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MED Greenhouses
**“Green Growth through the capitalization of innovative
Greenhouses”**

Gap Analysis & Policy recommendations

University of Thessaly

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Introduction

The overall objective of the “MED Greenhouses” project is to improve eco-innovation capacities of public & private actors in the greenhouse/agriculture sector, through stronger transnational cooperation, knowledge transfer and better collaborative networks. The main beneficiaries will be Greenhouse Farmers, Businesses specialized in Agro-food and Greenhouse industry, Policy Makers - Unions of Agricultural Cooperatives, Research & Technology Institutes, etc.

This deliverable (Del 3.1.5) is elaborated in the context of the Activity 3.1 - State of Play in Policies, Financing, Technologies & Stakeholders and WP3.

WP3 “Capitalising”, aims at improving the existing innovative framework conditions in the MED area, providing tailored recommendations to stakeholders and favouring eco-innovative investments in the agricultural sector, and ii) creating synergies and cooperation mechanisms strengthening innovative clusters and networks.

The Activity 3.1 aims to identify record & present the state of play in policies, frameworks, financing channels, technologies of innovative greenhouses and the stakeholders/ key players of agriculture/greenhouse sector.

Deliverable 3.1.5 aims to identify the missing links & develop tailored policy recommendations for the establishment of innovative greenhouses.

For this reason, based on the research conducted by the partners for the elaboration of the deliverables 3.1.1, 3.1.2, 3.1.3 and 3.1.4, this report identifies the **gaps** and **obstacles** at Regional and National level in the following sectors:

- Technologies of innovative greenhouses
- Stakeholders and key players of the greenhouse sector
- Financial Channels for eco-innovative technologies
- Policies and frameworks promoting eco-innovation

After assessing and analyzing the above findings, 3 policy recommendations are designed and presented by each partner aiming to facilitate the policy makers to enhance the existing investment conditions promoting innovative greenhouses at regional/national level. The report is structured at partner’s country level :

- Region of Berat / Albania
- Nicosia / Cyprus
- PACA region / France
- Region of Thessaly / Greece
- Molise Region / Italy
- Region of Murcia / Spain

1. Gaps and obstacles recorded regarding technologies of innovative greenhouses in the region

Based on the findings of the Del. 3.1.1 "Joint Report on technologies of innovative greenhouses in the involved MED regions", this section presents important gaps and barriers that have been identified at national / regional level, regarding technologies of innovative greenhouses. The lack of knowledge and the gaps of information of the stakeholders regarding existing innovative technologies of the greenhouse sector is also a subject of study.

1.1 Overview of the State of play

1.1.1 Albania

The Albanian greenhouse market has grown steadily in the last decades. The area occupied by protected cultivations and the production of vegetables produced in greenhouses increased substantively. According with the data reported by the Albanian National Institute of Statistics in December 2017, the total area under greenhouse production was 1,540.000 ha. This figure shows an increase from the previous year, when the greenhouses' production area was roughly 1,405.000 ha (December 2016). The area has grown about 5 times from 1998, when it was around 309,000 ha, and it has more than doubled in the last ten years.

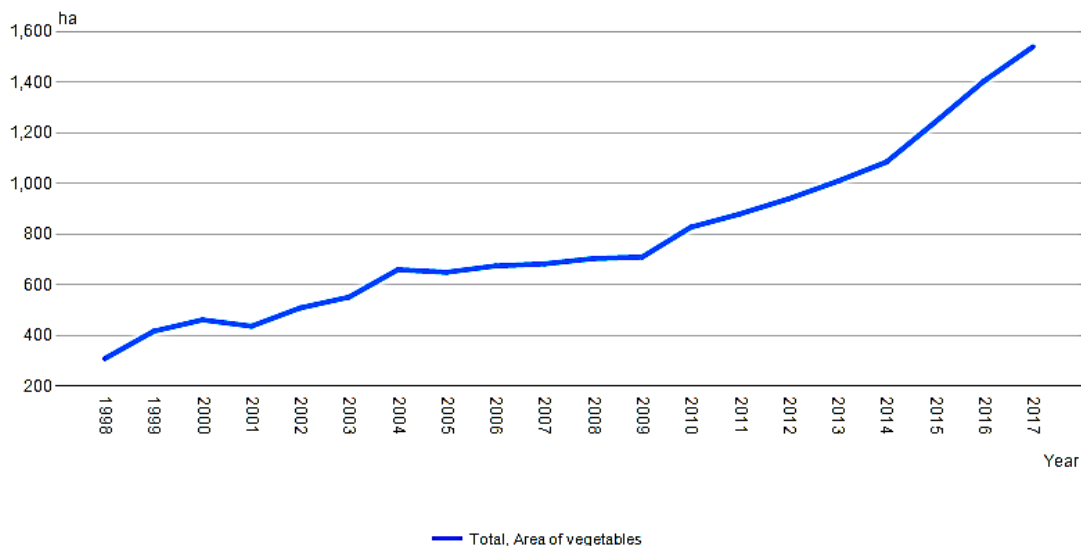


Figure 1 – Total area of vegetables under greenhouses (1998-2017)

Source: INSTAT

The graph above shows the steady increase in the total area of vegetables under greenhouses. Along with the area of cultivation under cover even the total production has witnessed a substantial increase. The general tendency is to build low cost non-heated greenhouses covered by plastic, commonly called Mediterranean greenhouses.

In fact, the construction of heated greenhouses progressively decreased during the last decade. This tendency can be explained by the high heating costs that make these kinds of greenhouses unaffordable. In fact, the high costs of energy and the lack of sustainable technologies to create a favorable microclimate for the indoor cultivations make the construction of heated greenhouses a non viable alternative. For these reasons often low-cost greenhouses are preferred by Albanian farmers. This general increase in greenhouse vegetable production is particularly evident in some areas such as Berat. The region's climate conditions, in fact, are extremely favorable for the protected cultivations. As a result, in the last decade the number of greenhouses in the area sharply increased.

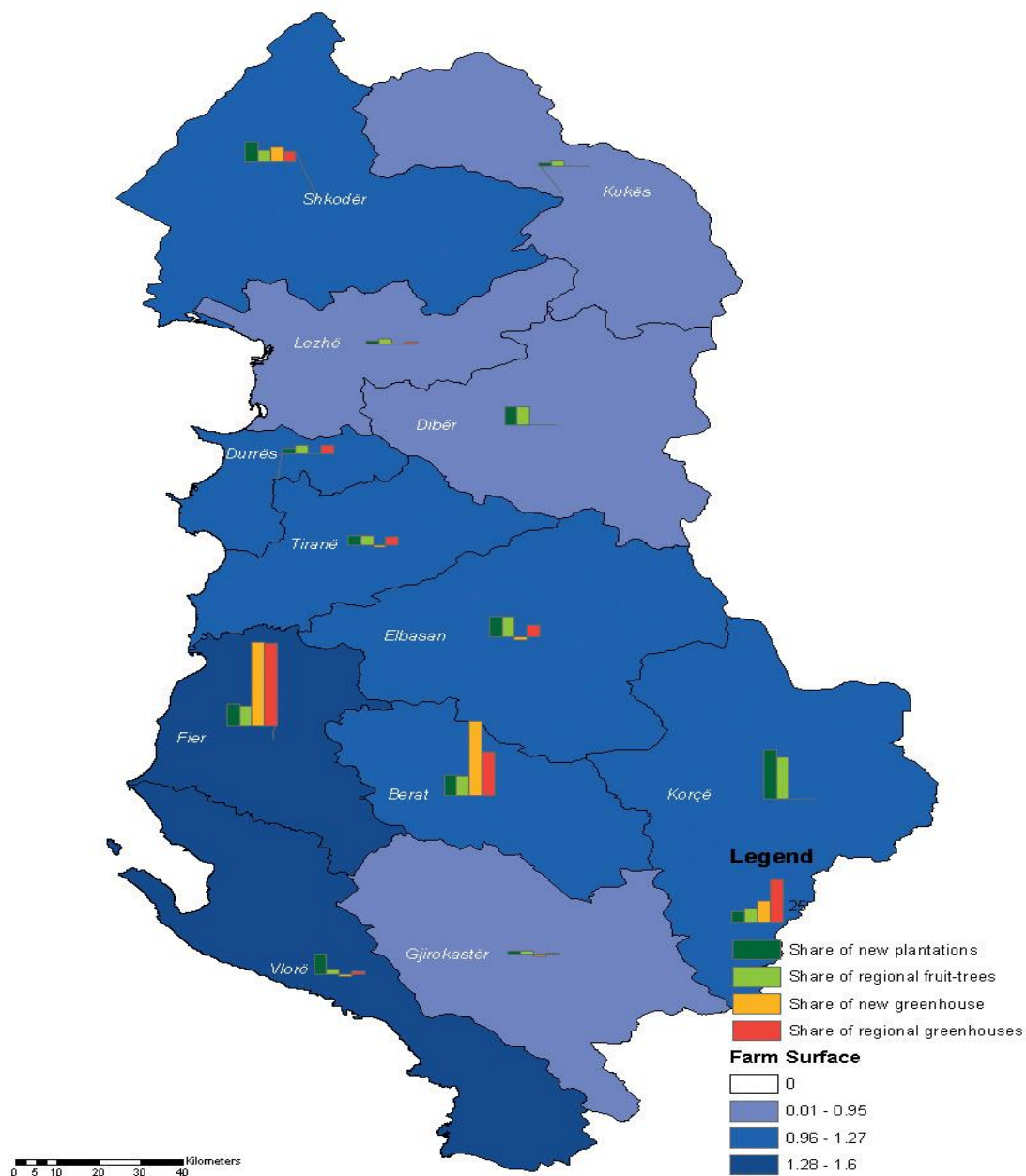


Figure 2 – Regional share of greenhouses and new greenhouses (1998-2017)

Sources: MAFCP, 2011; INSTAT, 2012/ European Union, 2015 (Guri et al. 2015)

However, despite the growth of this market segment there are still many issues that have to be addressed.

The system of protected cultivations in Albania, as commonly happens in the Mediterranean area, is characterized by a low level of energy input. The consequence is that the microclimate conditions are not satisfactory for cultivations for a large part of the year. The effects of this technological inadequacy strongly affect the yield and quality of the produced crop. Therefore, growers cannot exploit the high level of radiations in late spring and summer because of the lack of climate control technologies that allow to lower the temperature and to regulate the vapor pressure inside greenhouses. For this reason, plants inside greenhouses are continuously subjected to crop infestations and diseases, problems that are commonly addressed with a massive pesticides' usage. The yield and the plants' growth are strongly affected by the outside fluctuations of climate conditions. Although low cost greenhouses are widespread in Albania, there is a general positive trend in the construction of better equipped greenhouses.

Despite the large opportunities offered by the greenhouse market in Albania, there are some problems that affect the overall production that have to be addressed. The country should exploit better its comparative advantage with neighboring countries in terms of good environmental conditions and low labor cost. Modern design greenhouses are a solution to tackle the problem of the climate control and can allow farmers to extend the production period even during winter and summer. Cutting-edge technologies in greenhouses that rely on alternative sources of energy can replace common heated greenhouses and have a positive effect on the vegetable production and on the overall sector growth.

1.1.2 Cyprus

The agricultural sector in Cyprus contributes in 2,4% of the national GD, with a total gross output comes up to €698 million in 2015, compared to €666 million in 2014 which was decreased at 4.9% in relation to €701 million in 2013. The main reason of the reduction is attributed to unfavorable weather conditions, especially the water scarcity problem, which resulted in the decrease of the volume of crop production, mainly to cereals, straw and green fodder that decreased by 85.8%, 92.0% and 73.8% respectively. Crop production contributes in 35% of the total added value in agriculture and livestock contributes in 50% respectively. The main cultivated crops are fodder crops, cereals and olives, while the main exporting crop products are potatoes, citrus, leafy vegetables and Halloumi cheese.

Cyprus is a small producer of fruit and vegetables, accounting for less than 1% of the total EU production. Greenhouse crop production is considered to be the most intensive and energy consuming horticultural system. Greenhouses occupy 436 hectares corresponding to (approximately) 0,5% of the total cultivated area on the island. The main crops cultivated in greenhouses are vegetables and flowers.

Greenhouses infrastructure and equipment varies within the country: Approximately 50% of greenhouses are high and low tunnels. Another 50% of the greenhouses covered area is equipped with heating systems and an estimated 10% concerns hydroponic cultivation systems. An estimation of 10% refers to the greenhouses covered area which is equipped with cooling systems

Greenhouse cultivation has not transformed drastically in the recent two decades in Cyprus into a more advanced and productive sector. However, there are still specific difficulties that need to be tackled for the sector to become more modern, productive and efficient. These difficulties may be summarized in the following (not exclusive) list:

- Increased raw material prices (fertilizers, pesticides, etc.).
- Water shortage.
- Loss of good agricultural land in other activities (residential, tourist development).
- Increased energy price (oil, electricity).
- Increased production pressure from pests and crop diseases.
- Increased Purchase Needs in Product Quality (ie Need to Use New Technology).
- Increased Market Competition.
- Increased Market and EU requirements for environmental protection (reduction of emissions, pollutants, etc.)
- Requirement for Improved Working Conditions (Young Farmers)
- Difficulty finding initial capital for new businesses due to the financial crisis.
- Significant reduction of yields, product quality and unbalanced food chain market's supply.

Therefore, it should be noted that there is an important need for reduction of operational cost mainly derived from the tremendous increase of fossil fuel prices. In addition efforts and research should be focused on minimizing the use of energy and water consumption in greenhouse cultivation, through the introduction of new methods and innovative automated technologies.

1.1.3 France

In France, the area dedicated to greenhouses production represents about 10.000 ha, 2/3 of which is devoted to vegetable crops and 1/3 to ornamental products.

According to the database of the French Ministry of Agriculture and Food "AGRESTE", the number of Greenhouses and high shelters for vegetables or flowers in France is 13.842 whereas the number of Greenhouses for permanent crops is 1.163 which represents a total number of 15.005 (2010).

Provence-Alpes-Côte d'Azur "PACA" region (now called "Région Sud") is one of the most important French agriculture regions, it has the highest number of greenhouses in France. The region ranks as the first region for the production of fruits, fresh vegetables and flowers. In PACA there is 1.700 farms who produce vegetables under shelter on 2.166 ha (CTIFL 2010)

The map below shows the distribution of agricultural production based on greenhouses in PACA region:

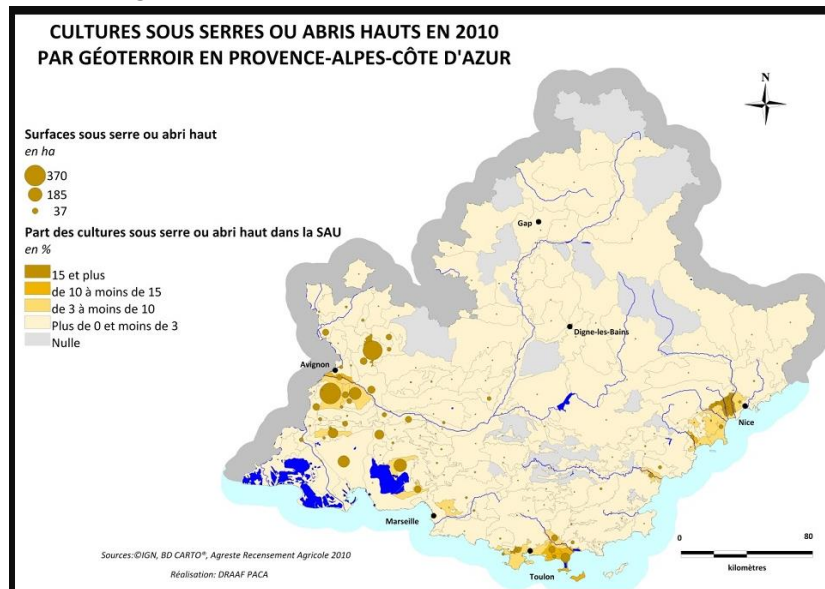


Figure 3 - Greenhouses production in PACA region (Provence Alpes côtéd'azur) (DRAAF PACA 2010)

In PACA region, while the greenhouse vegetable area grew by 7% between 1988 and 2000, it lost 13% over the last ten years.

The number of farmers having greenhouses, has decreased by -20% in the south of France between 2011 and 2016 (most shelters were built before the 2000s for market gardening and before 1990 for horticulture)

- Electricity consumption in agriculture sector in France is mainly absorbed by livestock buildings while natural gas consumed on farms is mainly used to heat greenhouses.
- According to the "Study of geothermal potential in the Provence-Alpes-Côte d'Azur region" made by the BRGM in 2013, the PACA region has 1.211.852.521 MWh / year of available energy, of which 66,724,446 MWh / year represents the potential of mobilizable energy.
- French vegetable producers want to give a boost to their sector, and to this end, they are betting on the development and modernization of their greenhouses, with investments totaling over 300 million Euro in the period from 2017 to 2020 on equipment and moderation.

While greenhouse agriculture is reducing some **innovative technologies have been introduced in recent years in France:**

- *Energy Storage Greenhouse:* possible energy savings range from 12 to 40 % through testing a doublethermal screen; a greenhouse with inflatable double walls.
- *Photovoltaic greenhouses in Bouches du Rhone:* Renewable electricity generation/ Economic opportunity through the sale of electricity, but agriculture practices need to be adapted compare to traditional greenhouses.
- *GROOF - Greenhouses to Reduce CO2 on Roofs:* an innovative cross-sectoral approach to reduce CO2 emissions in the construction and agricultural sectors by combining energy sharing and local food production
- *Geothermal energy in the horticultural sector:* Savings in water, energy, increased production compared to the conventional greenhouses.

1.1.4 Greece

Horticulture in Greece seems to be one of the more promising sectors of economic activity and employment of the country. It contributes about 4.1% of gross domestic product. Greenhouses cover about 150.000 ha (Eurostat, 2014) in the Mediterranean region while the greenhouse covered area in Greece is estimated to about 6000 ha. Presently, according to ELSTAT data, greenhouse vegetable production accounts for around 9% of the total vegetable cultivated fields in Greece. The greenhouse covered area increased about 13% from 2012 to 2017. The region that is now emerging in a rising production area is that of Western Greece, where greenhouse areas almost tripled in the three-year period 2012-2015). The crisis seems to be launching new data and new production expertise in greenhouses.

The greenhouses are scattered throughout the country, of which the majority, about 40% are located in the Crete Island, mostly in Ierapetra and Messara plain and another 25% is located in Peloponnese area. The recently intense financial crisis of Greece, however, has had a considerable impact to the greenhouse section growth.

Today's growers are confronted with the challenges of lasting changes in new entrepreneurship and the need to keep up with developments in technology, seeking solutions that match the needs of the Greek producer.

The estimated current situation of the greenhouse sector, however, is defined by family operated companies or small-scale growers that invest in low-cost and low level constructions. In this sense, the greenhouses are low tech and simple frame covered with plastic, suffering of high transportation costs, and lack of organization and specialized training skills. Totally, 8340 greenhouse units are spread throughout the Greece.

Many small farmers do not have the desire or the resources to invest. Still there is a large number of growers who are looking to innovate and improve. These are often the larger greenhouse companies, whose products are (partly) sold abroad.

The majority of greenhouses in Greece are generally characterized by their low technological level of the equipment used. Restrictions in the technology applied result in lower than expected agricultural practices, which in turn result in lower yields. Hi-tech greenhouses for instance (even in the lowest possible yield) outperform the yields of the other types of greenhouses. The fact is that due to the mild winter climate, the greenhouses in Crete and in Peloponnese area can produce during the period from mid-August to mid-May with the implementation of a few technologies: in these regions, the mean lower temperature observed during the winter is above 5°C, thus a greenhouse equipped with a ventilation and irrigation system will be capable to produce with low investment cost.

However, the greenhouses in these regions are not designed and equipped to produce during the summer period, while their production during the rest of the year always depends on the outside climate conditions. In addition to the unstable quantity of production, the quality of the production is also unstable.

Furthermore, due to the uncontrolled environment inside the greenhouse, the humidity levels (and in general the climate conditions) observed in these greenhouses are favourable for the development of diseases and insects, something that makes the need for pesticides use necessary.

Based on the climograph of Athens and Thessaloniki (Figure 4), it can be seen that for a year round cultivation, heating during day and night time is needed in Thessaloniki, from mid-November to February, since the average monthly air temperature in Thessaloniki during these months is lower than 8°C. In addition, it appears that natural ventilation is insufficient to meet the climate needs for a large period of the year but cooling is needed from May to September, something that is also applicable for Athens. Winter cultivation in unheated greenhouses is possible only in Athens compared to Thessaloniki.

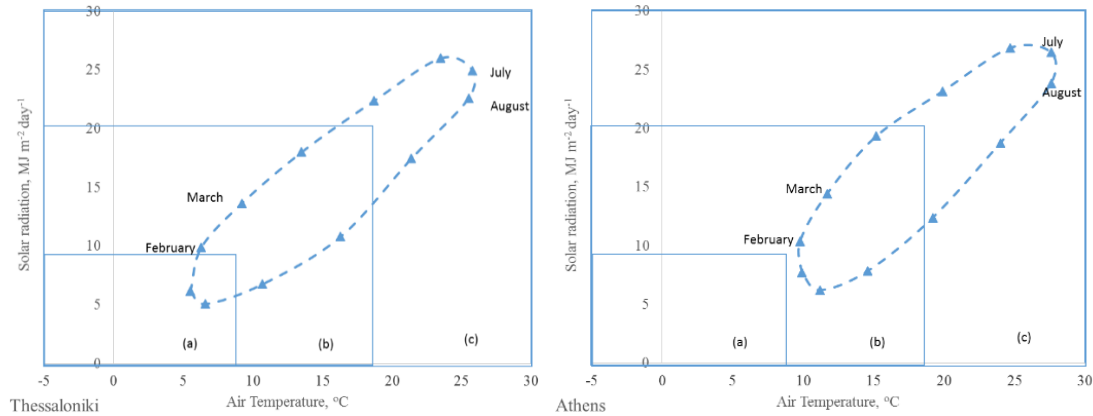


Figure 4. Mean daily solar radiation and air temperature during the year for the region of Athens and Thessaloniki. The different climate regions presented in each graph indicate (a) air temperature $< 8^{\circ}\text{C}$ and solar radiation $< 8 \text{ MJ m}^{-2} \text{ day}^{-1}$: daytime and nighttime heating and lightening; (b) $8^{\circ}\text{C} < \text{air temperature} < 18^{\circ}\text{C}$: nighttime heating and daytime ventilation; (c) $18^{\circ}\text{C} < \text{air temperature}$, and solar radiation $> 20 \text{ MJ m}^{-2} \text{ day}^{-1}$ cooling and shading. The dashed line indicates the average solar radiation and air temperature for the different months of the year.

Thus, it is absolutely necessary to follow the trend towards the application of a more advanced technology for better climate control and a lesser use of water and agrochemicals. Integrated management of pest and diseases, soilless cultivations, drip irrigation and fertigation systems are easily spread in most of the greenhouses of the Mediterranean zone. Cultivation of vegetables, flowers and other crops in greenhouses can easily, also, be performed by utilisation of geothermal energy as a heat source. Additionally, cogeneration or combined heat and power can be seen as an important technology to reduce carbon emissions resulting from energy production in Mediterranean greenhouses.

1.1.5 Italy

The diffusion of greenhouses in Italy in the agricultural sector has registered a constant increase that coincided with an increase in horticultural productions, which have consequently become the engine of development of the greenhouses market themselves. Cultivation in a protected environment represents, in terms of surface, a small fraction of the total area used, but for some sectors (horticulture, floriculture, nursery) is particularly important. The intended area to protected horticultural crops hovers in Italy around 37,000 ha (Istat, 2013) with a total surface of about 10% of the totally invested in vegetables (Inea, 2010). The total surfaces involved in horticultural crop is about 30000 hectares instead of about 7000 for floriculture activities.

Nowadays the number of farmers involved in greenhouses industries are 25829 (ISTAT, 2013). In the horticultural greenhouse sector are involved 14400 farmers, with about the 42% of farmers involved in tomato cultivation. In the floriculture sector are involved 9699 farmers.

Greenhouse production is usually based on small-size farms (less than 1 ha) which are owned and operated by families. Protected crops are scattered all over the country, but the most representative areas are located, moving from the north to the south, in Campania, Lazio, Lombardia, Veneto, Liguria, Toscana, Sicilia and Sardegna. Greenhouses are particularly widespread along the sea coast which has a mild winter climate. The main vegetables grown in the greenhouse are tomato, pepper, zucchini, lettuce, strawberry. While in the floriculture the species grown in the greenhouse belong mainly to the (pink, pink, gladiolus, chrysanthemum, aralia asparagus spp) and green and flowering plants from within and flowering fronds.

Different types of greenhouses and protection structures can be found, ranging from wooden structures covered with plastic film to glasshouses fully equipped for automatic climatic control and internal plant transportation. Most greenhouses are covered with plastic films (PE, EVA) with an emergency heating system or lacking heating altogether. Strawberry, vegetables and some flower crops (carnation) are usually cultivated in very simple greenhouses, whereas other flower crops and pot plants are grown in more sophisticated glasshouses. The favorable climatic conditions in the southern region make it possible to use simple and cheap structures also for winter cropping of warm-season species such as solanaceae and cucurbitaceae: these structures includes greenhouses made with wood and plastic films and walk-in or low plastic tunnels. Early vegetables are produced also in small row-covers, which are set-up at the beginning of growing season, and maintained for 1–2 months. In Italy protected cultivation of tree fruits is also used for earlier ripening of table grape, peach, nectarine, and plum, and for delayed harvesting of table grapes.

Greenhouses in Italy generally consist of a metal construction with plastic covering. Loose tunnels are often used for fruit and vegetable production. Multi-tunnel greenhouses are used for fruit and vegetable cultivation but also for the production of leafy vegetables that are packed on location, ready-to-use for the consumer. Greenhouses with a higher level of technology are mostly used for the cultivation of flowers and herbs and to grow cuttings. 20% of the greenhouses, mainly in the flower industry, are equipped with a heating system and 10% of greenhouse cultivation is done on substrate, particularly in tomato cultivation.

The economic dimension of the sector has a decisive impact, with a gross salable production of horticultural products exceeding 3 billion euros and a turnover of at least 2 billion in terms of components, systems and materials.

Requirements and investment

Many small farmers do not have the desire or the resources to invest. Still there is a large number of growers who are looking to innovate and improve. These are often the larger greenhouse companies, whose products are (partly) sold abroad.

In northern Italy there are opportunities in flower cultivation for technology and automation. In the south, Lazio and Sicily, substrate cultivation is expanding. In Campania the production of leafy vegetables is quickly developing, investments are being made in mechanization.

To act as a watershed between "active", or technologically advanced, greenhouses and "passive" greenhouses, which are more technologically obsolete, it is above all the question Energy. Hi-tech greenhouses require a very high energy input.

1.1.6 Spain

Production capacity of Greenhouses and their contribution in Agriculture:

The horticultural sector in the greenhouse occupies a position of unquestionable leadership in Europe. This is demonstrated by its figures: 43,400 hectares of land dedicated to the cultivation of the main fruit and vegetable products (pepper, tomato, zucchini, eggplant, cucumber, melon, watermelon and green beans), more than 5,000 million euros in turnover and 5 million tons of products that supply more than 60% of national consumption and more than 30% of European markets, reaching levels higher than 80% during the winter months.

Presentation of Greenhouse manufacturers:

Around 600 companies produce and / or commercialize greenhouses in Spain, with more than half of them located in Andalucía (250) and Murcia (67).

Predictions for the next 10 years (or more) – Demand & Supply:

According to the consulting company "Research And Markets.com's" report, the commercial greenhouse market was valued at US\$19.982 billion in 2017 and is projected to expand at a CAGR of 7.14% over the forecast period to reach US\$30.224 billion by 2023.

The global commercial greenhouse demand is expected to witness boost in sales over the forecast period owing to various factors such as reducing arable land for cultivation of crops, and rising trend of roof top and vertical farming.

Higher adoption of greenhouses commercially is vastly aided by the benefits of application of greenhouses for cultivation. The demand for commercial implementation of greenhouses is highly augmented by the decrease in arable land per capita, unfavorable conditions in the traditional agriculture, and higher output in comparison to the traditional techniques.

1.2 Gaps

1.2.1 Albania

Table 1 – Identified gaps in innovative technologies in Region the Berat (Albania)

N	Lack of Technology	Short Description - justification
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1	Lack of heating systems	The lack of heating systems has been mostly due to the high costs connected to the construction and management of this kind of greenhouses.
2	Lack of climate control system	The lack of sensors that can regulate the moisture, the vapor pressure inside greenhouses and the temperature level during winter and during summer seriously affect the crop life cycle and enhance the parasites infestations and diseases.
3	Lack of infrastructures	The lack of infrastructures negatively affects the entire greenhouses vegetable market because especially at local level the rural areas are poor connected with market places.
4	Lack of renewable technologies used to fuel greenhouses	The heated greenhouses on the Albanian territory are fueled with energy produced by fossil fuels that makes them unsustainable from the environmental and economic point of view considering the energy prices in the country.

1.2.2 Cyprus

Table 2 – Identified gaps in innovative technologies in Cyprus

N	Lack of Technology	Short Description - justification
1	Developing new agricultural practices and introducing crops (with high market value) adapted to greenhouses	Greenhouse agriculture is more resilient to the impact of climate change but at the same time climate change is bringing new opportunities for growing new crops and require new management practices
2	Introducing new business models considering the positive impact on the environment and jobs	Small market, limited interest in the market
3	Automations in greenhouse climate control	Most of the greenhouses do not implement automations for the greenhouse climate and irrigation control. Application of such technologies could lead to higher efficiency of resources in greenhouses

1.2.3 France

Table 3 – Identified gaps in innovative technologies in PACA region (France)

N	Lack of Technology	Short Description - justification
1	Development of mechanization and automation in greenhouses sector	France has among the most expensive workforce in Europe. To be competitive more automatization must be introduced
2	Optimizing climate, energy, fertilizers, water management and phytosanitary treatment	South of France has specific Mediterranean climate (Valorization of solar energy- no need for the heated greenhouses in some cases but rather refreshing or regulating climate, need for shelter to protect corps from the sun)
3	Developing new agricultural practices and introducing crops (with high market value) adapted to greenhouses	Greenhouse agriculture is more resilient to the impact of climate change but at the same time climate change is bringing new opportunities for growing new crops and require new management practices
4	Introducing new business models considering also the positive impact on the environment and jobs	Economic case studies are necessary to convince public authority to invest in this sector, boost innovation and provide incentives to farmers, research and technology providers

1.2.4 Greece

Table 4 – Identified gaps in innovative technologies in the Region of Thessaly(Greece)

N	Lack of Technology	Short Description - justification
1	Heating system	The greenhouses Greece located southern from Athens, in most of the cases do not have a heating systems. This leads to insufficient climate control. Thus, a heating systems for greenhouse air and crop heating is needed. This will lead to higher yield and quality and reductions of the needs for pesticide applications.

2	Energy saving systems	Most of the greenhouses in Greece are not equipped by energy saving systems. A simple energy saving system is the use of double cover for greenhouse covering or the use of a thermal screen. Utilisation of the above techniques may lead to an energy saving in heated greenhouses of 40-50%.
3	Utilization of geothermal energy	Several regions in Greece have low enthalpy geothermal fields that can be utilized for greenhouse heating. The hot water can be pumped from relatively low levels, used for greenhouses heating and return to the geothermal field.
4	Cooling system	To cultivate during summer in most of the regions in Greece, a cooling systems is needed. Evaporative cooling systems seem quite efficient for regions with low outside air relative humidity during summer.
5	Soilless cultivations	It is estimated that less than 10% of the cultivated greenhouses areas in Greece are done soilless. This leads to low water and fertilisers use efficiency and production. Application of substrate based soilless cultivations in closed loop systems could result in a high increase of the abovementioned indices.
6	Automations in greenhouse climate control	Most of the greenhouses in Greece do not implement automations for the greenhouse climate and irrigation control. Application of such technologies could lead to higher efficiency of resources in greenhouses

1.2.5 Italy

Table 5 – Identified gaps in innovative technologies in Molise Region (Italy)

N	Lack of Technology	Short Description - justification
1	No lack	Italy is a great producer of new technologies, in Italy there are also all the big companies

		involved in the sector (farmers are easily contacted with companies)
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1.2.6 Spain

Table 6 – Identified gaps in innovative technologies in the Region of Murcia (Spain)

N	Lack of Technology	Short Description - justification
1	Need to improve wastewater purification technology	The need of innovative projects in order to save in water, energy will increase production compared to the conventional greenhouses
2	Lack of knowledge transfer.	Encouraging scientists to continue their work beyond their basic research projects and even to participate in the application of its results , ensuring generational change in the sector.

1.3 Obstacles

1.3.1 Albania

Table 7 – Identified obstacles for the promotion of innovative technologies in the Region of Berat (Albania)

N	Identified Obstacles	Short Description of the obstacle - justification
1	Lack of knowledge transfer	In the country there is a poor transfer of technologies and knowledge among farmers, despite in the agricultural policies adopted in recent years a big emphasis has been given to the creation of advisory and training systems, actually these initiatives have never been undertaken because of lack of funds.
2	Lack of education	As it can be easily deduced from the Instat web site the rural population is not well educated. The business activities are run relying on traditional and empirical knowledge. For this reason for example the parasites infestations inside greenhouses are tackled with a massive pesticides usage that

		lead to the production of poor quality products.
3	High investments costs	Normally low costs greenhouses are preferred to cutting-edge technologies greenhouses because of the high start-up costs that make the low cost non-heated greenhouses a viable alternative.
4	Massive presence of smallholders	The presence of small and medium enterprises make the investments needed to build technologically advances greenhouses unaffordable for farmers.
5	Poor government incentives to agriculture	During the last decades the first sector output has grown steadily however the governmental incentives to agriculture were scarce or inexistent.

1.3.2 Cyprus

Table 8 – Identified obstacles for the promotion of innovative technologies in Cyprus

N	Identified Obstacles	Short Description of the obstacle - justification
1	Difficulty finding initial capital for new businesses	Due to the financial crisis
2	Lack of knowledge transfer – researchers - farmers	More intensive exchanges between researchers and farmers are required focusing on economic and agronomic performances
3	Limited cooperation between stakeholders	The quadruple helix cooperation method suggested through the S3CY should be encouraged more.
4	High cost of investment and high running costs	The cost for installing high tech heating systems especially in small greenhouses is high.
5	Water scarcity	The increase of greenhouse production is increasing the need of water, which is scarce in the production areas.
6	Energy consumption	The cost of energy in greenhouses is high. It could be improved by a more extensive use of renewable energy resources such as solar energy.

1.3.3 France

Table 9 – Identified obstacles for the promotion of innovative technologies in PACA region (France)

N	Identified Obstacles	Short Description of the obstacle - justification
1	High level of investment required for greenhouse	Payback period is perceived as very long by farmers and therefore very risky
2	Lack of knowledge transfer – researchers - farmers	More intensive exchanges between researchers and farmers are required focusing on economic and agronomic performances
3	Political decision to promote the use of geothermal energy	The use of geothermal resources to warm and cool greenhouses is an opportunity and requires improvement and political involvement in the PACA region and in France in general

1.3.4 Greece

Table 10 – Identified obstacles for the promotion of innovative technologies in Greece

N	Identified Obstacles	Short Description of the obstacle - justification
1	High cost of investment and high running costs	The cost for the installation of a high tech heating systems especially in small greenhouses is high. In addition, during the recent years, the cost of the energy source for the heating system is very high and biomass seems to be the only sustainable solution for greenhouses heating
2	High investment cos, lack of knowledge transfer	The growers are not aware of the advantages of an energy saving systems and taking into account the high cost for investment do not install energy saving systems in their greenhouses.
3	High investment cost	The cost for the drillings is high for small greenhouses
4	Investment cost, need for good quality water	The investment cost for the installation of the systems is one of the barriers. An

		important also obstacle is the need for high quantities of water and in the case of fog or mist systems a reverse osmosis system needs to be used to produce high quality water.
5	Lack of knowledge transfer and performance indices	The majority of the growers cannot operate a soilless cultivation system due to lack of knowledge on how to operate it and control it. Greenhouse production is usually based on small-size farms (less than 0.5 ha), often family-run, with a lack of specialized personnel (staff only laborers). In addition, the growers have not information on the performance that their greenhouse will have to obtain, and there are no strict environmental restrictions in relation to the footprint that a greenhouse has.
6	Lack of knowledge transfer, high cost of investment of small greenhouses	The cost of the system for a small greenhouse is high and the growers are not aware of the advantages that a greenhouse climate and irrigation control system can offer. Greenhouse production is usually based on small-size farms (less than 0.5 ha), often family-run, with a lack of specialized personnel.

1.3.5 Italy

Table 11 – Identified obstacles for the promotion of innovative technologies in Molise Region (Italy)

N	Identified Obstacles	Short Description of the obstacle - justification
1	price of new technologies	Greenhouse production is usually based on small-size farms (less than 1 ha)
2	Little need to implement new technologies	The favorable climatic conditions in the southern region make it possible to use simple and cheap structures also for winter cropping of warm-season species such as solanaceae and cucurbitaceae

3	some technologies have a high degree of complexity for management	Greenhouse production is usually based on small-size farms (less than 1 ha), often family-run, with a lack of specialized personnel (staff only laborers)
4	Lack of knowledge transfer, information etc.	Greenhouse production is usually based on small-size farms (less than 1 ha)

1.3.6 Spain

Table 12 – Identified obstacles for the promotion of innovative technologies in the Region of Murcia (Spain)

N	Identified Obstacles	Short Description of the obstacle - justification
1	Little public funding	Public funding for innovative technologies applied to greenhouses are not enough to incentivize farmers to invest in technology
2	Water scarcity	Most greenhouses in Spain are located in areas of water scarcity due to the fact that water and nutrients are more easily controlled in a protected system. However, the increase of greenhouse production is increasing the need of water, which is scarce in the production areas.
3	Energy consumption	The cost of energy in greenhouses is high. It could be improved by a more extensive use of renewable energy resources such as solar energy.

2. Stakeholders and key players of the greenhouse sector

Based on the findings of the Del. 3.1.2 “Development of Stakeholders & Beneficiaries database”, the partners present important gaps that have been recorded at national / regional level regarding stakeholders as well as key players of the sector. The section also presents the missing type of key actors that could strengthen the greenhouse sector at regional/ national level.

2.1 Overview of the state of play

2.1.1 Albania

The stakeholders’ analysis has shown a wide and composite number of subjects, entities and potential partners, private and public that can play an important role in the implementation of the MED greenhouse project.

Table 13 – Identified key stakeholders in the Region of Berat (Albania)

Type	Total No	Public		Private		Other		SMEs	Large Companies	Clusters/ Associations	Manufactures	Farmers	Research centres/institutions	Service providers
		No	% (of total)	No	% (of total)	No	% (of total)							
Enterprises	14	0	0	13	92,86	1	7,14	9	4			22		1
Academia	8	5	62,5	3	37,5	0	0						5	3
Government	16	16	100	0	0	0	0							16
Civil Society	19	1	5,26	9	47,37	9	47,37			6			1	3
Total	57	22	38,6	25	43,85	10	17,54	9	4	6		22	6	23

According with the table above considering the type of stakeholders / beneficiaries there is a total of 57 stakeholders, out of which 14 (or 25%) come from enterprises

(farmers are not included); 16 (or 28%) are governmental institutions, 8 (or 14%) are part of the academic world and research institutions and 19 (or 33%) are actors coming from the civil society and nonprofit organization, as shown in Diagram 1. Moreover, around 44% of all beneficiaries are private institution, whereas 39% are public institutions and 17% are nonprofit organizations.

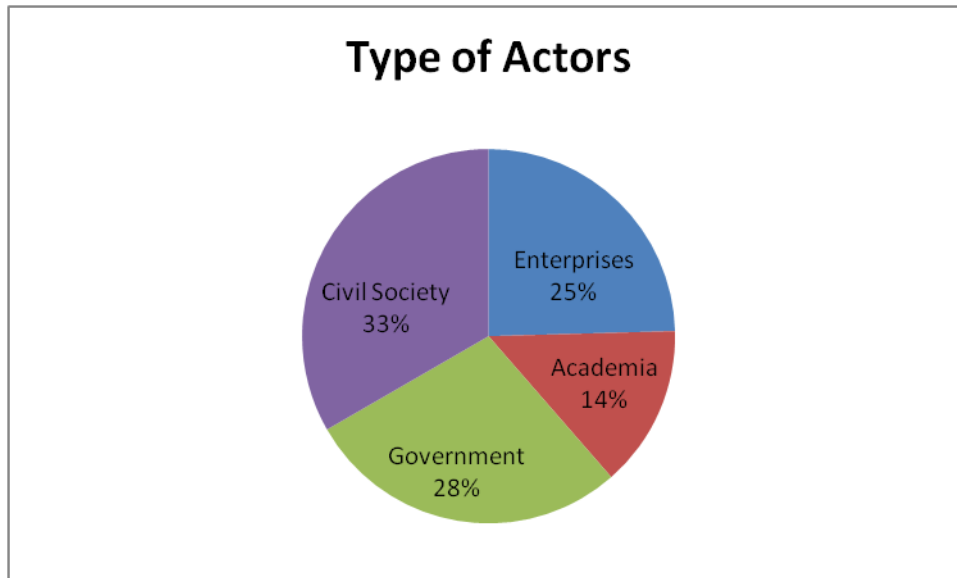


Figure 5 - Type of 4-helix actors (key identified actors)

2.1.2 Cyprus

The greenhouse sector in Cyprus includes several stakeholders representing the quadruple helix. The current research shows that in the private sector, civil society and academia are included stakeholders or beneficiaries that are directly engaged and occupied in the sector of greenhouse; therefore they would have the opportunity to benefit the most out of the project’s activities and outputs.

Another important point that derives from the outcomes of the research is the centralization of power in regards to the policy making in the greenhouse sector. The most important stakeholders in reference to decision making for policy development are the governmental institutions. Academia and the civil society has also an important role, however the private sector is not so powerful when it comes to impacting policy formulation.

The table below gives an overview of the stakeholders identified in Del. 3.1.2.

Table 14 – Identified key stakeholders in Cyprus

Type	Total No	Public		Private		Other		SMEs	Large Companies	Clusters/ Associations	Manufactures	Farmers	Research centres/institutions	Service providers
		No	% (of total)	No	% (of total)	No	% (of total)							
Enterprises	10			10	100			10			2	7		1
Academia	5	2	40	1	20	2	40						5	
Government	4	4	100											
Civil Society	5					5	100			5				
Total	24	6	25	11	46	7	29	10		5	2	7	5	1

2.1.3 France

40 French key stakeholders have expressed an interest to know more about Med Greenhouses project and to be part of the project cluster. SEMIDE made a state of play of regional and national stakeholders that could be included to the project data base. The most important categories of stakeholders identified in the region are in the table below.

Table 15 – Identified key stakeholders in PACA Region (France)

Category	Key actors	Main Interest	(potential) Role in Greenhouse innovation / deployment
Public	Territorial authorities (municipalities, province, region)	Maintaining green areas, Quality of life of citizens Job creation	Availability of lands dedicated to agriculture Incentives
Public	Agricultural chambers	Improving the economic, social and environmental	Promotion of greenhouse innovation

		performance of farmers	
Public	CTIFL Technical Center serving the Fruit and Vegetable Sector	Improve the expertise of the various trades in the sector and increase the competitiveness of companies	Technical support of professional actors in strategic development.
Public	Ministry of agriculture	Management of agriculture sector Ensure economic sustainability of the sector	Support for Local food systems initiatives
Research	INRA- National Institute of Agronomic Research	Integrate research knowledge in the development of innovative agronomic strategies	Research development
Education	Horticultural Universities	Research Training	Trainings on innovation in greenhouses sector
Education	Horticultural high school	Training Local production	Trainings on innovation in greenhouses sector
Private	Farmers	New technologies New innovations Financial channels	Application of new technologies and innovation
Private	Greenhouse technology providers	Product development and technical acclimatization	Demonstration of new technologies
private	Insurance companies	Extending greenhouse market segment Less incidents linked to greenhouses (e.g. agricultural losses)	Knowledge provision

Association	Terre de lien Farmers solidarity Agri bio PACA	Various	Provision of funds/lands/know how for farmers
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The table and figures below give an overview of the stakeholders identified in Del. 3.1.2.

Type	Total No	Public		Private		Other		SMEs	Large Companies	Clusters/ Associations	Manufacturers	Farmers	Research centres/institutions	Service providers
		No	% (of total)	No	% (of total)	No	% (of total)							
Enterprises	10	1	10	9	90			1	8	1				
Academia	10	9	90	1	10	0	0	0	0	0	0		10	
Government	10	10	100											
Civil Society	10	2	20	8	80					10				
Total	40	22		18				1	8	11			10	

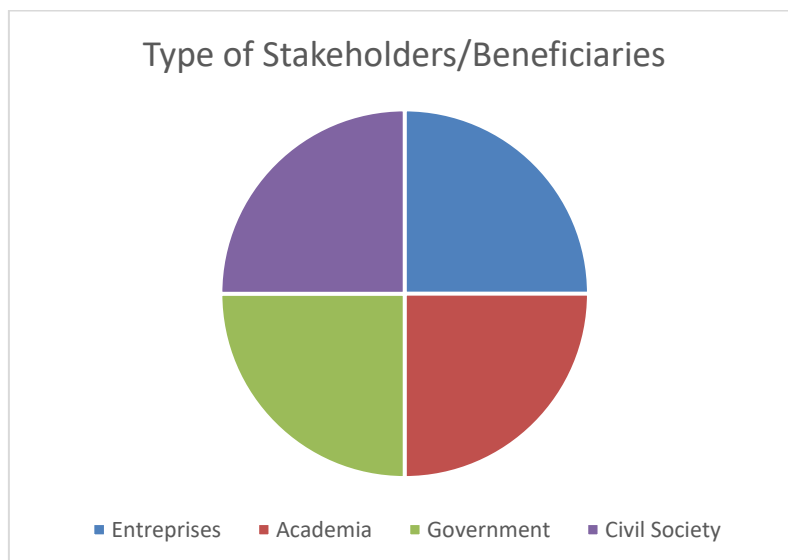


Figure 6 - Stakeholders/beneficiaries of Greenhouse industry

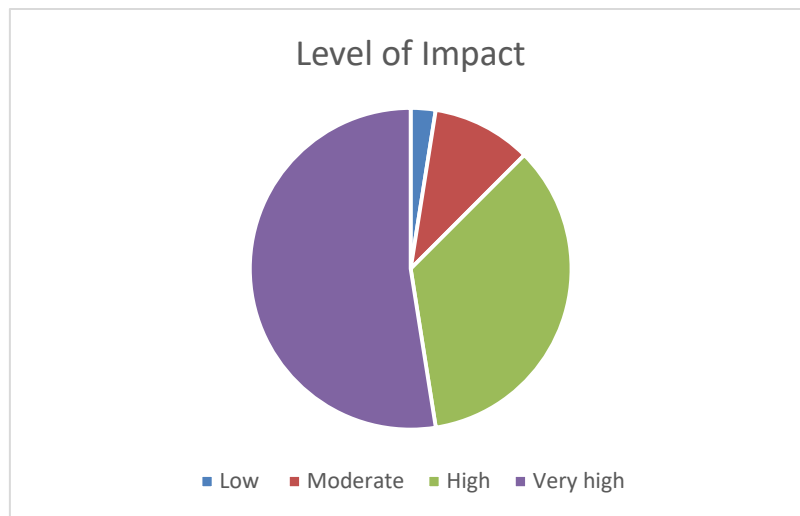


Figure 7 - Level of Impact of Stakeholders/beneficiaries of Greenhouse industry

2.1.4 Greece

Several high tech greenhouses have been built during the last decade for vegetable (tomato, cucumber and pepper, e.g. Agritex SA, Drama Greenhouses, Wonderplant, Thrace Greenhouses and other) and seedlings (e.g. Agris SA, Plantas SA and other) production. For the development of the above mentioned greenhouse areas, several companies have been established and operate around the country, dealing with the design, building and equipment of greenhouses, as well as with their operation and control, up to accessories for greenhouses, greenhouse coverings for mulching, and automations for greenhouses.

The greenhouse sector includes several suppliers of products or services, some of which are listed below:

- Technical suppliers. The government's plan for financial support of large investments created several years ago resulted in the establishment of high-tech greenhouses and equipment originating either from Greece or from North Europe and especially from France and The Netherlands. After that, several companies invested in agents and dealers to supply sales and after sales service. In the meantime most of the Greek competitors developed; the low tech greenhouses have also improved.

- Input suppliers. Basic inputs like chemicals, fertilisers and crop protection, different types of substrates and other are supplied by Greek companies. Products, like rockwool and peat are imported. Biological crop protection agents and bumble bees, which used to be supplied by foreign companies, can these days be also provided by a local companies.

- Suppliers of nursery materials: Some very important and large seedlings supplying companies have been developed during the recent years and the need for imported seedlings material is eliminated.
- Suppliers of knowledge; research, education and extension. Several research units have been developed, established either at Universities and Research Centres or in private companies. Experiments are executed with several vegetable and flower crops and optimal crop growth conditions are investigated. Education and training is also supported mainly by University Departments dedicated to agriculture vegetable crop production.

An analysis of the distribution of the different type of stakeholders/beneficiaries presented in the report 3.1.2 developed by the University of Thessaly is shown in Table 16.

Table 16 – Identified key stakeholders in PACA region (France)

Type	Total No	Public		Private		Other		SMEs	Large Companies	Clusters/ Associations	Manufactures	Farmers	Research centres/ institutions	Service providers
		No	% (of total)	No	% (of total)	No	% (of total)							
Enterprises	23	0	0	23	100	0	0	16	5	2	10	9	0	7
Academia	10	10	100	0	0%	0	0	0	0	0	0	0	10	10
Government	10	7	70	3	30	0	0	3	0	0	0	0	0	3
Civil Society	10	0	0	0	0%	10	100	0	0	0	0	0	0	10
Total	53		17		26		10		19	5	2	10	9	10

The greenhouse sector in Greece incorporates several stakeholders from the quadratic helix. From the research carried out to sample and list the stakeholders presented in

this report, it is considered that the Enterprises and Academia have stakeholders that are directly devoted to the greenhouse sector and thus the project may have high impact on them.

The analysis of stakeholders presented a great variability and a different lacks among the actors. It can be seen that about 40% of the presented stakeholders belong to the enterprises sector while the Academia, Governmental and NGOs equally share the rest 57%. Both SMEs and Large Companies rarely have relations with other actors in the supply chain, such as universities, civil society, etc. Their reference is the buyer; in most cases, they are not involved in clusters.

Innovative Start up purposes is the production of innovative services with high technological value, related to energy systems for air conditioning with renewable energy sources, geothermal systems with vertical (closed circuit) or ground water (open circuit) probes, more generally in innovative solutions.

The Academic actors of the greenhouse industry presented are mainly University Laboratories and Research Centre Departments or Divisions from all over Greece. The contribution of academic actors to novelty has only lately become one of their main missions. At a national level, both universities and research centers are strongly committed to developing innovative greenhouse technologies. However, they are not connected in clusters and only recently participate in SME driven research and development projects.

Local authorities, Regions, Municipalities, Ministries, Chambers etc. are involved in projects with the aim to develop and innovate the agricultural and agro-industrial system. However, the performance of these projects is not always high. There is no strong territorial collaboration in projects involving several municipalities, regions, chambers of commerce, local action groups and regional or national research centers. In addition, there is a lack of projects aiming to promote the dissemination and exchange of know-how (transfer knowledge), develop new systems (research activities), innovative methodologies and technologies for monitoring, control and increase the efficiency of the greenhouses system (rational use of resources: fertilizers, energy, water).

There is a high need for consulting in innovative greenhouse systems development and operation. In most of the cases, when the high cost of investment is not the main barrier, lack of knowledge on the management of innovative greenhouse systems is a significant obstacle.

The Governmental bodies presented belong to different sectors, and may be public or private. Finally, as actors from civil society are reported several NGOs that are related to Agriculture, rural development and the environment.

It was also found that not many Governmental organisations/stakeholders are solely devoted to the greenhouse sector while in addition, there are no Civil Society

organisations directly involved or connected with the greenhouse sector in Greece. Involving the citizens in the development of an innovation can lead to more successful, user oriented innovations. The end users will be more likely to accept and use the innovation. It will also have a greater social benefit at a lower cost and improve empowerment of the citizens, who will increasingly experience trust towards the innovators and become an active part of the innovation system.

2.1.5 Italy

The analysis of the stakeholders and key players of the sector has been performed on the actors of 4-helix (Enterprises, Academia, Government, Civil Society) of the Greenhouse Industry at national level. The analysis of stakeholders showed a great variability and a different gaps and lack among the actors. Using the Quadruple Helix and involving the citizens in the development of an innovation can lead to more successful, user oriented innovations. The end users will be more likely to accept and use the innovation. It will also have a greater social benefit at a lower cost and improve empowerment of the citizens, who will increasingly experience trust towards the innovators and become an active part of the innovation system.

The SMEs usually offers products and services related to the greenhouses sectors, starting from the design and installation of greenhouses, the equipment and systems for the automatic control of greenhouses and related air conditioning systems, up to accessories for greenhouses, greenhouse coverings for mulching, automatism for greenhouses.

Large companies are involved in the production of greenhouses for horticultural and floricultural productions, warehouse greenhouses, farm greenhouses, photovoltaic greenhouses, garden center greenhouses and greenhouses for any other use and coverage. Are also involved in the production of a wide range of control units for the greenhouses management, such as irrigation fertigation and climate control.

Both SMEs and Large Company rarely have relations with other actors in the supply chain, such as universities, civil society, etc. Their reference is the buyer; in most cases, they are not involved in cluster.

Innovative Start-up purposes is the production of innovative services with high technological value, related to energy systems for air conditioning with renewable energy sources, geothermal systems with vertical (closed circuit) or ground water (open circuit) probes, more generally in innovative solutions.

Universities and Research Institutes contribution to innovation has only recently become one of the main missions of the University sphere, creation of knowledge has always been a fundamental goal of the Higher Education Institutions (HEIs).

At a national level, both universities and research centers are strongly committed to developing innovative greenhouse technologies. They are often present in clusters and participate in projects with national and international partners.

Regions, Municipalities, Ministries, Chambers etc. are involved in projects with the aim to develop and innovate the agricultural and agro-industrial system. Actors are involved at international level, national level and regional level.

Usually there is strong territorial collaboration in projects involving several municipalities, regions, chambers of commerce, local action groups and regional or national research centers. The projects aim is to promote the dissemination and exchange of know-how (transfer knowledge), develop new systems (research activities), innovative methodologies and technologies for monitoring, control and increase the efficiency of the greenhouses system (rational use of resources: fertilizers, energy, water).

Initiatives Civil Society: NGOs, Associations, Clusters, fosters the aggregation of companies, universities and research centers that collaborate to increase and improve technological development and innovations in the agri-food sector.

2.1.6 Spain

Number of Greenhouses recorded:

Spain, with 70,000 hectares is the second country in the world, after China, in terms of agricultural area dedicated to horticultural production in permanent greenhouse, either with plastic or glass insulation, according to the Rabobank Research Department (Ref.- The research office of Rabobank, map of the wintering horticulture in the world). Of these 70,000 hectares accounted for by the whole of Spain, just over 40,000, that is, more than half of the national total, are located in the region of Andalucía (Source.- Regional Ministry of Agriculture in Andalucía).

Number of Farmers involved in Greenhouse industry:

The contribution to the Spanish economy of Greenhouse industry, including service industry is 40%.

Number of companies involved with Greenhouse industry:

The greenhouse industry in Spain is linked to the vegetable producers and commercial companies of fresh products, of which 25% of the cases are whole sales distributors, 50% are cooperatives and 25% are warehouses- non producers (25%).

2.2 Gaps

2.2.1 Albania

Table 17 – Identified gaps regarding stakeholders and key players of the greenhouse sector in the Region of Berat (Albania)

N	Missing Actors / key players of the greenhouse sector	Short Description of the type of actor required - justification
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Agricultural Research Institute



1	Training centers	Most Albanian farmers need tailored training schemes on good agricultural practices/technologies that does not allow them to expand their businesses.
2	Clusters/associations	There are few clusters or association of farmers strictly connected to the greenhouse market that remains sharply fragmented. The creation of a greenhouse producer's cluster can help the overall sector selling products in new markets.
3	Large companies	Smallholders constitute the greatest part of the greenhouse market. From the stakeholders analysis appears clear that there are solely few large firms that can invest in new technologies and infrastructures.
4	Geothermal energy producers	In the country there are many untapped geothermal sources, however from the stakeholder analysis it is clear that there are no companies directly involved in this market that can drive a change in the sustainable energy production.
5	Academic linkage with rural society	In the country there are many agriculture faculties and research centers, however the academic world that can boost a change and improve farmers' educational level seems to be poorly or not connected at all with rural society.
6	Pesticides usage advisory system	There are no authorities that train farmers in the correct pesticides usage.

2.2.2 Cyprus

Table 18 – Identified gaps regarding stakeholders and key players of the greenhouse sector in Cyprus

N	Missing Actors / key players of the greenhouse sector	Short Description of the type of actor required - justification
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1	Professional education bodies	Innovative technologies should first be introduced to agriculture curricula in order to reach a wider range of farmers
2	Academic institutions specializing in the greenhouse sector	Academic institutions do not offer specific degrees on greenhouse science that could boost research and innovation production in the sector

2.2.3 France

Table 19 – Identified gaps regarding stakeholders and key players of the greenhouse sector in PACA region (France)

N	Missing Actors / key players of the greenhouse sector	Short Description of the type of actor required - justification
1	Funding bodies	SEMIDE tried to invite a funding body, that are responsible of special fund for greenhouses, to participate at one of the consultations organized, but as the fund was ended, the body did not accept the invitation to the consultation. The Implication of the funding body in the project is not guaranteed
2	Farmers with small exploitation	Farmers with small exploitation greenhouses do not have time to participate in projects such as Med-greenhouses
3	Professional education bodies	Innovative technologies should first be introduced to agriculture curricula in order to reach a wider range of farmers

2.2.4 Greece

Table 20 – Identified gaps regarding stakeholders and key players of the greenhouse sector in Greece

N	Identified Obstacles	Short Description of the obstacle - justification
1	Lack of specialized personnel	There is no experienced personnel for the development of actors related to consulting

		in greenhouse design, operation and management
2	Small greenhouse farms	Most of the greenhouse farms are smaller than 0.5 ha and thus the number of farmers is very large. Thus, a significant effort is needed to reach a large number of greenhouses farmers and increase the performance of the greenhouse farms
3	Lack of clusters	The growers do not collaborate and do not develop clusters with the SMEs and the relevant actors of knowledge development. Thus, it is very difficult to reach them and raise awareness on the advantages that high tech greenhouse technologies offer.

2.2.5 Italy

Table 21 – Identified gaps regarding stakeholders and key players of the greenhouse sector in Molise Region (Italy)

N	Missing Actors / key players of the greenhouse sector	Short Description of the type of actor required - justification
1	<i>There are no missing actors</i>	

2.2.6 Spain

Table 22 – Identified gaps regarding stakeholders and key players of the greenhouse sector in the Region of Murcia (Spain)

N	Missing Actors / key players of the greenhouse sector	Short Description of the type of actor required - justification
1	<i>Industries of recycled or improved materials for greenhouses</i>	One of the most negative effects of greenhouse industry is the fact that it produces great amounts of residues, in particular plastic. This could be avoided by a more dynamic sector of the plastic industry using biomaterials.
2	Organic producers	Organic products demand is increasing in developed countries. Organic production in greenhouses is still very little.

3	Pest control companies	Ecologic production in innovative greenhouses need the application of efficient pest control management.
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2.3 Obstacles

2.3.1 Albania

Table 23 – Identified obstacles for the stakeholders and key players of the greenhouse sector in the Region of Berat (Albania)

N	Identified Obstacles	Short Description of the obstacle - justification
1	High costs of infrastructures for educational purposes	Universities and research centers do not receive enough funding to build and train farmers in greenhouses research centers.
2	Geothermal energy producers' incentives	In the national strategy for renewable energy usage geothermal energy is identified as one of the potential renewable energies upon which rely to reach the 38% of renewable energies usage in 2020. However, in the plan there are no specific strategies to boost and develop this sector.
3	Pesticides control authority	The pesticides' usage is not regulated at all and the over usage can be detrimental for the quality of products produced, for the environment and for the farmers' health. Because of farmers' low education level and frequent crops' diseases inside greenhouses the pesticides usage is massive and uncontrolled.

2.3.2 Cyprus

Table 24 – Identified obstacles for the stakeholders and key players of the greenhouse sector in Cyprus

N	Identified Obstacles	Short Description of the obstacle - justification
1	Limited greenhouse owners' involvement	Especially for small exploitations, greenhouse owners have no time for participation into non-productive activities

2	Cost of greenhouse infrastructure for education purposes	Education bodies are lacking lands and funds to invest in educational greenhouse infrastructures
3	Lack of technology transfer offices and tools	Technology is still developed in R&D institutions but very little of this technology is finally applied in the private sector

2.3.3 France

Table 25 – Identified obstacles for the stakeholders and key players of the greenhouse sector in PACA region (France)

N	Identified Obstacles	Short Description of the obstacle - justification
1	No priority for greenhouses within National / regional policies	There is no more any special fund allocated to greenhouses in the new French agricultural fund. Therefore, funding agencies do not take part in activities/consultation related to this topic
2	Lack of farmer's involvement	Especially for small exploitations, farmers have no time for participation into non-productive activities
3	Cost of greenhouse infrastructure for education purposes	Education bodies are lacking lands and funds to invest in educational greenhouse infrastructures

2.3.4 Greece

Table 26 – Identified obstacles for the stakeholders and key players of the greenhouse sector in the Region of Thessaly (Greece)

N	Identified Obstacles	Short Description of the obstacle - justification
1	Lack of specialized personnel	There is no experienced personnel for the development of actors related to consulting in greenhouse design, operation and management
2	Small greenhouse farms	Most of the greenhouse farms are smaller than 0.5 ha and thus the number of farmers is very large. Thus, a significant effort is needed to reach a large number of

		greenhouses farmers and increase the performance of the greenhouse farms
3	Lack of clusters	The growers do not collaborate and do not develop clusters with the SMEs and the relevant actors of knowledge development. Thus, it is very difficult to reach them and raise awareness on the advantages that high tech greenhouse technologies offer.

2.3.5 Italy

Table 27 – Identified obstacles for the stakeholders and key players of the greenhouse sector in Molise Region (Italy)

N	Identified Obstacles	Short Description of the obstacle - justification
1	Very specific projects	some actors work exclusively on specific projects financed by European, national and regional programs
2	Structural problem	small amounts of money to invest

2.3.6 Spain

Table 28 – Identified obstacles for the stakeholders and key players of the greenhouse sector in the Region of Murcia (Spain)

N	Identified Obstacles	Short Description of the obstacle - justification
1	Lack of technology transfer offices and tools	Technology is still developed in R&D institutions but very little of this technology is finally applied in the private sector
2	Lack of financing instruments promoted by the public administration	Farmers are demanding more financing instruments such as low interest loans and grants for greenhouse industry, and not only for crop production or for industrial sector

3. Financial Channels for eco-innovative technologies

Based on the findings of the Del. 3.1.3, this section presents important gaps that have been recorded at national / regional level regarding financial channels and tools for eco-innovative technologies.

3.1 Overview of the state of play

3.1.1 Albania

As it has been pointed out by the United Nations in the environmental performance review, in the Albanian Statistical System there is a lack of accurate data that can thoroughly describe the current situation for what concerns the investments on eco-innovative technologies. The National Statistic Institute should provide detailed information about the national expenditures to support the eco-innovations and the percentage of GDP bounded to the research and development of such technologies. In fact the provision of reliable and updated data can have positive repercussions on the national economy attracting foreign and local investors. The aforementioned investments can shift the current situation of general lack of expenditures in research and development in the private sector and boost the technological transfer among different actors that operate in the Albanian market. Small and medium enterprises, that constitute the backbone of the Albanian economy playing an important role in terms of employment, turnover and value added, are characterized by a general weakness in technological capacity to upgrade by absorbing existing advanced technologies. In fact the total amount of private investments in research and development is a scarce 0.4% of the GDP. Despite SMEs are driving the entire Albanian trading system in almost all fields such as agriculture, tourism and hydropower generation, the measures undertaken by the national government to attract businesses and simplify the access to funding, some bottlenecks remain. One of the issues that still have to be addressed is the technological and innovation transfer among firms that is still believed to be poor. Actually, although some SMEs introduced products, process, marketing or organizational innovations the general lack of data collected by the government does not provide a thorough insight of the actual situation leaving scarce or inexistent room for national programs specifically conceived to increase eco-efficient businesses and eco-innovative technologies. The National Business and Investment Strategy refers to the need to ensure environmental sustainability but does not provide any concrete measure. Moreover, business actors lack of expertise on environmental issues. *Businesses remain largely unaware of environmental management systems and standards, and no incentivizing measures are in place, although, as of 2016, 111 ISO 14001 certificates were issued in the country* (UN 2018). Despite the government poorly supports the eco-innovative businesses there are several organizations and foreign donors that are helping this sector to grow.



However, according with UN, SMEs still lack access to finance and credit. It has been estimated that the total demand for SMEs loans is 1.4 billion euro, which represents 14 per cent of GDP and 34 per cent of the total loans in the financial system (UN 2018). Hence, the facilitation to credit access for new enterprises represents a good opportunity to achieve higher levels of specialization, innovation and competitiveness.

3.1.2 Cyprus

Despite significant improvement, Cyprus continues to perform poorly in eco-innovation. In 2017, the country scored only 45 (EU average = 100), which is a slight improvement compared to the score of 43 in the 2015 assessment. This places the country just second last in the EU28 ranking of eco-innovative countries. Cyprus is heavily behind the EU28 average in eco-innovation inputs and activities, socio-economic outputs and resource efficiency outcomes. It performs above the EU28 average in Eco-innovation outputs. Eco-innovation in Cyprus is predominantly produced by individual actors – research institutes or enterprises. As such, there are no distinct and mature eco-innovation sectors. Given the country's rich natural capital and inaccessibility to the energy grid of other countries, new developments in renewable energies could also promote eco-innovation activities. Eco-innovation in the field of energy is also driven by efforts to increase energy efficiency.

The agricultural and food industries are also contributing to eco-innovative solutions. Additionally, a number of EC funded research and innovation projects in the field of eco-innovation are currently under implementation. In terms of eco-innovation drivers, there is a wide range of EC supported funding opportunities for R&D that include eco-innovations. With a total budget of approximately EUR 100 million, the programme RESTART acts as a significant support of research. The country also provides numerous tools to enhance access to information that is vital to increase innovation and growth. Regarding barriers, the R&D sector in the country is relatively new as it dates from the mid-90s.

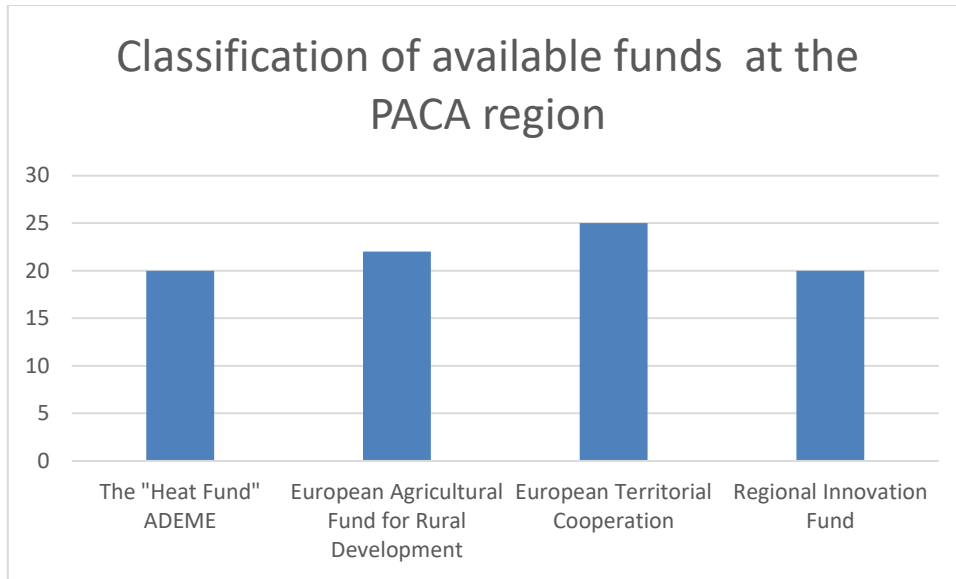
As such, the system is still fragmented with a lack of coordination between the different stakeholders. The governance of research is lacking whereas the interface between research and business is inadequate. In addition, there is an inadequate evaluation culture to monitor research and increase its effectiveness.

3.1.3 France

Short presentation of the of the key findings of del. 3.1.3

- France has favourable legislation supporting eco-innovation and entrepreneurship since 2003. In 2017, France ranked 13th among the EU Eco-innovation composite index, a bit below the European average of eco-innovation inputs (Europa, 2018).

- The French Gross domestic expenditure on R&D (GERD) is **2.25%** below the planned target of 3% (Eurostat, 2016), while the total number of R&D personnel was around **576K** in 2014. (Eurostat, 2018).
- For the period 2007-2013 in PACA region, 34% of FEDER funds were allocated to Eco innovation.
- The main Greenhouses investment aid fund is managed by France Agrimer at the national level and by the PACA region authority at the regional level. It is the "Future agricultural and agribusiness projects "P3A", but this fund was stopped in 2016.
- Some other schemes are available at the regional level for funding eco innovation and are applicable to agriculture and greenhouses sector as for example:
 - **The Heat Fund "ADEME"**: The French government has introduced a "heat fund" (Fonds Chaleur) in order to support the production of heat through renewable energy plants. This fund is applicable for the construction of innovative greenhouses if it concerns energy efficiency.
 - **European Agricultural Fund for Rural Development**: This fund is implemented in France through a national program that includes regional components.
 - **European Territorial Cooperation**: Due to its geographical position, the Provence-Alpes-Côte-D'azur region is very involved in European territorial cooperation. For the period 2014-2020, it participates in 5 cooperation programs.
 - **Regional Innovation Fund (RIF)**: The Provence-Alpes-Côte d'Azur Regional Innovation Fund is combining regional and national (BPI-France) funding schemes. It provides a significant leverage effect on financing collaborative R & D projects between regional SMEs and academic research structures.



3.1.4 Greece

Greece continues to focus its policies on the promotion of renewable energies, energy efficiency measures and the new policy on waste management, which can also promote eco-innovations. The aim of the country is to derive 20% of final energy consumption from RES by 2020.

The National Strategic Reference Framework (NSRF) is expected to allocate approximately € 5.18 billion for the period 2014-2020 on activities relating to the environment and another € 1.2 billion is expected to be allocated on the objective 'Strengthening Research, Technological Development and Innovation'. Research is expected to be supported directly through the funding of actions supporting innovations in businesses. In addition as mentioned Operational Programme on Competitiveness, Entrepreneurship and Innovation will allocate at least 55 million EUR to support eco-innovation.

The Action Plan for the Implementation of the National Strategy for Research, Technological Development and Innovation for the period 2015-2021 (Action Plan) was published in 2014 and set the framework for the support of the Greek Government on research and innovation, and the promotion and strengthening the competitiveness of businesses through innovation.

The National Fund for Entrepreneurship and Development (ETEAN) was founded in 2011 (Law 3912/2011) in order to support enterprises, particularly small, medium, and innovative enterprises. ETEAN is co-funded by the Operational Programme 'Competitiveness and Entrepreneurship' and other NSRF programmes, supported by the European Regional Development Fund and the European Fisheries Fund. Amongst its priority areas, the Fund aims to support business in the fields of sustainability, energy efficiency (especially in the built environment) and renewable energies. The

scheme also supports activities that relate to the upgrade of energy efficiency in households.

There are several barriers related to political, institutional, cultural, social and economic aspects that prevent the development of eco-innovation in the country.

Compared to 2015, Greece continues to lack a clear and cohesive framework for the support of eco-innovation and eco-industries despite the improvement through the 2014 Action Plan for the Implementation of the National Strategy for Research, Technological Development and Innovation for the period 2015-2021, which promotes specific activities in relation to eco-innovation. Under the Action Plan, efforts are directed towards industrial waste management, anti-pollution technologies and industrial symbiosis, climate change mitigation, access to environmental information and mitigation of natural disasters.

Issues related to malpractices by local authorities and limited enforcement of laws by national authorities continues to exist. The long-lasting deterioration of the economy has further compounded these problems as the penury of resources makes any kind of systematic funding for eco-innovation unrealistic. Austerity policies have had a major impact on public funding leading to stagnation in terms of R&D expenses and delays in payments. Meanwhile, venture capital for eco-innovations is not easily available especially after the imposition of capital controls in July 2015, with most funding coming from EU Structural Funds.

In terms of competitiveness, the trade balance of high- and medium-tech products is negative and this prevents by default all types of technological innovation (Innovation Union 2014). The poor performance on technological innovation is also demonstrated by the low number of patent applications. The economic downturn, together with structural problems and bureaucratic obstacles has forced companies to prefer investments with low risks and short-term return over knowledge-based activities where by default the risks are higher and the return period longer. The small size of Greek companies also acts as a deterrent to further developing and commercialising innovations. Small companies may be more flexible and adapt at seizing innovation opportunities but ultimately a sustainable national framework requires synergy and economies of some scale. Nevertheless, as highlighted in chapter 1 only 3.5% of enterprises plan to perform investments.

Between the main obstacles to the implementation of eco-innovation are the economic-structural ones and those related to education and the labour market. With regard to the former, there is still difficulty in establishing a real competition in those markets that have been privatized; often both the regulation and the costs of using the network make it difficult for new companies to enter the market. Linked to this first aspect, it is also important to consider that the greenhouse sector is constituted from small farms that by definition have more difficult access to credit (and whose

production scale can make it difficult to sustain the high costs associated with the research and development of new cultivation systems and technologies.

On the administrative side, it is an often repeated complaint that Greece's complex bureaucratic stipulations (despite the progress achieved in the last years) dissuade actors and investors from developing eco-innovations. Moreover, the regulatory framework changes frequently thus limiting the ability of involved actors to plan and organise investments.

Research in Greece relies to a large extent on external funding, namely, the EU structural Funds and EU research funds (e.g. Horizon 2020). The dependence of Greece on external funds indicates the difficulty of the country to finance research (either through public funding or private sector investment) due to the deterioration of the economy. As regards the internal funding, in 2016 42.5% of funding derives from public funding whereas only 39.9% come from private funds. In relation to the EU research funds, Greece has been relatively successful in the participation in the FP7, in comparison to the EU average, but the success rate of the applications for funding remain relatively low.

Finally, there remain social barriers towards eco-innovation mostly related to public attitudes and unawareness of the benefits of innovation (especially in the area of energy efficiency in the built environment). These sometimes translate into outright distrust of change, especially in the current economic and political climate.

Greece benefits from its significant natural capital in renewable energies (solar, wind, tidal), growth in green and alternative tourism and innovation in agriculture and the food industry. The country has a small number of leading research institutions that can contribute in developing an innovation-driven economy. A significant number of small and medium ICT and high tech companies and start-ups can also help in supporting R&D. In addition, many Greek researchers have migrated in third country.

Greece is below the EU average with 0.99% of GDP spent on R&D activities 2016 (EU average 2.03%) (National Documentation Centre, 2017). Despite the austerity measures, a slight increase on R&D expenditure was achieved compared to 2015 (from 0.92%). Nevertheless, this share increased by 0.6% in the period 2007-2012 which indicates that the country is on its way to catch up (Innovation Union 2014). This improvement is also indicated by the slight increase the eco-innovation input index. Greece is also well placed regarding the eco-innovation related publications (which reached 27.45 publications per million inhabitants with an EU average of 20.53 publications). In this context, the economic downturn might act as an opportunity to move towards a knowledge-based economy.

EU Cohesion policy funding has increasingly focused on investments in energy efficiency and renewables in line with the Europe 2020 Strategy for smart, sustainable and inclusive growth and the related 20-20-20 targets. In this context, EU Structural

Funds available in Greece play a significant role in financing energy efficiency and eco-innovation projects. The majority of the measures related to eco-innovative technologies in greenhouses are targeted at energy-efficient heating systems (including co-generation and conversion to renewable energy sources), energy saving, improvement of agricultural processes and crop cultivation in general, as well as the purchase of energy-efficient equipment. Investment support (e.g. grants, subsidies, loans) is mainly provided to accelerate the introduction of efficient energy systems in greenhouses.

3.1.5 Italy

The financial schemes for eco-innovative investments in Italy were investigated. Existing knowledge and the state of play technologies of innovative greenhouses in Italy were analysed and available financial channels for eco-innovative technologies were identified. The aim was to identify the obstacles and the existed bottlenecks and design tailored policy recommendations for the establishment of innovative (geothermal) greenhouses.

It's not easy to find data and percentage related to the eco-innovation in our Country. Most of the information are taken from study cases or researches made by experts and they show clearly how difficult is to find data because of the transversal nature of the topic. Nevertheless, most of the eco-innovation funds are related to European funds (ROP and RDP) and the main beneficiaries and areas that benefited most from the increase in eco-innovation are waste management and sustainable transport, while the areas that proved to be the most in difficulty are those of Research & Development. According to the Observatory's report, in this sector, investments appear to be substantially lower than the European average for both the private sector (1.29% in Italy versus 2.03% average in Europe) and for the public sector, where the share of investments in environmental research accounts for 6.5% of all public spending. In the waste management sector, there is a marked increase in the separate collection and recycling of various materials (from the textile sector to batteries); among many, a leading initiative is the adherence of Italy to Weelabex, a project conducted at European level whose goal is the creation of rules and standards for the management of waste from electrical and electronic equipment. Related to this sector, it is also the development of the methodology Romeo (Recovery of metals by hydrometallurgy) by ENEA (the National Agency for New Technologies, Energy and Sustainable Development) which aims to recover raw materials of high value (gold, silver, tin, copper) from the Raee.

In the transport sector, innovations mostly involve private transport. Sales of vehicles powered by alternative energy sources saw an increase of 15.3% compared to 2013. Furthermore, according to the Ministerial Decree of 10 October 2014, the production and use of fuels from waste and biological waste are incentivized. With regard to this

aspect, in the fuel sector the introduction of green diesel, the result of over 10 years of study and development of Ecofining™ technology, at the Eni plants in Porto Marghera (Venice), is all Italian. This new technology allows the hydrogenation of various types of vegetable oils thus obtaining a fuel fully compatible with the fossil fuel to which it is mixed, thus allowing a reduction in air pollution.

Among the main barriers to the adoption of eco-innovation, the economic-structural ones and those related to education and the labor market are relevant. With regard to the former, there is still difficulty in establishing a real competition in those markets that have been privatized; often both the regulation and the costs of using the network make it difficult for new companies to enter the market. Linked to this first aspect, it is also important to consider that the Italian entrepreneurial fabric is constituted for most of small and medium-sized enterprises that by definition have more difficult access to credit (the risk to lenders may be much higher) and whose production scale can make it difficult to sustain the high costs associated with the research and development of new products and processes.

The second major brake on growth and the development of eco-innovation is identified in the lack of adequate skills between human capital.

Ultimately, the picture of eco-innovation in Italy presents lights and shadows: if it is true that many fundamental elements are already present, that some companies are able to bright and produce eco-innovations of international value, that on this theme there is an increasing commitment from big companies and from the side of the general public, it is equally true that, to make the real leap in quality and become European leaders eco-innovation requires a clear willingness to invest in research in order to dedicate significant resources to these economic issues.

3.1.6 Spain

The most important eco-innovation areas and trends include waste management, eco-design, green engineering, recycling, energy efficiency, sustainable construction, water efficiency and urban water systems.

However, agriculture is not a representative sector for the eco-innovative technologies implementation. The construction sector ranks first in terms of eco-innovation and leadership potential estimated for the year 2030. In particular, it is estimated that energy saving in buildings is the first global measure to reduce the environmental impact of buildings. Transport also plays a key role in reducing energy consumption, both with the development of new motorized vehicle technologies and the implementation of new transport concepts that encourage reduced use. On the other hand, for the reduction of emissions and waste, the development of ecological chemistry is fundamental, which will encourage eco-innovation in sectors such as biological products, food and packaging. Other sectors that have significant potential

for improvement at the environmental level are Information Technologies (with the development of concepts such as Smart Cities), Consumer Goods or the Health Sector. Regarding funding for innovation, the Ministry of Economy and Competitiveness has created the Centre for Industrial Technological Development (CDTI), a Public Business Entity that channels the funding and support applications for national and international RD+i projects of Spanish companies, including greenhouse sector. Beside this, each region in Spain has a specific department of promoting innovation thanks to incentives and grants.

3.2 Gaps

3.2.1 Albania

Table 29 – Lack of financial models in the Region of Berat (Albania)

N	Lack of financial models	Short Description of the financial channels required - justification
1	Research and development strategy	The country lacks of specific incentives and financial models to promote research and development programs in order to boost SMEs' innovation and competitiveness to reach higher levels of specialization.
2	National financial schemes specific to agricultural sustainable development in greenhouse sector	Except for the European Funds bounded to the implementation of the project, in the National Energy Strategy there is no room for the provision of specific measures to increase the sustainability of the greenhouse sector. The country strategy is aimed at reaching the 38% of renewable energy usage within 2020 boosting the hydropower energy production. In order to increase the agricultural sector sustainability the biodiesel production is deemed to be strategic. Any other activity has been pinpointed to be crucial to reduce the first sector environmental impact.
3	National strategy to exploit the untapped geothermal resources	In the National Energy Strategy the exploitation of numerous untapped geothermal resources has been defined as strategic, nevertheless in the same strategy there are no provisions on how to exploit these resources to increase the production of clean energy. In the same way there is no

		mention on how to exploit this kind of energy in the agricultural sector.
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3.2.2 Cyprus

Table 30 – Lack of financial models in Cyprus

N	Lack of financial models	Short Description of the financial channels required - justification
1	Financial schemes specific to Greenhouses innovation development	The Greenhouse sector is hosted in financing schemes covering a wider field (e.g. agriculture or rural development).

3.2.3 France

Table 31 – Lack of financial models in PACA region (France)

N	Lack of financial models	Short Description of the financial channels required - justification
1	Financial schemas specific to Greenhouses	The "Future agricultural and agribusiness projects "P3A managed by France Agrimer fund was stopped in 2016. No information available on the launch of a new program.
2	Research and innovation funds	Targeting small exploitation holders with pilot cases are necessary to bridge the gap between researchers and farmers

3.2.4 Greece

Table 32 – Lack of financial models in the Region of Thessaly (Greece)

N	Lack of financial models	Short Description of the financial channels required - justification
1	Lack of programs targeted to innovation in greenhouses	Most of the financial models are general and are not related to application of innovative technologies. The financial rate is the same in all cases while innovations may need higher subsidy rate

3.2.5 Italy

Table 33 – Lack of financial models in Molise Region (Italy)

N	Lack of financial models	Short Description of the financial channels required - justification
1	<i>Sectoral programs</i>	Most of the funding channels are not dedicated to the “innovative greenhouse sector”. The main financial models are more general and inclusive (i.e. innovation financial model)

3.2.6 Spain

Table 34 – Lack of financial models in the Region of Murcia (Spain)

N	Lack of financial models	Short Description of the financial channels required - justification
1	<i>Sectoral programmes for agriculture innovation</i>	Financing of innovation in Spain is generalist. Although there is a significant investment in ICT and new products developed for the greenhouse industry, financing of this particular topic is still not very remarkable

3.3 Obstacles

3.3.1 Albania

Table 35 – Identified obstacles for the use of the existing financial channels in the Region of Berat (Albania)

N	Identified Obstacles for the use of the existing financial channels	Short Description of the obstacle - justification
1	Gap between the priorities identified in the National Energy Strategy and the measures undertaken	There is a gap between the identified priorities in achieving the sustainable production and energy usage and the measures undertaken to boost their production. The geothermal energy usage is considered a priority; however there is a lack of specific measures to exploit it.
2	Inelastic demand for green goods	Albanian consumers still present an inelastic demand for green goods and more sensitiveness to the price. The consumers’ behavior does not incentive the production of

		eco-innovative technologies because the awareness to environmental issues has still to be raised. A shift in the consumers' behavior could affect the eco-innovative technologies usage and the adoption of financial schemes to boost their production.
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3.3.2 Cyprus

Table 36 – Identified obstacles for the use of the existing financial channels in Cyprus

N	Identified Obstacles for the use of the existing financial channels	Short Description of the obstacle - justification
1	Complexity of the procedures to apply	Application procedures are complex and usually need specialized human resource, something that the potential beneficiaries do not possess and are not able to hire due to high cost
2	Long time from application to finance	Time from the approval of an application of a greenhouse project until the farmer receives the subsidy is usually long. Thus, the farmer will have to have the initial capital available for the investment as well as for another couple of years after the operation of the greenhouse unit. building and operation of the greenhouse in most of the times for more than two years after the operation of the investment.
3	Difficulties in getting a loan from a bank	After the financial crisis the banks in Cyprus have become stricter and applied long-lasting procedures in loan approvals. The time required to acquire a loan is usually long-lasting and therefore affects the application procedures (that have strict deadlines)

3.3.3 France

Table 37 – Identified obstacles for the use of the existing financial channels in PACA Region (France)

N	Identified Obstacles for the use of the existing financial channels	Short Description of the obstacle - justification
1	Modification and update of the existing financial channels	It is necessary to change the existing channels and separate them. Currently they are all related to the device PA3 of France Agrimer from a financial and technical point of view.
2	Different priorities at national and regional levels No-separate the regional program from the national one	Regional programming is linked to the national until 2020, so even if a region wants to give priority to greenhouse, it is now impossible as it is not anymore, a national priority

3.3.4 Greece

Table 38 – Identified obstacles for the use of the existing financial channels in the Region of Thessaly (Greece)

N	Identified Obstacles for the use of the existing financial channels	Short Description of the obstacle - justification
1	High bureaucracy	Complicated procedures and reporting schemes for small scale farmers with no experience in economic models
2	Long time from application to finance	There is no clear timeframe how long it will take from the approval of the application of a greenhouse project to the time that the farmer will receive the subsidy. Thus, the farmer will have to have available the capital for the building and operation of the greenhouse in most of the times for more than two years after the operation of the investment.
3	Low or no availability of loans from the banks	Due to the economic crisis in Greece, the banks do not offer loans to the farmers or when they offer, the interest rate is very high.
4	High cost of investment for a simple/small farmer	An innovative greenhouse may cost from 0.8 to 1.2 MEuro per ha. This is a very high investment cost for a single farmer and

		bigger financial schemes are necessary for the development of the sector
5	Lack of support to small scale farmers for application for finance from regional or EU funds	Small farmers are not able to apply for funding from EU or National funds due to lack of knowledge and experience. Consulting stakeholders have not high experience in the design of the investments for innovative greenhouses.

3.3.5 Italy

Table 39 – Identified obstacles for the use of the existing financial channels in Molise Region (Italy)

N	Identified Obstacles for the use of the existing financial channels	Short Description of the obstacle - justification
1	Delay in all the procedure phases	The main obstacle is represented by the difficulty in writing the application, the uncertainty of the approval
2	financial timing	uncertainties on the date of payments
3	too much bureaucracy	complicated and laborious reporting

3.3.6 Spain

Table 40 – Identified obstacles for the use of the existing financial channels in the Region of Murcia (Spain)

N	Identified Obstacles for the use of the existing financial channels	Short Description of the obstacle - justification
1	Programs for cooperation of companies , in particular SME'S, and R&D institutions	Effective cooperation between R&D and private companies is still not very common. Only large companies use to understand the benefits of such cooperation. Funded plans incentivizing such cooperation should be promoted.
2	Lack of instruments that anticipate funding	Most of funding is received after the projects are executed, so the company needs to apply for private funding

4. Policies and frameworks promoting eco-innovation

Based on the findings of the del. 3.1.4 “Joint Report on existing policies frameworks”, this section presents important gaps and obstacles that have been recorded at national / regional on policies and frameworks favouring eco-innovation.

4.1 Overview of the state of play

4.1.1 Albania

After receiving the status of EU member country in 2014, in Albania, many reforms have been undertaken to align the national agricultural strategies with the EU Common Agricultural Policies. In fact, in 2014 it has been adopted the “Inter Sectoral Agricultural and Rural Development Strategy” (ISARDS 2014-2020) to boost the country competitiveness. The strategy is supported by the legal framework of the Law on Agriculture and rural development issued in 2007 and it is in compliance with the “Europe 2020” strategic framework. Albeit the strategy focuses on sustainable and inclusive growth and on specific needs for the development of agriculture, agro-processing and rural areas in Albania, there are still many issues that have to be addressed. The strategy, for example, recognizes the importance of the creation of an advisory system to boost the knowledge transfer on new technologies among farmers. It also points out the importance of the creation of advisory services that can foster the innovation in the agricultural field. However, despite the forward-looking measures adopted in the legal framework the implementation of policies still lags behind. In particular, according with authors, the budgetary plan provided to support the first sector has increased in the recent years but not as it was expected according with the 2020 aims. The reduction in the financial support is a consequence of the recent financial recession. Another issue that has to be addressed is the mismatch of political targets set in different documents that creates a non clear understanding on the overall strategy to undertake to boost the Albanian first sector. Furthermore, the Ministry of agricultural rural development should provide more funds to the advisory services and knowledge transfer activity between farmers because one of the main problems related to the Albanian first sector is the lack of education of farmers that often rely on traditional knowledge to run their businesses. Hence, more focus and financial support should be provided to implement the advisory measures that can foster the Albanian competitiveness. Another problem that has to be tackled is the general lack of data that often hamper the adoption of specific policies and the possibility to have a general and thorough vision of what is really happening in the first sector. For this reason the creation of a Market Information Systems and a Farm Accountancy Data Network are needed. Another important issue that can mine the productivity of the overall sector is the lack of adequate infrastructures and the poor financial budget bounded to their improvements. This issue stems also from the general lack of financial resources

provided to regional and local administrations that should enhance the construction and the development of a modern road network that can sharply boost the agricultural competitiveness and development reducing the transportation costs and aligning the country with the most advanced countries in Europe.

4.1.2 Cyprus

Eco-innovation in Cyprus is predominantly produced by individual actors – research institutes or enterprises. As such, there are no distinct and mature eco-innovation sectors. Given the country’s rich natural capital and inaccessibility to the energy grid of other countries, new developments in renewable energies could also promote eco-innovation activities. Eco-innovation in the field of energy is also driven by efforts to increase energy efficiency. The agricultural and food industries are also contributing to eco-innovative solutions. Additionally, a number of EC funded research and innovation projects in the field of eco-innovation are currently under implementation. In terms of eco-innovation drivers, there is a wide range of EC supported funding opportunities for R&D that include eco-innovations. With a total budget of approximately EUR 100 million, the programme RESTART (in the framework of OP “Competitiveness and Sustainable Development” 2014-2020) acts as a significant supporting mechanism for research and innovation. In addition, the Rural Development Programme (RDP) provides financing for the sector of greenhouse establishment, development and innovation. Both financing tools are in line with the Smart Specialization Strategy of Cyprus (S3Cy) which is applied during the entire programming period 2014-2020 and constitutes the basis for the formation of any other developmental policy or strategic documents during this period. The country also provides numerous tools to enhance access to information that is vital to increase innovation and growth. Regarding barriers, the R&D sector in the country is relatively new as it dates from the mid-90s. As such, the system is still fragmented with a lack of coordination between the different stakeholders. The governance of research is lacking whereas the interface between research and business is inadequate. In addition, there is an inadequate evaluation culture to monitor research and increase its effectiveness.

The following table presents a SWOT analysis based on the national policies identified and mentioned above:

Strengths	Weaknesses
<ul style="list-style-type: none"> - Political Willingness - Existing Policies - Financial support - Availability of Research based policies 	<ul style="list-style-type: none"> - Insufficient Institutional Infrastructure - Bureaucracy - Delays in approval of Policies

<ul style="list-style-type: none"> - Fostering Innovation 	<ul style="list-style-type: none"> - Lack of coordination among stakeholders - Accountability - Monitoring and Evaluation - Poor Governance and administration - Lack of specific policy for greenhouses
Opportunities	Threats
<ul style="list-style-type: none"> - Availability of successful models at national and International level - EU Guidelines - Support through exchange of experience with other EU member states - EU Interregional Cooperation Funding Programs 	<ul style="list-style-type: none"> - The recent financial crisis - Environmental Degradation - Degradation of Natural Resources - Failure of Projects - Local, National and International Conflicts - Socio-economic disparities - Difficulty for actors to access the main funding program

Furthermore, the following recommendations have occurred through the analysis for each policy instrument:

POLICY FRAMEWORK	RECOMMENDATIONS
<i>OP "Competitiveness and Sustainable Development" 2014-2020</i>	More eco-innovation measures should be introduced
<i>Rural Development Programme (RDP)</i>	Eco-innovation and circular economy measures need to be added. More links to RIS3 should be created.
<i>Smart Specialization Strategy of Cyprus (S3Cy)</i>	More emphasis on greenhouses needs to be included

4.1.3 France

The key policies identified at regional (PACA region) and national level are:

- **National Ecological Transition Strategy for Sustainable Development-SNTEDD**: 2015-2020: This strategy was adopted by the Council of Ministers in

- February 2015 and sets the framework for emerging issues in sustainable development policies for the period 2015-2020.
- **Sector Strategies 2025 - towards a competitive agriculture at the service of people:** Strategy established by the ministry of agriculture and food to maintain and improve the competitiveness of France’s products, a vision and a strategy shared by all the actors of the different sectors were established.
 - **Regional Innovation Strategy 2014-2020 of PACA region:** it aims at finding new talent, boost innovative companies, support them in their conquest of markets to create jobs and strengthen the regional industrial sector.
 - **Innovate more to boost growth and competitiveness in PACA region:** This strategy focuses on concentrating resources on some strategic sectors and some segments where the Region has comparative advantages. The strategy has 8 operations of Regional Interest which includes “Energy of tomorrow”: developing the green economy at the service of the energy transition in Provence-Alpes-Côte d’Azur
 - **Regional strategy for agriculture:** It aims to improve sustainable production, climate change adaptation and mitigation, provide income to farmers, and meet societal expectations for product quality.

The following table presents a SWOT analysis based on the regional and national policies identified.

Strengths	Weaknesses
<ul style="list-style-type: none"> - Political Willingness - Institutional Capacity - Existing Policies - Existing financial support - Existing strategies 	<ul style="list-style-type: none"> - Lack of financial instruments dedicated to farmers to lower the risk linked to high investment in innovative greenhouses - Monitoring and Evaluation of strategies and policies - Limited cross coordination between the implementation of agricultural policy and ecological - Lack of economical prospective analysis to support crop and food production (local and international market trends) - Lack of awareness on add value of green house agriculture at political level

Opportunities	Threats
<ul style="list-style-type: none"> - Availability of successful models at national and International level - EU instruments - Emerging EU networks/clusters for exchange of experiences - Technical and research skills in the region - Institutional capacity and infrastructure 	<ul style="list-style-type: none"> - Degradation of Natural Resources - limited farmers resources - High competition with Mediterranean countries (EU and South Mediterranean Sea)

4.1.4 Greece

Environmental policy in Greece focuses on the promotion of renewable energies and energy efficiency measures that can promote eco-innovations. The country benefits from its significant natural capital in renewable energies – solar, wind, tidal –, growth in green and alternative tourism and innovation in agriculture and the food industry. Despite the economic crisis, by the end of 2017, the installed capacity of photovoltaics, reached 2,623 MWp which covered 7.1% of the electricity consumption. Nevertheless, the uptake of renewable energy has been stagnated the past years.

In terms of eco-innovation performance, in 2017 Greece continues to rank low among the EU-28 countries with a score of only 77 (on an EU-28 average of 100). This places Greece on 19th position in the EU-28 ranking of eco-innovative countries.

Although, Greece shows potential in certain eco-innovation sectors, these areas cannot be characterised as fully developed. The efforts to introduce eco-innovations in the greenhouse sector were slowed down. Due to the economic crisis, companies have sought to explore opportunities afforded by eco-innovations in terms of costs but also in order to provide to clients’ needs focusing (amongst other things) on transparent solar cells which can be used for greenhouse covering. Eco-innovation in agriculture, and more specifically in Greenhouses, needs to be better addressed in the existing policies for investments in innovation and competitiveness, as well as in rural policy.

Strengths	Weaknesses
<ul style="list-style-type: none"> - Variety of programmes at different levels (regional, national) - Financial support by the European Union - Monitoring and Evaluation 	<ul style="list-style-type: none"> - Lack of coordination among stakeholders - Delays in approval of Policies - Lack of Research based policies - Insufficient Institutional Infrastructure

	<ul style="list-style-type: none"> - Availability of successful models at national and International level
Opportunities	Threats
<ul style="list-style-type: none"> - RIS3 - New EU funding 	<ul style="list-style-type: none"> - Failure of Projects - National, Regional and International Conflicts - Socio-economic disparities

At regional level, the Regional Operational Programme 2014-2020, is the programming tool for regional rural development for the realization of the Europe 2020 strategy. The ROP of Thessaly Region is the main measure related with greenhouses sector. Aim of the program is to create autonomous agricultural systems positioning them towards higher sustainability, and autonomy. It can be used for the development of innovative greenhouses aiming to improve the competitiveness of the agricultural sector. The policy encourages investments to improve the energy efficiency of building (also with geothermal energy).

At National Level, the Smart Specialisation strategy RIS3 program is about identifying the unique characteristics and assets of each region, highlighting each region's competitive advantages, and rallying regional stakeholders and resources around an excellence-driven and outward-looking vision of their future. The greenhouse sector is included in the RIS3 program and promotes activities that capitalise on Research, Technology and Innovation to bring structural changes in the greenhouse sector and improve their competitiveness.

Based on the assessment and findings, the following improvements/recommendations are provided for the policies and framework promoting eco-innovation in greenhouses:

POLICY FRAMEWORK	RECOMMENDATIONS
1. Operational Programme on Competitiveness, Entrepreneurship and Innovation under the new National Strategic Reference Framework (2014-2020)	More eco-innovation measures should be introduced
2. Regional Operational Programme of Thessaly Region 2014-2020 (ROP 2014-2020)	Eco-innovation and circular economy measures need to be added. More links to RIS3 should be created.
3. National Research and Innovation Strategy For Smart Specialization 2014-2020	Links to regional RIS3

4. European Agricultural Fund for Rural Development (EAFRD)-Greek programme 2014-2020	More emphasis on greenhouses needs to be put
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Although there are several policies related to agriculture, the greenhouse sector seems to be among the least popular for the implementation of energy efficiency and eco-innovation actions. Innovation programmes and demonstration project schemes for pilot applications with focus on energy-efficient processes and technologies, including the application of renewable technologies and the development of new products and cultivation techniques are missing.

4.1.5 Italy

In Italy were identified different policy related to the eco-innovative greenhouses. At regional level, the **Rural Development Program 2014-2020**, is the programming tool for regional rural development for the realization of the Europe 2020 strategy. RDP of Molise Region, measure 4.1: investment in agricultural company is the main measure related with greenhouses sectors. The main objective of the measure is to create a more autonomous agricultural system from global trends and markets, through a modernization of agricultural, orienting them towards greater sustainability, and greater autonomy. Is it applicable for the construction of innovative greenhouses investments in farms aimed at improving the competitiveness of the agricultural sector, and to counteract the phenomena of weakening of the agri-food sector. The policy encourages investments to improve the energy efficiency of building (also with geothermal energy).

At National level different plans are related to eco-innovative solution, such as the strategic plan for innovation and research in the agricultural, food and forest sectors (2014-2020). Among the seven initiatives identified at community level to guide the implementation of the strategy, the "Innovation Union" initiative has the task of steer the implementation of the strategy on research, development and innovation, reorienting the relative policy according to the challenges facing our society e strengthening all the links in the innovation chain, from more theoretical research to marketing.

Agricultural, food and forestry sectors National strategy plan, he policy is implemented at National and regional level. The policy is implemented at national level by ministry of agriculture and the main institutions that deal with agri-food research. At regional level, agricultural research is regulated by specific rules, while an important coordinating role is played by the Interregional Research Network agriculture, forestry, aquaculture and fishing. In the field of development and transfer services innovation, regional administrations have full autonomy of action.

The plan is related to two crucial areas of programming for innovation in agriculture, the rural and territorial development through the European Agricultural Development Fund (EAFRD); and research and innovation through the new Horizon 2020 instrument.

National plan of flowers and ornamental sector

The National Plan of the floriculture sector identifies the issues to be addressed, the strengths and weaknesses and a series of interventions and lines of action aimed at the economic and productive strengthening of one of the most dynamic sectors of our agricultural economy, in order to enhance its competitiveness on EU and international markets. The general objective is to preserve, through the necessary synergistic actions with other public institutions, at regional and local level, the wealth of both human and technical and productive capacities, whose employment impact is very significant. The Sector Plan includes regulatory updates, professional training, valorization and qualification of production, research and experimentation, communication, promotion, logistics and promotion. Information actions at Community level to highlight the problems of the sector.

- Encourage the transition from the use of fossil fuels to renewable energy sources
- Promote aggregation and the competitiveness and innovation of companies.
- Encourage a more rational and sustainable use of energy (renewable energy sources).

Installation of greenhouses and greenhouse tunnels. Regional Law 26, 2008, n. 5.

Provisions regarding the installation of greenhouses and greenhouses at regional level. Installation of greenhouses and greenhouse tunnels. It is a Regional law, discipline the installation of greenhouses (mandatory) Municipalities, SMEs, farmers. Basic regulations (mandatory) for building a greenhouse in the regional territory.

National Energy Strategy

The National Energy Strategy is the ten-year plan that the Italian Government drew up to anticipate and manage the change of the national energy system: a document looking beyond 2030, and laying the groundwork for building an advanced and innovative energy model.

The objective of the Strategy is to make the national energy system more competitive, more sustainable, and more secure

The Strategy aims to make the national energy system more competitive, sustainable and secure.

4.1.6 Spain

Public policy support in Spain is a mix of first and second-generation policies and measures, addressing technologies and resources for pollution control and energy efficiency.

Eco-innovation is generally embedded in national and regional policies targeting resource efficiency, environmental innovations, clean technologies and sustainable development.

4.2 Gaps

4.2.1 Albania

Table 41 – Lack of Policies and frameworks favouring eco-innovation in the Region of Berat (Albania)

N	Lack of policies	Short Description required policy/framework - justification
1	Specific policies related to greenhouses	With the last agricultural strategy adopted in the country a great emphasis has been given to the competitiveness enhancement of the first sector, however there are no specific measures in the strategy related to the greenhouses' vegetable production.
2	Specific policies related to the geothermal energy production	Despite of the adoption of the national strategy for renewable energies there are no specific measures or incentives related to the geothermal production industry.
3	Lack of coordination among policies	Many documents have been issued during last years to boost the Albanian agriculture competitiveness, however there is a mismatch between the various documents issued, therefore there is a lack of a strategic overall view that can specifically address all the problems related to the first sector.
4	Lack of implementation policies process	Albeit during recent years the legal framework has been modified to align the national agricultural policies to the EU Common Agriculture Policy and although the looking forward present agricultural strategies, the implementation process of all measures still lags behind.
5	National research and development policies	In the national strategies provisions little or inexistent attention is given to the enhancement of the research and development policies that can boost the first sector.

6	National statistic tools and indicators	The National Statistic Institute database lacks of specific statistical tools or indicators that can give an insight on the national expenditures in eco-innovation and green economy.
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4.2.2 Cyprus

Table 42 – Lack of Policies and frameworks favouring eco-innovation in Cyprus

N	Lack of policies	Short Description required policy/framework - justification
1	Lack of specific policy for the greenhouses sector (The policies concern the agro food sector in general)	Many political strategies contain aid for the greenhouses sector, but there is no exclusive policy for those, who must include all the action necessary to implement innovative eco-greenhouses.
2	Lack of policy for knowledge transfer	Measures to enable stakeholders to evaluate the effectiveness and impact of innovation should be introduced.

4.2.3 France

Table 43 – Lack of Policies and frameworks favouring eco-innovation in PACA region (France)

N	Lack of policies	Short Description required policy/framework - justification
1	Structured regional policy	Despite a favourable national policy for eco-innovation, this was not translated into a strong regional policy in PACA
2	Lack of financial policy to minimize the investment cost of greenhouses for farmers	Need of financial instruments dedicated to farmers to lower the risk linked to high investment in innovative greenhouses
3	Lack of policies on economical prospective analysis to support crop and food production	Farmers need guidance /advices on local and international market trends

4.2.4 Greece

Table 44 – Lack of Policies and frameworks favouring eco-innovation in the Region of Thessaly (Greece)

N	Lack of policies	Short Description required policy/framework - justification
1	Lack of specific policy for the greenhouses sector (The policy concerns the agro food sector in general)	Many political strategies contain aid for the greenhouses sector, but there is no exclusive policy for those, who must include all the action necessary to implement innovative eco-greenhouses.
2	Policies for the development of demonstration and pilot projects	No specific policy actions are undertaken for demonstration projects focusing on eco-innovative greenhouses and use of new energy technologies for RES, new energy technologies and energy efficiency or presentation of good practices in sustainable greenhouse production.
3	Lack of plan for specific research and innovation in the greenhouses sector and the development of technology innovation campuses	There is no plan for the research needs for the greenhouses sector. The setting up of technology centres, research laboratories and programmes to enhance competitiveness of the greenhouse sector is necessary. Policies for eco-innovative greenhouses development and related research from the idea to the market introduction phase are missing.
4	Lack of plan for specific development of the academic sector related to greenhouses	No plan for the development of the academic sector in relation to greenhouses. The relevant departments/labs could merge to one unit and work together for the development of the sector.
5	Lack of policy for knowledge transfer	No policy for the measures to enable stakeholders to evaluate the effectiveness of innovations is available
6	Lack of market analysis plan and policies for new market opportunities and strategies	Lack of political strategies to promote the value of products grown in innovative greenhouses
7	Lack of plan for development of eco-innovative, zero emission greenhouses	Lack of advice on energy savings opportunities and information about related subsidies. Policies forcing the indication by labelling and standard product information of

		the consumption of energy, water, fertilisers and other related inputs/resources is missing. Lack of policies for sustainable greenhouse products, included the implementation of ecodesign and labelling requirements as a separate measure.
8	Lack of policies for the development of eco-innovation clusters	Lack of policies for the development of strategic cutting-edge expertise, green growth and sustainable communities related to eco-innovation in the greenhouse sector

4.2.5 Italy

Table 45 – Lack of Policies and frameworks favouring eco-innovation in the Molise Region (Italy)

N	Lack of policies	Short Description required policy/framework - justification
1	Lack of specific policy for greenhouses sector (Policy concerning too many sectors)	Many political strategies contain aid for the greenhouses sector, but there is no exclusive policy for those, who must include all the action necessary to implement innovative eco-greenhouses.
2	Lack of coordination strategies	The strategies are linked to the individual issues
3	Lack of plan for specific research and innovation in the greenhouses sector	There are no specific research strategies for the greenhouse, from construction to systems of energy, conservation and cultivation
4	Lack of policy for knowledge transfer	measures to enable stakeholders to evaluate the effectiveness of innovations
5	Lack of policies for new markets opportunities and market strategies	lack of political strategies to promote the value of products grown in innovative greenhouses

4.2.6 Spain

Table 46 – Lack of Policies and frameworks favouring eco-innovation in the Region of Murcia (Spain)

N	Lack of policies	Short Description required policy/framework - justification
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1	Policies promoting participation of private sector	The weaknesses focus on the poor and insufficient participation of the private sector in the financing of R + D + i.
2	Technology transfer offices	There are very few offices of technological transfer, to which is added that the R + D + i of the universities and public centers of research is not entirely oriented to the technological needs of companies.
3	Policies for technology company's entrepreneurship	There is a lack of policies addressed to create technology enterprises. At present, most of promoters are private investment funds or big companies, which are interested in supporting such new entrepreneurs

4.3 Obstacles

4.3.1 Albania

Table 47 – Identified obstacles for the adoption/development of frameworks/policies favouring eco-innovation in the region of Berat Albania

N	Identified Obstacles for the use of the existing financial channels	Short Description of the obstacle - justification
1	Political class ineptitude	Politicians are concerned in the attainment of European standards and for this reason modern development strategies have been adopted at national level. However the political class is responsible of the general lack of effective measures and national funding, as well as of the poor infrastructures development and the lack of funding in research and development projects. Hence, a modern overall strategy that can link different productive sectors based on the concept of sustainable development is needed.
2	Lack of funding	The general lack of funding is one of the main causes that hinder the first sector strategies development.

3	Lack of inter ministerial coordination	The Ministry of Agricultural Development and water management, the ministry of Energy and Infrastructures and the ministry of the Economic Development lack of a inter ministerial cooperation strategy that can boost the first sector development.
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4.3.2 Cyprus

Table 48 – Identified obstacles for the adoption/development of frameworks/policies favouring eco-innovation in Cyprus

N	Identified Obstacles for the use of the existing financial channels	Short Description of the obstacle - justification
1	Lack of awareness on added value of greenhouse agriculture	Need for highlighting the greenhouses sector contribution on the national production, as well as its impact on the environment and the society (jobs, local (organic) food)
2	Lack of communication between stakeholders	Absence of cooperation between academia, public sector, civil society and the private sector/entrepreneurs.
3	Return on investment	Often the return on investment is too low and discourages the stakeholders
4	Small Market	The market in Cyprus for selling the products is rather small and exporting procedures require extra know-how and specializations that are linked with extra cost
5	Lack of capacity building and training	Farmers are the target of the innovation. However, there is a lack of capacity building in this kind of enterprises, in such a way that understanding the benefits of innovation is not clear for them.

4.3.3 France

Table 49 – Identified obstacles for the adoption/development of frameworks/policies favouring eco-innovation in PACA Region (France)

N	Identified Obstacles for the adoption/development of	Short Description of the obstacle - justification
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	frameworks/policies favouring eco-innovation	
1	Land planning in favor of urban development rather than agriculture	Agriculture generates lower incomes than industry and tertiary sectors.
2	Lack of awareness on add value of greenhouse agriculture at political level (national, mainly)	Need for highlighting the greenhouses sector contribution on the regional and national production, as well as impact on the environment and the society (jobs, local (organic) food)

4.3.4 Greece

Table 50 – Identified obstacles for the adoption/development of frameworks/policies favouring eco-innovation in the Region of Thessaly (Greece)

N	Identified Obstacles for the use of the existing financial channels	Short Description of the obstacle - justification
1	Lack of communication between stakeholders	No cooperation between the academic and research actors and the SMEs.
2	Undeveloped heat market due to the low and irregular demand for heat and cooling	No market available for use of heating energy produced by the greenhouse sector that could be used for domestic use.
3	Difficulty in investment financing	This difficulty is enhanced by the lack of attractiveness of these technologies compared to RES investments in other sectors
	Lack of commercial availability on the market of small-scale innovation systems at low cost (such as cogeneration plants)	The technologies available for eco-innovative greenhouses have been developed for large scale investments and low scale investments for single farmers are not always possible and sustainable.
	Delays in approval of policies	Often the calls and the subsequent payments are delivered with huge delays, discouraging the stakeholders
	Return on investment	Often the return on investment is too low and discourages the stakeholders

	Competition with other countries	The greenhouse products are sometimes not competitive with those imported and disincentive the creation of greenhouses, very expensive especially from the energy point of view
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4.3.5 Italy

Table 51 – Identified obstacles for the adoption/development of frameworks/policies favouring eco-innovation in Molise Region (Italy)

N	Identified Obstacles for the use of the existing financial channels	Short Description of the obstacle - justification
1	Delays in approval of Policies	often the calls and the subsequent payments are delivered with huge delays, discouraging the stakeholders
2	Return on investment	Often the return on investment is too low and discourages the stakeholders
3	Return on investment	the products grown in Italy are sometimes not competitive with those imported and disincentive the creation of greenhouses, very expensive especially from the energy point of view

4.3.6 Spain

Table 52 – Identified obstacles for the adoption/development of frameworks/policies favouring eco-innovation in the Region of Murcia (Spain)

N	Identified Obstacles for the use of the existing financial channels	Short Description of the obstacle - justification
1	Bureaucracy in applying for funding	Bureaucracy in the application for funding and in the process of implementation of funded innovation projects, creates a lack of interest for companies and farmers.
2	Lack of capacity building and training	Farmers are the target of the innovation. However, there is a lack of capacity building in this kind of enterprises, in such a way that

		understanding the benefits of innovation is not clear for them.
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5. Policy Recommendations favouring the establishment of innovative greenhouses

Taking into consideration the analysis of the previous chapters, this section presents at least 3 policy recommendations per country, favouring the establishment of innovative greenhouse. To be noted that the recommended policies were designed in accordance with existing regional/national policies and strategies of agriculture sector in order to be applicable from policy makers.

5.1.1 Albania

POLICY RECOMMENDATION 1: *Initiatives & capacity building seminars for farmers*

Short Description: Supporting through incentives and tax reductions farmers that produce vegetables in heated sustainable greenhouses fueled by clean and renewable energies (such as solar, geothermal, biomass, wind) with a particular attention on farmers that produce high quality organic vegetables that can be sold on international markets at higher prices. The beneficiaries of these incentives must be in this market for at least 5 years in a row otherwise they have to pay back the funds that they have received with an interest rate of 4%. After the third year of production the incentives will turn into productivity and sustainability subsidies for farmers in term of marketing support systems. The government will help farmers to create a label that will allow consumers to recognize the food produced in sustainable greenhouses on local and international markets. At the same time in order to implement this strategy it is important to train farmers. The training must be compulsory for all farmers involved in the project otherwise farmers will be excluded from the financing plan. After the training period farmers must take a final exam to assess their knowledge. Universities and research centers have to implement the farmers' training with the aim to educate to good environmental practices that will be helpful in terms of pollution reduction, increased product quality and farmers' health prevention. At the same time government should boost the domestic consumption of food produced in sustainable way raising awareness educating children in schools and boosting the rural tourism in sustainable farms.

Priority Axis: Boosting Albanian agricultural competitiveness promoting sustainable greenhouses production and farmers' education

Specific Objectives:

- promote sustainable agriculture and organic food production;
- promoting crop production in sustainable greenhouses;

- fostering the Albanian agriculture competitiveness at national and international level.

Implementing body / authority: MARDWA, Ministry of Agriculture Rural Development and water Management

Beneficiaries: Greenhouses' producers

Proposed interventions / measures:

- support farmers that produce food in sustainable heated greenhouses;
- increase the Albanian agriculture competitiveness through marketing support measures;
- increase farmers' education through specific training systems;
- raising awareness among people and farmers on the importance of the implementation of sustainable practices.

Links with existing (regional/ national/ sectoral) policy/framework:

The policy on sustainable greenhouses can be included in the Inter Sectoral Rural Development Strategy ISARD strategy and implemented through the incentives provided in IPARD II measures.

POLICY RECOMMENDATION 2: Incentives for investors in order to use clean forms of energy in agricultural sector

Short Description: Even if the country has adopted the National Action Plan for Renewable Energy Resources 2015-2020, poor attention has been given to the production of geothermal energy. The country has many untapped geothermal resources that should be used to produce clean energy. Hence, the government should provide incentives to energy producers that want to exploit this energy to fuel high environmental impact activities such as the crop production in heated non-sustainable greenhouses. In the National Plan, in fact, the geothermal energy has been recognized such as one of the sustainable energy resources that have to be exploited to reach the 38% of sustainable energy consumption in 2030, however presently the percentage of energy produced with this kind of resource is almost 0%. In the Plan more focus has been given to the implementation of hydroelectric power plant. Therefore, the government should provide a special favorable fiscal system to attract investors on this market that can enhance job creation and contribute to the national clean energy production. Furthermore, the government should provide additional subsidies to energy producers that build sustainable geothermal plants that can substantively reduce the environmental impact in a specific economic sector.

Priority Axis: Fostering the Albanian clean energy production focusing on geothermal energy.

Specific Objectives: Reduce the environmental impact on some specific economic sector.

Implementing body / authority: National Agency of Natural Resources NANR, Ministry of Energy and Industry MEI, Ministry of Environment ME

Beneficiaries: Sustainable energy producer, geothermal energy producers.

Proposed interventions / measures:

- Special favorable fiscal system for geothermal energy producers,
- Additional subsidies to geothermal energy producers that link their activity on the environmental impact reduction of some specific economic sectors.

Links with existing (regional/ national/ sectoral) policy/framework:

National Action Plan for Renewable Energy Resources 2015-2020.

POLICY RECOMMENDATION 3: Community-based enterprises implementation

Short Description: One of the problems related to the Albanian agriculture competitiveness is the land smallholding. This is a heritage of the past communist era and represents one of the issues that have to be tackled in order to increase the first sector productivity. However, smallholding can be seen as an impediment to attain higher GVA in agriculture or it can be seen as a peculiarity of the Albanian territory that can produce virtuous circles in the overall sector. In fact, according with important international agencies, such as FAO, smallholders represent a resource in terms of environmental and traditions conservation, they prevent the migration floods to the urban areas and they have a positive impact on the biodiversity conservation. Hence, they represent a formidable resource to reduce the environmental impact in agriculture and the climate change. However, because of their poor lobby power on governments they are often excluded from national policies and considered as an issue. In order to tackle this problem the government should implement policies to gather all the smallholders of a specific area in community-based enterprises. The policy should provide incentives for the creation of these CBEs focusing on the agro-ecological production. The subsidy should work as a productivity incentive for clusters of smallholders that decide to share the costs for plants and equipments, inputs costs, administrative costs, start-up costs and total revenues. Above all, incentives have to be granted to smallholders clusters that adopt the principles of agro-ecology. The government should train farmers in the reduction of chemicals and pesticides usage, in the production of organic compost and in the wise waste disposal. In order to push

the CBEs' products in the market the government should implement specific marketing strategies such as the creation of a specific label for CBEs organic products and networking strategies with the aim to put in contact local and international firms interested in purchasing organic products and small farmers.

Priority Axis: Enhancement of the smallholders' conditions and creation of community-based enterprises.

Specific Objectives: Tackle the problem of smallholding in agriculture gathering all small farms of a specific area in an agro-ecological producer cluster that can compete with big producers in domestic and international markets.

Implementing body / authority: MARDWA, Ministry of Agriculture Rural Development and water Management

Beneficiaries: smallholders

Proposed interventions / measures:

- Incentives to the creation of stallholders' agro-ecological producers CBEs;
- Implementation of market strategies;
- Implementation of networking strategies;
- Training systems.

Links with existing (regional/ national/ sectoral) policy/framework: ISARD and IPARD II

POLICY RECOMMENDATION 4: *Establishment of National Contact Points – Information Centers for farmers*

Short Description: An important issue to be addressed in the Albanian agricultural market is the lack of national contact points or information centers for farmers. As it has been pointed out from the same farmers during consultations, the lack of awareness about the benefits and the opportunities of eco-innovative technologies limits the investments in this field with a negative impact on the technological advancements on the overall agricultural sector. Thus, a policy that can strengthen the link between members of civil society involved in the agricultural sector, such as farmers and small entrepreneurs, public institutions and national agencies is needed, in order to discuss and implement policies to the benefit of all interested parties. Hence, the creation of National Contact Points can address not only the general lack of awareness about the eco-innovation but also the lack of knowledge transfer in order to make use of new technologies to reduce costs of constructing, operating and maintaining greenhouses. In fact the generally family-run enterprises that operate in

the Albanian agricultural market need to be supported by development agencies in order to receive reliable and useful information regarding the possibility of developing greenhouses and receive incentives in order to cut the startup costs of building new modern plants. Hence, Information Centers shall help farmers in the identification and provision of financial support from different projects and opportunities.

Priority Axis: Create national information points that can help farmers to recognize the benefits of eco-innovation in agriculture and access to financial schemes created ad hoc for them.

Specific Objectives: Raise awareness among farmers about the benefits of eco-innovative technologies and inform them about transferability and operation issues as well as funding opportunities through national/regional and EU financial schemes.

Implementing body / authority: MARDWA, Ministry of Agriculture Rural Development and water Management, National Development agencies.

Beneficiaries: Farmers, SMEs and smallholders that operate in the agricultural sector

Proposed interventions / measures:

- Creation of National Information Points
- Increase the awareness about eco-innovative technologies;
- Boost the linkage between the National Government, farmers and national development agencies.

Links with existing (regional/ national/ sectoral) policy/framework: ISARD and IPARD II.

5.1.2 Cyprus

POLICY RECOMMENDATION 1: Application of the quadruple helix approach in greenhouse innovation production and application

Short Description: Absence of cooperation between academia, public sector, civil society and the private sector/entrepreneurs. The quadruple helix approach should be encouraged and strengthened to boost the production and application of innovation in the greenhouse market.

Priority Axis: Innovation, Energy and sustainability, Green economy-growth

Specific Objectives: To strengthen the cooperation between the stakeholders in the greenhouse sector to boost production and application of innovation in the greenhouse market.

Implementing body / authority: Ministry of Agriculture, Rural Development and Environment.

Beneficiaries:

- Central Government
- Chambers
- Educational Institutions
- Large Enterprises
- Local Authorities
- NGOs
- Researchers/Research Centers/Institutions
- Small and Medium Enterprises (SMEs)
- State-owned Enterprises
- Trade Unions

Proposed interventions / measures: Establishment of clusters/networks of greenhouse innovation.

Links with existing (regional/ national/ sectoral) policy/framework:

- Rural Development Programme (RDP)2014-2020
- Smart Specialization Strategy of Cyprus (S3Cy).

POLICY RECOMMENDATION 2: Innovative Greenhouses

Short Description: Provision of support in establishing innovative, efficient and productive greenhouses with minimum expenses, exploiting the use of RES. The intention of this new policy could be that of creating a specific link to the greenhouses sector as part of the research and innovation program RESTART (in the framework of OP "Competitiveness and Sustainable Development" 2014-2020).

Priority Axis: Innovation, Energy and sustainability, Green economy-growth.

Specific Objectives: Establishing innovative, efficient and productive greenhouses with minimum expenses, exploiting the use of RES.

Implementing body / authority: Foundation for Research and Innovation or Ministry of Agriculture, Rural Development and Environment.

Beneficiaries:

- Farmers
- Producer groups
- Businesses



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- Local authorities
- Public authorities
- Research Institutions
- NGOs

Proposed interventions / measures:

- Application of innovative technologies in Greenhouse Units
- Establishment of new innovative Greenhouse Units
- Exploitation of the use of RES in Greenhouse Units

Links with existing (regional/ national/ sectoral) policy/framework: Program RESTART (in the framework of OP “Competitiveness and Sustainable Development” 2014-2020), Rural Development Programme (RDP) 2014-2020, Smart Specialization Strategy of Cyprus (S3Cy).

POLICY RECOMMENDATION 3: Innovative Greenhouses

Short Description: Provision of support in establishing innovative, efficient and productive greenhouses with minimum expenses, exploiting the use of RES. The intention of this new policy could be that of creating a specific link to the greenhouses sector as part of the research and innovation program RESTART (in the framework of OP “Competitiveness and Sustainable Development” 2014-2020).

Priority Axis: Innovation, Energy and sustainability, Green economy-growth.

Specific Objectives: Establishing innovative, efficient and productive greenhouses with minimum expenses, exploiting the use of RES.

Implementing body / authority: Foundation for Research and Innovation or Ministry of Agriculture, Rural Development and Environment.

Beneficiaries:

- Farmers
- Producer groups
- Businesses
- Local authorities
- Public authorities
- Research Institutions
- NGOs

Proposed interventions / measures:

- Application of innovative technologies in Greenhouse Units
- Establishment of new innovative Greenhouse Units

- Exploitation of the use of RES in Greenhouse Units

Links with existing (regional/ national/ sectoral) policy/framework: Program RESTART (in the framework of OP "Competitiveness and Sustainable Development" 2014-2020), Rural Development Programme (RDP) 2014-2020, Smart Specialization Strategy of Cyprus (S3Cy).

POLICY RECOMMENDATION 4: *Interregional Innovative Technology Transfers*

Short Description: Knowledge of innovation on greenhouse industry is spread around the EU member states and innovative technologies may be applicable in Cyprus too. In this way, time, money and human resource could be saved on investing in creating innovative technologies which might already exist. In addition, the commercial value of the research results is one of the most important concerns of the scientific and technological policy of the most advanced countries, encouraging scientists to continue their work beyond their basic research projects and even to participate in the application of its results.

Priority Axis: Innovation, Eco-innovation, Research.

Specific Objectives: To create synergies between European regions in exchanging experience and practices on greenhouse innovation technologies.

Implementing body / authority: Foundation for Research and Innovation or Ministry of Agriculture, Rural Development and Environment.

Beneficiaries:

- Farmers
- Producer groups
- Businesses
- Research Institutions
- NGOs

Proposed interventions / measures: Establishment of greenhouse innovation knowledge networks.

Links with existing (regional/ national/ sectoral) policy/framework: Program, RESTART (in the framework of OP "Competitiveness and Sustainable Development" 2014-2020) Rural Development Programme (RDP) 2014-2020.

5.1.3 France

POLICY RECOMMENDATION 1: Improve existing financial instruments

Short Description: In order to improve the establishment of innovative greenhouses it is necessary to change the existing policies, and create separated financial strategies. Currently all of the financing policies are related to France Agrimer funding plan and the regional program will be linked to the national one until 2020.

Priority Axis: Promoting Mediterranean innovation capacities to develop smart and sustainable growth.

Specific Objectives: Decentralization - More independence for the regional funding bodies.

Implementing body / authority: Ministries – Regions

Beneficiaries: Regional authorities

Proposed interventions / measures:

- Separation between the nationals and regionals financial strategies
- Creation of an instruction unit at regional level
- Organization of farmers' consultation at regional level for the implementation to be taken into account in the implementation of financial strategies.

Links with existing (regional/ national/ sectoral) policy/framework:

Bioeconomic Strategy for France - 2018-2020 Action Plan

- Under the axis: Lift the brakes and mobilize funding

POLICY RECOMMENDATION 2: Creating new business models for the promotion of innovative greenhouses

Short Description: Regional authorities could develop new innovative business models for farmers to encourage them to invest in innovative and sustainable greenhouses. Example of innovative business models developed by some enterprises of photovoltaic energy: Greenhouses installation and maintenance cost is totally covered by the enterprise who exploits the energy produced by the photovoltaic panels.

Priority Axis: Promoting Mediterranean innovation capacities to develop smart and sustainable growth.

Specific Objectives:

- Improve sustainable agriculture

- Facilitate the investment on sustainable and innovative greenhouses

Implementing body / authority:

- Chamber of agriculture
- Regions
- Ministry of agriculture
- Ministry of ecology

Beneficiaries: Framers.

Proposed interventions / measures:

- Preparation of innovative business models adapted to farmers groups in the region
- Preparation of support plan for the implementation of investments of material and immaterial projects selected by calls for projects.

Links with existing (regional/ national/ sectoral) policy/framework:

- Regional Innovation Strategy 2014-2020 of PACA region
- Regional strategy for agriculture

POLICY RECOMMENDATION 3: Better identify, produce and disseminate innovations

Short Description: Innovation can come in both ways: a) from researchers to farmers or b) from farmers to researchers in this case researchers should analyze the innovative methods applied by framers and evaluate the possibilities of replicability. As for researchers, farmers shall be recognized as producers of innovations and knowledge. Therefore, the exchange of know-how between the two categories of actors is essential to improve innovation.

Priority Axis: Promoting Mediterranean innovation capacities to develop smart and sustainable growth.

Specific Objectives:

- Facilitate the exchange of know how between researchers and farmers
- Promote different forms of innovation at regional and national levels and between different actors → increase innovative technologies/methods use.

Implementing body / authority: National and regional authorities

Beneficiaries:

- Framers
- Researchers
- Policy makers

Proposed interventions / measures:

- Creation of platform for exchanging experiences and know-how integrating all actors
- Capitalization and dissemination of innovations to all actors.

Links with existing (regional/ national/ sectoral) policy/framework:

- Sector Strategies 2025 - towards a competitive agriculture at the service of people
- Regional Innovation Strategy 2014-2020 of PACA region

5.1.4 Greece

POLICY RECOMMENDATION 1: Pilot/demonstration eco-innovative greenhouses

Short Description: This policy could aim to the development of demonstration centers of eco-innovative greenhouses in several places around Greece. These centers could creating a specific link to the greenhouses sector as part of ERDF program.

Priority Axis: Innovation

Specific Objectives: The specific objectives could be the demonstration of the efficiency of the application of different type of technologies, the test of new technologies and the transfer of knowledge related to the management of innovative greenhouses.

Implementing body / authority: National or Region governmental Body.

Beneficiaries: Private companies, Academic and Research Institutions.

Proposed interventions / measures:

- Technical assistance in writing proposal
- Technical assistance in the implementation of the intervention

Links with existing (regional/ national/ sectoral) policy/framework: ERDF

POLICY RECOMMENDATION 2: Knowledge cluster of the greenhouse sector



Short Description: This policy could aim to the development of knowledge clusters and living labs related to innovative greenhouses in Greece. These clusters could create a specific link to the greenhouses sector as part of ERDF program.

Priority Axis: Innovation, Energy and sustainability, Green economy-growth

Specific Objectives: The specific objectives could be the development of research and development projects and innovation plans as well as knowledge transfer plans related to the development of innovative greenhouses.

Implementing body / authority: National

Beneficiaries: Private companies, Academic and Research Institutions, Farmer Associations, Start-ups.

Proposed interventions / measures:

- Technical assistance in writing proposal
- Financing channels for fostering greenhouses

Links with existing (regional/ national/ sectoral) policy/framework: ERDF

POLICY RECOMMENDATION 3: Eco-innovation upgrading of the greenhouse sector

Short Description:

The intention of the policy could be that of fostering:

- Upgrade of greenhouse climate control systems
- Upgrade of greenhouses energy saving systems
- Upgrade of greenhouse water and fertilizer control systems

Priority Axis: digital innovation, energy and sustainability, green economy-growth.

Specific Objectives: Fostering the upgrade of the performance of greenhouses, increase of their efficiency and reduce their environmental impact.

Implementing body / authority: National

Beneficiaries: Private companies, farmers, start-ups, etc.

Proposed interventions / measures: financing channels for fostering eco-innovation technologies in greenhouses.



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Links with existing (regional/ national/ sectoral) policy/framework:

The intention of the policy could be that of fostering:

- Greenhouses construction
- Greenhouses energy development
- Greenhouse innovation and technology

POLICY RECOMMENDATION 4: *Market analysis of the greenhouse sector and marketing challenges of the greenhouse products*

Short Description: Small companies cannot easily create a certain market for the sale of the product. Marketing policies can favor the creation of supply chains and the certainty of the return on investment for innovative greenhouses. A market analysis of the greenhouse sector can help the interested stakeholders to invest on the necessary sub sectors.

Priority Axis: Market investment.

Specific Objectives: Create a supply chains for the sale of greenhouse products.

Implementing body / authority: National and Regional level.

Beneficiaries: Farmers, SMEs, companies.

Proposed interventions / measures: Encourage the creation of commercial chains with supply chain agreements and contracts at interregional level.

Links with existing (regional/ national/ sectoral) policy/framework:

- Supply chain and district contracts at national level
- Supply chain and district contracts at regional level

5.1.5 Italy

POLICY RECOMMENDATION 1: *"Innovative Greenhouses"*

Short Description: The intention of this new policy could be that of creating a specific link to the greenhouses sector as part of ERDF program.

Priority Axis: Innovation

Specific Objectives: The specific objectives could be that of creating innovative greenhouses.

Implementing body / authority: Region governmental Body.

Beneficiaries: Private Company.

Proposed interventions / measures:

- Technical assistance in writing proposal
- Technical assistance in the implementation of the intervention

Links with existing (regional/ national/ sectoral) policy/framework: ERDF (PSR)

POLICY RECOMMENDATION 2: Fostering Greenhouses

Short Description:

The intention of the policy could be that of fostering:

- Greenhouses construction
- Greenhouses energy development
- Greenhouse innovation and technology

Priority Axis: digital innovation, energy and sustainability, green economy-growth.

Specific Objectives: Fostering the construction of greenhouses through digitalization.

Implementing body / authority: National

Beneficiaries: Private Company, research institute, farmers, start-up, etc.

Proposed interventions / measures: financing channels for Fostering Greenhouses.

Links with existing (regional/ national/ sectoral) policy/framework: -

POLICY RECOMMENDATION 3: Promote marketing channels for greenhouse products

Short Description: One of the main problems with small companies is to create a certain market for the sale of the product. Aggregation and commercialization policies can favor the creation of supply chains and the certainty of the return on investment for innovative greenhouses.

Priority Axis: Market investment.

Specific Objectives: Create a supply chains for the sale of greenhouse products.

Implementing body / authority: National and Regional level.



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Beneficiaries: Farmers, SMEs, company.

Proposed interventions / measures: Encourage the creation of commercial chains with supply chain agreements and contracts at interregional level.

Links with existing (regional/ national/ sectoral) policy/framework:

- Supply chain and district contracts at national level
- Supply chain and district contracts at regional level

5.1.6 Spain

POLICY RECOMMENDATION 1: ENCOURAGE LOCAL MARKETS

Short Description: There is a trend to supply local markets with imported crops. However, local consumers could be better encourage to buy from local producers that are investing in innovative greenhouse systems, creating a more environmental friendly production and distribution system. Therefore, public awareness should be remarked on the importation of products from third counties, and to encourage the consumption of national products.

Priority Axis: -

Specific Objectives: Create a strategy to encourage consumption of local products, putting our local products in value. This initiative would be part of a set of actions for the valorization of the products.

Implementing body / authority: Regional Authority

Beneficiaries: The entire food chain (production, transformation, distribution, sale and marketing).

Proposed interventions / measures: The development of a web portal that can serve as a promotional platform for these products. Another direct action would be the creation of an application for mobile devices that aims to bring these products to the consumer.

Links with existing (regional/ national/ sectoral) policy/framework: Market innovation.

POLICY RECOMMENDATION 2: PROMOTE TECHNOLOGY TRANSFER PROJECTS

Short Description: The commercial valuation of the results of the research is one of the most important concerns of the scientific and technological policy of the most



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advanced countries, encouraging scientists to continue their work beyond their basic research projects and even to participate in the application of its results.

Priority Axis: -

Specific Objectives: To ensure generational change in the Greenhouse sector.

Implementing body / authority: National administration authority.

Beneficiaries: Farmers, SME's.

Proposed interventions / measures: To encourage the innovative activity of many Spanish companies, hiring more technologists in their staff, capable of implementing innovations and being effective interlocutors with research centers. It is essential to incorporate young researchers into the private sector.

Links with existing (regional/ national/ sectoral) policy/framework: R&D national programs promoting cooperative projects with private and public sector

POLICY RECOMMENDATION 3: WATER SUPPLIES

Short Description: To ensure the necessary water supplies for the farmer to cultivate.

Priority Axis: -

Specific Objectives: The objective is to guarantee water resources to irrigators and farmers with modernization projects and infrastructures that help in water management, so that the Region remains a world leader in water use.

Implementing body / authority: Regional authority

Beneficiaries: Irrigators and farmers

Proposed interventions / measures: Promote investments in water and provide the infrastructure necessary for the Region to remain a world leader in water reuse.

Links with existing (regional/ national/ sectoral) policy/framework: Water Framework Directive Irrigation modernization policies at national and regional level.