



Midas

MARGINAL LANDS, INDUSTRIAL CROPS
AND INNOVATIVE BIO-BASED VALUE CHAINS

Deliverable D6.2

Business Plan Visions for 16 Case Studies



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1. Introduction

D6.2, entitled '**Business Plan Visions for 15 Case Studies**', is connected with Task 6.2 of the project. Task 6.2 aims to identify the key aspects of the future development of farms/ farming systems within a circular bioeconomy. To do so, the task centers around the recording of the business assets (stock-taking), the current financing options available to farmers at local and national levels (both public and private financing), the barriers, the level of circularity of operations and products [i.e., in terms of the ecosystem services other than biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation)] and the business vision of each one of the 16 MIDAS WP3 field case studies (Figure 1). In each field case study, innovative cropping systems are being tested; intercropping in 11 sites and agroforestry in 5 sites.

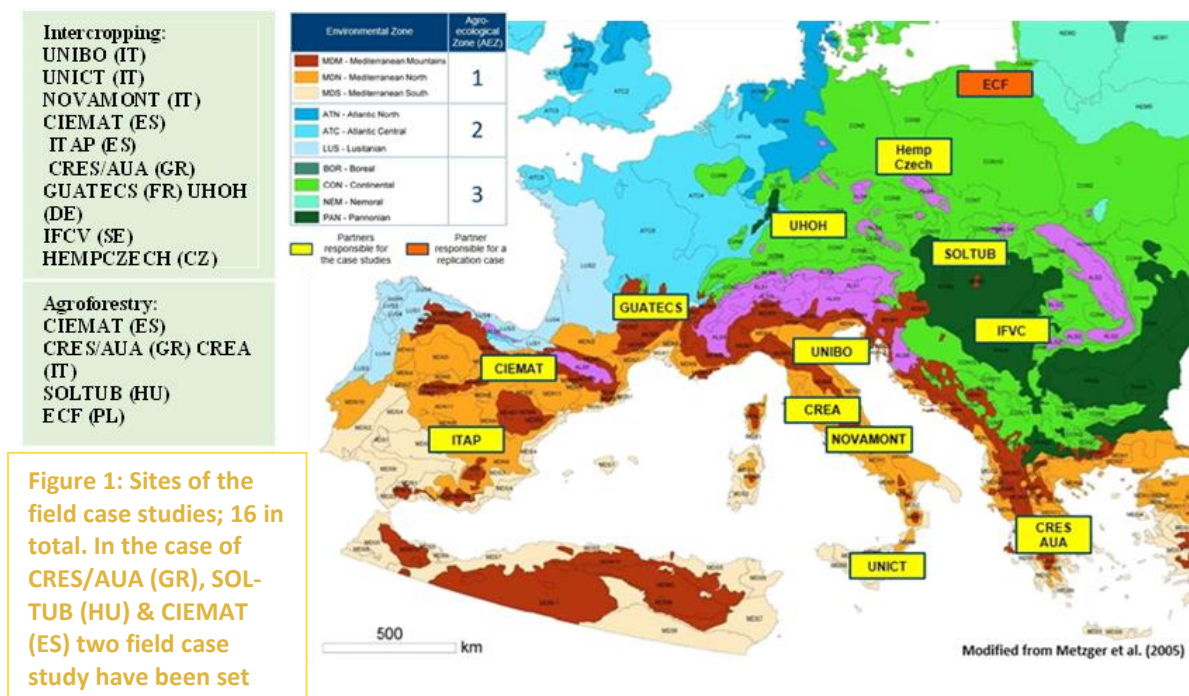


Figure 1: Sites of the field case studies; 16 in total. In the case of CRES/AUA (GR), SOLTUB (HU) & CIEMAT (ES) two field case study have been set

In order to collect the required input from each case study –and always with the development of sustainable business plans in mind (Task 6.4)- a questionnaire was developed by CRES, which was distributed and individually filled in by all case study leaders. As presented in Figure 2, the field case studies have a central role in the MIDAS project since they provide valuable data to all WPs.

Taking into account the information required for the creation of a business plan, the questionnaire was developed incorporating particular topics contained in tools such as the SWOT (Strengths, Weaknesses, Opportunities,

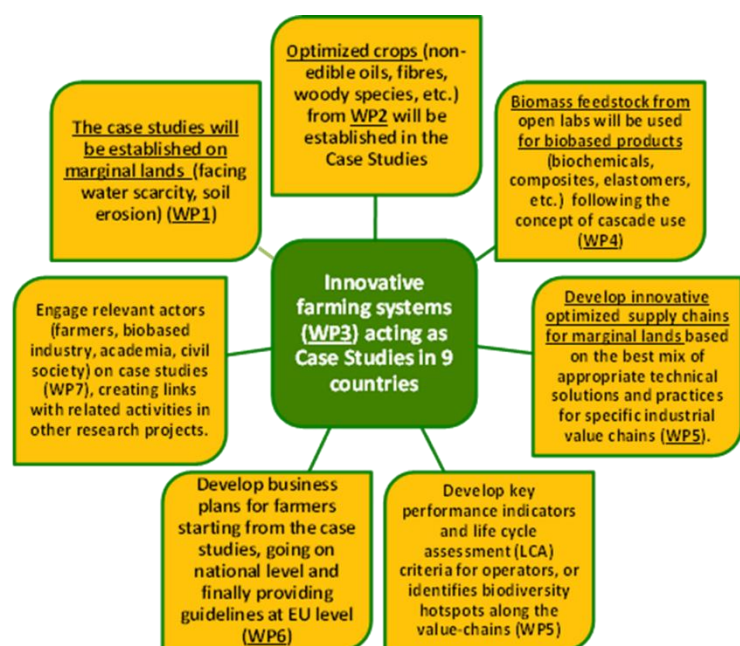


Figure 2: The central roles of field case studies in MIDAS

and Threats) analysis, the PESTLE (Political, Economic, Social, Technological, Legal, and Environmental) factors analysis and the Business Model Canvas (including the elements of Customer Segments, Value Proposition, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure). The topics of these tools that have not been addressed in the specific questionnaire will be considered during the information-collection activities of Task 6.3 and Task 6.4.

The questionnaire consists of 14 open-ended questions based on the following themes:

- ♦ **General information:** Question #1 requests a short case study description.
- ♦ **Vision statement:** Following the guidelines on the creation of a business's vision statement, question #2 focuses on the main purpose, question #3 on the product/s, question #4 on the vision, question #5 on the current resources and question #6 on the needs of the case study.
- ♦ **SWOT analysis:** In the context of recording the business assets and barriers of the case study, corresponding questions have been included based on the four dimensions of SWOT analysis: question #7 on strengths, question #8 on weaknesses, question #9 on opportunities, and question #10 on the case study's threats.
- ♦ **Financing options:** Question #11 addresses current financing options available to farmers at the local and national levels (both public and private). The particular topic will be explored in detail in T6.3.
- ♦ **Legislation and governance:** Deriving from the political and legal factors of the PESTLE analysis, question #12 considers the role of national legislation and national/regional/local government in relation to the case study. This information will be relevant during the development of sustainable business plans (T6.4).
- ♦ **Circularity:** Questions #13 and #14 on the type and potential revenues of additional ecosystem services deal with the circularity of the case study operations and products.

The completed questionnaires per partner are presented in Chapter 2 of D6.2.

The outcomes of this activity will be utilized within Task 6.4, which focuses on co-creating sustainable business plans, in addition to the information collected in Task 6.3 (addressing potential revenue and customer relations aspects). Moreover, in addition to the input collected within Task 6.2 and Task 6.3, additional information will be collected through Task 6.4 concerning environmental, economic, and social attributes (benefits, risks, needs and requirements) from a long-term perspective.

2. Partners' input

2.1 CIEMAT in Northern Spain

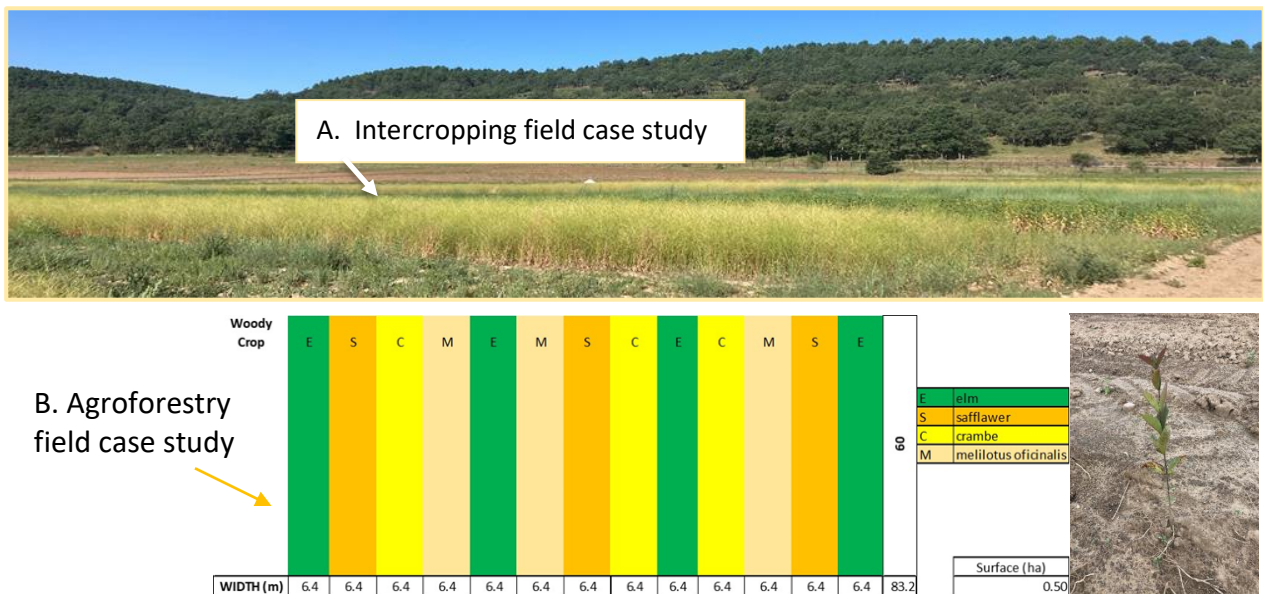


Figure 3: View of the intercropping (A) and agroforestry (B) field case studies in Soria (Northern Spain).

Case Study short description

At CEDER-CIEMAT installations in the Spanish province of Soria two demo field of ≈ 0.5 ha each (Figure 3) had been established including: a) rotating strips of safflower, crambe and melilot (*Melilotus officinalis*) and b) non-rotating strips of lavender (*Lavandula stoechas ssp luisieri*) as fix perennial crop in the 1st trial (intercropping) and Siberian Elm in the second (agroforestry).

What is your main purpose in the context of the MIDAS project?

To provide new alternatives to farmers for growing industrial crops as source of biomass for the bio-industry. CIEMAT has the ambition to demonstrative that these alternatives are profitable for farmers, beneficial for the environment and could serve to create job spots in depopulated rural environments as Soria's province is in Spain.

Which are your products in the MIDAS context?

Essential oil from lavender, oils from the oilseeds (safflower and crambe), biomass feedstock from melilot for pharmacy and biogas industry and finally biomass feedstock from Siberian elm.

What is your vision in the MIDAS context?

To introduce new crops and new crops schemes at the regional level and help famers to diversify their income bringing into production marginal lands.

What are your current resources?

CIEMAT owns marginal land, experienced personnel and commercial machinery to properly grow the MIDAS non-edible crops.

What are your needs?

Some of the under-study crops in the understudy case study are relatively new in the region and thus tailored better knowledge is needed especially concerning the optimization of the harvest time and the adjustment of the harvest machinery for crambe.

What are your main strengths?

CIEMAT owns many hectares of marginal lands and has carried out long-term experiments using commercially available machinery. Thus, has the knowledge to demonstrate the growing of non-edible crops on marginal lands as a possibility to increase their income. CIEMAT has also the possibility to work on biomass conversion into biobased products and to support several value chains.

What are your main weaknesses?	Being a research Centre and not a farmer association we need work harder to develop a deep understanding on farmers' problems/ needs. In order to overcome this weakness, CIEMAT is creating farmers groups to interact with them regionally to show to the local farming community how they can use the MIDAS work to increase their income through growing on marginal lands facing natural constraints.
What are the main opportunities that you could capitalize on?	The alternatives that we are proposing are new and interesting to diversify farmer's income and benefit the environment and the demo fields of MIDAS will be used to attract the farmers' interest regionally, the local associations and extension services by presenting the benefits of MIDAS crop schemes/rotations as well as the policy makers.
Which are the main barriers/ difficulties/threats you are facing?	♦ Difficulties to convince farmers to introduce new crop scheme rotations. ♦ If these new growing schemes are not introduced in the CAP to obtain additional subsidies this is a big barrier. ♦ Perhaps we can obtain new subsidies for Midas stipe plantations but this could change in the near future (this can be considered a threat).
Which current financing options are available to farmers at local and national levels (both public and private)?	The main financial options are based on CAP subsidies. At regional and/or national level there are additional subsidies for the renewal of agricultural machinery. Farmers usually obtain financing from private banks.
What is the role of national legislation and national/regional/local government?	National-regional administrations are critical because they both take part in the definition of the intensity, requirements and exceptions for the CAP subsidies. Eco-schemes definition is the key.
Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?	We are providing pollinator support due to the flowering crops that we grow, erosion mitigation due to the increase of the soil coverage compared to the reference system (the reference system is a rotation with winter cereals combined with fallow that in some cases sunflower is included as low input spring crop). Furthermore, the proposed cropping system is contributing to carbon sequestration and to soil quality improvement due to the increase of soil organic matter attributable to the perennial crops that are growing (lavender).
Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?	♦ Some crop schemes/rotations similar to the ones here described could benefit from additional subsidies from the CAP due to the benefits they provide to the soil and the environment. ♦ Farmers could obtain additional revenues from the installation of bee hives (pollinator support). ♦ Carbon sequestration in soil because of the increase of soil organic matter could be paid in the near future as positive externality.

2.2 CREA in central Italy



Figure 4: View of the agroforestry field case studies in Monterotondo (Central Italy).

Case Study short description	An agroforestry trial (Figure 4) has been set up near Rome (>0.5 ha) where woody crops (poplar) intercropped with non-edible annual crops (safflower, crambe). The demo trial is set up in an existing poplar field trial that the distances between the rows where 3 m and in the beginning of MIDAS half of the poplar rows had been removed in order the distances between the rows to be 6 m. In these 6 m rows annual crops had been established in rotation (safflower and crambe).
What is your main purpose in the context of the MIDAS project?	To study the interaction of perennial and annual crops in the agroforestry system from a mechanical point of view. An already poplar field trial had been modified to allow annual crops to grow between the poplar rows.
Which are your products in the MIDAS context?	Safflower and crambe as non-food crops are being grown for oil, while poplar as woody species will provide feedstock for biobased products as particle boards, etc.
What is your vision in the MIDAS context?	To develop an innovative agroforestry system with woody species and annual crops in rotation.
What are your current resources?	Experimental field for agroforestry deriving from a converted MRF, and a field with marginal constraints at CREA experimental farm.
What are your needs?	Strengthen the collaboration with partners in the framework of subtask 3.2.2. regarding ecosystems services assessment and for task 3.5 concerning further studies on selected non-edible crops.
What are your main strengths?	Long-term expertise woody species for biomass production, on machinery testing, experimental farm.
What are your main weaknesses?	Difficulties with experimental plot of the project due to each size.
What are the main opportunities that you could capitalize on?	Valorization of a MRF converted in an agroforestry system for agriculture resilience and providing feedstocks for bioproducts production without affecting agricultural land that is devoted to food and feed.
Which are the main barriers/difficulties/threats you are facing?	Testing harvesting solutions on small surfaces of the experimental fields is a barrier. CREA has to run not only its agroforestry case study but should run harvesting strategies on fields of 0.5 ha.
Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?	Pollinator and biodiversity support in the agroforestry field as well soil erosion mitigation.

2.3 CRES and AUA in Greece



Figure 5: View of the intercropping field case studies in Lexaina (South Greece).

Case Study short description	Two field case studies have been set up in Greece. The 1 st located in south Greece (Lexaina; Figure 5) where: a) rotating strips of safflower, sorghum and safflower and b) non-rotating strips of miscanthus as fix perennial crop. In the 2 nd case study (north Greece, Krini Chalkidiki) the rotating strips including crambe and safflower and the non-rotating poplar as fixed perennial woody crop.
What is your main purpose in the context of the MIDAS project?	To study at the level of field case studies innovative cropping systems; intercropping and agroforestry. The field case studies are connected with regional farmers groups since MIDAS has as moto to work with the farmers and for the farmers. Demo activities will be carried out at several stages of the plantations to present and communicate the case study results.
Which are your products in the MIDAS context?	For the oilseeds included in the demo cases (safflower, crambe and castor bean) biobased products will be produced from the oil. From the lignocellulosic crops (miscanthus and poplar) the biomass feedstock will be used for biobased materials like particle boards and bioenergy. In this route the oilseeds straw will be included.
What is your vision in the MIDAS context?	To develop innovative cropping systems that will be appropriate for marginal lands facing natural constraints, avoiding their abandonment and helping the farmers to increase their income.
What are your current resources?	The knowledge on which non-food crops to grow on marginal lands that had been built on previous research projects (e.g., MAGIC, BIKE). Through MIDAS, CRES will improve this knowledge with emphasis on crops cultivation and set up of value chains.
What are your needs?	Through the field case studies implementation to improve the mechanical cultivation and harvesting of the crops including on the under study cropping systems.
What are your main strengths?	The long-term experimentation on growing industrial crops on marginal lands facing natural constraints. Its should be stressed out that the cultivation on marginal lands is not easy, the yields can vary a lot and crops and it is important to know which non-food crop is appropriate per marginality factor.
What are your main weaknesses?	Being a research center should work harder to build string linkages with the farming community at regional level. In order to overcome this CRES has set up field trials throughout Greece (different environments and crops) in collaboration with farmers cooperatives and/or extension centers.

What are the main opportunities that you could capitalize on?

The development of innovative cropping systems (intercropping and agroforestry) at different marginal fields in different climatic zones in Greece. The knowledge will be communicated to the farmers community.

Which are the main barriers/ difficulties/threats you are facing?

Growing on marginal lands is challenging. Deep knowledge is needed to successfully implement the growing of selected non-edible crops. The whole value from production till the end use should be organised. For some of the non-edible crops included in the cropping systems the harvesting is not yet total mechanized.

Which current financing options are available to farmers at local and national levels (both public and private)?

In Greece the main financing options for farmers are these related to CAP. Since last year a national strategic plan has been set up and there special funding is available for eco-schemes. Since this plan put in force recently the picture of funding is not always clear and stable. At the same time some finding from farmers is coming from the Ministry of Agriculture on specific actions like improving the machinery of the farmers, etc.

What is the role of national legislation and national/regional/local government?

Part of the national legislation is the national strategic plan that was developed in Greece in the view of CAP23-27. Emphasis is given on eco-schemes. Furthermore, at regional level operational groups had been set up working on specific themes (collaboration of scientists, companies and farmers).

Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?

The under-study case studies support ecosystem services e.g., pollinator support (the majority of the crops selected producing flowers), erosion mitigation (avoiding the land abandonment), soil carbon sequestration (the perennial crops increase the soil carbon), crops diversification (avoiding the monoculture), etc. Moreover, all non-edible crops in MIDAS producing residual feedstock that could be used for advanced biofuels production since it is being produced on marginal, degraded lands and could be considered as low ILUC feedstock.

Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?

The understudy cropping systems could be included to ecosystem services schemes. They can support the biobased industry as well as the advanced biofuels production offering to the farmers the possibility to have access to new markets and value schemes helping them to increase their income and supporting the rural development.

2.4 CZECHEMP in Czech Republic



Figure 6: View of the intercropping field case studies in Chomutov (Czech Republic).

Case Study short description

Intercropping perennial (miscanthus) x annual (hemp, safflower, sorghum) in cooperation with Crop research institute in Chomutov, the Czech Republic (Figure 6). Marginality classification of the soil: low soil fertility, overburden from coal mining, poor agrochemical properties. The soil acidity is weak. It is medium to light soil, stony, skeleton content up to 25%.

<i>What is your main purpose in the context of the MIDAS project?</i>	Performing the planned activities in the MIDAS for improving innovative farming systems in case-studies.
<i>Which are your products in the MIDAS context?</i>	Primary agricultural production products – aboveground biomass as raw material for biogas production from annual and perennial crops. In addition, for all crops except miscanthus, the proportion of total aboveground biomass and seeds is determined separately for research balance purposes.
<i>What is your vision in the MIDAS context?</i>	Improvement of marginal soils use for crop production (edible and non-edible crops) with minimal impact on agroecosystem. Solutions for a marginal land restoration/repairation.
<i>What are your current resources?</i>	Financial support from the MIDAS project, cooperation support from the sub-contracted VÚRV Chomutov - personal support from Czechemp Ltd.
<i>What are your needs?</i>	There is no possibility of acquiring capital equipment through projects (harvesters, tractors, testing machines), and according to the Institute's investment plan, we are unable to invest in the acquisition of expensive equipment that would enable the improvement and further expansion of the production of less cultivated plant species. Lack of funds for the renovation and maintenance of the existing infrastructure (equipment and buildings) for the work of researchers and research. Storage areas for the production that is being tested within the project have not been developed, and there are no subsidies for their construction. According to the AKIS system, all elements exist: agricultural producers, educational institutions, the non-governmental sector, political decision-makers, and the market, but nothing is networked or connected. Lack of staff, research and support staff and the impossibility of renovation of the infrastructure. There is a lack of interest among students in studying agriculture. A small number of students who complete their studies go to commercial companies due to higher incomes, but also the migration of residents abroad.
<i>What are your main strengths?</i>	The Crop research Institute in Chomutov is a leading institution in the region that is mainly dedicated to the cultivation of technical crops, the processing and use of agricultural biomass and bio-waste for the production of biofuels. It also develops monitoring, control and evaluation of possible health and ecological risks (Technology Team for sustainable agriculture and landscape restoration). They have a lot of experience with research on miscanthus as well as sorghum for biogas and energy production as well for phytoremediation and soil reclamation. Czechemp strength is in knowledge about particular hemp value chain topic, as well as EU market developments and products development potential. Czechemp is also strong in the networking within EU and abroad hemp industry.
<i>What are your main weaknesses?</i>	The main weaknesses of practical realization of agricultural research results in the CzR are as follows: the lack of a labor force, primarily due to the demographic problems with outflow of the village population (migration); high prices of production inputs, low prices of products, the inability to adjust prices towards users (due to high production costs), and unfair competition on the market.

What are the main opportunities that you could capitalize on?

Intellectual property concerning innovative technologies for technical crop production on marginal lands connected with soil reclamation and produced biomass using for energy and technical purposes including biogas production. Hemp breeding as Czech Republic has not own hemp varieties registered yet but has long tradition in cultivation flax and textile industry.

Which are the main barriers/ difficulties/threats you are facing?

The problem of very poor growth of miscanthus seedlings in unfavorable soil-climate conditions of the tested marginal soil. The hemp harvest was difficult due to the fiber, which was winding around the rotating parts of the cutter.

Which current financing options are available to farmers at local and national levels (both public and private)?

- ♦ Direct payments (e.g., support for the improvement of primary agriculture, risk management preservation and improvement of the environment and natural resources, organic production, preservation of plant and animal genetic resources, etc.);
- ♦ Rural development measures (e.g., deductions for diversification of income and improvement of the quality of life in rural areas, incentives for improving the system of creation and transfer of knowledge, etc.);

There are several funding options available to farmers in the Czech Republic at both the local and national level. Here are some of them:

1. Common Agricultural Policy (CAP): The European Union's Common Agricultural Policy (CAP) provides a significant source of funding for farmers in the Czech Republic. The CAP's strategic plan for 2023-2027 is more environmentally rooted and has more support for smaller farms. This is reflected in Czechia's own farming strategic plan, with additional funding going to family-run and small enterprises.
2. Redistributive Payments: Small and medium-sized farms receive additional funds in the form of redistributive payments. These payments are made for the first 150 hectares at a level of 23% of the national pool of funds for direct payments.
3. Government Support: The Czech government has several plans to support farmers and organic produce. Support for Small Family Farms: The government has announced that it will more effectively support small family farms, as well as start-up, small, medium, and organic farmers. The agency Media Age will work on the campaign of organic produce with a budget of 30 million CZK per year.

What is the role of national legislation and national/regional/local government?

The Czech Strategic Plan for Agriculture aims at ensuring the sustainable competitiveness and resilience of farms while at the same time improving the protection of natural resources and the climate. The role of national legislation and national/regional/local governments in this Strategic Plan Realization is based on substantially contributes to improving the redistribution of financial support to small- and medium-sized farms, strengthening the position of organic farming, and improving the vitality and quality of life in rural areas through investments.

For hemp there is requirement from drug regulation to announce to Custom office the place and size of the field plot bigger than 100m² and sowed variety latest month after sowing, the farmers have to use registered varieties and also announce month after harvest how much did they harvested and where did they store the production.

Which ecosystem services besides biomass

The Czech Republic, like any other country, can benefit from a variety of ecosystem services. Here are some examples:

provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?

1. Pollinator Support: Planting native flowering plants can help support local pollinators.
2. Habitat Functioning: The country's diverse landscapes, from mountains to lowlands, provide habitats for a wide range of species. Protecting these habitats is crucial for maintaining biodiversity.
3. Recreational Value: The numerous Czech Republic's natural areas offer numerous recreational opportunities.
4. Air Regulation: Forests play a crucial role in air purification. Maintaining and expanding these forests can help improve air quality.
5. Erosion Mitigation: Practices such as reforestation and sustainable farming can help prevent soil erosion, particularly in areas with hilly terrain.

Considering the specifics of our specialization, we can apply as a potential operator of ecosystem services only for activities No. 1 and 5.

Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?

The aforementioned ecosystem services have the potential to generate revenue, but the actual realization of this potential would depend on a variety of factors, including policy decisions, market conditions, and public perception. It's also important to consider the balance between economic benefits and the sustainability of the ecosystems. The most obvious of them are revenues that come from pollinators include honey and pollinators (insect farming) production. The important factor is the investment in building the infrastructure what will process the industrial crops into valuable products.

2.5 ECF in Poland



Figure 7: View of the agroforestry field case studies in Poland.

Case Study short description

A demo field of mixture of perennial grasses – cocksfoot (Latin: *Dactylis*, Polish: Kupkówka), meadow fescue (Latin: *Festuca Pratensis*, Polish: Kostrzewa łąkowa), timothy (Latin: *Phleum*, Tymotka) and bromus (Latin: *Bromus*, Polish: Stokłosa) – with poplar.

What is your main purpose in the context of the MIDAS project?

Our key objective in the context of the MIDAS Project is to develop businesses cases for industrial uses of hay produced by the farmer we are working with, as well as for the woody biomass. In our reality, the farmer has a lot of experience of producing and working with hay and much less with the woody biomass.

Which are your products in the MIDAS context?

Our two groups of products are: hay and woody biomass – woodchips.

What is your vision in the MIDAS context?

The big vision behind our implementation of MIDAS Project in Poland is to accelerate adoption of industrial crops growing by the farmers, with a particular focus on including trees in their landscapes, by advancing and accelerating creation of value chains for processing those crops into bioeconomy outputs.

What are your current resources?

Among the key resources, we have highly committed farmer, institutional resources of the European Carbon Farmers, as well as industry and political goodwill. We are also the Founding Member of the Polish National Bioeconomy Hub.

<i>What are your needs?</i>	The biggest need seems to be the scale of operation – there seems to be a gap between demo project making sense in the scale of the MIDAS Project and adoption by a new farmer in the support-free environment.
<i>What are your main strengths?</i>	We are first-hands farmers, who speak the language of the farmers and we are very committed to the success of this project.
<i>What are your main weaknesses?</i>	This is our first Horizon Europe project, so we are not exactly sure how ambitious we can be with the project implementation.
<i>What are the main opportunities that you could capitalize on?</i>	Developing this first Horizon Europe project into another Horizon Europe project, as well as developing/accelerating creation of a specific business opportunity for the farmers we are working with at the intersection of the industrial crops and bioeconomy.
<i>Which are the main barriers/ difficulties/threats you are facing?</i>	The main barrier is the lack of various big pieces of the ecosystem needed for the biobased value chains to make sense without financial subsidies – lack of supply of consistent and affordable biomass, lack of processing capacities and markets for the finished products.
<i>Which current financing options are available to farmers at local and national levels (both public and private)?</i>	There is mainly public funding available, especially through the National Strategic Plans of the CAP (Common Agricultural Policy of the European Union).
<i>What is the role of national legislation and national/regional/local government?</i>	There are numerous initiatives supporting development of bioeconomy and industrial crops production at national, regional and local government levels. However, the challenge is the (missing) leadership at those various levels in operationalizing those policies. The very challenge that we address by supporting the National Bioeconomy Hub.
<i>Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?</i>	In addition to the ecosystem services specified above, we also positively contribute to the carbon sequestration and water retention. Not to mention social value the project is creating.
<i>Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?</i>	Yes – carbon sequestration. Also, water retention and filtration. Potentially also habitat protection.

2.6 GUATECS in France

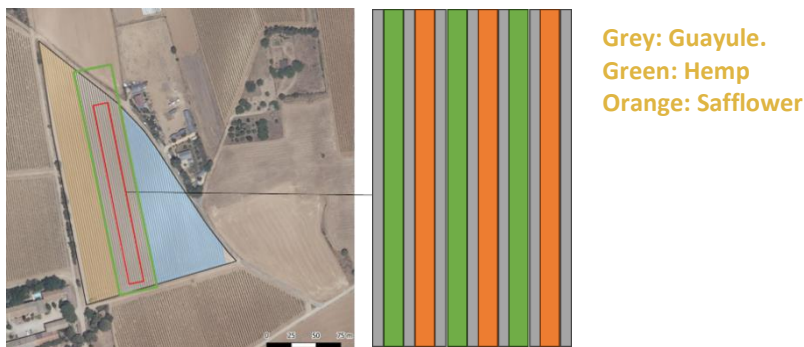


Figure 8: View of the intercropping field case studies in South France.

Case Study short description	GuaTecs is producing Guayule latex and other coproducts for gloves and other applications. In MIDAS has set up an intercropping field trial in south France, where guayule is being grown in perennial strips, while in between guayule strips two annual crops are being rotated; hemp and safflower (Figure 8).
What is your main purpose in the context of the MIDAS project?	Validation of the Guayule latex quality in glove application. Meanwhile, intercropping is being evaluated to increase the farmer's income. While doing so GuaTecs increases its expertise in view of later improving the process and scaling-up agricultural and extraction capacity.
Which are your products in the MIDAS context?	Guayule latex, a water-based polyisoprene dispersion, is validated with Piercan company, and bagasse to be used for wood panel applications is developed with MIDAS partners: Chimar and Valbopan. The Guayule latex films are non-allergenic, stronger and softer than Hevea ones, GuaTecs also targets glove manufacturing as one of the largest markets with high added value.
What is your vision in the MIDAS context?	Presently Europe imports all natural (Hevea) rubber and latex from Asia. Furthermore, this latex is allergenic and contributes to deforestation. MIDAS will improve applications for Guayule products and increase profitability, in order to place Guayule as the first European sustainable source of natural latex.
What are your current resources?	6 hectares of guayule fields, a 1 kg/hour latex patented extraction unit, and 15 years of expertise (since EU-PEARLS project) on Guayule agronomy, process engineering, and product chemistry and quality.
What are your needs?	Current main targets are scaling-up Guayule biomass production and extraction capacity towards a demo and later industrial scale production. Additional funding is needed including (i) CAP subsidies for the farmers and (ii) private funds (Venture Capital, Corporate VC) for biomass processing for GuaTecs.
What are your main strengths?	The expertise from the EU-PEARLS project (2008 - 2013) and others funded by French ADEME, brought by its four scientists' founders, enabled GuaTecs to develop a patented unique water-based (solvent-free) extraction process enabling to preserve the high molecular mass of polyisoprene chains. The process was then validated at pilot scale, as well as latex quality for targeted applications with industrial manufacturers. GuaTecs expertise covers selected Guayule varieties adapted to various pedoclimatic conditions, agronomy, process engineering for extraction of latex and resins, physicochemistry of latex, chemistry of natural products, a technical and scientific network (farmers cooperatives, agricultural organizations, industrial manufacturers). This up-stream and down-stream expertise enables GuaTecs as a driving partner to set-up this new agro-industrial production chain in France and abroad.

<i>What are your main weaknesses?</i>	The challenge is to progress in parallel in various fields: (1) implementing this new crop with farmers (24 months long field trials before first harvest), (2) up-scaling the production capacity (raising private funds), and (3) valorizing all coproducts (resin, co-extracted water-soluble active compounds, bagasse, leaves...) in addition to latex and derived rubber.
<i>What are the main opportunities that you could capitalize on?</i>	The current world political and climate situation shows that (1) farmers must adapt and look for low irrigation crops, (2) the industry should not be so dependent on far-sourced critical materials and try to increase the share of natural products vs petrochemicals. Concomitantly to funding research on Guayule, EU should now list the products (latex and rubber) as critical raw materials (cf. Critical Raw Material list) and include Guayule to the CAP positive list.
<i>Which are the main barriers/ difficulties/threats you are facing?</i>	Developing such an agro-industrial production chain and business will take time and therefore needs huge financial investments until having built the first industrial extraction factory. Venture Capital organizations seem to find the risk to be quite high.
<i>Which current financing options are available to farmers at local and national levels (both public and private)?</i>	Presently Guayule is not on the CAP positive list and this is a huge problem for farmers. GuaTecs can -easily- find subsidies from French authorities (ADEME...) and Europe (SME instruments...), but needs to fund raise first.
<i>What is the role of national legislation and national/regional/local government?</i>	French and European authorities must agree to help Guayule through CAP.
<i>Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?</i>	Guayule is fully adapted to poor soil, hot and dry climate, and low water availability. Coming from the Mexican / Texan desert, this crop brings a true alternative to climate warming for farmers in Southern Europe (also Northern Africa). It is also suitable for fighting against desert progression. Resin extract contains active compounds to be used as natural substitutes for phytochemicals, therefore avoiding to spread harmful synthetic petrochemicals.
<i>Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?</i>	Guayule (leaves, etc.) can also be used for animal feed (goats, etc.), a vital issue for farmers in places where they are fighting against desert progression (in Africa, but also in places already suffering of rainfall shortage in Southern France and Europe).

2.7 IFVC in Serbia



Figure 9: View of the intercropping field case studies in Serbia.

Case Study short description	Case study: intercropping perennial x annual. Perennial crop is miscanthus, while annual crops are Brassicaceae (white mustard 2023; crambe 2024-2026), safflower, sorghum (Figure 9). Marginality classification of the soil: Excessive wetness, low soil fertility, unfavorable chemical conditions, Limitations in rooting; adverse terrain. Marginality constraints: excessive humidity (limited soil drainage and excess soil moisture), low soil fertility (low content of organic matter), unfavorable soil properties (salinity, high clay content), bad conditions for rooting and unfavorable terrain conditions (risks of flooding, underground water).
What is your main purpose in the context of the MIDAS project?	Optimization of selected industrial crops through testing of plant breeding and evaluation and improving innovative farming systems in case-studies.
Which are your products in the MIDAS context?	Primary agricultural production products – seed and biomass.
What is your vision in the MIDAS context?	Improvement of marginal soils use for plant production (edible and non-edible crops) with minimal impact on agroecosystem. Solutions for a marginal land restoration/repairation.
What are your current resources?	Current activities are research, breeding, and creation of new cultivars and hybrids of less cultivated oil plant species, research on their adaptation, especially in the domain of resistance to biotic and abiotic stress, and quality parameters. Currently, one of our focuses is the examination of production technology in our conditions and adaptation to the requirements related to the use of oilseeds as pre-sowing for the main crops in order to use them in different methods of intercropping. IFVCNS is a public, scientific research institution under the Ministry of Science and the Ministry of Agriculture (Republic of Serbia). In accordance with the Law on Research and Science, as a national institute, we implement activities that ensure food security for the country and the possibility of doing business in the market and commercializing products, which represents the transfer of knowledge into practice, as a part of our activities.
What are your needs?	There is no possibility of acquiring capital equipment through projects (harvesters, tractors, testing machines), and according to the Institute's investment plan, we are unable to invest in the acquisition of expensive equipment that would enable the improvement and further expansion of the production of less cultivated plant species. Lack of funds for the renovation and maintenance of the existing infrastructure (equipment and buildings) for the work of researchers and research. Storage areas for the production that is being tested within the project have not been developed, and there are no subsidies for their construction. According to the AKIS system, all elements exist: agricultural producers, educational institutions, the non-governmental sector, political decision-makers, and the market, but nothing is networked or connected. Lack of staff, research and support staff and the impossibility of renovation of the infrastructure. There is a lack of interest among students in studying agriculture. A small number of students who complete their studies go to commercial companies due to higher incomes, but also the migration of residents abroad.

What are your main strengths?

The Institute is a leading institution in the region that performs research on breeding and cultivation (breeding, agro-technology, plant physiology and biochemistry, plant protection, and soil science), as well as agrobiodiversity preservation (the Institute has the most abundant collections of plant genotypes, of cultivated species and their wild relatives, from different parts of the world that grow in temperate regions) of diverse field and vegetable crops of importance to various industries. One of the Institute's tasks is the transfer of knowledge and close communication with agricultural producers and agricultural expert services that work within the Provincial Secretariat for Agriculture (Autonomous Province of Vojvodina). Spreading knowledge and the intensive dissemination of knowledge are some of our main tasks. IFVCNS is the only one that provides free plant breeding technology with the purchase of seeds, and IFVCNS researchers are available to farmers at any time.

What are your main weaknesses?

The lack of a labor force, primarily due to the demographic picture and the outflow of the population (migration); a lack of adequate income, i.e., the inability to pay the labor force according to the job. High prices of production inputs, low prices of products, the inability to adjust prices towards users (due to high production costs), and unfair competition on the market.

What are the main opportunities that you could capitalize on?

Intellectual property concerning plant breeding and production.

Which are the main barriers/ difficulties/threats you are facing?

The main challenge is extreme weather and climate change, as well as adaptation to good agricultural practices to reduce the risk due to the occurrence of natural disasters. Given that agricultural production is the most represented in Serbia, the country is highly dependent on and prone to these risks. Very expensive inputs in agricultural production, and the uncertainty of the agricultural producer, what to do and where to store final product, what the price will be, lack of subsidies, uncertainty of duration of diverse and unfavorable conditions, the uncertainty that agricultural producers have regarding inputs, marketing of the final product, and the impossibility of long-term planning.

Which current financing options are available to farmers at local and national levels (both public and private)?

- 1) direct payments (e.g., support for the improvement of primary agriculture, risk management preservation and improvement of the environment and natural resources, organic production, preservation of plant and animal genetic resources, etc.);
- 2) rural development measures (e.g., deductions for diversification of income and improvement of the quality of life in rural areas, incentives for improving the system of creation and transfer of knowledge, etc.);
- 3) credit support in agriculture;
- 4) special incentives;
- 5) IPARD incentives.

What is the role of national legislation and national/regional/local government?

Determines professional tasks on the improvement of agricultural production; gives consent to special management bases and private forest management programs; establishes and gives consent for the management of hunting grounds; gives consent to the hunting grounds; gives consent to the amount of fees in the field of water management; prepares the acts passed by the Assembly and the Executive Council, which refer to: the agricultural and rural development program; acts on the establishment of a special budget, funds and other forms of organization; balances of agricultural and food products and basic raw materials and conditions of export and import of certain products; program for the protection of the use and development of agricultural land;

the program of selection measures for the improvement of animal husbandry and the education of the Scientific and Professional Council for the implementation of selection measures in animal husbandry; the program of improvement, protection and breeding of game; as well as the general guidelines for the development and improvement of forests and the water management base, proposes measures for the implementation of programs, guidelines and bases and monitors their implementation; preparation of acts on the establishment of enterprises for forest and water management and acts on the establishment of the agricultural service; preparation of other decisions and general acts in these areas; supervises the work of the agricultural service and performs administrative supervision except inspection; achieves cooperation with the appropriate authorities and performs other specific tasks.

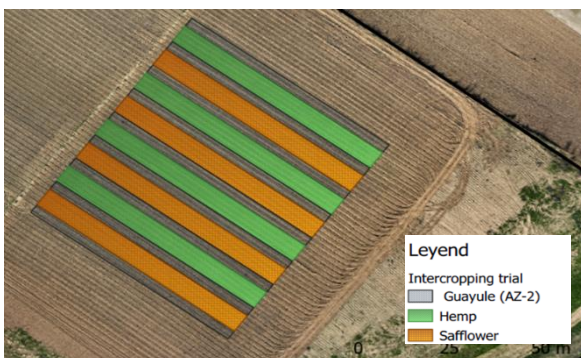
Pollinator support, erosion mitigation, and soil formation.

Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?

Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?

Revenues that come from pollinators include honey and pollinators (insect farming) production.

2.8 ITAP in Spain



Guayule (*Parthenium argentatum*)

Figure 10: View of the intercropping field case studies in central Spain.

Case Study short description

An intercropping field case study has set up in central Spain (Figure 10).
Perennial Crops: Guayule (40,000 plants/ha, 0.75 m between the lines and 0.33 cm between the plants); Guayule (P. Argentatum, accession AZ-2, origin USDA-AZ).
Annual Crops: Safflower (CW 99 OL, MAS SEEDS) and industrial hemp (Fibror 79).
Total area: 0.5025 ha. Marginality constraints: dryness (300-400mm), organic matter <2%, sandy > 70%, gypsiferous, loss of biodiversity.

What is your main purpose in the context of the MIDAS project?

Establish new innovative farming systems for marginal areas. The aim is to get the maximum yield from these areas by establishing techniques to improve them.

Which are your products in the MIDAS context?	We are mainly the supplier of guayule biomass to the University of Castilla-La Mancha. Guayule, a specialised crop native to arid regions, has great potential to produce latex, rubber, and resin. One of the objectives of MIDAS is to demonstrate its value, with the partner University of Castilla-La Mancha (UCLM) focusing on the extraction of resin and rubber from guayule biomass.
What is your vision in the MIDAS context?	Optimise selected climate-resilient and biodiversity-friendly industrial crops and farming systems capable of tolerating water scarcity and mitigating desertification, while enhancing biodiversity conservation. In addition, the aim is to create new products from these industrial crops.
What are your current resources?	ITAP, in line with the important activity it has been developing in technology transfer and dissemination of knowledge and technological advances, acting as a bridge between the scientific world and daily agri-food activity, is carrying out one of the real studies contemplated by MIDAS. Specifically, with the industrial cultivation of guayule (<i>Parthenium argentatum</i> Gray) in an agricultural plot considered marginal located in Fuentidueña de Tajo (Madrid). The objective is to adapt and optimise different agronomic practices in guayule to increase the efficiency in the use of inputs. Productivity will be evaluated, as well as its impact on the environment where it is planted. We have two experimental trials, one on intercropping between guayule and other annual industrial crops in rotation and the other on a prototype (tool) of a Water Sub-Retention System (SWR), developed in the MediOpuntia project (ERANETMED) by the Italian organisation CREA.
What are your needs?	We have the need to contract an external service specialised in the cultivation of guayule (<i>Parthenium argentatum</i> Gray) to carry out the agronomic maintenance of all the trials committed within the European project MIDAS.
What are your main strengths?	The guayule plant has a long development. Not only in terms of agriculture, but also in other fields such as chemistry and biomedicine. There are currently numerous experimental plantations in the towns of Zarza de Tajo (Cuenca), Villarubia de Santiago (Toledo) and Santa Cruz de la Zarza (Toledo). All of them are part of a research project shared by our Provincial Technical Agronomic Institute of Albacete (ITAP) with the University of Castilla-La Mancha (UCLM) and the Finland company Nokian Tyres.
What are your main weaknesses?	As it is a crop that is being implemented in Spain, it is not yet included in the CAP, which means that farmers in the trial area are not yet encouraged to introduce it on their plots, as they would lose the subsidy.
What are the main opportunities that you could capitalize on?	The generation of a new industry in Spain with the aim of boosting the agricultural and industrial economy of guayule through its cultivation, exploitation, and commercialisation. Its focus is on transforming this plant into essential raw materials for various sectors, with the aim of achieving profitable sustainability.
Which are the main barriers/ difficulties/threats you are facing?	Mainly to the adaptation of the crop to the soil based on the weather conditions. Last year we had a bad adaptation of the guayule crop to the soil, so we had to postpone the planting of the crop.
Which current financing options are available to farmers at local and national levels (both public and private)?	They have the common CAP subsidies together with some advantages for being young farmers coming from the State. They also sell their products to private companies.

What is the role of national legislation and national/regional/local government?

Strengthen and legitimise the strategic role played by local authorities in the development of the respective national levels in order to improve policy impact in this area.

Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?

Recreational value and erosion mitigation.

Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?

Only biomass procurement.

2.9 NOVAMONT in Italy



Sowing safflower
30/10/2023



Cardoon re-growing and
Safflower germination
30/10/2023



Cardoon and
Safflower
24/01/2024



Figure 11: View of the intercropping field case studies in Italy by Novamont.

Case Study short description

The case study to be implemented by Novamont is the intercropping between annual oil crops (safflower and castor bean) and perennial oil crop (cardoon) on marginal land (Figure 11). Moreover, a trial with only castor bean will be implemented to study the performance of this crop on marginal land and for the production of agro-feedstock for the biorefinery (seeds/oil).

What is your main purpose in the context of the MIDAS project?

The main purposes are the study of sustainable and diversified agricultural strategies for marginal land through the implementation of new cropping system (intercropping) and, at the same time, the valorization of agro-feedstocks for the production of added value bio-products (mulch film, biolubricant, bioherbicide, biostimulants).

Which are your products in the MIDAS context?

In the MIDAS project the products that Novamont will develop from the oil seeds are biodegradable mulch film, biolubricants, bioherbicide and biostimulants.

What is your vision in the MIDAS context?

The Novamont's vision in the context of MIDAS project is to optimize the cultivation of low-input oil crops on marginal land through the adoption of sustainable agricultural practices and new cropping systems with the aim to mitigate desertification and soil erosion, while improving biodiversity conservation.

	In addition, Novamont will develop innovative bio-based products following the bioeconomy concept through the circular use of biomass to valorize in the bio-refineries.
<i>What are your current resources?</i>	Novamont will use the company resources in terms of knowledge and infrastructures to achieve the project goals. More company departments are involved in the project activities, starting from research and development dept. Through proprietary technology for the oxidative cleavage the oils will be converted by Novamont into monomers that will be used for the production of biodegradable mulch films to test in the WP2. Moreover novel biodegradable in soil bio herbicides formulations based on bio-based pelargonic acid derived from the vegetable oils and essential oils will be formulated. The biolubricants based on vegetable oils will be formulated in a specific demonstration plant. The agricultural biostimulants will be developed at propriety pilot plant starting from proteolysis of oil cake. Thanks to the collaboration between NOVAMONT and Coldiretti (biggest Italian Farmer Association) it will be possible to disseminate the MIDAS ambitions and goals among stakeholders.
<i>What are your needs?</i>	In the context of MIDAS project and on agronomical point of view, Novamont needs regard the optimization of cultivation protocols for each targeted crop. For cardoon and safflower particular attention will be dedicated to the management of pests (weeds, disease, and insects). Regarding castor bean cultivation, the focus will be on the optimization of the agricultural operations and their mechanization (sowing, harvest).
<i>What are your main strengths?</i>	Novamont is a European leader on bioplastic, biopolymer and bio herbicide production with a strong network with local farmers and primary producers thanks to the collaboration with Coldiretti aimed at disseminating the cultivation of low-input and dry resistant oil crops on marginal lands and promote an innovative and sustainable agricultural model, compatible with local areas and resources. Novamont has vast experience in EU projects for the cultivation of low inputs oil crops on marginal land valorization by means of a biorefinery.
<i>What are your main weaknesses?</i>	In the context of the MIDAS project, the main weakness is the limited information concerning the cultivation of castor beans on Italian marginal lands. Novamont will carry out the castor bean cultivation trials to optimize the cultivation protocol.
<i>What are the main opportunities that you could capitalize on?</i>	In the context of MIDAS project, the main opportunities are to validate new agricultural cropping system (intercropping) that can be implemented by farmers to valorize the Italian marginal lands and develop innovative bio-based products following bio refinery concept starting from valorization of agro-feedstock.
<i>Which are the main barriers/ difficulties/threats you are facing?</i>	One of the main challenges we're encountering relates to the adoption of these types of crops, relatively new to farmers. Addressing this requires a multifaceted approach, including enhanced technical dissemination and training for operators, as well as making these crops economically more appealing. It involves understanding how these crops fit within farmers' existing crop systems to provide benefits and integrate into rotations effectively. Additionally, establishing industrial supply chains that secure product purchases from companies or end-users could be beneficial, thereby organizing the market to facilitate farmer

	decision-making. Furthermore, increased support from the Common Agricultural Policy (CAP) for crops that contribute to the bioeconomy would be invaluable, especially for those newly adopted or recently introduced.
<i>Which current financing options are available to farmers at local and national levels (both public and private)?</i>	The main financing programs at national and regional level are the "Piani di Sviluppo Rurale" (PSR) with the aim to support the development of rural areas and the agricultural system (financing by FEASR). At local level there are also the "Gruppi di azione locale" (GAL) that is a 'bottom up' approach, in which farmers, rural businesses, local organisations, public authorities and individuals from different sectors come together to form local action groups.
<i>What is the role of national legislation and national/regional/local government?</i>	The role of national legislation is to implement EU objectives (Common Agricultural Policy - CAP) through specific funding (PSR) differentiated according to the needs of individual region and their territory characteristics and agricultural supply chains.
<i>Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?</i>	Starting from the expertise developed by NOVAMONT in previous projects (FIRST2RUN) the cultivation of cardoon can be implemented on marginal lands (including dry land, or lands at risk of abandonment or marginalization). The cultivation of cardoon represents an interesting option for farmers to valorise marginal land and contribute to increase soil organic carbon stock (SCOC). Moreover, the biophysical properties of the cardoon root improve the biophysical properties of the soil. Indeed, the cardoon root has high tensile strength, which in combination with the high root density contributes to soil reinforcement. The cardoon characteristics can provide the natural mitigation of soil erosion.
<i>Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?</i>	The Novamont's solutions for agriculture, deriving from biorefineries integrated in the local area, help to solve specific problems linked to a wide range of products' end of life. From reducing the possibility to have residues in the soils at the end of use with fully biodegradable in soil bioplastics (such as mulch films, clips, pheromone dispensers), to minimising the risks associated with the dispersion of products within the ecosystem (biolubricants) and reducing the use of some high environmental impact molecules (bioherbicides). Revenues can stem from the sale of seeds and other valuable parts of oilseed crops. These crops can be cultivated in marginal areas, otherwise underutilized, and in a circular economy perspective, they can also provide the additional benefit of bioproduct availability. These bioproducts can help optimize and reduce the impacts of agricultural practices, also opening opportunities for revenues from carbon farming.

2.10 SOLTUB from Hungary

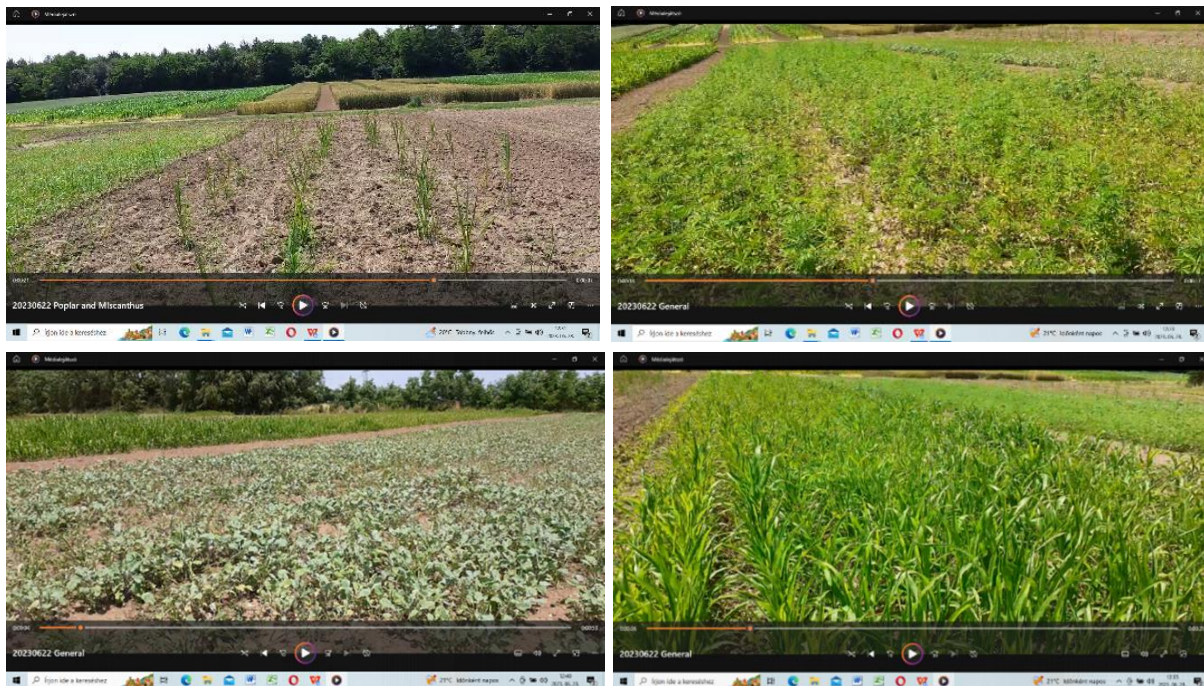


Figure 12: View of the field case studies in Hungary.

Case Study short description

SOLTUB Ltd. perform the case study in cooperation with the MATE Gödöllő sub-contracted partners on a plot of 0.5 ha (Figure 12). The plot arrangement is in 4 blocks (25x50 m= 1250 m²). The blocks have 1 m field margin. In the blocks are established the plots (10 m x 25= 250 m²) Each crop has 1000 m² for harvesting. In 2023 as annual crops were cultivated hemp (2 varieties as Tiborszálási and Kompolti), sorghum (2 varieties as GK Balázs and GK Erik), carinata (Capuccino variety) and perennial crops as Miscanthus spp. and poplar. As the carinata crop was not successful in 2023 (not flowering) it is replaced by *Carthamus tinctorius* (safflower). In the year 2024 in the hemp culture will be sow Tiborszálási and Futura 83 variety. The sorghum varieties are the same for 2024.

During the vegetation period the following observation are performed: planting and sowing date, emerging date and %, diseases and insect damages (species, data, %), maturity date, growth intensity (in 2-week intervals), max. high (date), daily average temperature, monthly precipitation and during the vegetation. As harvesting date and sampling for hemp, *B. carinata* and sorghum the density, green mass, seed mass, humidity, and for *Miscanthus* spp. and poplar the density, green mass and humidity (from year 2024)

Marginality factors: water and wind erosion, high clay content 15-20%, compaction, slope 5-10%, low fertility< 1% OM

What is your main purpose in the context of the MIDAS project?

Performing the planned activities in the MIDAS DoV

Which are your products in the MIDAS context?

Annual crop: yearly biomass and seed production from sorghum, carinata and hemp crops (year 2023). For the year 2024 sorghum, hemp and safflower. Perennial crops: yearly biomass from *Miscanthus* spp. and poplar from year 2024.

What is your vision in the MIDAS context?

Performing the planned activities in the MIDAS DoV

<i>What are your current resources?</i>	Financial support from the MIDAS project, cooperation support from the sub-contracted MATE Gödöllő, personal support from SOLTUB Ltd.
<i>What are your needs?</i>	Performing the HU case studies (field crops and agroforestry) during the 4-year duration of the MIDAS project as described in the DoV. Cooperation with the subcontracted MATE partner.
<i>What are your main strengths?</i>	Strengths annual crops: land availability (Note: in HU the estimated marginal land area is 500 (700). 000 ha.), species (varieties) availability, farming income diversification, CAP support on biomass production, CAP support on agri-environmental protection e.g., erosion (wind and water) protection, water protection, biodiversity protection, also national legislations for soil, water, biodiversity, air protection Strengths perennial crops: idem with the field crops with specific aspects to short rotation crops
<i>What are your main weaknesses?</i>	Weaknesses annual crops: uncertainty (how to measure) the environmental impact of the CAP measures on short and long term for marginal crops, availability of national studies in the matrix of species, soil and climate conditions, species, industrial utilization, economic viability, extending the benefits of cultivating the marginal lands e.g. carbon storage and sequestration potential of different species, defining the most suitable species for cultivation, land use change from arable to marginal land, Weaknesses perennial crops: idem with the field crops with specific aspects to short rotation crops
<i>What are the main opportunities that you could capitalize on?</i>	Opportunities annual crops: available technologies and research results enhance the area of marginal lands, changing the biomass utilization from cultivated lands to production from marginal lands, extending the advantages provided by marginal lands e.g. biodiversity protection of species, water protection, carbon storage, nutrient management, climate change, interlinking the advantages of organic production technologies with the marginal land production technologies, improving the policies related to marginal lands, introducing in the practice of the new research results, improving the training and advisory services, biomass value chain analysis, LCA, crop diversification, land use change from marginal to arable, grassland or/and pasture, improve resilience and adaptation of farming systems, Opportunities perennial crops: idem with the field crops with specific aspects to short rotation crops.
<i>Which are the main barriers/ difficulties/threats you are facing?</i>	Barriers annual crops: contradiction in the cultivation of food crops and non-food crops (bio-mass), lack of national land/soil maps on marginal land, lack of national research results on specific marginal land with specific crops and specific industrial utilization, lack of monitoring systems, lack of the connections between the processing industry and biomass production from marginal lands, lack of technologies, lack of interest (knowledge) from farmers, lack of interest from the processing industry, non-adequate policies, Barriers perennial crops: idem with the field crops with specific aspects to short rotation crops
<i>Which current financing options are available to farmers at local and national levels (both public and private)?</i>	Barriers annual crops: contradiction in the cultivation of food crops and non-food crops (biomass), lack of national land/soil maps on marginal land, lack of national research results on specific marginal land with specific crops and specific industrial utilization, lack of monitoring systems, lack of the connections between the processing industry and biomass production from marginal lands,

What is the role of national legislation and national/regional/local government?

lack of technologies, lack of interest (knowledge) from farmers, lack of interest from the processing industry, non-adequate policies,
Barriers perennial crops: idem with the field crops with specific aspects to short rotation crops

The HU financing options available to farmers are according to the CAP regulation 2021/2115 EC formulated and conform to the EU Green Deal, Farm to fork and Biodiversity strategies including the LULUF 2018/841 EC regulation. Under direct payment HU farmers are eligible in the agri-environmental schemes for basic income support (BISS) from 125 €/ha to 169 €/ha, as complementary relative income support from 55 €/ha to 103 €/ha (CRISS). For participating in the eco-schemes as climate protection and agri-environmental activities the eligibility is from 60 €/ha to 105 €/ha. Young farmers are eligible for complementary income support from 78 €/ha to 236 €/ha. Note: the low limit off support is for farmers from 10-150 ha.

Under rural development support HU farmers are eligible as: agri-environmental protection schemes (RD 19 G01 AEC 70) at arable land to 338 €/ha, at grassland 282 €/ha, eroded land 380 €/ha, water protection area 342 €/ha, dried land 342 €/ha. In the LULUF (RD22 G05 LCP70) from 2025 the HU farmers are eligible for biodiversity protection 820 €/ha, establishing soil protection grasslands 820 €/ha, land protection forest strips 1373 €/ha, land protection forest 708 €/ha, pasture/hayfield with trees 225 €/ha, water protection puffer strips 911 €/ha.

Under investments HU farmers are eligible at non-productive agro-ecologic investments (RD 21 G04 LCI73) in protecting biodiversity 938 €/ha, annual crops for biodiversity protection in plantations 375 €/ha, erosion protection by grassland strips on arable lands 898 €/ha, erosion protection by grassland strips in plantations 335 €/ha, erosion protection by bush strips on arable lands 1223 €/ha, soil protection by grassland 898 €/ha,

Investments in the agro forestry sector: land protection by forest strips 11400 €/ha, land protection by forest 4800 €/ha, establishing grassland/hayfield with trees 2850 €/ha. Industrial forest investment (RD 38 FO5 AFI73) is 4160 €/ha.

The investments for the biomass economy (RD52 BIC77) are 218.472 € (year 2024) and 218.472 € (year 2025).

Annual crops: the national regulation is conformed EU directive as the CAP 2021/2115 where local governments are involved by their participation in the rural development activities e.g., the realization of the biomass-based economy RD52 BIC 77 (COOP77) and the rural development program e.g. land use change RD22 G05 LCP 70 having the role of biodiversity protection. In the presentation of the farmers subsidy system, we refer to the available national agricultural strategy for 2023-2027 final version <https://kormany.hu/dokumentumtar/magyarorszag-kap-strategiai-terve-2023-2027>.

Other relevant national plans and strategies:

National Energy Strategy to 2030: extending the renewable energy utilisation <https://2010-2014.kormany.hu/download/4/f8/70000/Nemzeti%20Energiastrat%C3%A9gia%202030%20teljes%20v%C3%A1ltozat.pdf>

National Energy and Climate Plan: extending the renewable energy utilisation and efficiency

<https://cdn.kormany.hu/uploads/document/5/54/54b/54b7fc0579a1a285f81d183931bfaa7e4588b80e.pdf>

National Climate Change Strategy <https://mkogy.jogtar.hu/jogszabaly?docid=A18H0023.OGY>

National Clean Development Strategy 2020-2050

	https://cdn.kormany.hu/uploads/document/5/54/54e/54e01bf45e08607b21906196f75d836de9d6cc47.pdf to achieve carbon neutrality to 2050 Action plan for soil protection https://portal.nebih.gov.hu/documents/10182/1237425/Talajvedelmi+Cselekvesi+terv.pdf AM order 59/2008. (IV. 29.) FVM protecting the water sources from nitrate pollution https://net.jogtar.hu/jogszabaly?docid=a0800059.fvm National Air pollution reduction programme https://xn--krnyezetvdelem-jkb3r.hu/levegotisztasag-vedelem-orszagos-levegoterheles-csokkentesi-program National Landscape Strategy https://kormany.hu/agrarminiszterium/termeszetvedelem National Nature Protection Plan https://kormany.hu/agrarminiszterium/termeszetvedelem National Biodiversity Strategy https://kormany.hu/hirek/elfogadtak-a-3-nemzeti-biodiverzitas-strategiat Perennial crops (agroforestry): the National Forest Strategy (2016-2030) https://eionet.kormany.hu/download/c/c9/a1000/Nemzeti_Erdostrategia.pdf establish the priority of forests in carbon sequestration in priority 4.3. increasing the renewable energy utilisation share in agriculture 4.3.1. improving the renewable energy sources having in focus the environmental concerns e.g. energy crops, and 4.3.2. improving biomass production for renewable energy e.g. energy crops.
<i>Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?</i>	Annual crops: in its inherent part all kind of land including marginal lands have a multi-functionality character having a complex interaction, circularity between soil, air, light, water and man. In general, economic returns are on the first place of ranging the value of a land but in case of marginal land more important are the provided ecosystem services. Beyond those mentioned other are for importance as the carbon storage and carbon sequestration capacity, water retention capacity, climate change mitigation, wind protection, crop rotation, recreation, soil nutrient management e.g. by incorporating the plant residues, an/or by providing input sources to bio-refineries as biogas and composting plants which provide organic fertilizers for marginal lands (circularity). Perennial crops (agroforestry): most suitable is the combination between the forestry plants, herbaceous plants and animal husbandry. Beyond those ecosystem services mentioned above other are for importance as the carbon storage and carbon sequestration capacity, water retention capacity, climate change mitigation, wind protection, soil nutrient management. Other benefits: protecting and providing microclimatic environment, reducing wind erosion (deflation), providing wild life corridors between smaller marginal lands, reduction the pesticide load of the area (cleaning effect), the increase of landscape diversity, providing habitat for protected wild life, increasing the number of species in the given habitat.
<i>Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?</i>	Annual crops: crops diversification can bring revenues Perennial crops (agroforestry): marginal lands can be used for low-intensity livestock farming, also for fruit production crating surplus revenues to farmers. Other: farmer revenue diversification, the revenues per hectare are larger compared with the area cultivated only with forestry plants. National normative subsidy are available e.g. if the forest plants are lower than 100 pc/ ha, and if

the number of fruit crops is below 99 pc/ha direct payment can be used. Furthermore, other funding sources are available as greening. It is estimated that the revenues in agroforestry are 1:0,6 compared to forestry, and 1:0,8 compared to agricultural crops.

2.11 UHOH in Germany

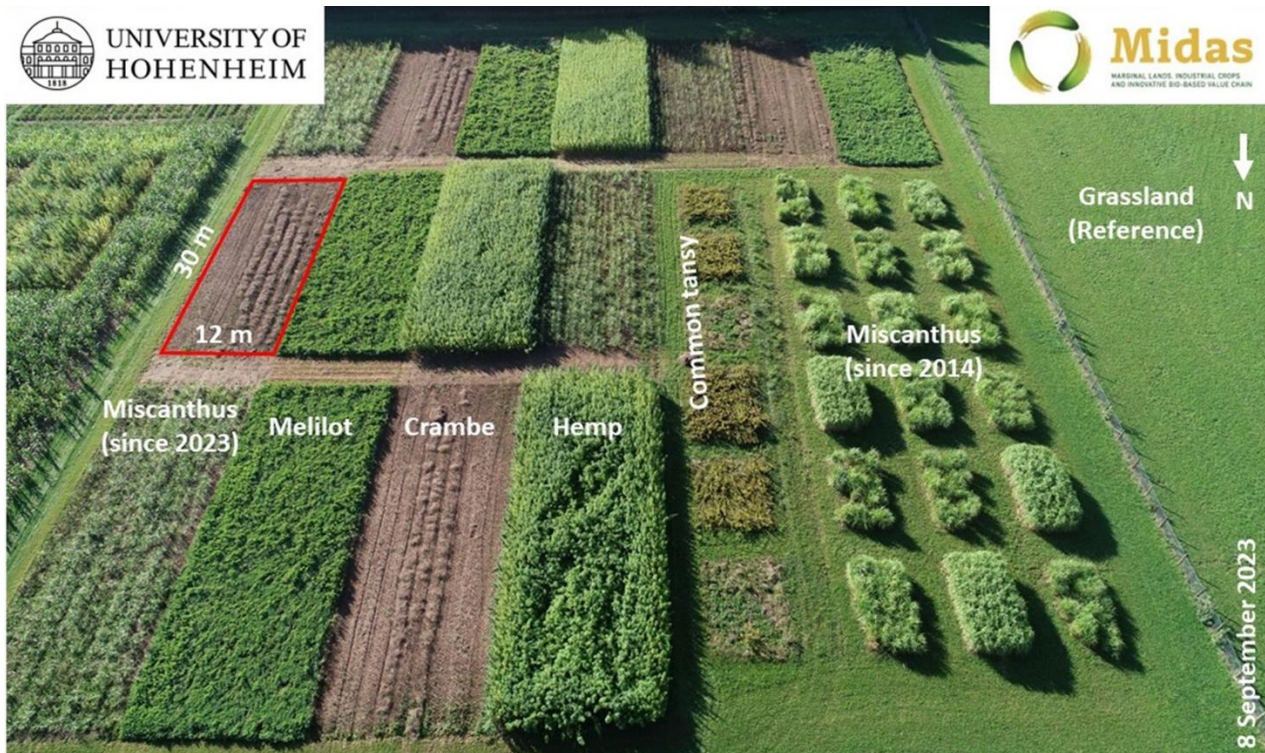


Figure 13: View of the intercropping field case study in Germany

Case Study short description

UHOH – Strip-intercropping (Figure 13) of perennial, biennial and annual non-edible crops, with the biennial and annual crops grown in a four year-crop rotation.

What is your main purpose in the context of the MIDAS project?

Demonstrate cultivation and multifunctionality of the non-edible crops to various stakeholders, i.e. farmers, companies, scientists etc. Gather more evidence from the large-scale field trials both to derive conclusions for the various stakeholders, and to provide data for other WPs in the MIDAS project.

Which are your products in the MIDAS context?

Fiber (hemp), oil (crambe), lignocellulose (melilot and miscanthus) for various purposes (biobased products and/or bioenergy).

What is your vision in the MIDAS context?

Information and discussion with stakeholders via Regional Advisory Group (RAG) in the region about the possibilities of bio-based value webs based on the biomass types of the MIDAS strip-intercropping system. In the long-term, to find out more about the true opportunities for a social-ecologically more sustainable bioeconomy in the region of the Swabian Alb.

What are your current resources?

Large-scale field trial with a net area of about 0.5 ha. Miscanthus established in 2023. Melilot in 2nd year. First results on yield potential of hemp and crambe available.

<i>What are your needs?</i>	Timely and detailed information from other WPs about whether someone needs data from our field trial so that we can collect and provide the data appropriately. For a basic biodiversity assessment (not promised in the GA, but it would be better to have some data on biodiversity, too), we need advice how to measure what and when (and how often).
<i>What are your main strengths?</i>	A well-developed, large-scale field trial and a well-positioned RAG with representatives from agriculture, industry, science and public institutions.
<i>What are your main weaknesses?</i>	One weakness is our power of persuasion in dealing with the very low (reluctant) willingness of local farmers to try something new. Further, we do not know yet how to assess the biodiversity-friendliness of our strip-intercropping approach.
<i>What are the main opportunities that you could capitalize on?</i>	The MIDAS crops are growing very well so far, so that a high biomass yield and biomass quality level could be expected. Further, the flowers of melilot, hemp and crambe are attracting numerous pollinator species which indicates that the MIDAS strip-intercropping system is biodiversity friendly.
<i>Which are the main barriers/ difficulties/threats you are facing?</i>	Large areas of marginal land in the region are covered with permanent grassland so that their use for the MIDAS approach is subject to strict conditions (no plowing, compensation areas must be provided, etc.). This could also deter many farmers in the region.
<i>Which current financing options are available to farmers at local and national levels (both public and private)?</i>	For a strip-intercropping approach of miscanthus and wild plant mixtures, 260 €/ha and year can be funded (public). But there is no funding option for the MIDAS approach yet. Depending on the willingness of the rural communities, up to 500 €/ha could be granted to farmers (private funding).
<i>What is the role of national legislation and national/regional/local government?</i>	Define the funding basis and, after implementing suitable funding measures for the MIDAS approach, monitor compliance with the associated conditions (e.g. do not harvest before 15.7., proof of purchase of suitable seed, etc.).
<i>Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?</i>	Pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation, groundwater protection, climate regulation, air quality regulation, genetic resources.
<i>Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?</i>	Yes, the benefits for the environment (habitat functioning, erosion mitigation etc.) and the society (recreational value etc.) could be monetized likewise to the perennial wild plant mixture cultivation carried out in Southwest Germany since more than a decade. Depending on the willingness of the rural communities, up to 500 €/ha could be granted (private funding) for the farmers.

2.12 UNIBO in Italy



Figure 14: View of the intercropping field case studies in Italy by UNIBO.

Case Study short description

UNIBO case study is located in a marginal site in Ozzano dell'Emilia (Bologna) (Figure 14). The soil is characterized by slope of about 10-12% and poor chemical composition of the soil, which consists for more than 60% of sand. The trial is a strip intercropping with three annuals, safflower, hemp and crambe, and one perennial, miscanthus.

What is your main purpose in the context of the MIDAS project?

To assess the feasibility of strip intercropping in such marginal conditions, aiming at testing the achievable yield of the selected crops. Additionally, in collaboration with WUR the impact of the adoption of strip intercropping on insect biodiversity will be also assessed.

Which are your products in the MIDAS context?

The main products will be: seeds from which to derive oil and cake (crambe and safflower), and lignocellulosic biomass (hemp & miscanthus).

What is your vision in the MIDAS context?

The MIDAS aims to address major challenges in promoting sustainable biomass production in marginal areas. The adoption of strip intercropping will promote feedstock differentiation and reduce the risk of complete failure for farmers which are occurring quite often in such marginal conditions.

What are your current resources?

Farm-scale equipment available at the experimental farm, organic fertilizers, and propagation materials (seeds/rhizomes).

What are your needs?

Irrigation system available in case of need, particularly for the establishment of the perennial crop. Weed management strategy able to control weeds in slowly growing species such as miscanthus.

What are your main strengths?

The knowledge gained in the previous MAGIC project in establishing and harvesting industrial annual crops in such marginal conditions

What are your main weaknesses?

Lack of knowledge on the optimal establishment technique for perennial crops in such marginal conditions.

What are the main opportunities that you could capitalize on?	Several key opportunities could be capitalized such as: enhancement of marginal areas, meeting the growing demand for biomass for the biobased industry, income diversification for farmers, improvement of the ecosystem services, research and innovation (including crop selection, mapping of new marginal lands, and development of proper agronomic strategies).
Which are the main barriers/ difficulties/threats you are facing?	The successful establishment particularly of miscanthus in such conditions results very challenging, also in relation to the lack of irrigation system. Furthermore, the farm is managed under organic farming and there is not the possibility to use herbicides to control weed which are the main problems so far.
Which current financing options are available to farmers at local and national levels (both public and private)?	There are not specific financing options for Italian farmers operating in such conditions.
What is the role of national legislation and national/regional/local government?	None so far available.
Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?	Erosion control, improvement of pollinator habitat, promotion of local biodiversity, creation of habitats for animals.
Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?	No

2.13 UNICT in Italy



Figure 15: View of the intercropping field case studies in Italy by UNICT

Case Study short description	The case study on which the University of Catania (Italy) is working consists of intercropping perennial (cardoon)/annual (safflower, castor and hemp) herbaceous crops (Figure 15). The trial is in Sicily located at 320 m a.s.l. The margin-
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	ality constraints of the field site are: slope>15%, organic matter <1%, precipitation/potential evapotranspiration <0.5, and low soil water availability during spring- summer seasons.
What is your main purpose in the context of the MIDAS project?	The main purpose is to provide evidence of the application of innovative cropping systems in marginal lands.
Which are your products in the MIDAS context?	The products that we are aiming to produce are seeds and oil from the cultivated crops. At the same time, we aim to use the biomass.
What is your vision in the MIDAS context?	Considering that we are working on a site where it is impossible to have water for irrigation and with very low rainfall rates especially during spring-summer seasons we think that the species sown in spring (hemp and castor) could face a severe drought and, as a consequence, could have low establishment rates and low chance of surviving. Cardoon and safflower, instead, have more probability of giving good results because during the winter season have the time to develop a deep root system and cope better with drought and heat.
What are your current resources?	The current resources came from MIDAS funding.
What are your needs?	The main need is to find the seed of these crops which are not common in the market.
What are your main strengths?	The possibility of sowing annual herbaceous crops such as castor, hemp and safflower in rotation with wheat, which is one of the most common crops produced in the center of Sicily. These crops could also prevent the soil erosion typical of these cultivation areas.
What are your main weaknesses?	To date, there is no real market for the products obtained in the intercropping system.
What are the main opportunities that you could capitalize on?	These crops are not well known yet, but motivated young farmers could bring these innovative systems to their farms.
Which are the main barriers/ difficulties/threats you are facing?	Poor knowledge among the farmers and lack of machinery for the agronomic operations for the entire growth cycle.
Which current financing options are available to farmers at local and national levels (both public and private)?	Subsidies for farmers come from the Common Agricultural Policy at the national level and from the Rural Development program at the regional level. According to the "conditionality", farmers should respect some rules the conditionality in order to receive income support from the first pillar of the Common Agricultural Policy (CAP). Within the case studies' frame, an applicable good agricultural and environmental condition (GAEC) could be the GAEC-7 which is about the crop rotation in arable land to preserve soil organic matter content.
What is the role of national legislation and national/regional/local government?	The role of national/regional and local legislation is crucial to the sustaining of this new possibilities of cultivation. The legislation, based on the supporting of sustainability, should help to create the necessary chains for the marketing of this new products.

Which ecosystem services besides biomass provisioning (e.g., pollinator support, habitat functioning, recreational value, air regulation, erosion mitigation) do you serve?

Pollinator support
Erosion mitigation
Enhancement of biodiversity

Could any of the above ecosystem services (besides biomass provisioning) potentially provide revenues?

Yes, in the future.



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The consortium

