Barriers to the adoption of Conservation Agriculture in the Mediterranean Countries

CONTEXT

According to FAO (2023), **Conservation Agriculture (CA) is a farming system that promotes minimum soil disturbance** (i.e. no tillage) through **direct seed and/or fertilizer placement**; maintenance of a **permanent soil cover with crop residues and/or cover crops**, at least 30 percent; and **diversification of plant species** through varied crop **sequences and associations** involving at least three different crops.

In 2018/2019 the global total CA cropland area was approximately 205,4 M ha, which corresponded to about 14,7% of the total global cropland, 5,2% and 1,1% of cropland area in Europe and Africa, respectively (Kassam *et al*., 2022).

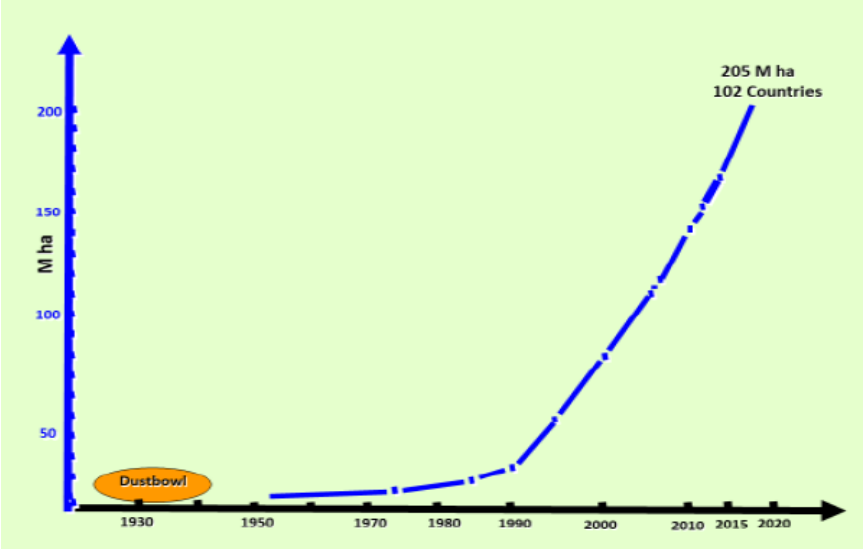

Fig.1. Area of global uptake of CA of cropland (10^6 ha) (Kassam et al., 2022).

Adoption rates of CA in Mediterranean countries, however, remain low despite more than three decades of research, development investments and, in the EU countries, economic subsidies, representing about 2% of the arable crop area for EU countries and 0.8% only for African countries.

According to Friedrich *et al*. (2012) the CA area increased exponentially in North & South America and Australia & New Zealand mainly due to the benefits that the CA promotes in terms of for example yield, sustainability of land use, timeliness of cropping practices, and from the initiative of farmers and their organizations.

In Europe and Eurasia support for the adoption of CA has increased - the southern European Union (EU) countries in the Mediterranean area have increased their areas. The adoption process has generally been farmer-led, including a growing support from governments and the EU. The CA area expansion includes in addition cropland permanent crops such as vineyards and orchards (Kassam *et al.*, 2022).

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Considering the representativeness and trends of CA in Europe and Africa, mostly in the Mediterranean region (Figure 2), the CAMA project set out to understand the reasons for low adoption of CA in the 8 Mediterranean Countries involved in CAMA by collecting information in target Region/Areas and data from farmers – this was the main goal of Work Package 2 of the CAMA project**.**

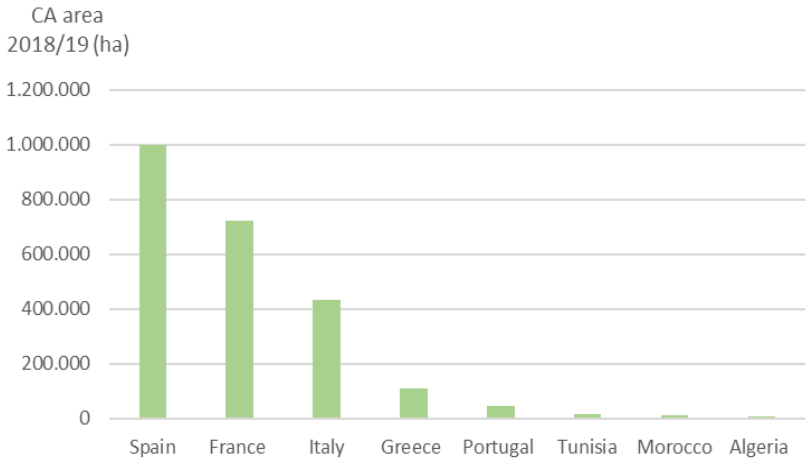

Fig.2. Adoption area of CA in Mediterranean countries partners of CAMA project in 2018/19 (Kassam *et al.*, 2022)

WORK DONE IN CAMA PROJECT

A **literature review** based on 34 published articles, book chapters and proceedings of Congress/Workshop identified factors was developed to identify indicators hampering and influencing CA adoption in the Mediterranean/Europe/North Africa/Other regions. The year of documents publication was from 2001 to 2019.

A total of **88 factors and indicators hampering CA adoption** identified through the Publications Review were classified in 3 principal categories and then in 10 secondary categories (Table 1)

Considering the number of times that factors and indicators hampering CA adoption were referenced in the consulted publications, the identified main ones - top 5 - in the Mediterranean/Europe/North Africa/Other regions, in descending order, were identified in order (Table 2).

Table 1. Categories of factors hampering CA

Principal categories	
• natural conditions; • socio-economic conditions; • technical and agronomic conditions/options	
Secondary categories	
• agro-climatic conditions	• long-term results
• crop residues/livestock	• policy
• culture/mind-set	• risk
• knowledge/research	• socio-economic conditions
• investment	• technical factors

Table 2. Importance of factors hampering CA adoption

Rank	Factors and indicators hampering CA adoption	Nº of references
1	Socio-economic conditions	25
2	Knowledge/research	24
3	Technical factors	23
4	Policy	17
5	Culture/mind-set	16

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Considering the literature review and other indicators/factors influencing CA adoption, **a survey was developed and implemented.**

The survey included preliminary and general information about the farmer or non-farmer - public services or association extensionist; technical consultant; enterprise/company technician (e.g. of seeds and fertilizers companies); machinery service company (contractor); researcher; other-, and CA-user or CA-non user, as well as data on 5 main categories of barriers to CA adoption - agronomic; pedo-climatic; economic, organizational and practical; policy related; and social and cultural. The survey worked on an online Google Forms with the option of being answered directly by the interviewee or by the interviewer (in case the interviewee cannot/does not know how).

The survey provided to partners, being single and general, was adapted according to the reality of all CAMA countries and to possible diversities among the respondents. It was translated from English into local languages and preliminary tested by CAMA partners.

A total of **152 responses** were registered, spread across the different countries as depicted in the and the profile of the respondents characterised in the Table 2.

Table 2. Profile of the respondents

Farmers (nº)	122
Researchers & Technical consultants (nº)	30
CA adopters (%)	89
Age of farmers	50
Level of education	medium or high level
Mean farmland size (hectares)	40-100 and >250
Irrigation/rainfed	mostly rainfed*
Level of field advice services	low presence

* the highest contribution was from Greece about 61% of irrigation, mainly in the cotton crop; the lowest contribution was from Algeria & Tunisia 6% and 1% of irrigation

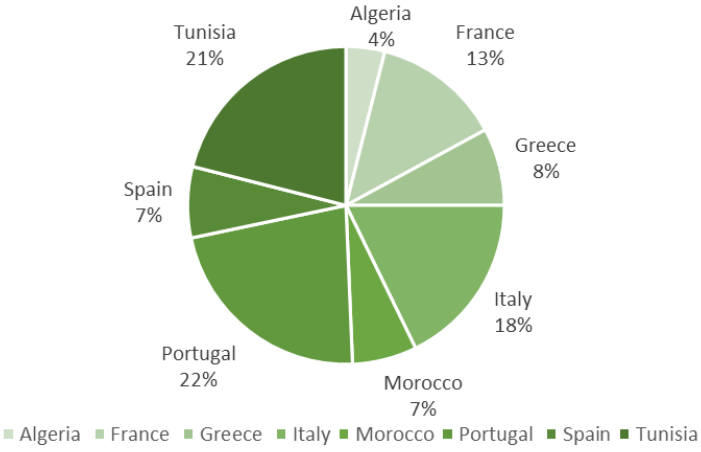

Fig. 3. Total of respondents per country

The analysis of the results was based on the evaluation of each barrier and on the relevance given to the different factors that contributed to defining the barriers. Beyond a general overview of the results, a statistical analysis was performed to assess the incidence of the different factors hampering the spread of CA.

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RESULTS

The survey results showed that considering the importance of the different types of obstacles to CA adoption, the policy and socio-cultural barriers were the most important (both 24%), and the agronomic, pedo-climatic and economic contributed, respectively, to 17%, 17% and 18% representing a lower contribution.

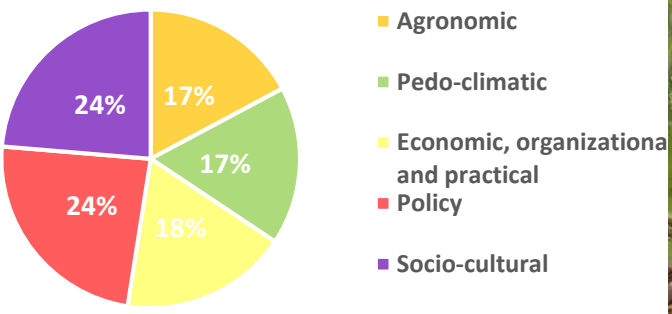


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Fig. 4. Importance of the different barriers to CA adoption.

Among the **political barriers** the need of farmers to receive more public support to adopt CA represented the major aspect. The public support is motivated by the need to compensate economic losses and to support investments to purchase new machineries. Additionally, the public support is required as a reward for the environmental benefits due to CA and as enhanced services of training and advice.

The **socio-cultural barriers** can be interpreted as the need to increase training and advice services for farmers. CA is recognised as a complex agricultural system, therefore an improvement of the training and advice services could expand the diffusion of CA in the countries comprised.

To a lesser extent, **economic barriers** also contribute as an obstacle to the spread of CA. Its greatest difficulty is represented by the purchase and use of no-till seeders, and in the further lack of contracting services or farmers associations able to share mechanical tools and knowledge.

Among the **pedo-climatic barriers**, differentiated between Countries due to the different pedo-environmental conditions, the extreme summer climatic conditions represent the pedo-climatic barrier that greatly hinder the adoption of CA - in particular the crop diversification (use of summer cover crops).

Finally, among the **agronomic barriers**, crop diversification is hindered mainly by climatic conditions and also by the lack of active markets for cover crops in some Countries; permanent soil cover and the management of crop residues is hampered by the need to use forage by livestock and difficulty in managing weeds and pathogens in the presence of crop residues; no-tillage technique is particularly linked to the problems of purchasing suitable machineries, which requires adjustments according to different territories and environments.

CAMA PROJECT FACTSHEET

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CONCLUSIONS AND RECOMMENDATIONS

CA practices contribute to sustainable food and agriculture, in its three pillars: social, economic and environmental. Considering the benefits of CA and the barriers identified its their adoption by farmers, the following strategies should be promoted:

- **Public support** should be **rewarding/incentivising and technically viable** being able to stimulate farmers to adopt CA practices, while respecting the farmers' comfort/risk zone.
- **Support for Farmers Associations** for **training and knowledge transfer** activities to technicians and farmers.
- **Support for research/demonstration/experimental** projects applied experimentation of CA and Conservation Tillage practices in different crops, which can help farmers to adopt them more quickly and with a greater guarantee of success. It is necessary to adapt the CA practices to different soils and production systems.
- **Exchange of experience** between farmers by building **networks** and promoting **"live" observations** of no-till practices and cover crops.

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