# Decent DesErt CROPS

Concept Note (May 31st, 2026)



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| **Full Title** | **Decentralised Brackish Water Desalination Environments for Cultivating Artificial Soils and Fish Farming using Reverse Osmosis Powered by Solar Energy** |
| **Acronym** | **Decent DesErt CROPS** |
| **Keywords** | *desalination, solar energy, artificial soils, food production, carbon dioxide fixation, $CO_2$ storage* |
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| **Main Objective** | Establishing independently functioning solar greenhouses (SGH) with integrated systems for energy provision for sand milling, air conditioning, soil irrigation, brackish groundwater desalination, and water filtering. By this, unused or disadvantageous plots in arid or desert regions can not only used for one single type of economy (i.e. solar power plants vs. irrigation farming), but both. |
| **Expected Impact** | Combing several of such modular systems will not only provide energy, freshwater, and food for one family of locals, but also for bigger groups or communities. Combining plants of such modular systems will also allow to sell any surplus to available markets. In addition, the totals in fixation of carbon dioxide can be sold as $CO_2$ allowances or carbon bonds, respectively. Establishing such modular systems in other regions with e.g. little prospects like children's villages or refugee camps will provide not only distraction from e.g. loneliness and being displaced by war. Moreover, it could provide the prospect of finding a challenging job in a sustainable eco(nomic )system and an opportunity to learn, improve and become a valuable member in a self-sufficient and thus stable community which could become the base for a whole stable country. Accordingly, the wholistic project shall have high impact in almost any of the 17 sustainable development goals. |
| **Specific Innovations** | The main economical innovation is using a disadvantageous plot not only in a single way, but as a three-layered economic space: the top layer (i.e. the solar panels on or in the top of the roofs of greenhouses) produces usable or sellable energy, the second layer (i.e. pods for crop cultivation or aquaculture) produces food or agricultural products, the third layer (i.e. the artificial soils) stores carbon dioxide by enriching barren with organic matter which otherwise would decay and emit greenhouse gases. Creating artificial fertile soils will be achieved by milling desert sands that otherwise would endanger roads of housings by burying them. The milled fractions will be mixed with portions of the original sand to maintain some of the local soil life, especially microbes. |


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| **Specific Innovations (-continuation-)** | In addition, blended organic material like macro- or microalgae will be mixed in to provide the specific needs for carbon and nitrogen as basic nutrients. Alternatively, manure pellets provided by over-fertilised agro-industrial countries can be applied. Thus, countries facing nitrate pollution of groundwaters could turn their surpluses into cheap or even free fertilisers for yet sterile arid or desert regions. |
| **Current Technology Readiness Levels (TRL)** | Regarding desalination of brackish waters (= work package 1; principal investigator: confirmed partner 1), relevant work can be defined as starting from at least technology readiness level #4, meaning validation of the basic technology has already been performed at the laboratory level. Regarding the creation of artificial soils (= WP 2; PI: CP 3 & 4), relevant work is on TRL 2 since only the milling of desert sands has yet been proven as feasible. The creation of artificial fertile soils for growing crops has yet to be validated by a proof-of-concept model. Regarding the softening of desalinated concentrate for growing fish in it (= WP 3; PI: CP 2), relevant work can be defined as starting from at least technology readiness level #4, meaning validation of the basic technology has also already been performed at the laboratory level. |

**Planned Activities towards 1st Demonstrator**

| Months @ 3 y | 01–06 | 07–12 | 13–18 | 19–24 | 25–30 | 31–36 |
|---|---|---|---|---|---|---|
| *Months @ 6 y* | *01–12* | *13–24* | *25–36* | *37–48* | *49–60* | *61–72* |
| **WP 1: Decentralised solar-powered brackish water desalination** | | | | | | |
| 1.1. System design & modelling | | | | | | |
| 1.2. Prototype development | | | | | | |
| 1.3. Pilot development | | | | | | |
| 1.4. Monitoring & optimisation | | | | | | |
| 1.5. Validation & impact assessment | | | | | | |
| **WP 2: Decentralised crop production on fertilised artificial soils in SHG** | | | | | | |
| 2.1. SHG prototype development | | | | | | |
| 2.2. Crop selection & soil preparation | | | | | | |
| 2.3. Evaluation of crop yields | | | | | | |
| 2.4. Optimisation of artificial soil fertility | | | | | | |
| 2.5. Optimisation of $CO_2$ fixation | | | | | | |
| **WP 3: Softening the desalination concentrate for aquaculture usage** | | | | | | |
| 3.1. Selection of macro & micro algae | | | | | | |
| 3.2. Optimisation of algae growth | | | | | | |
| 3.3. Prototype development | | | | | | |
| 3.4. Continuous operation in field | | | | | | |
| 3.5. Validation & optimisation | | | | | | |
| **Integration WP 1-3** | | | | | | |

For a more detailed working programme, confer to:
https://green-deserts.net/application/files/8717/7903/7581/DecentDesErtCROPS_Proposal_Part_II_2026-05-14.docx


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<table>
<tr><td>Consortium</td><td>Confirmed Partners,<br>Country / EU PIC / Type</td><td>Potential Partners Contacted,<br>Country / Type / Website</td></tr>
<tr><td></td><td>1. Moulay Ismail University<br>Morocco / 885039253 / HSE<br>2. Braude College of Engineering<br>Israel / 994298016 / HSE<br>3. University of Vechta<br>Germany / 888361891 / HSE<br>4. Cooperativa Khat Endia<br>Morocco / 863836217 / SME</td><td>• INRA Maroc, Morocco / 927839824 / PUB / https://www.inra.org.ma<br>• Agribitiost, Türkiye / SME / https://agribot.ist<br>• WAMA, Germany / SME / https://www.wamadirekt.de<br>• SOS Children Village, Mali / IO / https://www.soschildrensvillages.ca/mali/sos-childrens-village-sanankoroba-bamako</td></tr>
<tr><td>Legal Status (Timeline)</td><td colspan="2">Current legal status of ‘Green Deserts’ is being represented by a private individual (Guido Franz-Josef Bohmann, Germany / PIC 87074863 / OTH). Funds for establishing an initial non-profit limited liability company (NPLLC) are available. Initial contact to notaries for setting up all the relevant documents has already been established. Thus, the intended NPLLC could be established by the end of 2026 the latest.</td></tr>
<tr><td>Indicative Budget</td><td colspan="2">
<table>
<tr><td>Months @ 3 y</td><td>1 – 6</td><td>7 – 12</td><td>13 – 18</td><td>19 – 24</td><td>25 – 30</td><td>31 – 36</td><td>Total</td></tr>
<tr><td>Months @ 6 y</td><td>1 – 12</td><td>13 – 24</td><td>25 – 36</td><td>37 – 48</td><td>49 – 60</td><td>61 – 72</td><td>[€]</td></tr>
<tr><td>WP 1 [2 FTE]</td><td>200,000</td><td>200,000</td><td>150,000</td><td>150,000</td><td>200,000</td><td>150,000</td><td>1.05 M</td></tr>
<tr><td>WP 2 [3 FTE]</td><td>300,000</td><td>300,000</td><td>260,000</td><td>260,000</td><td>300,000</td><td>250,000</td><td>1.67 M</td></tr>
<tr><td>WP 3 [2 FTE]</td><td>200,000</td><td>200,000</td><td>150,000</td><td>150,000</td><td>200,000</td><td>150,000</td><td>1.05 M</td></tr>
<tr><td>Total [€]</td><td>700,000</td><td>700,000</td><td>560,000</td><td>560,000</td><td>700,000</td><td>550,000</td><td>3.77 M</td></tr>
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The budget contains, aside from the needed costs for personnel in full-time equivalents (FTE), an amount of € 700,000 for setting up 3 demonstrators at each partner’s site. This would support all work packages being realised in designated and due time. Also, having redundant demonstrators allows for continuing work at a second site in case any damages or delays arise at one site. This is even more true since the results of all WP will have to be integrated in the final 1st demonstrator which shall be established in Morocco, preferably at the site of partner #4.</td></tr>
<tr><td>Funding Needs</td><td colspan="2">Due to little own funds, the indicative budget needs to be covered in full by external funding. But due to the establishment of a non-profit limited liability company, a higher initial funding could be ‘returned’ by dedicating the winnings from the NPLLC to any EU charity eligible. Alternatively, the budget could be cut down to a single 1st demonstrator to be realised in WP 2, which is the basic idea of the Green Deserts project (cf. link at the bottom).</td></tr>
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| **Target Countries** | The focus lies countries along the Sahara Desert and its adjacent Sahel region like Morocco, Mali, or Chad. But also, Israel, Türkiye, or any other Mediterranean country threatened by an increase of aridity or water scarcity due to global warming can benefit from such a water-efficient, yet output-efficient farming system. |
| **Implementation Strategy** | Whereas WP 1 tends to increase the availability of irrigation and drinking water by converting brackish water cost-effectively using renewable energy, WP 2 focusses on using irrigation water in a most efficient way by propagating closed environments to minimise the loss of water via evaporation and wind while keeping air humidity at a level preferable for supporting any photosynthesis process. Growing crops, or fish like in WP 3, will not only provide food for humans, or animals. It will also support the fixation of carbon dioxide. Even if the fixation is temporary when it comes to food, any rise in temporary fixation will help reduce the contents in the air. If non-edible or non-usable food waste will be used for enriching artificial soils made from desert sands, new crops can be grown on these new soils. By this, a sustainable cycle for reducing or recycling greenhouse gases will be realised. Accordingly, the usage of washed ashore or harvested but unsold/unsellable algae is propagated to reduce the direct loss of nutrients and the direct production of greenhouse gases by any residues rotting away. Thus, any carbon dioxide fixated or kept stored in soils or plants could be monetarised by selling $CO_2$ allowances. Hence, the project will not only increase availability of irrigation or drinking water, renewable energy, and protein-rich crops. It will also increase the fixation of carbon dioxide. In addition, the project will provide new job opportunities for locals of all levels of qualification. Moreover, it will do all this in regions where poverty and hunger are high and prospects for life are low. Therefore, Green Deserts shall be turned from a one-man-initiative into an SME, a charitable company donating any winnings to e.g. children's villages, refugee camps or any charity carried out in Northern Africa. Any winnings of selling such allowances shall be invested into installing additional modular environments in or along the Sahara Desert, especially in the Sahel region to stop the threat of further desertification. Thus, this project could succeed where other projects like Africa's Great Green Wall fail (cf. e.g. https://doi.org/10.1016/j.landusepol.2025.107670, https://thenewhumanitarian.org/investigations/2025/11/11/cop30-cautionary-tale-sahel-great-green-wall, or https://earth.org/the-great-green-wall-legacy). |


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