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the LIFE+ programme of the EU.

Project 101074744 — LIFE21-CCA-CY-LIFE

Regenerative approaches for building climate change resilience into EU agricultural regions prone to desertification

LIFE-ArgOassis

Work Package 2

Preparatory Actions and Implementation Plan to Combat Desertification and Adapt to Climate Change

Deliverable D2.2

Replicability and Transferability Plan

Lead Beneficiary: MINISTRY OF AGRICULTURE, RURAL DEVELOPMENT AND ENVIRONMENT OF CYPRUS (MARE) - AGRICULTURAL RESEARCH INSTITUTE (ARI) & DEPARTMENT OF FORESTS (DF)

Contributing Partners: KES RESEARCH CENTRE (KESRC)

Contents

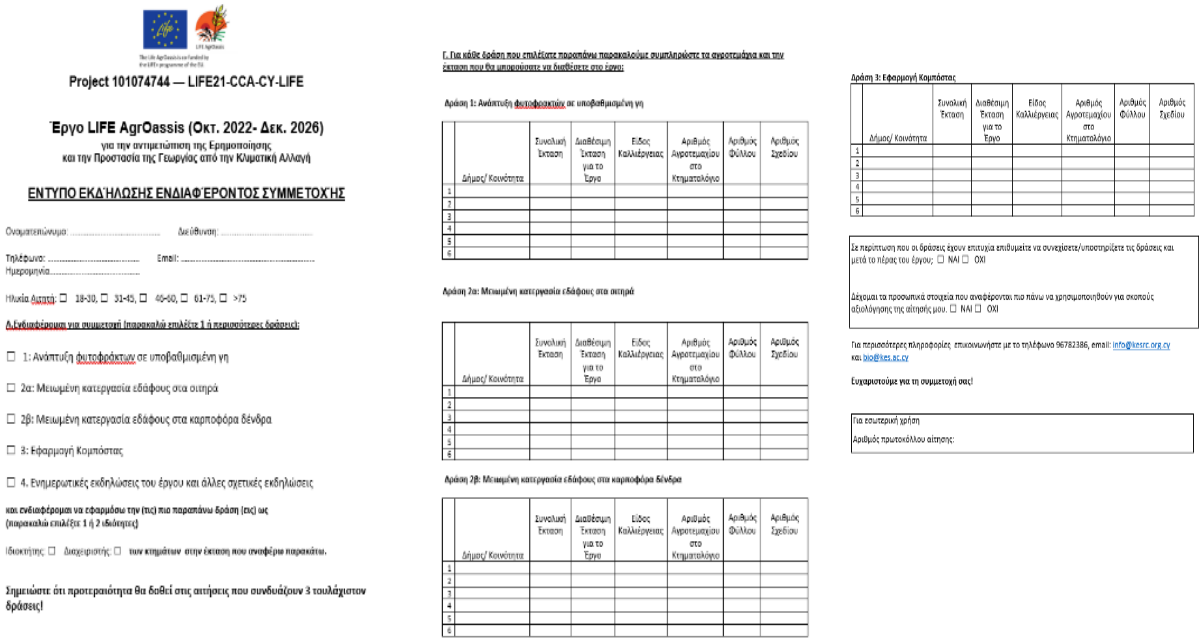
D2.2 Introduction

The following report describes the procedures that were followed in Cyprus during the first year of the project for the implementation of WP2, WP3, WP4 and WP5. It also contains the experience gained during this first year and underlines eventual limitations and difficulties that have faced.
The aim of the report is to sustain the continuity of these actions by making the necessary adjustments and also to exploit the lessons learned and expertise acquired in order to effectively expand the practices in Greece (Thessaly and Crete) and Cyprus (PRD).
The experience gained from initial application of reduced tillage, and mulching in Cyprus, where the know-how is limited, and the preparatory work in developing hedgerows performed in Cyprus, will be transferred and replicated in Thessaly and Crete. The establishment of a small composting unit and the application of compost in fields will be replicated by PRD in Cyprus.

D2.2 A) Procedure of land selection

The procedure for the selection of fields participating in the project included the finalization of the guidelines/award criteria and the announcement of the competition (Figure 1) through campaigns (e.g. local farmer meetings, online promo through farmer unions, radio spots on farmer programs).

Figure 1: Announcement of the project and the competition



Project 101074744 — LIFE21-CCA-CY-LIFE

Έργο LIFE AgrOassis (Οκτ. 2022- Δεκ. 2026)
για την αντιμετώπιση της Ερημοποίησης
και την Προστασία της Γεωργίας από την Κλιματική Αλλαγή

ΕΝΤΥΠΟ ΕΚΔΗΛΩΣΗΣ ΕΝΔΙΑΦΕΡΟΝΤΟΣ ΣΥΜΜΕΤΟΧΗΣ

Ονοματεπώνυμο: ..... Διεύθυνση: .....

Τηλέφωνο: ..... Email: .....
Ημερομηνία: .....

Ηλικία Αιτητή: ☐ 18-30, ☐ 31-45, ☐ 46-60, ☐ 61-75, ☐ >75

Α.Ενδιαφέρομαι για συμμετοχή /παρακαλώ επιλέξτε 1 ή περισσότερες δράσεις):

☐ 1: Ανάπτυξη φυτοφράκτων σε υποβαθμισμένη γη

☐ 2α: Μειωμένη κατεργασία εδάφους στα σιτηρά

☐ 2β: Μειωμένη κατεργασία εδάφους στα καρποφόρα δένδρα

☐ 3: Εφαρμογή Κομπόστας

☐ 4. Ενημερωτικές εκδηλώσεις του έργου και άλλες σχετικές εκδηλώσεις

και ενδιαφέρομαι να εφαρμόσω την (τις) πιο παραπάνω δράση (εις) ως
(παρακαλώ επιλέξτε 1 ή 2 ιδιότητες)

Ιδιοκτήτης/ ☐ Διαχειριστής/ ☐ των κτημάτων στην έκταση που αναφέρω παρακάτω.

Σημειώστε ότι προτεραιότητα θα δοθεί στις αιτήσεις που συνδυάζουν 3 τουλάχιστον δράσεις!

Γ. Για κάθε δράση που επιλέξατε παραπάνω παρακαλούμε συμπληρώστε τα αγροτεμάχια και την έκταση που θα μπορούσατε να διαθέσετε στο έργο:

Δράση 1: Ανάπτυξη φυτοφρακτών σε υποβαθμισμένη γη

	Δήμος/ Κοινότητα	Συνολική Έκταση	Διαθέσιμη Έκταση για το Έργο	Είδος Καλλιέργειας	Αριθμός Αγροτεμαχίου στο Κτηματολόγιο	Αριθμός Φύλλου	Αριθμός Σχεδίου
1							
2							
3							
4							
5							
6							

Δράση 2α: Μειωμένη κατεργασία εδάφους στα σιτηρά

	Δήμος/ Κοινότητα	Συνολική Έκταση	Διαθέσιμη Έκταση για το Έργο	Είδος Καλλιέργειας	Αριθμός Αγροτεμαχίου στο Κτηματολόγιο	Αριθμός Φύλλου	Αριθμός Σχεδίου
1							
2							
3							
4							
5							
6							

Δράση 2β: Μειωμένη κατεργασία εδάφους στα καρποφόρα δένδρα

	Δήμος/ Κοινότητα	Συνολική Έκταση	Διαθέσιμη Έκταση για το Έργο	Είδος Καλλιέργειας	Αριθμός Αγροτεμαχίου στο Κτηματολόγιο	Αριθμός Φύλλου	Αριθμός Σχεδίου
1							
2							
3							
4							
5							
6							

Δράση 3: Εφαρμογή Κομπόστας

	Δήμος/ Κοινότητα	Συνολική Έκταση	Διαθέσιμη Έκταση για το Έργο	Είδος Καλλιέργειας	Αριθμός Αγροτεμαχίου στο Κτηματολόγιο	Αριθμός Φύλλου	Αριθμός Σχεδίου
1							
2							
3							
4							
5							
6							

Σε περίπτωση που οι δράσεις έχουν επιτυχία επιθυμείτε να συνεχίσετε/υποστηρίξετε τις δράσεις και μετά το πέρας του έργου; ☐ ΝΑΙ ☐ ΟΧΙ

Δέχεσαι τα προσωπικά στοιχεία που αναφέρονται πιο πάνω να χρησιμοποιηθούν για σκοπούς αξιολόγησης της αίτησής μου. ☐ ΝΑΙ ☐ ΟΧΙ

Για περισσότερες πληροφορίες επικοινωνήστε με το τηλέφωνο 96782386, email: info@kesrc.org.cy και bio@kes.ac.cy

Ευχαριστούμε για τη συμμετοχή σας!

Για εσωτερική χρήση

Αριθμός πρωτοκόλλου αίτησης:

Figure 2: Application form of the three project implementation actions

The Farmer Competition had two phases. Phase A was to gather applications and validate if they comply with requirements. The selection was limited to cereal and orchards fields prone to desertification.

Phase B assessed in detail the baseline conditions for the land selected from Phase A, proposed the managing plan for the implementation actions in collaboration with the farmer. It also contained the signature procedure of the final agreements with farmers.

The call for applications (Figure 2) contained the award amounts, the criteria for selection of winners, the obligations for awarded farmers, the means and deadline for applications, the members of the evaluation committee and the expected date of result announcement for Phase A and Phase B.

For assessing baseline conditions, the following steps were required:

(i) map each land plot in detail documenting natural features such as roads, streams and erosion gullies using GIS technology

(ii) classify it in term of its current degradation status using available tools

(iii) validate the classification by conducting on-site inspections (figure 3).

ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ ΤΕΜΑΧΙΩΝ	Παρατηρήσεις – Καταγραφή				
Ημερομηνία					
Αριθμός Πρωτοκόλλου					
Αριθμός Τεμαχίου					
Αριθμό Εγγραφής					
Βαθμός ομοιγενέιειας εντός τεμαχίου	20%	40%	60%	80%	100%
Αριθμός Καταγραφής 1					
Αριθμός Καταγραφής 2					
Αριθμός Καταγραφής 3					
Αριθμός Καταγραφής 4					
Αριθμός Καταγραφής 5					

ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ ΤΕΜΑΧΙΩΝ	Παρατηρήσεις - Καταγραφή					Συντ. Βαρύτητας	Score
Ημερομηνία							
Αριθμός Πρωτοκόλλου							
Αριθμός Τεμαχίου							
Αριθμό Εγγραφής							
Αριθμός Καταγραφής							
Τύπος καλλιέργειας							
Συντεταγμένες	Β			Α			
Υψόμετρο							
Έκθεση	Β (1)			Ν (2)		7	
Ώρα φωτογραφίας							
Κλίση %	0-3 (1)	3-8 (2)	8-16 (3)	16-30 (4)	30-45 (5)	5	
Μήκος γραμμής μέγιστης κλίσης							
Βαθμός διάβρωσης του εδάφους (βαθμός έκθεσης μητρικού πετρώματος) %	0-10 (1)	11-20 (2)	21-30 (3)	31-40 (4)	>41 (5)	7	
Πολύ πετρώδες (>20cm)% (3)						10	
Πετρώδες (2-20cm)% (2)							
Ελαφρά πετρώδες (2mm -2cm)% (1)							
Συμπίεση εδάφους (χαμηλή, μέτρια, υψηλή)						2.5	
Υπαρξη σκληρού υπεδάφιου ορίζοντα (hardpan) (ναι, όχι)						2.5	
Επιφάνεια διαβρυμένη από νερό (PHOTO)	0-10 (1)	11-20 (2)	21-30 (3)	31-40 (4)	>41 (5)	7	
Εγκαταλελειμμένη αγροτική γη (PHOTO)	0-10 (1)	11-20 (2)	21-30 (3)	31-40 (4)	>41 (5)	5	
Κάλυψη άγριων θάμνων και δέντρων στα όρια του αγρού							
Δένδρα >2m	>21 (1)	16-20 (2)	11-15 (3)	6-10 (4)	0-5 (5)	2	
Θάμνοι (0,5-2m)	>21 (1)	16-20 (2)	11-15 (3)	6-10 (4)	0-5 (5)	2	
Βότανα (<0.5m)	>21 (1)	16-20 (2)	11-15 (3)	6-10 (4)	0-5 (5)	2	
Ακάλυπτο	>21 (1)	16-20 (2)	11-15 (3)	6-10 (4)	0-5 (5)	2	
Είδη Άγριας Βλάστησης							
Κάλυψη εδάφους από υπολείμματα φυτών (%)	80-100 (1)	60-80 (2)	40-60 (3)	20-40 (4)	0-20 (5)		
Βάθος εδάφους (cm)	80-100 (1)	60-80 (2)	40-60 (3)	20-40 (4)	0-20 (5)	14	
Τύπος εδάφους	Αργιλώδες (1)		Πηλώδες (2)	Αμμώδες (3)		7	
Ποιότητα εδάφους	Καλή (1)	Μέτρια (2)	Κακή (3)			5	
	Πυριγενές (Κοκκινόχωμα 1)	Χημιογενές (Ασπρόχωμα 2)				2	
Προηγούμενη διαταραχή από πυρκαγιά (αρ.πυρκαγ. τα τελευταία 50 χρόνια)	0 (1)	1(2)	2 (3)	3 (4)	4 (5)	5	
Προσβασιμότητα σε δρόμο	Πολύ δύσκολη (1)	Δύσκολη (2)	Μέτρια (3)	Ευκαλη (4)	Πολύ εύκαλη (5)	10	
Ενδείξεις βόσκησης	Οχι (1)		Ναι (2)			3	
(i) proximity among the selected fields to maximise impact						100	
at the landscape level (j) proximity to sites of compost production (for Cyprus) to minimize transfer costs.							

Figure 3: Validation the classification by conducting on-site inspections

Final land rating (Figure 4) was based on a score that each field will receive for the parameters described above. Priority is given to the land with the highest scores.

Ζώνη Αξιολόγησης για 2023-24	Βαθμός Υποβάθμισης	Μέγιστη Έκταση (δεκάρια)	Τύπος καλλιέργειας	Συντεταγμένες
Field 1	224	171	Παπουτσοσυκία	35.16666, 33.1349
Field 2 c	208	253	Σιτηρά	34.86858, 33.56071
Field 2d	203	400	Σιτηρά	34.86333, 33.55312
Field 1b	192	243	Σιτηρά	35.17607, 33.13972
Field 3	178	20	Σιτηρά	35.07599, 33.16175
Field 4a	176	7	Σιτηρά	35.14655, 33.07993
Field 4b	171	8	Σιτηρά	35.14422, 33.08054
Field 5	170	300	Σιτηρά	35.03651, 33.18976
Mean or Sum	190	1402.5		

Figure 4: Example of final land rating

In order to ensure a common understanding between participating farmers and the project team a contract for every farmer, was finalized detailing the actions that will take place in their fields. Each farmer selects the action that is participating and agrees with the terms. A map indicating the fields that participating in the project is also attached (figure 5). The signed contract determines the interval of inspections (at least 2 times the year) at each selected field to confirm that farmers comply with the agreed protocols.

Figure 5: Example of map indicating the participating fields (yellow color) of the contract

More information on the competition and selection criteria are given in D2.1of the project.

D2.2 B) Procedures of implementation of WP3, WP4 and WP5.

The procedures refer to:
(a) application of minimum tillage including the related weed management practices (WP3)
(b) Hedgerow installation in degraded agricultural land, (preparation of deep-rooted plants on the nursery, selection of locations, selection of plant species that will be installed, final planting scheme) (WP4)
(c) production of compost and application in fields (WP5)

D2.2 B1.1) Procedures for implementation of minimum tillage and mulching

This action was initially applied in cereal fields and orchards by introducing minimum tillage farming. The fields were specified, based on the completion and the selection procedure that was described previously.
Meeting with the farmers that have expressed their willingness to participate in the project, have taken place, to discuss soil management procedures. Most applications were collected during these meetings.

A management plan, for each of the selected fields was drown in collaboration with the farmers, detailing the practical activities in their fields. The actions that the farmers should follow for this part of the project was to control the weeds emerging before wheat sowing, using a mechanical mower. Mechanical mower could be used also for the destruction of weeds that appear after harvest. Destroyed vegetation should be left on the soil surface. If necessary, in order to prepare the seedbed, a shallow ploughing, for example with a disc harrow, is recommended to be applied during the last week before seeding.

The approach towards weed management applied for cereals can be also used in orchards. Natural vegetation can be controlled by cutting with mowers two to three times per year. Destroyed vegetation should be left within the rows to form a natural mulch.

D2.2 B1.2) Limitations and gained experience from the implementation of the action

The first year of implementation of this action in Cyprus, showed the following:

Cost limitations caused by the need to eventually purchase or rent machinery (e.g. mower, disc harrow) have to be taken into account. In some cases, the purchase of machinery by a group of farmers is advisable.

It was observed that there is a generally lack of conviction for the effectiveness of minimum or no-tillage farming.

Fields that follow a system that require mechanical cultivation of the soil cannot, by definition, adopt the minimum or no–tillage system. For instance, fields that follow a three-year rotation system that includes the incorporation of vetch, or fields for cultivation of potatoes.

The cost of production using no-tillage systems has been shown to be lower than the conventional system. However, the provision of financial support to farmers especially those with farmlands in areas threatened by desertification, would help the acceptance of this practice by the farmers.

To limit weed infestation, the growth of the wild vegetation has to be frequently monitored and cutting has to be carried out before seeds ripen.

D2.2 B2.1) Procedures for implementation of resilient hedgerow installation in degraded agricultural land

The action requires the production in nurseries of plants resistant to water stress, and seedlings with reduced requirements for irrigation during the initial stages of establishment. Accordingly, there is a need for settling nursery infrastructure, suitable for the production of these plants. Seedlings are preconditioned to drought stress by growing them in plastic tubes in order to develop a deep root. More information for this planting system can be found in D4.1 of the project.

Plants to be used in hedgerow formation were separated according to whether their root system was prepared in tubes or in conventional pots, and divided into three groups: tree, shrub and herbaceous according to their biotype. The list of the plant species used can be found in Deliverable D4.1., where the following information can also be found:

1. Guidelines for preparing deep rooted plants in the nursery
2. Installation of seedlings in root growth tubes

i) Preparation steps for deep-rooted species
ii) Watering protocol for tube plants
iii) Quality control of tube planting systems

The Planting Scheme that was finally followed was discussed with the owner of the field. This Final Planting Scheme was designed to maximize reversing desertification processes, to increase ecosystem services, and possibly the farmer's income.

Preparation for planting started 1.5 months in advance, during which, the planting date, location of planting, number and composition of plant species, and the planting design was set (Figure 6).

Figure 6: Example of planting design, showing the planting zones with different plant compositions

Planting activities was carried out with the aid of volunteers, who were invited to participate in this effort, through social media and personal contact.
In Cyprus the first planting effort was announced at a press conference by the Environment Commissioner and partners of the LIFE AgrOassis, and at the local TV news.

An e-mail with the training video that was created for this purpose, was sent to each of the volunteers, together with an invitation and the instructions contained in the “Nursery and Planting Protocol” (Figure 7). In addition, volunteer group leaders attended a demonstration of the deep root planting system.

Figure 7: The invitation and the instructions for the first hedgerows planting in Cyprus

A contractor bored the holes for the plants using an excavator, following the Final Planting Scheme, at least a day before planting.

During the planting day, the plants were transferred to the field, as well as all necessary tools for this purpose. The volunteers, were divided in groups, following the instruction of their leader, and the plants were planted according to the Planting Scheme. In case that control plants (not grown

in tubes) were also planted, they were marked appropriately. At the end of the plantation, all seedlings were recorded, according to the number of individuals per species that was planted. All empty tubes and plastic bags were collected and returned to the nursery.

D2.2 B2.2) Limitations and gained experience from the implementation of the action

It appeared that some species had a moderate success in surviving in the nursery, due to the unprecedented prolonged heat wave of last summer. However, it has to be noted that the percentage survival of tube plants was much greater than that of the control plants (growing in pots).

Planting scheme must be ready and communicated with volunteers well in advance of the planting date.

In the case that the planting scheme, includes various plant species, then the plants have to be separated, according to their species, in the platforms prior to the transportation to the fields.

Frequent visits to the fields, before the plantation, are required, for designing the planting scheme and excavator needs to be tested.

The number of plants transferred to the field should be according to the volunteer's capacity; it is estimated that 20 – 50 volunteers are able to plant 150 – 375 plants per day.

Drilling holes with manual tree planting augers was time-consuming. It was more practical and less time-consuming to hire a contractor for mechanical drilling. Therefore, the cost of the contractor has to be taken into account.

The great weight of the tube plants makes them difficult to transport by hand for long distances, therefore, the plants have to be transferred in platforms and unloaded close to planting lines. The unloading point of the plants has to be determined in advance. Due to tube weight, volunteers under 18 were excluded.

The provision of financial support to farmers would be very helpful. Formation of hedgerows, requires time for the plant preparation in the nursery, and has a high cost, considering also the

transportation cost to the field. This action requires a very organized planning, frequent visits to the fields, a detailed planting scheme as well as the aid from volunteers.

The survival of the plants after planting needs to be monitored, to ensure successful establishment of the hedgerow. Irrigation at the initial stage after planting maybe needed.

Plantations in fields that are owned by the state may need a special permission. This is something that needs to be examined in prior for each region that hedgerows are to be established.

D2.2 B3.1) Procedures for Sustainable Production of Compost

Establishment of a composting unit

To establish a compost unit in Cyprus, a waste management license from the Department of Environment is needed. ARI's request to be exempted from the normal procedure was accepted by the Department of Environment, as this was a pilot unit and it was established within the framework of a project.

A compost unit with the capacity of producing 200m^3 of mature compost per year has been established inside the premises of ARI.

Feedstock for windrow creation of the composting unit was provided by the municipality of Lacatamia. Green waste is shredded by them, and transported to ARI with 20 m^3 trucks.

To facilitate the replicability and transferability of the approach followed in Cyprus, we decided to choose a low-tech compost method.

For the operation of the composting unit, we constructed a compost turner that is mounted with a tractor and a sieving machine (Figure 8), after tender procedures. On the compost turner, a watering system is installed, that is spraying the compost during material mixing. The compost turner is used for mixing the material at regular intervals, to ensure proper aeration throughout its volume.

Figure 8: The compost turner and the sieving machine.

During the visit to farmers that were selected to participate in this action of the project, the protocols of compost applications were discussed.

The compost incorporated in the fields will be in accordance with the quality standards described in the new EU Fertilizer Regulation, and the special Annex of the new national legislation on fertilizers.

In collaboration with the farmer, the compost was transferred to the field, and spread and incorporated in soil a few weeks before cereal seeding. Proper machinery provided by the farmer was used for uniformly spread compost in the field. For comparative reasons, a small part of each field, was left as a “control” area, to follow conventional management practices.

Compost incorporation in the same field will be repeated in 2 years.

D2.2 B3.2) Limitations and gained experience from the implementation of the action

The exemption of the normal licensing procedure, at ARI’s pilot compost unit that was granted by the Department of Environment, was accompanied by a series of conditions and obligations, such as the protection of the surrounding environment, that should be taken into account, during the operation of the unit.

The first pilot unit in the framework of AgrOassis was established in the premises of ARI. The owner of a compost unit thought, has to consider the cost of land purchase or rental.

The capacity of a compost unit, greatly depends on the availability and continuous supply of feedstock. During the initial face of ARI's compost unit operation, when the turning machine was not yet available, spent mushroom substrate, that was provided free from a local mushroom producer, gave an alternative solution, for incorporation in soil before sowing.

The tender procedure showed that the construction of the necessary machinery (turner and sieving machine), is possible to be carried out by local manufacturers in Cyprus, and cost can be much lower than purchasing them from the international market.

Compost application in the fields can potentially be expensive, considering the transportation cost. The ongoing financial support to farmers incorporating compost in their soils in the frame of the new CAP, was proved to be a significant incentive for producers to participate in this action.