advisory support made at the extension clusters have contributed to the development of capacity and expertise of farmers. They have created and consolidated a dynamic exchange and positive competition among farmers and strengthening their commitment to the process of development and extension of the practice of no-till. This dynamic is evident in the field and reflects the growing interest in conservation agriculture by neighbor farmers of extension clusters. Moreover, the private sector, through the providers of no-till seeders, played a leading role in the transfer, development and diffusion of conservation agriculture. In addition to this commercial role, the company has actively participated in the dissemination of the technique of no-till in organizing demonstrations, putting at the disposal of some farmers no-till seeders for rent and conducting free tests at small scale with motivated and interested farmers. In addition to the sale of seeders, that company provides after-sales service, technical support for its customers (Angar et al. 2012). Based on the experience of this initiative, it has been recommended to continue to support the process of adoption of CA in Tunisia through i) intensifying research and development in order to establish technical packages dealing with various aspects of CA in the Tunisian context; and (ii) creating the necessary conditions for medium and small farmers to access this technology (Angar et al. 2012).

As mentioned above, Conservation Agriculture (CA) was first introduced to Tunisia in 1999, where it was pilot-tested on 11 farms in the country's North-East (ICARDA 2016). While the area cultivated under CA has since grown, the practice is still applied on only 12,000 ha of agricultural land – an area distributed among 200 farmers and operated by some 102 seeders (ICARDA 2016). In 2016, the area under CA was 41 percent in sub-humid, 30 percent in lower semi-arid, and 28 percent in upper semi-arid regions (ICARDA 2016).

The constraints previously identified to explain the slow adoption of CA in Tunisia include: the small size of farms and the low investment capacity of farmers who are unable to afford Zero Tillage (ZT) machinery, and the mixed nature of agricultural production systems where an

abundance of livestock, particularly small ruminants, creates significant demand for feed. This creates a dilemma for farmers who are forced to decide whether they use crop residue for livestock feed or mulch for CA. The high cost of no-till seeders and their unavailability in Tunisian markets are the major constraints (Angar et al. 2012).

As indicated by the partners, locally available seeder and harvester of cereals used for camelina with minor adjustments. These machines performance was satisfactory. For harvesting of Camelina, Wintersteiger plot combiner was used. Use of these machines in general saved time, however, adjusting these old machines for Camelina was a difficult task.

### 1.2.7 Conservation agriculture in Morocco

Agriculture in Morocco is characterized by the co-existence of both large-holder modern and smallholder traditional agriculture systems. Both types of agriculture are under degradative processes due to mis-use of tillage implements, mis-management of crop residues and inappropriate links between crop and livestock productions (Mrabet et al. 2012).

The research conducted over the last three decades showed that the beneficial tillage effects are short-lived. On the other hand, the harmful effects of conventional tillage (CT) systems are long-lasting, if not permanent. There were several projects supported by different donors (e.g. the World Bank, ICARDA) were implemented which evaluated critically conventional tillage, conservation agriculture and no-tillage systems, and showed negative effects of conventional tillage and benefits of CA and NT systems (Mrabet et al. 2012).

In Morocco, CA began to be promoted in 1990s, in response to issues of soil conservation, drought mitigation, and soil quality management. Field tests by the National Institute of Agronomic Research (INRA) and development organisations (i.e., the World Bank, ICARDA) have successfully demonstrated that the introduction of CA would bring more stable yields and lower production costs, reduced soil erosion, greater soil water conservation, improved soil quality, stable and higher crop yields, and lower production costs (Boughlala and Dahan, 2011; Moussadek et al., 2011; Mrabet et al., 2012). For Central Morocco, Boughlala and Dahan (2011) estimate a net gain of about 60% for large farmers and 200% for small farmers. Nevertheless, these data derive largely from demonstration trials, where all necessary inputs - such as herbicides, or forage management - are optimally available and implementable. Reality may not be as favourable, as the implementation of the three principles, and especially residue retention and the appropriate rotation are often challenging, especially amongst smallholders (Bonzanigo et al. 2011).

Changes in crop production practices due to shifting to NT or CA systems and retention of crop residues at or near the surface produced progressive qualitative and quantitative variations in soil organic matter. This can allow agriculture to contribute to country's efforts to reduce and control greenhouse gas emissions (Mrabet et al. 2012). These effects benefited both farmers and society in terms of higher returns and efficiencies. The other strong benefits that CA brings come

from the opportunity for early sowing and savings in time, machinery and fuel (Mrabet et al. 2012).

Indeed, despite many agronomic, socio-economic and environmental benefits accrue from CA and NT, increasing crop diversity, the successful demonstrations in research stations and two decades of advocacy, CA found limited adoption in Moroccan farm communities. Despite remarkable efforts, to date, adoption in Central Morocco still lingers around 1% (Bonzanigo et al. 2011).

Lack of incentives from the government, use of stubbles for grazing livestock, and other social and cultural factors encourage the continued use of conventional tillage systems (Mrabet et al. 2012). The shift in the late nineties to more on-farm research did not result in the envisaged breakthroughs, mainly due to poor research-extension linkages, non-availability of machineries for CA and several social and technical barriers (Mrabet et al. 2012). Consequently, in order to realize durable agricultural growth, there is a need to out- scale and up- scale CA through linkage of all stakeholders including farmers, developers, researchers, industrials and policy makers.

There is a great demand for oil for human consumption in Morocco. In this context there is a great market opportunity for Camelina in Morocco. For planting and harvesting experimental seed drills and combined harvesters of cereals/legumes were used respectively. Since Camelina seeds were very small and seed rate is also very low, barley meal was used as carried to increase volume and uniform distribution of seeds while planting. For harvesting, the combiner's cleaning fans were adjusted to lowest flow rate, to prevent loss of grains. Therefore, second level of cleaning using sieve was necessitated.

### 1.3 Conclusion

From the survey and published literature, it is evident that CA is increasing in all the 4CE-MED country. The process of adoption is slow, farmer driven, and the major driving force in surveyed countries are reduction in cost of production by saving fuel and labour costs. Availability of right kind of machinery (seeder and combiners) suitable for CA at right time is very important and it one of the constrains in some of the 4CE-MED partner countries. Farmers associations and co-operatives could play major role in making available the required machineries for CA for rent, especially small holder-farmers. In cereal-based cropping system in Mediterranean region, CA also shows the importance of using cropping and crop diversification with legumes and other cash crops such as Camelina, instead of a fallow period, leading to improved productivity, soil quality, N-fertiliser use efficiency and water-use efficiency. More recently, due to recurrent occurrence of drought and soil erosion problems coming with climate change, exacerbated by increase in cost of energy and production inputs, many governments in the North Africa and EU support has accelerated for climate smart agriculture such as CA. At the local and regional level, CA allows several environmental services to be harnessed at a larger scale, particularly C - sequestration, cleaner water resources, considerably reduced soil erosion, runoff, and flooding, as well as enhanced biodiversity. In nut shell, CA as an alternative paradigm for sustainable

agriculture offers many benefits to farmers, the economy, consumers and the environment that cannot be obtained from conventional agriculture.

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## Annex 1: Response to Questionnaire from Italy

### Questionnaire 1

Dear Colleagues,

As a part of WP1 activities, after the first season of Camelina trials under CA in WP2, a second consultation of Local Multi-Stakeholder Platforms (LMSPs) will be taking place in order to improve and possibly upgrade the settings of WP2 trials for coming season. In this context, a compiled national diagnostic report needs to be formulated indicating best 4CE-MED practices and constrains based consultation with local stakeholders (farmers, extension workers, SMEs, agronomists, farm mangers, scientists/professors, farm labours, students, etc.) and the partners of 4CEMED who conducted trials under CA (WP2). In order to facilitate this report, I have developed a questionnaire (attached). Kindly respond to these questions and send me your feedback by 20-July-2021, so that I can compile consolidated report and submit to WP1 leader for final submission.

Thanking you,

### Questionnaire

2. What is your profession:

- Farmer     Small and Medium Scale Entrepreneur,     Agriculture Extension Worker  
 Student     Teacher/Professor     Agricultural Researcher     Farm Manager  
 Farm worker     Scientist/Agronomist    (    )    Others,

specify..... ..

3. Do you heard about Camelina oil crop or Camelina oil

- Yes     No

4. Have seen Camelina Crop and/or Camelina Seeds

Yes       No

5. Are you cultivating Camelina as a crop in cereal based cropping system?

Yes       No

If yes, how many ha?

.....

6. Are you using conservation agriculture? And for which crops?

Yes  No      Name of the crops:  Bread Wheat,  Durum Wheat,  barley,  
Soybean, pea, maize, sunflower

7. If you are cultivating Camelina, are you cultivating Camelina under Conservation Agriculture (CA)?

yes       No

8. If you are already cultivating Camelina, do you have market opportunity in your country?

Yes       No

If Yes, provide us bit more details about markets (like formal or informal markets, etc.)


9. Do you have enterprises who are extracting oil from Camelina?

Yes       No

10. If Camelina is not cultivated in your country, do you think that Camelina has a market opportunity and also has prospects in oil industry?

Yes       No



If yes, why?


After showing camelina seeds and crop to the stakeholders who have not seen camelina before!

11. How do you plant (sow) Camelina?

Broad casting     using seed drills     very difficult to plant using machines

12. How do you like to harvest camelina?

Manually     Using locally available Combiners

Specific questions for Partners of 4CE-MED

13. Approximate area of Camelina planted under CA in WP2 (in square meters or in ha): 1 ha

### Crop management

14. Planting equipment (seed drill) used for planting Camelina under CA during 2020-2021 cropping season under WP2:

Model: Damax 17

In your country, usually this model is used for planting .....  Wheat,     Barley,  
 Legumes,     Other crops..... (tick appropriate box)

Have you satisfied with planting Camelina using above mentioned planter?

yes, highly satisfied     Yes, Satisfied     Not at all satisfied

15. If satisfied, please list below key advantages and constrains (if any) of using this planter for planting Camelina under CA. And also list, how these minor constrains can be over come next time (by adjusting setting of machines, etc.)

15a. Advantages:

The sowing was easy in row seeded plots, emergence was satisfying, sowing was performed rapidly because the farmers already had experiences with the machineries

15b. Constrains faced, if your response as “Not yet all satisfied or not satisfied”

Some difficulties in broadcasted plots because the machinery was not setted for broadcasting. A surplus of seeds was sown and sometimes emergence rate was higher than 100%. Moreover in broadcasted plots seeds were sown only in the length of the hopper causing inhomogeneity in emergence

15c. How these constrains can be rectified next time (adjusting the planter settings, land preparation, or go for another model of planter, etc.) in order to plant smoothly to achive desired spacing/plant density during next cropping seasons

This year we will adjust seeder setting in order to be more accurate and control emergence rate.

15d. Any suggested planter models available in your country for planting Camelina in farmers fields during coming season


16. Harvesting equipment (Combine harvester) used for harvesting Camelina under CA during 2020-2021 cropping season under WP2:

Model:

In your country, usually this model is used for harvesting  Wheat,  Barley  Legumes  Other crops..... (tick appropriate box)

Have you satisfied with harvesting Camelina using above mentioned combine harvester?

yes, highly satisfied  Yes, Satisfied  Not at all satisfied

17. If satisfied, please list below key advantages and constrains (if any) of using this combined harvester for harvesting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

17a. Advantages:


17b. Constrains faced, if your response as “Not yet all satisfied or Not satisfied”


17c. How these constrains can be rectified next time (for example, by adjusting the settings, closing ventilation system, or go for another model of combine harvester, etc.) in order to harvest smoothly to achieve minimal seed loss during next cropping seasons


17d. Any suggested planter models available in your country for harvesting Camelina in farmers fields during coming season


18. Do you practice mechanical harvesting with two passes (mowing/swathing and thrashing)  
 yes       No

18a. Please describe which machineries use for two passes harvesting

Swathing was carried out using a GS mower with 1.80 m working width. Cutting height was set up at 0.25 m, in order to ensure proper drying of the swathed plants. Harvesting was performed in both treatments with a combine harvester equipped with a 3 m wide cereal header


18b. Any additional information you need to provide regarding combined harvesters or harvesting of Camelina


## Questionnaire 2

Dear Colleagues,

As a part of WP1 activities, after the first season of Camelina trials under CA in WP2, a second consultation of Local Multi-Stakeholder Platforms (LMSPs) will be taking place in order to improve and possibly upgrade the settings of WP2 trials for coming season. In this context, a compiled national diagnostic report needs to be formulated indicating best 4CE-MED practices and constrains based consultation with local stakeholders (farmers, extension workers, SMEs, agronomists, farm mangers, scientists/professors, farm labours, students, etc.) and the partners of 4CEMED who conducted trials under CA (WP2). In order to facilitate this report, I have developed a questionnaire (attached). Kindly respond to these questions and send me your feedback by 20-July-2021, so that I can compile consolidated report and submit to WP1 leader for final submission.

Thanking you,

### **Questionnaire**

2. What is your profession:

- Farmer     Small and Medium Scale Entrepreneur,     Agriculture Extension Worker  
 Student     Teacher/Professor     Agricultural Researcher     Farm Manager  
 Farm worker     Scientist/Agronomist     Others,  
specify...consultant of seed crusher company .....

3. Do you heard about Camelina oil crop or Camelina oil

- Yes     No

4. Have seen Camelina Crop and/or Camelina Seeds

- Yes     No

5. Are you cultivating Camelina as a crop in cereal based cropping system?

Yes  No

If yes, how many ha?

90 ha in different Italian regions

6. Are you using conservation agriculture? And for which crops?

Yes  No Name of the crops:  Bread Wheat,  Durum Wheat,  barley,

7. If you are cultivating Camelina, are you cultivating Camelina under Conservation Agriculture (CA)?

yes  No, organic systems

8. If you are already cultivating Camelina, do you have market opportunity in your country?

Yes  No

If Yes, provide us bit more details about markets (like formal or informal markets, etc.)

Yes, in organic systems the prize of camelina can vary from 1200-1400€ per ton

9. Do you have enterprises who are extracting oil from Camelina?

Yes  No

10. If Camelina is not cultivated in your country, do you thing that Camelina has a market opportunity and also has prospects in oil industry?

Yes  No

If yes, why?




After showing camelina seeds and crop to the stakeholders who have not seen camelina before!

11. How do you plant (sow) Camelina?

Broad casting     using seed drills     very difficult to plant using machines

12. How do you like to harvest camelina?

Manually     Using locally available Combiners

Specific questions for Partners of 4CE-MED

13. Approximate area of Camelina planted under CA in WP2 (in square meters or in ha): 1 ha

### Crop managemet

14. Planting equipment (seed drill) used for planting Camelina under CA during 2020-2021 cropping season under WP2:

Model: Damax 17

In your country, usually this model is used for planting .....  Wheat,     Barley,  
 Legumes,     Other crops..... (tick appropriate box)

Have you satisfied with planting Camelina using above mentioned planter?

yes, highly satisfied     Yes, Satisfied     Not at all satisfied

15. If satisfied, please list below key advantages and constrains (if any) of using this planter for planting Camelina under CA. And also list, how these minor constrains can be over come next time (by adjusting setting of machines, etc.)

15a. Advantages:

The sowing was easy in row seeded plots, emergence was satisfying, sowing was performed rapidly because the farmers already had experiences with the machineries


15b. Constrains faced, if your response as “Not yet all satisfied or not satisfied”

Some difficulties in broadcasted plots because the machinery was not setted for broadcasting. A surplus of seeds was sown and sometimes emergence rate was higher than 100%. Moreover in broadcasted plots seeds were sown only in the length of the hopper causing inhomogeneity in emergence

15c. How these constrains can be rectified next time (adjusting the planter settings, land preparation, or go for another model of planter, etc.) in order to plant smoothly to achive desired spacing/plant density during next cropping seasons

This year we will adjust seeder setting in order to be more accurate and control emergence rate.


15d. Any suggested planter models available in your country for planting Camelina in farmers fields during coming season


16. Harvesting equipment (Combine harvester) used for harvesting Camelina under CA during 2020-2021 cropping season under WP2:

Model:

In your country, usually this model is used for harvesting  Wheat,  Barley  Legumes  Other crops..... (tick appropriate box)

Have you satisfied with harvesting Camelina using above mentioned combine harvester?

yes, highly satisfied  Yes, Satisfied  Not at all satisfied

17. If satisfied, please list below key advantages and constrains (if any) of using this combined harvester for harvesting Camelina under CA. And also list, how these minor constrains can be over come next time (by adjusting setting of machines, etc.)

17a. Advantages:


17b. Constrains faced, if your response as “Not yet all satisfied or Not satisfied”


17c. How these constrains can be rectified next time (for example, by adjusting the settings, closing ventilation system, or go for another model of combine harvester, etc.) in order to harvest smoothly to achieve minimal seed loss during next cropping seasons



17d. Any suggested planter models available in your country for harvesting Camelina in farmers fields during coming season


18. Do you practice mechanical harvesting with two passes (mowing/swathing and thrashing)  
 yes       No

18a. Please describe which machineries use for two passes harvesting

Swathing was carried out using a GS mower with 1.80 m working width. Cutting height was set up at 0.25 m, in order to ensure proper drying of the swathed plants. Harvesting was performed in both treatments with a combine harvester equipped with a 3 m wide cereal header

18b. Any additional information you need to provide regarding combined harvesters or harvesting of Camelina


### **Questionnaire 3**

Dear Colleagues,

As a part of WP1 activities, after the first season of Camelina trials under CA in WP2, a second consultation of Local Multi-Stakeholder Platforms (LMSPs) will be taking place in order to improve and possibly upgrade the settings of WP2 trials for coming season. In this context, a compiled national diagnostic report needs to be formulated indicating best 4CE-MED practices and constrains based consultation with local stakeholders (farmers, extension workers, SMEs, agronomists, farm mangers, scientists/professors, farm labours, students, etc.) and the partners of 4CEMED who conducted trials under CA (WP2). In order to facilitate this report, I have developed a questionnaire (attached). Kindly respond to these questions and send me your feedback by 20-July-2021, so that I can compile consolidated report and submit to WP1 leader for final submission.

Thanking you,

### **Questionnaire**

2. What is your profession:

Farmer     Small and Medium Scale Entrepreneur,     Agriculture Extension Worker  
 Student     Teacher/Professor     Agricultural Researcher     Farm Manager  
 Farm worker     Scientist/Agronomist    (    )    Others,  
specify..... ..

3. Do you heard about Camelina oil crop or Camelina oil

Yes     No

4. Have seen Camelina Crop and/or Camelina Seeds

Yes     No

5. Are you cultivating Camelina as a crop in cereal based cropping system?

Yes  No

If yes, how many ha?

.....

6. Are you using conservation agriculture? And for which crops?

Yes  No Name of the crops:  Bread Wheat,  Durum Wheat,  barley, corn, soy, wheat, barley, rye, alfalfa, vetch, buckwheat, pea.

7. If you are cultivating Camelina, are you cultivating Camelina under Conservation Agriculture (CA)?

yes  No

8. If you are already cultivating Camelina, do you have market opportunity in your country?

Yes  No

If Yes, provide us bit more details about markets (like formal or informal markets, etc.)


9. Do you have enterprises who are extracting oil from Camelina?

Yes  No

10. If Camelina is not cultivated in your country, do you think that Camelina has a market opportunity and also has prospects in oil industry?

Yes  No

If yes, why?





After showing camelina seeds and crop to the stakeholders who have not seen camelina before!

11. How do you plant (sow) Camelina?

Broad casting     using seed drills     very difficult to plant using machines

12. How do you like to harvest camelina?

Manually     Using locally available Combiners

Specific questions for Partners of 4CE-MED

13. Approximate area of Camelina planted under CA in WP2 (in square meters or in ha): 1 ha

**Crop managemet**

14. Planting equipment (seed drill) used for planting Camelina under CA during 2020-2021 cropping season under WP2:

Model: Damax 17

In your country, usually this model is used for planting .....  Wheat,     Barley,  
 Legumes,     Other crops..... (tick appropriate box)

Have you satisfied with planting Camelina using above mentioned planter?

yes, highly satisfied     Yes, Satisfied     Not at all satisfied

15. If satisfied, please list below key advantages and constrains (if any) of using this planter for planting Camelina under CA. And also list, how these minor constrains can be over come next time (by adjusting setting of machines, etc.)

15a. Advantages:

The sowing was easy in row seeded plots, emergence was satisfying, sowing was performed rapidly because the farmers already had experiences with the machineries
--


15b. Constrains faced, if your response as “Not yet all satisfied or not satisfied”

Some difficulties in broadcasted plots because the machinery was not setted for broadcasting. A surplus of seeds was sown and sometimes emergence rate was higher than 100%. Moreover in broadcasted plots seeds were sown only in the length of the hopper causing inhomogeneity in emergence

15c. How these constrains can be rectified next time (adjusting the planter settings, land preparation, or go for another model of planter, etc.) in order to plant smoothly to achive desired spacing/plant density during next cropping seasons

This year we will adjust seeder setting in order to be more accurate and control emergence rate.
--


15d. Any suggested planter models available in your country for planting Camelina in farmers fields during coming season


16. Harvesting equipment (Combine harvester) used for harvesting Camelina under CA during 2020-2021 cropping season under WP2:

Model:

In your country, usually this model is used for harvesting  Wheat,  Barley  Legumes  Other crops..... (tick appropriate box)

Have you satisfied with harvesting Camelina using above mentioned combine harvester?

yes, highly satisfied  Yes, Satisfied  Not at all satisfied

17. If satisfied, please list below key advantages and constrains (if any) of using this combined harvester for harvesting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

17a. Advantages:


17b. Constrains faced, if your response as “Not yet all satisfied or Not satisfied”


17c. How these constrains can be rectified next time (for example, by adjusting the settings, closing ventilation system, or go for another model of combine harvester, etc.) in order to harvest smoothly to achieve minimal seed loss during next cropping seasons



17d. Any suggested planter models available in your country for harvesting Camelina in farmers fields during coming season


18. Do you practice mechanical harvesting with two passes (mowing/swathing and thrashing)  
 yes       No

18a. Please describe which machineries use for two passes harvesting

Swathing was carried out using a GS mower with 1.80 m working width. Cutting height was set up at 0.25 m, in order to ensure proper drying of the swathed plants. Harvesting was performed in both treatments with a combine harvester equipped with a 3 m wide cereal header

--

18b. Any additional information you need to provide regarding combined harvesters or harvesting of Camelina


## **Questionnaire 4**

Dear Colleagues,

As a part of WP1 activities, after the first season of Camelina trials under CA in WP2, a second consultation of Local Multi-Stakeholder Platforms (LMSPs) will be taking place in order to improve and possibly upgrade the settings of WP2 trials for coming season. In this context, a compiled national diagnostic report needs to be formulated indicating best 4CE-MED practices and constrains based consultation with local stakeholders (farmers, extension workers, SMEs, agronomists, farm managers, scientists/professors, farm labours, students, etc.) and the partners of 4CEMED who conducted trials under CA (WP2). In order to facilitate this report, I have developed a questionnaire (attached). Kindly respond to these questions and send me your feedback by 20-July-2021, so that I can compile consolidated report and submit to WP1 leader for final submission.

Thanking you,

### **Questionnaire**

2. What is your profession:

Farmer     Small and Medium Scale Entrepreneur,     Agriculture Extension Worker  
 Student     Teacher/Professor     Agricultural Researcher     Farm Manager  
 Farm worker     Scientist/Agronomist    (    )    Others,  
specify..... ..

3. Do you heard about Camelina oil crop or Camelina oil

Yes     No

4. Have seen Camelina Crop and/or Camelina Seeds

Yes     No

5. Are you cultivating Camelina as a crop in cereal based cropping system?

Yes  No

If yes, how many ha?

.....

6. Are you using conservation agriculture? And for which crops?

Yes  No Name of the crops:  Bread Wheat,  Durum Wheat,  barley,

7. If you are cultivating Camelina, are you cultivating Camelina under Conservation Agriculture (CA)?

yes  No

8. If you are already cultivating Camelina, do you have market opportunity in your country?

Yes  No

If Yes, provide us bit more details about markets (like formal or informal markets, etc.)


9. Do you have enterprises who are extracting oil from Camelina?

Yes  No

10. If Camelina is not cultivated in your country, do you thing that Camelina has a markect opportunity and also has prospects in oil industry?

Yes  No

If yes, why?




After showing camelina seeds and crop to the stakeholders who have not seen camelina before!

11. How do you plant (sow) Camelina?

Broad casting     using seed drills     very difficult to plant using machines

12. How do you like to harvest camelina?

Manually     Using locally available Combiners

Specific questions for Partners of 4CE-MED

13. Approximate area of Camelina planted under CA in WP2 (in square meters or in ha): 1 ha

### Crop management

14. Planting equipment (seed drill) used for planting Camelina under CA during 2020-2021 cropping season under WP2:

Model: Damax 17

In your country, usually this model is used for planting .....  Wheat,     Barley,  
 Legumes,     Other crops..... (tick appropriate box)

Have you satisfied with planting Camelina using above mentioned planter?

yes, highly satisfied     Yes, Satisfied     Not at all satisfied

15. If satisfied, please list below key advantages and constrains (if any) of using this planter for planting Camelina under CA. And also list, how these minor constrains can be over come next time (by adjusting setting of machines, etc.)

15a. Advantages:

The sowing was easy in row seeded plots, emergence was satisfying, sowing was performed rapidly because the farmers already had experiences with the machineries


15b. Constrains faced, if your response as “Not yet all satisfied or not satisfied”

Some difficulties in broadcasted plots because the machinery was not setted for broadcasting. A surplus of seeds was sown and sometimes emergence rate was higher than 100%. Moreover in broadcasted plots seeds were sown only in the length of the hopper causing inhomogeneity in emergence

15c. How these constrains can be rectified next time (adjusting the planter settings, land preparation, or go for another model of planter, etc.) in order to plant smoothly to achive desired spacing/plant density during next cropping seasons

This year we will adjust seeder setting in order to be more accurate and control emergence rate.


15d. Any suggested planter models available in your country for planting Camelina in farmers fields during coming season


16. Harvesting equipment (Combine harvester) used for harvesting Camelina under CA during 2020-2021 cropping season under WP2:

Model:

In your country, usually this model is used for harvesting  Wheat,  Barley  Legumes  Other crops..... (tick appropriate box)

Have you satisfied with harvesting Camelina using above mentioned combine harvester?

yes, highly satisfied  Yes, Satisfied  Not at all satisfied

17. If satisfied, please list below key advantages and constrains (if any) of using this combined harvester for harvesting Camelina under CA. And also list, how these minor constrains can be over come next time (by adjusting setting of machines, etc.)

17a. Advantages:


17b. Constrains faced, if your response as “Not yet all satisfied or Not satisfied”


17c. How these constrains can be rectified next time (for example, by adjusting the settings, closing ventilation system, or go for another model of combine harvester, etc.) in order to harvest smoothly to achieve minimal seed loss during next cropping seasons



17d. Any suggested planter models available in your country for harvesting Camelina in farmers fields during coming season


18. Do you practice mechanical harvesting with two passes (mowing/swathing and thrashing)  
 yes       No

18a. Please describe which machineries use for two passes harvesting

Swathing was carried out using a GS mower with 1.80 m working width. Cutting height was set up at 0.25 m, in order to ensure proper drying of the swathed plants. Harvesting was performed in both treatments with a combine harvester equipped with a 3 m wide cereal header

18b. Any additional information you need to provide regarding combined harvesters or harvesting of Camelina


## **Questionnaire 5**

Dear Colleagues,

As a part of WP1 activities, after the first season of Camelina trials under CA in WP2, a second consultation of Local Multi-Stakeholder Platforms (LMSPs) will be taking place in order to improve and possibly upgrade the settings of WP2 trials for coming season. In this context, a compiled national diagnostic report needs to be formulated indicating best 4CE-MED practices and constrains based consultation with local stakeholders (farmers, extension workers, SMEs, agronomists, farm mangers, scientists/professors, farm labours, students, etc.) and the partners of 4CEMED who conducted trials under CA (WP2). In order to facilitate this report, I have developed a questionnaire (attached). Kindly respond to these questions and send me your feedback by 20-July-2021, so that I can compile consolidated report and submit to WP1 leader for final submission.

Thanking you,

### **Questionnaire**

2. What is your profession:

Farmer     Small and Medium Scale Entrepreneur,     Agriculture Extension Worker  
 Student     Teacher/Professor     Agricultural Researcher     Farm Manager  
 Farm worker     Scientist/Agronomist    (    )    Others,  
specify..... ..

3. Do you heard about Camelina oil crop or Camelina oil

Yes     No

4. Have seen Camelina Crop and/or Camelina Seeds

Yes     No

5. Are you cultivating Camelina as a crop in cereal based cropping system?

Yes  No

If yes, how many ha?

.....

6. Are you using conservation agriculture? And for which crops?

Yes  No Name of the crops:  Bread Wheat,  Durum Wheat,  barley, corn, soy, wheat, barley, rye, alfalfa, vetch, buckwheat, pea.

7. If you are cultivating Camelina, are you cultivating Camelina under Conservation Agriculture (CA)?

yes  No

8. If you are already cultivating Camelina, do you have market opportunity in your country?

Yes  No

If Yes, provide us bit more details about markets (like formal or informal markets, etc.)


9. Do you have enterprises who are extracting oil from Camelina?

Yes  No

10. If Camelina is not cultivated in your country, do you think that Camelina has a market opportunity and also has prospects in oil industry?

Yes  No

If yes, why?





After showing camelina seeds and crop to the stakeholders who have not seen camelina before!

11. How do you plant (sow) Camelina?

Broad casting     using seed drills     very difficult to plant using machines

12. How do you like to harvest camelina?

Manually     Using locally available Combiners

Specific questions for Partners of 4CE-MED

13. Approximate area of Camelina planted under CA in WP2 (in square meters or in ha): 1 ha

### Crop management

14. Planting equipment (seed drill) used for planting Camelina under CA during 2020-2021 cropping season under WP2:

Model: Damax 17

In your country, usually this model is used for planting .....  Wheat,     Barley,  
 Legumes,     Other crops..... (tick appropriate box)

Have you satisfied with planting Camelina using above mentioned planter?

yes, highly satisfied     Yes, Satisfied     Not at all satisfied

15. If satisfied, please list below key advantages and constrains (if any) of using this planter for planting Camelina under CA. And also list, how these minor constrains can be over come next time (by adjusting setting of machines, etc.)

15a. Advantages:

The sowing was easy in row seeded plots, emergence was satisfying, sowing was performed rapidly because the farmers already had experiences with the machineries
--


15b. Constrains faced, if your response as “Not yet all satisfied or not satisfied”

Some difficulties in broadcasted plots because the machinery was not set for broadcasting. A surplus of seeds was sown and sometimes emergence rate was higher than 100%. Moreover ,in broadcasted plots seeds were sown only in the length of the hopper causing inhomogeneity in emergence

15c. How these constrains can be rectified next time (adjusting the planter settings, land preparation, or go for another model of planter, etc.) in order to plant smoothly to achive desired spacing/plant density during next cropping seasons

This year we will adjust seeder setting in order to be more accurate and control emergence rate.
--


15d. Any suggested planter models available in your country for planting Camelina in farmers fields during coming season

The seeder DAMAX 17 could be satisfying for camelina sowing in row, for broadcasted techniques some adaptations should be used, maybe a pneumatic seeder could perform better.

16. Harvesting equipment (Combine harvester) used for harvesting Camelina under CA during 2020-2021 cropping season under WP2:

Model:

In your country, usually this model is used for harvesting  Wheat,  Barley  Legumes  Other crops..... (tick appropriate box)

Have you satisfied with harvesting Camelina using above mentioned combine harvester?

yes, highly satisfied  Yes, Satisfied  Not at all satisfied

17. If satisfied, please list below key advantages and constrains (if any) of using this combined harvester for harvesting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

17a. Advantages:

Camelina can be harvested with satisfying result with conventional combined machines but some adjustments can be apported to the machine in particular to the air flow, setting in to the minimum level, because of the small size of the seeds

17b. Constrains faced, if your response as “Not yet all satisfied or Not satisfied”


17c. How these constrains can be rectified next time (for example, by adjusting the settings, closing ventilation system, or go for another model of combine harvester, etc.) in order to harvest smoothly to achieve minimal seed loss during next cropping seasons


17d. Any suggested planter models available in your country for harvesting Camelina in farmers fields during coming season


18. Do you practice mechanical harvesting with two passes (mowing/swathing and thrashing)  
 yes       No

18a. Please describe which machineries use for two passes harvesting

Swathing was carried out using a GS mower with 1.80 m working width. Cutting height was set up at 0.25 m, in order to ensure proper drying of the swathed plants. Harvesting was performed in both treatments with a combine harvester equipped with a 3 m wide cereal header

18b. Any additional information you need to provide regarding combined harvesters or harvesting of Camelina


## Annex 2: Response to Questionnaire from Greece

Dear Colleagues,

As a part of WP1 activities, after the first growing season of camelina trials under CA in WP2, a second consultation of Local Multi-Stakeholder Platforms (LMSPs) took place in Greece (Thessaloniki) on 20<sup>th</sup> of October 2021 in order to improve and possibly upgrade the settings of WP2 trials for 2021-22.

Please find attached the completed questionnaire. I am remaining at your disposal, Kyriakos.

### Questionnaire

2. What is your profession:

<i>a/a</i>	<i>Profession</i>
1	Researcher, Institute of Plant Breeding and Genetic Resources, Hellenic Agricultural Organization - Demeter
2	Director, Variety Research Institutes of Cultivated Plants
3	Agricultural Engineer MSc, PhD, AgroApps PC
4	Business Development Manager, Agroapps PC
5	Farmer
6	Postdoctoral Researcher, Department of Plant Breeding, Aristotle University of Thessaloniki
7	Responsible for Energy Crops, Biomass Department of CRES
8	Responsible for Investment & Research Programs, BIOS Agrosystems
9	Agronomist in the department of seed production in Bios Agrosystems

3. Do you heard about Camelina oil crop or Camelina oil  
5 people answered Yes

4. Have seen Camelina Crop and/or Camelina Seeds  
5 people answered Yes

5. Are you cultivating Camelina as a crop in cereal based cropping system?  
2 people answered Yes

If yes, how many ha?  
2 Ha

6. Are you using conservation agriculture? And for which crops?  
 Yes                       No

In Greece we are growing cereals using conservation agriculture on demo fields.

7. If you are cultivating Camelina, are you cultivating Camelina under Conservation Agriculture (CA)?  
 yes                       No we tested camelina only in the view of 4CEMED.

8. If you are already cultivating Camelina, do you have market opportunity in your country?  
 Yes                       No

9. Do you have enterprises who are extracting oil from Camelina?  
 Yes                       No

10. If Camelina is not cultivated in your country, do you think that Camelina has a market opportunity and also has prospects in oil industry?  
 Yes                       No

If yes, why?



Biofuels
----------

After showing camelina seeds and crop to the stakeholders who have not seen camelina before!

11. How do you plant (sow) Camelina?

Broad casting     using seed drills     very difficult to plant using machines

12. How do you like to harvest camelina?

Manually     Using locally available Combiners

Specific questions for Partners of 4CE-MED

13. Approximate area of Camelina planted under CA in WP2 (in square meters or in ha): 0.5 ha in the 1<sup>st</sup> year

### Crop management

14. Planting equipment (seed drill) used for planting Camelina under CA during 2020-2021 cropping season under WP2:

A model of pneumatic seeder that is used for cereals (Wheat and Barley). In generally, we were satisfied with the sowing of Camelina and we made also some necessary mechanical adjustments in order to have high density of camelina plants (approximately 500 plants/m<sup>2</sup>).

15. If satisfied, please list below key advantages and constrains (if any) of using this planter for planting Camelina under CA. And also list, how these minor constrains can be over come next time (by adjusting setting of machines, etc.)

15a. Advantages:

Easy sowing
Save time
High density of plants

15b. Constrains faced, if your response as “Not yet all satisfied or not satisfied”

The sowing requires experience because the seed of camelina is small. So, it needs attention to land preparation and depth of camelina seed.
--

15c. How these constrains can be rectified next time (adjusting the planter settings, land preparation, or go for another model of planter, etc.) in order to plant smoothly to achieve desired spacing/plant density during next cropping seasons

Prepare seed bed properly (land preparation)
Choose the right seed disc for the pneumatic seeder

15d. Any suggested planter models available in your country for planting Camelina in farmers fields during coming season

Pneumatic Seeder
But it is depended on the planting equipment of the local farmers

16. Harvesting equipment (Combine harvester) used for harvesting Camelina under CA during 2020-2021 cropping season under WP2:

A model of a Combine harvester that is used for harvesting of cereals (wheat and Barley). We changed the sieve of the combine in order to minimize the losses of the seeds. In generally, we were satisfied of the harvesting process.

17. If satisfied, please list below key advantages and constrains (if any) of using this combined harvester for harvesting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

17a. Advantages:

Fast and easy way of harvesting
It is not required a new combine harvester

17b. Constrains faced, if your response as “Not yet all satisfied or Not satisfied”

It requires experience for the harvesting and making the properly mechanical adjustments and the air flow
---

17c. How these constrains can be rectified next time (for example, by adjusting the settings, closing ventilation system, or go for another model of combine harvester, etc.) in order to harvest smoothly to achieve minimal seed loss during next cropping seasons

Technical support for the mechanical adjustments of the combine harvester
---

17d. Any suggested planter models available in your country for harvesting Camelina in farmers fields during coming season

It is depended on the available harvesting machines in the cultivation area
---

18. Do you practice mechanical harvesting with two passes (mowing/swathing and thrashing)

( ) yes ( ✓ ) No

18a. Please describe which machineries use for two passes harvesting

-
---

18b. Any additional information you need to provide regarding combined harvesters or harvesting of Camelina

-

## Annex 3: Response to Questionnaire from Morocco

Dear Colleagues,

As a part of WP1 activities, after the first season of Camelina trials under CA in WP2 of 4CE-MED Project, a second consultation of Local Multi-Stakeholder Platforms (LMSPs) will be taking place in order to improve and possibly upgrade the settings of WP2 trials for coming season. In this context, a compiled national diagnostic report needs to be formulated indicating best 4CE-MED practices and constrains based consultation with local stakeholders (farmers, extension workers, SMEs, agronomists, farm managers, scientists/professors, farm labours, students, etc.) and the partners of 4CEMED who conducted trials under CA (WP2). In order to facilitate this report, I have developed a questionnaire (attached). Kindly respond to these questions and send me your feedback by 20-July-2021, so that I can compile consolidated report and submit to WP1 leader for final submission.

Thanking you

### Questionnaire

2. What is your profession:

- Farmer     Small and Medium Scale Entrepreneur,     Agriculture Extension Worker     Student  
 Teacher/Professor     Agricultural Researcher(~)     Farm Manager     Farm worker  
 Scientist/Agronomist     Others, specify..... ..

3. Do you heard about Camelina oil crop or Camelina oil(~) Yes     No

4. Have seen Camelina Crop and/or Camelina Seeds(~) Yes     No

5. Are you cultivating Camelina as a crop in cereal based cropping system?

(~) Yes ( )

No If yes, how many

ha?

0.5 ha.....

6. Are you using conservation agriculture? And for which crops?

(~) Yes ( ) No Name of the crops: ( ~) Bread Wheat, ( ~) Durum Wheat, ( ~ )  
barley, legumes

7. If you are cultivating Camelina, are you cultivating Camelina under Conservation Agriculture (CA)? (~) yes ( ) No

8. If you are already cultivating Camelina, do you have market opportunity in your country? ( ) Yes (~) No

If Yes, provide us bit more details about markets (like formal or informal markets, etc.)


9. Do you have enterprises who are extracting oil from Camelina? (~) Yes ( ) No

10. If Camelina is not cultivated in your country, do you think that Camelina has a market opportunity and also has prospects in oil industry?

(~) Yes ( )

No If yes, why?

Big table oil demand

After showing camelina seeds and crop to the stakeholders who have not seen camelina before!

11. How do you plant (sow) Camelina?

Broad casting(~) using seed drills  very difficult to plant using machines

12. How do you like to harvest camelina?

Manually  (~) Using experimental

Combiners Specific questions for Partners of

4CE-MED

13. Approximate area of Camelina planted under CA in WP2 (in square meters or in ha): 0.25 ha

**Crop management**

14. Planting equipment (seed drill) used for planting Camelina under CA during 2020-2021 cropping season under WP2:

Model:

In your country, usually this model is used for planting .....  (~) Wheat,  (~) Barley,  (~) Legumes,  Other crops ..... (tick appropriate box)

Have you satisfied with planting Camelina using above mentioned planter?  yes, highly satisfied  (~) Yes, Satisfied

Not at all satisfied

15. If satisfied, please list below key advantages and constrains (if any) of using this planter for planting Camelina under CA. And also, list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

15a. Advantages:

Good distribution of seeds


15b. Constrains faced, if your response as “Not yet all satisfied or not satisfied”


15c. How these constrains can be rectified next time (adjusting the planter settings, land preparation, or go for another model of planter, etc.) in order to plant smoothly to achieve desired spacing/plant density during next cropping seasons

We used the wintersteiger Experimental seeder as the quantities are small and the seeds are very small we used barley meal to have a good seed distribution



15d. Any suggested planter models available in your country for planting Camelina in farmers fields during coming season


16. Harvesting equipment (Combine harvester) used for harvesting Camelina under CA during 2020-2021 cropping season under WP2:Model:

In your country, usually this model is used for harvesting ( ~ ) Wheat, ( ~ ) Barley ( ~ ) Legumes ( ~ ) Other crops..... (tick appropriate box)

Have you satisfied with harvesting Camelina using above mentioned combine harvester? ( ) yes, highly satisfied ( ~ ) Yes, Satisfied ( ) Not at all satisfied

17.If satisfied, please list below key advantages and constrains (if any) of using this combined harvester for harvesting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

17a. Advantages:

Speed operation
We had to set the cleaning fans to the lowest flow rate so as not to lose any grain, which meantthat we had to iron the seeds and pods through a second cleaning system, even in the tests we cleaned the seeds manually.


17b. Constrains faced, if your response as “Not yet all satisfied or Not satisfied”


17c. How these constrains can be rectified next time (for example, by adjusting the settings, closing ventilation system, or go for another model of combine harvester, etc.) in order to harvest smoothly to achieve minimal seed loss during next cropping seasons


17d. Any suggested planter models available in your country for harvesting Camelina in farmers fields during coming season


18. Do you practice mechanical harvesting with two passes (mowing/swathing and thrashing)  
 yes  No

18a. Please describe which machineries use for two passes harvesting


18b. Any additional information you need to provide regarding combined harvesters or harvesting of Camelina



### Questions regarding Camelina oil

Do you ever extract oil from Camelina seeds?  Yes  No

If yes, what is your opinion or experience?

Easy to extract,  difficult to extract, or  same as rape seed oil

What about oil yield? Is it same as rape seed oil?

Same as rape seeds  More than rape seeds  Less than rape seeds

How do you like aroma of the oil?  Like it  Do not like it

Did you use oil for cooking?  Yes  No

If yes, how it tastes?

Good,  same as other oils such as rape seeds,  sunflower oils

## Annex 4: Response to Questionnaire from Tunisia

Dear Colleagues,

As a part of WP1 activities, after the first season of Camelina trials under CA in WP2, a second consultation of Local Multi-Stakeholder Platforms (LMSPs) will be taking place in order to improve and possibly upgrade the settings of WP2 trials for coming season. In this context, a compiled national diagnostic report needs to be formulated indicating best 4CE-MED practices and constrains based consultation with local stakeholders (farmers, extension workers, SMEs, agronomists, farm managers, scientists/professors, farm labours, students, etc.) and the partners of 4CEMED who conducted trials under CA (WP2). In order to facilitate this report, I have developed a questionnaire (attached). Kindly respond to these questions and send me your feedback by 20-July-2021, so that I can compile consolidated report and submit to WP1 leader for final submission.

Thanking you,

### Questionnaire

2. What is your profession:

Farmer     Small and Medium Scale Entrepreneur,     Agriculture Extension Worker  
 Student     Teacher/Professor     Agricultural Researcher     Farm  
Manager     Farm worker     Scientist/Agronomist     Others,  
specify..... ..

3. Do you heard about Camelina oil crop or Camelina oil

Yes     No

4. Have seen Camelina Crop and/or Camelina Seeds

Yes     No

5. Are you cultivating Camelina as a crop in cereal based cropping system?

Yes  No

If yes, how many ha?

.....

6. Are you using conservation agriculture? And for which crops?

Yes (I mean in Tunisia)  No Name of the crops:  Bread Wheat,  Durum  
Wheat,  barley, .....

7. If you are cultivating Camelina, are you cultivating Camelina under Conservation Agriculture (CA)?

yes  No

8. If you are already cultivating Camelina, do you have market opportunity in your country?

Yes  No

If Yes, provide us bit more details about markets (like formal or informal markets, etc.)


9. Do you have enterprises who are extracting oil from Camelina?

Yes  No

10. If Camelina is not cultivated in your country, do you think that Camelina has a market opportunity and also has prospects in oil industry?

Yes  No

If yes, why?

Farmers are looking for new crops to diversify crop rotation


After showing camelina seeds and crop to the stakeholders who have not seen camelina before!

No one have seen camelina before

11. How do you plant (sow) Camelina?

Broad casting     using seed drills (for 4 CE- MED)     very difficult to plant using machines

12. How do you like to harvest camelina?

Manually     Using locally available Combiners

Specific questions for Partners of 4CE-MED

13. Approximate area of Camelina planted under CA in WP2 (in square meters or in ha): 1720m<sup>2</sup>

### Crop management

14.Planting equipment (seed drill) used for planting Camelina under CA during 2020-2021 cropping season under WP2:

Model: Tractor-mounted Wintersteiger plot seeder; Syrial no.: 2200-20080676; Type: TRM 180; year: 2008

In your country, usually this model is used for planting .....  Wheat,     Barley,  Legumes,     Other crops..... (tick appropriate box)

Have you satisfied with planting Camelina using above mentioned planter?

yes, highly satisfied     Yes, Satisfied     Not at all satisfied

15.If satisfied, please list below key advantages and constrains (if any) of using this planter for planting Camelina under CA. And also list, how these minor constrains can be over come next time (by adjusting setting of machines, etc.)

15a.Advantages:

Save time
Avoid heterogeneous sowing of camelina seeds

15b. Constrains faced, if your response as “Not yet all satisfied or not satisfied”

Adjustment of the machine
Very old machine

15c. How these constrains can be rectified next time (adjusting the planter settings, land preparation, or go for another model of planter, etc.) in order to plant smoothly to achieve desired spacing/plant density during next cropping seasons

adjusting the planter settings

15d. Any suggested planter models available in your country for planting Camelina in farmers fields during coming season: **No**


16. Harvesting equipment (Combine harvester) used for harvesting Camelina under CA during 2020-2021 cropping season under WP2:

Model: Wintersteiger plot combine ; Fabr. Nr. 1400/90/359/12; Type: NM-ELITE; year: 1990



In your country, usually this model is used for harvesting (×) Wheat, (×) Barley (×) Legumes ( ) Other crops..... (tick appropriate box)

Have you satisfied with harvesting Camelina using above mentioned combine harvester?

( ) yes, highly satisfied (×) Yes, Satisfied ( ) Not at all satisfied

17.If satisfied, please list below key advantages and constrains (if any) of using this combined harvester for harvesting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

17a.Advantages:

Save time
Avoid yield losses maximum

17b.Constrains faced, if your response as “Not yet all satisfied or Not satisfied”

Very old machine

17c.How these constrains can be rectified next time (for example, by adjusting the settings, closing ventilation system, or go for another model of combine harvester, etc.) in order to harvest smoothly to achieve minimal seed loss during next cropping seasons

adjusting the settings,
closing ventilation system

17d.Any suggested planter models available in your country for harvesting Camelina in farmers fields during coming season: **No**


18. Do you practice mechanical harvesting with two passes (mowing/swathing and thrashing)

yes       No

18a. Please describe which machineries use for two passes harvesting

Rotary mower (SaMAZ-Z010 1.65 Stoggia Agriculture Division SRL) + Wintersteiger plot combine harvester

18b. Any additional information you need to provide regarding combined harvesters or harvesting of Camelina


## Annex 5: Response to Questionnaire from Algeria

Dear Colleagues,

As a part of WP1 activities, after the first season of Camelina trials under CA in WP2, a second consultation of Local Multi-Stakeholder Platforms (LMSPs) will be taking place in order to improve and possibly upgrade the settings of WP2 trials for coming season. In this context, a compiled national diagnostic report needs to be formulated indicating best 4CE-MED practices and constrains based consultation with local stakeholders (farmers, extension workers, SMEs, agronomists, farm mangers, scientists/professors, farm labours, students, etc.) and the partners of 4CEMED who conducted trials under CA (WP2). In order to facilitate this report, I have developed a questionnaire (attached). Kindly respond to these questions and send me your feedback by 20-July-2021, so that I can compile consolidated report and submit to WP1 leader for final submission.

Thanking you,

### Questionnaire

Here you will find the summarized answers of the questions from the questionnaire distributed to our stakeholders (farmers, engineers, cooperatives managers, farmer associations, researchers, university teachers) in Algeria.

The following figure is a map of the location of our stakeholders (in red):



3. Do you heard about Camelina oil crop or Camelina oil

All people interviewed didn't heard about camelina oil crop or camelina oil before the starting of the 4CE-MED project.

4. Have you seen Camelina Crop and/or Camelina Seeds?

All people interviewed didn't see Camelina crop or Camelina seed before the starting of the 4CE-MED project.

5. Are you cultivating Camelina as a crop in cereal based cropping system?

No.

If yes, how many ha?

6. Are you using conservation agriculture? And for which crops?

Some farmers of Sétif region are using conservation agriculture. Among them, our stakeholders are practicing CA in cereal, legumes and forages. In the region of eastern Algeria, there are 39 direct seeders (50% disc seed drill and 50% tine disc drill).

7. If you are cultivating Camelina, are you cultivating Camelina under Conservation Agriculture (CA)?

No.

8. If you are already cultivating Camelina, do you have market opportunity in your country?

No,

9. Do you have enterprises who are extracting oil from Camelina?

No,

10. If Camelina is not cultivated in your country, do you think that Camelina has a market opportunity and also has prospects in oil industry?

Yes, but the policymakers should encourage the development of Camelina crop.

11. How do you plant (sow) Camelina?

They don't

12. How do you like to harvest camelina?

They don't

**Specific questions for Partners of 4CE-MED**

13. Approximate area of Camelina planted under CA in WP2 (in square meters or in ha):  
100% of the surface (7200 m<sup>2</sup>).

**Crop management**

14. Planting equipment (seed drill) used for planting Camelina under CA during 2020-2021 cropping season under WP2: Two models of drill seeding are used by farmers for planting Camelina. They use the same equipment for the rest of their crops (cereal and legumes). The models are shown below



15. If satisfied, please list below key advantages and constrains (if any) of using this planter for planting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

15a. Advantages:

Save time (Low amounts of seed needed)
Low fuel consumption (shallow drilling)

15b. Constrains faced, if your response as “Not yet all satisfied or not satisfied”

The seeding drill is heavy need high power tractor
Sowing requires experience and certain skills

15c. How these constrains can be rectified next time (adjusting the planter settings, land preparation, or go for another model of planter, etc.) in order to plant smoothly to achieve desired spacing/plant density during next cropping seasons

Extension and training to farmers

15d. Any suggested planter models available in your country for planting Camelina in farmers' fields during coming season

Tine- based seed drill used for planting rapeseed with some adjustment because it doesn't need high power tractor

16. Harvesting equipment (Combine harvester) used for harvesting Camelina under CA during 2020-2021 cropping season under WP2:

The harvesting of Camelina was carried out by mowing and threshing by hand.



17. If satisfied, please list below key advantages and constrains (if any) of using this combined harvester for harvesting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

17d. Any suggested harvester models available in your country for harvesting Camelina in farmers fields during coming season

There is no specific harvester model for Camelina

18. Do you practice mechanical harvesting with two passes (mowing/swathing and thrashing)

Yes, for this year

18a. Please describe which machineries use for two passes harvesting

Mower but swathing and threshing by hand

18b. Any additional information you need to provide regarding combined harvesters or harvesting of Camelina

The suitable models are the ones working with low airflow to reduce losses

## Annex 6: Response to Questionnaire from Spain

Dear Colleagues,

As a part of WP1 activities, after the first season of Camelina trials under CA in WP2, a second consultation of Local Multi-Stakeholder Platforms (LMSPs) will be taking place in order to improve and possibly upgrade the settings of WP2 trials for coming season. In this context, a compiled national diagnostic report needs to be formulated indicating best 4CE-MED practices and constrains based consultation with local stakeholders (farmers, extension workers, SMEs, agronomists, farm managers, scientists/professors, farm labours, students, etc.) and the partners of 4CEMED who conducted trials under CA (WP2). In order to facilitate this report, I have developed a questionnaire (attached). Kindly respond to these questions and send me your feedback by 20-July-2021, so that I can compile consolidated report and submit to WP1 leader for final submission.

Thanking you,

### **Questionnaire**

We will show here the summary or conclusions to the proposed questions based on our experience working mostly with cooperatives, farmers, farm managers and farm workers ins Spain.

Here is a map of the location of our collaborators:





### 3. Do you heard about Camelina oil crop or Camelina oil

Most of the people we work with have heard about camelina oil crop or camelina oil from us. There are some farmers cultivating camelina for us since 2010 in Spain. Over these past 10 years, farmers in Spain have cultivated over 50.000 hectares of camelina in dryland regions as a rotation crop with barley, mainly.

We work as well with more than 10 research centres and some Spanish universities, including ITAP (Albacete), JCCM Finca Entresierras (Ciudad Real), JCCM Finca Albaladejito (Cuenca), ITAGRA (Palencia), DGA Aragón (Zaragoza), INTIA Navarra, INIA Finca La Canaleja (Madrid), IMIDRA Fincas El Encín, La Isla and La Chimenea (Madrid), ICA.CSIC Finca La Poveda (Madrid) and Universidad de León.

### 4. Have you seen Camelina Crop and/or Camelina Seeds?

In the regions where camelina is cultivated, most of the farmers and cooperatives have heard about camelina crop or even visited other farmers' crop.

### 5. Are you cultivating Camelina as a crop in cereal based cropping system?

The vast majority of the farmers cultivating camelina in Spain have a cereal based cropping system, where barley is the main winter cereal cultivated.

If yes, how many ha?

Typically, camelina farmers cultivate plots ranging from 10 to 25 ha, although there are also large farmers that have introduced camelina in their crop rotations with up to 80-100 hectares per year.



6. Are you using conservation agriculture? And for which crops?

Most of the farmers cropping cereals in Spain are not using conservation agriculture. Around 89% of the surface of reference crops (cereals, sunflower, forage corn and other forage crops) is sown in a conventional way according to the Ministry of Agriculture. Nevertheless, conservation agriculture practices are increasing every year (from 6% to 11% in the last 10 years), being cereals and other forages the groups where a higher percentage of direct sowing is observed: 11,29% of the cereals at a national scale.

**Table. Distribution of direct seeding by crop and autonomous communities in 2020**

Comunidades Autónomas	Cereales			Girasol			Maíz forrajero			Otros forrajes		
	Sup siembra directa (ha) A	Sup total (ha) B	% A/B	Sup siembra directa (ha) A	Sup total (ha) B	% A/B	Sup siembra directa (ha) A	Sup total (ha) B	% A/B	Sup siembra directa (ha) A	Sup total (ha) B	% A/B
GALICIA	163	32.275	0,51%				952	70.202	1,36%		79	
P.DE ASTURIAS	40	409	9,67%				379	7.373	5,14%	1.488	1.936	76,83%
CANTABRIA		984					738	4.530	16,29%			
PAIS VASCO		50.027			3.354		13	1.055	1,19%		1.047	
NAVARRA	39.190	192.138	20,40%	1.295	2.353	55,06%	28	163	17,07%	511	4.160	12,29%
LA RIOJA	8.532	57.124	14,94%	383	634	60,44%		1			375	
ARAGON	127.681	884.604	14,43%	192	11.208	1,72%		632		11.207	40.668	27,56%
CATALUÑA	65.633	322.903	20,33%	111	2.829	3,92%	130	2.637	4,93%	5.717	41.085	13,92%
BALEARES	979	29.982	3,26%					435		1.657	22.537	7,35%
CASTILLA Y LEON	247.736	2.082.558	11,90%	17.855	255.355	6,99%	56	1.164	4,81%	15.584	133.167	11,70%
MADRID	1.765	77.058	2,29%							15	1.145	1,35%
CASTILLA –LA MANCHA	35.995	1.278.520	2,82%	475	158.249	0,30%		520		1.999	46.468	4,30%
C.VALENCIANA	6.827	27.859	24,51%	221	221	100,00%	5	720	0,64%	1.098	2.628	41,78%
R.DE MURCIA	21.396	55.507	38,55%	498	498	100,00%	2	2	100,00%	23	23	100,00%
EXTREMADURA	30.281	233.132	12,99%	36	10.663	0,34%	359	841	42,63%	14.159	25.208	56,17%
ANDALUCÍA	86.567	633.144	13,67%	11.514	215.157	5,35%	31	359	8,76%	6.314	34.203	18,46%
CANARIAS	171	476	35,88%				2	11	16,51%	169	398	42,38%
Total	672.955	5.958.700	11,29%	32.581	660.521	4,93%	2.694	90.646	2,97%	59.941	355.128	16,88%

Source: 2020 Survey on crop surfaces and yields: Analysis of soil maintenance techniques and sowing methods in Spain. ESYRCE. Ministry of Agriculture, Fisheries and Food

7. If you are cultivating Camelina, are you cultivating Camelina under Conservation Agriculture (CA)?

Most of the farmers cultivating camelina produce winter barley under conventional tillage. However, we also have the experience of farmers (about 25-30%) performing Conservation Agriculture (CA) which have incorporated camelina as a resilient oilseed alternative in their crop rotation.

8. If you are already cultivating Camelina, do you have market opportunity in your country?

Yes, Camelina Company España S.L. provides a contract at the beginning of each agricultural campaign, which includes the supply of high quality camelina planting seed, technical support during the crop cycle as well as the commitment to the purchase of all the camelina harvest production.

9. Do you have enterprises who are extracting oil from Camelina?

Yes, Camelina Company España S.L. has experience extracting camelina oil, both with mechanical press as well as with solvent extraction. The main market driver is the sustainable biofuel industry. Additionally, there is a niche market (although in much smaller scale) in the cosmetic industry.

10. If Camelina is not cultivated in your country, do you think that Camelina has a market opportunity and also has prospects in oil industry?

n/a

11. How do you plant (sow) Camelina?

Most of the farmers use seed drills.

12. How do you like to harvest camelina?

All farmers in Spain use combine harvesting machinery. Some (usually larger farmers) have their own equipment, but otherwise farmers subcontract locally available services.

### **Specific questions for Partners of 4CE-MED**

13. Approximate area of Camelina planted under CA in WP2 (in square meters or in ha):

66% of the surface

### **Crop management**

14. Planting equipment (seed drill) used for planting Camelina under CA during 2020-2021 cropping season under WP2:

Several models that are also used for wheat, barley, legumes and other crops. In general, farmers are satisfied or highly satisfied planting camelina with the same equipment that they use for the rest of their crops.



15. If satisfied, please list below key advantages and constrains (if any) of using this planter for planting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

15a. Advantages:

Save time (Low amounts of seed needed)
Low diesel consumption (shallow drilling)
Both mechanical seed drill and pneumatic seed drill are available for sowing camelina
tine-based drill vs a disc-based drill

15b. Constrains faced, if your response as “Not yet all satisfied or not satisfied”

Not all seeders are valid for sowing camelina. In general, all pneumatic seeders can be employed – however, mechanical ones can only be used when it is possible to adjust and fine tune to small size seeds.
Sowing requires experience and certain skills
The farmer needs to change the sowing methodology (depth, land preparation, roller harrow use,..)
Tine-based drills are preferred in no tilling schemes (to guarantee seed-soil contact)

15c. How these constrains can be rectified next time (adjusting the planter settings, land preparation, or go for another model of planter, etc.) in order to plant smoothly to achieve desired spacing/plant density during next cropping seasons

Communicate the correct protocol and allow technical support, as the main limitation does not come from a machinery or mechanical limitation.
Choosing the right seed drill model
Preparing the bed of seeding properly

15d. Any suggested planter models available in your country for planting Camelina in farmers fields during coming season

As indicated above, almost all seed machines are valid: Mechanical sowing machines with gearbox and any pneumatic sowing machine can be employed for camelina sowing.
Horsch seed drills

16. Harvesting equipment (Combine harvester) used for harvesting Camelina under CA during 2020-2021 cropping season under WP2:

Several models that are also used for wheat, barley, legumes and other crops. In general, farmers are not very satisfied harvesting camelina. The main reason is that, in order to minimize camelina losses during harvest, it is recommendable that a certain amount of camelina husks or pods

(camelina silique) are harvested with camelina grain. This means that camelina harvest usually contains 10-20% impurities. Farmers that usually harvest barley are not used to such impurities.



17. If satisfied, please list below key advantages and constrains (if any) of using this combined harvester for harvesting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

17a. Advantages:

Camelina can be harvested with a conventional combine harvester
Only small setting adjustments for small seed harvest are needed

17b. Constrains faced, if your response as “Not yet all satisfied or Not satisfied”

Conventional combine machines are designed for higher seed size and seed losses can be high if not fine tuned
Some of the combines can not be adjusted to sufficiently reduce the air flow
Camelina is harvested with a high amount of impurities (10-20%)

17c. How these constrains can be rectified next time (for example, by adjusting the settings, closing ventilation system, or go for another model of combine harvester, etc.) in order to harvest smoothly to achieve minimal seed loss during next cropping seasons

Adjusting combine harvester settings to small seeds
Starting harvest with low moisture (crop should be at harvest point) and low humidity (from noon)
Having a better camelina implantation from the beginning greatly reduces weed contamination



17d. Any suggested planter models available in your country for harvesting Camelina in farmers fields during coming season

Any new machine (last decade) of the typical brands (New Holland, Klass,..) is valid.

18. Do you practice mechanical harvesting with two passes (mowing/swathing and thrashing)  
Most of the farmers in Spain do not practice mechanical harvesting with two passes. However, it seems possible. Swathing should be done when 75% of siliques are turning yellow or about 2-3 weeks after losing the last flower. Harvest should be done approximately 1 week later.

18a. Please describe which machineries use for two passes harvesting

18b. Any additional information you need to provide regarding combined harvesters or harvesting of Camelina

The preferable models are the ones that can work with low airflow  
Harvesting at low speed is required most of the times

## Annex 7: Response to Questionnaire from France

### Questionnaire (ICARDA)

The questionnaire was translated, delivered and commented to the participants. For us, this questionnaire is a bit too early. Cooperatives could send to farmers, but it's a bit skewed because they discuss with farmers interested in camelina. Crop management is advised by cooperative or advisors of local network. Participants to the LMSP are informed of camelina. Questionnaire would be specified for the first questions with a period (question 3-4-5). Questions for Conservation Agriculture are interesting, but are they to better know the proportion of this crop management? Many discussions happen with this questionnaire.

Answers below are a first overview of the feeling of the LMSP attendants. When specified, questionnaire could be sent to farmers network.

3. Do you heard about Camelina oil crop or Camelina oil

Yes, mainly with SAIPOL works

4. Have you seen Camelina Crop and/or Camelina Seeds?

No before SAIPOL interactions

5. Are you cultivating Camelina as a crop in cereal based cropping system?

No ( Dijon Céréales 750 ha for 2021 Terrena 150 ha)

6. Are you using conservation agriculture? And for which crops?

It depends on each farm, it's not a question of cropping system but farmer behaviour.

7. If you are cultivating Camelina, are you cultivating Camelina under Conservation Agriculture (CA)?

Not necessary

8. If you are already cultivating Camelina, do you have market opportunity in your country?

No nowadays but SAIPOL is interested.

9. Do you have enterprises who are extracting oil from Camelina?

SAIPOL

10. If Camelina is not cultivated in your country, do you think that Camelina has a market opportunity and also has prospects in oil industry?

yes

11. How do you plant (sow) Camelina?

Direct sowing or conventional, low tillage

12. How do you like to harvest camelina?

No answer

**Specific questions for Partners of 4CE-MED**

13. Approximate area of Camelina planted under CA in WP2 (in square meters or in ha):

Around 1ha

**Crop management**

14. Planting equipment (seed drill) used for planting Camelina under CA during 2020-2021 cropping season under WP2:

Direct drill, conventional and experimental seed drill

15. If satisfied, please list below key advantages and constrains (if any) of using this planter for planting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

15a. Advantages:

15b. Constrains faced, if your response as “Not yet all satisfied or not satisfied”

15c. How these constrains can be rectified next time (adjusting the planter settings, land preparation, or go for another model of planter, etc.) in order to plant smoothly to achieve desired spacing/plant density during next cropping seasons

15d. Any suggested planter models available in your country for planting Camelina in farmers fields during coming season

16. Harvesting equipment (Combine harvester) used for harvesting Camelina under CA during 2020-2021 cropping season under WP2:

Conventional combine, different types depending on experiment site (conventional, experimental...)

17. If satisfied, please list below key advantages and constrains (if any) of using this combined harvester for harvesting Camelina under CA. And also list, how these minor constrains can be overcome next time (by adjusting setting of machines, etc.)

17a. Advantages:

existing machinery to set up

17b. Constrains faced, if your response as “Not yet all satisfied or Not satisfied” :

depends on seeds maturity and green weeds into the field

17c. How these constrains can be rectified next time (for example, by adjusting the settings, closing ventilation system, or go for another model of combine harvester, etc.) in order to harvest smoothly to achieve minimal seed loss during next cropping seasons.

Better know and set up the combine

17d. Any suggested planter models available in your country for harvesting Camelina in farmers fields during coming season

18. Do you practice mechanical harvesting with two passes (mowing/swathing and thrashing)

18a. Please describe which machineries use for two passes harvesting

Swath Mower with sections of blades

18b. Any additional information you need to provide regarding combined harvesters or harvesting of Camelina





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