

Stakeholder analysis and map for all demo cases

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¹ PU = Public

P = Restricted to other programme participants (including the Commission Services)

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MarginUp! in a nutshell

MarginUp! is developing sustainable and circular value chains to produce bioproducts and biofuels in innovative business models from natural raw materials grown on marginal lands. In the project, climate resilient and biodiversity-friendly non-food crops will be introduced on marginal and low-productivity lands, not competing with food crop production. To further improve biodiversity and environmental benefits, MarginUp! will contribute on understanding which marginal lands are suitable, with regards to the lowest impact for indirect land-use change (ILUC) biomass production. The project will identify good practices for sustainable biomass production and bio-based products that safeguard biodiversity and local ecosystems. All this will be done in close collaboration with land managers, farmers and SHs from the growing bioeconomy industry.

Hence, MarginUp! is expected to provide viable outcomes to ecosystems degraded by e.g. water-stress or desertification due to human activity and/or climate change. The project will also contribute to restoration and stimulation of ecosystems in abandoned mine lands, as well as boosting land yield and health in low productivity marginal lands. Through this innovative approach, MarginUp! will increase farming system resilience, enhance rural areas, and promote stakeholder participation.

MarginUp! is building on learnings from seven use-cases: Five implementations across Europe (Spain, Greece, Sweden, Germany and Hungary), and two use-cases in Argentina and South Africa, together increasing the replication potential of the project's results. Each use-case considers the current use and properties of its area and proposes crops and crop rotation strategies that promote biodiversity and increase soil productivity according to local requirements of Mediterranean soils in Spain, mining lands in Greece, boreal soils in Sweden, wetlands in Germany, lands exposed to desertification in Hungary, degraded pastures in Argentina, and areas with invasive bush species encroachment in South Africa. The proposed crops create a sustainable supply of resources to foster the development of the bioeconomy businesses at local and regional levels while providing ecosystem benefits and building resilience to climate change.

On this basis, the MarginUp! project will enhance European industrial sustainability, competitiveness, and resource independence, by reducing the environmental footprint, considering biodiversity aspects, enabling climate neutrality and increasing resource efficiency (particularly through upcycling and cascading use of biomass) along different value chains in seven use-cases including enhanced technologies and business models for innovative bio-based products that will lessen EU reliance on fossil-based products.

To stay up to date with MarginUp! project events and reports, follow us on Twitter ([@MarginUp_EU](https://twitter.com/MarginUp_EU)), LinkedIn ([MarginUp! EU](https://www.linkedin.com/company/marginup-eu/)) or visit www.margin-up.eu.

Summary

MarginUp! as a project pursues a collaborative and inclusive stakeholder engagement. This contributes to an active participation of important SHs until the end of the project. Beyond this it empowers SHs and builds capacities for successful replication. To enhance collaboration and inclusion, this report (D 5.1) presents in-depth *mappings and analyses* of the different *use-cases*¹ based on an explorative, iterative and at the same time systematic data gathering.

The methodology part describes how the data was gathered and revised, presents the *stakeholder lists* that were generated for every use-case and that provide the basis for a *semi-quantitative analysis* of the use-case *stakeholder landscapes*. This part also explains the representation used in the mappings. After that, the results are presented in separate chapters for every use-case. Each portrays the *processes and products along the value chain*, presents certain *action and decision moments* that have been identified and gives a visual overview of the *stakeholders along the value chain*. For the European use-cases, a semi-quantitative stakeholder analysis based on the MarginUp! stakeholder lists sheds light on specific interesting aspects of the stakeholder landscape. The complete stakeholder lists for each use-case and more detailed descriptions for the European use-cases are to be found in the annex of this report.

The comprehensiveness, detail and scrutiny of mappings and analyses enable well-directed future *stakeholder engagement* and provide a knowledge base and guidance for other work packages. This, in turn, will enable collaborative design of value chains and co-assessment of project results within the broader European and global bioeconomy transition.

¹ Differing from the title of this report, in the rest of the text the seven “MarginUp! demo cases” are named “use-cases” as this term is used widely between MarginUp! partners.

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List of Acronyms

ALFA WOOD	ALFA WOOD Group
BZN	Bay Zoltán Nonprofit Ltd. for Applied Research
CEICH	Chacra Experimental Integrada de Chascomús
CICYTEX	Center for Scientific and Technological Research in Extremadura
CluBE	Cluster of Bioeconomy and Environment of Western Macedonia
COPAL	Sociedad Cooperativa del Alagón
CSO	Civil society organisation
CTAEX	National Agri-Food Technology Centre
DEI	Public Power Corporation S.A.
EEXP	Ernsts Express AB
EU	European Union
HS	Hushållningssällskapet
KUJÁNI	Kujáni Production and Advisory Ltd.
MODULAR SYSTEM	Modular System Global S.L.
NÉBIH	National Food Chain Safety Office
NGO	Non-governmental organization
PILZE	Pilze-Nagy Ltd.
SH	Stakeholder
SMS	spent mushroom substrate
UC	use-case
UCL	use-case leader
WP	Work package

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Keywords list

Stakeholder analysis

Stakeholder mapping

Stakeholder list

Stakeholder engagement

Online collaboration tools

Value chain

Entrepreneurial ecosystem

Scale-up

1. Introduction

MarginUp! deliverable (D5.1) presents the outcomes of task 5.1 (from first to 9th project month), which aimed to comprehensively map and analyse the stakeholders (SHs) involved in each of the seven use-cases (UCs) within the project. The core objective guiding our efforts was to answer the following question: “Which are the relevant stakeholders to be engaged at appropriate levels and steps of the processes along the entire value chain and within the supporting entrepreneurial ecosystem to ensure a socially, ecologically and economically sustainable progression of the existing UC value chain and to envision a potentially successful upscaling of these activities?”

To address this central question, we embarked on a comprehensive process of SH identification (along a broad definition, see chapter 2.1), characterization (regarding their capacities in the UCs) and mapping of SH interactions and relationships as well as their roles and responsibilities along the value chain. This multi-layered information was continuously refined through feedback loops in co-operation with the use-case leaders (UCLs) and enriched with information from identified *key stakeholders*². Ultimately the whole setup of each UC was analysed and is presented in the following chapters. Our methodical approach maintains consistency across all UCs, facilitating meaningful comparisons.

The knowledge and insights gained as well as the relations captured and visualized (expounded upon in chapter 3) will serve as foundation for deliverable 5.2, the Action plan for multi-actor engagement in demo cases (M12 by inter 3). It will also be used to inviting actors for establishing a *Board of Actors* (BA) in each UC and to a lesser degree for inviting members of an *Actors Advisory Group* (AAG) for the whole project. Especially the choice and involvement of key SHs already contributed to networking and engagement and sets a path to be continued. Effective continuation of these efforts throughout the project's duration will facilitate further multi-actor engagement and networking. This, in turn, will enable collaborative design of value chains and co-assessment of project results within the broader European and global bioeconomy transition.

It is important to recognise that the process of establishing new value chains is highly dynamic and not always fully predictable. The value chains of the MarginUp! UCs are particularly innovative and experimental and thus constantly evolving. Thus, the results depict the current state of affairs that might still change in parts during the lifetime of the project. Having said that, however, the results are very much up-to-date due to the active engagement of UCLs and key SHs. And due to the collaborative online format of the mappings and the comprehensive and standardized SH list, this information can be easily taken up by the UCs and other work packages (WPs) and updated.

² “key stakeholders” were defined here as “every stakeholder, whose (non-) actions are crucial for a successful project”, for more information see chapter 2.1.2

2. Methodology

2.1. Data gathering

This section outlines the methodological steps undertaken to identify and analyse the SHs. This forms a basis for the development and update of a stakeholders' engagement plan that incentivizes the co-design of the value chains and the co-assessment of the results and outcomes of the project. Overall, these activities should ensure the engagement of all necessary actors and the empowerment of SHs for an effective exploitation and replication of the project results (task 5.2).

Accordingly, the relevant SHs must be engaged at the appropriate level and step of the processes along the entire value chain and in the surrounding and supporting entrepreneurial ecosystem to ensure a socially, ecologically and economically sustainable progression of the existing UC value chain and to envision a potentially successful future upscaling of these activities. For this, information about two different aspects had to be gathered for the relevant SHs: "Who are the stakeholders?" and "What are their stakes?". This data gathering followed the same steps for each UC.

2.1.1. Preliminary assessment

A preliminary, heuristic assessment identified processes, products and actors along the value chain, based on information available in the project agreement, with very few additions based on web-searches. For this purpose, "actor" was defined as "everybody, every institution and every group that incorporates the agency to change the course of action of the value chain". The actors found were mapped with their different (non) roles in the development of the bio-based value chains in a quick visual compilation of the SH landscape. They were also related to the different main steps (segments) of the respective value chain of each UC. These temporal and functional value chain segments were defined after consultation with WP6 (value chain analysis) as follows: *biomass provision, pre-treatment, processing, industrial application of biomass, market, regulations and policies, representation of interests, value chain management and development*.

2.1.2. Feedback loops with use-case leaders and interactive mapping

The resulting mapping was presented to the UCLs during extended and interactive online video sessions, to gain a first feedback and additional information. WP5 applied a collaborative online tool (MIRO board) that allowed for engaged discussions via its interactive graphic interface and for a dynamic hybrid collaboration. Together, processes and products were verified, and actors assessed. "Every actor that has substantial stakes in the value

chain” was defined as a *stakeholder* and kept in the mapping, other actors were excluded. Missing SHs or missing relations, processes or products were added, wrong positioning along the value chain was corrected, faulty relations and unfitting actors were deleted. The mapping was adapted according to the new information, uncertain aspects and open questions were gathered and clarified by the UCLs via email or directly in the interactive online mappings.

2.1.3. Stakeholder lists

A stakeholder list was set up (in consultation with WP1 and other partners) with input from task 1.1, from the mappings and from the feedback loops and further filled out by the UCLs for each UC. Besides the name, a short description and a short narrative on the SH’s relationship to the use case, the lists capture various categories for every SH:

- value chain segment,
- type of actor,
- (economic) sector of the SH’s main activities,
- products that are part of the UC value chain,
- market role,
- demonstrated implementation,
- resources,
- technological innovation system (TIS) functions,
- attitude towards the UC,
- main scale of operations,
- website,
- replication potential,
- number of employees (for internal use the physical location, addresses and contact data were included, but not published).

For most categories a set of attributes was pre-defined in drop-down menus, some allowed for open text. The content of the list is based on manifold sources, but in many cases the information relies on the UC leaders’ and the authors knowledge. This approach was chosen because not all SHs are in close contact with the UCLs, a data collection involving all SHs would have exceeded the scope of the deliverable, not all information is publicly available and last but not least because the UCLs feature an informed knowledge of the UC region and most of the SHs. The lists were finally checked by the UCLs in various feedback rounds. The SH lists (one for each UC) provide the basis for a semi-quantitative analysis of the UC stakeholder landscapes (see chapters 3.1.3, 3.2.3, 3.3.3 and 3.4.3), but also provide an informational basis for the work of other WPs, e.g. WP1 (location and names), WP4 (economic categories), WP7 (replication potential).

2.1.4. Key stakeholder designation and interviews

In a next step, “every stakeholder, whose (non-) actions are crucial for a successful project” was designated as *key stakeholder* in collaboration with the UC leaders. From this group, around 6 SHs from each UC were chosen to be interviewed. This choice was also affected by attempt to reach an even distribution of interview-partners along as many different segments of the value chain and to cover as many different market roles as possible. Each of these key SHs was subsequently interviewed by the UC leaders to tap its knowledge, using a semi-structured questionnaire designed and provided by WP5 (a list of all key SHs and the template of the questionnaire can be found in the annex 7.3). The UCLs translated the questionnaires (if necessary) and the answers. These interviews provided ample, rich information and multiple perspectives on the UCs and their value chains. In addition, the key SHs were asked to verify or correct their information in the SH list and in the mapping. In most cases, the WP5 leader had another video session to clarify questions that arose from the interviews.

2.1.5. Refinement and contextualization

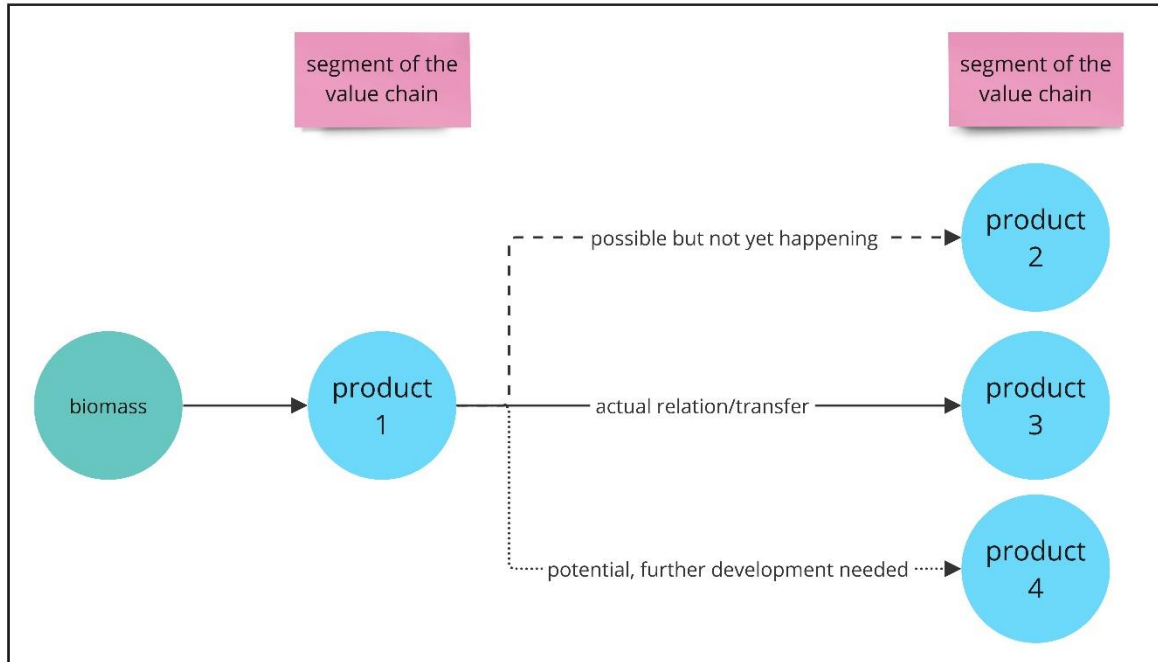
Finally, all the information received was used to refine the SH lists and the mappings, but also to contextualize the analyses of the SH lists. At the end, several action and decision moments were identified for each UC (see definition in chapter 2.2). Besides the findings presented in this deliverable, the interviews also contain valuable information about opportunities and barriers, alternative value chains, and on information and knowledge exchanges between the key SHs, that will be used and assessed by other tasks (T5.2) and WPs (e.g. WP1, 6).

All use-cases have provided sufficient information for analysis, from which valuable insights can be derived depending on the stage of development of each UC. As expected, the information based on the international use cases is of a preliminary nature, as the use cases are still at a conceptual stage of value chain development. This is reflected in the slimmer mappings and analyses for Argentina and South Africa. In the UC in Germany, a special situation arose due to the relatively new development of the upstream parts of the value chains and the changing constellation of actors in the downstream part of the value chain. For this reason, the analysis of this use case still needs to be completed in the coming months of the project, once the process of designing the value chains has been completed and the cooperation structures have stabilized. The consistent methodical approach across UCs allows and will allow for a certain comparison, even though this is limited by the very diverse nature of the value chains and rather big economic, political and cultural differences between the UC regions.

WP5 has identified mechanisms that unfold between research community and bio-based industry and has enquired on the information- and knowledge-exchange between the key SHs. The information received through the interviews made it clear however, that it was premature to assess these topics at such an early stage of the project. Many SHs are barely involved in the processes yet, especially at the later segments of the value chains. For example, up to the end of the data gathering no UC had harvested any biomass to be processed or applied in production. WP5 will continue to gather information on these topics, interpret the data once available and ensure that the results are taken up and reproduced elsewhere in the project results.

2.2. Guidance for the visual mappings

products along the value chain



stakeholders along the value chain

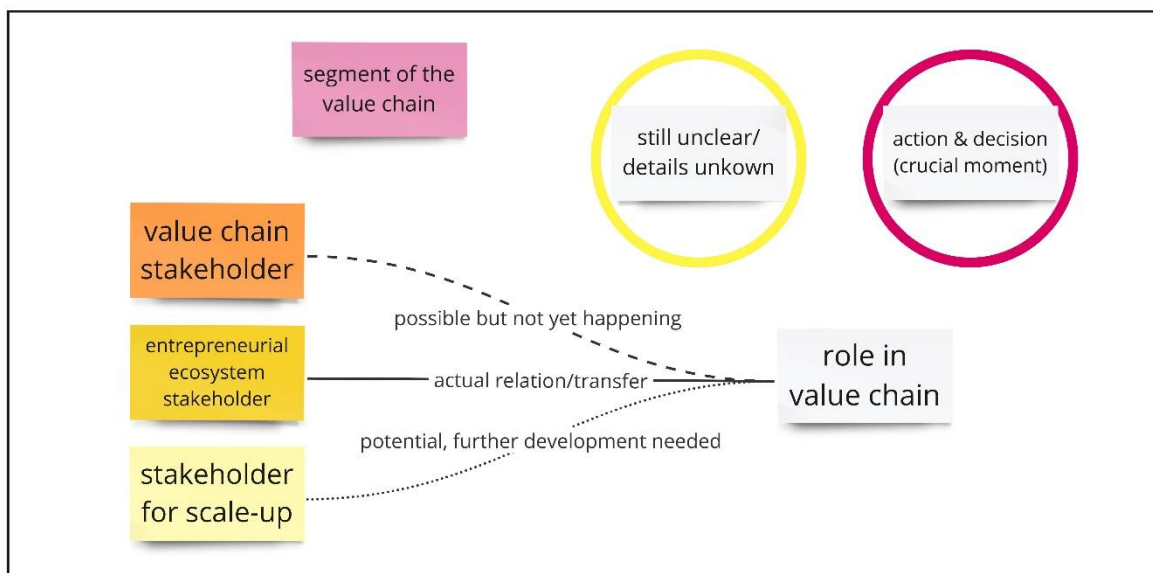


Figure 1: Explanation of mapping elements

Figure 1 shows the elements of the two different visual mappings presented for each UC in the following chapters: The *mapping of products and processes along the value chain* gives a comprehensible visualization of the value chains of each UC. For comprehensibility and clarity, only the most important physical, technical, commercial relations and intermediate products are shown. The *mapping of the stakeholders along the value chain* arranges the use-cases' SHs according to their roles and responsibilities in the value chain. A single SH can show up in several segments, if it fulfils more than one role. For comprehensibility and clarity, some SHs of minor importance for the UC that are in the lists (see annex 7.2) are not presented in the mappings. For analytical reasons, SHs are separated into three groups, mapped in different colours:

- first, SHs that are directly involved in the value chain(s), from the provision of biomass until the selling of the products on the market (in orange);
- second, SHs that belong to the wider entrepreneurial ecosystem of the value chain(s) (in yellow) and
- third, SHs that would or could be important for a future scale-up of the value chain(s) (in straw yellow).

Each SH-element is connected to another (grey) element that explains its relationship (finance, influence, knowledge, material) to the UC, its role and responsibility in the value chain. In both mappings, different qualities of relationships are illustrated with different lines, see figure 1 above. In the mapping of the stakeholders, numbered purple circles highlight so called *action and decision moments*. These indicate constellations or situations that need to be influenced and changed in certain ways to ensure a favourable development of the envisaged value chain or a successful and sustainable scale-up. These moments are described subchapters of each UC description.

2.3. Semi-quantitative stakeholder analysis based on the stakeholder list

The data obtained in the SH lists underwent a semi-quantitative analysis. The main results for each UC are presented in the respective chapters. For this analysis, categories with definite, pre-defined attributes were edited as graphs (some with the input of one single categories, some combine up to three) and then assessed. This assessment is crucial, as the size of the samples (~30-50 entries), often qualitative nature of the attributes and the complexity of the UCs compared to the narrowness of the tables called for contextualization and triangulation with the mappings, the interviews and the comprehensive understanding acquired during the data collection. For that reason, each graph is accompanied by a small contextualization and interpretation. The graphs do not depict the general composition and properties of all actors involved in value chains around the crops and products that are at the centre of the respective UCs, but rather the composition and properties of the actors that are SHs in the MarginUp! use-case around these value-chains. They therefore do not attempt to represent landscapes of all possible actors, but landscapes of SHs that are already connected to the UCs in different ways or that are known to the UCLs or the key SHs and deemed important or interesting for a future scale-up.

3. Stakeholder mappings and analyses

In the following chapters, all the use-cases are presented along the same structure:

1. the processes and products along the value chain are described shortly in writing, followed by a visual overview,
2. the *Action and Decision Moments* that have been identified are presented in writing, followed by a visual overview of the stakeholder landscape along the value chain. Both visualizations together form the stakeholder mapping. Detailed descriptions of the SHs included in the mapping can be found in the annex (7.1.1, 7.1.2, 7.1.3, 7.1.4),
3. and a stakeholder analysis based on the MarginUp! stakeholder lists (the full lists are in annex 7.2).

3.1. Greek use-case

3.1.1. Processes and products along the value chain (including mapping)

The [region of Western Macedonia](#) is in the process of decarbonization and restoration of former open-pit mines. In this UC, pseudoacacia (*Robinia pseudoacacia*) trees have been planted by [DIADYMA S.A.](#) on a 20 hectares trial site in a former mine that they own. In an intercropping-system, herbs (lavender, maybe chamomile) will be planted between the trees. In addition, walnut and pine might be planted to increase the biodiversity. All these attempts aim at restoring and rehabilitating the land and at making it profitable again.

- Biomass provision
 - wood-based value chain: Even though some woody biomass could be taken from the planted trees in 2 years, they will not be able to grow fast enough to provide sufficient biomass to produce the sample products. Thus, the UC will receive or buy pseudoacacia-biomass from other sources. In a first step, just a small quantity will be asked from the owner of most mine-lands (see [Public Power Corporation S.A. \(DEI\)](#) in annex 7.1.1) to be used in testing. As the [ALFA WOOD Group \(ALFA WOOD\)](#) requires at least 100 tonnes of biomass for its product, more biomass will then be acquired from [DEI](#) or alternatively from areas near but outside the mining area. [The Cluster of Bioeconomy and Environment of Western Macedonia \(CluBE\)](#) as UCL is in touch with private forest owners through two [Forest Agricultural Cooperatives \(DASE\)](#).

- value chains based on blossoms and herbs: While pseudoacacia is already being used on former mine lands in the region to protect the soil, its blossoms can also be used to gain essential oil (a practice which is new to the region). For this purpose, the acacia blossoms will be collected. Regarding the herbs, lavender has a strong value chain in the wider region and will thus be collected and tested in the use case (maybe also chamomile and even other herbs). Blossoms as well as herbs will have to be tested for poisonous substances from the mine soils that could have accumulated in the biomass.
- Pre-treatment
 - wood-based value chain: The felled pseudo-acacias (trunks and bark) are cut, stored and transported first to the [University of Thessaly](#) for test samples and in later stages of the project to [ALFA WOOD](#).
 - value chain based on blossoms and herbs: The herbs will be dried before further processing. A certain share of the herbs might be used without further processing to be sold as tea, if all the tests conducted will show that they can be used in the food chain. [Beekeeping associations](#) already present in the area might use the area as bee forage (acacias and herbs).
- Processing
 - wood-based value chain: after grinding, the wood dust must be dried. The necessary heat is partially provided by branches and other leftovers from cutting (to dry 100 tonnes, additional 100 tonnes are needed for bioenergy). Contrary to the food and cosmetic products from the parallel value chains, there is no need for additional testing for poisonous substances from the mine soils, as the wood will be used for construction panels that do not enter the food chain.
 - value chain based on blossoms and herbs: extracted essential oils and aromatic essences: Around 100kg of acacia blossoms will be used by [Etheleo](#) (and maybe other local distilleries) to produce 500g or less of essential oil. Similarly, aromatic essences will be produced from the herbs.
- Industrial application of biomass
 - wood-based value chain
 - bioenergy: A yet unknown share of the biomass will directly be burned in [ALFA WOOD's](#) own bioenergy plants. While the heat is used for drying in processing, the electrical energy produced is sold to the grid. A part of the ashes goes back to the field as fertilizer (not too much to avoid increased acidity), the rest might potentially be used in concrete production.

- pellets: [ALFA WOOD](#) is a big pellet producer, but they currently do not use pseudoacacia biomass to produce pellets but pine. They will measure the thermal properties and if the final products fulfil EN norms, there is a possibility to sell them on the market. As for now this seems rather improbable. Otherwise, it will be used for internal consumption (see above).
 - fibre-boards: The goal here is to replace pine biomass used until now with pseudoacacia to produce, by adding glue and other additives, fibre-boards for construction purposes. First samples will be produced by the [University of Thessaly](#), later by [ALFA WOOD](#). Differences in colour, strength and other properties might result in the development of a new product.
 - egg packaging: The [University of Thessaly](#) will also study alternative applications of the biomass, for example for egg packaging.
- value chain based on blossoms and herbs
 - The essential oils and extracts will be used by [OKIROI S.A.](#) and maybe other small local companies to produce cosmetics, facial creams, and soaps. It is not clear, if the very small amount of acacia essential oil that can be provided by the test field is enough for more than just a test value chain.
 - residues: The waste of lavender essential oil extraction could be turned into pellets for bioenergy. [ELPIS Pellet Co](#) could run tests and there was a first discussion on the subject. The plans are not yet finally fixed.
- Market
 - ashes: go back to the land as fertilizer, a share might potentially be sold as additive for concrete production to a concrete producer.
 - fibre-boards (and pellets): [ALFA WOOD](#) being the leading producer of wooden fibre-boards in Greece can use its existing marketing and distribution channels for the new varieties made from pseudoacacia.
 - electricity: is sold to [DEI](#) and flows into the national grid using the existing infrastructure.
 - cosmetics, facial creams and soaps: the producers involved in the UC are small (family) businesses and cannot produce high quantities. Appropriate market access seems to be rather challenging for their products.

Figure 2 reveals a mapping of the use-case's products along the different segments of the value chain. For detailed description of the method and a legend please confer chapter 2.2.

Greek use-case – products along the value chain

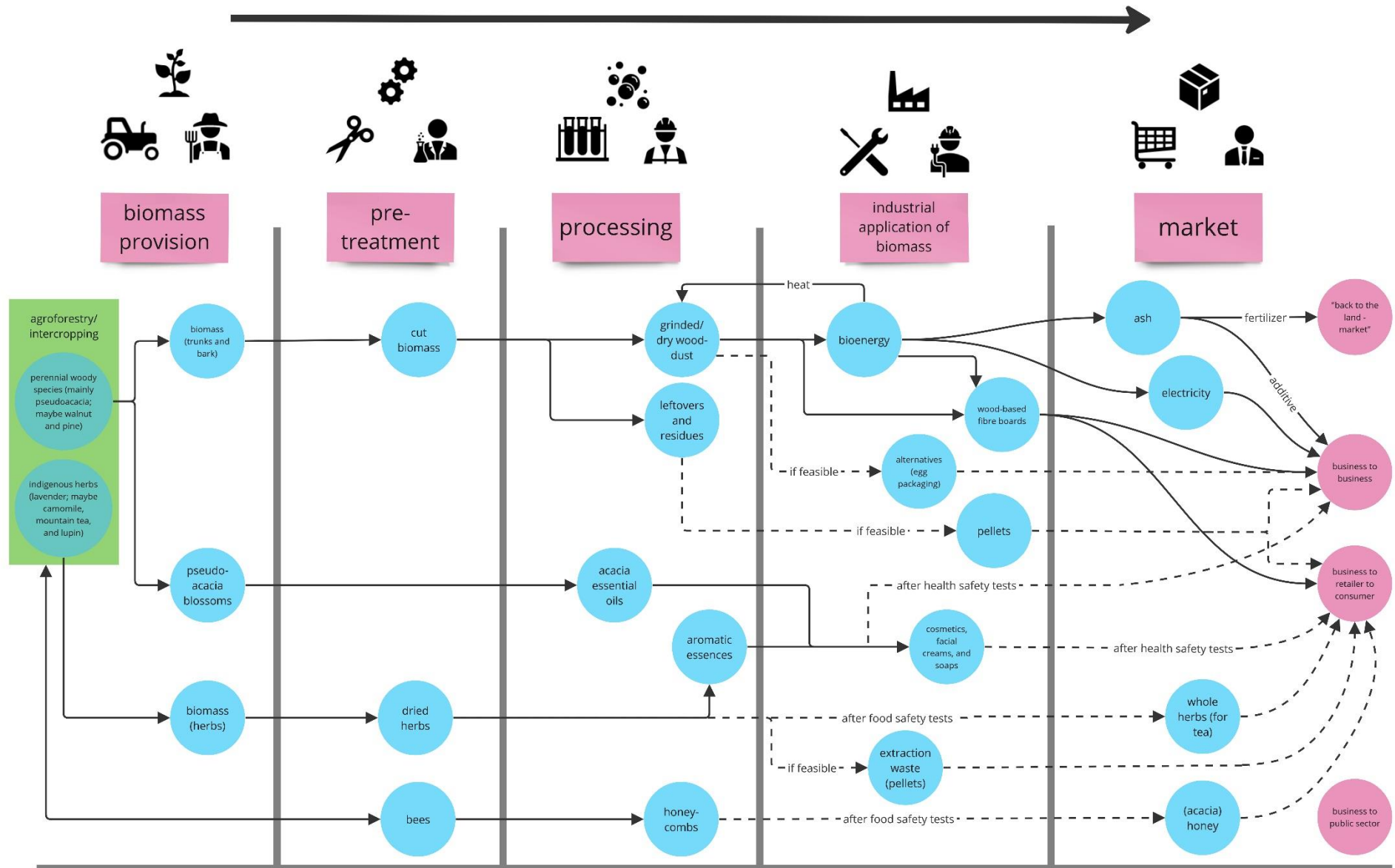


Figure 2: Greek use-case – products along the value chain

3.1.2. Action and decision moments (including mapping)

In the mapping of the SHs along the value chain (see figure 3) we identified several *action and decision moments*, highlighted with purple circles and numbered. These moments flag up constellations or situations that need to be influenced and changed in a certain way to ensure a favourable development of the envisaged value chain or a successful and sustainable scale-up. Below, each such moment in the mapping is presented.

I. Sufficient provision of woody biomass for the use-case

As the trees planted within the project will not be able to grow fast enough to provide sufficient biomass, the UC will receive or buy pseudoacacia biomass from other sources. In a first step, just a small quantity will be asked for from the owner of most mine-lands, to be used in testing. As [ALFA WOOD](#) requires at least 100 tonnes of biomass for its product, more biomass will have to be acquired from [DEI](#) or alternatively from areas near but outside the mining area. The UCL [CluBE](#) is in touch with [DEI](#) and private forest owners through [DASE](#). A formal request to get it for free is filed, but negotiations are ongoing and [DEI](#) has been difficult to reach until now (e.g. no disposition for an interview, slow reaction to biomass-request).

II. Future land-use and ownership of the former mine lands

As for now, it is unclear if biomass provision on former mine lands could be scaled up, as future land-use and land ownership is subject to an ongoing political debate. According to key stakeholder-interviews, these decisions are at least partly taken far away from the region in the capital of Greece, Athens. As coal (lignite) phase-out in Greece is set for 2028, it is clear that huge areas will be available for other uses, in addition to the lands already exploited. But it is not clear yet, to whom these lands will belong in the future and how they will be used. Plans to restitute the lands to adjacent communities and ultimately to local farmers are colliding with plans to construct enormous photovoltaic fields. Apart from the national government in Athens there is a handful of local and regional actors that have stakes in this debate and upcoming changes in land-use legislation: the [regional Government of Western Macedonia](#), [local municipalities](#), [local universities](#), local farmers, but also specialized Greek institutions as the [Geotechnical Chamber of Greece](#). An analysis of the SH network suggests, that the UC has little contact to national politics deciding about the overall framework of the region's future development, but also hints at difficulties to capture the opinions and interests of local farmers as well as of the local civil society, including environmental organizations. This might come mainly from the reportedly not very pronounced level of organization of the two groups. For example, a degree of local opposition against the photovoltaic plans was mentioned in key SH interviews, but no group representing these voices could be identified.

[CluBE](#) is in contact with a handful of local herbs and essential oil producers, some of them also growing their own feedstock. There is an association called [Union of Young Farmers of Kozani](#), but it is not sure if they would be interested in the UC. [CluBE](#) also has some contacts to [WWF Greece](#). Beyond these, there seems to be no farmers'

associations or trade unions that could give access to a bigger number of potential biomass providers, in case there is any land available.

III. Possible contamination of blossoms and herbs and subsequent products

The value chains based on the blossoms and the herbs is subject to reservation. This is due to the fact, that the soil of the former mines can possibly be contaminated. Poisonous substances might accumulate in the plants and be present in the products made from them (honey, cosmetics, etc.). Thus, the products must undergo food and health-safety testing in a laboratory before any possible marketing and/ or up-scaling. As soils on different locations in the former mines might show different occurrence, tests might also be needed in the future. For the UC, the [Greek agricultural organization "DIMITRA"](#) will probably run these laboratory tests, but as for now the results cannot be known beforehand. Lack of information on this factor, or tests that find any contamination are a hindrance for any possible investments in the connected value chains.

IV. Potential investors in the herbs & blossoms value chain

While [ALFA WOOD](#) has enough resources and influence at its disposal to shape a future scale-up of woody biomass production on former mine-lands, the SHs of the herbs & blossoms value chain have no comparable leverage. Several options seem thinkable: first, investments by big Greek cosmetics companies like [Korres S.A.](#) and [Apivita S.A.](#) or their partly international owners; second a stronger cooperation and better alignment of some of the smaller SHs (they reportedly have growing access to the (Greek) market, some of them sell internationally; in the key SH interviews plans for a commonly financed bigger distillery were mentioned); third, investments and credits by local banks, maybe backed by big funding schemes that are active in the region in consequence of European Union's (EU) Climate Politics ([EU Just Transition Platform](#); [Greek Fair Transition Fund](#)). Relations to these funds and their mode of operation is not clear to the authors at this moment and no information about local or regional banks or investors was conveyed.

On figure 3 you can find a mapping of the use-case's stakeholders along the different segments of the value chain. For detailed description of the method and a legend please confer chapter 2.2.

Greek use-case – stakeholders along the value chain

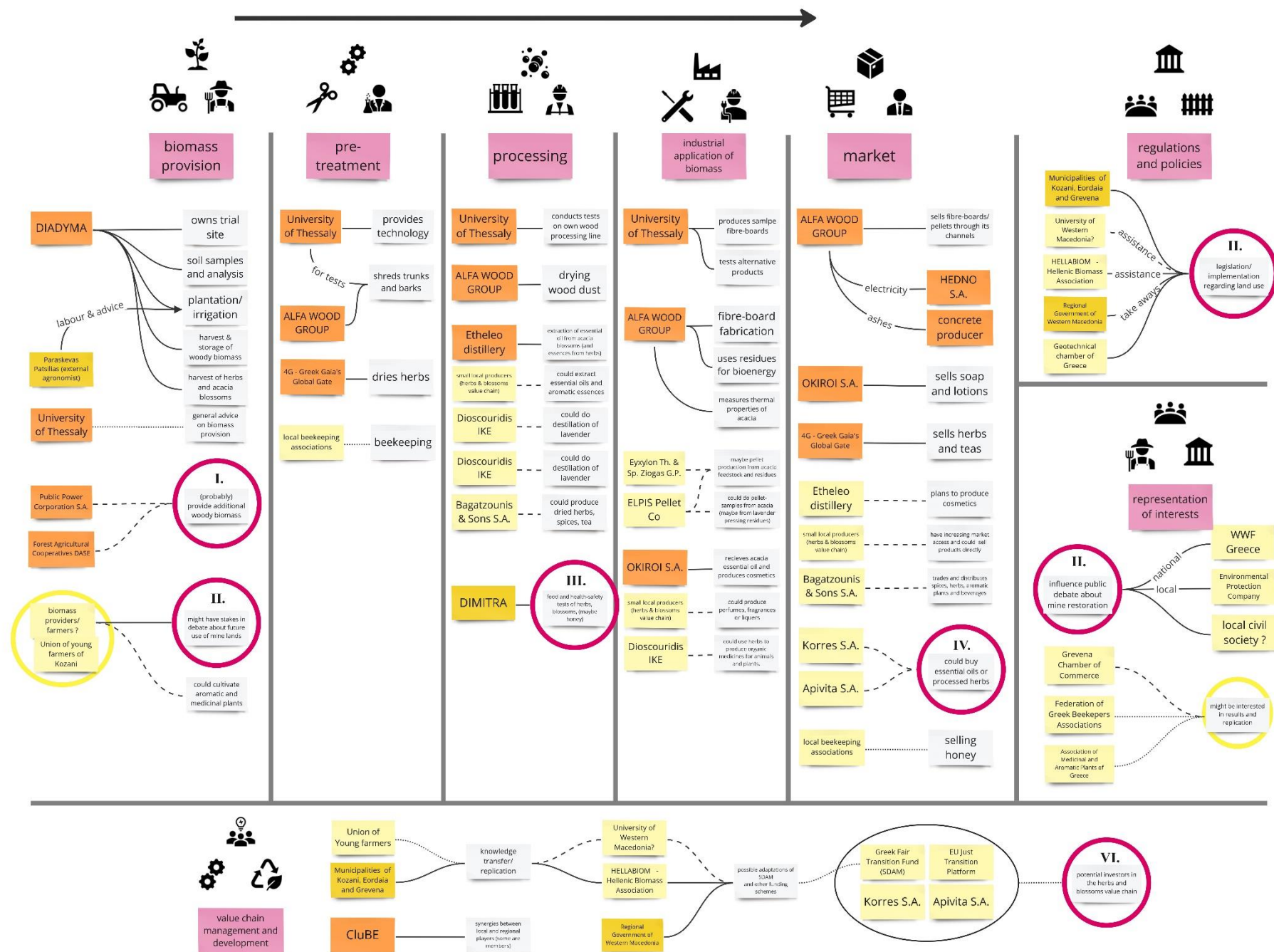


Figure 3: Greek use-case – stakeholders along the value chain

3.1.3. Semi-quantitative stakeholder analysis

3.1.3.1. Economic sector of stakeholders' activities

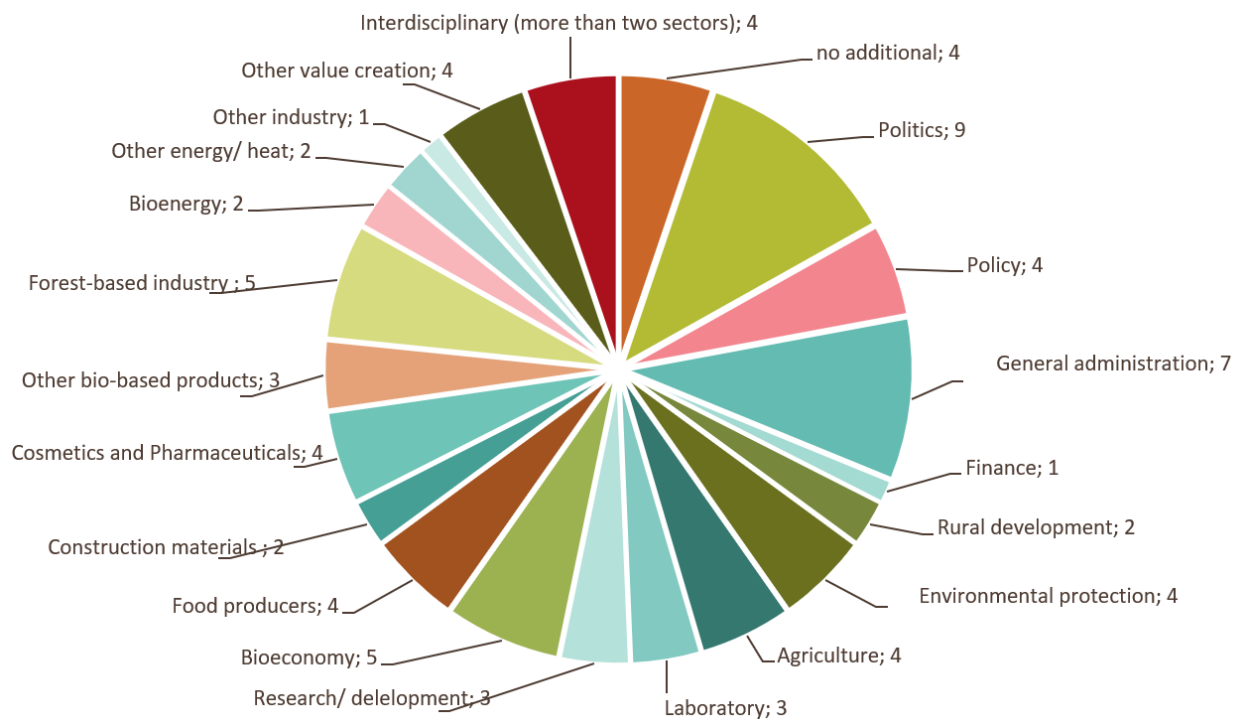


Figure 4: Greek use-case – economic sector of stakeholders

The diversity of the sectors covered by the UC's stakeholders reflects to two very different value chains building one on the woody biomass and the other on blossoms and herbs. This is amplified by the circularity of both value chains. The public sector is well represented, as well as different forms of research and testing. Noticeable is the absence of *Water*, given the presence of big-scale irrigation in the region. The absence of *Transport* and *Machinery Industry* is most probably due to the very small biomass volumes of the UC but might also hint to the few biomass providers/ farmers in general (see figure 7 below).

3.1.3.2. Type of stakeholders

The pie chart in figure 7 shows the different types of actor that the SHs of the Greek UC belong to. Most striking aspects are:

- The high amount of (*small* and *middle*) *entrepreneurs, feedstock users* and *traders*, reflecting the local “ecosystem” of the herbal essence and essential

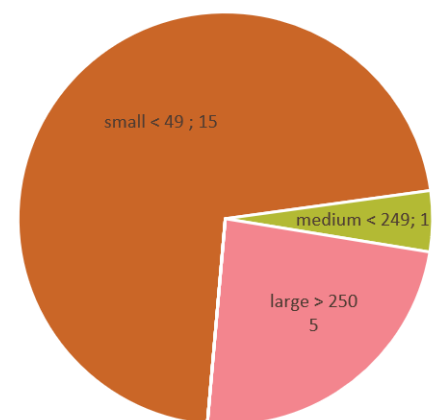


Figure 5: Greek use-case – number of employees of economic stakeholders

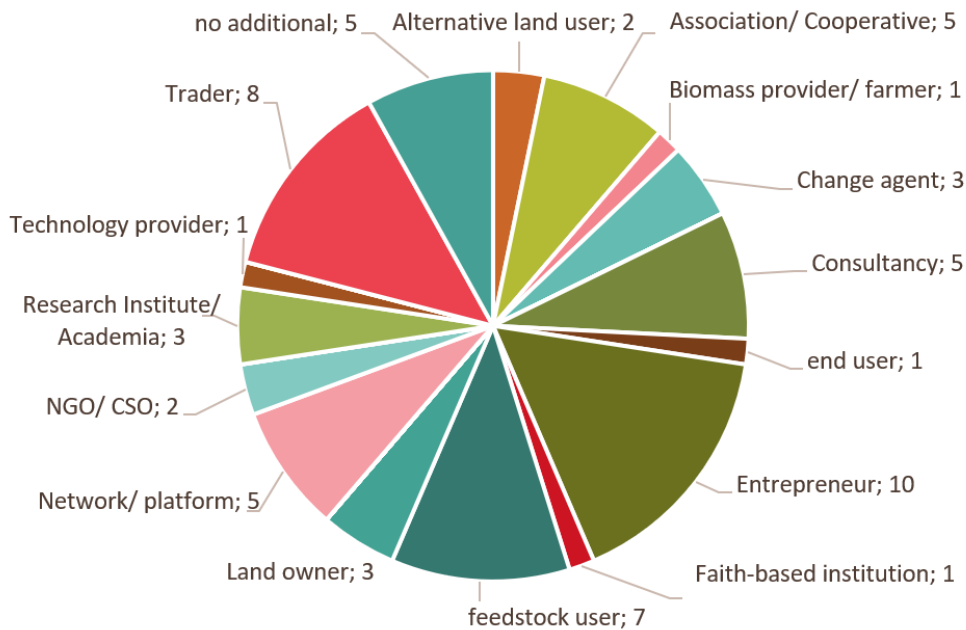


Figure 6: Greek use-case – actor type of stakeholders

oil value chain. This also shows up in the pie chart in figure 5, where small enterprises (less than 49 employees) comprise almost three quarters of the total.

- The very limited number of *biomass* providers (see chapter 3.1.2 for discussion)
- The low number of *non-governmental organizations (NGOs)* and *civil society organizations (CSOs)* listed as SHs (see chapter 3.1.2 for discussion)
- The absence of *market regulators*, given the fact that permissions for the selling of products from former mining lands might be hard to get (see chapter 3.1.2).
- The absence of *trade unions*, highlighting the unclear pathway to access to a bigger number of potential biomass providers, in case there is any land available (see chapter 3.1.2).

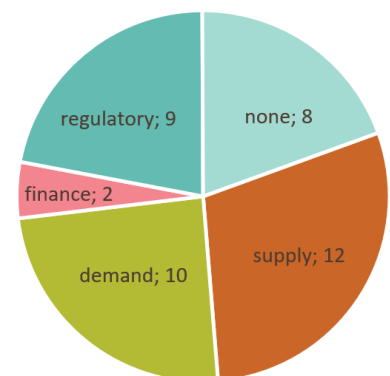


Figure 7: Greek use-case – market role of stakeholders

3.1.3.3. Market role of stakeholders

While all market roles are represented by the SHs of the UC, the only two that are listed as *finance* are a European and a national fund, while other national or regional financing schemes, institutions or banks are not included in the list.

3.1.3.4. Attitude of stakeholders towards the use-case

While 40 % of the SHs are listed as *strongly supportive* and a quarter *supportive*, almost a third has an *unknown* attitude, probably reflecting little or no contact to the UCL. That no SH is listed as *neutral* and only one as *non-supportive* (DEI) is in line with the other UCs, but could indicate to the possibility, that critical actors are not properly pictured.

3.1.3.5. Main scale of operation of stakeholders along the value chain segments

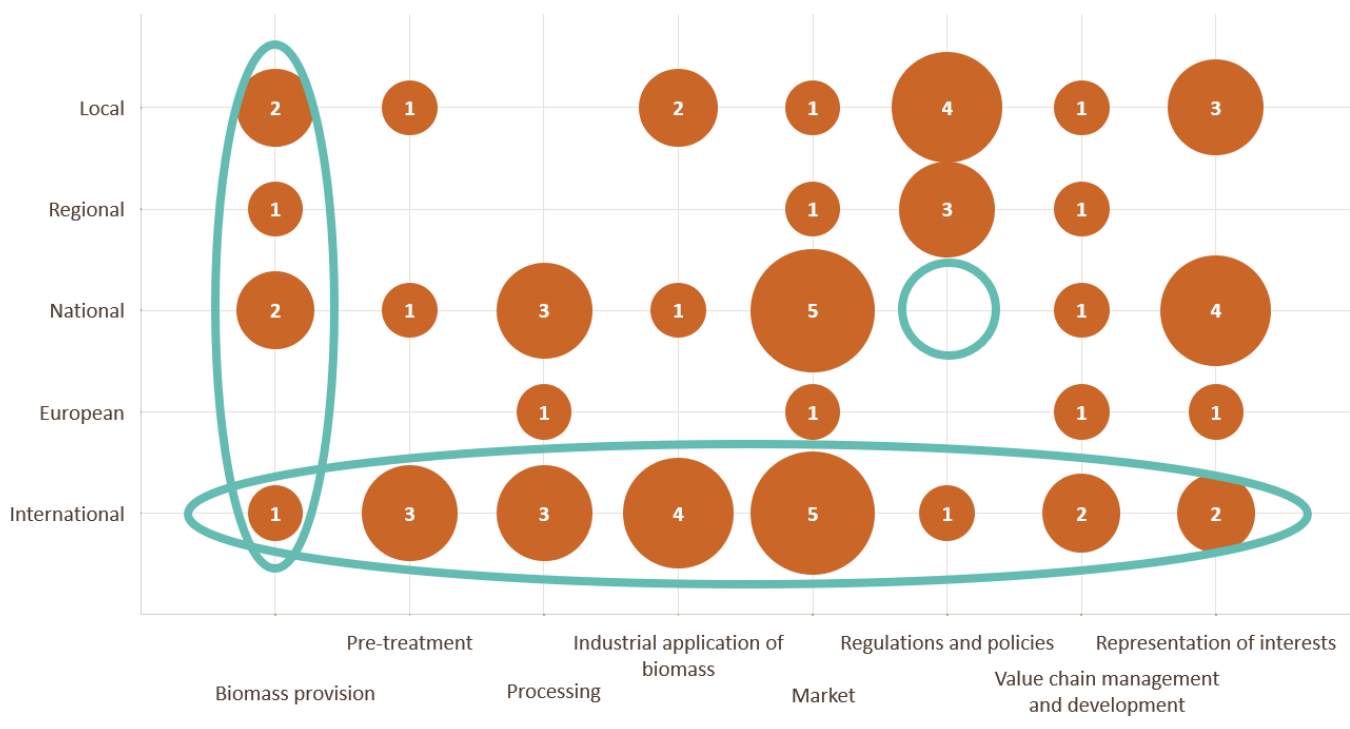


Figure 8: Greek use-case – main scale of operation of stakeholders along the value chain

The graphic in figure 8 shows the main scale of operation (vertical axis) of SHs of the Greek UC (including all entries in the SH list) along the different segments of the value chain (horizontal axis). Most striking are three aspects (green circles from left to right):

First, the rather low number of SHs occupied with *biomass provision*. This reflects the very dominating role of [ALFA WOOD](#) in the value chain of woody biomass, but also the fact that no strictly private entrepreneurs are involved as important SHs in the biomass provision up to now.

Second, the very *international* orientation of the *market* actors. Supposedly this reflects the good (national, European and international) market access of the [ALFA WOOD](#) and of the local “ecosystem” of small-scale producers of cosmetics and similar products, that is very much needed especially for the shopping and luxury goods produced by the latter.

Third, even though the key SH interviews hinted at land-use decisions taken often at *national* level, no actor from the central government is so far connected to the UC, that is however well connected at *local* and *regional* level.

3.1.3.6. Key stakeholders' resources, attitude and involvement in action and decision moments

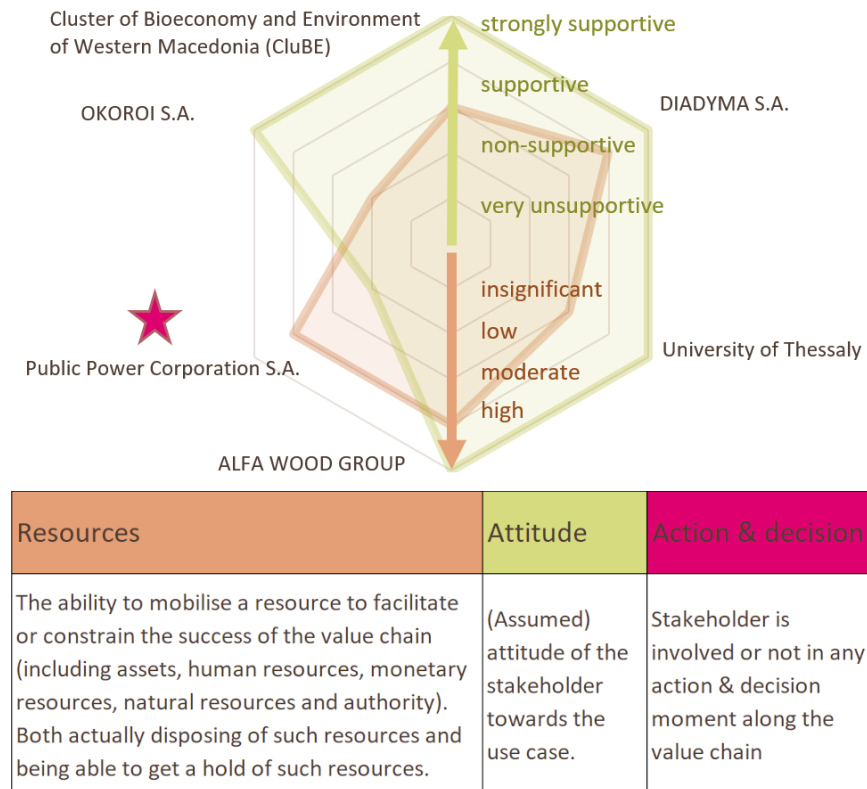


Figure 9: Greek use-case – radar chart showing key SHs' resources, attitude and involvement in critical actions & decisions

As clearly visible on figure 9, the [Public Power Corporation S.A. \(DEI\)](#) has a *high* ability to mobilize resources (the by far biggest provider of electrical energy in Greece) or to constrain the success of the value chain (as owner of most former mining lands). At the same time, it was difficult to reach until now (e.g. no disposition for an interview, slow reaction to biomass-request), but hopefully will be engaged in the near future. It is thus consequent that [DEI](#) is involved in a constellation or situation identified as *action and decision moment* in the mapping (see above in chapter 3.1.2). It is also very visible, that [DEI](#) is the only one of the five SHs that were identified as key SHs by the UCL [CluBE](#) and WP5 leader that is involved in such a moment. This shows that the interviews and subsequent meetings revealed additional barriers and opportunities that had not found their way to the surface of the mapping before. In the future of the project, SHs involved in these moments (like the alternative biomass providers, environmental NGOs and civil society, potential investors or funding opportunities and political actors involved in the land-use debate) will have to be especially targeted by the engagement and replication plans (deliverable 5.2).

3.2. Hungarian use-case

3.2.1. Processes and products along the value chain (including mapping)

- **Biomass provision:** While most arable land in the region is used to grow cereals, sunflower and maize in crop rotation systems, the Hungarian MarginUp! use-case plants *Sida hermaphrodita* (Virginia fanpetals or Virginia mallow) and energy willow *Salix viminalis* (from willow cuttings and *Sida* plantlets) in rows in an agro-forestry system. In between, substrate surplus from mushroom substrate production is deployed to obtain complete soil cover, retaining precipitation on the sandy soil. The [Kujáni Production and Advisory Ltd. \(KUJÁNI\)](#) established a drum irrigation system for the plantations, as even woody and herbaceous plants need this given the extreme meteorological situations on site. Biogas production results a huge volume of digestate as biofertiliser that includes high amount of readily available macro- and micro-nutrients, organic components that is tested on the UC site.
- **Pre-treatment:** *Sida hermaphrodita* and *Salix viminalis* energy willows are harvested and added (to a certain degree, formula is ongoing research) by [Pilze-Nagy Ltd. \(PILZE\)](#) to wheat straw to produce substrate for the production of oyster mushrooms (composting and solid-state fermentation). This mixed-biomass-substrate is a product itself and could be sold to other oyster mushroom producers. For the biogas production the mushroom cultivation serves as a pre-fermentation process.
- **Processing:** Oyster mushrooms are grown on the substrate. The mushroom substrate remaining after the harvesting period (digested biomass with the enclosed mycelia) is called spent mushroom substrate (SMS). After the cultivation and harvesting period, SMS is used for different purposes (see below).
- **Industrial application of biomass:** As of today, two of these usages are being pursued by the use case, one is in trial phase.
 - Oyster mushrooms: most mushrooms are sold fresh (after packaging by [PILZE](#)), but PILZE is continuously working on the development of new products, such as mushroom spread which is already available on the market.
 - Use of SMS:
 - biogas – produced in [PILZE's](#) own plant: together with a certain necessary amount of manure (bought or received from other farms³) biogas is produced. Producing the substrate and the mushroom cultivation serve as a kind of processing of the biomass, that becomes even better to use for biogas production. This biogas is used on site to produce electricity (sold to electricity market players). The heat generated is mostly (during the colder months) used to heat the biogas plant itself, a share of it is used to dry fresh oyster mushrooms. The residues from biogas production accumulate

³ Animal manure is one of the most relevant input materials for biogas generation. Source of origin: Laying hen farms, that continuously produce manure with around 25-30 % of dry matter content that is not considered as a high-quality manure for cropping systems due to the unfavourable structure and consistency.

in huge volumes are particularly used as digestate under certain stipulations. The biogas digestate is a good biofertilizer applied on soils in the neighbourhood ⁴.

- Novel feed additive: SMS with a high level of mycelial biomass has a high level of protein and nutritive ingredients – in cooperation with a major actor in the animal feeding sector as exclusive partner of [PILZE](#), recommendations for new recipes, depending on the characteristics of the substrates, will be developed, tested and analysed.
- MarginUp!-partner [Bay Zoltán Nonprofit Ltd. for Applied Research \(BZN\)](#) will examine the possibility to produce other useful compounds which can be derived from SMS ⁵.

- Market

- oyster mushrooms (fresh and processed): the mushrooms are sold to other businesses, as well as to retailers or consumers, nationally and internationally.
- the mushroom substrate sold to other mushroom growers
- electricity is sold to the market.
- biogas: as the gas is unfiltered, it is currently not sold; but nearby a natural gas entry point is available that provides an opportunity for biomethane injection in the near future. In the moment it is in any way more profitable to produce and sell electricity than gas, but this might change with the economic environment and policy.
- digestate from biogas production: (local farmers)

⁴ According to the present regulation, agricultural biogas digestate can become a certificated organic fertilizer, if it meets requirements for physical-chemical, hygienic microbiological and seed germination test parameters. Using the digestate as fertilizer has a big economic potential, but the application of biogas digestate is regulated by a soil protection plan that includes maximum doses in tones or cubic meters per hectare for a year.

⁵ This product development is at idea level for the time being. SMS includes several useful compounds that are readily available after harvesting the mushrooms. Based on literature data, medicinal substances and enzymes can be isolated from the SMS: The most relevant components are enzymes, enzyme-groups, bioactive compounds and polymers. However, this type of product development is not the subject of the MarginUp! project, it is mentioned only as a possible way in the valorization of SMS. Hungarian partners will examine the possibility of some initial steps in this regard (Technological Readiness Level 3-4 would be considered as the most appropriate level).

Hungarian use-case – products along the value chain

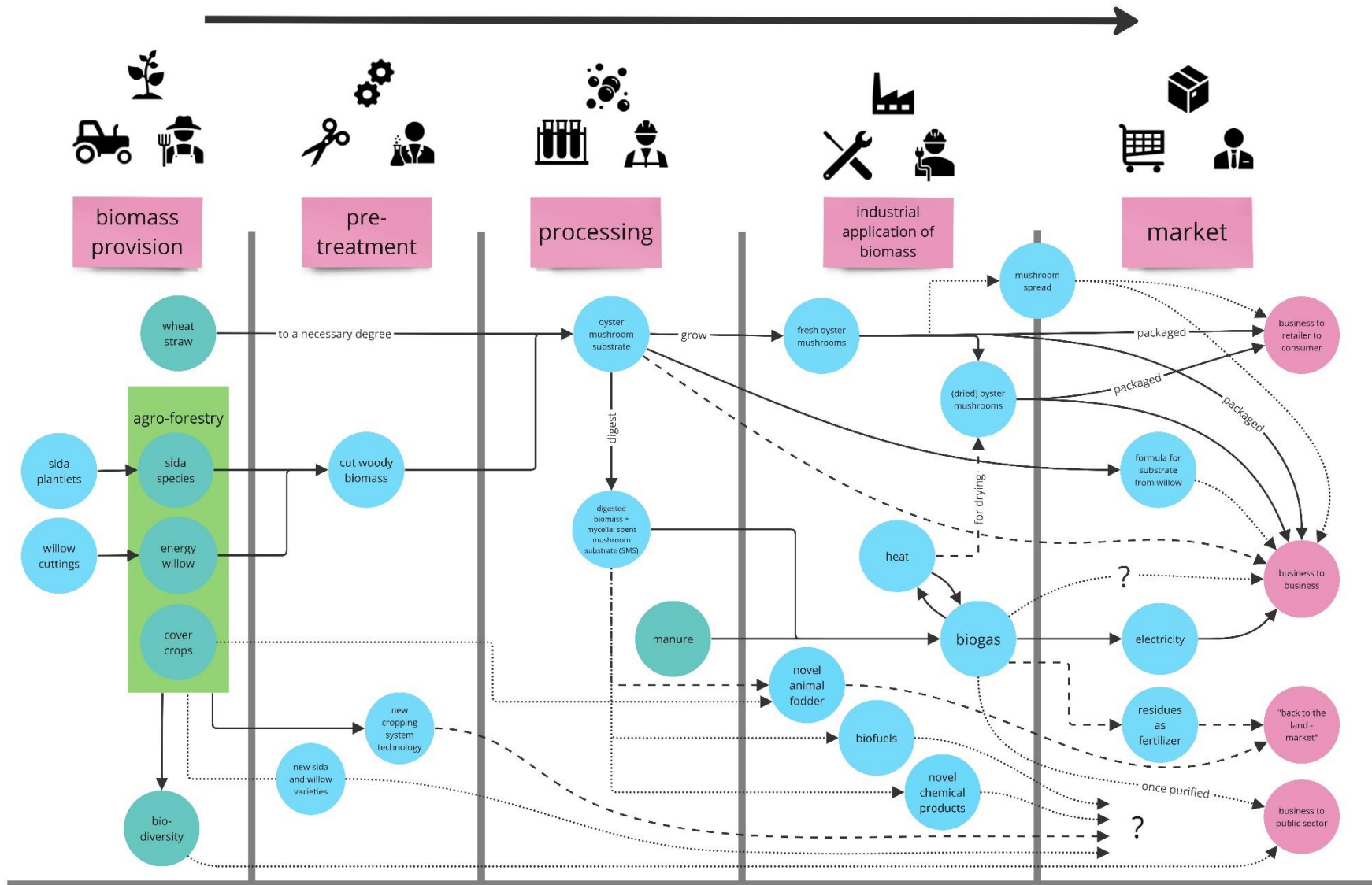


Figure 10: Hungarian use-case – products along the value chain

3.2.2. Action and decision moments (including mapping)

In the mapping of the SHs along the value chain (see figure 11) we identified several action and decision moments, highlighted with purple circles and numbered. These moments flag up constellations or situations that need to be influenced and changed in a certain way to ensure a favourable development of the envisaged value chain or a successful and sustainable scale-up. Below, each such moment in the mapping is presented.

I. Uncertainty around the business model for farmers

From the questionnaires and other sources it became clear, that up to now it is uncertain, if the value chain based on woody and herbaceous biomass would be attractive for a future scale-up. There are several reasons, amongst others:

- Local conditions for the widespread and well-established fruit orchards have harshly deteriorated due to local and global environmental and economic changes. This comes on top of already rather special and difficult soil and climate conditions.
- Manual workforce is expensive (due to concurrence of regional automotive industry, unfavourable age-composition of farmers and agricultural workers, emigration from rural areas)
- High investments are needed to counterbalance the two factors mentioned before, to build up efficient irrigation systems and increase mechanization.
- The value chain as it is currently set up depends very much on the take-up of biomass by [PILZE](#). But the Hungarian biomass market is driven by huge biomass-based power plants and they continuously look for new suppliers. This market situation gives an additional opportunity for potential new biomass growers.
- There is little experience with the innovative arable land management brought forward in the UC (with many aspects of an agroforestry system).
- For the commercialisation of the new biomass it is compulsory to develop the needed storage and logistics technology.

On the other hand, a general agricultural advisory system in place is well working, the machinery level at family farms is very good (e.g. through existing services), local farmers have resources (knowledge and to a certain degree finance), loans are available through Hungarian banks and there seems to be a rising openness for alternatives to current cropping systems. To secure sufficient biomass production for [PILZE](#), unless enough land can be acquired and cultivated and even though [KUJÁNI](#) could scale up production substantially, more farmers need to become interested in the new value chain. For this, a properly and independently elaborated business model analysis including a professional profitability count would be the necessary next step (as mentioned several times in the interviews). This should also include the possible use of *Sida hermaphrodita* and *Salix viminalis* for alternative business models, as SHs report to have limited knowledge about it.

II. Droughts and irrigation systems

After a series of droughts and irregular distribution of rainfall over the past years, it became obvious that even the plantation of woody and herbaceous species needs irrigation systems to provide good growing conditions in the most delicate phenology phases. However, badly organized and planned irrigation systems and a climate change already led to a regional water scarcity, that is a main motivation for alternative cropping systems. Even if woody species plantation, probably grown in a sort of agro-forestry system, will have much reduced water demands compared to fruit orchards, this is a critical point to be observed.

III. Legislation processes

Dr Erika Kurucz, working for the [Institute of Horticultural Sciences of Debrecen University](#) and as an advisor for [Zsila Gardening Center](#), is involved in breeding new varieties of *Sida hermaphrodita*. As long as the newly bred *Sida* species are not registered, they cannot be sold, for example as seedlings, just for experimental use. This could be an alternative business model for farms like [KUJÁNI](#) (broadening the sales options beyond [PILZE](#)) and thus is a critical point for a couple of actors. This registration is coordinated by the [National Food Chain Safety Office \(NÉBIH\)](#) that is supportive but contact with it is in the moment reportedly distant and bureaucratic. There are several candidates that is why research institutes are motivated to be involved into this process and support the authorisation process.

Another branch of the value chain, the biogas production, creates huge volumes of digestate that could potentially be used as fertilizer on a bigger scale than used currently. This use is limited by several regulations on national and European level, for example for reasons of environmental protection (see footnotes in chapter 3.2.1). A barrier might for example be, that each secondary product (digestate, feed additive, etc.) must meet the compliance. There might be opportunities though for innovative cascading uses of biomass that would require legislation changes. The [National Chamber of Agriculture](#) would be the primary platform for [PILZE](#) for any changes in that direction, with other SHs of the entrepreneurial ecosystem (e.g. the [Hungarian Biogas Association](#)) giving valuable information and advice.

IV. Political support for non-food crops production in Hungary

Hungary is a member of [BIOEAST](#), a consortium of Central and Eastern European governments to offer a common political commitment and shared strategic research and innovation framework for working towards sustainable bioeconomies and for gaining the EU's support for bioeconomy in their homelands. The [Hungarian Ministry of Agriculture](#) can provide knowledge and information for relevant SHs through workshops, forums, online databases. The main focus of the ministry is on food production and food security in line with challenges of the climate change and the vulnerable food production. The biomass production is supported by the Common Agricultural Policy (CAP) and the National Strategic Plan, but the non-food production does not constitute a fundamental priority. This aligns with the fact that up to now there is no national organization of non-food crop producers in Hungary similar to the [National Chamber of Agriculture](#). Associations like the [Hungarian Bioeconomy Cluster](#) could create leverage to lobby for more political attention towards the bioeconomy.

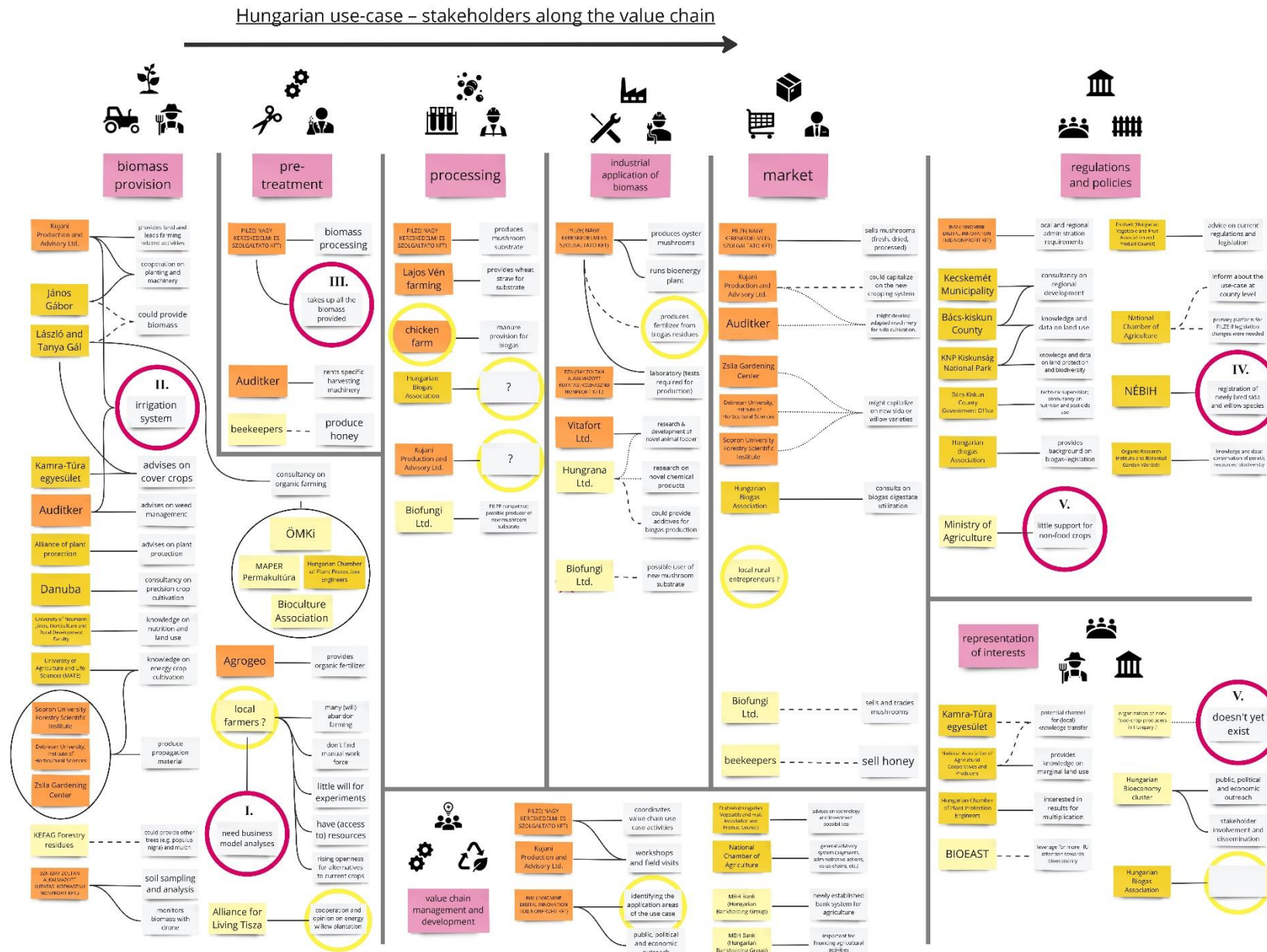


Figure 11: Hungarian use-case – stakeholders along the value chain

3.2.3. Semi-quantitative stakeholder analysis

3.2.3.1. Economic sector of stakeholders' activities

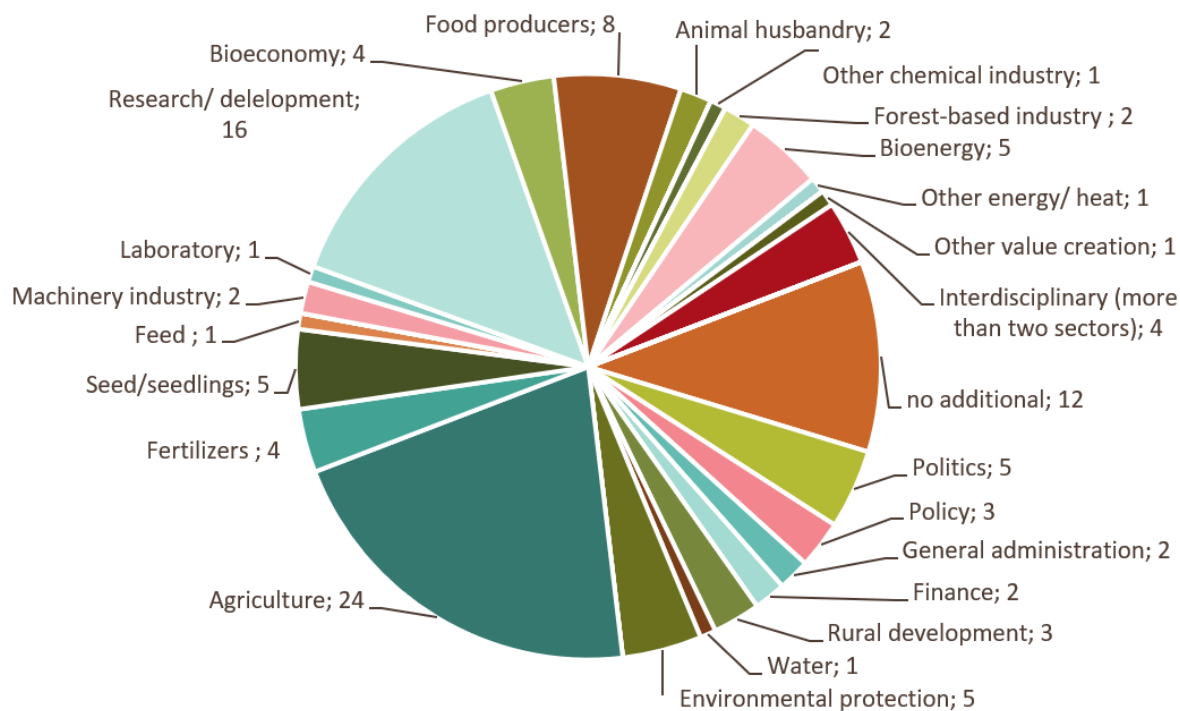


Figure 12: Hungarian use-case – economic sector of stakeholders

With a strong representation of the biomass providers amongst the UC stakeholders, *agriculture* is the most important economic sector that they are active in. *Research and development* features strongly as well, reflecting the introduction of the up to now unknown non-invasive *Sida hermaphrodita* varieties, and the research around alternative uses of spent mushroom substrate. Given the problems with droughts and the importance of irrigation, the *water* sector seems underrepresented.

3.2.3.2. Type of stakeholders

The big pie chart in figure 14 shows the different types of actors that the SHs of the Hungarian UC belong to. Most striking aspects are:

- The only *end user* listed is the electricity company that receives the production from biogas by [PILZE](#). The oyster mushroom value chain has excellent market access through [PILZE](#), and the alternative value chains are all at (very) early development stages.

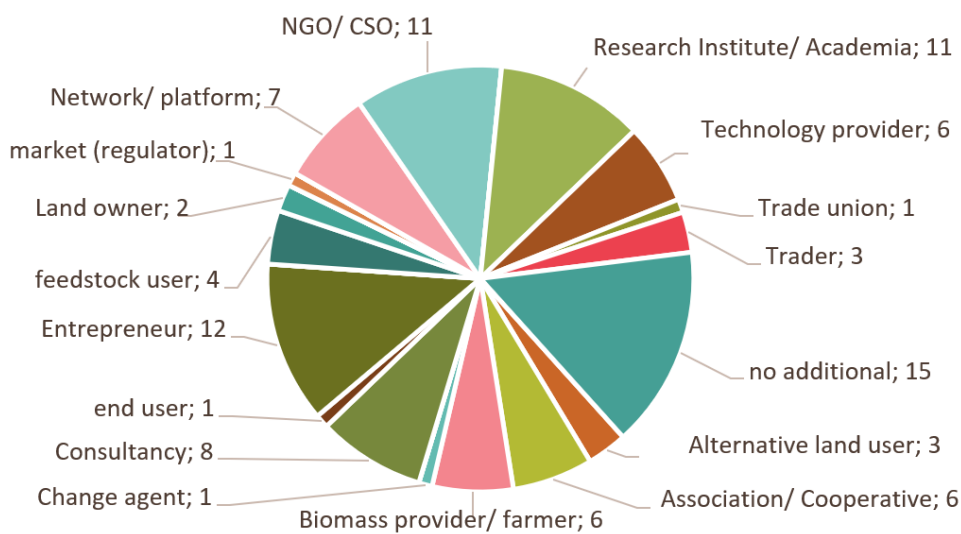


Figure 14: Hungarian use-case – actor type of stakeholders

- Even though 11 SHs are listed as *NGO/ CSO*, most of them (with one exception whose role is unclear) represent the interests of farmers, agricultural companies or the agro- and agro-food-industry. The local civil society or independent environmental organizations are clearly underrepresented.
- Similarly, the only organization in the SH list with the attribute *trade union* is COPA COGECA, a representation of farmers and agri-cooperatives in the EU that acts on a European level and doesn't represent the interests of agricultural labour that are not farmers. Given the stated problems of available labour force, an inclusion of suchlike trade unions or associations (if existent) could be beneficial to investigate common interests.
- When looking at the size of the economic SHs (see figure 13), *small*, *medium* and *large* enterprises are all well represented. But none of these large enterprises listed is engaged directly in the value chain, and only one ([UBM Agro Zrt.](#)) is in the moment connected to the UC, representing SHs for a future scale-up.

3.2.3.3. Market role of stakeholders

Figure 15 shows that all market roles are represented by the SHs of the UC, the prevalence of SHs that do not perform any market role comes from the many universities, public entities, associations, or organizations among the SHs. The only two that are listed as *finance* are Hungarian banks, but some intermediates

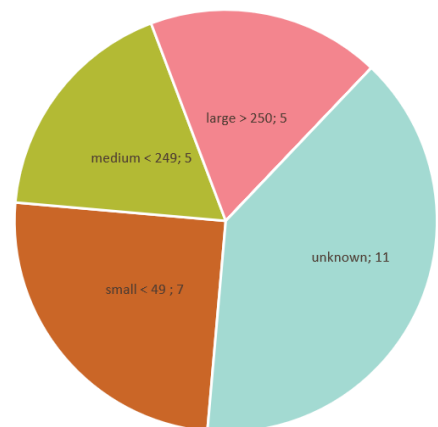


Figure 13: Hungarian use-case – number of employees of economic stakeholders

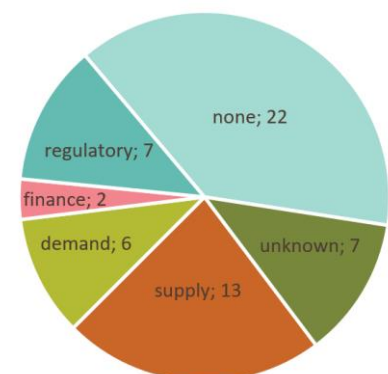


Figure 15: Hungarian use-case – market role of stakeholders

between farmers or small companies and big banks that could for example assist with business model analyses might be missing yet.

3.2.3.4. Attitude of stakeholders towards the use-case

While 50% of the SHs are listed as *supportive* and another 10% *strongly supportive*, more than a third has an *unknown* attitude, probably reflecting little or no contact to the UCL. That no SH is listed as *neutral*, *unsupportive* or *very unsupportive* is in line with the other UCs, but could indicate to the possibility, that critical actors are not properly pictured.

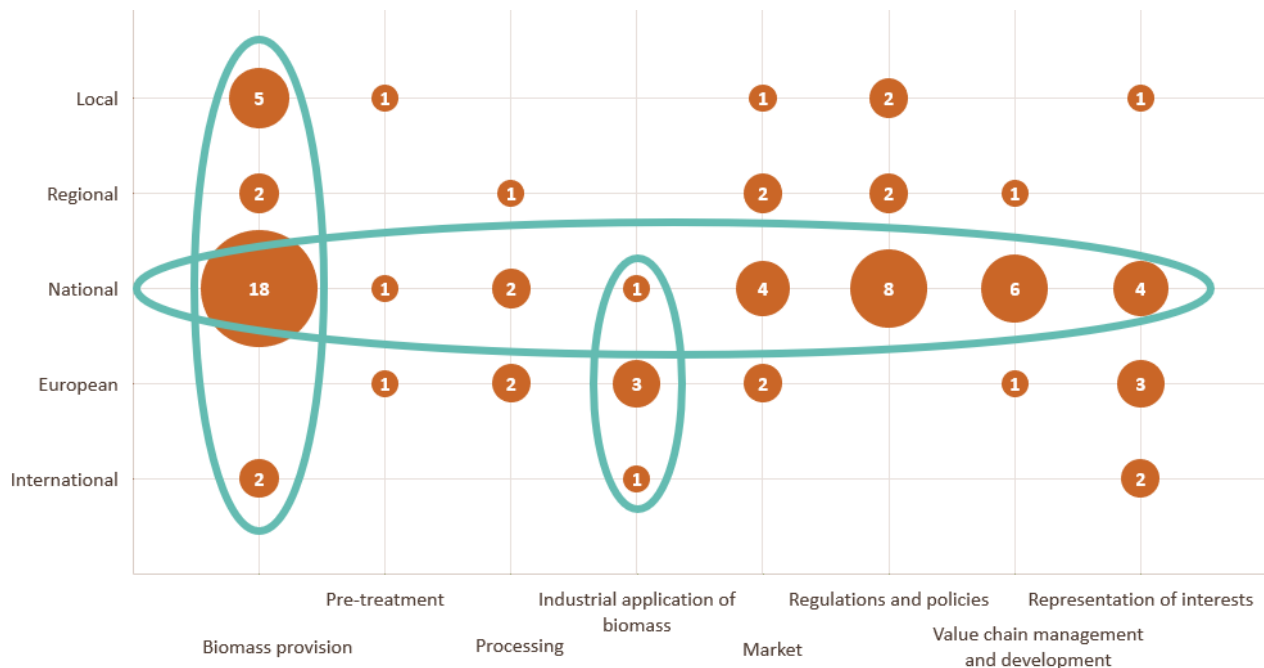


Figure 16: Hungarian use-case – main scale of operation of stakeholders along the value chain

3.2.3.5. Main scale of operation of stakeholders along the value chain segments

The graphic in figure 16 shows the main scale of operation (vertical axis) of SHs of the Hungarian UC (including all entries in the SH list) along the different segments of the value chain (horizontal axis). Most striking are three aspects (green circles from left to right):

First, it is clearly visible that the big majority of SHs operate mainly on a *national* level. It is though important to say, that [PILZE](#) as the main producer of the value chain is very much orientated towards the European market, which is not reflected well in the chart as all actors are weighed equally here.

Second, the biggest concentration of SHs is the handful of agricultural advisors, consultants and research institutes that participate in the *biomass provision* or form the entrepreneurial ecosystem around biomass provision and mainly operate at *national*

Hungarian level. It reflects the fact that especially *Sida hermaphrodita* is a species newly introduced to Hungary and KUJÁNI, as an experimental farm, resorts to its wide network to receive the necessary knowledge and experience.

Third, only few actors are involved in the *industrial application of the biomass*, that is heavily dominated by PILZE's oyster mushroom and biogas production. Opportunities for a more diverse industrial segment of the value chain would only open up, if the ongoing or planned research on novel animal feed or even additional novel products from SMS prove to yield promising results.

3.2.3.6. Key stakeholders' resources, attitude and involvement in action and decision moments

Figure 17 shows, that all key SHs are supportive or even strongly supportive towards the UC and all seem to have sufficient (access to) resources. Almost all the earlier identified key SHs are involved in a constellation or situation identified as *action and decision moment* in the mapping (see above at chapter 3.2.2), confirming the choice. As mentioned above, given the importance of water for local agriculture, public entities dealing with the subject could add interesting aspects to the discussions in upcoming workshops. The same is valid for actors that could address the need for business model analyses for the biomass providers.

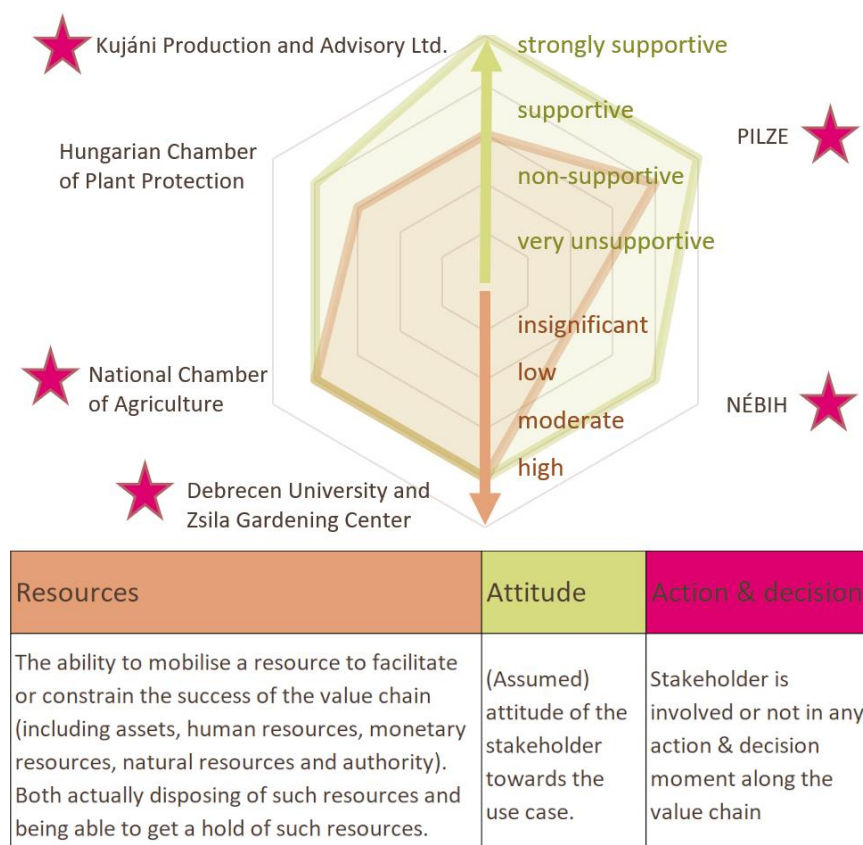


Figure 17: Hungarian use-case – radar chart showing key SHs' resources, attitude and involvement in critical actions & decisions

3.3. Swedish use-case

3.3.1. Processes and products along the value chain (including mapping)

- Biomass provision
 - In the Swedish UC, turnip rape is cultivated in the northern [counties Västerbotten and Norrbotten](#). The lands used do not have marginal soil conditions (as turnip rape requires good drainage, a pH at 6,5 and good nourishment), but due to the degree of latitude to growing period is very limited. Other marginality factors are the long distances with high transport costs in the sparsely populated provinces and the old age of most farmers in the region, leaving more and more land to lie fallow.
 - In the long run, it will be necessary to grow turnip rape every fourth year in rotation with grass and forage in the other years.
 - As turnip blossoms for a short time, for bees it would need more different plant types. There are remnant grasslands and red clover fields in the surrounding areas. But for the moment, it is not planned to plant additional stripes with clover on the same fields. This could be added in the later years of the project, to foster biodiversity, attract bees and other pollinators, and contribute to pests and disease management.
- Pre-treatment
 - After harvest, the seeds must be dried within days. For the UC, [Hushållningssällskapet \(HS\)](#) will do the drying at its Agro Park facility in Öjebyn.
- Processing
 - Hushållningssällskapet bought the necessary facilities and presses the seeds to gain rapeseed oil.
- Industrial application of biomass
 - Biodiesel value chain
 - [Ernsts Express AB \(EEXP\)](#), a transport company located in southern Sweden, provides its existing biodiesel plant to the UC. Until now it produced biodiesel from used edible oil acquired from the fast-food chain Burger King. Together with [RISE PROCESSUM](#), the biodiesel plant was adapted to the production of biodiesel from rape seed oil. The production unit was automatized and can be controlled by RISE PROCESSUM from around 500 km away.
 - The biodiesel production leaves crude glycerol as by-product, that in turn can be used for the production of biogas. The residues from biogas production (digestate) can be used as fertilizer while the gas would be turned into electricity. Currently, the UC has no biogas plant and is not in contact with any biogas producer. But there are a few producers in the region, including the [Municipality of Luleå](#), the capital of [Norrbotten County](#) (used for the city's public transport).

- Raw oil and press cake value chain
 - The raw rapeseed oil can be filtered and brought to the market as edible oil.
 - The pressing residues (press cake) can be a valuable and protein rich ingredient for animal feed.
- Market
 - Biodiesel value chain — different setups are imaginable: all steps could be integrated into one company, or turnip could be grown on many farms that provide biomass to one biogas/biodiesel producer, etc.
 - [EEXP](#) might test the produced biodiesel in its trucks, [HS](#) might do so in the future with agricultural machines. In case of a scale-up, there are several potential buyers of greater quantities conceivable.
 - [Energifabriken](#), a SH of big experience with biodiesel and its own distribution network, could provide experience and theoretically also market access.
 - Local [municipalities like Luleå](#), that are trying to get out of the use of fossil-fuels, have high energy demands for public transport, school transport, road maintenance and other duties.
 - Other (local) freight companies.
 - The newly modified biodiesel production unit could be a product of its own, if brought to product readiness. It could be used by farmers that cultivate turnip rape, but also by other users, since it can use different types of oil.
 - Regarding the biogas production, there are different possible scenarios:
 - Or the biogas is produced on site and electricity used and sold to the grid while the digestate would go “back to the land” inside the producer’s own company or sold to other farmers. In that case, the heat generated as by-product could be used on the farm, e.g. for drying the turnip rape seeds.
 - Or the glycerol is sold to an existing biogas plant in the area. Apart from public users there are also companies that produce and sell biogas for private consumption at petrol stations, for example [Polargas](#) or [Gasum](#).
- Raw oil and press cake value chain:
 - The edible oil can be sold to retailers or to food industry and gastronomy. The latter two offer the chance to get the used oil back for biodiesel production (see above).
 - The press cake could be sold to feed producers, for example [Fodercentralen](#). This company buys both dried seeds and cold-pressed cake to use in its locally produced animal feed.

Swedish use-case – products along the value chain

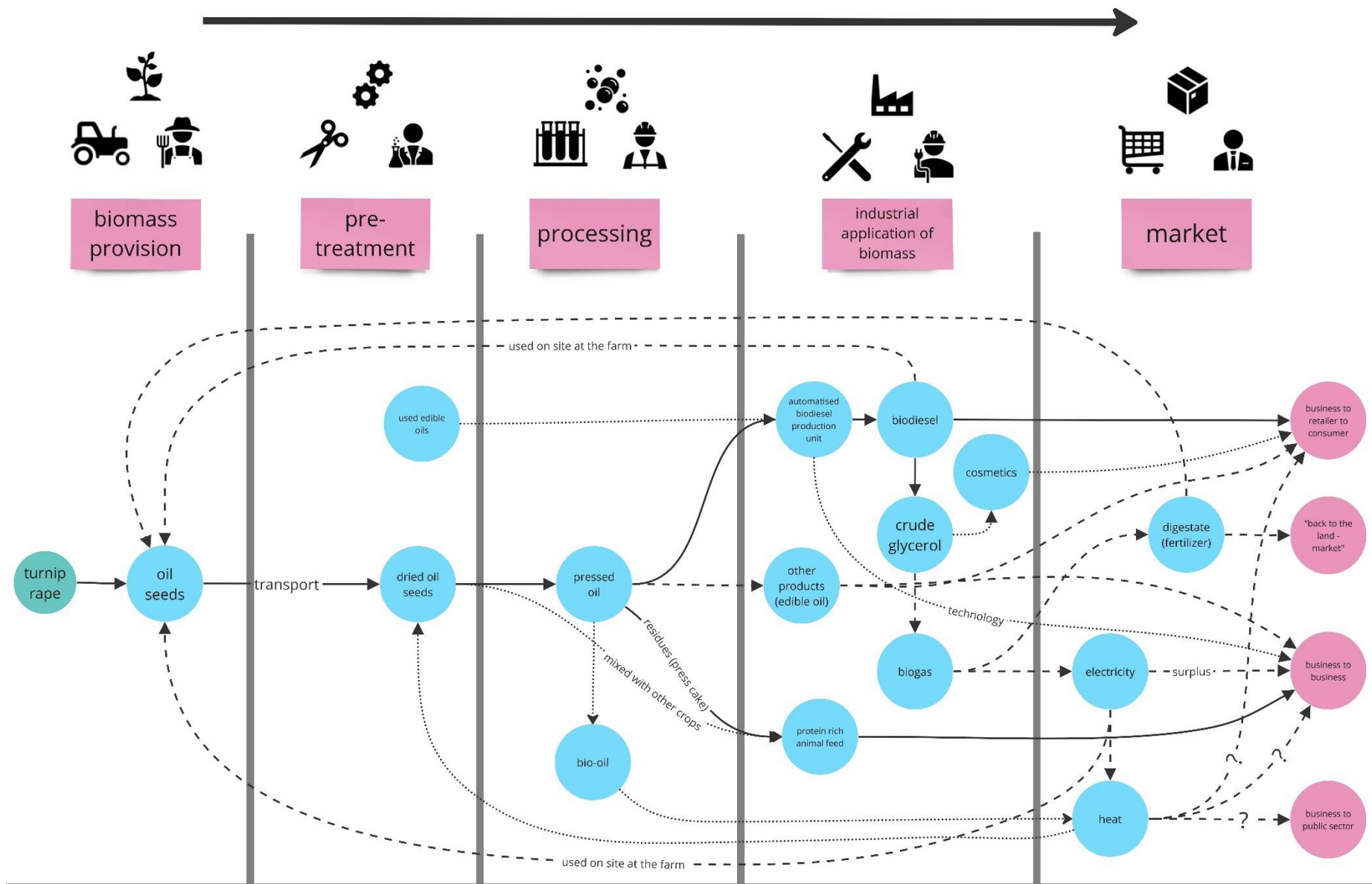


Figure 18: Swedish use-case – products along the value chain

3.3.2. Action and decision moments (including mapping)

In the mapping of the SHs along the value chain (see figure 19) we identified several *action and decision moments*, highlighted with purple circles and numbered. These moments flag up constellations or situations that need to be influenced and changed in a certain way to ensure a favourable development of the envisaged value chain or a successful and sustainable scale-up. Below, each such moment in the mapping is presented.

I. Distance

Distances in northern Sweden are rather big, and important SHs have their seats even further away in central or southern Sweden. For example, MarginUp! project partner [EEXP](#) (owner of the biodiesel plant and possible tester of the produced biodiesel) is located more than 750 km south of Piteå, the seat of [HS](#) with Öjebyn Agro Park, where part of the biomass is produced. PM Bioenergi & Smide, who provided technology for the oil press, is located even further to the south. The remote-control technology of the biodiesel plant is a high-tech solution addressing the long distances. But, for example in the case of technical failures, the distance remains a fact and a potential problem. Even though it is too early to judge, the fact that quite some important SHs are located outside the region could make it more difficult to sustainably build up local knowledge and a value creation at site, something that must be specifically addressed by future SH engagement and replication plans.

On the regional level of Västerbotten and Norrbotten, distances are still quite big, increasing production costs for all SHs. But at the same time the distances increase business opportunities for any kind of transport companies and increase fuel demand by agricultural actors, both constituting primary target groups for the UC's biodiesel (as [HS](#) and [EEXP](#)).

II. Limitations and technical maturity of the UC's innovative biodiesel production

The UCs biodiesel plant will produce Rapeseed Methyl Ester (RME). This type of biodiesel is very common and mixed to various degrees with fossil diesel in most European countries. However, it also comes with some limitations:

- If sold on the open market, the European standard for diesel sets a limit to the maximum share of RME and other Fatty Acid Methyl Esters in the blends.
- Due to some of its properties, not all diesel engines can use RME, especially if the share in the diesel blend is high. Many engines are adapted though, which gives machine rings and sellers like Maskinring Norrland and Norrmaskiner and similar actors in agriculture, but also public transport operators an important role in promoting these adapted machines as a prerequisite for higher regional demand necessary for any scaled-up biodiesel value chain.
- RME starts gelling at low temperatures, a comparative disadvantage to Hydrotreated Vegetable Oil (HVO), also called "green diesel" (largest manufacturer worldwide being the Neste Corporation from Finland; Sweden on a national average has up to 30% of HVO in its diesel blends). Additives, or blending with fossil fuels can solve these problems, amongst other solutions. There is ongoing research on this topic, for example from Energifabriken.
- In contrast to most RME produced, the UC uses hydrothermal liquefaction (HTL) to transform the oil into biodiesel. Up to now there exists no large scale or commercial production using this method. This highlights the innovative

character of the UC but also makes clear, that any scale-up of the value chain will require significant investments (e.g. in the up to now inadequate supply chain infrastructure; in increased technical maturity of HTL biocrude production, etc.)

III. Economic competitiveness of RME biodiesel

Apart from technical limitations, the economic competitiveness of biodiesel is another challenge:

- Farmers and forestry operators in Sweden can get back a certain amount of taxes they paid when acquiring diesel for their machinery. To the knowledge of the authors there are ongoing discussions about privileged handling of biodiesel, but at this point the existing regulations do not favour biodiesel.
- Low volumes of regionally available turnip rape, differences in production compared to other, more commonly grown rape varieties as well as low specific demand for diesel from renewable sources makes it hard to achieve compatible prices. The price for the byproduct glycerol has plummeted due to increased biodiesel production worldwide, and the biogas plants in the region have very cheap alternatives (mostly other residues) at hand for their production. This highlights the importance of SHs with potentially high uptake rates for the UC. The regions and municipalities can actively put out for tender renewable public transport, waste-picking and other transport solutions, RME propelled vehicles being one of them. And the 9 existing biogas plants, mostly owned by municipalities, could potentially absorb higher amounts of glycerol in case of a scaled-up regional value chain.
- The industry present in the two regions of the UC has high expectations on volume and properties, that is likely not to be met by the local value chain of the UC. On the other side, companies like WIBAX (experts on bio-oil for industrial applications) might very well be interested to build upon the experiences of the UC to build up a bigger production unit for themselves. Local industries might also offer opportunities for industrial symbiosis and a leverage on local politics.
- Compared to southern parts of the country, finance for investments is difficult to get for farmers in the two regions of the UC. Many farmers are of advanced age, many are small scale farmers, making it more difficult to present profitable business plans to finance institutions. On the other hand, there is an existing turnip rape cultivation in Norbotten and Västerbotten and member owned banks specialized on agriculture are present in the region. Machinery rings, extension services and farmer cooperations could help with knowledge transfer and reduce investment costs for the individual farmers.

IV. Profitability of biodiesel production from turnip rape and alternative uses of turnip rape and byproducts

Several interviews mention the necessity of a detailed profitability count of the value chain based on biodiesel production from turnip rape. It seems that from the side of the biomass provision, turnip rape can compete economically with grain, at the same time offering potentially improved ecosystem services, resilience of the regional agricultural system and reduced environmental impacts compared to other crops. More difficult to assess is the profitability of the use of turnip rape seeds for biodiesel production, compared to other uses, that might exceed the profits of the biodiesel. These uses could be for example the production of edible oil or bio-oil useable for heating (e.g. in district heating units; [HS](#) plans experiments to use the oil in

its own drying facilities). The use as edible oil however opens up the possibility of re-use of old cooking oil for biodiesel production [EEXP](#) used old cooking oil in its biodiesel plant before start of the UC).

These considerations are complicated and framed by political developments on a higher level. For example, the EU ban on combustion engines (see below) but also by the ongoing war in Ukraine. The Swedish state is currently asking all its political entities on various levels to assess their preparedness to potential value chain disruptions, the evaluation is still ongoing. A look on neighbouring Finland, traditionally more aware of national preparedness, shows a lot of experience with biofuels, but also, as an example, with protein for animal feed from turnip rape in replacement of imported soy. If political decisions should demand similar preparedness in Sweden accompanied by legislation changes and political support, the profitability count would most probably be affected substantially.

V. European Union 2035 internal combustion engines ban and associated policies

Following a decision in March 2023, the EU agreed to ban the sale of cars and vans using internal combustion engines from 2035⁶. It also requires “new trucks to cut emissions by 90% by 2040 and all new city buses to have zero emissions from 2030”⁷. Agricultural and forestry machines are also not affected by the ban in 2035 but regulated differently. Because of these exceptions, and as vehicles already in use by 2035 will be allowed to stay in use until the end of their life-spans, and the overall share of fuels of biological origin in the fuel blends sold in Europe is likely to rise over the next decades, demand for biodiesel and other biofuels will not cease. The war in Ukraine could likely have additional effects on the future demand (see also above), but there are many uncertainties concerning the future of biofuels⁸. Any investment in a scale-up of the value chain will certainly be influenced by these developments.

⁶ <https://www.europarl.europa.eu/news/en/headlines/economy/20221019STO44572/eu-ban-on-sale-of-new-petrol-and-diesel-cars-from-2035-explained>

⁷ <https://www.electrive.com/2023/02/14/eu-commission-proposes-truck-and-bus-emission-targets/>

⁸ <https://www.iea.org/reports/renewable-energy-market-update-june-2023/will-energy-security-concerns-drive-biofuel-growth-in-2023-and-2024>

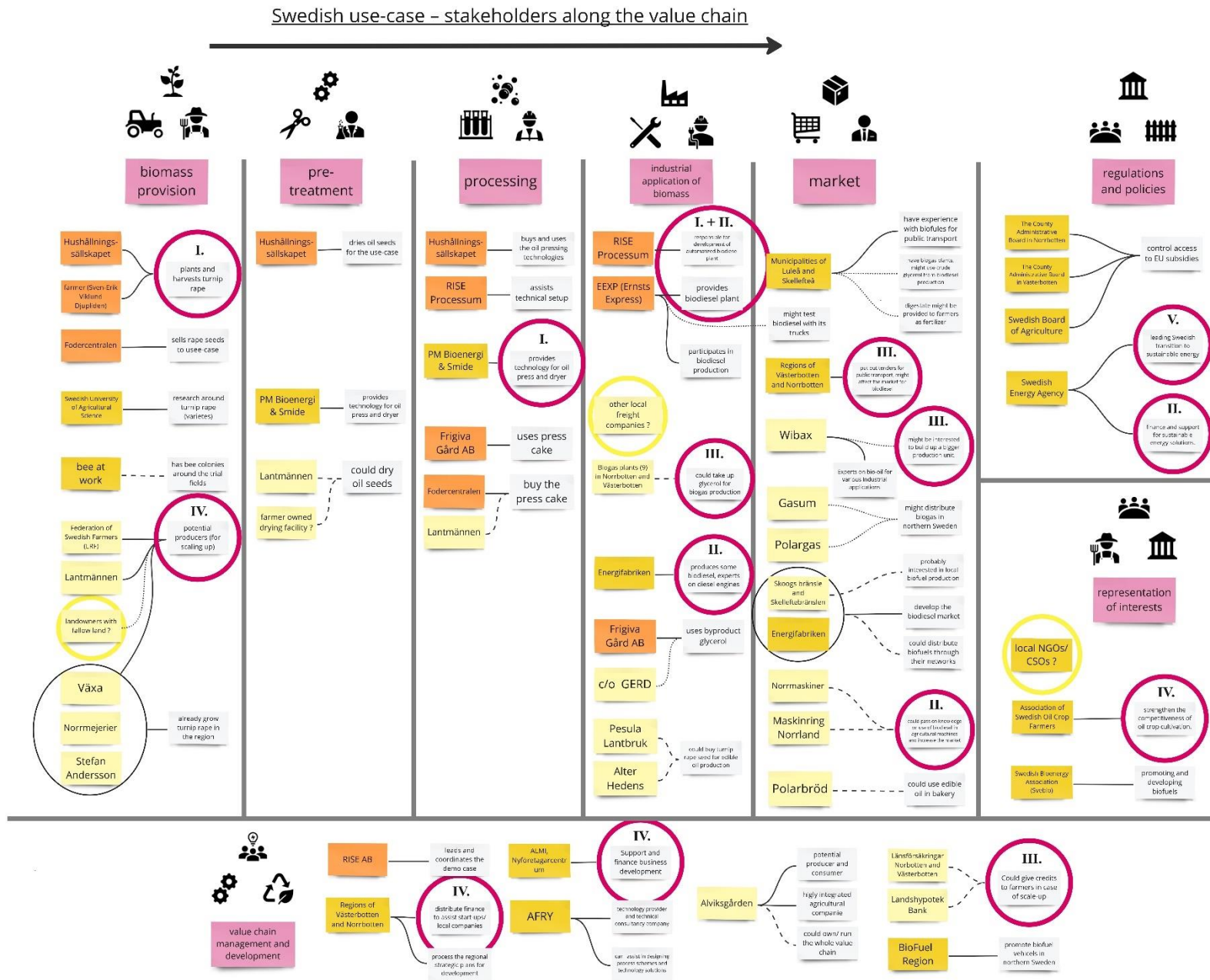


Figure 19: Swedish use-case – stakeholders along the value chain

3.3.3. Semi-quantitative stakeholder analysis

3.3.3.1. Economic sector of stakeholders' activities

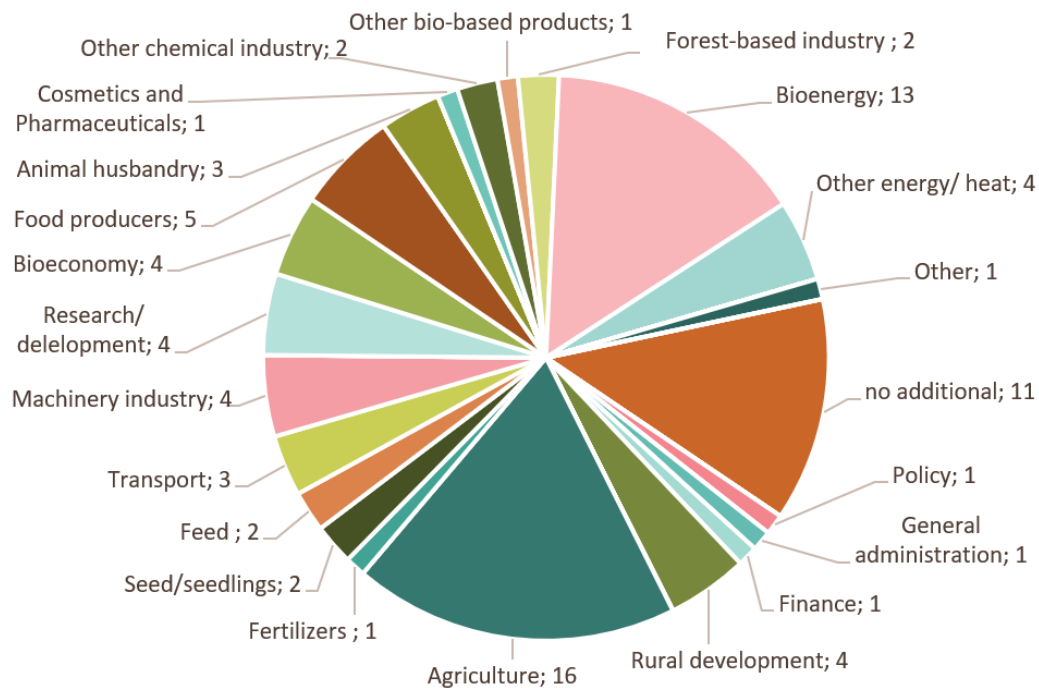


Figure 20: Swedish use-case – economic sector of stakeholders

The sectors *Agriculture* and *Bioenergy* are well represented in the graph in figure 20, fitting the Swedish main value chain's approach to use cultivated turnip rape for diverse energetic application and the side value chain of high protein food from the pressing residues. The value chain using the crude glycerol for cosmetics is experimental, with a single company from the sector of *Cosmetics and Pharmaceuticals*. Some *Food producers* show up, some (potentially) involved in the biomass provision, some as possible users of the turnip rape seeds for the production of edible oils. Interesting is the absence of any SH from the sector of *Environmental protection*. While the agricultural extension and research entities involved in the UC, for example [Hushållningssällskapet \(HS\)](#), are certainly well grounded in environmental topics, closer engaging with an actor with decided environmental responsibilities could be valuable for the UC. Given the highly political question of the future use of biofuels against the background of latest EU decisions, it stands out that no SHs from national politics are listed for the UC.

3.3.3.2. Type of stakeholders

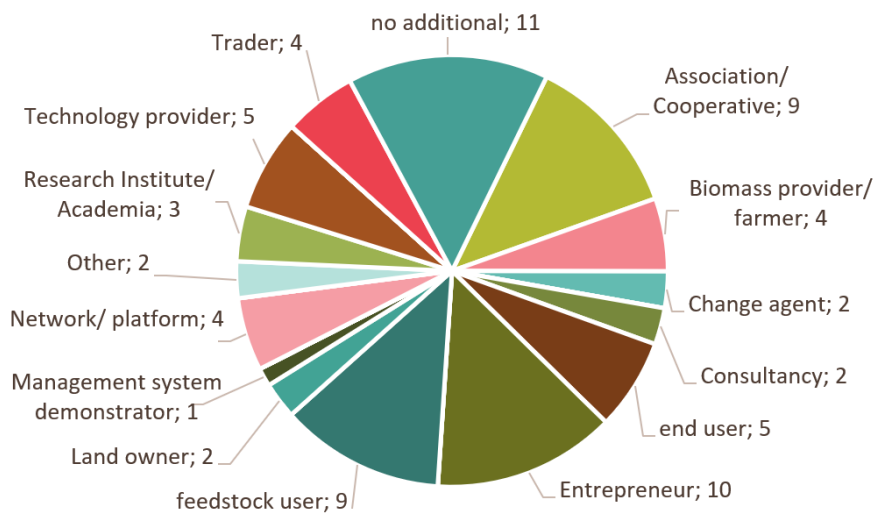


Figure 21: Swedish use-case – actor type of stakeholders

Most striking aspect of figure 22 is the absence of any *NGO* or *CSO* amongst the SHs of the Swedish UC. This can be explained from the fact that turnip rape is no newly introduced crop in the area (even though not very common), that biodiesel from other rape varieties is a very well-known product of the Swedish bioeconomy and that the cultivation of turnip rape in the UC would, in case of a scale-up, happen on (former) farmland used for similar crops before. Nevertheless, to identify and engage local and regional environmental NGOs could be valuable for the (social) sustainability of the UC.

Figure 21 shows that almost three quarters of the SHs are economic actors of some kind, considerably more than in the other UCs. This probably reflects the organisational form of many of the knowledge holders of the UC, that are public enterprises like [RISE](#) or companies like [EEXP](#). In line with that few public universities and research centres are involved compared to the other UCs, with [HS](#), [RISE](#) and [RISE PROCESSUM](#) being very prominent.

3.3.3.3. Market role of stakeholders

Concerning the market role (see figure 23), most SHs play a role on the supply side of the value chain (upstream, production, distribution), similar to the other UCs. Interesting is the overall share of SHs with a market role, underlining the analysis on the size of the SHs (see above). Few SHs hold a *regulatory* role, less than in other UCs. Assuming, that biofuels and feed additives both need to meet certain standards that might very probably have to

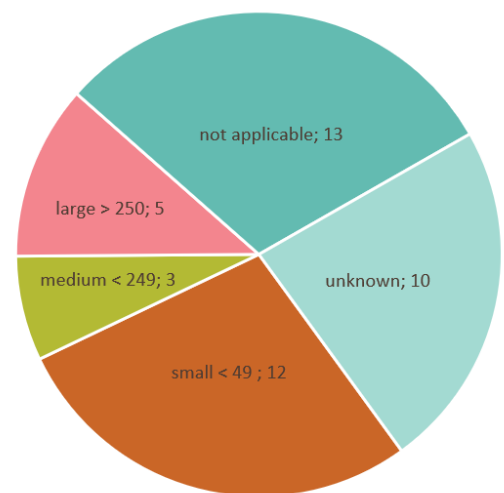


Figure 22: Swedish use-case – number of employees of economic stakeholders

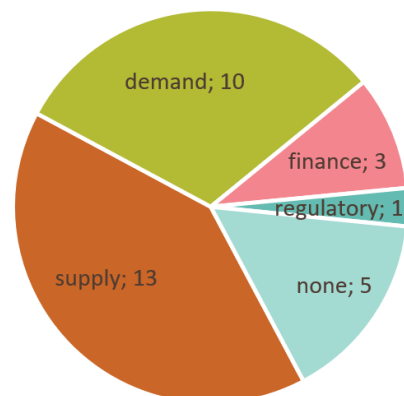


Figure 23: Swedish use-case – market role of stakeholders

be tested before entering any market, this could hint at a spot that needs to be taken account of in the further development of the UC. The presence of several SHs with a *finance* role is promising for future up-scaling.

3.3.3.4. Attitude of stakeholders towards the use-case

Almost three quarters of the SHs are listed with an *unknown* attitude. This might in part be due to a cautious approach of the UCL, as the information regarding the attitude is partly based on assumptions. It does however also point out that many SHs that could play a role in a potential scale-up of the UC's value chain are not (yet) very much involved and firmer contact must be established. Most of the remaining SHs are *strongly supportive*, two *neutral*. That no SH is listed as *unsupportive* or *very unsupportive* is in line with the other UCs, but could indicate to the possibility, that critical actors are not properly pictured.

3.3.3.5. Main scale of operation of stakeholders along the value chain segments

The graphic in figure 24 shows the main scale of operation (vertical axis) of SHs of the Spanish UC (including all entries in the

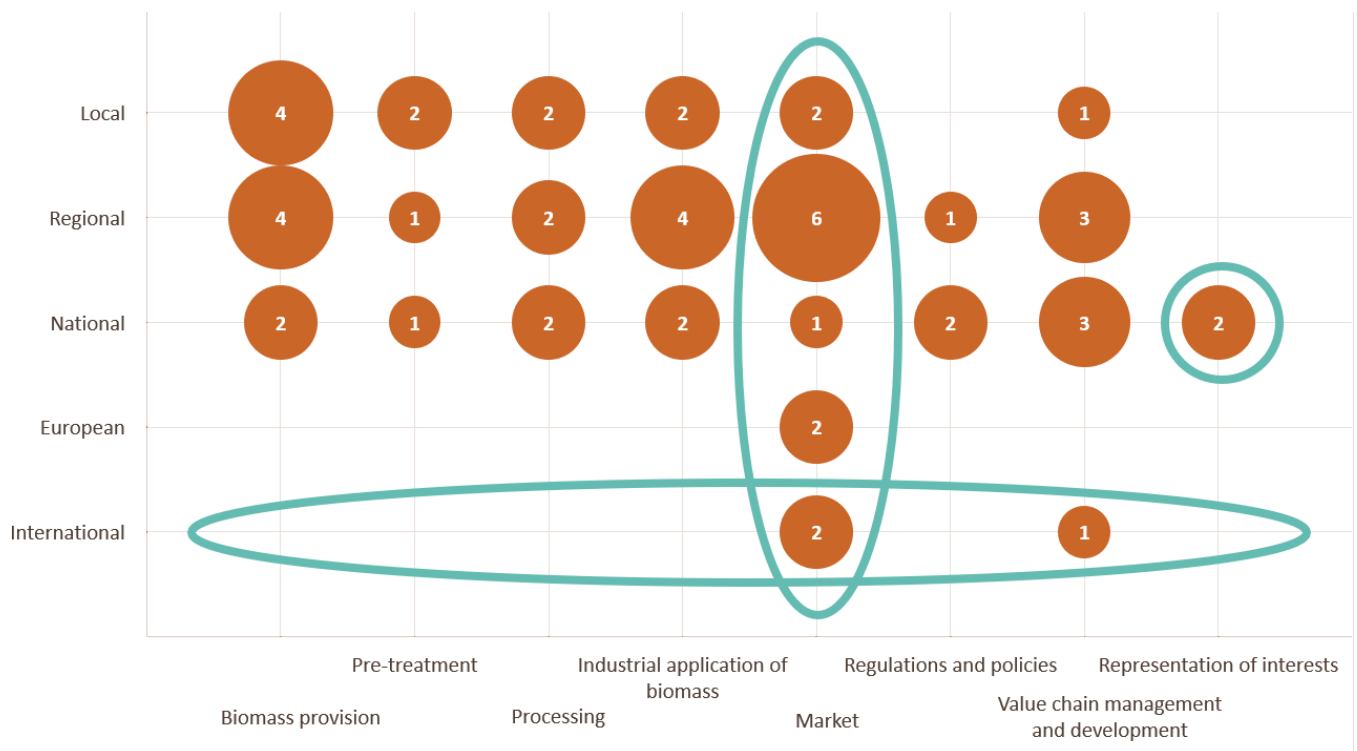


Figure 24: Swedish use-case – main scale of operation of stakeholders along the value chain

SH list) along the different segments of the value chain (horizontal axis). Most striking the following aspects (green circles from top to bottom): Regarding the scale of operation, a concentration of SHs in the *market* segment is apparent. Most of the SHs depicted there offer different opportunities to increase the demand for biodiesel in the region. Competitiveness and profitability of biodiesel production from turnip rape are main concerns that come up in the key SH interviews and that are described further in chapter 3.3.2, so that it makes sense to concentrate SH engagement on suitable SHs. This leads to the

fact that only two SHs are to be found in the segment *Representation of interests*. Keeping in mind the aforementioned concerns and the latest EU policies regarding combustion engines, it seems pertinent to also engage political actors that bring forward the interests of the value chain on a *national* or *European* level. Last remarkable point is the rather low number of SHs that mainly act on an *international* level, most probably mostly stemming from the fact that the targeted market for the biodiesel as well as the byproducts is regional in northern Sweden and the producers that form the current value chain act on the regional level, too.

3.3.3.6. Key stakeholders' resources, attitude and involvement in action and decision moments

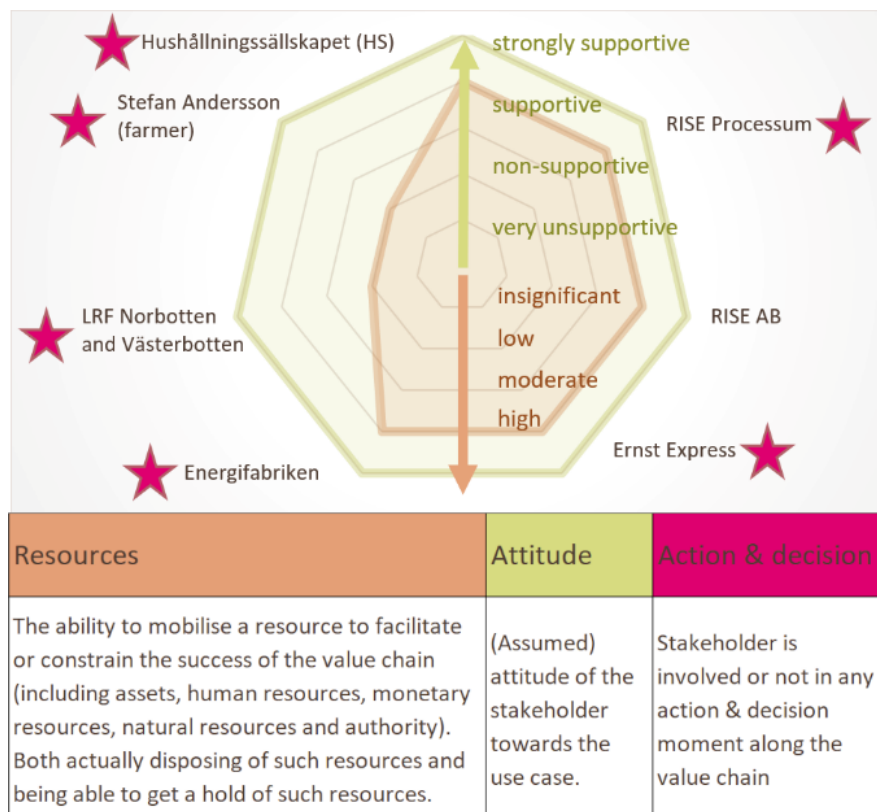


Figure 25: Swedish use-case – radar chart showing key SHs' resources, attitude and involvement in critical actions & decisions

The first point that is well illustrated by the chart in figure 25 is the proper choice of key SHs. Almost all of them are involved in the identified *action and decision moments*, and RISE AB is UCL. The second point is the many key SHs with *high* resources available to directly or indirectly influence the success of the UC. Stefan Andersson as well as other farmers in the list have *moderate* or *low* resources available. Even though most potential farmers might not need high investments to grow turnip rape, in order to reach the needed high volumes, relevant investments in the supply infrastructure (storage, drying, transport) will be needed. This hints at the importance of financial solutions for investments, described in more detail in chapter 3.3.2.

3.4. Spanish use-case

3.4.1. Processes and products along the value chain (including mapping)

In the use case's main value chain, fibres from hemp and kenaf are used by [Modular System Global S.L. \(MODULAR SYSTEM\)](#) as additives for the fabrication of precast concrete panels for building purposes in their own fabric in [the city of Coria](#). In a possible side-stream, the fibre remains are used for biogas production and downstream products. The activities take place in the central and northern parts of the autonomous region of Extremadura in central western Spain. While some crop trials and most of the facilities of the UCL [Center for Scientific and Technological Research in Extremadura \(CICYTEX\)](#) are situated around Badajoz and [Cáceres](#), it is planned to increase the crop production on fields of farmers that are part of the [Sociedad Cooperativa del Alagón \(COPAL\)](#) around Coria.

While the biomass production is very much under the leadership of the UCL [CICYTEX](#), the industrial application of the biomass is dominated by [MODULAR SYSTEM](#). The Portuguese company [Agrovete S.A.](#) provided the hemp seeds and cultivation knowledge and cooperates with [CICYTEX](#) on the separation of the fibres. The side-stream value chain around biogas is only at pilot level, but in an apparently positively developing business environment in Extremadura there is potential for scale-up.

The fields in the Alagón river valley are irrigated and mostly used as pastures, but also for crop production. With several drought years and expected climatic changes, identifying crops that need less water is crucial for the local farmers and connected industries both for environmental reasons as well as economic reasons (farmers pay for the water, an important fraction of total production costs for farmers).

- Biomass provision
 - Within the scope of MarginUp! hemp and kenaf will be grown in yearly rotation with corn, pepper and tomatoes. This is expected to bring better yields and consume around 50% less water than growing corn on the same areas.
 - In the area of [Moraleja](#), 2000 m² were sown with hemp and an experimental trial with three varieties of hemp and four kenaf varieties on the Finca La Orden experimental farm (about 2000 m²) that belongs to [CICYTEX](#). In 2024, it is planned to sow about 4 hectares of hemp and kenaf with 2 farmers of the [COPAL](#) cooperative.
 - The value chains regarding production and processing of hemp and kenaf in the UC are very similar, the actors involved are mostly the same, too.
 - [CICYTEX](#) plans trials with organic fertilizer and bio-pesticides on the UC fields, probably starting next year.
- Pre-treatment
 - Machines for corn and grass sowing/harvesting can be used to harvest hemp and kenaf. If scaled up, adapted machines would be necessary, that are already available on the market in other EU countries.

- The hemp and kenaf stalk harvests consist of mowing, then drying of the biomass on the field for two weeks and subsequent baling.
- Processing: [CICYTEX](#) and [Agrovete S.A.](#) cooperate on the separation of the fibres of the trial biomass. [MODULAR SYSTEM](#) studies these prototype fibres in its own laboratory.
- Industrial application of biomass
 - [MODULAR SYSTEM](#) will use the fibres to substitute additives from plastic in the fabrication of precast concrete panels for building purposes. The panels are produced in their own fabric in [Coria](#).
 - The biomass remains from the fibre production (mostly dust) could theoretically be used for biogas production.
 - If generated on proximity to the concrete panel production, the heat could be used in the connected processes.
 - There is not market-ready biogas plant in the region, yet. But [CICYTEX](#) and the [Centro de Formación del Medio Rural de Moraleja](#) are running a biogas pilot plant that will be used for tests on biogas production from the fibre remains (dust).
 - [CICYTEX](#) and the [Centro de Formación del Medio Rural de Moraleja](#) will also test the production of biofertilizer from the digestate of the biogas pilot plant.
- Market
 - [MODULAR SYSTEM](#) is a major company with sales offices all over Spain and it uses the concrete panels in the construction of pre-fab houses. These are often sold turn-key and sometimes together with the plots.
 - Electricity and heat from biogas could be sold to other businesses or to the grid. If purified, the biogas could enter the local gas grid.
 - The biofertilizer could potentially be produced by local compost producers and farmers.

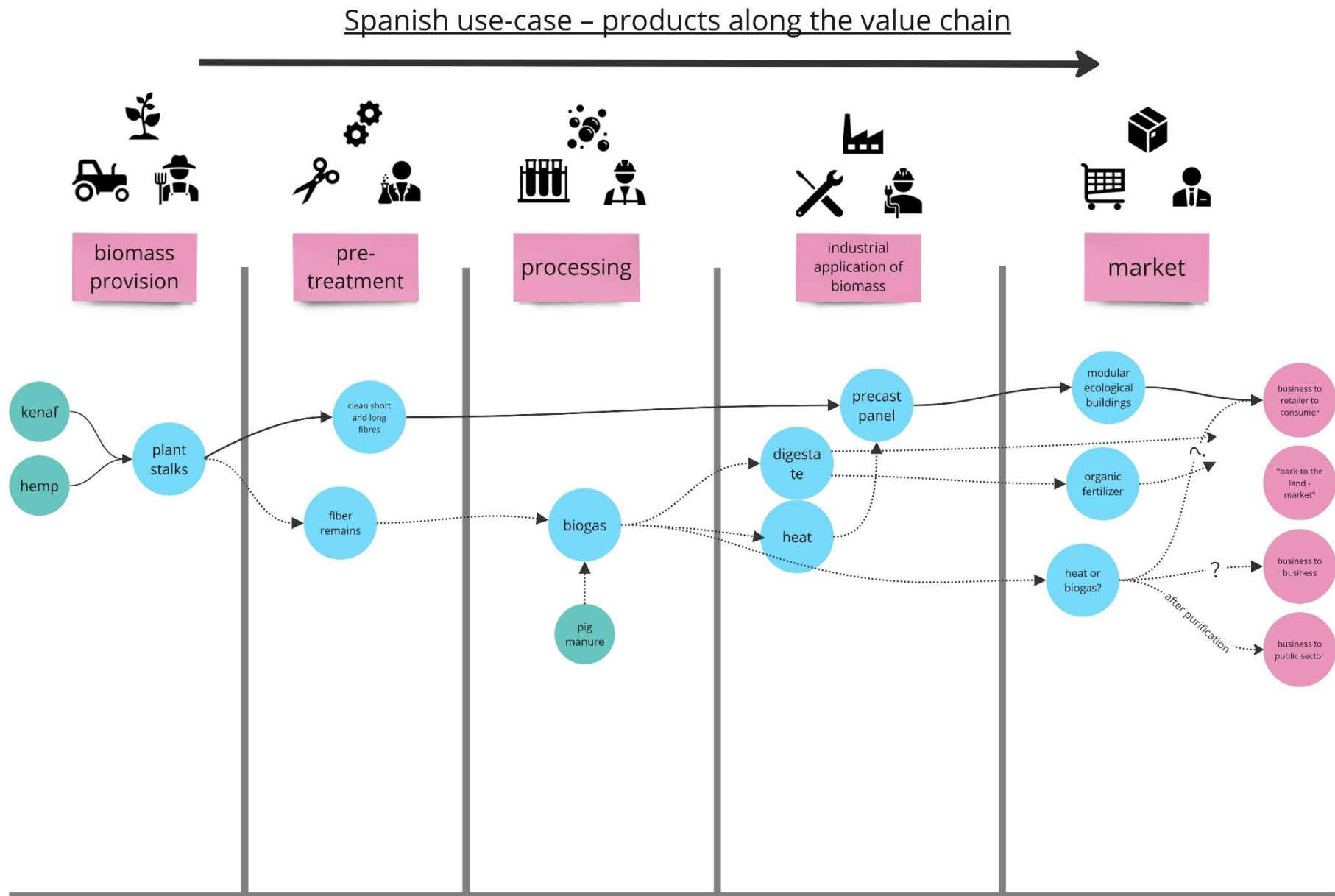


Figure 26: Spanish use-case – products along the value chain

3.4.2. Action and decision moments (including mapping)

In the mapping of the SHs along the value chain (see figure 27) we identified several *action and decision moments*, highlighted with purple circles and numbered. These moments flag up constellations or situations that need to be influenced and changed in a certain way to ensure a favourable development of the envisaged value chain or a successful and sustainable scale-up. Below, each such moment in the mapping is presented.

I. Hemp and kenaf seeds

As of today, there is no kenaf-seed industry in Europe. But throughout the MarginUp! project, information on the production will be generated that may allow the SHs involved to think about this as a possibility. This would also provide opportunities to breed varieties that match the local conditions and the industry's requirements on the fibres as good as possible. Hemp seeds however can be bought on the European market. There are hemp varieties for seed and for fibre production.

II. Fibre separation

As of today, there is no local industry in Extremadura that can separate biofibres on a bigger scale. The UC thus draws on the experience of [Agrovete S.A.](#), a private company from very close Portugal. For a future up-scaling of fibre production, ties between [MODULAR SYSTEM](#) and the Portuguese industry would have to be tightened. Another alternative could arise, if an already existing [initiative for a fibre separation facility in the near-by La Vera area](#) proves to be successful. To establish contact to this initiative seems to be a good task for future SH engagement.

III. Biogas and downstream products

There is not market-ready biogas plant in the region, yet. Thus, apart from the experimental plant run by [CICYTEX](#), there are no SHs connected to the UC along this conceptual part of the value chain (manure providers, biogas plants, compost producers for fertilizer from digestate; gas and electricity companies). But following other regions in Spain, investors seem to be interested and there are several initiatives to build biogas plants in Extremadura, with some projects on the pipeline. In the near future, next year or in 2025, it could be interesting to talk with these entrepreneurs and inform them about MarginUp! and the project's experience and research results.

IV. Legislative regulation of hemp production in Spain

Several key SHs mentioned concerns about the value chain based on hemp, as the cultivation is strongly regulated. They see these legislative barriers as major threat to any up-scaled business. In the EU, the Common Agricultural Policy (CAP) allows the cultivation of certificated hemp varieties for seeds and fibre production when the Tetrahydrocannabinol (THC) content is lower than 0.3%. This is an interesting opportunity for local farmers that might introduce hemp in their crop rotations.

Spain - value chain oriented

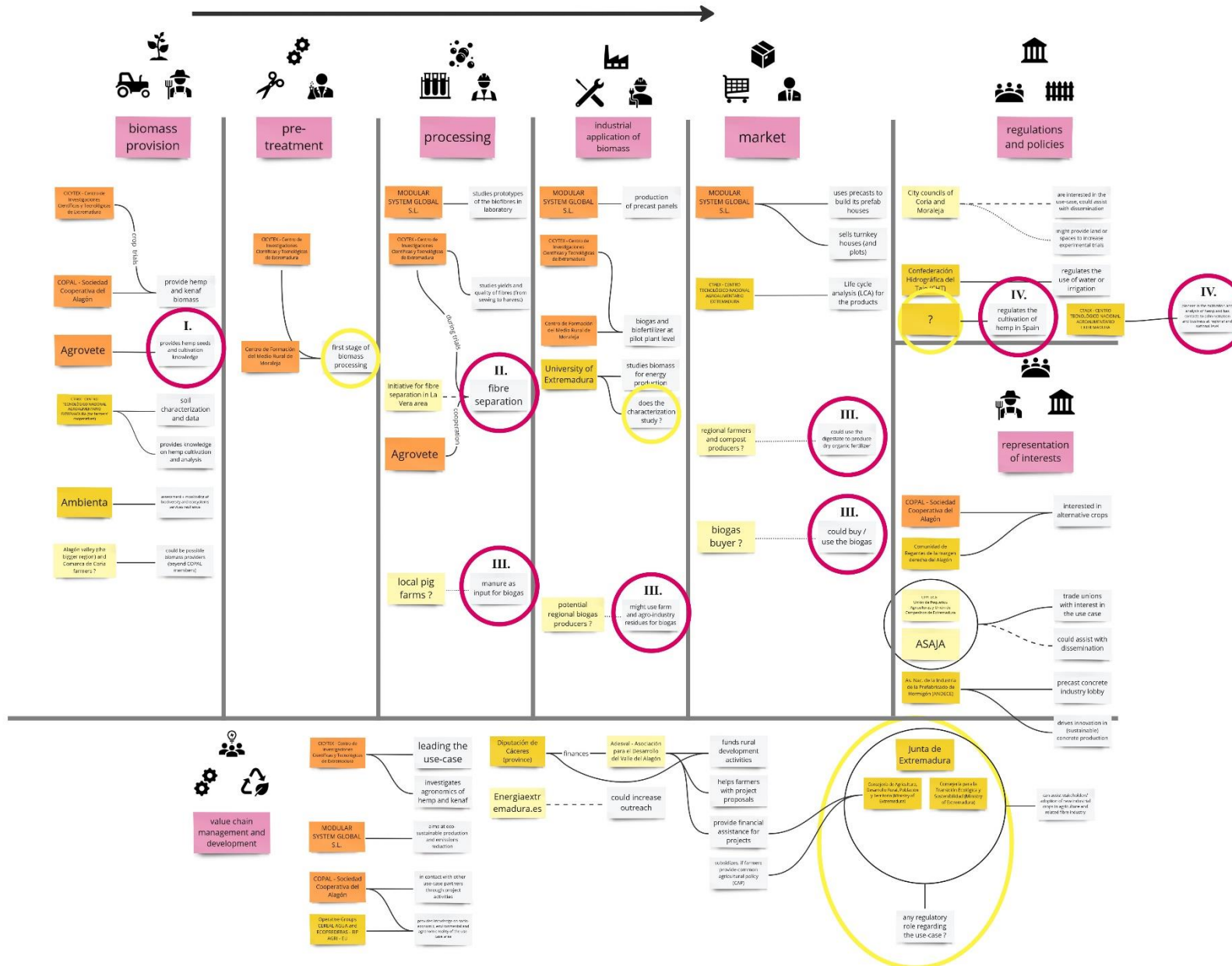


Figure 27: Spanish use-case – stakeholders along the value chain

3.4.3. Semi-quantitative stakeholder analysis

3.4.3.1. Economic sector of stakeholders' activities

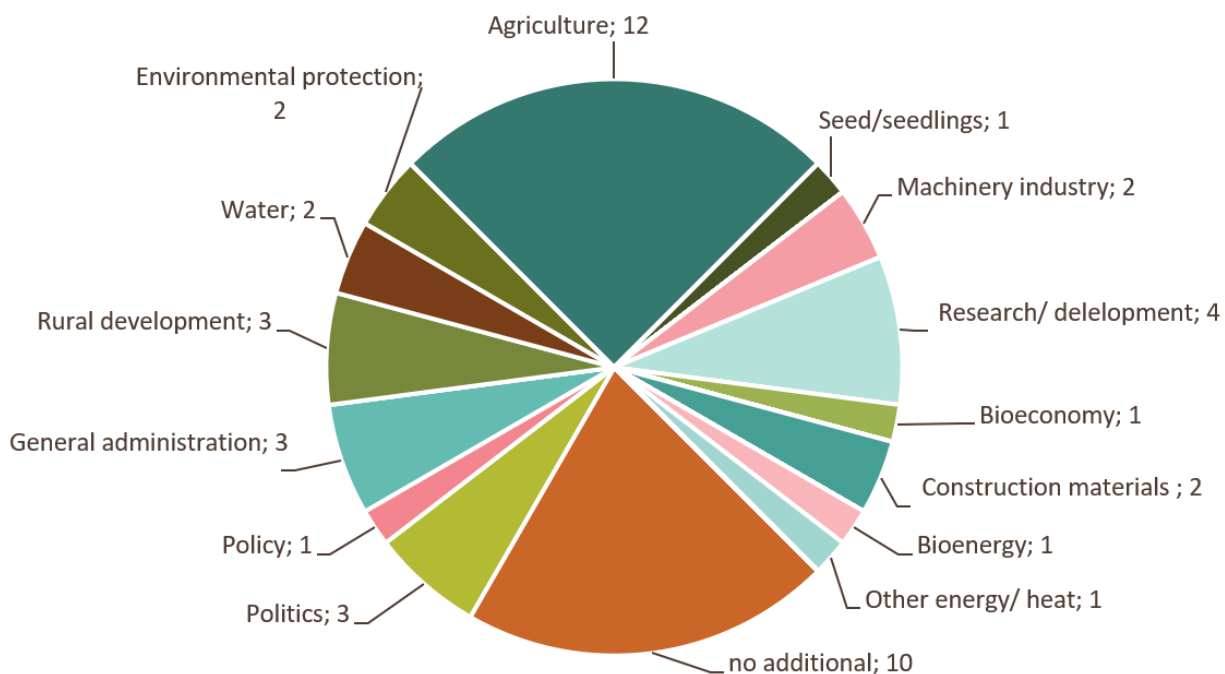


Figure 28: Spanish use-case – economic sector of stakeholders

Palpable are the relatively few economic sectors represented in the graph in figure 28. This reflects above all the fact that the focus of the UC lies on one single value chain. Interesting is the visible presence of the *water* sector, pointing to the intensive irrigation system of the UC region. Remarkable is the absence of *finance* SHs. With regards to the mostly conceptual nature of the downstream value chains on the one side and the reportedly growing business interest in bioenergy and other parts of the bioeconomy on Extremadura, this suggests a path for future SH engagement. The with *bioenergy* is similar. *Construction material* seems underrepresented, but this is relativized by the weight of **MODULAR SYSTEM** and its highly integrated value chain.

3.4.3.2. Type of stakeholders

The big pie chart in figure 29 shows the different types of actors that the SHs of the Spanish UC belong to. Most striking aspects are:

- The rather high number of *associations or cooperatives*, and the presence of *trade-unions*, that could be a sign for a very highly organized agriculture, connected to the tasks imposed by complex irrigation. This goes hand in hand with the low number of *farmers/ biomass providers* (as they are represented by associations). This also shows up in the pie chart in

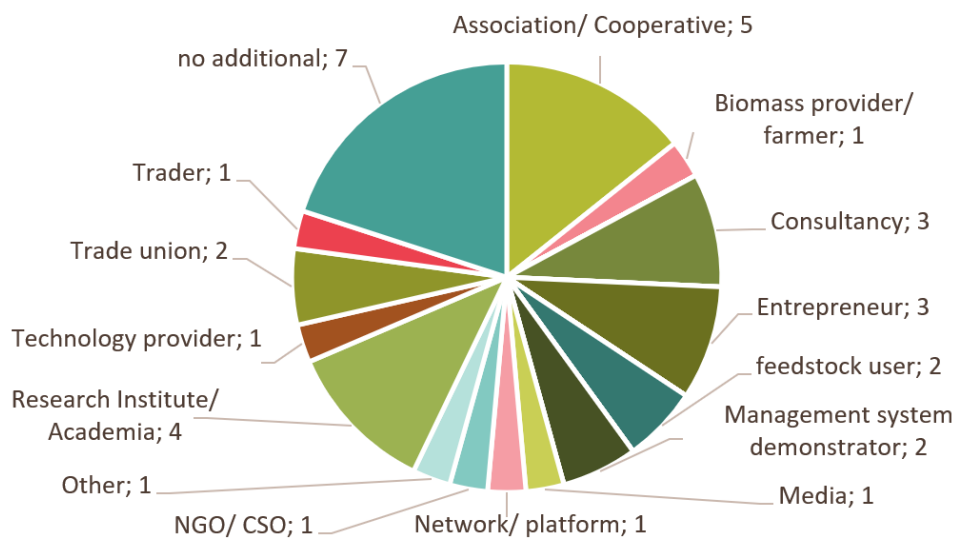


Figure 29: Spanish use-case – actor type of stakeholders

figure 29, as most actors are associations, networks or non-economic actors such as public institutions or research centres and thus appear as *not applicable*. It also becomes very visible, that **MODULAR SYSTEM** is the only one *large* company (more than 250 employees) connected to the UC.

- The presence of one SH from the *media*, which is an exception compared to the other UCs. Certainly, this only emphasizes the necessity to better identify and involve such actor types in the future SH engagement and MarginUp! public relations activities.
- The low number of *NGOs and CSOs* listed as SHs (see chapter 3.4.2)
- The absence of *market regulators*, given the fact that there are legal circumstances for hemp cultivation in the EU (see chapter 3.4.2).
- The absence of *end users*. This comes on the one side from the fact that **MODULAR SYSTEM** has its own access to the construction and real estate market, but on the other side from the absence of any alternative up-take for fibres and the conceptual nature of the downstream value chains.

3.4.3.3. Market role of stakeholders

Most obvious aspects in figure 31 are the absence of *demand* and the very high share of *none*. While the latter is due to the prevalent role of public institutions, research institutes and universities, the first highlights once again the pivotal role

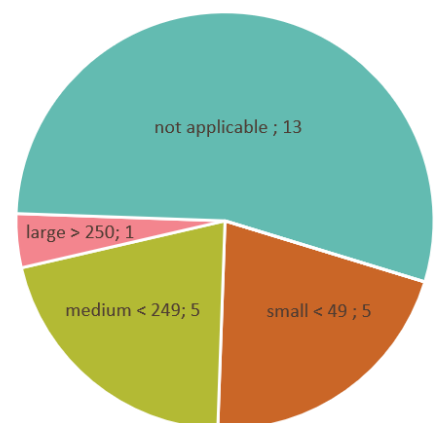


Figure 30: Spanish use-case – number of employees of economic stakeholders

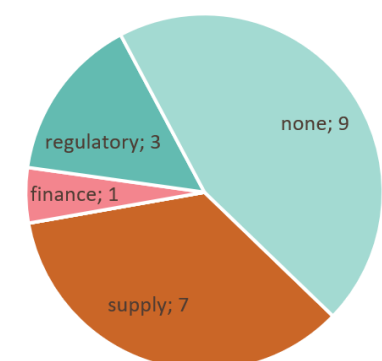


Figure 31: Spanish use-case – market role of stakeholders

of [MODULAR SYSTEM](#) for the UC as well as the fact that the downstream products are still being researched and developed and not yet market-ready. The only SH listed as *finance* is a development association with low resources, financed itself by the [Province of Cáceres](#). National or regional financing schemes, institutions or banks are not included in the list.

3.4.3.4. Attitude of stakeholders towards the use-case

Almost 70 % of the SHs are listed as *supportive* and another 20 % *strongly supportive*. That no SH is listed as *non-supportive* or *very unsupportive* is in line with the other UCs but could indicate to the possibility that critical actors are not properly pictured. Two SHs are listed as *neutral*, though.

3.4.3.5. Main scale of operation of stakeholders along the value chain segments

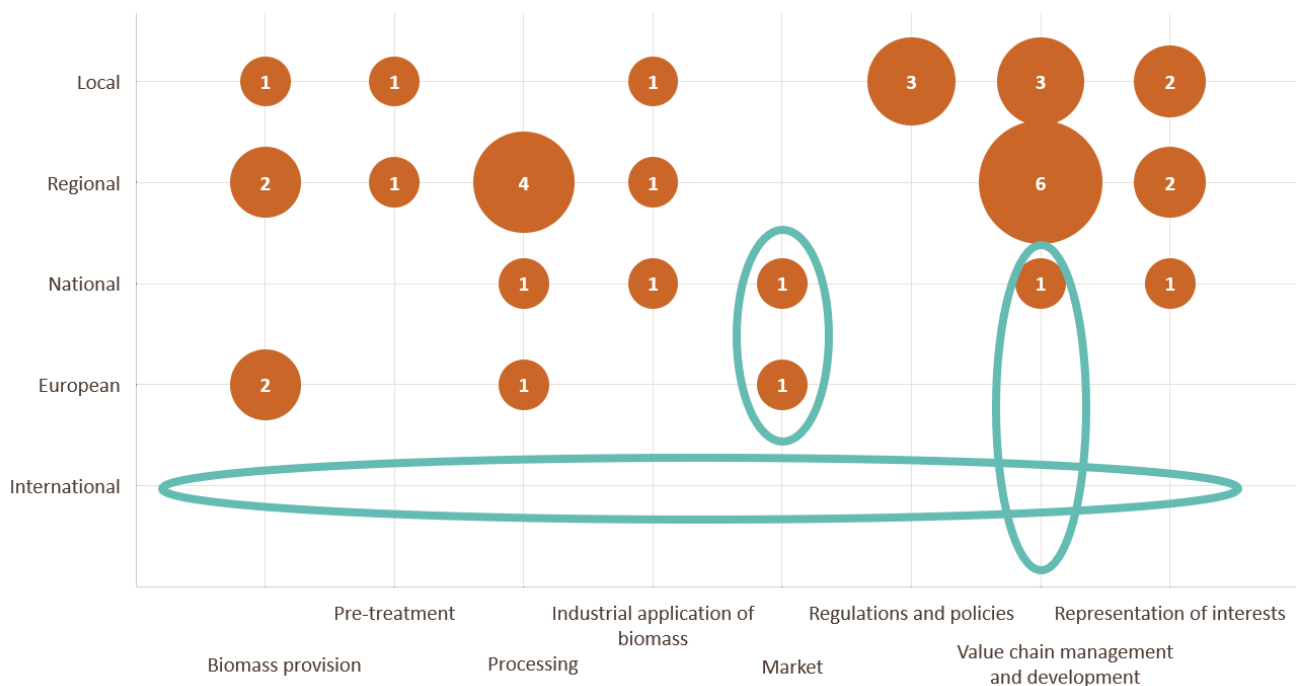


Figure 32: Spanish use-case – main scale of operation of stakeholders along the value chain

The graphic in figure 32 shows the main scale of operation (vertical axis) of SHs of the Spanish UC (including all entries in the SH list) along the different segments of the value chain (horizontal axis). Most striking are three aspects (green circles from left to right):

First, no SH operates mainly at *International* level, and only a few on *European* level. Even though this is not a necessity, given the very localized question of marginal land use, it could be of advantage for a future scale-up to identify and involve relevant actors during the SH engagement.

Second, only two SHs are situated in the *market* segment, one being [CICYTEX](#) (as it does the life cycle analyses). [MODULAR SYSTEM](#) has excellent access to the national market, but there is no alternative SH that could take up the fibres. Concerning the downstream products biogas and biofertilizer, the UC has not yet established contact to any SH from the demand side (public sector or industry).

Third, as potential donors and investors are listed under *value chain management and development*, it becomes clear that no major investor or donor (that would operate on a *National* to *International* level) is connected to the UC. The one actor on the *National* level is again [CICYTEX](#), which as a public research and development institute would not have necessary funds for a real up-scaling.

3.4.3.6. Key stakeholders' resources, attitude and involvement in action and decision moments

In figure 33 it stands out that the *Attitude* of [Agrovete S.A.](#), a critical SH, is unknown. The authors had no opportunity to get a better understanding of this SHs, as the key SH interview could not be conducted. [Agrovete S.A.](#) must thus clearly be addressed by future SH engagement activities. Another interesting point is, that [CICYTEX](#) and the [National Agri-Food Technology Centre \(CTAEX\)](#) have only *moderate* resources (and will due to their institutional task not assume any investment-role) and attention must turn on [COPAL](#) and [Modular System Global S.L.](#) But the latter does certainly not depend economically on a successful scale up and is, probably also due to this reason, not *strongly supportive* of the UC activities. This points at a weak point of the UC: there is no alternative feedstock user and no identified investor. This will have to be especially targeted by the engagement and replication plans (deliverable 5.2).

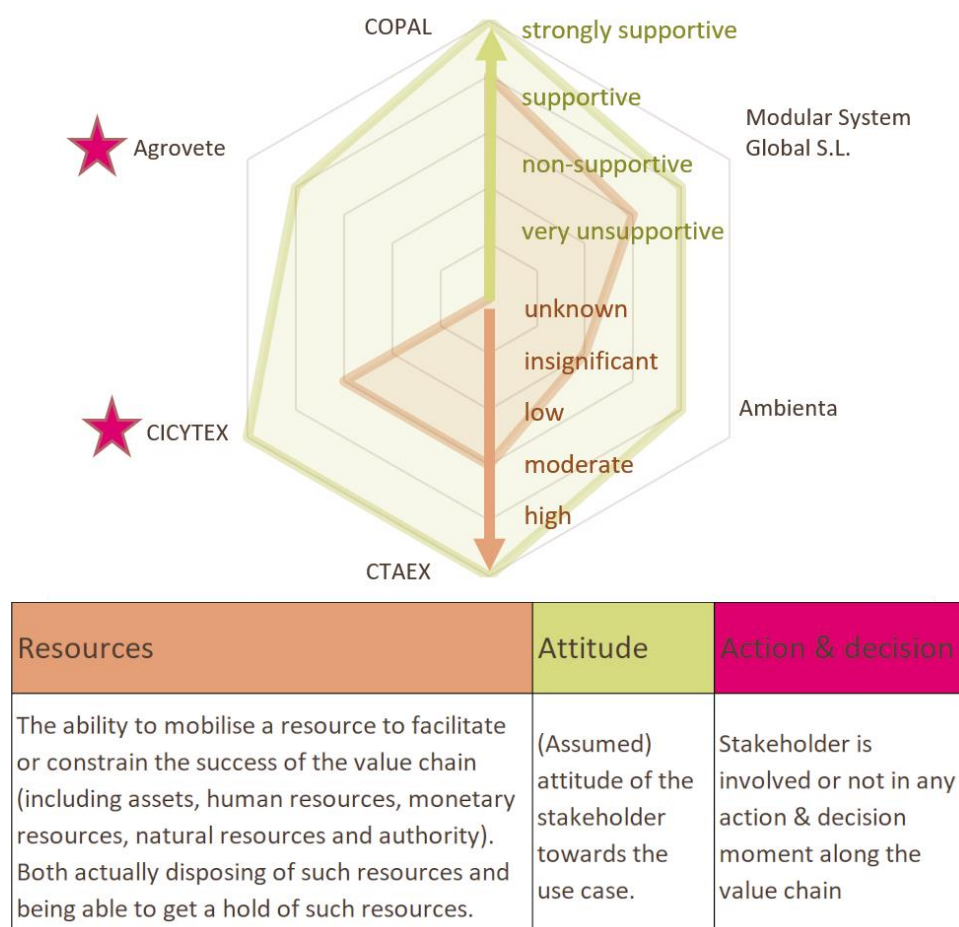


Figure 33: Spanish use-case – radar chart showing key SHs' resources, attitude and involvement in critical actions & decisions

3.5. International use-cases

3.5.1. Argentina

3.5.1.1. Processes and products along the value chain and main stakeholders (including mappings)

The Argentinean use-case is centred around the experimental farm [Chacra Experimental Integrada de Chascomús \(CEICh\)](#), where most fields used for the UC are. The Farm is located on marginal, saline/alkaline soils that are part of a wetland ecosystem in the Salado River Basin region and that are limiting for agriculture. Due to the fragile environment in Chascomús, the use of agrochemicals is regulated by local conservation and environmental policies. The region represents the largest cattle breeding area in the country, and its main economic focus lies on the production of meat. Research and development institutions involved in the UC and the local government are committed to designing strategies for sustainable regional development. Accordingly, actions in the framework of MarginUp! could allow to promote the cultivation of different plant species novel to the region that could be used for novel non-food purposes and markets such as nano-biofertilizer, jet oil, and biogas. These actions would bring both environmental and socio-economic benefits to the region.

In this context, *Lotus tenuis*, a legume native of the European Mediterranean that has successfully naturalized, emerges as a key-species for simultaneous forage supply and soil quality improvement. The production of other plant species with similar attributes that would allow to increase crop and value chain diversity are currently being studied and use-case stakeholders are evaluating the performance of winter oilseed species of the *Brassicaceae* genus (*Brassica napus*, *Brassica carinata* and *Camelina sativa*) for biofuels and oils, and that of *Arundo donax* for bioenergy production.

Existing main value chains connected to the experimental farm [CEICh](#) and other SHs of the UC lay on the production of food, particularly meat, honey (500.000 kilograms annually), milk and edible mushrooms. In addition to the already existing value chains, the UCL and MarginUp! partners identified several other potential value chains for the region:

- the cultivation of rape varieties on more elevated and drier land, to gain oilseed feedstock used as edible oil, animal feed (pressing residues), and the production of biofuels. Argentina is an exporter of biodiesel to Europe and the United States of America (including for aviation). This value chain is likely not further elaborated within the framework of the MarginUp! project.
- the cultivation of kenaf or hemp on more elevated and drier land, to gain fibres as alternative feedstock for the existing paper industry. Until now this industry in northern Argentina uses mainly pines and eucalyptus trees. This value chain is likely not further elaborated within the framework of the MarginUp! project.
- Beekeepers: There are many well established associations for commercialization as well as individual sellers and the bees could forage well on *Lotus tenuis*.
- Dairy farms are important agroproducers in the region. The experimental dairy farm of [CEICh](#) included in this UC counts on approximately 230 milking cows and produces 4500 Lt milk/day that is sold to [La Serenísima company](#). The cattle are

already partially feeding on *Lotus tenuis*. The dairy farm has no manure treatment facility. To solve this problem, *Salicaceae* species could be planted along the small canals pervading the landscape and around the discharging areas of the dairy farms. They would serve as bio-remediators, filtering out nutrients and thus contributing to ecosystem protection, but also provide biomass usable in other value chains (e.g. for mushroom substrate, see below).

- The local company [Micelio.Bio](#) uses sawdust, wood chips and other feedstock to produce inoculation substrate for edible mushroom cultivation. To a certain degree, this feedstock could be replaced by woody biomass from *Salicaceae* pruning on the dairy farms. Once exhausted, substrate is composted and given for free to local horticultural production on family level. The Mushrooms are sold on local and regional markets.
- The spent mushroom substrate (SMS) could be used for biogas production, together with the manure of the cattle. The [CElCh](#) has no plant, but the UC stakeholders have experience with the general matter (see chapter 4.5.1). The heat and the gas would have to be consumed on spot, as there are restrictions that strongly regulate transport and sale biogas (and manure).
- Furthermore, the UCLs are working on the design and obtaining of nanoparticles making use of organic methodologies, using *Lotus tenuis* hay. For now, they work on micronutrients like zinc, manganese and copper to be incorporated in fertilizers through the company [Bahnsa SA](#).

Argentinian use-case – products along the value chain

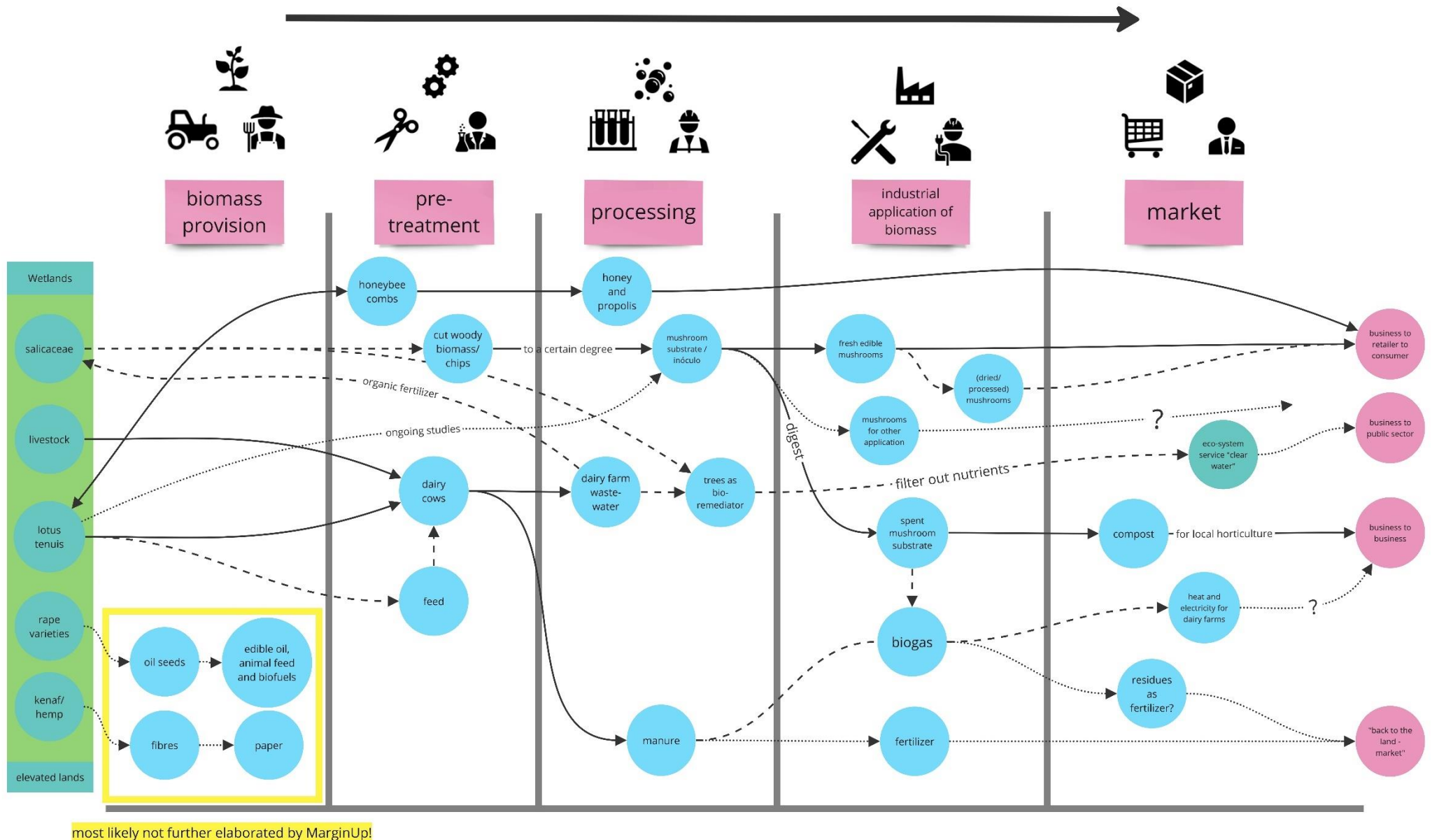


Figure 34: Argentinean use-case – products along the value chain

Argentina - stakeholders along the value chain

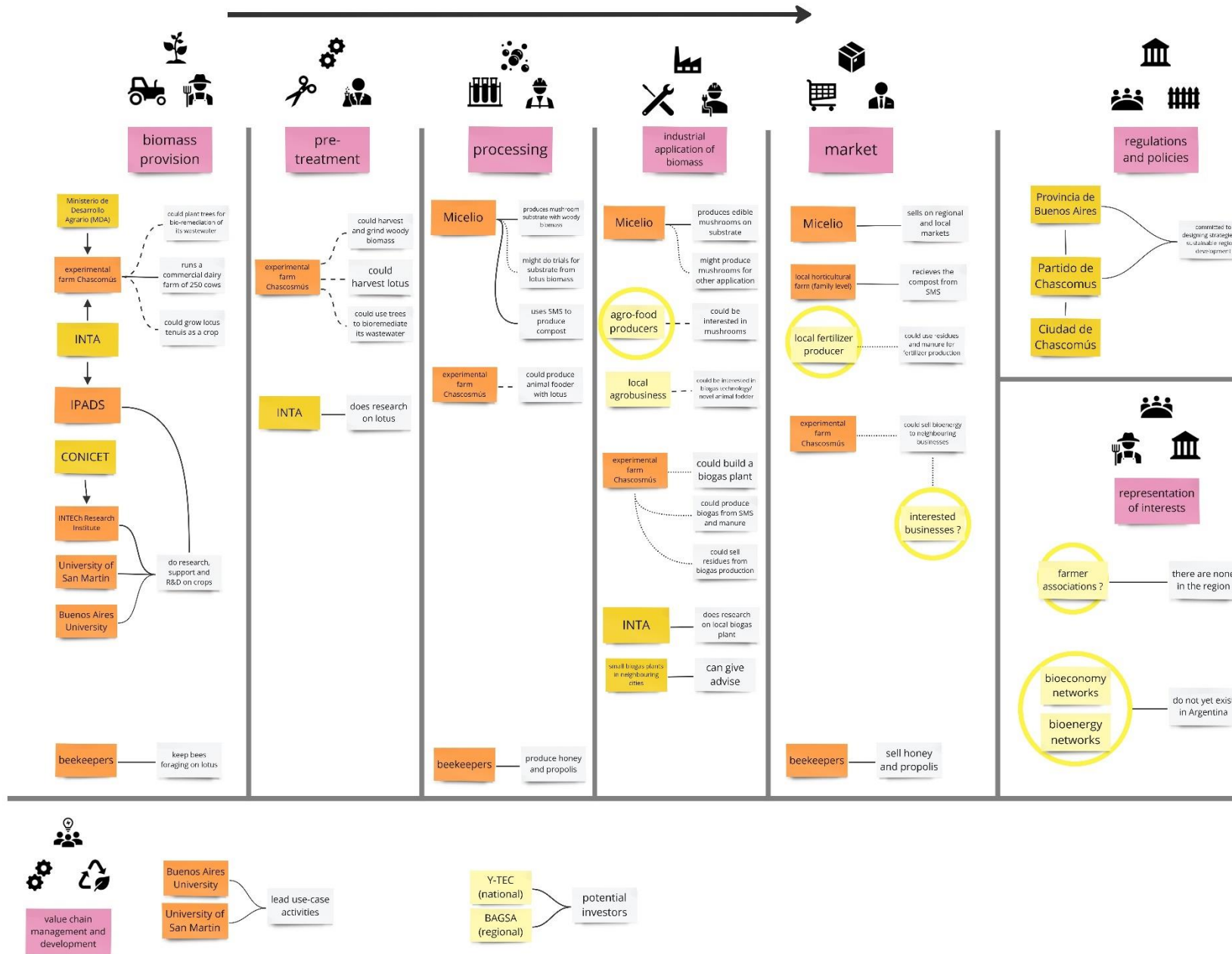


Figure 35: Argentinean use-case – stakeholders along the value chain

3.5.2. South Africa

3.5.2.1. Processes and products along the value chain (including mapping)

The UC in South Africa is built up around the biomass of tree species, that are invasive (pines, acacias, eucalyptus, prosopis, poplars, willows, etc.) and that have been spreading in vast areas of the country (private land, communal land, national parks, etc.). As they threaten local biodiversity, encroach on farmland with resulting reduced productivity, increased fire risks and, maybe most importantly, greatly affect the local water balance, there are many private and government initiatives to fight them (e.g. the [Overberg Renosterveld Conservation Trust](#) or the [Aghulas Biodiversity Initiative](#)). The UC wants to follow up on some potential value chains that could make economic use of the trees' biomass hence increasing the productivity of these invaded "marginal lands" either/both for environmental services (e.g. more water supplies) and for agricultural production including livestock management. Some of them are already being pursued on a small-scale level, others are still cutting-edge research. Things are evolving, for example there are a few value chains that are up-and-running (mostly biochar and bioenergy but also wood vinegar, animal bedding and others). But information on these developments is not available and if it is, then not yet centralized, analysed and made accessible. The value-chains presented below are the ones that are presumably most market-ready.

- Biomass provision: there are many conceivable ways to deal with the invaded areas, but all the ones presented below would yield woody biomass. Some only once, others on a regular basis.
 - natural regrowth with rotation cycles
 - substitution by other non-invasive species
 - development of farming/ grazing activities on previously cleared land
 - land clearing followed with ecosystem restoration
- Pre-treatment: the biomass (trunks, barks and leaves) can be left to decay or be burnt on site, or it can be put to use.
 - The wood can be used locally, for example with the construction of fences with poles or with biochar application to the soil for enhanced productivity and/or carbon storage.
 - Wood and branches can be used as firewood by local communities or be sold as firewood.
 - Wood, barks and leaves can be stockpiled and transported elsewhere for further processing.
- Processing: the biomass can be used as
 - charcoal for cooking and heating
 - or be turned into wood chips for further industrial application.
 - Industrial application of biomass:

- The wood chips serve as raw material for different products:
 - torrefied wood chips (with better combustion properties)
 - pellets and briquettes for domestic energy uses or exports to Europe under the Renewable Energy Directive.
 - bio-char (that can be applied to fields, especially if further activated, e.g. with chicken manure). Sometimes biochar is produced on site in mobile retorts and applied directly to neighbouring fields (similar with charcoal and mulch).
- The chips can also be directly used in bio-energy plants, to produce heat (e.g. for chicken breeding farms, or to dry pellets) and electricity.
- The logs for higher quality and bigger trees can be used at the sawmills, e.g. for planking or lumber.
- Market: While biochar, electricity and heat can be used directly by farmers, most products are interesting for other businesses and small industries. The electricity can also be sold to the public sector, as well as construction wood (sought after for large public housing projects). Firewood and charcoal are also directly sold to private consumers or retailers.

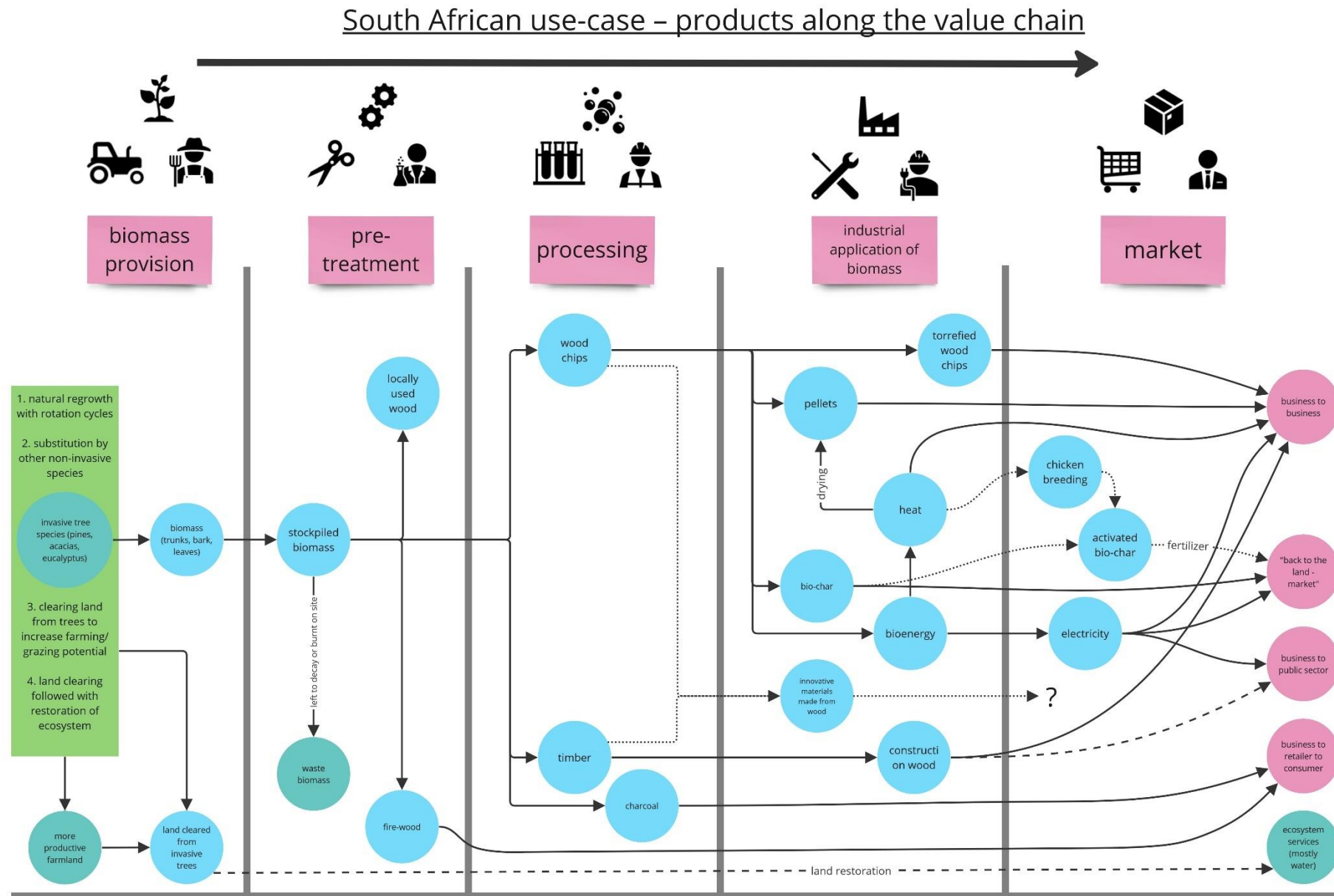


Figure 36: South African use-case – products along the value chain

3.5.2.2. Action and decision moments (including mapping)

In the mapping of the SHs along the value chain (see figure 37) we identified several *action and decision moments*, highlighted with purple circles and numbered. These moments flag up constellations or situations that need to be influenced and changed in a certain way to ensure a favourable development of the envisaged value chain or a successful and sustainable scale-up. Below, each such moment in the mapping is presented.

I. Create (financial) incentives for landowners to clear their lands from invasive species and/or increase efficiency of supply chains

Even though landowners in South Africa are legally compelled to remove invasive species, this is not enforced and rarely followed. Cutting the trees can have positive impacts on the strained water balance, but until now there is no financial retribution for this ecosystem service in place in South Africa. It has been tried by a provincial government (water users in a city would pay for restoration upstream) but faced regulatory barriers. Thus, creating (financial) incentives for landowners is a crucial point for the whole value chain, to ensure a sufficient and steady flow of biomass.

A way to go could and should be, that a good coordination between publicly-funded land clearing operations and biomass suppliers and users is organised and implemented. As it stands, governmental programs (or NGOs) do the land clearing but leave the logs on the site, occasionally burning them. These can then be collected by small and middle-sized enterprises (e.g. [Bio Logistics Africa](#)) to supply the biomass to buyers like the [COEGA biomass centre](#). This case is happening, but unfortunately still very rarely for several reasons and especially because of the absence of information-sharing. Another way could be to substantially increase the demand by public entities (e.g. municipal bioenergy plants such as the one in [Knysna](#)) or large industries, with support by law enforcement to constrain landowners to provide access if not to (at least partially) cover the costs of land clearing.

For the sake of completeness, it should be mentioned that environmental NGOs and scientists may have concerns about increasing industrial usage of this biomass because of alleged negative impacts from harvesting operations and incentives to maintain the resource (instead of eradicating the invasive species on the particular sites). Yet the current rate of propagation has let some of these SHs to be more open to such compromises for the sake of pragmatism.

II. Innovative energetic use of invasive species' biomass for a multinational enterprise

The start-up [Thegka](#) developed new briquettes made from biomass from water hyacinth and invasive trees within a supply agreement with the multinational [UNILEVER](#). UNILEVER produces soap in South Africa and plans to acquire these briquettes in sizeable quantities to remove coal from its boilers. This promising value chain links innovative research with the high demands and investment power of a big enterprise, all within South Africa. Such moves seem to announce more similar projects and feedstock agreements in the framework of the just energy transition and under market pressure to reduce emissions and contribute to sustainable development. For the sake of illustration, another example of innovative application is the interest of a company designing water treatment plants to use biomass from invasive alien trees as a fuel to operate such plants.

III. Biochar as study subject with promising benefits for soils

Many SHs explore ways to use the biomass to produce biochar. This material can, under the right circumstances, contribute to a better soil quality more resilient to climate change (e.g. water stress) and storing carbon for a relatively long period of time (e.g. decades). But the exact effects are very dependent on the specific soil, composition of biochar and pre-treatment with other organic matter (e.g. manure), and still subject to research. In many cases the biochar needs to be “activated” with nutrients and other elements, for example from chicken manure, in order to have positive effects. The farmer [Angus](#) as well as the [Council for Scientific and Industrial Research](#) experiment with this value chain. MarginUp! might facilitate contact between these two SHs and other landowners, as well as possible end users of the biochar.

IV. Plans for a municipal bioenergy plant in Knysna

Biomass is used in South Africa by pellet (or briquette) producers and industries that use boilers to generate their own energy. Beyond that, the UCL’s knowledge about practical applications of invasive trees for bioenergy in the country remains limited to this point (including possible investment plans). An exception is the [Municipality of Knysna](#), that is very active in invasive alien trees control and biomass use. The municipality plans to build a “waste to energy - plant”, that would also involve biomass and it already conducted a feasibility study. It could mobilize resources and use legal instruments to facilitate the implementation. [NRGen Advisors](#), a consultancy providing services on bioenergy value chains, especially from an engineering / processing standpoint, is involved in another project to build a plant near [Stellenbosch University](#) (in collaboration with the university) to produce electricity for local uses; the UCL is connected and will follow the evolution of the project.

V. Enquiry about sawmills that (could) use invasive trees

Even though [G&K Mouldings](#) is listed as SH, the UCL encountered difficulties when establishing contact. In general sawmills are interested in the biomass, some of them were also connected to the commercial tree plantations that contributed significantly to the introduction of the invasive alien tree species in South Africa. Many use the same invasive alien tree species to this day but most of the time from commercial plantations. A few instances were identified where sawmills do source some wood from unmanaged invaded areas and particularly pines and eucalyptus.

VI. Potential conflicting uses of local communities

The widespread invasive alien trees have been commonly used by communities, especially as firewood. Currently, there is no tension between industry and communities that the UCL is aware of. But increased demand of the biomass could potentially create situations of concurrence with subsequent tensions with the local population. Such conflict situations would particularly arise when invaded areas that used to provide goods and services to the communities are cleared and restored so that such trees are removed from the landscape. This is the case especially when the biomass collected and used by others than the communities. This social and political dimension must be considered in any value chain design.

South Africa - stakeholders along the value chain

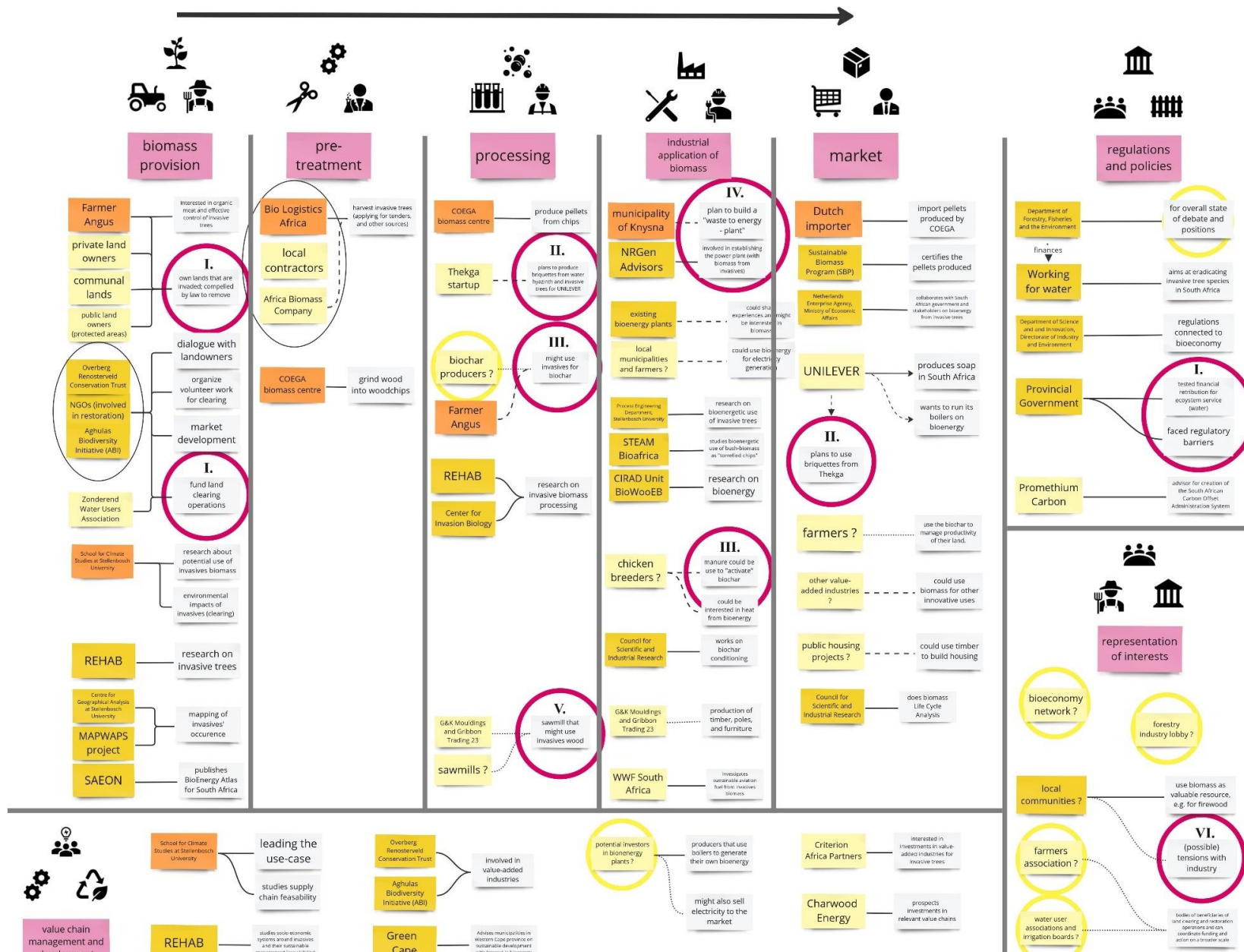


Figure 37: South African use-case – stakeholders along the value chain

3.5.2.3. Semi-quantitative stakeholder analysis

3.5.2.3.1. Economic sector of stakeholders' activities

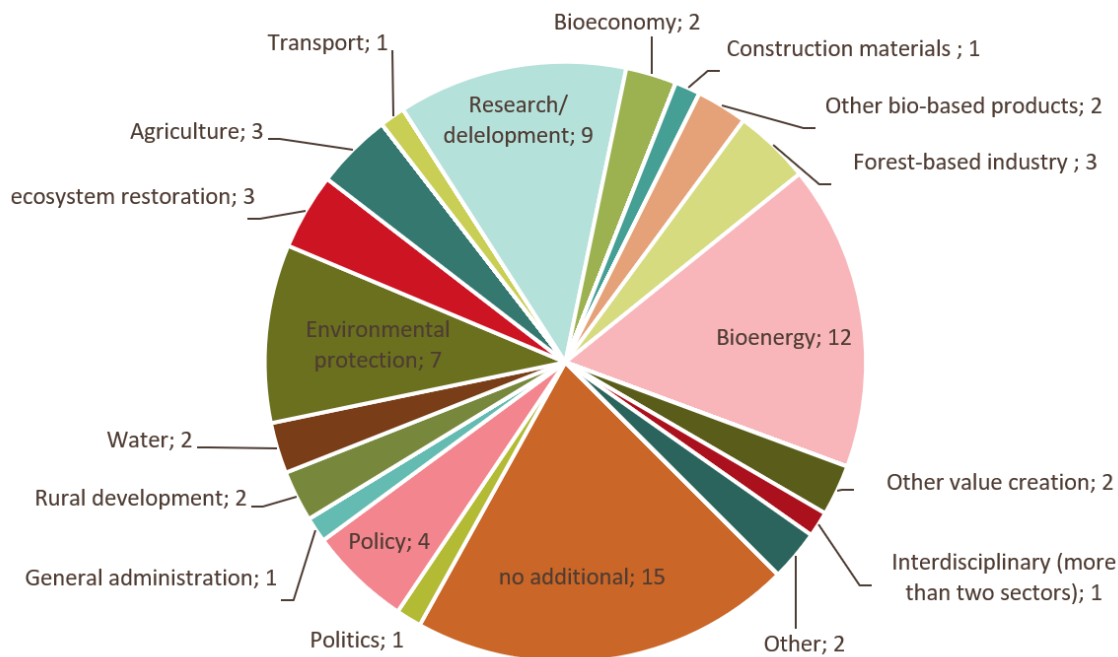


Figure 38: South African use-case – economic sector of stakeholders

Reflecting the fact that the biomass does not derive from planted crops, *Agriculture* features very little in figure 38, with *Bioenergy* being most prominent due to the multiple energetic uses of the woody biomass. However, it also highlights the fact that the UCL is in direct contact with only one concrete private landowner and farmer. Compared to the other UCs, *Environmental protection* and *Ecosystem restoration* show up much more, proportionately as well as in absolute numbers. Representatives of these two sectors are conservation NGOs as well as research institutes and public entities, giving the environmental threats through invasive alien species to the South African ecosystems a prominent role in the whole setup of the UC.

3.5.2.3.2. Type of stakeholders

The pie chart in figure 40 shows the different types of actor that the SHs of the South African UC belong to. *Research institutes and Academia* feature most prominently, amongst them the [University of Stellenbosch](#) as UCL. Included in this category are many (international) research institutes and projects, that work on the up-to-date topics of invasive alien species, bush encroachment, climate adaptation and water as well as the use of biomass for renewable energy. *Entrepreneurs* make up a quite small portion of the total. This is coherent given the fact that many SH groups on the mapping (see figure 37 above) remain to this date placeholders, as contact to specific actors is still being made (e.g. farmers, biochar producers, chicken breeders and sawmills).

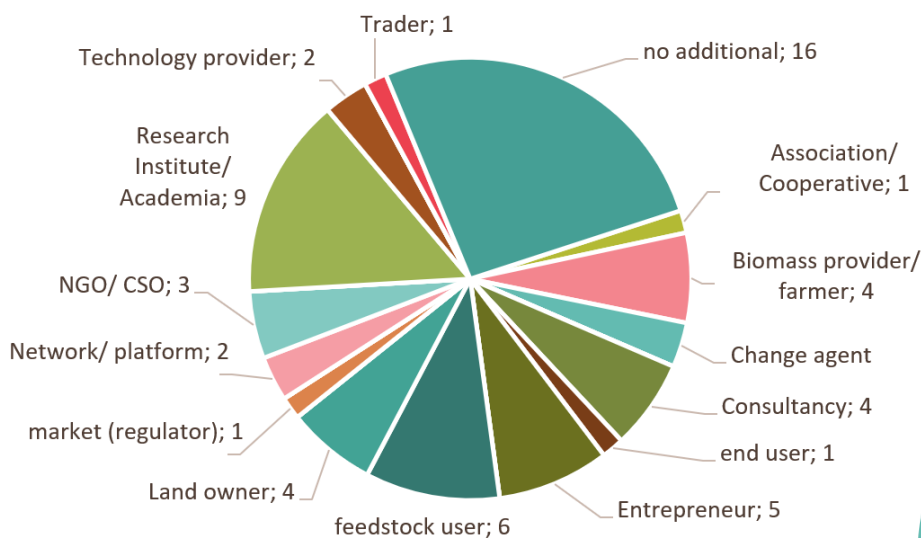


Figure 39: South African use-case – actor type of stakeholders

Regarding the size of the actors it becomes apparent in figure 39, that almost half of the SHs are not classified as *economic actors* and thus no number of employees was registered. It underlines that fact that many SHs are research institutes and projects, as the value chains featuring in the UC are in part still in development and the knowledge on others is not available and if it is, then not yet centralized, analysed and made accessible.

3.5.2.3.3. Market role of stakeholders

The share of SHs with *no market role* in figure 41 is very high, but still comparable to other UCs. It further underlines the in large parts conceptual nature of the portrayed value chains, but also derives from the many public entities represented (e.g. municipalities or state departments). Favourable is the good representation of *finance*, especially when looking at the challenge to create financial incentives for clearings described in chapter 3.5.2.2.

3.5.2.3.4. Attitude of stakeholders towards the use-case

While few SHs are listed as *strongly supportive*, half is listed as *supportive*. As the depicted value chains are in parts conceptual, this will likely be the assumed attitude through informed assessment of the UCL. As with other UCs, no SH is listed as *unsupportive* or *very unsupportive* which could indicate the possibility that critical actors are not properly represented in the SH list.

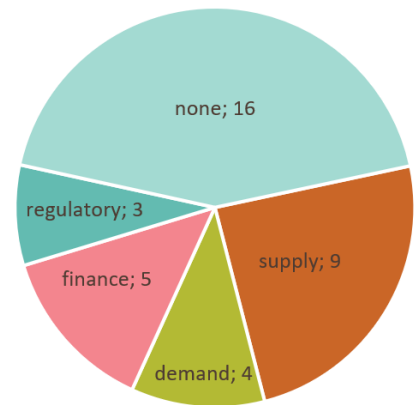


Figure 40: South African use-case – number of employees of economic stakeholders

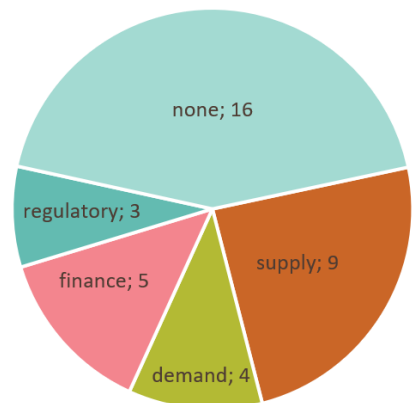


Figure 41: South African use-case – market role of stakeholders

3.5.2.3.5. Main scale of operation of stakeholders along the value chain segments

Figure 42 shows the main scale of operation (vertical axis) of SHs of the South African UC (including all entries in the SH list) along the different segments of the value chain (horizontal axis). Most striking are four aspects (green circles from top left to right bottom):

First, most SHs are somehow involved in the segment *biomass provision*. While only some SHs really possess land that has invasive biomass, some SHs represent groups of landowners that could possibly provide biomass. Others do research on the topic or work on incentives to clear invaded areas. The focus on this area reflects the fact that there is plenty of biomass available, but access and economic harvest pose serious challenges at the core of the UC (see chapter 3.5.2.2).

Second, many SHs work mostly on a *National* level, stemming from the fact that the UC does (so far) have not focus on any specific area but examines the situation in the whole of South Africa.

Third, many SHs are well connected internationally, and a few are situated in other countries. This is not only valid for many of the research institutes, but also for SHs from the *market* segment as the multinational company [Unilever](#) or the [Dutch importer](#) that buys wood pellets from South Africa.

Fourth, and most remarkable, is the absence of any identified SH from the segment *Representation of interests*. Bioeconomy networks, farmer's associations, lobby organizations of the forestry industry, water user associations and irrigation boards as well as affected local communities can be assumed as important SHs representing the interests of the respective groups but have to date not been contacted and identified. This presents itself as an opportunity for future SH engagement.

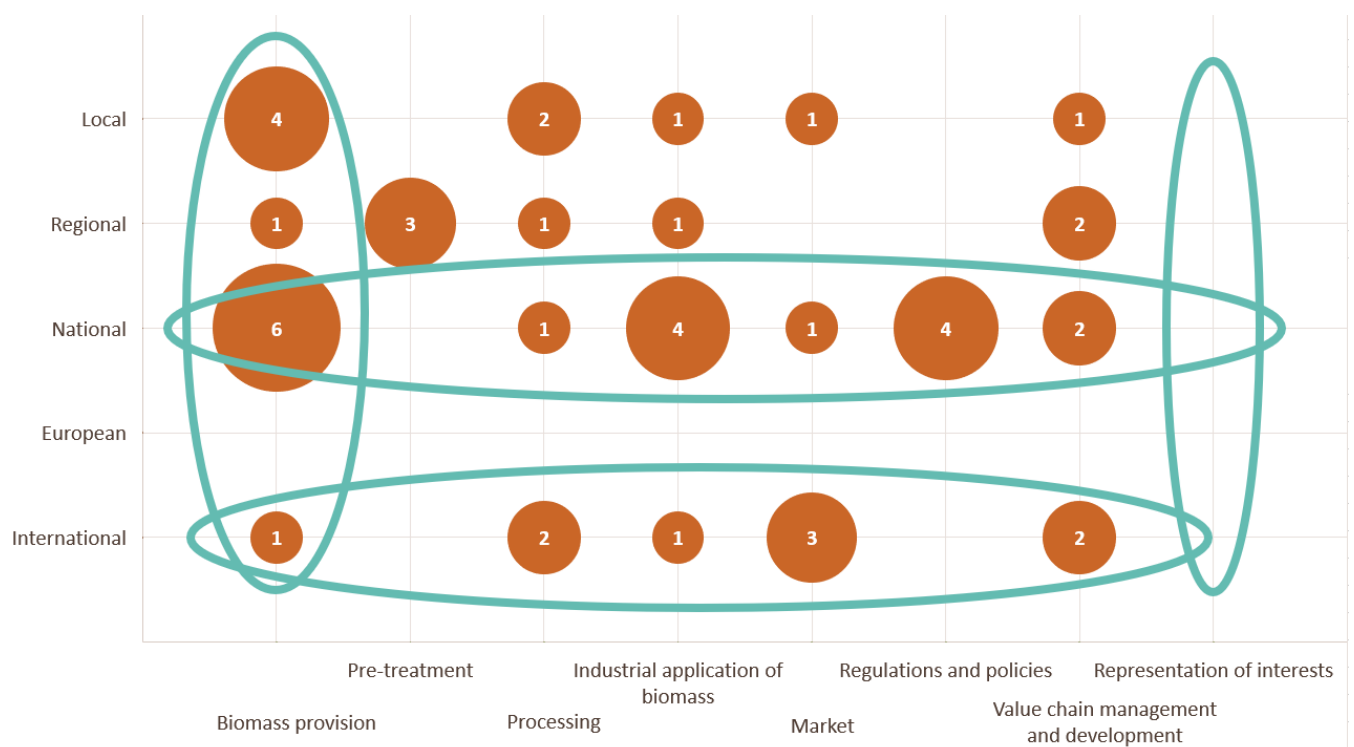


Figure 42: South African use-case – main scale of operation of stakeholders along the value chain

4. Composition and objectives of the value chains

While some value chains are highly integrated, others are characterized by many different and mostly rather small SHs. The following paragraphs give a brief summary of the composition of the stakeholder landscapes and the objectives of the main stakeholders of each UC.

4.1. Greece

The main value chains in the Greek UC plan to shift land that is currently not used economically (former mine lands) to a twofold biomass production (i. woody feedstock and ii. blossoms and herbs). Both value chains exist in (remotely) similar forms in the area but not up to now focused on the species *Robinia pseudoacacia*, which is mainly used in the UC. The main stakeholder of the wood value-chain, [ALFA WOOD](#), has a highly integrated value chain that involves even foreign markets. However, on the biomass supply side, to the authors' knowledge, it does not have direct access to its own biomass (forests or plantations) and therefore must compete with other users. The situation of the value chain based on acacia flowers and herbs is very different, with some very small SHs performing single steps of the expanding value chain. The potential for a scale up comes through two types of actors. One is the many representatives of the local and regional essential oils, herbs, and derived cosmetic and health products producers, that have evolved in the region. The other is some major Greek cosmetic companies with international ownership and markets, that might be potential investors.

The main objective of the landowner is the restoration of former mine lands. [ALFA WOOD](#) tries to widen its feedstock basis while the SHs of the cosmetic value chain search for innovative products, networking with other SHs and increasing the visibility of their rather small businesses. The main obstacle is the question of land ownership and usage (redistribution? restoration? reutilization (photovoltaic)?), which is highly political and decided to good parts on a national level. On the other side it is an opportunity through the availability of "new" land and likely future investments through European funds connected to the decarbonization process.

4.2. Hungary

The Hungarian UC uses marginal lands unsuitable or limitedly suitable for food crop production for growing energy plants (*Sida hermaphrodita*, *Salix viminalis*), to support cascading use of the biomass via food (oyster mushroom) production, bioenergy and biofertilizer generation. While the area has a strong agricultural setting, the regional business models are endangered by local and global environmental change and economic changes. The value chain is very much centred around a major agricultural enterprise and food producer ([PILZE](#)) that has strong connections and control towards both ends of the value chain (biomass provision and market). For [PILZE](#), the main motivations for change are cost reduction, elimination of the problem of chemical residues (in wheat straw) and the availability of feedstock in the close area compared to the conventional wheat straw in the short run and a potential full integration of biomass provision (through yet to be acquired marginal lands, that seem to be quite

abundant). For the second important stakeholder and biomass producer [KUJÁNI](#), the motivation is to acquire more expertise for own consulting activities and the analysing the potential valorisation of sandy soil (e.g. because of water scarcity). The apparently strong presence of international agro-chem-tech enterprises with strong research capacities could facilitate a scale-up, as well as national agricultural banks and the strong network of soil- plant- and agricultural scientists.

4.3. Sweden

The main value chain of the Swedish UC is centred around the test of a new renewable feedstock for the biodiesel production of the transport company [Ernsts Express AB \(EEXP\)](#). This company runs all its vehicles on almost fossil free fuels since 2015 and produced its own biodiesel. The production used spent kitchen oil, and [EEXP](#) is now looking for turnip rape as alternative feedstock. While turnip rape is already grown in small quantities in the two UC provinces, the use of turnip rape seed oil in the specific chemical process (see chapter 3.3.2) is a novel process. [RISE PROCESSUM](#) plays a key role here, adding significant technological expertise. In addition, there exists a number of innovative stakeholders in the field of biofuels, that could help with technical challenges (like cold temperature performance of the biodiesel), but also offer logistical services and facilities for a possible future distribution of higher quantities. As a precondition for increased production volumes, developments on both ends of the value chain are decisive:

To scale up biomass provision, additional farmland would have to be cultivated including turnip rape in the crop rotation. This can happen through the continued use or re-use of farmland that is already fallow or in danger of being abandoned, constituting a main goal of the Swedish MarginUp UC. To achieve this, there are several possible ways: one is to provide interested local farmers (like [Stefan Andersson](#)) with convincing business cases to encourage them to invest in (expanded) production. In an ideal case, another small biodiesel plant could produce biodiesel that could be used by the farmers themselves for their own machinery. These farmers could for example be reached through the [Federation of Swedish Farmers](#), or other stakeholders.

On the market side of the value chain, it is indispensable for any scale-up to increase the local and regional demand for biodiesel. The stakeholder mapping identified several SHs that could play a role here, for example the [Regions of Västerbotten and Norbotten](#), that put public transport services out for tender and could probably influence decisions on technology used and sustainability standards to be met.

Another possibility that joins two ends of the value chain could be to win over a company with highly integrated value chains (e.g. [Alviksgården](#)) for increased production and in-house use. This would be especially interesting if, in addition to the biodiesel production, spent edible oil could be used for the biodiesel production and other byproducts of this production could be used as valuable feedstock for on-site biogas production.

4.4. Spain

The Spanish UC aims at increased resilience and sustainability of an existing cropping system, which is based on intensive irrigation and a rotation of pastures, corn, pepper and tomatoes. To achieve this, hemp and kenaf are planned to be introduced into the crop rotation. As these plants are expected to consume considerably less water and require less pesticides, their

cultivation is more environmentally friendly and also better adapted to climate change and subsequently strained water reserves. In addition, the use of the biomass (the fibres) by a local industry ([MODULAR SYSTEM](#)) and potential cascading uses (residues for biomass and downstream products like digestive as fertilizer) diversify the farmers' incomes and add to regional value creation in the industry.

The use of the bio-fibres as replacement of plastic fibres in the production of precast panels for modular houses is a technical challenge, but the involved SHs are well established, connected and a transfer to a scaled-up harvest, processing and application as well as the marketing of the final product is well conceivable. Presumably, beyond the very interested farmers of [COPAL](#) that are already involved in the UC, the highly organized local farmers could easily be approached if rising demand of the fibres requests a higher production. The pre-treatment and processing of the biomass (mainly the fibre separation) however could at this time not be scaled up in the region but would depend on SHs elsewhere (e.g. from Portugal).

The downstream value chains of the biomass residues (e.g. biogas and biofertilizer) are at this stage of the project on a conceptual level. Groups of potential SHs are identified and the growing business environment around biogas production in Extremadura is closely observed by [CICYTEX](#), but the situation is unsettled and thus no specific SHs could yet be identified.

4.5. International use-cases

The stakeholder landscapes of the two international UCs represent ideal conceptions of future value chains, reflecting the very early and conceptual stage of value chain development. Accordingly, not all necessary SHs are identified, and many identified SHs are not yet in close contact with the UCLs, and their properties are not known in detail. Nevertheless, ideas about available biomass and possible value chains are well-founded and detailed, and often parts of the depicted value chains are already operated by SHs in the two countries. The next step in both UCs will be to gather more information about all SHs and to contact the ones identified as *key stakeholders* and tap their knowledge and experience. On this basis, the different value chains of each UC and the different segments (often located in very different regions of the country) could be brought together by means of stakeholder engagement. Once Boards of Actors (BAs) have been created, the SHs and MarginUp! partners can debate and develop ideas for a socially, ecologically and economically sustainable progression of the existing UC value chains and envision a potentially successful future upscaling of these activities.

4.5.1. Argentina

The UC as a whole is currently dominated by the two [Universities of San Martín](#) and [of Buenos Aires](#) (both MarginUp! project partners) and several research institutes, that concentrate in the biomass provision as starting point of research and of the conception of local value chains. There are also research activities around the use of biomass for biogas production and practical experience: the neighbouring Balcarze (a small and marginalized community) already has a biogas plant in Los Pinos that produces heat and electricity for a dairy farm. It is a public-private demonstrative unit and is run with chicken manure and potato residues from local origin. The central value chain around lotus is developed around the experimental farm [Chacra Experimental Integrada de Chascomús \(CEICh\)](#). Besides its research activities, the farm sells milk and other products, possibly biogas (once a plant has been established) and potentially biomass from lotus or woody biomass. The only private economic

stakeholder is [Micelio.Bio](#), that has an existing value chain based on edible mushroom production and is interested in alternative feedstock (until now relying mostly on what straw, sawdust and woodchips) for the production of the inoculation substrate.

Currently, there is only one local farmers association that concentrates on horticulture (potential uptake of compost from SMS), but no associations that include dairy farms or other potential stakeholders for a scale-up. Anyways there are many small-medium dairy farms nearby, that could replicate the plantation of trees for bioremediation of wastewater (and downstream value chains). More difficult is the situation regarding a scale-up of the biogas production due to strong regulations (see chapter XX) but also due to lacking demand, as there are no energy intensive businesses in Chascomús. So funding will probably have to come from public sources. There is no funding yet, but the UCL is actively engaged in the search for funding. Currently, there is no regional or national network on bioeconomy or bioenergy, yet. To contribute to such developments could be a valuable contribution of the Argentinean MarginUp! use-case. The local administration and government is reportedly interested in innovative and new value chains, but to the author's knowledge there is no close contact about the UC yet, leaving space for future SH engagement.

The described value chains are in part existing, in part conceptual in nature. As of now, the UCL together with WP5 and other partners is analysing the stakeholder landscape and agricultural, ecological, industrial and economic possibilities of the UC region. This is ongoing, and no choice has been made yet for a specific biomass, bioproduct and the respective value chains. Thus, the value chains depicted in this report will be modified and the Technological Readiness Level of the envisaged bioproducts can only be determined in the months to come. The running activities are in any case often complementary to research and implementation done by the European MarginUp! partners. This is especially valid for the evaluation of ecosystem services, the identification of soil microbiological functional communities and the design and evaluation of bio-inoculants to improve the abiotic stress tolerance of plant species implanted in marginal soils for agriculture.

4.5.2. South-Africa

In contrast to all other UCs, the biomass in South Africa doesn't have to be cultivated, but only to be harvested. Up to now, main reasons to harvest the invasive trees are nature conservation and water balance security. This is because nor the legal prescription to remove invasive species, nor the economic benefits seem to effectively enforce or motivate landowners to cut the trees. At the centre of the set-up of the value chain are therefore several SHs from the value chain management and development segment and research institutes, that develop business models around the invasive trees. As important are innovative and engaged farmers and start-ups, that invest their resources in their entrepreneurial experimentation. From the demand side, local municipalities, overseas importers, and a multinational corporation seem to be the most promising SHs for a future scale-up. The crux of the matter will be to connect research & development with the potential biomass buyers and then jointly to present a convincing business model to the landowners, that takes account of the interests of local communities that rely in part on domestic use of invasive trees.

5. Conclusions

The findings and insights presented in this deliverable (D5.1) hold significant value for the MarginUp! project and for the understanding of the stakeholder landscapes of innovative value chains based on bioproducts and biofuels from marginal lands. By identifying and analysing the SHs for each UC, this deliverable offers several specific benefits that contribute to the project's objectives:

5.1. Results overview

1. **Analyses on stakeholder configuration:** The comprehensive information allows to define underrepresented stakeholder groups (e.g. from environmental protection, local and national civil society, finance, media) for a proper stakeholder representation in local Boards of Actors and future involvement. It also provides hints to some blind spots or weak points of the UC setups regarding a potential upscaling of the value chains (e.g. financing institutions, market access, government support). The related findings differ from UC to UC but often point at improvement opportunities that will have to be further elaborated and capitalized by other MarginUp! WPs.
2. **Increasing involvement of external partners:** The motivated private economic actors and the experienced UCLs had already involved many important SHs from the outset as they were project partners or are very closely related to them. Nevertheless, the activities of task 5.1 have led to a deeper understanding of the (key) stakeholders' interests, positions, capabilities and relations and dependencies. These insights will help MarginUp! to foster even greater buy-in and commitment from all parties involved.
3. **Improving replicability and scalability:** By analysing stakeholder interactions and relationships with a steady focus not only on the actions already happening, but also at interests, planned investments, expected developments and SHs with potential contribution to successful scale-up, this deliverable offers valuable insights into replicability and scalability potential (and limitations).

5.2. Contribution to MarginUp! and next steps

1. **Internal mainstreaming of information on local contexts:** The aggregation of the different local contexts and its actors in a coherent and easily understandable and accessible form contributes to the mainstreaming of information. This already proved helpful for MarginUp! partners from other work-packages to get a better overview of all seven UCs as well as very specific information about the SHs.
2. **Contribution to other work packages:** The information and findings of this deliverable contribute to the MarginUp! online maps (deliverable 1.1), laid tracks for the identification of barriers and opportunities (to be continued taken up by task

1.3) and serve as an important starting point for the value chain analysis in WP6. Complementary to the WP5 focus on stakeholders, the analysis in WP6 will address factors that are fundamental for value chain coherence, transparency and stability by studying value chain performance from an economic point of view.

3. Enhanced multi-actor engagement: Task 5.1 has laid the groundwork for effective multi-actor engagement throughout the MarginUp! project. By identifying (key) SHs and understanding their roles, interests, and capabilities, the project can better involve and collaborate with the relevant actors at various stages of the value chains and the entrepreneurial ecosystem. The engagement, that in a way already started during this task and will be further followed up in task 5.2, will aim at fostering a sense of ownership and involvement among SHs, promoting collective decision-making, and thus increasing the likelihood of successful outcomes.
4. Board of Actors and Actors Advisory Group formation: The results of task 5.1 will strongly facilitate the establishment of a BA for each UC and an overarching Actors Advisory Group (AAG) for the entire MarginUp! project. These bodies will ensure representation from diverse perspectives and play a crucial role in co-designing the value chains and co-assessing the project's results, in providing valuable insights and guiding the project's strategic direction. Their collective expertise and input enhance project governance and increase the project's outreach, impact and overall chances of success. As some few key stakeholders could not be interviewed until now, contact will have to be established during the stakeholder engagement. The choice of key stakeholders will also have to be reassessed with all the information now accessible in mind. This reassessment together with the findings presented here will form the basis for the choice of stakeholders for the BAs and the AAG.

In conclusion, this deliverable serves as foundation for the MarginUp! project, offering specific benefits and starting points for stakeholder engagement, value chain optimization, decision-making, public relations and project governance. By understanding and involving SHs, the project can effectively navigate challenges, capitalize on opportunities, and achieve its overarching goal of promoting sustainable industrial feedstock for the bioeconomy, biodiversity enhancement, and profitability on marginal lands.

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7. Annex

7.1. Description of the stakeholders for the European use-cases

The following descriptions are separate for every UC. In line with the mappings in chapter 3, the SHs are grouped along three categories (*stakeholders of the value chain, stakeholders of the wider entrepreneurial ecosystem, stakeholders for potential scale-up*). Next to the SHs' names it shows if they are MarginUp! partners and if they have been identified and chosen as key stakeholder of the UC. Below the name you find a short description and an explanation of the SHs' connection to the UC.

7.1.1. Description of stakeholders – Greece

7.1.1.1. Stakeholders of the value chain

Cluster of Bioeconomy and Environment of Western Macedonia (CluBE) [MarginUp! partner] [key stakeholder]

The Cluster of Bioeconomy and Environment of Western Macedonia (CluBE) is a non-profit platform for cooperation of the pillars of the regional economy. The Cluster seeks to develop synergies between local and regional players and businesses in bioenergy and the environment, aiming at introducing and developing innovation in the sector and increasing its added value. CluBE is formed by different members, as a network of companies and institutions and includes, amongst others, the [University of Thessaly](#) (and more than 45 members from public sector, cooperatives, R&D, wood and food production, waste management, municipal district heating companies, boiler manufacturers, biomass consulting companies, social and environmental companies and others). CluBE has taken part in many similar European projects and studies.

For the UC: CluBE coordinates the partners and the SHs involved in the Greek use case and provides guidance with its experts.

DIADYMA S.A. -Waste Management company of Western Macedonia [MarginUp! partner] [key stakeholder]

DIADYMA S.A. was founded by the municipalities of [Western Macedonia](#) to serve the needs for Waste Management in the area and it is the official waste management body of the region (13 municipalities, 300.000 residents, 100.000 tonnes of Mixed Solid Waste per year). The company has substantial know-how in environmental engineering, waste management systems analysis & evaluation and environmental impacts, including in collection and transferring systems, recycling and mixed solid waste treatment & processing, hazardous waste management (e.g. managing [DEI's](#) waste stream) and as in the use case, landfill design & restoration.

The company owns the land that will be used for the plantation of the UC. It has its own experts who will care for the field's needs (e.g. irrigation). DIADYMA will also harvest the biomass, ensure quantity and quality and store it until transported to the other SHs for further processing (wood to [University of Thessaly](#) and later [ALFA WOOD](#); herbs possibly to [4G Greek Gaia's Global Gate](#) and [Etheleo](#)). In addition, they will conduct the soil sampling and send the samples for analysis. DIADYMA has an

agronomist ([Paraskevas Patsilias](#)) under contract, who will plant trees and herbs and who might advise on planting and irrigation.

Public Power Corporation S.A. (DEI) [key stakeholder]

The Public Power Corporation S.A., acronym DEI or PPC, is the largest electric power company in Greece. Founded by the Greek government in 1950, its main purpose was to produce and distribute cheap electric power to all Greek citizens, with a focus on the exploitation of domestic resources (mainly lignite). PPC started the integration of all the small local private and local production units and grids to its own national interconnected grid. Today, PPC Group has been privatised and consists of 3 subsidiary companies PPC S.A., the [Hellenic Electricity Distribution Network Operator \(HEDNO\) S.A.](#) and PPC RENEWABLES S.A.. The state-owned Hellenic Republic Asset Development Fund holds slightly more than a third of the shares and is thus able to veto resolutions on certain basic topics (e.g. change in the nationality of the company or modification of the object of the company). PPC has lignite mining areas adjacent to many of its power plants, being located in the [Kozani](#) regional unit in [Western Macedonia](#) and around Megalopolis on Peloponnese.

As landowner of most of the former lignite mines, DEI has many fields similar to the ones of the UC and could thus provide similar biomass from neighbouring old mining areas already planted with pseudoacacia trees years ago (formal request is filed to get it for free, negotiations ongoing). Apart from that, it will offer knowledge transfer to the project.

HEDNO S.A. (Hellenic Electricity Distribution Network Operator)

The Hellenic Electricity Distribution Network Operator was formed by the separation of the Distribution Department of Greece's Public Power Corporation ([DEI](#)). It serves as Greece's only Distribution Network Operator. It's a 100% subsidiary of DEI; for the UC: buys and distributes the electricity produced by [ALFA WOOD](#) from biomass.

Forest Agricultural Cooperatives DASE of Pentalofof and of Palaioigratsano – Elati

Cooperatives for the protection of forests. They are logging in areas similar to the UC plantation; for the UC: could be alternative biomass providers from areas close by if negotiations with [DEI](#) are not successful.

University of Thessaly, Department of Forestry, Wood Sciences and Design, Institute for Wood, Furniture and Wooden Packaging - Academic Centre of Research, Innovation and Growth [key stakeholder]

The University of Thessaly is a public university in Thessaly, Greece. With a main campus in the city of Volos and regional campuses located in other cities it includes several faculties. The University of Thessaly is a member of [CluBE](#). The Department of Forestry, Wood Sciences and Design is located in the city of Karditsa (15,000 students, more than 1000 doctoral students, and 710 faculty members). The Institute for Wood, Furniture and Wooden Packaging is very well experienced on the production of several composite products for construction from forestry- and agro-waste. They already use cannabis, kenaf, straw, vine stalks, corn stalks, wood bark and more as raw material for final products.

In the UC the institute provides expert knowledge, quality control and sample production and testing and will also give advice on the plantation. After initial tests on the pseudoacacia wood from the UC, the institute will use its small processing line to test the production of fibre boards and of some alternative products (with around 10 tonnes of biomass). After harvest, they will need 3 -4 months to have results on the sample-boards, and after this on the alternative products. Within the frame of the project the university will provide their technology free of charge.

ALFA WOOD Group - Wood Processing Industry [MarginUp! partner] [key stakeholder]

The ALFA WOOD Group (ALFA WOOD) is the largest wood processing industry (e.g. laminate floor, fibre-boards/MDF and pellets) in Greece and one of the most important in the Balkans. Besides the regular processing, it also processes the residues from the production of its products, as well as any kind of wood residues (e.g. wood- and plant tissue-waste, wooden packaging, other materials), and uses them to produce alternative fuels. The industrial facilities (one for pellets, one for boards, one for electricity) are in three different locations in Greece: Larissa, Drama and [Grevena](#) in the UC region.

In the project, it is the central entrepreneurial stakeholder in the wood-based value chain. It will produce wood boards (MDF) from biomass. It will also use the biomass to produce electricity in its own bioenergy plant.

Value chain of acacia blossoms and herbs

Quite some local producers already use the common lavender oil for cosmetics, others sell herbs as spices or tea. Some of these businesses now want to try to use acacia blossoms and herbs grown in the use case in their products.

Etheleo distillery

A family business that distils oils and extracts from herbs (mainly lavender); for the UC: will use the acacia blossoms (and maybe other herbs) to produce essential oils and hydrolates. Is planning to establish a small cosmetic company and might in the future also produce their own cosmetics.

4G Greek Gaia's Global Gate

Small producer of dried fruits, vegetables and edible plants; for the UC: will dry the herbs, might also sell some directly (e.g. as tea).

OKIROI S.A. [key stakeholder]

A small-medium manufacturer of personal care products which produces innovative and clinically effective skincare with don-key milk. It has started with six products and hopes to increase its array of products. For the use case, Okiroi will do tests to examine and use the processed acacia blossoms (and maybe herbs) received from [Etheleo distillery](#). The essential oils, their biomass and residuals will be used to produce facial lotions and soaps that are ready for sale.

7.1.1.2. Stakeholders of the wider entrepreneurial ecosystem**Greek agricultural organization "DIMITRA"**

Organization engaged in agricultural research, seed production, agricultural education and training for professionals, agricultural product quality assurance, farm advisory systems, genetic and quality analysis.

DIMITRA will conduct the soil analysis for the use case and possibly all analyses (e.g. food and health safety of products) that will be needed.

Paraskevas Patsilias

External agronomist that planted the trees, will plant the herbs and might advise on planting and irrigation.

Regulations and policies

SHs with horizontal activities, ensuring frameworks for biomass production, pre-treatment, processing as well as stakeholder engagement:

Municipalities of Kozani, Eordaia and Grevena

Kozani is a city in northern Greece, located in the northern part of the Aliakmonas river valley. It is the capital of the [Region of Western Macedonia](#) and the Kozani regional unit (5 municipalities, including Kozani and Eordaia). Kozani (over 70 000 inhabitants) and Eordaia (around 45 000; seat of the municipality is the town Ptolemaida) are the two municipalities where most of the (former) open pit mines in the area are located. The seat of [ALFA WOOD](#) is in the neighbouring regional unit of Grevena (around 25 000 inhabitants).

The former mining lands are given to the municipalities against restoration costs, that is, with an obligation to restore them. The municipalities can transfer knowledge and would play a role in any legislation amendment regarding land use and ownership.

Region of Western Macedonia (Periferia Dytikis Makedonias)

Western Macedonia is one of the thirteen regions of Greece. Located in north-western Greece, it is divided into the regional units of Florina, [Grevena](#), Kastoria, and [Kozani](#).

It is a local public authority which could transfer knowledge and would play a role in financing of activities and the amendment of legislation regarding land use and ownership (could thus be interested in the UC for take-aways); could possibly enact adaptations of structural funds (e.g. the [EU Just Transition Platform](#)) and other funding schemes.

7.1.1.3. Stakeholders for potential scale-up

Geotechnical Chamber of Greece, West Macedonia section

A public service whose purpose is to expand and promote scientific knowledge in the fields of agriculture, animal husbandry, forestry, fisheries and the management of mineral and water resources, in an effort to intervene and guide the development in the above areas.

Authority which will transfer knowledge and would play a role in any amendment of legislation concerning land-use, land cover and land rights. Through it, (land) claims can be brought forward. It can help with legislation and implementation, as well as with the possible adaptations of any possible funding schemes.

Union of Young Farmers of Kozani

The union was formed for the mass sale of agricultural products at better prices, for raising the awareness of the municipality to the problems of farmers, breeders and those engaged in agriculture and for finding solutions to them. Among others dealing with land use politics; for the UC: could help with transfer of knowledge and know-how to the SHs in the value chain, might have stakes in the discussions about land rights concerning former mining land.

WWF Greece

Organization that acts against the major challenges of the climate and ecological crisis. It has started writing the proposal of the first Greek climate law with a vision of a sustainable relationship between man and nature; for the UC: WWF Greece has been active in workshop participation and articles concerning lignite areas restoration, climate change and just transition so they could be a potential interested party in the project's activities. [CluBE](#) has some connections to WWF. As of today, CluBE did not identify the presence of any other organization working in land restoration in the area.

Environmental protection company

A local environmental protection NGO in [Kastoria](#), could have stakes in the discussions about land rights concerning former mining land.

HELLABIOM - Hellenic Biomass Association

HELLABIOM is a Greek non-profit biomass association and is, as the National association representing Greece, a full member of the corresponding association Bioenergy Europe. Its scientific objectives are the recording, promotion and coordination of research related to production, energetic and industrial exploitation, agricultural application and the market. On a political level it aims at the dissemination and support of the uses of biomass at national level and the well-intentioned defence and expression of the interests of the Greek biomass/bioenergy sector in Greece, the EU and internationally; for the UC: [CluBE](#) is a member; HELLABIOM can play a role in knowledge transfer, it can help with the legislation and implementation, as well as with the replication of the project and possible adaptations of any possible funding schemes.

EU Just Transition Platform (JTP)

The JTP is the EU's key tool to help member states and regions unlock the support available through the Just Transition Mechanism. It provides a single access point and helpdesk to support and knowledge on Europe's transition to a sustainable, climate-neutral economy.

The JTP is in contact with regional authorities and funds projects through calls (e.g. Just Transition Fund). It provides comprehensive technical and advisory support. Authorities and beneficiaries can access it to find all they need to know about the funds, including opportunities, relevant regulatory updates or sector specific initiatives. The platform also promotes actively the exchange of best practices among all SHs involved, e.g. through regular physical and virtual gatherings.

Greek Fair Transition Fund (SDAM)

In 2018, Greece established this fund to support the diversification of local economies and creation of new jobs in lignite dependent regions. The fund collects 6% of the revenue from auctioning the allowances of the Emissions Trading System of the EU, or around 20 million EUR per year; for the UC: the fund is expected to finance low-carbon and low-environmental footprint projects in the Florina and [Kozani](#) regional units and in the Megalopolis municipality.

Grevena Chamber of Commerce

Serves as an advisor to the government on issues of trade, industry, services and general development policies but also represents, supports and informs its members; for the UC: has direct access to all companies in the region; could be interested in the UC.

Beekeeping associations of Kozani, Kastoria and Grevena

The beekeepers are already working in the area and could use the herbs or pseudoacacia nectar as bee forage. But due to the potentially contaminated soils of the former mine, the honey needs to be very thoroughly tested. The [University of Thessaly](#) is studying this topic.

Federation of Greek Beekeepers' Associations (O.M.S.E.)

The highest trade union body of beekeepers that covers all of them in Greece, whether they participate in its member associations or not. The general purpose of the Federation is to assert, promote and safeguard the economic, social, and professional interests of beekeepers. Also, the purpose of the organization is the supervision and protection of the authenticity of beekeeping products as well as systematic and scientific research; for the UC: might be interested in the results and might have replication interest.

Universities and institutes active in bioeconomy-related R&D

Play an important role in processing technology development and testing:

University of Western Macedonia

The University of Western Macedonia is a public university in Greece. With a main campus in the [city of Kozani](#) and regional campuses located in other neighbouring cities, it includes several faculties such as polytechnic school, school of economic sciences, school of Fine Arts, school of agricultural sciences, school of social science and humanities, faculty of Health Sciences and Formal sciences. The University of Western Macedonia is a member of [CluBE](#).

In continuous cooperation with [CluBE](#) on the promotion of new technologies, but at the time no contact on the UC. Could play a role in knowledge transfer, and could help with the legislation and implementation, as well as with the possible adaptations of any possible funding schemes.

Companies as possible consumers of essential oils

[OKIROI S.A.](#) as a small family company might not have the capacity for a lot of products; but the distilled essential oils could be used by other companies, as well: first there is a small regional "ecosystem" of distilleries, cosmetics producers and medical plants companies and second Greece has some important big companies in this sector. If their specific quality standards could be met, more potential demand would increase volumes (with connected benefits) and in addition give farmers alternatives, flexibility and bargaining power.

Small local producers of the herbs & blossoms value chain

Most of the local companies are small, some are bigger and reach even the European market. Some cultivate the plants themselves, other buy them from local farmers; for the UC: could process herbs and blossoms (for essential oils and aromatic essences) and use these for different products (flower water, liqueur, perfumes and fragrances, cosmetics such as facial creams and soaps). They have increasing market access and could sell products directly.

Dioscouridis IKE

Local medicinal plants company that also has a distillery. It works with lavender and other herbs; for the UC: could do distillation of lavender; could use the herbs to produce essential oils, flower water and organic medicines for animals and plants.

Bagatzounis & Sons S.A.

A middle-sized, family owned company, founded in 1976. Its main activity is producing, trading and distributing spices, herbs, aromatic plants and beverages in a wide range of packaging; for the UC: could use the herbs to produce dried herbs, spices, tea. Has its own good market access.

Korres S.A.

Korres is a Greek stock company that produces beauty products for women and men, based on natural ingredients from Greece. It was a pioneer in Greece in this sector and serves the international market; for the UC: could use the extracts and essential oils for its products; might be interesting as an investor.

Apivita S.A.

Production of natural beauty products for the face, body and hair; owned by PUIG, a Spanish owned international fashion and fragrance company; for the UC: could use the extracts and essential oils for its products; might be interesting as an investor.

Companies as possible consumers of woody biomass***CHLIAPAS S.A.***

A company with a long tradition of wood processing, and the use of high technology and software in the design and production process of its products. With continuous investments and expansions, the company turned into a large wood industry, while at the same time expanded its activities outside of Greece with important partnerships in the neighbouring Balkan countries and significant exports to Egypt and the Middle East. It has new modern wood drying and impregnation equipment, significantly improving its quality and performance; for the UC: could use wood feedstock for MDF, boards and wooden structures.

ELPIS Pellet Co

Elpis is a family company involved in the field of renewable energy sources which mainly produces pellets (pellet from beech, fir and pine), briquettes and charcoal. The company is outward looking and carries out tests and experiments examining the potential of other biomass sources such as by products from bean, stones from peach and olives etc. Elpis is registered as a wood waste recycling company; for the UC: could produce sample bioenergy (pellets) from pseudoacacia wood feedstock. Might also do trials on pellets from lavender pressing residues.

Eyxylon Th. & Sp. Ziogas G.P.

Wood processing industry engaged in wooden constructions and production of wood pellets. Could produce bioenergy (pellets) by wood feedstock and their residual streams.

7.1.2. Description of stakeholders – Hungary**7.1.2.1. Stakeholders of the value chain**

Pilze-Nagy Ltd. (PILZE-NAGY KERESKEDELMI ES SZOLGALTATO KFT) [MarginUp! partner] [key stakeholder]

Pilze-Nagy is a family business, that operates the oyster mushroom value chain. The family of the owners has more than 30 years of experience in oyster mushroom production and trade. PILZE, with 50 employees, is the largest producer of substrate and oyster mushrooms in Central Europe. As current production of mushroom substrate relies almost entirely on wheat straw as raw material (with associated risks: competing uses, price increase, logistics, problem of chemical residues), it aims at diversifying the raw material base.

In the UC, PILZE processes the received alternative biomass (develops a whole logistic system: harvesting, packing, transport and storage to maintain the quality of the biomass), produces mushroom substrate (incl. tests how to mix with straw), grows, harvests, and partially treats the mushrooms, packages and sells them. The spent mushroom substrate (SMS) is partially used in its own biogas plant and the biogas digestate is used as biofertilizer. Together with partners ([Vitafort Ltd.](#)) it will also develop novel feed additive based on the SMS and explores other uses. PILZE conducts tests during the small bag mushroom cultivation and analyses the digestate. Furthermore, they coordinate the overall value chain use case activities. If the trials give good results, they consider a scale-up of the biomass production to secure availability. This might involve buying additional land, to supply enough biomass for own use and reduce risks and dependence on suppliers.

Vitafort Kft.

Large animal feed producer (for pigs and cattle) that is located half-way between [Kecskemét](#) and Budapest; for the UC: exclusive partner of [PILZE](#) for novel oyster mushroom mycelia feed additive.

MIZSETÁP Ltd.

A laying hen and broiler chicken farm in a 30 km of radius from [PILZE](#); for the UC: manure provision for the biogas production (transported around 3-4 times per month).

Lajos Vén Farming

Family farm with 600 hectares really close to UC location; for the UC: delivers cereal straw biomass for substrate production of [PILZE](#) and receives biogas digestate in exchange; has some marginal plots and would like to change the cropping system there.

Bay Zoltán Nonprofit Ltd. for Applied Research (Bay Zoltán Alkalmazott Kutatási Közhasznú Nonprofit Kft.; BZN) [key stakeholder]

Non-profit-organization, owned by the Hungarian state; does research and development from laboratory to farm level. BZN can support primary biomass production, biorefinery processes, fertiliser production etc.

For the use case it runs the laboratory tests required for production, does soil sampling and analysis for physical, chemical, microbiological parameters. Also applies drone technology to monitor biomass growth.

INNOMINE DIGITAL INNOVATION HUB NONPROFIT KFT (INM) [key stakeholder]

Innovation hub to develop companies research and development that also does project management; for the UC: the hub served as a nexus for the Hungarian UC, as it contacted [PILZE](#); responsible for facilitation and management activities concerning for example local and regional administration requirements; identifies the application areas of the use case; does public, political and economic outreach.

Biomass provision (primary production)

Kujáni Production and Advisory Ltd. (KUJÁNI) [MarginUp! partner] [key stakeholder]

This farm is a small family enterprise, settled in 1999. It produces and processes fruits in a small scale (possesses around 25 ha) and has some experience with integrated pest management. As a demonstration farm it conducts field trials for other farmers on its land. In addition to the family members, from 2 to 20 (during harvest) seasonal workers work on the farm. Biomass production in an agroforestry cropping system is new terrain for the farm, but they are interested in trying something new and change direction.

For the use case it provides the land, farms *Salix viminalis* and *Sida hermaphrodita*, leads all farming related activities and provides the biomass; it organizes common workshops and field visits together with [PILZE](#) (both are located close to each other). In case of a scale-up, the farm could grow biomass on an additional 40 ha.

In addition to its farm, the Kujáni family manages a farm advisory service, working for around 300 farmers. For the project: They provide plant protection and soil management advice. Through their network and personal contacts, they could approach interested local farmers in case of a scale-up and suggest producing biomass for [PILZE](#). They are interested to put the acquired knowledge and know-how into use and advise other farmers.

Agrogeo

A small engineering service company that develops e.g. fertilizers from food and agricultural waste; for the UC: it provides new organic and organic mineral fertilizer to [KUJÁNI](#).

Auditker

A local business of agricultural machinery and equipment for agriculture production; for the UC: they gave advise on the set-up of [KUJÁNI's](#) irrigation system for the biomass plantation and on weed management; especially the harvest of the biomass requires specific machinery that is rented from Auditker; in the future, Auditker might cooperate on development of especially adapted machinery for *Sida hermaphrodita* cultivation.

Propagation material producers

These SHs are key for the value chain, as they provide/ sell quality plantlets used for the plantations. As they breed new varieties, after successful registration these can be sold as a product in its own.

Zsila Gardening Center [key stakeholder]

Horticultural crop production and nursery - Dr. Erika Kurucz works there as an expert of *Sida hermaphrodita*; for the UC: provided skilled staff and facilities for *Sida hermaphrodita* plantlets bred from seeds.

Debrecen University, Institute of Horticultural Sciences, Dr. Erika Kurucz [key stakeholder]

The University of Debrecen is the second largest university in Hungary. In addition to medical and natural sciences education, agricultural education plays a significant role. Out of approximately 1600 faculty members across the university, 140 work at the faculty. The mission of the faculty is to promote integrated development and knowledge sharing in competitive agriculture, ethical food production, and environmental sustainability support. Ms. Kurucz, as external expert, holds a PhD, with the topic of multifunctional utilization of temperate malvaceous plants. As an advisor with experiences in similar projects and particularly

with *Sida hermaphrodita* and with energy crops, she contributes effectively to the value chain with a focus on *Sida* plantlet production and breeding.

Sopron University, Forestry Scientific Institute (EERTY)

This public university is the only one for forest management in Hungary. Among others it does research on agroforestry and develops new varieties for biomass production and utilization in the bioeconomy; for the UC: provides knowledge and cuttings (energy willow *Salix viminalis*) for the plantation.

7.1.2.2. Stakeholders of the wider entrepreneurial ecosystem

László Gál Tanya

Local farmers and landowners with crop and livestock production; for the UC: could be a contact point for upscaling and a biomass provider, knowledge provider on organic farming and cover crops.

János Gábor

A local farmer and landowner really close to [PILZE](#) that does arable and horticultural crop farming; for the UC: cooperation on planting and machinery; could be a biomass provider.

Kamra-Túra Pantry Tour Association

An association of individual agricultural producers and local (small scale) craft food producers. It provides opportunity for local farmers (pursuing hand made products) to realize joint appearance at events, to obtain new knowledge material and information, to organize site visits; for the UC: founded with the [KUJÁNI](#) family, connections are still strong; the association's president owns plantations and gave [KUJÁNI](#) advise on cover crops; potential channel for local knowledge transfer.

National Chamber of Agriculture [key stakeholder]

The Hungarian Chamber of Agriculture (HCA), as a key stakeholder in knowledge transfer, covers the whole domestic food chain, the agricultural production activity and the field of rural development through its members. Established in 2013 as a public body, the HCA aims to give a new impetus to the Hungarian agri-food economy and increase the competitiveness of its members. It is uniformly organized at national level with mandatory membership and currently has 360 thousand members, playing a significant role at local and county level. Key activities: providing consultancy and information, knowledge transfer and dissemination, management for agricultural subsidies, access to resources, administrative and payment management for farmers, professional events and workshops. The HCA can suggest farming methods for farmers impacted by climate change through their own advisory experts (e.g. biomass-based fertilizers, novel technologies, soil quality management, marginal land use as e.g. sandy soil land management, crop rotation, market background). It also gives assistance to set up more complete value chains. At county level it has 60 employees.

For the UC: It has different working groups, in some of them [PILZE](#) is involved. The chamber would be the primary platform for PILZE if legislation changes were needed. Could be a good partner to inform about the UC at county level.

Danuba

A private business association founded to promote precision agriculture; for the UC: consultancy on precision crop cultivation. Providing biofertilizer for farmers.

Organic Research Institute and Botanical Garden Vácrátót

Research institute; for the UC: knowledge provider on conservation of genetic resources, biodiversity.

ÖMKi - Research Institute of Organic Agriculture

The Research Institute of Organic Agriculture (ÖMKi) is the only research institute in Hungary that specializes in organic agriculture. It was established in 2011 with the aim of promoting the improvement and more widespread use of organic agriculture in Hungary; for the UC: knowledge provider on organic farming.

Fruitveb (Hungarian Vegetable and Fruit Association and Product Council)

NGO /inter-trade organization(s) representing the sector that tries to improve the cooperation of actors that work with fresh fruits and other agricultural products; channeling information on possible payments (single area payments, drought payments, etc.); for the UC: provides data and knowledge on technology and investment possibilities and current regulations and legislation.

MAPER Permakultúra (Hungarian Permaculture Association)

Non-governmental umbrella organization for permaculture producers; for the UC: consultancy on organic farming

Hungarian Biogas Association

Non-governmental umbrella organization for representatives of biogas farms; provides opportunity to obtain updated information, knowledge, research results, upcoming projects, legislation background (pre-treatment, processing, digestate). For the UC it cooperates and consults on biogas digestate utilization.

Regulations and policies

SHs with horizontal activities, ensuring frameworks for biomass production, pre-treatment, processing and also stakeholder engagement:

KNP Kiskunság National Park

Kiskunság National Park is the second largest national park in Hungary. Its main mission is to preserve the centuries old coexistence of people and nature in the Danube-Tisza Interfluvium. The national park is not a contiguous protected area but is a mosaic of nine distinct territories, representing all the characteristic natural values of the Kiskunság. The Kiskunság National Park oversees several other protected areas in the region, including three landscape protection areas, 19 nature reserves and a biosphere reserve. The authority of the National Park Directorate covers mainly [Bács-Kiskun County](#). The most important tasks of the National Park include the planning and execution of the maintenance of protected areas, planning research activities, educating people on nature, and managing assets.

Providing advice to various organizations and persons is getting a more and more frequent daily task of the National Park. The range of topics is very wide from assistance in filling out forms for applying agricultural subsidies to the professional

preparations for establishing locally protected areas; for the UC: knowledge and data provider on land protection, land use, biodiversity.

Kecskemét Municipality

Kecskemét is a city with county rights in central Hungary. It is the eighth-largest city in the country, and the county seat of [Bács-Kiskun county](#). Every city with county rights is allowed to be subdivided into districts. The representative body is the General Assembly (“közgyűlés” in Hungarian) which elects with the County Assembly a council that takes care of different tasks related to the county (e.g. regional development, land use planning); for the use case: consultancy on regional development. Probably interested in any new solution that helps the local economy.

Bács-Kiskun County

Bács-Kiskun is a county located in southern Hungary, governed by an elected council. The county seat and largest city of Bács-Kiskun is [Kecskemét](#). With an area of 8,445 km², Bács-Kiskun is the largest county in the country, its terrain in the Great Hungarian Plain is mostly flat. It is responsible for regional development and land-use planning; for the UC: knowledge and data provider. Probably interested in any new solution that helps local economy.

Bács-Kiskun County Government Office

A special division at county level, responsible for legislation and authorization and environmental protection, waste management supervision and soil protection; for the UC: technical supervision; consultancy on nutrition and pesticide use.

Ministry of Agriculture

Hungarian Ministry of Agriculture, also responsible for the environment; responsible for knowledge transfer, collecting information to forward to EU; for the UC: is currently not connected to the UC; has an activity to improve research and development in the agricultural sector; could provide information and contacts; financing activities are rather small compared to EU funding and non-food crop production is not supported by the Hungarian government.

National Food Chain Safety Office (NÉBIH) [key stakeholder]

Important for the food market, permits, dissemination. Plays a significant role at local and county level; for the UC: as long as the newly bred *Sida hermaphrodita* (and willow) species are not registered, they cannot be sold, for example as seedlings. This registration is coordinated by NÉBIH.

Universities active in bioeconomy-related R&D

Play an important role in processing technology development and testing:

University of Neumann János, Horticulture and Rural Development Faculty

Department of Soil Sciences and Agrochemistry at Neumann University, does research on plant nutrition and land use; for the UC: knowledge provider on plant nutrition and land use.

Hungarian University of Agriculture and Life Sciences (MATE)

Public university located on Gödöllő close to Budapest (former Szent István University), does amongst others research on energy crop cultivation; for the use case: consultancy and knowledge provider.

Agricultural Umbrella Organisations

Bring together specific actors in agricultural production:

Associations of Agricultural Advisors

Advisors registered in the network of the National Chamber of Agriculture; for the use case: provides consultancy on rural development

Alliance of plant protection

This NGO brings together specific actors in agricultural production; for the UC: knowledge provider on the protection of energy plantations.

National Association of Agricultural Cooperatives and Producers

The NGO brings together specific actors in agricultural production; for the UC: knowledge provider on marginal land use.

Hungarian Chamber of Professional of Doctors and Plant Protection Engineers

This NGO has 4200 active members that play a major role in plant protection with their expert knowledge. Is an important lobby and has important role in Hungarian agriculture. It has only one full time employee responsible for general management. The chamber does its own research, but as the focus lies on arable farming, there is no experience with agroforestry cropping systems yet. Lately the chances of drone technology are being pursued.

For the UC: A [KUJÁNI](#) family member is vice-president and president at county level; the chamber provides knowledge on plant protection necessary for adaptation of organic farming at [KUJÁNI](#) farm and soil amelioration and more generally cooperates with [PILZE](#) and [KUJÁNI](#) on the development and use of new technologies to improve food chain safety and soil health; the chamber will also participate in a field visit of the UC and co-organize a workshop and is interested in the results for potential multiplication.

Bioculture Association

A non-governmental farmers association that brings together organic farmers; for the UC: knowledge provider.

7.1.2.3. Stakeholders for potential scale-up

UBM Agro Zrt.

Animal feed producer and trader; for the UC: possibly will be interested in the novel feed additive.

KEFAG Forestry residues

Most relevant enterprise for forest management at county level, owned by the [Ministry of Agriculture](#); produces and processes primary forestry biomass and woody by-products from the forests between rivers Danube and Tisza; for the UC: knowledge provider on land use and forestry; could provide alternative energy trees (e.g. *Populus nigra*) and mulching material.

Local Beekeepers

There are some beekeepers in the surroundings of the UC fields; for the UC: could feed their bees on *Sida hermaphrodita*.

MBH bank

Big Hungarian bank; shares are owned by Hungarian state and private owners; has a division responsible for financing farmers and agricultural production; for the UC: could provide finance for possible future investments in the value chain.

OTB Bank

Private bank that is important for financing agricultural activities in the region; for the UC: could provide finance for possible future investments in the value chain.

Alliance for Living Tisza

A local / regional NGO that is occupied with water quality and nature protection; for the UC: cooperation and exchange of opinions on energy willow (*Salix viminalis*) plantation.

Champex Ltd.

The most relevant activity is mushroom production (*Agaricus bisporus* and *Pleurotus ostreatus*). There are about 300 000 m² large artificial stone caves in Budapest and its surroundings. Typical Hungarian production-method: polythene bags in basements; for the UC: this company is a possible user of mushroom substrate that can be prepared using alternative biomass.

BIOEAST

Consortium of Central and Eastern European governments to lobby for EU support for bioeconomy in their homelands. Hungary is a member; for the UC: knowledge provider; could be a point/source of leverage for more attention towards bioeconomy by the Hungarian government.

Hungarian Bioeconomy Cluster

This business-oriented cluster was created as NGO during an EU Horizon 2020 project by [BZN](#), which is still an important member; for the UC: public, political and economic outreach, cooperation and stakeholder engagement; portal for knowledge exchange and dissemination on bioeconomy, agriculture and environmental protection.

7.1.3. Description of stakeholders – Sweden**7.1.3.1. Stakeholders of the value chain****farmer (Sven-Erik Viklund Djupliden)**

Sven-Erik is a farmer in [Skellefteå, Västerbotten county](#); for the UC: subcontractor to [RISE](#) that will provide turnip rape for the project (1,5 ha). He has its own drying facility.

Hushållningssällskapet Norrbotten Västerbotten (HS), with its Öjebyn Agro Park [[MarginUp!](#) partner] [key stakeholder**]**

The *Rural Economy and Agriculture society* is a non-governmental extension service and non-profit association that operates in whole Sweden. It is working with development, innovation and consultancy services for agriculture and rural development (member of the national umbrella organization *Hushållningssällskapens förbund* and of [LRF](#)). As extension service, HS can be a local driver of innovation and pilot studies like MarginUp! and may help new businesses to get started. It has contacts to many farmers and other agricultural companies in the region, that could prove very valuable in case of a scale-up, even though bio-energy is a new terrain for the local HS. HS itself is not manufacturing products for sale, as main task are field trials (some oat and barley is sold to other farms); for the UC: the regional HS is a MarginUp! partner; it plants and harvests a share of the turnip rape, dries the oil seeds for the use-case, buys oil pressing technologies and does the pressing.

EEXP (Ernsts Express) [MarginUp! partner] [key stakeholder]

A transport company with a focus on heavy industrial transport for Swedish basic industry (steel/mining/ forst/gas) and on sustainability in transport industry. Has produced biodiesel from cooking oil and runs its trucks on a FAME-Diesel mix (*fatty acid methyl ester*) since 10 years; for the use-case, it participates in biodiesel (RME – FAME from rape seed oil) production and adds knowledge, owns the biodiesel plant used; EEXP might test the biodiesel in some of its trucks (could also be tested with farm machinery of value-chain stakeholders).

RISE AB [MarginUp! partner] [key stakeholder]

RISE is an independent, state-owned research institute that develops technologies, products, services and processes in collaboration with and on behalf of the academia, private actors and the public sector. It has a particular focus on supporting small and medium-sized companies with their innovation processes but does not invest itself. With more than 3,000 employees RISE works all over the country and in a number of foreign subsidiaries. RISE has experience with similar projects with other agricultural crops; for the UC: the department Biorefinery and Energy is a MarginUp! research partner and the use case leader.

RISE Processum [MarginUp! partner] [key stakeholder]

Processum AB is a subsidiary of [RISE](#). It is a world-leading cluster for the development and commercialization of biorefinery processes, green products, chemicals and materials. Moreover, RISE Processum is also the hub of an innovation platform that spans both borders and industries, nationally and internationally. It has worked on activities similar to MarginUp!, for example with [Lantmännen](#); in the use-case as research partner responsible for development and optimization of the automatized biodiesel plant; does main work of biodiesel production. Has a hydrothermal liquefaction (HTL) test bed where biomass can be converted into bio-based oil, as a precursor for biofuels.

Fodercentralen

Company that supplies most things around fodder, fertiliser, seed etc. in northern Sweden. According to a study by [Swedish University of Agricultural Sciences \(SLU\)](#), there is regional experience of using press cake from turnip rape. The study shows that producers use the press cake directly on the farm or sell it to Fodercentralen; for the use-case: it sold the rape seeds used and the Fodercentralen in Holmsund (Umeå, [Västerbotten county](#)) buys both dried seed and cold-pressed cake to use it in its locally produced animal feed.

Frigiva Gård AB

A farm with milk production (cows, cattle), and a biogas plant producing heat and electricity from the manure; for the UC: end user of the byproducts glycerol and press cake for biogas and fodder.

7.1.3.2. Stakeholders of the wider entrepreneurial ecosystem***Energifabriken [key stakeholder]***

Company owned by three farmer families who have been fossil free since 2009. Energifabriken produces, sells and distributes biofuels such as HVO (*Hydrotreated Vegetable Oils*), RME and biooil (e.g. for heat units) through their own grid. Has its own RME production in southern Sweden. Has a small daughter company in Norway. Plays a role in the “market” segment of the value chain in whole Sweden. Had a project with HS in the north about turnip rape and the processing of the seeds. Is member of [Svebio](#); for the UC: brings in market experience; could contribute to a substantial scale-up.

Bee at Work

Regional honey producer that offers leasing of beehives to companies who want to support sustainability and biological diversity. Also shared hives to private persons and pollination service to farmers; for the UC: it that puts up beehives around the trial fields and elsewhere, independently from the use-case.

PM Bioenergi & Smide

Company that offers and installs furnace and equipment for heating with biofuels; for the UC: provide technology as oil press and burner for the dryer.

AFRY

Technology provider and technical consultancy company; for the UC: can assist in designing process schemes and technology solutions.

Almi Företagspartner AB

Owned by the Swedish state, it is the parent company of a group of 16 regional subsidiaries and the Almi Invest AB subgroup. The regional subsidiaries provide loans and business development, are 51 percent owned by the parent company and 49 percent owned by regional owners. Almi Invest is fully owned by the parent company and conducts venture capital activities; for the UC: support business development and provides finance.

Representation of interests***Association of Swedish Oil Crop Farmers***

Association of Swedish Oil Crop Farmers; for the UC: Work to strengthen the competition of seed and oil crop cultivation.

Swedish Bioenergy Association (Svebio)

Member-based commercial organization promoting and developing biofuels in a sustainable society; for the UC: could be useful for knowledge transfer and lobby for biodiesel.

Local NGOs / CSOs

Up to now, there are no environmental protection agencies and / or NGOs taking part in the use case and have not yet been informed about the project. The use case will be presented at a local agricultural fair in August 2023. There are voices who dislike production of crops for other uses than food. Some municipalities for example want to give priority to food production.

Local administration (also responsible for public transport)***Municipalities of Luleå and Skellefteå***

Skellefteå and Luleå municipalities are, amongst many other things, responsible for providing preschools, schools, social services and elderly care. Some municipalities in the region want to give priority to food production, but some have big amount of unused farmland and would be interested in innovative uses. Some focus on biogas and electricity, as they produce this kind of energy, but others could be interested in biodiesel; for the UC: both communities have experience with biofuels for public transport. They have biogas plants that could potentially take up some of the glycerol from biodiesel production, while the digestate could be provided to farmers as fertilizer.

Region of Västerbotten and Region of Norrbotten

Political based organizations representing the municipalities in the region. Working with healthcare and regional development; for the UC: involved in the organization of public transport (put out to tender), might affect the market for biodiesel; distribute finance to assist start-ups/local companies; process the regional strategic plans for development.

Regulations and policies

Stakeholders with horizontal activities, ensuring frameworks for biomass production, pre-treatment, processing as well as stakeholder engagement:

Swedish Board of Agriculture

The Swedish Board of Agriculture is Sweden's expert authority in the areas agriculture, fishery and rural areas. It implements political decisions and administrates EU funds and CAP. Via the [County Administrative Board](#) it checks that farmers/land owners and the municipality follow applicable laws, rules and regulations; for the UC: might have statistics and data bases on fallow land in the region/ on land that has fallen or is in danger of falling out of agricultural use.

The County Administrative Boards in Norrbotten and Västerbotten (Länsstyrelsen)

The County Administrative Board is a government authority that exists in close proximity to the people in each county. An important link between the people and the municipal authorities on the one hand and the government, parliament, and central authorities on the other. Lead by a County Governor; for the UC: controls access to EU subsidies; probably interested in the transition to a bioeconomy, the green transition and biorefinery in general. Not yet sure about the specific UC, as local political actors have been informed about the project on a local agricultural fair only in August 2023.

Swedish Energy Agency (Energimyndigheten)

The Swedish Energy Agency is leading society's transition to a sustainable energy system; for the UC: Financier supporting activities towards sustainable energy solutions.

Universities and institutes active in bioeconomy-related R&D

Play an important role in processing technology development and testing:

Swedish University of Agricultural Science (SLU)

SLU is a world-class international university with research, education and environmental assessment within the sciences for sustainable life. Its principal sites are in Alnarp, Umeå and Uppsala, but activities are also conducted at research stations, experimental parks and educational establishments throughout Sweden; for the UC: does research around turnip rape, for example on varieties that are better adapted to conditions in northern Sweden, together with some companies.

7.1.3.3. Stakeholders for potential scale-up

Stefan Andersson (farmer) [key stakeholder]

Its main business situated in southern Sweden (ecological milk and pig production), Andersson since 2015 has a farm in Frostkåge with 150 ha of cultivation (40 ha forage, the rest grain and ~40 ha turnip rape, about 1000-2000 tons seeds per year). All cultivation and breeding is ecological according to KRAV certificate. He sells 30-40 tons of rapeseed yearly and has also sold to [Fodercentralen](#) but has no experience with biofuel producers; for the UC: potential biomass provider for scaling up; has extensive knowledge on turnip rape production.

Federation of Swedish Farmers (LRF) [key stakeholder]

LRF is a farmer cooperation with around 140 000 members and the biggest business network in Sweden. It is less involved in technical development but in seed production and the application of products. Takes part in a cooperation in northern parts of Sweden together with *Norrländsk Jordbruksforskning* on regional food strategies, regional crisis preparedness. Also cooperates with [Maskinring Norrland](#); for the UC: could serve as platform for communication, events, cooperation and promotion; holds much competence and knowledge about rural, farming and biobased conditions; probably has know-how about rape seed cultivation spread over the whole umbrella organization due to earlier engagements in different projects and case studies (e.g. great experience and knowledge in southern Sweden with *Brassica napus* value chains).

c/o GERD

A local cosmetics company interested in use local raw materials.; for the UC: could buy the glycerol.

Växa

An economic association owned by farmers breeding animals. The owners are also the customers who are served with service and advice; for the UC: could play a role in knowledge propagation; could help with technical questions like analyses and economics.

Farmer-owned drying facility

Farmer-owned drying facility in Öjebyn ([Norrbotten](#)); for the UC: could overtake some of the important drying of the turnip rape seeds close to the fields where they are grown, reducing transport costs.

Local agricultural banks (*Landshypotek Bank and Länsförsäkringar Norbotten and Västerbotten*)

Landshypotek is a Swedish bank for borrowing and saving, owned by members from farming and forestry; Länsförsäkringar [Norbotten](#) and [Västerbotten](#) are the regional branches of Sweden's largest insurance company and bank (member owned) for agriculture, forestry, vehicles, etc.

Both banks could give credits to farmers interested in scaling up their turnip rape production and respective infrastructure. Interest rates are high in the moment, and banks are in general more unwilling to give loans. Limited access to financing or high investment costs can pose significant challenges to investments in the value chain. Insufficient access to capital, especially for small-scale farmers and entrepreneurs, can impede investment in the value chain. And banks in northern Sweden have bigger demands on entrepreneurs than in the south, for different reasons (e.g. small farms, lack of business plans).

Food companies as possible consumers of turnip rape seed and oil

Probably, the oil could competitively be sold as food oil to local manufacturers in addition to the biofuel market, which would give farmers alternatives, flexibility and bargaining power.

Lantmännen

A company that sells and buys seeds; cooperative composed of ca. 18 000 farmers; for the UC: probably has experience with *Brassica rapa* value chain; could be important customer of the press cake.

Polarbröd AB

Industrial bakery in Älvsbyn ([Norrbotten](#)), with a branch in Norway and export to other countries; for the UC: has shown interest in using turnip rape food oil, if volumes are enough.

Norrmejerier

An economic association owned by milk producers/ farmers with cows, that produce and sell dairy products; for the UC: potential biomass provider and consumer. Could maybe use turnip rape oil in its dairy products if volumes were high enough.

Pesula Lantbruk

Local farm that grows turnip rape and produces food oil for sale; for the UC: Could be alternative buyers for turnip rape seed.

Alter Hedens

Local farm that produces and sells a wide variety of regional food products; for the UC: [Stefan Andersson](#) sells its rape seed in the south to a food oil mill. They don't like turnip rape though as seeds are smaller and demand adjustments, also transport costs are high to get the seeds down south. Alter Hedens could buy turnip rape seed and press it for edible oil production in northern Sweden.

Alviksgården

Farm with pigs, butchery, biogas plant, production of fertilizer for organic production (based on rest material from biogas plant) from [Luleå](#); for the UC: could be interested in protein feed and glycerol.

Companies connected to biodiesel / biogas production and distribution

BioFuel Region

A non-profit organisation that collaborates with the public sector, industry and research and development. Funding is through membership fees, regional funding and project funding. Together with members in northern Sweden, they promote a low carbon vehicle fleet and a well-developed bioeconomy; for the UC: might be interested in the UC.

Maskinring Norrland

Association of farmers and entrepreneurs, who offer different machine service and help for farmers, cooperates with [LRF](#); for the UC: could pass on knowledge on use of biodiesel in agricultural machines and increase the market.

Norrmaskiner

Seller of agricultural machines; for the UC: could pass on knowledge on use of biodiesel in agricultural machines and increase the market.

Skoogs bränsle and Skelleftebränslen

Local fuel distributors for liquid fuels; for the UC: probably interested in local biofuel production; could distribute through their own network.

WIBAX

Company that produces liquid chemical products, biofuels and salt; for the UC: experts on bio-oil for various industrial applications; could potentially be interested to build up a bigger production unit.

Biogas plants (9) in Norrbotten and Västerbotten

Existing Biogas plants in the two regions; most owned by [cities](#); two of them are owned by farmers, two additional plants are being built by farmers; for the UC: Offer enough demand to absorb more by-products of biodiesel production in case of a scale-up.

Polargas

Company that sells and distributes biogas; distribution through container-based compression stations; for the UC: could distribute through their network for biogas in northern Sweden.

Gasum

A nordic energy company, work for clean mobility of people and goods on land and at sea. Offer industry and combined heat and power production and clean, cost-effective energy and raw materials in Finland, Sweden and Norway. Help customers to master the energy market and provide services and consultancy throughout the market chain. Has biogas plants and tank stations with CNG and LNG; for the UC: could distribute through their network for biogas in northern Sweden.

7.1.4. Description of stakeholders – Spain

7.1.4.1. Stakeholders of the value chain

Sociedad Cooperativa del Alagón (COPAL) [MarginUp! partner] [key stakeholder]

A business association of around 500 farmers, seated on [Coria](#); COPAL is closely involved in the development of alternative crops for its farmers (like hemp and kenaf). For the UC: Provider of hemp and kenaf biomass, as the crop trials of the UC are done on farms of COPAL in the Region of Coria; two members will grow about 4 ha of hemp in 2024; connection with other partners of the Spanish UC in the different MarginUp! Project activities; [CICYTEX](#) works with COPAL, as they are a lot of farmers and they are very much interested in the search for alternative crops; has extensive knowledge of the economic, social, environmental and agronomic reality of the case study area in the [Alagon Valley](#).

Modular System Global S. L. (MODULAR SYSTEM) [MarginUp! partner] [key stakeholder]

An engineering, architecture, manufacturing and real estate company founded in 2004; manufactures pre-fabricated houses for the whole of the Peninsula, including the Balearic and Canary Islands; headoffice in Madrid, registered in Coria; fabric in [Coria](#), several offices all over Spain; for the use case: Produces precast panels from fibres, uses precasts in its own house-building company; has a laboratory for studies and prototypes of all the biomaterials they are working on; aims at eco-sustainable production and emissions reduction.

Centro de Formación del Medio Rural de Moraleja [key stakeholder]

Agricultural education centre; professional and advanced training and experiments; belongs to Dirección General de Desarrollo Rural de la [Consejería de Agricultura, Desarrollo Rural, Medio Ambiente y Energía de la Junta de Extremadura](#); for the UC: participates in the first stage of biomass processing

Center for Scientific and Technological Research in Extremadura (CICYTEX) [key stakeholder]

The Center is an autonomous public body, belonging to the [Junta de Extremadura](#). As a general objective, CICYTEX intends to provide support to the business sector of Extremadura for the incorporation of R+D+i into their production processes. It has 4 centers (INTAEX, LA ORDEN, ICMC and CAEM) in which different areas such as fruit growing, horticulture, extensive crops, animal experimentation are researched; for the UC: coordinates the different activities carried out in the project (leader of the Spanish UC and task leader 2.2) and investigates the agronomic side of hemp and kenaf; gives advice on all the processes in the value chain; grows hemp and kenaf in experimental trials on its land (4000m²); Provides raw material supply (separated fibres) to [MODULAR SYSTEM](#).

Agrovete S.A. (Agrovete) [key stakeholder]

Seed company located in Portugal close to Extremadura; for the UC: provides hemp seed to the project; collaborates with [CICYTEX](#) in the first steps of the project, because of its knowledge of hemp crop in similar conditions to Alagón Valley and of its hemp fibre separation capabilities.

7.1.4.2. Stakeholders of the wider entrepreneurial ecosystem***Ambienta Ingeniería y Servicios Agrarios y Forestales S.L.U.***

A private Spanish company founded in 2006, with experience in engineering, consultancy and services in the engineering, in the rural and natural environment and in the agricultural and forestry sectors, as well as in the field of innovation in agriculture, forestry and environmental matters, with investments made and several R+D+i projects successfully developed. Ambienta works with other companies, universities and research centres; for the UC: provides environmental studies and works with [CICYTEX](#) on the UC; AMBIENTA is closely involved in the territorial profile of the agricultural and ecosystem services in Vegas del Alagón (including social and economic models)

National Agri-Food Technology Centre (CTAEX)

a non-profit farming business association and agri-food technological center; offers R&D&I, training and information to its members; laboratory accredited for medical cannabis and industrial hemp testing; for the UC: is a pioneer in the cultivation and analysis of hemp and has contacts to administration and business at regional and national level; does soil characterization and data during the project and the Life cycle analysis for the products

Operative Groups ECOPRADERAS and CEREAL AGUA – EIP AGRI Agriculture & innovation, European Commission

The European Innovation Partnership for Agricultural productivity and Sustainability (EIP-AGRI) has Operational Groups that are intended to bring together multiple actors such as farmers, researchers, advisers, businesses, environmental groups,

consumer interest groups or other NGOs to advance innovation in the agricultural and forestry sectors. The groups are project-based and tackle a certain (practical) problem or opportunity which may lead to an innovation. They receive funding from the EU Rural Development Programmes (since April 2023 EIP-AGRI is part of the EU CAP Network); for the UC: the two groups provide [CICYTEX](#) information about the agriculture of Alagón Valley.

Asociación Nacional de la Industria del Prefabricado de Hormigón (ANDECE)

A national representation of interests for the industry of concrete prefab housing; for the UC: [MODULAR SYSTEM](#) is a member; the association drives innovative solutions to help achieving the goal of reducing emissions and promoting sustainable practices in the precast concrete industry.

Regulations and policies

SHs with horizontal activities, ensuring frameworks for biomass production, pre-treatment, processing as well as stakeholder engagement:

Consejería de Agricultura, Desarrollo Rural, Población y Territorio

Ministry of Agriculture and Rural Development of Extremadura region, part of the government (Junta de Extremadura); for the UC: Regional council, interested in the UC; gives partial finance to projects.

Consejería para la Transición Ecológica y Sostenibilidad

Ministry of Ecologic Transition and Sustainability of Extremadura region, part of the government (Junta de Extremadura); for the UC: The Administration can help SHs with the introduction of the industrial crops in the agriculture of Alagón Valley and with industrial developments related to natural fibres in the area.

Confederación Hidrográfica del Tajo (CHT)

Tajo River Organisation; for the UC: agricultural water regulation

Comunidad de Regantes de la margen derecha del Alagón

Irrigation Agriculture Service; The main object of the Community is policing and administration of the waters that they receive from an artificial lake at the upper Alagón river, as well as the avoidance of disputes between the different users of the water which it uses. They are obliged to maintain and repair the infrastructure. Big parts of the land are used as pastures, others are used for agriculture; for the UC: agricultural water service, very much interested in the search for alternative crops.

Diputación de Cáceres (province)

Governing body and the autonomous administration of the province of Cáceres. This province of western Spain makes up the northern half of the autonomous community of Extremadura. It has a little less than half a million inhabitants, its capital is the city of Cáceres; for the UC: provides assistance; finances rural development.

7.1.4.3. Stakeholders for potential scale-up

ADESVAL

Development Association; for the UC: provides partial funding to rural development activities and can help to prepare farmers' proposals; has shown interest in the UC; [Ambienta](#) and [COPAL](#) are members.

energiaextremadura.es

Small editorial office based in [Cáceres](#); for the UC: Runs the website [energieextremadura.es](#) and publishes a yearly publication about energetic topics and alternative energies in Extremadura region. Could provide valuable contacts and report on MarginUp!.

University of Extremadura

Public university in Extremadura (Badajoz and [Cáceres](#)); for the UC: studies the integrated use of biomass resources for energy production; hosts a research group on the topic (GAIRBER); does the characterization study

Initiative for fibre separation in La Vera area

Initiative in La Vera area (Extremadura region) to build a fibre separation company (in the first stage of study); for the UC: in a future value chain, an economic actor in the region could separate the fibres (until now [CICYTEX](#) or [Agrovete S.A.](#) in Portugal)

Owners of land for potential biomass cultivation

The following SHs own lands or represent land owners that could, in case of a scaled-up production, provide lands for additional biomass cultivation.

Coria and Moreleja City Councils

Coria and Moreleja are two small towns in the northern part of the [province of Cáceres](#), close to the Portuguese border. They have around 12000 and 7000 inhabitants and are located in the Alagón and Árrago river basins. In contrast to the mountainous areas around, these basins are fertile and irrigation is used to raise cereals, tobacco, tomatoes, peppers and cherries, as well as cattle and pigs as some of the most important agricultural products; for the UC: interested in the UC; might provide land or spaces to increase experimental trials.

Unión de Pequeños Agricultores (UPA - UCE)

Organisation that represent and defends the interests of farmers; for the UC: interested in the UC; through the trade unions, farmers beyond [COPAL](#) could be reached.

ASAJA (Asociación Agraria Jóvenes Agricultores)

Organisation that represent and defends the interests of farmers; for the UC: interested in the UC; through the trade unions, farmers beyond [COPAL](#) could be reached.

CETARSA (Asociación Agraria Jóvenes Agricultores)

Study of fibre processing; for the UC: involved in the cultivation of alternative crops to tobacco.

7.2. Key stakeholder interview — questionnaire template



Task 5.1 - Questionnaire for Key Stakeholders

Why do we need this?

MarginUP! aims for effective multi-actor engagement and network building to co-design the bioeconomy value chains and co-assess the results and outcomes of the project. To do so, inter 3 together with the use-case leaders has produced abstract mappings of the value chains and the involved stakeholders and has identified a number of key stakeholders for each use-case. With this interview, we want to present the project to the key stakeholders and to collect information on their interests, roles, responsibilities and capabilities with regard to the value chains. We also want to capture the key stakeholders' relationships with other relevant stakeholders and their view on barriers and potentials for low ILUC biobased products from marginal lands in their region and beyond.

The outcome of this interview will help to prepare a multi-actors' engagement plan for MarginUp! and to select stakeholders for establishing a Board of Actors for each use-case. These boards will be engaged in co-designing and co-assessment of the project results and participate in replication activities. Amongst other activities, interactive bottom-up strategy workshops will be held in each use-case region, to facilitate exchange and to identify strengths, weaknesses, opportunities and threats of existing farming systems and their application on marginal lands and subsequently formulate bottom-up appropriate strategies together.

Questions *[info for use-case leaders]*:

— A. Description of interviewee and the entity he or she represents:

- Could you please present yourself shortly?

- How would you describe your organization/ enterprise/ other entity in a few sentences?

- How and when have you heard about MarginUp?

- Could you please check the information gathered by us about you as a MarginUp! key stakeholder? *[confer the information provided by use-case leaders in the stakeholder template]*

please correct in the template

- How many employees does your entity have and how many of them are taking part in the activities that derive from your role in the use case (and its value chain)?

B. Stakeholders related to the use-case:

- If you look at the mapping, do you miss any important stakeholders (local, regional, national, EU)? *[confer PDF of MIRO-mapping, add max. 5 new stakeholders]* If yes, please name them and provide some information. *[only the information that is necessary to fill out a new row in the stakeholder template]*

please fill out in the template

- Do you know if local political authorities (e.g. cities, counties, etc.) are interested in the use-case or similar activities? If yes, please name them and specify.

- Do you know if important local economic actors (e.g. producers, financiers, retailers, etc.) are interested in the use-case or similar activities? If yes, please name them and specify.

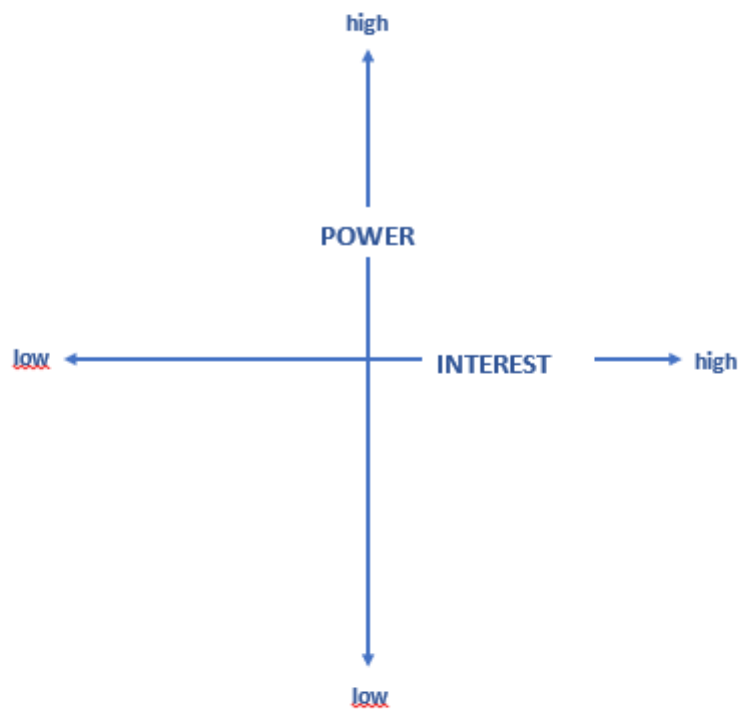
- Do you know if important local societal actors (e.g. NGOs, associations, trade unions, etc.) are interested in the use-case or similar activities? If yes, please name them and specify.

— C. The value chain of the use-case:

- Could you please locate your entity in the matrix below?

The vertical axis indicates if your entity has limited or plenty of power to influence, shape, or also block the value chain (including assets, human resources, monetary resources, natural resources, authority).

The horizontal axis indicates your interest in this value chain, including but not limited to how much you would under the right circumstances be interested to invest (time, money, knowledge, resources, etc.).



- How would you describe the role of your entity in this value chain?

- Have you/Has your entity already had experiences with this or a similar value chain, or is this new terrain for your organization?

- If you already had or plan to have any investment in infrastructure or products along the value chain, could you please give some details?

D. Local Boards of Actors:

- Would you be interested to participate in discussions about possible replication and scale-up of the use-case value chain?

☐ yes ☐ no

- Could you imagine to be a member of the Board of Actors of this use-case, if you were chosen? [

☐ yes ☐ no

- What other actors beyond the other key stakeholders identified by us would you like to see as members of the local Board of Actors (also on national or European level, if reasonable)? Please name them and write why: *[max. 4; the Board of Actors will be engaged in co-designing and co-assessment of the project results and participate in replication activities. See more above in introduction.]*

(1.)

(2.)

(3.)

(4.)

E. Relationships and exchanges between stakeholders:

- Could you please say a sentence on your relationship with every other key stakeholder identified by us, or in addition other stakeholders [*max. 2*] that you find very important? Please mention the kinds of interaction (e.g. payments; administrative assistance; material exchange; knowledge transfer, etc.) that happen with each of them.

1. _____

2. _____

3. _____

4. _____

5. _____

(6.) _____

(7.) _____

- Is your entity member in any organization, institution or network that is important for you in the use-case (e.g. a bio-economy networks, machinery rings, research associations, cooperatives, lobbying organizations)? Or are there any such networks that would be helpful, but that you are not a member of?

- For successful value chains, interaction and cooperation of the different stakeholders are crucial (joint investments, research, or lobbying; product development; marketing; economic relations, knowledge exchange).

Please evaluate your experience with cooperation and interaction in the value chain of the use-case:

In case of suboptimal cooperation and interaction, please name three main reasons that you can think of:

(1.)

(2.)

(3.)

- Did you have to build up any specific know-how to participate in the value chain? If yes, how did you or your entity acquire this knowledge?

- Is knowledge shared commonly between the stakeholders of the use-case/ the actors along the value chain? If not, what are the main obstacles?

- If you are involved in the development, diffusion or use of new technology, from where did you gain the knowledge, the technology and the skilled staff?

— **D. Barriers and potentials**

- What possible or already existing barriers come into your mind when you think about a successful scaling-up of the use-case?

- What potentials come into your mind?

- In your opinion, what are the most important barriers (legal, economical, ecological, etc.) to investments in the value chain?

- Opposition against land-use practices can be strong in some cases and be a crucial factor to the success of new practices and value chains, if not addressed constructively.

Did you hear about actors that are uncertain or critical about the value chain or a future scale-up because of its possible socioeconomic or ecological impacts?

- Do you have any other ideas that you want to share with us?

Thank you very much for your support!

7.3. MarginUp! stakeholder lists for each use-case and key stakeholder list

(see separate excel sheets/ PDFs)