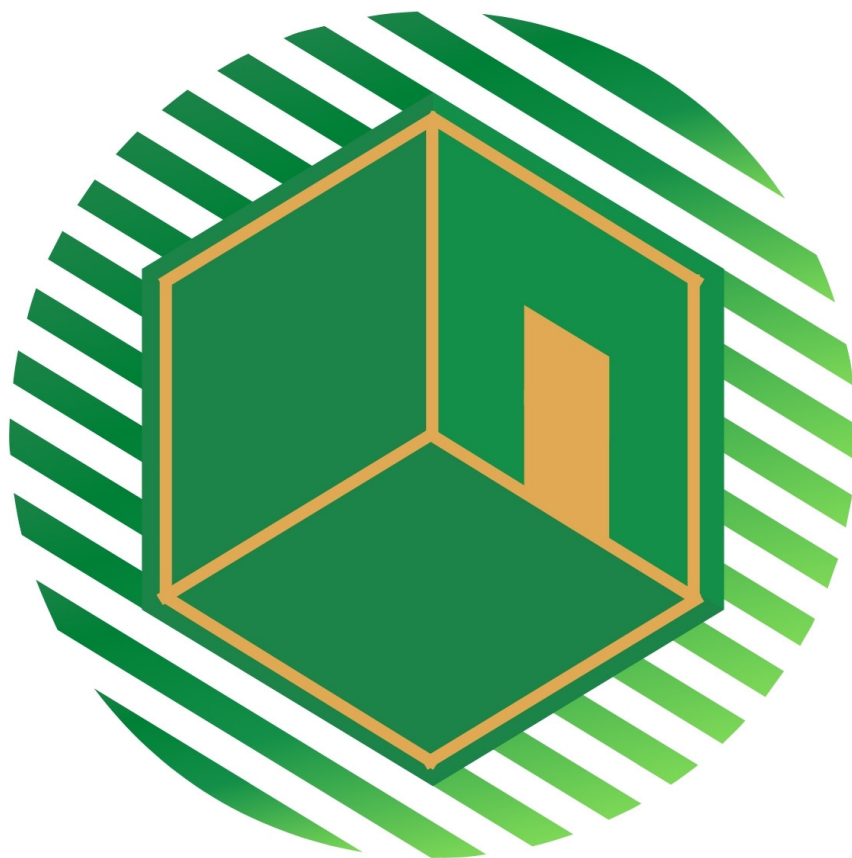# "THE EDUCATIONAL BEARING OF GAME-BASED LEARNING IN AGRO-ENTREPRENEURSHIP FOR THE YOUTH SECTOR"

Project Number: 2020-2-CY02-KA205-001870

AGRO

EDUGAMES

PARTNERS

Citizens In Power (CIP) is an independent non-profit, non-governmental organization. CIP aims at the development of different ramifications of entrepreneurship, education and democratic dialogue in Cyprus and abroad. To achieve those targets CIP has established an on-going collaboration with the majority of Cypriot leading universities, NGOs and research organizations in Cyprus, especially for the development of innovative projects and international trainings or seminars as well as for the deployment of pedagogical educational material, by primarily using web platforms and other technological innovations.
Website: https://www.citizensinpower.org/

Challedu pioneers new models of learning, inclusion and engagement. Its team consists of educators, teachers, experts, game designers and designs playful experiences and games with the aim to transform every activity into an irresistible experience. The scope is to unlock the transformative power of people as seekers and solvers of complex problems, risk-takers, inventors and visionaries. Our work also empowers creativity, fantasy, inclusion and empathy.
Website: http://challedu.com/

The Polish Farm Advisory and Training Centre not-for-profit Sp. z o.o. is a private not-for-profit company (in the process of becoming an NGO) dedicated to providing farm advisory services, enhancing the entrepreneurial spirit in rural areas and fostering rural development in general. The company's main goal is to improve the livelihoods of rural inhabitants by offering them the best and most professional and personalised advice in the field of agriculture as well as a variety of training courses and materials relevant to rural actors in the subjects of environment protection, sustainability, food safety, green growth, permaculture, social farming, etc.
Website: https://farm-advisory.eu/en/

DRAMBLYS is a non-profit organisation located in Spain that works for the promotion of social innovation. In DRAMBLYS we combine sociological imagination & inquiry with social creativity and design to approach, explore, and innovate solutions to contribute to sustainable development. Our main programmes and areas of expertise include the following: programmes design and evaluation, data visualization and social innovation design, development and management. In DRAMBLYS the aim is to facilitate creative dialogues and co-create sustainable alternatives and so, to inspire new social entrepreneurs and community leaders & promote sustainable ways of living.
Website: https://dramblys.org/

Erasmus+

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Erasmus+

Glossary

Acronym	Name	Definition
AE	Agricultural Entrepreneurship or Agro-Entrepreneurship	The marketing and manufacturing of different agricultural products and inputs.
ARiMR	Agency for Restructuring and Modernisation of Agriculture (Poland)	
BoBs	Breakout Boxes	
	Carbon footprint	The amount of carbon dioxide released into the atmosphere as a result of the activities of a particular individual, organization, or community.
CO_2	Carbon dioxide	It consists of a carbon atom covalently double bonded to two oxygen atoms. It occurs naturally in Earth's atmosphere as a trace gas.
CAP	Common Agricultural Policy	The agricultural policy of the European Union.
CIP	Citizens In Power	
	Emissions	The act of producing or sending out something (such as energy or gas) from a source.
EGs	Escape Games	
EPALE	Electronic Platform for Adult Learning in Europe	
ER	Escape Rooms	A game in which a team of players cooperatively discover clues, solve puzzles, and accomplish tasks in one or more rooms in order to progress and accomplish a specific goal in a limited amount of time.
ER-SE	Escape Room for Social Entrepreneurship (project)	
GBL	Game-Based Learning	Learning that is facilitated by the use of a game.
GMOs	Genetically Modified Organisms	
GVA	Gross Value Added	The value of output minus the value of intermediate consumption.
ICT	Information and Communications Technology	
IO	Intellectual Output	An activity that results in tangible and meaningful outcomes such as publications and course materials.
ktoe	kilotonnes of oil equivalent	
kWh	Kilowatt-hour	Unit of energy equal to 3600 kilojoules.
MEEN	Ministry of Environment and Energy of Greece	
NEET	Not in Education, Employment, or Training	
NECCA	Natural Environment and Climate Change Agency (Greece)	
OERs	Open Educational Resources	
PFA	Polish Farm Advisory and Training Centre not-for-profit Sp. z o.o.	
RPD	Rural Development Programme	

SEAO	Spanish Society for Organic Agriculture	
SME	Small and Medium-sized Enterprises	The main factors determining whether an enterprise is an SME are staff headcount; either turnover or balance sheet total.
STEAM	Science, Technology, Engineering, Arts and Mathematics	
STEM	Science, Technology, Engineering and Mathematics	
UNEP	United Nations Environmental Programme	Responsible for coordinating responses to environmental issues within the United Nations system.
UNESCO	United Nations Educational, Scientific and Cultural Organization	
UUA	Utilised Agricultural Area	The total area taken up by arable land, permanent grassland, permanent crops and kitchen gardens used by the holding.
VR	Virtual Reality	

Introduction

This Guidebook's content is produced as part of Agro_EduGames Project's Intellectual Output 1. It consists of three chapters. Chapter 1 is an introduction to important information in regards to Agricultural Entrepreneurship (AE). It mainly holds information related to 7 main topics; Agro-Entrepreneurship; soil, irrigation and water; biodiversity and ecology; climate crisis and its effects on agriculture; organic farming; energy consumption; and permaculture. The final sub-division of this chapter focuses on existing practices in Agriculture and Environmental Policies in Cyprus, Greece, Poland and Spain.

Chapter 2 of the document focuses on GBL Methods and ERs. It consists of 6 sub-divisions that firstly explain what GBL methods are and it provides examples of these methods related to the AE in each partner country. This chapter also provides an introduction to ERs theory and ERs as a pedagogical tool, which is basically a definition of how ERs and AE can emerge together in order to create a gamified environment for young agro-entrepreneurs.

The third and final chapter of this guidebook is mentioning the expected results and impact of Agro_EduGames and how this project can achieve its goals through its outputs and activities. In this chapter, the reader can find more thorough information on how and why GBL methods – and specifically the use of ERs – can be integrated with AE.

The following document is written and reviewed by Agro_EduGames IO1 leader, CIP Citizens In Power, and the Project's consortium; Challedu, Dramblys & Polish Farm Advisory and Training Centre for whom you can find information in the page right after the publication's cover page. The content of this Guidebook aims to be used for the training of youth workers, trainers and educators who are dealing with entrepreneurially-oriented fields. The project has been funded by the Erasmus+ Programme of the European Union and the European Commission, and this publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained.

Chapter 1:
An Introduction to Agriculture and Entrepreneurship

1.1. What do we know about Agriculture historically?

Agriculture has been described by many scientists as a science, sometimes it has been described as a form of art, that helps in growing and cultivating grains, fruits, vegetables and livestock. Historically, agriculture is considered to be the crucial point that determined the rise of sedentary civilizations, because of the food surpluses that occurred due to farming of domesticated species which allowed Homo sapiens to live in communities that are located at specific geographical positions, also known as cities, towns and villages (Harari, 2014). From this point onwards, thousands of years ago, agriculture pushed our species to leave its gathering and hunting roots. Homo sapiens, from an ape that used to roam around gathering fruits and hunting small animals, became a settler which now invests more effort into cultivating wheat. Agriculture is the reason our kind was forced to settle permanently next to wheat fields and rivers.

However, one historian, Yuval Noah Harari, described agriculture as the biggest scam of our humankind's history. The reason why he believes this is due to the fact that we may now have a huge sum total of food, but this does not necessarily mean that we enjoy a better diet or more leisure. Because of agriculture, human population explosions occurred and then the creation of elites followed. An average farmer nowadays works harder than an average forager, and in return, the first farmers had gotten a worse diet. What is usually misunderstood is that Homo sapiens did not domesticate plant species in the process of the Agricultural Revolution. A handful of grain including wheat, rice and oat accepted way fewer modifications in comparison to our species that modified its entire social existence. It was neither kings nor merchants who are responsible for the Agricultural Revolution, it is rather these grains that did this revolution and they transformed Homo sapiens as we know us today (Ibid 2014, p. 90). It is weird how we decided to settle down and cultivate plants if as foragers we had more food to eat than we had as early farmers.

What changed entirely agriculture though was the Industrial Revolution. Agricultural production increased once land and labour productivity increased too. And this happened due to the industrialisation that started somewhere in the 18th century. Especially in the last 200 years, according to Yuval Noah Harari, industrial production methods became the backbone of agriculture. Different types of machines were introduced into agriculture, such as tractors, field cultivators, seeders, planters, etc. they began to execute tasks that humankind used to perform in the past (Ibid 2014, p. 382). With the use of this machinery, efficiency and effectiveness was achieved. Now, fields and animals are more productive than ever before thanks to fertilizers, pesticides and other medications and artificial hormones.

Figure 1: Boggy Creek bridge, Bairnsdale-Orbost line, circa 1914 – Photo by Museums Victoria

However, as we well know, every action we take has its impact; and agriculture in the modern era has already obtained a variety of impacts on the environment and on us. A few impacts that are well known are livestock issues, water issues, pesticides and climate change. As regards livestock, it occupies around 30% of Earth's surface and it is the biggest contributor to greenhouse gases; specifically, 18% of the world's greenhouse gas emissions are coming from livestock. Another impact of livestock is deforestation, whose expansion occupies now what was previously forested areas. Another issue that occurs due to farming is the destruction of natural wetlands and other environmental problems that put under strain freshwater resources. Additionally, pesticides and their increasing numbers cause many concerns, such as poisoning. The final impact is Climate Change. With global warming featuring every environmental disaster and weather extremes, livestock is to be blamed for the excessive production of CO_2 and a significant percentage of the world's methane (UNEP 2020).

Figure 2: An agricultural field at Palghar in Maharashtra – Photo by Radha Krishnan

1.2. Agro-Entrepreneurship

Figure 3: by eGov Magazine

Entrepreneurship is when one acts upon opportunities and ideas, and she or he transforms them into values for other people. This value can either be financial, cultural or social (EntreComp, 2016, p. 10). According to Ntale et al. (2015, p. 827), the process of AE has essentially its base on diverse and complex motivations. Their essay gives a suggestion on a model on entrepreneurship readiness which gives a baseline on what is entrepreneurship. It is basically a model that composes a structure of personal and social features, work experience, culture and economic environment that depicts entrepreneurial readiness. Also, according to Rezaei-Moghaddam & Izadi (2019, p. 5), Entrepreneurship is an important factor to economic growth and development for every region, country or continent, and it is achieved through mechanisms that affect the financial performance of them. It can also give plenty of opportunities for entrepreneurs to increase their income, as well as reduce unemployment and improve living standards (Rezaei-Moghaddam & Izadi 2019, p. 13).

Additionally, AE is the process where farmers use creative methods in order to improve the quality and the quantity of their production, as well as their involvement in activities regarding the agricultural industry through some AE policy areas. Some of these key policy areas are, for example, the rise of agricultural productivity for small-scale farmers, the promotion of a diversified environment of non-traditional agricultural products in order to reduce vulnerability, the encouragement of food safety and the reduction of poverty (Ntale 2015, p. 826).

Small and medium enterprises (SMEs) have a significant role in a country's economic progress. Specifically, agricultural SMEs can contribute to many developing countries' economies with regard to employment, internal migration and the production of wealth (Ntale 2015, p. 830). These agricultural SMEs can expand a more sustainable economic background for a country which plays a big role in the country's development. The conditions that already exist in a market do not always guarantee productivity, so some initiatives are needed in order for small-scaled farming entrepreneurs to increase their profit and production; especially in rural areas. Lastly, another reason that makes SMEs so important is the concern about food security, as well as sustainability. Small farmers can easily be convinced by development organisations that prosperity in agriculture and food safety is crucial, not only for them but also for the development of the rural area.

Besides, small farmers produce food for their own and their families, and meanwhile, they sell a number of their products to markets. These sales done by small farmers and their contribution to the general market indicate that they are agricultural entrepreneurs; and like other entrepreneurs, small farmers can work alone and maintain the profit from the manufacture, or be a part of a farmers' association and sell their production collectively, which means that their profit will be redistributed among their partners accordingly (Ibid 2015, p. 830). The reason to enter into such a collective business is to increase profit, as well as to create a larger business after some time when their association gets to be well established among the agricultural industry. In order to achieve such a big success and get such a leading role in the market, smallholder farmers need to develop their knowledge related to the market along with their understanding of incoming opportunities on an economical level. Furthermore, they must convince third party corporations that they are a successful and profitable business. Some farmers may hold innovation, but they may lack the knowledge to become entrepreneurs, and this knowledge is mainly related to the market. This is why they need to get advised and supported by an extension service, so they can increase their sales to a stable and profitable level.

According to a 2015 research by the World Bank, agriculture must be considered an enterprise, and smallholder farmers or small farming associations must be seen as entrepreneurs. Regarding the latter, when this research was conducted, mainly large agricultural industries were considered to be enterprises in the field of agriculture due to their performance (Thakur 2020). Clearly, farming is not enough in order to meet the farmers' needs, neither is it enough to meet their families' necessities. So, most of them move from rural and remote areas into urban areas in order to support their business ambitions. Here is where the extension agents come across to help farmers in order to assist them to innovate the farming methods of local communities, as well as give more opportunities to farmers so they can succeed and provide more than just the essentials to their families. Lastly, extension services must move forward and seek the creation of wealth, not only the production of some profit; in other words, they must put the focus on the profitability along with the improvement of the production.

Figure 4: Parma, Province of Parma, Italy - Photo by Gabriella Clare Marino

1.3.Soil, Irrigation & Water

Water is the source of life on our planet. Every living organism needs water in order to survive; plants, animals (including humans), fungi and bacteria. Thankfully, our planet is covered by 1.234 million trillion litres of water. This is 1.234 followed by 18 zeros, or 1.234.000.000.000.000.000.000. However, 98% of this water is oceanic saltwater, and 1.5% is located frozen in the North and South poles. This means that only 0.5% of the total amount of water is drinkable. This 0.5% is what we call freshwater. Adding a few more numbers in this paragraph, 92% of fresh water is used for agricultural purposes.

This means that humans consume more water by eating than by drinking, and this is obvious in our diet and our water-intensive meat and plant consumption. The reason farmers use so much water in the agricultural industry is due to the fact that only 30% of watering is really going to plants, the rest of this water mainly evaporates, or otherwise, it is wasted in the fields and never makes it to the crops. This happens because of the way farmers chose to irrigate their crops. In recent years, some factors have contributed to the world's fresh water shortage. These factors are: global population, which has exploded dramatically; earth's overall temperature, which has shifted and rose; and humanity's failure to switch into less wasteful practices (Eden District Council Website 2020).

Another issue that troubles scientists is soil's fertility. According to some information presented on Eden District Council's website - a local government district in Cumbria, England - we are a few harvests away from the eradication of soil fertility, and this is due to the increased agricultural commodities. Day by day, we transform forested areas into massive farming fields in order to serve our needs, and this transformation usually exhausts soil which drains it from its natural minerals and nutrients. This is not the only factor regarding agriculture that affects soil quality. Other factors that have an impact on soil can be compaction, loss of soil structure and soil salinity. These issues can also increase pollution, clog waterways, reduction in fish number or other animals and floods.

Figure 5: Samoeng District, Thailand – Photo by Jordan Opel

Sustainable use of the land is key for reducing the side-effects of agriculture. A more sustainable solution can be a more reliable irrigation method which can result in broad and wide improvements for agricultural production. It can also maintain economic prosperity for the region. Irrigated land was the base of many civilisations of the past; some scientists have estimated that only 15-20% of today's worldwide total cultivated area is irrigated, however, this small area is responsible for 30-40% of the world's agricultural output. Method, frequency and duration of irrigation have some important advantages and disadvantages on crops and productivity (Walker 1989). The most common method of irrigation is surface irrigation which is generally more acceptable to agriculturists. This method can emerge with minimum effort and quite cheaper. The capital investment for surface irrigation is lower than other ways of irrigation due to its inexpensive and available materials like wood, concrete and brick. Another factor that makes surface irrigation so common is its resistance to climate and natural disasters: meanwhile,

  moderate winds can easily affect other irrigation systems, such as sprinklers. A disadvantage of surface irrigation is that any kind of soil has properties that vary regarding time and space. These properties cannot be predicted and they can be defined only when the process of irrigation is ongoing. Therefore, further action in order to help these properties to be estimated must take place only at the field. Another problem with surface irrigation is that it helps weeds grow much faster than crops, increasing pests and diseases (Ibid 1989).

1.4. Biodiversity & Ecology

Our guide's next subsection is about Biodiversity and Ecology. Biodiversity is the variety of natural life and habitats on Earth, both plants and animals. In scientific words, biodiversity is the variability of different DNAs that exist all at the same time on our planet, which also contributes to the variety of different species and subspecies. It is the variability among all living organisms, on a terrestrial domain, such as forests, deserts and savannas; in aquatic ecosystems, such as seas, lakes and rivers; air; and anything in between. Biodiversity does not include only diversity from species to species, but also within species and between species; as well as between and within ecosystems. Biodiversity has an important function for humankind too (Sarukhan & Whyte 2005). It contributes to a critical level to our well-being since it underpins our needs, such as food security and nutrition, water and medication, which all together support our well-being. It is the foundation of our ecosystem which is intimately linked to our health. It is the most complex and dynamic feature of our planet and it is also experiencing the most changes and most dramatic changes since Homo sapiens took over every little corner of the land and all depths of the sea.

Biodiversity has some direct loss that we caused, but it also has some indirect negative effects. In general, about 7,000 species of plants and hundreds of species of animals have been consumed by humans, with wild animal life being also consumed specifically by our indigenous and landless ancestors. And the reason why wildlife is so important in this matter is that if we consume it, then biodiversity is lost once and for all. This is also observed in marine fisheries overexploitation which has led to a severe reduction of availability of marine life. We can only imagine the consequences that practices like bushmeat – the consumption of wild-caught animal meat at the tropics – have. And when the numbers of different DNAs decline, infectious diseases can easily access entire populations of one species and then infect another species that are fed on the first species. The more the numbers of different DNAs, the more difficult it is for a disease to spread from one species to another. This is also how pandemics arise from time to time, and the more we damage biodiversity, the more pandemics our species will have to face (Ibid, 2005).

Another human-made challenge that biodiversity faces lately, and that affects not only us but every single life on this planet, is the ecological disaster we call climate change or climate crisis. Extinction is something our planet faced several times before, and the extinction of a species is something that happens all the time, since the very beginning of life. However, human destruction across the globe is something that accelerates the process of extinction and causes mass extinctions on an extreme level, without giving time to different species to arise and take over. Humans, from a force within nature, have become a force against nature, by overconsuming and without replacing what we have taken away from nature.

Figure 6: Photo by Boris Smokrovic

Climate Crisis affects plant wildlife, not only animal wildlife. Consequently, it affects the habitats of wild plants, such as insects, bugs, worms, etc. Therefore, climate change has effects on all kinds of things that we eat, wear and use. For example, the extinction of a specific plant that is the home of an insect that produces silk can cause a chain reaction to silk production (Eden District Council Website 2020). Deforestation and the increasing numbers of carbon dioxide (CO_2) can be the reason why different species face extinction, and they are also the reason renewable energy sources and afforestation programs are growing. Renewable energy sources, or green energy, is the production and the consumption of energy from natural resources such as the sun, water, wind and geothermal power. Afforestation is the establishment of forests in areas where there was no forest previously. These two green practices increase conservation efforts, restoration of wildlife and reduction of CO_2 emissions.

Figure 7: Lorenzer Platz, Nuremberg - Photo by Markus Spiske

1.5. Climate Crisis and its Effects on Agriculture

In an academic essay in 2010, the authors Hertel & Rosch projected the serious problems of climate change in agriculture and poverty. Almost 800 million people live under the poverty line and a large portion of them are kids under the age of 5 who are undernourished and famished. As of 2020, recent estimates for global poverty are at 9.2% of the world, this means that 689 million people live in extreme poverty, according to the World Bank (2020). This number is expected however to rise for the first time after 20 years due to the COVID-19 pandemic (WorldVision, 2020).

Since farming is the main source of food and income, and it has a huge impact on their economy, their entire lives are dependent on agriculture. Hence the levels of poverty in such countries, where climate change has deemed to have the most impact, are increasing all the time. Especially for countries where agricultural growth is the main method of reducing poverty, compared to growth in non-agricultural GDP (Hertel & Rosch 2010, p. 3). Such cases are obvious not only in some African countries but also to every person who is dependent on agriculture. Low-income people, in general, face much more difficulties when a climate disaster pushes food prices higher than an average middle-class person.

A very well-known cause of climate change is the increased concentration of Greenhouse Gases in the Earth's atmosphere. These concentrated gases, which cause the distinct problem, are Carbon dioxide, Methane, Ozone, Nitrous oxide and Chlorofluorocarbons, and they are all linked to anthropogenic (human) activities. These gases and their emissions have caused the globe to be warming 0.1ºC per decade for several decades. This happens way faster than it should have happened, without giving the planet's life the opportunity to adapt (Anwar et al 2013). The gas emissions continue to increase and the atmospheric CO_2 concentration, global temperature and sea levels are already facing the impacts of these effects.

Figure 8: Photo by Pawel Czerwinski

The agricultural impacts of climate change have long been visible to farmers, researchers and the simple consumer. During the last decades, the overall temperature of Earth has increased by 2%, and this may seem good for crops and pasture in some regions away from the tropical regions, but the tropics face a massive problem with the reduced crop yields (Hertel & Rosch 2010, p. 6). However, any further warming will most likely reduce the crop yields in all regions. Reduced agricultural output (crop yield) means higher food prices due to adverse productivity. This phenomenon will hurt not only low-income households as mentioned above but all the consumers everywhere. And this is due to the simple fact that all households spend money on food, and when food prices go up, the level of well-being goes down. If a family spends 50% of its income on food, but then all of a sudden, food prices rise by 50% due to climate change, then their income left for other use will reduce to 25%. If we adapt this simple theory to low-income households, who spend way more than just 50% of their income on food purchases, climate change will definitely have a disproportionate impact on them (Ibid 2010, p. 16).

The impacts on farm/producer households' earnings are much more different than those on consumer households' earnings. Productivity and climate change are also interlinked with the reduction of farm earning as a result. If, for example:

"*farm-owned inputs account for half of total costs and the prices of purchased (i.e. non-farm owned) inputs are exogenous to agriculture, then, in the absence of a commodity price rise, a one percent decline in agricultural productivity will result in a two percent decline in farm income*" (Hertel & Rosch 2010, p. 16).

It is obvious that prices will drift and change during the process of global warming, and it seems that it is strictly related to the emergence of food shortage in some regions. After operating 23 different scenarios on climate change in 2009, two researchers, Battisti and Naylor, have predicted that it is possible by 90% that by 2100, the tropics and subtropics will face higher average summer temperatures and it will exceed the recorded highest temperatures between 1900 and 2006, hence productivity and viability of plants change too (Ibid 2010, p. 23).

In order for us to manage some potential risks regarding the climate crisis, we must take some immediate actions and adaptations in terms of agriculture. The so-called adaptation research can help inform farmers, agro-entrepreneurs and policymakers about actions that must be taken in order to adopt a long-term strategy for fighting climate change. Currently, climate change adaptation is seen as a strategy that can be applied isolated to other issues. However, it must be understood that policies on climate change must be linked to a broader set of issues. These policies will be linked to already existing policies on climate risk. Climate change considers vital these policies adjustment and becoming more dynamic.

Figure 9: Photo by Bill Oxford

These policies are the ones we already have regarding climate change, such as reducing our CO_2 emissions and individual carbon footprint; carbon footprint is the greenhouse gases emissions that are generated by our action (Anwar et al 2013, p. 19695). Additionally, climate change policies interact with natural resource management and sustainable development policies such as those that protect political rights, human rights and animal rights.

Lastly, regarding agriculture and climate challenges, there are some specific climate change adaptation policies that can be introduced or transformed. The first one is about altering different already existing practices, such as adjusting the amounts and the timing of irrigation or other water management, as well as modifying fertilizer rates to maintain the quality of the grains or fruits with the climate of each region (Ibid 2013, p. 19695). The second policy has to do with the use of technology only where it is needed, such as conserving soil moisture and transporting water to regions where rainfall decreases; this is where climate forecast will be needed in order to reduce production risks. Also, limiting the timing and the location for each cropping activity is another suggested idea for more sustainable production. Diversification of livestock is something to be taken into account too if we want to find possible diseases and other health threats.

1.6.Organic Farming

Consuming organic products is an easy way for consumers to control what they eat and if what they eat is free of pesticides, fertilisers and genetically modified organisms (GMOs). According to the EU, organic production is a system of sustainable agriculture that respects the environment and animal welfare (2018). However, organic farming is more than just choosing not to use all these antibiotics and growth hormones. Organic production is a system developed to optimise the productivity of diverse communities within the agricultural ecosystem, including plants, livestock, soil organisms and people (Martin 2009). The ultimate goal of organic production is to develop enterprises that are harmonious and sustainable with nature.

In order for a product to be considered organic in the EU, it has to be certified as organic by one or more specific organisations or public agencies. These agencies have to inspect the crops and respect the EU law that specifies the organic farming practices. Some of those practices are:
● Crop rotation for efficient use of resources
● A ban on the use of chemical pesticides and synthetic fertilisers
● Very strict limits on livestock antibiotics
● Ban of genetically modified organisms (GMOs)
● Use of on-site resources for natural fertilisers and animal feed
● Raising livestock in a free-range, open-air environment and the use of organic fodder
● Tailored animal husbandry practices

Figure 10: by European Commission

According to the organic standards - and this is applied by every organisation and the public agency that is promoting organic farming – the use of GMOs products, synthetic pesticides, fertilizers, drugs, and animal cloning is prohibited. However, turning a field of crops organic takes about 3 years. This means that crops do not turn organic once a farmer stops using the products mentioned above. It will take about 3 years for a field of crops to be certified as organic. As regards to livestock, animals must be raised entirely in an organic way, which means that they have to be fed by 100% organic ingredients. Even though growing organic products is challenging due to the fact that some crops face difficulties growing in an organic way, almost every product can be produced organically.

Organic farming can also be the promotion of crop rotation in order to encourage a more balanced relationship between hosts and predators. Crop rotation is the practice of planting different crops sequentially on the same plot of land to improve soil health, increase nutrients in the soil, and fight the emergence of pest and weed. In this way, nutrients that have been produced organically on the farm are getting back into the soil in a recycling way (Ibid 2009). Even organic manure has its use, in order to keep the soil fertile organically; it is as if we talk about organic fertility of the field. However, it can be tricky to prevent insects and other pests from entering the field of crops. The correct way to do it is to integrate a new method of pest and weed management, as well as natural pest control products that have been organically approved. This can also be solved with crop rotation, as it has been mentioned earlier, of resistant varieties of crops so pests cannot find the way to increase their numbers by feeding on the same crop yield.

Regarding organic production, why do farmers want to grow organically? The main reason for farmers to grow organic products is their concerns about the environment. First of all, it is all these chemicals that are being used on crops, as well as, the energy that is required in order to be manufactured which is based on heavy use of fossil fuels (Ibid 2009). By minimizing the use of chemicals, the relationship between demand and production for these chemicals is dropped, and therefore less energy and fewer fossil fuels are being wasted for their manufacture. Additionally, many farmers, by growing organically, find it more profitable and rewarding.

Figure 11: Photo by Brad Stallcup

As regards to organic consumption, why do consumers prefer purchasing organic food and products? The reasons vary. The majority of the people who consume organically simply want products that are chemical-free and to avoid genetically engineered organisms. Some others find organic products tastier. Many do it for environmental issues and because of their concerns about the climate crisis. While some others do it because they simply want to buy organic products and support small enterprises. According to a 2018 survey, the EU-28's organic food market sales rise up to 37.4 billion of euros, and its organic farmland is estimated at 13.438.168 hectares.
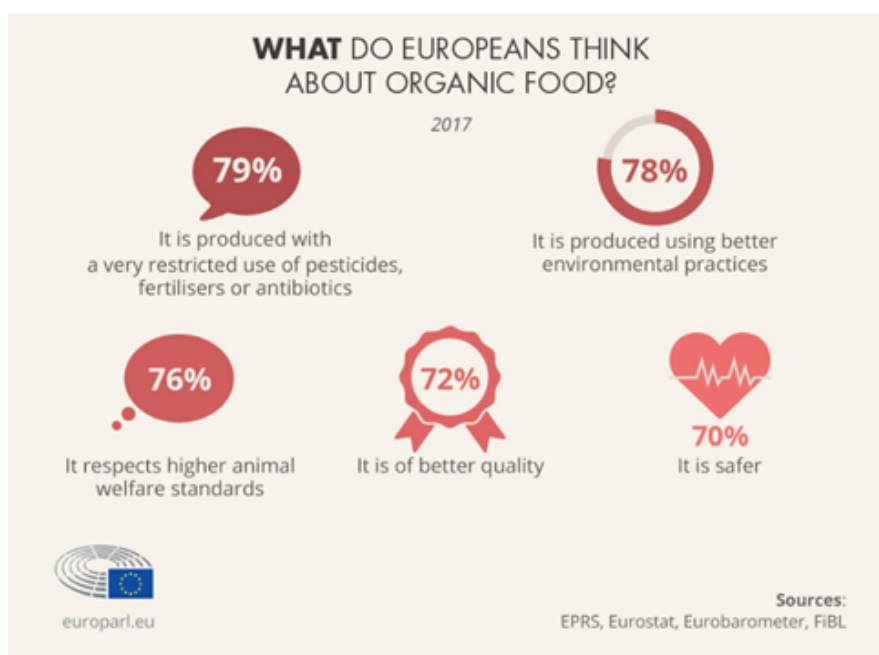
Figure 12: Photo by Eurostat

1.7. Energy Consumption in Agriculture

The agricultural sector is a significant contributor to energy consumption and the patterns that are being followed in different regions are remarkable, so they are worthy of being mentioned. Firstly, it is important to mention the three entry levels for interventions in order to examine both the need for energy at the agricultural level, as well as, the energy services in rural areas and their requirements in developing countries. These three levels of energy evolution in agriculture are firstly human force for harvesting, irrigation and processing; then animal force that provides various energy inputs; and finally, renewable energy technologies, along with fossil fuel technologies.

Figure 13: Niksic, Montenegro –Photo by Appolinary Kalashnikova

Agriculture is itself a way of energy production as well as consumption. Through photosynthesis, solar energy turns into crop yield and food energy for humans and animals (FAO 2010). Back in the day, agriculture was simply the scattering of seeds on a field of land and then harvesting the yield. Nowadays, agriculture needs energy input throughout the stages of production; such as different types of machinery, water management and irrigation, cultivation and harvesting. Energy is also required in post-harvest stages, such as food processing, storage and transportation.

However, this energy consumption in agriculture is something that has been benefiting modern industrialised countries. Meanwhile, other countries have not been so into modern energy based agricultural methods. As we saw in the first section of this chapter, the industrial revolution was what made agricultural production so profitable (Harari, 2015). Energised production has been essential to agricultural development in industrial and modern societies; not only for increasing the numbers of production but also for food security. Meanwhile, developing countries still struggle to catch up with post-industrialised countries and to modernise their energy inputs regarding agriculture (FAO 2010).
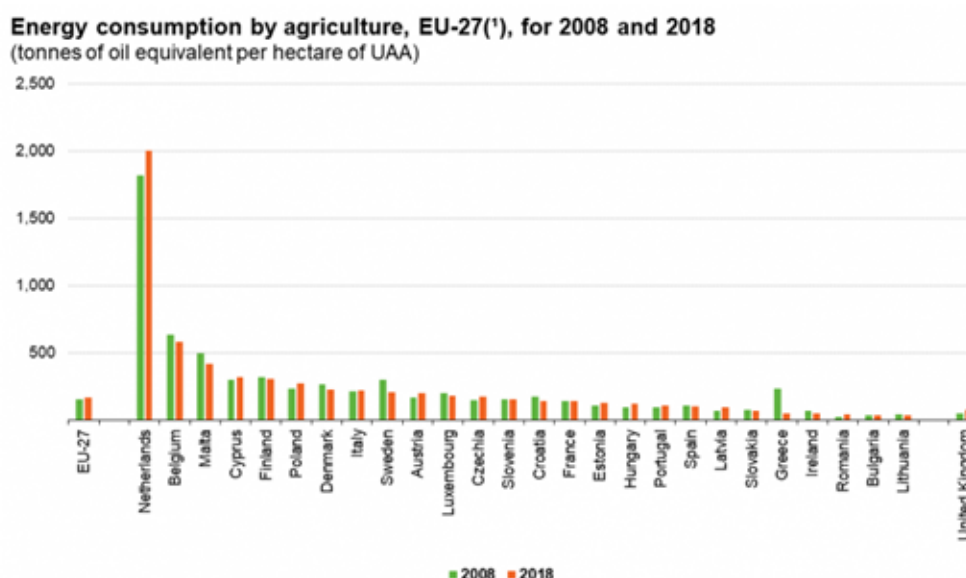

Figure 14 by Eurostat

Although agriculture is making use of relatively small amounts of energy demand and consumption in industrialised and developing societies, the numbers between these two categories are quite different. For example, only 3,2% of total energy consumption is a direct input to agriculture in the EU, whereas, in countries like the Netherlands and Poland, the number can reach up to 8,1% and 5,6% of total energy use respectively (Eurostat, 2018). This of course does not mean that the actual numbers behind these percentages are respectively higher in developing countries, compared to industrial countries. Modern energy, such as fossil fuels, is seen as essential to increase agricultural productivity in industrialised societies.

On the contrary, human and animal sources of energy are still the two basic and fundamental sources of energy in developing countries. This is due to the shortage of machinery and electricity in agriculture. Therefore, developing countries cannot even realise how beneficial modern energy services are for farming. Humans have evolved many different types of energy input for agriculture in the past that are still used in developing countries. Domesticated animals, such as cattle and horses, is what we called above animal energy and it existed for more than 8,000 years. Meanwhile, water wheels and windmills have existed in agriculture for 2,000 and 1,000 years respectively (Ibid 2010).

Energy in modern agriculture can be categorised in two ways based on its needs. Direct and indirect. The direct need for energy can include the energy that is needed for cultivation, irrigation, harvesting, food processing, storage and transportation of goods. Energy in the form of human or animal work in developing countries is primarily categorised as direct energy (Ibid 2010). Specifically, human force, which can be limited compared to animal force, can be more versatile due to its ability to make judgements and a more skilful function as transplanting, weeding, harvesting, etc. However, water lifting and soil preparation for planting are processes that need fewer skills, but more raw energy; this is where animal force is more needed.

Figure 15: Adams, United States - Photo by William DeHoogh

The indirect need for energy is the energy consumed for manufacturing fertilisers, pesticides and insecticides. Chemical inputs to agriculture are important in order to increase crop yield all around the world. Nevertheless, chemicals like this need energy consumption in order to be manufactured and distributed to the market at a later stage. Among these chemicals, fertilisers and pesticides are the two most energy-intensive agricultural inputs, compared to insecticides and fungicides that can be reduced with various pest management methods.

Figure 16: Detroit Dam, Detroit, Oregon, United States - Photo by Dan Meyers

1.8.Permaculture

Permaculture is a revolutionary design that mimics the patterns and relationships that can be found in nature, and it can be applied in various ways including agricultural production and energy provision on a local scale. Permaculture is a holistic design and it can affect directly and indirectly our way of life, but its primary focus is our buildings and the way we organise our lives (Holmgren 2007, p. 2). Its main goal is to increase the natural capital for future generations through a diverse scheme of ideas and skills that are lost in time and we must rediscover or develop to serve our needs without harming nature and create a more sustainable culture.

A sophisticated living environment is based on a simplified chain that leads to permanence in culture, this is obvious in a permaculture design course:

Figure 17: PDC

A very well-known and thoroughly thought example of permaculture design course is the chicken connection. The diagram below illustrates how different elements that would have been considered as waste are used in production through the process of correct identification and placement into the design. Every good permaculture design must attain balance between the needs of all the parts of nature and to offer self-perpetuation and resilience; whereas, resilience is the ability of an ecosystem to recover after a shock.
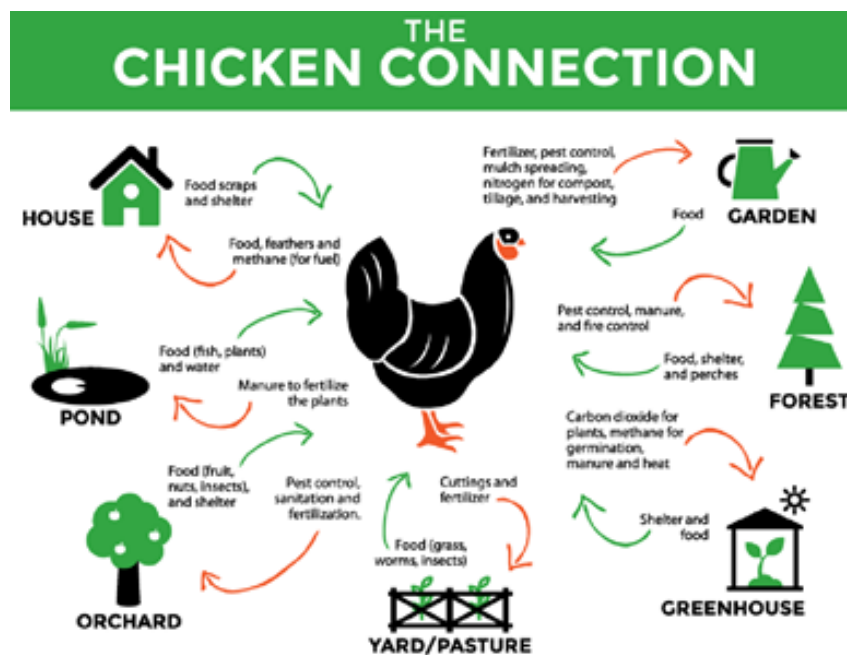

Figure 18: abundantpermaculture.com

A design is sustainable if:
- It provides for its own needs
- It produces more energy than it consumes
- It provides enough product yield to maintain and replace the system over its lifetime
- It requires minimum intervention: Only when there is a deficiency of resources or when an element of the system is not useful, then the result is work.

A design is sustainable when:
- Each element performs more than a function
- Each Function is supported by many elements
- Relative location results in proper placement of elements to save energy and resources
- The needs of one component in the system are met by the yields or products of another component.

"Permaculture" as a term was developed in the 1970s by the Australian researcher Bill Mollison and his student David Holmgren, but a similar concept was already in use in Europe as early as the 1960s. According to Holmgren (2007, p. 4), permaculture is a form of activism due to the fact that they are mainly unsupported by governments and businesses, as well as, unrecognized by academia. People who are dedicated to permaculture consider themselves activists because the way in which they contribute to sustainable development and organic agriculture in small local communities is slowly and indirectly influencing the greater society and policies regarding such issues. The mentality that these activists need to adopt is that the permaculture strategy must focus more on opportunities and less on obstacles that every now and then appear in their way. This mentality is central in their slow way of contributing to sustainability. Permaculture's roots can be traced into ecology and the science behind ecological systems, but it entails many and different fields and cultures with the hope to be evolved into a new type of popular culture for sustainability. To achieve such a thing, permaculture was founded on a few fundamental assumptions that transform permaculture into nearly a cult and not just a form of pop culture. These assumptions are:

●Humankind is subject to the scientific laws that govern everything that is included in the material universe. These laws include the Darwinian theory on the evolution of species.
●The increase of humankind's number during and after the industrial revolution is due to the tapping of fossil fuels. Fossil fuels are also responsible for technological innovations that appeared during the modern and post-modern eras.
●Climate crisis and environmental challenges are real and probably greater than what we already know or expect.
●During the processes of global warming, global dimming, etc. – that resulted from the rise of the industrial society – the well-being and health of every form of life are directly and indirectly threatened, and it will finally result in a mass extinction at the end of this era.

● Due to the high consumption of fossil fuels and other minerals and their depletion, humans will have to return into practices that involve no use of these fossil fuels; this means that we will go back into more natural and pre-industrial sources of energy, as well as make use of new technologies that allow us to handle and control the renewable source of energy.

Permaculture is using 12 principles that generalise sustainability but also promote the application of it. These principles are simple and can be perceived as too general, but the reason behind their generalised identity is the fact that we have too little time to adapt to our ecologically limited new reality, and that the adaptation must be done universally (Ibid 2007, p. 8). Historically, we saw that humankind needed decades or even centuries to adopt new ideals. Currently, the new ideals that derive from permaculture must be adopted in a much shorter period of time. The structure of the principles is simple, they are made up of a brief statement that can easily be memorised, and they are applied on different levels that permaculture tries to reorganise; on a personal, economic, social and political level. This does not mean that these principles cannot change and evolve and any time given since sustainability is also an evolving and transforming term. They also lie in the science of ecology.

First of all, it is wise to mention that the 12 design principles are very much moral because they are based on three main ethical principles (Ibid 2007, p. 7). Mollison & Holmgren include a sense of morality in order to create a more emotional point of view, and they do it in three broad ethical principles/ways: (i) Earth Care; (ii) People Care: look after yourself and your community; and (iii) Fair Share: set limits to production and consumption and redistribute surplus.

Figure 19: Ethical Principles, danoportfolio.weebly.com

These three principles derive from community ethics of older societies and tribal/indigenous cultures, as well as modern socioeconomic systems and post-modern cooperative groups; such as "global nation" of like-minded people. Connected to the three ethical principles, the design principles are sets of positive actions, accompanied by icons and traditional proverbs that we will mention below. Bellow, there is an illustration of the three ethical principles and the 12 design principles:

1. Observe & Interact – "Beauty is in the eye of the beholder"
2. Catch & Store Energy – "Make hay while the sun shines"
3. Obtain a Yield – "You can't work on an empty stomach"
4. Apply Self-Regulation & Accept Feedback – "The sins of the fathers are visited on the children unto the seventh generation"
5. Use and Value Renewable Resources & Services – "Let nature take its course"
6. Produce No Waste – "Waste not, want not" & "A stitch in time saves nine"
7. Design from Patterns to Details – "Can't see the wood for the trees"
8. Integrate Rather Than Segregate – "Many hands make light work"
9. Use Small and Slow Solutions – "The bigger they are, the harder they fall" & "Slow and steady wins the race"
10. Use & Value Diversity – "Don't put all your eggs in one basket"
11. Use Edges & Value the Marginal – "Don't think you are on the right track just because it is a well-beaten path"
12. Creatively Use and Respond to Change – "Vision is not seeing things as they are but as they will be"
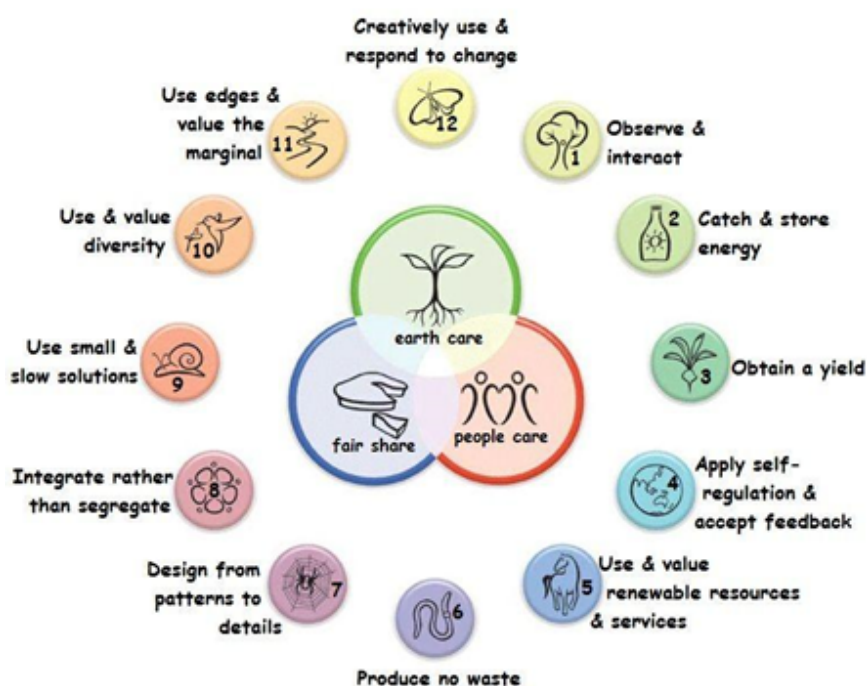

Figure 20: Permaculture Ethics & Principles, makingpermaculturestronger.net

The above principles are described as design protocols for land-based models, but they also extend to other fields as well; for example, businesses, education, urban design, construction, human ecology, etc.

Finally, Permaculture is a bridge between pre-industrial cultures and environmental consciousness. This does not mean that science or technology will be abandoned in the process. Permaculture is fundamentally the creation of a culture similar to a cult that takes inspiration from Eastern philosophy and the indigenous mentality that allowed aboriginal people to thrive without harming nature.

1.9. Existing Situation in Agriculture and Environmental Policies in Partner Countries

Cyprus

Cyprus is comparatively a young country that was established as a state in the 1960s. Since the 1980s, Cyprus has struggled with its agricultural policy due to various shortcomings such as unsustainable costs, poor performance of farmers, lack of technological machinery, lack of working hands, etc. Due to inefficient use of tools and lack of human resource development, agricultural and rural development in Cyprus was unsustainable. It was then when many farmers transformed agriculture into a commercial and private process in an attempt to increase involvement of the private sector in the delivery of rural sustainability (Koutsouris 2014, p. 85). Right when rural development in Cyprus had started gaining some momentum, concerns about the negative environmental impacts of industrial agriculture emerged, along with the quality of life and the quality of employment in rural areas. These concerns have led to a new agenda regarding more environmentally sustainable rural development.

Figure 21: Logo by the Ministry of Agriculture, Natural Resources and Environment of Cyprus

In Cyprus, agriculture is mainly monitored by the Ministry of Agriculture, Natural Resources and Environment, which consists of many divisions, subdivisions and departments. However, in this part of the paper, we will examine only a few of these subdivisions that concern our project directly and they can be found on the Ministry's website (https://moa.gov.cy)

The first one to discover is the Department of Agriculture which has as a main goal to develop the agricultural sector through training and guidance for farmers. According to the department's website, there are programs that are currently trying to increase production, but also to achieve a higher quality of agricultural products in both local and international markets. The department has a mission to provide education and training through programs to farmers on the latest technological developments as regards farming. These programs make sure to adopt the European policies and agenda and to implement it to a local agricultural extent. Additionally, the Department of Agriculture has implemented the Rural Development Programme 2007-2013 which aimed to revitalise the rural economy of Cyprus and to ensure the long-term harmonious future of the countryside. This programme has promoted the improvement of production, the modernization of agricultural methods and the development of sustainable farms. This helps in improving food safety and the protection of natural resources and the environment.

The second department is the Water Development Department which is responsible for implementing the water policy of the Ministry. Its mission is to manage water resources through various methods; such as collecting and processing hydrological data, the construction of infrastructure (dams, irrigation, sewage networks, water treatment, etc.) and raising the consumers' awareness about water conservation.

Figure 22: Cyprus, Photo by Klāvs Taimiņš

Due to Cyprus' semi-dry climate, the reduction of rainfall and the climate crisis in the area, the country suffers from water shortages. This is also due to the increase in permanent population, the high numbers of tourists who visit the island, as well as the limited natural water sources that are not able to serve the island's needs to the full.

This Climate is pretty much affecting agricultural yield as well, with crops like potatoes, bananas, vineyards and beans being some of the main species that grow naturally on the island without much effort. Among its duties, the Water Development Department promotes measures to encourage more effective and rational use of water. Since 2016, the department has been assigned the role of Technical Advisor of the district councils for the Exploitation of the Solid Waste Disposal Sites. The department is now having to promote the completion of brand-new constructions for the Management of Waste and implement a new national strategy. This strategy is based on prevention, reuse recycling, recovery and disposal. Its ultimate goal is to protect the environment and human health. This will be achieved with the reduction of the negative effects and management of waste, as well as the encouragement of recycling and reuse.

Another important department of the Ministry is the Department of Environment which has an advisory role regarding environmental policies. It also coordinates different environmental programmes. Moreover, it promotes the enforcement of laws related to the control of pollution of water, as well as the management of hazardous waste. It combats the climate crisis and encourages environmental awareness and the protection of biodiversity.

Figure 23: Photo by Claudio Schwarz

As regards energy production and energy consumption in Cyprus, the country is mainly an importer of energy, as over 90% of its energy comes from imports and it is mainly oil products. Whereas, the remaining 10% is renewable energy, primarily solar and wind energy (Maxoulis & Kalogirou 2008, p. 358). Agricultural energy consumption data was reported at 154,878.000 kWh (CEIC, 2018). Since 2002, the Council of Ministers has approved an Action Plan for Renewable Energy Resources which envisaged the doubling of RES by 2010; compared to 1995 that RES contribution to the total energy production was 4.5%. Policies regarding renewable energy in Cyprus mainly stem from the countries obligations towards the EU and the Kyoto Protocol Agreement, which both influence Cyprus into becoming a more sustainable and environmentally friendlier country.

Lastly, this paragraph is dedicated to the behaviour of the consumers related to organic products in Cyprus – as it has been presented in an academic essay by Chrysargyris et al. (2017, p. 57) – and permaculture. For this research, a group of 180 consumers over the age of 18 has answered a questionnaire that led to the following answers. 99% of Cypriot consumers are aware of organic products, but only 69% of them consume organically. Cypriots have also answered that organic products can be found in grocery stores, street markets and supermarkets. According to them, organic products are healthier and tastier than conventional products, specifically vegetables. Lastly, as Chrysargyris et al. have written "there appears to be a lack of knowledge about the stipulations of organic farming but consumers show great willingness not only to get properly informed via different means but to pay higher for organic vegetables" (2017, p. 57). As for permaculture strategies in Cyprus, it seems that the primary sources of promotion of Permaculture in the island are NGOs and various other agricultural communities, such as Activate Organisation and Permaculture Association Cyprus.

Greece

The sectors that are more present in Greece's agricultural development are the private sector and third sectors. Apart from national park preserves, agriculture is mainly privately owned (Panagiotioula, 2017). It is supported, though, by relevant state-driven agricultural policy, which aims at the qualitative and quantitative development of products to benefit farmers and the general population. The agricultural sector had diachronically been one of the central pillars of the Greek economy. Greek agriculture represented 4.1% of the Gross Value Added (GVA) and 14% of total employment, having a relatively steady increase of 3% between 2013 and 2018 (fi-compass, 2020).

It has also been a critical source of employment, since it is estimated that 1.300 enterprises are involved in this sector of the economy, creating approximately 70.000 jobs (2010) (Gkekas, 2017). It somehow remained unaffected during the recent Greek economic recession. There are about 1.200.000 people employed in agriculture with almost a 70% share to work exclusively on one farm (fi-compass, 2020). However, it is characterised by very low productivity and low penetration in markets abroad. The majority of Greek farms are small-sized, family-run and owned. In 2016, 684.950 farms were estimated to run in Greece, most of which - 95.4% of them in particular - had a Utilised Agricultural Area (UAA) of less than 20 hectares; which equals to 200.000 square meters. This increasingly dominating trend in Greece stems from the unique Greek physical geography (fi-compass, 2020). For almost a century, Greek farmers as individuals formed agricultural cooperatives. Regarding NGOs in the field, there is a trend in creating smart farming-related NGOs.

As already mentioned, coops are the most dominant type of farmers self-organization. For almost a century, the Greek government has outlined the coops' profile through issuing from time-to-time relative regulatory framework. The most recent law (N.4673/2020), tries to revolutionary the previous insufficient coop framework, offering financial and organizational benefits for the farmer participants ("Οι Αγροτικοί Συνεταιρισμοί περνούν σε νέα εποχή", 2020). The Greek state was the median between EU funds allocated to agriculture and farmers. Even during the recent Greek recession, Common Agricultural Policy (CAP) support significantly sustained the Greek agricultural sector (fi-compass, 2020).

Regarding environmental issues, the Natural Environment and Climate Change Agency (NECCA) is an entity by the Greek Ministry of Environment and Energy (MEEN) and was established in 2020 under the law 4685 / 2020. Two of NECCA's principal duties is to supports MEEN (Ο.ΦΥ.ΠΕ.Κ.Α., n.d.) to meet the obligations of Greek administration towards the European Environment Agency and to implement programs, projects and actions of environmental nature. Lastly, taking measures to disseminate environmental policy and cooperate with all stakeholders and raising public awareness for the environment and sustainable development is among NECCA's responsibilities.

According to the national plan, drafted action is made towards the following directions (Climate adapt, n.d.):
●the integration of adaptation measures into the more comprehensive economic policy;
●the correlation of CO2 emission reduction and adjustment policies; and
●the problem of financing new investments.

The Greek State has drafted an action plan by 2030 being more aligned to the relevant regulatory framework (Greece's Green Agenda on Energy and Climate, 2020). Greece's climate is typical of the Mediterranean climate and is characterized by a mild and rainy winter season and a relatively warm and dry summer season (Climatology, HNMS, Hellenic National Meteorological Service, 2021). During the whole year, Greece experiences long sunshine periods. A wide variety of climate subtypes also characterizes the country influenced by the local topography, but always under the Mediterranean framework. Greece's topography is rich, and more than 70% of its surface is unsuitable for cultivation. Suitable land is concentrated in the prefectures of Thessaly, Macedonia and Thrace (Central and North Greece) (Greece Agriculture, Information about Agriculture in Greece, 2021). The entire area for cultivation is estimated at 5 million hectares, of which 57 per cent is located in plains, and 43 per cent is located in mountainous or semi-mountainous areas (export.gov, 2021). Primary cultivations are corn, wheat, barley, sugar beets, cotton and tobacco (Greece Agriculture, Information about Agriculture in Greece, 2021).The main crops cultivated are vegetables, horticulture products and olives. In terms of animal products, milk has the most significant share.

Sustainable agricultural production has been one of the main drivers of international market competition (Koutsouris, 2008). The Greek economic crisis of the last years is considered an opportunity to redefine the country's entire development strategy. This process should be accomplished in the prism of sustainability and respect for its subregions' economic, social, and environmental characteristics (PAPAGEORGIOU, 2012). In Greece, sustainable agriculture is equivalent to organic farming. In Greece, the first organized organic farming programs began in the 1980s in addition to organic crops, there are also organic animal and poultry farms (Φιλικά στον άνθρωπο και στο περιβάλλον, 2015). According to statistics from 2019, organic farming holds 10.3% in the total farming area (Organic farming area 2019 map, 2021). In other words, 460000 hectares are used for organic crops employing 22000 producers. The quality of such products is verified by various organic certification bodies (Βιολογικά Προϊόντα - Οργανικά | Agrohunter, 2021). According to research, Greeks favour organic products for the following reasons. They think that there are benefits for their health; organic farming is more environmentally friendly and protects wildlife. It is also the main driver of support to the local community (Krystallis et al., 2006). Organic farming was introduced in Greece in 1992. Organic products are currently available in more than 70 open-air markets, supermarkets, and other shops specialising in organic products. This face highlights the penetration of these products of Greek consumers.

In addition to organic farming, Permaculture is widely known in Greece, mostly in the agricultural sector. From the total agricultural land estimated at 51,780,000 acres (Eurostat - Agriculture, forestry and fishery statistics, 2010) a share of 32% accounts for permanent crops mainly arboriculturally (ELSTAT, 2016). According to a relevant census of 2016, vineyards account for 911,4 acres, plantations of citrus trees for 417,00 acres, fruit trees for 895,30 acres, nuts for 39,50 acres, olive groves for 8262,70 acres (ELSTAT, 2016).

Another sector for permaculture is eco architecture – natural building. In other words, a way of promoting cheap and environmentally friendly building design (Permaculturenews, 2021). A building approach oriented at the use of natural, local, carefully chosen or recycled materials, simple tools and building techniques (Home - Φυσική δόμηση Βιοκλιματική αρχιτεκτονική Cob.gr, 2021). In terms of architectural practice, green interventions in existing buildings could also be considered examples of permaculture (e.g. planted roofs). These interventions are also supported by the relative regulatory framework (Arvaniti-Pollatou et al., 2020). Also, permaculture is directly linked to alternative forms of tourism (Re-green: permaculture and yoga retreats in a natural paradise in Greece, n.d.).

Regarding energy sources, unfortunately, Greece has diachronically using fossil fuels. For this reason, the majority of its economic activities relies on such types of primary power to function (Hellenic Association for Energy Economics, 2019).The country has to make a lot of transformation in its energy grid to fulfil the goals for zero CO_2 transmission. Even though the country has succeeded in reducing gas emissions by 20% by 2020, it was mainly achieved due to the recent Greek recession and not specific politics (Hellenic Association for Energy Economics, 2019). According to a recent report issued by the Organization for Economic Cooperation and Development, in 2018, Greece's primary energy sources are fossil fuels. More specifically, oil accounts for a 47% share, followed by coal with 21% and natural gas with a 19% share. Hydropower accounts for 2% whereas geothermal solar and wind have a common share of 5% (Fossil fuel support country note, 2020). So, fossil fuels have a disproportionate share of the total energy input. Crude oil and natural gas are mostly imported (Hellenic Association for Energy Economics, 2019).

Poland

Farm development policy remains an essential part of the broader rural development policy. Sustainable development of Polish rural areas is possible thanks to Common Agricultural Policy (CAP) and national RDP measures.

The EU summit in March 2013 was of great importance for the development of agriculture and rural areas in Poland, at which it was decided that Poland received the highest support from all EU funds. By organizing and implementing work plans, development programs and paying subsidies, the state supports and stimulates the development of agriculture. It was pointed out that further development of the agricultural sector is possible through financial support and support for knowledge transfer and consultancy. Since Poland acceded to the EU and the Polish Ministry's actions for Agricultural and Rural Development, the positive balance of trade in agricultural and food products has been growing. Currently, 80% of Polish beef, 45% of poultry and 30% of dairy products are exported. In 2018, the value of agri-food exports amounted to almost EUR 30 billion. Compared to 2004, this represents a 6-fold increase in the value of food sales abroad (Polish export offer of agri-food products, Serwis Rzeczypospolitej Polskiej, 2021). The Polish government also noted the potential of organic farming, supported by one of the main support centres, the European Union. In addition to the EU budget's financial instruments, the vital role in supporting agricultural development in Poland plays ARiMR (state Agency for Agricultural Restructuring and Modernisation, 2021). It is a crucial element of national aid for farmers modernizing their production workshops and improving financial liquidity in the period of increased purchases of means of production.

The state tries to relate the support of rural areas under the idea of multifunctional development and the development of agricultural and food functions and all forms of service and industrial activities, especially those that do not threaten the natural environment. The Polish Ministry of Agriculture and Rural Development provides programs for rural development (Ministry of Agriculture and Rural Development, 2021) which frame and inform about the support for organic farming, climate effects in agriculture, the production of healthy Polish food, etc.

The Rural Development Programme (RPD) 2014 - 2020 has been developed based on European Union legislation. The Programme is integrated into the overall system of national development policy. The main objective of RDP 2014 - 2020 is to improve the competitiveness of agriculture, sustainable management of natural resources and climate action, and sustainable territorial development of rural areas.

The Programme will implement all six priorities set for the EU Rural Development Policy 2014 - 2020, namely:

●facilitating knowledge transfer and innovation in agriculture, forestry and rural areas.
●improving the competitiveness of all types of farming and enhancing farm viability.
● Improving the organisation of the food chain and promoting risk management in agriculture.
●Restoring, preserving and enhancing ecosystems dependent on agriculture and forestry.
●Promoting resource efficiency and the shift towards a low-carbon and climate-resilient economy in the agriculture, food and forestry sectors.
● To enhance social inclusion, reduce poverty and promote economic development in rural areas (Serwis Rzeczypospolitej Polskiej, 2019).

This sector is particularly important from the point of view of sustainable development of rural areas and requires considerable and correctly targeted support. The financial aid instruments planned in the Programme will be primarily aimed at developing agricultural holdings; Modernisation of agricultural holdings, restructuring of small agricultural holdings, Premiums for young farmers, Payments for farmers transferring small agricultural holdings. Such financial aid instruments as Transfer of Knowledge and Innovation and Agricultural Advisory will also contribute to further developing the agricultural sector and increasing its competitiveness. A new tool supporting the implementation of innovations in the agri-food sector will be the measure of Cooperation. Within the framework of improving the food chain organisation, support will be provided for investments related to the processing and marketing of agricultural products. A new measure will be Organic farming, the aim of which is to increase commercial organic production.

Undertakings for protecting the environment - including water, soils, landscape - and preservation of biodiversity will be financed under the agri-environment-climate and afforestation measures. To ensure sustainable development of rural areas, the actions contributing to the development of entrepreneurship, village renewal and development, including in technical infrastructure, will be continued (Serwis Rzeczypospolitej Polskiej, 2019).

The European Green Deal is a good step towards coupling economic development with climate policy and nature conservation. Poland now faces a significant challenge to integrate national policies with the European Commission's proposals, but one that is within its capabilities. The most crucial objective of the Green Deal is rebuilding the economy to reduce greenhouse gas emissions in Europe to net-zero by 2050 at the latest; a certain amount of greenhouse gases may still enter the atmosphere, but they must be offset by absorption by ecosystems or technical facilities. The climate neutrality target has been endorsed by the Parliament of the EU and the European Council. It is enshrined as legally binding in the European Climate Law, a new regulation currently in the legislative pipeline (The European Green Deal, 2019). Currently, the EU law obliges EU countries to collectively reduce greenhouse gas emissions by 40% compared to 1990, increase the share of renewable energy to 32% and reduce energy demand by 32.5% compared to projections (Europejski Zielony Ład w Pięciu Punktach, 2020). In the long term, implementing the European Green Deal's objectives will bring numerous environmental benefits and contribute to the modernisation of the economy. Poland, together with other countries of Central and Eastern Europe, belongs to a group of countries where the share of industries most affected by the energy transformation - mining, energy, metallurgy, heavy industry - in the GDP structure is much higher than in the countries of the so-called old Union.In Poland, for example, industries at risk account for almost 10% of employment, which is more than double the EU average.

Apart from applying, inter alia, changes in the issues of energy generation and saving, modernisation of the industrial structure leading to its decarbonisation and greater incorporation of research and innovation into business activities, changes in agriculture and forestry consisting in adaptation to climate modifications, implementation of new products and breeding directions, sequestration/absorption of CO_2 in forestry, activities for more significant accumulation and retention of carbon in soils carried out within the framework of agriculture will play a very important role in the worsening climate condition. In the process of low-carbon transformation, it will be necessary to consider the specific nature of Polish energy sector, that is, the natural resources, technologies and infrastructure available (Europejski Zielony Ład, 2019).

The Polish climate has shown a systematic tendency to increase air temperature significantly since 1989. Precipitation does not show unidirectional trends and is characterized by periods more or less humid. On the other hand, the precipitation structure has changed mainly in the warm season of the year; where the precipitation is more violent, short term, destructive, causing more and more often damaging floods. At the same time, the precipitation below 1 mm/day disappears. The structure and specificity of the individual seasons have also changed, where previously broken down into characteristic spring, summer, autumn and winter now merge into a colder season from the end of October until the end of March and warmer from early April to October ("Klimat Polski", 2013). The effects of the warming of the climate are an increase in the occurrence of dangerous weather phenomena. A draft Framework Plan for Organic Food and Farming in Poland for 2021-2027 has been created and is available for review. Polish organic products are mainly cereals, fruit, vegetables and dairy products. Main organic fruits are blueberries, apples, strawberries, raspberries. Main organic vegetables produced in Poland are carrots, potatoes, beetroot, spring onions, leek, celery and others (Owoce i warzywa, 2021).

On 1 August 2014, the Minister of Agriculture and Rural Development adopted the "Framework Action Plan for Organic Food and Farming in Poland 2014-2020". A draft Framework Plan for Organic Food and Farming in Poland for 2021-2027 has been created in 2020. This document was developed based on extensive consultations with all interested parties, organisations, associations and associations of farmers, producers and processors, scientific and research centres and entities subordinate or supervised by the Minister of Agriculture and Rural Development, as well as other entities cooperating with the Ministry of Agriculture in the field of organic farming. Several training courses were organised for advisors in the field of changes in organic farming (Serwis Rzeczypospolitej Polskiej, 2014). Research is being conducted to improve production technology. Organic farming is widely promoted among the society in various ways, e.g., in the mass media. The interest is growing not only through increasing trends but also through encouraging subsidies, stimulating the development of processing, diversifying and strengthening the distribution channels of organic products, increasing consumer knowledge about organic farming and organic food, increasing cooperation between actors in the organic sector, maintaining a high level of control and certification system for organic products.

Consumers are becoming increasingly aware of their choices when it comes to organic products. Nutritional trends will favour the development of this food category, among other things, due to the growing interest in healthier and more sustainable consumption. Numerous studies, such as studies conducted by Polish Ministry of Agriculture (Serwis Rzeczypospolitej Polskiej, 2021), have been carried out on this topic, where, on the one hand, the majority of respondents point to the continuously developing organic food market in Poland and, on the other, to its still untapped potential. Promotional and educational campaigns encouraging the purchase of organic products, making the offer of organic food more attractive and extending the availability of products to a larger group of recipients are conducive to the growth of these products' share. A very important role is played by the exposed features and benefits of organic food, especially in relation to local food treated as a substitute, inspiring confidence among consumers.

Permaculture is becoming more and more widely known and available in Poland. Society is beginning to see and understand the need for a change of attitude. From year to year, the deteriorating state of the environment forces people to seek alternative lifestyles. Gradually, more and more initiatives related to permaculture appear, books on the subject are published, and farms are promoted (Permakultura, Zrównoważone Rolnictwo, 2021). Unique maps are also available, which show the distribution of individual centres available to everyone (PermaKultura.edu.pl, 2021). Unfortunately, it is still not as popular as in other countries, but the noticeable upward trend is encouraging. In Poland, permaculture is most promoted by the third sector, NGOs and community. Poland's primary permaculture practices are companion planting, polyculture, and agroforestry (Ogrody Permakultury, 2020).

Regarding energy consumption in Poland, fossil fuels are used and biofuels and renewable energy sources with a small share. Recently, the acquisition of solar energy has been viral by entrepreneurs and individuals. The required energy resources used in Poland are hard coal and lignite and oil and natural gas (Struktura I Produkcja Energii Elektrycznej W Polsce, 2021). Approximately 70% of the hard coal mined in Poland is used to produce electricity. Two other energy resources used in Poland - oil and natural gas - must be imported from abroad in large quantities. Due to the fact that Poland has its own resources, the raw material is used to the extent allowing the country to limit the import of other fuels (of course, as far as possible). Coal deposits are currently estimated to last for several hundred years, and they are the primary source of energy in Poland, but due to the worsening of the climate, work is underway to prepare and increasingly use renewable energy sources (Światowe Zasoby Surowców Energetycznych, 2008).

Spain

Primarily, agriculture in Spain comprises three main economic sub-sectors: (i) forestry and silviculture; (ii) fishing; and (iii) aquaculture and agriculture, which includes livestock production. The area of farming land represents 33% of the total Spanish surface, 16,7 million hectares (Presidencia Del Gobierno De España, 2017). With various climate conditions combined with a strong agricultural tradition, Spain has one of the widest varieties of crops and the proportion of agriculture in terms of its GDP (FAO 2019). Thus, Agriculture represents the 2,7% of Spanish GDP; representing a net value of €33.077M. Private sector – formed by farm owners and companies – is the most representative sector involved in agricultural development. In 2019 a total of 945.020 agricultural businesses operated in Spain. Most of them are small and medium-sized private companies managed as "family businesses". This explains the specific characteristics of the agricultural sector regarding social and labour statistics. Most of the agricultural businesses are driven by farm owners and their family members. Owners operate more than 91% of agricultural companies over 40 years; 60% of these businesses are managed by persons between 40 and 64 years old, and 31% are managed by persons over 65. Thus, only 9% of the farmers are "young farmers" under the age of 40. Contrarily, agriculture is a predominantly male sector: only 23% of the owners are females.

The agricultural industry represents 3,9% of Spain's total employment, with a net number of 708.900 people employed. However, as commented in the previous lines, about 56% of the full employment are self-employees under a specific social-security regimen due to the sector's characteristics. In addition to the seasonal nature of jobs, this situation makes it that a high temporary employment level can characterise an industry.

In the past, agriculture used to be a strong economic sector in Spain. Agriculture has always been involved in an "unending" discussion about its modernization and improving the tools and resources that support it. However, the sector's current status - with a little weight in the economy and some structural challenges: depopulation and ageing of the rural industry - has led the rural development to look for measures that deal with these social challenges. Public administration has a crucial role in rural development. National, regional and local administration manages funds and offers financial support to promote specific measures for rural development.

European rural development funds are vital to support the rural development in Spain, and the programmes launched by Spanish public administration have been implemented according to main European trends (Ministerio De Agricultura, Pesca Y Alimentación, 2020). Three different measures have been implemented to support rural development:

-Direct subsidies and financial support for farms, from the Spanish funds of European Agricultural Policy;

-Innovative activities promoted in the National Rural Development Plan. The financial support comes from the EU (European agricultural fund for rural development (EAFRD) and the Spanish administration budget;

-Social measures to promote rural areas' training and employment through European Social Fund and regional and national support.

Except for direct subsidies to farms, the other instruments to promote rural development involve different actors. Most of them are managed by regional or local administrations. These bodies collaborate with other private organisations - such as non-profit and third sector organisations - to promote rural development measures.

The public body to manage the climate, energy and environmental policies is the Ministry of Ecological Transition and Demographic Challenge. One of the primary duties of the Ministry is to create the appropriate tools and resources to fight against climate change: legislative development, awareness campaigns and specific plans and programmes to develop instruments to deal with the environmental, social and economic challenges. Aimed at coping with the climate crisis, the Ministry has approved the Plan Nacional de Adaptación al Cambio Climático 2021- 2030 [National Climate Change Adaptation Plan 2021 - 2030] (Ministerio De Transición Ecológica Y Reto Demográfico, 2021). This strategic document is the main instrument for promoting a coordinated action to address climate change. The plan was elaborated on three main pillars: the lessons learned in the previous project for Climate Change adaptation; the contributions of the main actors involved in the topic and the European and International policies to deal with climate change. The plan's main objective is to promote coordinated and coherent action to address the effects of climate change in Spain to avoid or reduce present and future damage from climate change and build a more resilient economy and society (Presidencia Del Gobierno De España, 2020).

Together with this plan, the Ministry has promoted other measures as follows:

-New laws that seek to transform the production system into a more sustainable one;
-A citizens' assembly on climate change;
-Education Action Plan for Sustainability in Spain 2020-2025;
-Courses, networks and campaigns.

Due to Spain's geographical location, we can distinguish different climate areas in Spain as follows: Oceanic; Mediterranean; Continental; Mountainous and Arid. We cannot forget that Canary Island, located close to the trophic, has a sub-tropical climate. In addition to these different climates, some other facts make Spain the appropriate place for agriculture. Cultivated areas are nutrient-rich soil and lands that allow using the land by turns without losing any harvest; this means that one-third of cultivable land rests every year. The rivers, including the underground rivers, run through Spanish mountains that naturally enrich the fields, making it possible to maintain irrigation and optimum humidity for each type of crop. And of course, the "sun": Spain has more than 2500 hours of daylight, making the crops grow fast and healthy. This favourable condition and the possibility of cultivating during all seasons constitutes a comparative advantage in the diversity of crops. Within this diversity of crops, 75% are vegetables, fruits, and cereals. The main products are barley, wheat and rice; but there are also others such as olives, oranges, bananas, grapes, tomatoes, onions, potatoes, etc.

Organic farming has been regulated in Spain since 1989. In 1993, the first EU regulation came into force, which was replaced by the current Council Regulation 834/2007 on organic production and labelling of organic products, developed by Commission Regulations 889/2008 and 1235/2008 (European Commission, 2019). In 2019, a total of 36.704 farmers cultivated 2.354.925 hectares of land for organic farming. That is, 4% of Spain's total farmers are dedicated to organic agriculture, who work in 15% of the Spanish agricultural surface. Thus, Spain has the largest organic farming area in the EU and is among the top five in the world. Through the Directorate-General for the Food Industry, the Ministry of Agriculture, Fisheries and Food is responsible for the development of guidelines for organic production under national and European legislation and coordinates the National Programme for the official control of the organic output (Ministerio De Agricultura, Pesca Y Alimentación, 2020). Autonomous Communities are responsible for the organisation and supervision of official control within their territorial scope. Besides, the Ministry of Consumer Affairs cooperates with and provides technical support to the Autonomous Communities and other Public Administrations' consumer services in relation to official control or surveillance in the organic market.

We have to highlight that the involvement of different actors (together with organic farmers and public administration and bodies):
-**Instituto de Agricultura Sostenible** (Institute for sustainable agriculture), a public body depending on the High Center for Scientific Research addressed to research on the maximisation of the existing resources to ensure sustainable agriculture;

-**Spanish Society for Organic Agriculture** (SEAO) is a private non-profit organisation that connects farmers, technicians, scientists and many others to promote the improvement and dissemination of knowledge about organic farming. The organisation also takes care of different activities and initiatives to promote research, education, and dissemination;

-**Agriecol** a thematic network of scientific and technical character to promote the research on organic farming. It's formed by private organisations that work in the promotion and research of organic agriculture.

Both public and private organisations develop a set of initiatives and activities on a national, regional and local level, such as the basic and advanced research on organic farming; the training and education tools and activities for organic farmers; and the dissemination and promotion activities for final consumers and the general public.

Spain is the largest country with regards to the productive surface for organic agriculture. However, Spain is not among the largest countries with regards to the consumption of organic products. We can find Spain in the 10th world position (Saiz, Y. 2019). However, organic farming is still a priority of the Spanish agriculture policies and public authorities and knowing the consumers is vital to enhance the market. In this sense, the ministry of agriculture every year promotes a survey about this topic. The last survey (MAPA 2019) offers relevant information about how consumers perceive organic products and their consumption habits. 68% of the survey participants buy these products because organic products are healthier and help prevent diseases. However, we can find different approaches to this idea. Most of them think that the main reason to buy these products is just that they are healthy. About 26% of the consumers believe that in addition to being healthy, they contribute to protecting the environment by buying products coming from eco-friendly agriculture. Besides the consumers' behaviours, two reasons also are essential to promote the consumption of the organic products: the increase in the number of shops specialising in organic products and higher availability of these products in supermarkets and hypermarkets. This makes it possible that 31% of the bought products are organic products for the reference year, representing 36% of the cost of purchased products (AESECO 2019).

People buy these products for different reasons, among others:
- The quality stamp certifies the organic origin of the products. Nevertheless, the consumer goes through the ingredients to confirm this origin.
- Appearance and taste of the products: the consumers look for an irregular shape, good taste, colour and smell and floury texture.

The most frequently bought organic products are fresh: fruits and vegetables, bread, eggs, dairy products and yoghurts, fresh meat and cheeses. Finally, consumers tend to always shop at the same place, which they choose because of the number of organic products and their proximity. And they are willing to pay more for organic products because they are looking for a quality product.

Compared to organic agriculture, permaculture is a concept for sustainable agriculture that is not widely implemented in Spain. We can find some initiative developed by individuals or informal groups of persons. Still, it is challenging to find contrastable data to know how many projects are being implemented in Spain right now (Acosta Gutierrez 2015). We can also find private organisations, promoted by these individuals, which offer support to develop projects and activities under the permaculture concept. Here you can find a non-exhaustive list of these private non-profit bodies that work in the promotion of permaculture in Spain:

-Permacultura ibérica
-REPESEI - REd PErmacultura del SurEste Ibérico
-Permacultura mediterránea
-Instituto de permacultura MONTSANTS
Cambium - Permacultura en formación

Permaculture projects are usually implemented on agroecological farms or ecovillages. In both practices, agriculture is the main activity in which the concept of permaculture has been introduced. Sustainable agriculture includes concepts as environmentally friendly farming, energy and food self-sufficiency and bioclimate construction; especially relevant regarding ecovillages. All the projects also include activities to raise awareness about the main principles of permaculture. Besides, and through the organisations' activities, we can observe a significant number of workshops, formal courses and events - such as festivals, meetings, lectures, and so on - aimed at educating and increasing knowledge about permaculture principles (Caballero 2011).

In Spain, 75% of primary energy sources come from fossil fuels. In detail, 44,3% of the primary energy come from oil; 20,9% from natural gas; 8,9% from coal and 0,3% from non-renewable wastes. Renewables rank second, representing the 13,8% of the primary energy sources and finally Nuclear energy - 11,2%. Compared to the previous year's data, the use of fossil fuels as primary sources of energy has slightly reduced in recent years, mainly due to the reduction of the coal (from 9,9% in 2017 to 8,9% in 2019) and natural gas. Nevertheless, the use of oil products and non-renewable wastes has slightly increased - 0,5% concerning the previous year (Ministerio de Transición Ecológica Y Reto Demográfico, 2018).

Of the 129,813 kilotonnes of oil equivalent (ktoe) of primary energy consumed in Spain in 2018, 13.8% corresponded to renewable energies, resulting in an immediate consumption of 17,944 ktoe. Biomass is the most used renewable energy source, producing 30,3% of the total energy consumed in Spain. The second largest contributor is wind energy, contributing with 24.4% of the total. Hydropower represents 16,5% of the total consumed energy, and Solar energy 12,5%.

Regarding the fulfilment of the European objectives, the directive 2009/28/CE establishes the following objectives for Spain by 2020:

-20% of energy from renewable sources in the gross final energy consumption.
-10% of energy from renewable sources in final energy consumption in transport.
According to the data for 2018, the status of the European objectives is the following (European Commission, 2017):
-17,41% of energy from renewable sources in the gross final energy consumption.
-6,94% of energy from renewable sources in final energy consumption in transport.

Chapter 2:
Game-Based Learning Methods and Escape Rooms

2.1. What are GBL methods

The psychological foundations behind Game-Based Learning (GBL) are a complex learning environment that is difficult to understand if we take into consideration only one perspective of learning. According to Plass et al. (2015, p. 258), the gaming context is very similar to the learning context. This context includes cognitive, affective, motivational and sociocultural relations. GBL is a type of play, but in this situation, the game that is being played has preconstructed learning outcomes. The game can either be in real life or a digital one. A game is a system in which the players can engage in an artificial conflict that has to maintain some basic rules. The outcome of a game can always be quantifiable (Plass et al. 2015, p. 258). An example of a gamified method of learning can be the gamification of math homework, which can involve the points or stars for the completion of some activities. Sometimes, students may consider these activities boring, but with their gamification, they can be fun. Taking this approach, a step further, GBL of the same math homework can involve the redesigning of the activities by making use of artificial conflict and play rules in order to make them more engaging.

According to Alaswad and Nadolny (2015, p. 390), both traditional coursework instructors and game designers have to consider three elements. These elements must be viewed "from broad to narrow in scope". In this way, they both can firstly identify goals and learning outcomes, the evidence that will meet those outcomes, and finally, the activities that can lead the students / players / learners to those outcomes. Figure 25 also shows a structure that both traditional coursework and games follow.
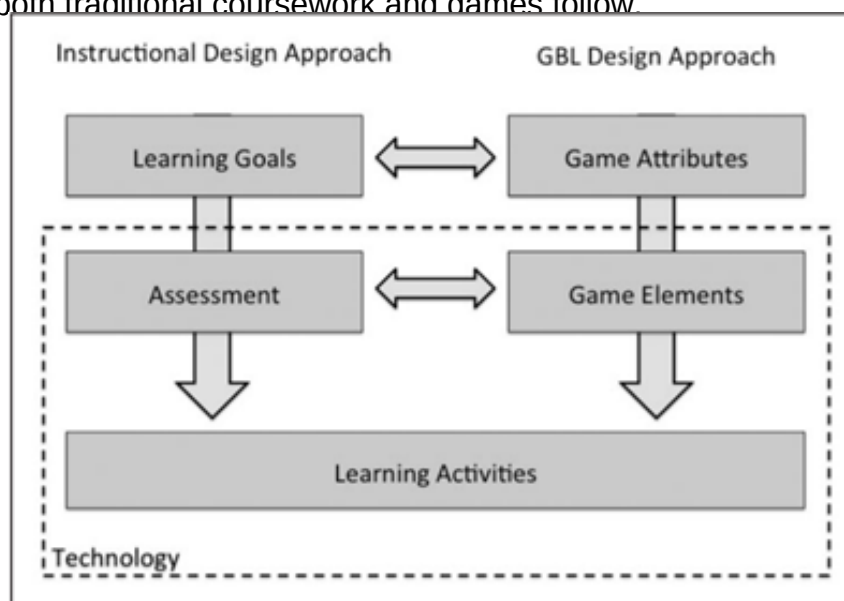

Figure 24: Game-based learning design process (Alaswad & Nadolny, 2015, p. 391)

These types of games vary from age to age. The age of a kid, or a group of children, set a pre-existing cognitive development that can be used in a GBL environment. A game becomes more abstract as children get older. It can get symbolic, such as the example of a child pretending that an eraser is a car or that a ruler is an airplane, while at the same time, the child is fully aware that those two objects are nothing else than stationary tools. Play can also get more social after a certain age. This type of abstract play allows children to develop and maintain an idea of symbolic representations in tools and objects around them, and this skill is required for the development of symbolic thinking (Plass et al. 2015, p. 259).

One reason that makes games a more effective learning environment than a simple classroom lesson is their motivational feature. A game's motivational function is its most well-known characteristic. Learners usually get motivated to get more engaged in a game over long periods through entertainment. In a GBL environment, stars, points, leader boards, badges and trophies are some of the tools that can be used to help the player maintain its engagement with the game. These tools are decided in the designing process of a game which reflects the specific learning goals or the learners' / players' / groups' characteristics.

GBL cannot be defined at an epistemological level due to its uniqueness, this is based on a review of existing games in Plass et al. essay in 2015 (p.260). Designers, in order to set up a game, use different types of elements, such as behaviourist, cognitive and constructivist, or a combination of them. A behaviourist type of game usually provides challenges that have a limited set of options by which the players can respond, and then get a right or wrong message as feedback. On the contrary, a constructivist type of game can allow the players to create their own challenges, provide the tools needed themselves and also provide a system of peer feedback (Ibid 2015, p. 260).

In order to design and develop a game, the designer must follow a basic model that all games follow. This model consists of three main elements: a challenge, a response, and feedback. Through this model, a loop is generated when the feedback leads to a new challenge. According to Plass et al., "The model shows how game design features are at the centre of the learning experience, permeating how challenge, response, and feedback are designed" (2015, p. 262). These three main elements can be transformed into a learning experience. For example, challenges can be inspiring when they are presented through a strong narrative, responses can be enjoyable when they have the form of game mechanics, and feedback can be playful when they are presented in the form of game characters or leader boards. According to Alaswad and Nadolny (2015), feedback is crucial for the development of a good instructional game.

Through feedback, learners can reflect on their learning strategies to create an evaluating loop. Through GBL, gamers / learners can engage in a "try-fail-try again" learning method which is not allowed in many cases of traditional classroom-based learning. "Recent research suggests that feedback provided through games should not only support reflective thinking but should also aid learners in constructing knowledge by focusing on relevant information from their point of view" (p.392). But what can happen when there is no feedback? It is proved that lack of feedback will discourage the learners' understanding of the relation between the gaming elements and the learning objectives.
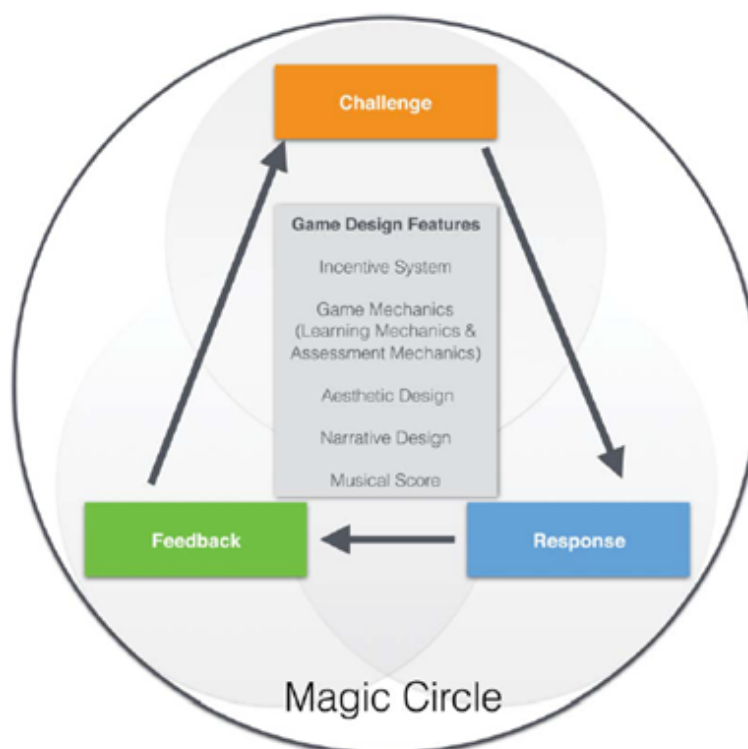
Figure 25: Model of GBL (Plass et al. 2015, p. 262)

Games are usually built upon some specific blocks; these building blocks are: game mechanics; visual aesthetics; narrative; incentives; musical score; and content and skills. Let's observe these building blocks one by one (Plass et al. 2015, p. 263). These elements, according to Alaswad and Nadolny (2015, p. 390), can be defined as common to elements to all games, but they are not essential to all the games. They could be included to all games, but eventually, not all games include them.

- Game mechanics are the activities, or the set of activities, that are repeated in a game by a player, who is being seen as a learner. This element mirrors the behaviour that is needed and it is linked to a learning activity in a game. It can be used in both single-player or multiplayer games.

- The second element is visual aesthetic design and it decides how the tools and the functions of a game will be visualized, as well as how feedback will be presented to the players. This means that visual aesthetic design has a cognitive function.

- The narrative of a game is the third element, and it mainly consists of the storyline that is presented through dialogues, voice-overs and other in-action games. Narratives usually provide contextual information that connects the rules of the game with the characters, the tasks and the events, which results in a motivational function.

- An incentive system can include many motivational features in a game that can encourage the players into continuing putting more efforts. It usually results in feedback that tries to modify the players' behaviour.

- A game also has a musical score which is basically the introduction of background music or sounds that usually function as navigational systems to lead the attention of the players to specific events in the game. It usually signals the moments of danger or opportunity in a specific moment of the game.

- Last but not least, a game is supposed to cover some specific content and skills. These content and skills can decide the learning mechanics, the visual design, the narrative design, the incentive system and the musical score that will be adopted for the needs of the game. In other words, the content of a game has a fundamental impact on all-important game elements and designs.

Many fields within psychology already contribute to game designing, including the theories on cognition, motivation, affect and sociocultural issues. All of these areas can contribute to the design of GBL, but the extent to which they contribute to GBL depends on a variety of factors, including the content of the game and the learning objectives related to it. Plass et al. continue "As a result, many findings obtained for specific subject matter areas, game functions, and game genres do not necessarily generalize to other subjects, functions, and genres" (2015, p. 265). Additional to these foundations, GBL has some cognitive foundations too, when viewed from a cognitive perspective. These cognitive foundations can be found in the learner's engagement in a game that interacts with the construction of mental models. Firstly, a learner selects how to memorise the information that is being presented in a game through visual and verbal ways. This helps the learner to organise her/his memories and integrate this information with pre-existing knowledge.

In cognitive theory and research, game designers take into consideration the elements of a game that can contribute to the cognitive processing of the content that the game wants to pass to a learner. In other words, the content should be represented and the learning mechanics should be designed in a way to engage the learner into specific intended cognitive outcomes. Designers also have to pay attention to the cognitive load experienced by the learner during the game.
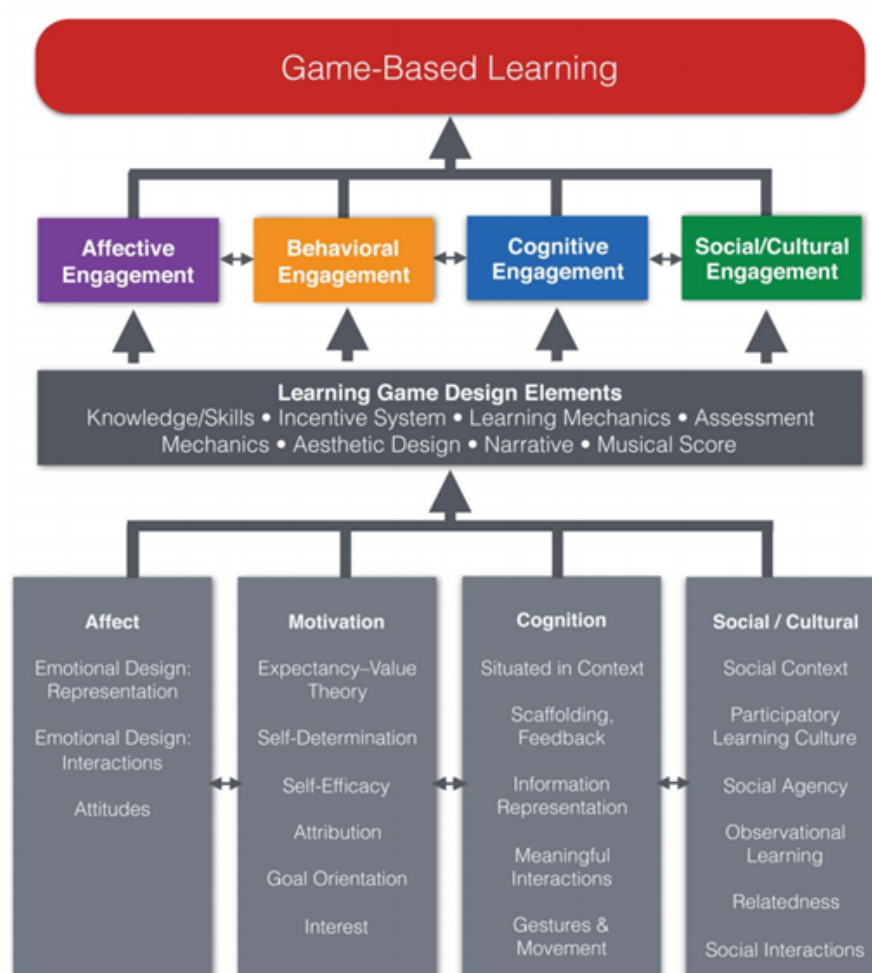
Figure 26: Structure of GBL (Plass et al. 2015, p. 263)

Something else that differentiates positively GBL from traditional classroom-based learning is its goals. Usually, GBL goals are described as long-term and more complex compared to traditional classroom-based learning goals. GBL goals are categorised into two main categories. The mastery goals and the performance goals (Alaswad & Nadolny 2015, p. 392). The first group of goals, also known as the mastery goals, are focusing on learners' willingness to develop new skills and abilities and gain new knowledge or expand the already existing one. The other group of goals, also known as the performance goals, are focusing on the learners' need to validate their success; and this is obvious in situations where learners feel the need to surpass others even if the gap between them and the others is not great.

Additionally, in GBL there are some tools and techniques that are needed in order to challenge learners and make them engage in GBL. These tools and techniques can include things such as rewards, levels, badges, leader boards, challenges, hidden items and bonus items (Ibid 2015, p. 394). These techniques are widely known. What is challenging in this phase is the integration of them during game design in order to be effective. The two most common tools are badges and leader boards. Badges are usually symbols that indicate a learner's achievement in the process of fulfilling her/his learning goals. They are much appreciated by high-achieving learners due to their positive reinforcement, as well as by competitive learners due to their preference of quantity over quality or rewards. In general, badges can increase engagement in a game (Ibid 2015, p. 394). The second technique is not only used in games, but also in sports. Leader boards are the ranking of accomplishments through visual means. It is a public display of different types of scores that promote competition and social interaction among the players. A leader board can also work as a social and cooperative tool. Social interactions usually occur when players at the top of the board reach out to players with poorer performance and they adopt the roles of mentors and mentees respectively. At the same time though, it is essential to have a more competitive interaction among the players when those at the top compete against each other for the highest score. This competitive interaction increases motivation for players at the bottom of the score too (Ibid 2015, 395).

Game Element	Affordances	Implementation
Badge	- Enhance decision making, engagement and achievement - Provides positive reinforcement - Creates a sense of competitiveness and status	- Include a variety of badges for points, skills, and behaviours - Make sure badges align to learning outcomes
Leadership	- Promotes social interaction - Authenticates attainment of learning goals - Provides meaningful feedback	- Routinely change leader board criteria - Make sure leaderboard criteria are meaningful to and align with learning outcomes

Figure 27: Game elements and implementation (Alaswad & Nadolny, 2015, p. 396)

2.2. Examples of GBL methods for Agro-Entrepreneurship (AE) from each national context

Cyprus

Due to inadequate data, the examples of gamification in AE are limited. However, there is a farm near Nicosia that is currently working with organic products, permaculture and it is also trying to provide a unique experience to visitors who are curious about agricultural enterprises and different practices that are implemented by them. Riverland Bio Farm is located in a village 40 minutes away from Nicosia's centre. According to the facility's website (riverlandbiofarm.com), visitors can spend a day at the farm and learn how to appreciate organic products, healthy food and also learn about these products producing methods. Also, livestock at Riverland Bio Farm is feed on organic food, produced in certified organic fields, running free. The farm is able to produce higher quality milk, free-range eggs, dairy products and meat-free of chemicals, antibiotics and pesticides which can affect the consumer's health negatively.

At Riverland Bio Farm, visitors can have a walk around the farm and examine the process of producing milk, pick up tomatoes, taste organic products, hiking in the surrounding areas, and get involved in various activities in nature. People can have interaction with the animals and get informed by professionals. It is a family-friendly place where people from every age can learn all the secrets about organic farming. Riverland Bio Farm has been part of "Best Investment in the European Rural Development Programme 2007-2013" by the European Commission, and it has been awarded by the CY GPP Awards 2019.

Figure 28: Photo from Riverland Bio Farm Website - https://riverlandbiofarm.com/gallery

However, regarding the gamification of different aspects of agriculture, such as permaculture, an Erasmus+ project called "Green STEAM Incubator" is using a game where the players need to find some items that are written in a list that a facilitator has prepared prior to their arrival. This list can include a variety of things, such as equipment, farm products or specific plants, vegetables and fruits. The game starts when the players receive the list and they have to locate all those items on the farm. To make the hunt for these items more educational, the facilitator prepares some cards which will provide information about the vegetables, fruits and other items that can be traced in the farm. The participants will be able to take those cards home in order to study them more carefully if they need.

Another similar Erasmus+ project is "Living STEM", which is a project that wants to help educators to teach STEM through practical examples and exercises related to permaculture. This project's target group is young people between 10-14 years old who want to discover the daily use of STEM through a gamified system. One of the activities that "Living STEM" has already developed is twenty outdoor and indoor educational games that introduce STEAM subjects and Permaculture. The activities are spread over the school year and they are combined with other theoretical projects. The project is aiming to create an enjoyable learning experience for children. According to the project's website (https://www.livingstem.eu/en/), one of the games is a card game and it consists of 120 cards that will mention seeds, plants, products such as bread and honey, and animals. These cards will demonstrate each product's profile, nutrients and calories. Their profiles mainly are information, such as its origins, where it grows, how it is produced, etc. An example of two cards is shown below (Figures 29 & 30):

Cheese
1. It is produced from the **milk**
2. The use of fresh **water** is necessary for its production
3. Gas Emissions are released into the **air** for its production
4. It is consumed by **Human Beings**

Milk
1. It is produced by **farm animals**
2. The use of fresh **water** is necessary for its production
3. Greenhouse gases are released into the **air** for its production
4. It is consumed by **Human Beings**
5. It is processed by industries for the production of many kinds of food (cream, **cheese**, yogurt, butter, …)

Greece

Kirstavridou et al. (2020) have researched different GBL methods applied in Greece and relevant best practices used. According to their findings, the most prevalent GBL methods are:

- Flashcard games – memory games
- Stimulation games
- Interactive games
- Quiz games
- Puzzles
- Strategy games
- Reality testing games

They also claim that GBL seems to be implemented only during undergraduate or postgraduate studies (Kirstavridou et al., 2020). Searching for relevant practices in EPALE (Electronic Platform for Adult Learning in Europe) platform, though, one can discover various GBL educational activities in a more significant educational context (beginning from primary schools).The domination of ICT (Information and Communications Technology) cannot leave unaffected the academic realm in our everyday lives. Also, the recently emerging need due to the COVID-19 has rendered GBL tools as a means of more participating education (Kirstavridou et al., 2020)

Regarding GBL methods in agriculture in the Greek national context, a game was developed by Smart-AKIS organisation in the "GATES - Serious Games for Smart Farming" project, funded by HORIZON 2020 and supervised by the Agricultural University of Athens. By using a variety of gaming technologies (3D scenarios, interactive storytelling, modelling and data), project partners created an educational game simulating the use of Intelligent Agriculture in order to train relevant professionals in the use of contemporary agricultural machinery equipped with sensors (Mentizis, 2018). In other words, it focuses on acquainting farmers with new skills for them to be more competitive in the agro entrepreneurship field.

Another example of the GBL method in the Greek agricultural sector is "Gamify Your Teaching Game". The game was developed under this Erasmus + project includes seven thematic modules for teaching entrepreneurial skills; with AE being one of them. Each level of the game can serve as an autonomous "scene", including decision-making processes, several possible learning paths, and an appropriate scoring procedure to determine each player's performance.

Poland

The most popular activating methods in Poland are methods based on students and teachers' activities that enable active learning, i.e. learning by doing, experiencing, learning, and discovering. They trigger curiosity and greater involvement of students. Teaching with activating methods, the teacher acts as a guide organising didactic situations, steering the student's discovery of knowledge. Activating methods can be divided into two groups: problematic methods, developing the ability to think critically. They consist of presenting the students with a problem situation and organising the cognitive process. Various sources of information are used, e.g., didactic films, photographs, drawings, the Internet and figures. The cognitive and educational strategies that occur then consist of analysis and explanation, evaluation, comparison and inference (Metody aktywizujące w edukacji przedszkolnej i wczesnoszkolnej, 2017).

Older students learn while playing different types of games, but entertainment is then only a secondary purpose with learning being the first one. Thus, it seems logical that instead of simple games, they play tricky and extensive games that give them online experience, but in the first place, teach them how to apply some decisions in real life. Many simulators train the student to drive a tractor and teach them what and when to seed, how to calculate the budget, and how different weather circumstances can influence the crops. Students can learn cooperation and management skills, boost the cost-effectiveness on their farms, and grow their business due to analysis of the moves they make online (Metody nauczania i formy pracy, 2021).

Moreover, drones are still sometimes being underrated even though they can be more than helpful and profitable. Kids may use simple drones as a flying toy, but adult farmers can use professional, technologically advanced equipment to automate their farm. Highly advanced drones can have sensors which measure everything from chlorophyll levels to plant water content in the real-time. Drones can develop maps which are helpful because the farmer can assess the effect of management. Yield maps allow the farmer to see the spatial variation of yield in the field, identifying areas for future action and management effects from previous seasons.

Also, when still speaking about precision agriculture, some demonstrative programmes and courses can help the user master skills essential when planning to implement precision agriculture. Such programmes can help forecast weather, vary fertiliser application rates, and measure plant health. One of the most remarkable features is the ability to accurately monitor the soil's condition and the plants to sow accurately and apply the right amount of fertiliser. With modern equipment and software, the field is divided into sections and is monitored continuously.

The data obtained on each section is sent to the software, which analyses it and then shows the best solution for each piece of land in the field.

Virtual reality (VR) is one of the most enthusiastically used methods as it enables the user to receive a realistic feeling and get an almost hands-on experience. They can see how a farm prospers from the inside, what actions can help sustain animals' wellbeing, a proper crop level, machinery functionality, and many more.

Another popular method is computer simulation games. There are a few leading ones – such as farming simulator 17 – and they are probably the most developed and tricky games at once. They allow the user to become a farmer in nearly every place globally, including local weather. Users can ride a horse, drive a tractor, feed pigs, reap the harvest, and sell crops, among others

Figure 31: Farming Simulator 17, STEAM - https://store.steampowered.com/app/447020/Farming_Simulator_17/

Lastly, drones can be used both for fun and for a serious matter - precision agriculture. It means the use of high technology, including computers and drones. They can also develop maps which allow the farmer to see the spatial variation of yield in the field, identifying areas for future action and management effects from previous seasons. Also, drones can be equipped in programmes that can help forecast weather, vary fertiliser application rates, and measure plant health or accurately monitor the soil's condition and the plants to sow accurately and apply the right amount of fertiliser (Rolnictwo precyzyjne – na czym polega i jakie przynosi korzyści rolnikom, 2019).

In the case of Agriculture and AE, many activation methods can be used with properly prepared material. They increase the emotional involvement of students. It is the effect of sensations and experiences connected with the performance of certain tasks. A jigsaw puzzle representing one aspect of the topic that needs to be completed to move on, a sample application form, a board game where you have to throw a certain number of dice to move on, or a board on the floor for guidance, all work very well in this type of case (Metody aktywizujące w edukacji przedszkolnej i wczesnoszkolnej, 2017).

Spain

Different publications (Martinez 2017; Gamelearn 2020; Matute 2016; and Educacion 3.0 2020) present a brief overview regarding the use of GBL methodologies in Spain. According to these publications' main conclusions, the use of GBL methodology is spreading widely in Spain. At the beginning of the 21st century, only big companies used these methodologies as a part of their internal learning offer. But now we can find GBL initiatives in all the levels of training. The methods vary depending on the target group and level of education, and include:
-Board games
-Video games
-Simulators (they are not properly a GBL tool, but we have included them because they are used to develop specific technical competences in specific occupations -such as medicine, mechanical, etc.).
-Serious games
-Role playing

And in these categories, we can find a broad type of pedagogies, such as:
-Collaborative and competitive games
-Memory games
-Strategic games
-Building games
-Problem solving games

However, even the ICT based games could provide a promising approach for self-learning and online collaboration, board games are more attractive for Spanish learners and facilitators, because they can be adapted according to fundamental characteristics of the GBL process as the resolution of the players-learners; interaction ability of the players-learners; adaptation of the rules and goals to the players-learners and adaptation of the challenges to players-learners (Sánchez, 2017).

A few examples of GBL methods in the fields of Agriculture and AE in Spain are:

-The project PLENTIS, as informed on its website, is a set of online educational minigames on the topic of AE to develop their entrepreneurial skills and competences. It is part of the Erasmus+ program of the European Union and was tested in some countries including Spain: http://plentis.eu/

-"Agro Jocs" is a game to teach agroecology, created by The Unió de Llauradors i Ramaders (association for sustainable agriculture). "Agro Jocs" is a suitcase with six games on agroecology, healthy eating and responsible consumption aimed at primary school children. A copy of the game can be found in the following link: https://agroviva.chil.me/post/maleta-ludica-agro-jocs--242382?l=CA

-The Consell Català de la Producció Agrària Ecològica (CCPAE) has launched a project called Ecosegell. It is a digital educational resource for learning the basics of organic farming and organic labels in the classroom, mainly aimed at young people aged between 10 and 14. The project aims to work on these issues and transfer them from young people to society through games. The main goal is to teach the basics of organic farming and promote attitudes and values that respect the health and the environment. In addition to the youngsters' material, the game has developed a guide for teachers to provide more in-depth theoretical content on the learning topic: https://www.ecosegell.cat (registration is required to access the game).

2.3. An introduction to Escape Rooms

Description of an Escape Room

Escape Rooms (ERs) are games that can train one's skills and abilities through different types of mental and physical tasks. Usually, ERs differ between them in regards to presentation, back story and tasks, but the idea behind the game is universal. ERs usually go like this: a team of players, from 2 up to 20 people, is being locked in a room that is themed. The team is explained the backstory of the room by the Game Master. Then they have a mission to accomplish within a specific timeframe. There is also a person who supervises them who can also be the Game Master. There are many and different themes and narratives to build an ER, such as horror themes, fantasy ones, futuristic ones, etc. The ultimate goal of the team does not necessarily have to do with escaping the room, but it can also be solving a mystery, finding a cure to a virus, or even escaping from a hoard of vampires who are coming to drink their blood, or werewolves who are on their way to feast on the team's flesh.

As stated above, the Game Master's job is to explain the tasks to the team. Once the team has understood the rules and realized that they have been transferred into another reality, they are locked in the room which they have to escape and the Game Master starts the countdown. Usually, an ER takes 30 to 60 minutes on average. Within this limit, the team has to gather all the clues that they can find laying around in public display in the room or being hidden in drawers and suitcases; and then they must solve a series of mental and physical obstacles, known as puzzles, which are linked altogether in order to complete the mission. It is up to the ER's designer, whether or not the puzzles will solve the mystery or unlock new tasks. If the puzzle leads to another task, this means that the ER designer decided to increase the difficulty of the adventure and add to the players' experience. In case the players are stuck, then the Game Master can provide a hint which will allow them to proceed further into solving the puzzle. Regarding the hints in an ER, it is up to the designer of the room whether or not the provision of a hint will result in a time penalty. In some cases, every hint provided to the team can reduce the time given to escape by 5 or 10 minutes. If the team does not manage to escape or solve the mystery within the timeframe, then they are locked in the room until the Game Master releases them free. After this, the process that follows and is called "the debriefing process" where the Game Master and team discuss the logic behind each task and each puzzle. The debriefing process's goal is to allow the team to return to "the real world" smoothly.

Lastly, if the team managed to escape, the participants receive a reward for having accomplished the tasks. This reward can either be a voucher or a souvenir photo. Since ERs is a GBL method, feedback by the participants is crucial for the designers and the developers of the room in order to trace some malfunctions of the tasks and resolve them for achieving further improvements.

Figure 32: A photo from the testing of one of CIP's ERs in ER-SE project (Escape Rooms for Social Entrepreneurship), November 2020

Additional to the ERs, the Agro_EduGames project must contain Breakout Boxes (BoBs), which are technically locked boxes that the participants of the project have to "break into" through challenging puzzles. Breakout box game is very common as a non-formal education method due to the fact that they require "the four C's": critical thinking; creativity; collaboration; and communication (Maple East Elementary, 2021).

The educational purpose of Escape Rooms in AE

ERs in general are characterised by a series of skills and knowledge that are needed in order to be solved or escaped. This is exactly what makes ERs educational and they can be used as a tool in education. The basic skills that are required according to Casa Todd (2019) are Critical Thinking, Creativity, Character, Communication, and Collaboration. These skills are also known as the 5 Cs.

During an ER, the participants who have been locked in the room have to observe around them in order to find clues that can either help them and be useful or just be placed in the room without any purpose, only to confuse the participants. These kinds of clues are also known as red herrings. Red herrings usually work as time-consuming traps. Once the participants discover the hidden clues, their problem-solving skills are being tested. Innovation and creativity are promoted due to an alternative way of thinking that can help the participants to find a solution to a problem.

Another two critical aspects of ERs are time management and pressure management. These two aspects are necessary for a successful escape due to the adrenaline that limited time has as an impact on the participants. Such competencies are essential for agricultural entrepreneurs, and this is due to the fact that they need to set priorities that may allow them to approach their businesses to a specific business plan. Time management and pressure management will make sure that different activities within the frame of AE will be efficient and effective, as well as that the goals of an enterprise will be achieved (Growthink Inc., 2019).

Another aspect of ERs is organisational management, which is critical in order to sort and compile the clues during the game. According to Bryzhko and Kosheleva (2012, p. 195), organisational management in AE can contribute to the increase of efficiency of an agricultural enterprise which will result in the development of essential conditions that allow stable production growth, an increase of competitiveness and provision of increased profitability in agricultural activities.

Lastly, being locked in an ER with so many clues, tasks and puzzles make it impossible for a single person to find the solution and escape the room in the time given (Loup & Morgan 2018, p. 43). Therefore, a team is needed in order to accomplish the mission. This is where communication and collaboration are also needed. It is almost identical to how agricultural enterprises work, where the entire team has to work together and develop good communication skills that will allow the partners to achieve their common goals.

The five types of escapers

According to the EG website (2018), there are 5 main types of escapers. The Spotter, the orchestrator (aka the leader), the communicator, the brain and the tinkerer:

- The Spotter is always the first person to check every possible hiding place to find the clues. As a player, the Spotter is great at paying attention to the details and collecting clues that are needed for solving puzzles.
- The Orchestrator is the person who likes to keep the more complex information for themselves in order to process them. They usually take the leader's responsibility for having their team spread out to every corner of the room and they like solving as many puzzles as possible.
- The Communicator is the person who people usually describe as a good listener. They get every small piece of information, and they make sure to work with it. They also make sure that the rest of the team is also busy with these pieces of information, and that they all work together in order to keep everybody on the same page.
- The Brain is usually the one who analyses everything and can discover new patterns and challenges. They are described as the masters of puzzles and they are the first persons that their teammates will search for when they find new clues.
- The Tinkerer is the always curious member of the team. They will never get discouraged when solving a puzzle regardless of the difficulties they may face. This person will most likely try to see the puzzles in an ER through a different angle if their initiative method did not work.

Figure 33: Pinky and the Brain. Warner Bros' most famous escapers - www.mentalfloss.com

2.4 Escape Games: Understand & Design the educational purpose of an ER; Define the Learning Objectives you want to Achieve

How to design an Escape Room for Agro-Entrepreneurship

It might look taxing and difficult to design and create an ER, but this is not always the case due to the fact that the designer can set limits on the space and the tasks that she or he wants to make use of. Something designers must bear in mind all the time while creating an ER is the question "Why?" (Nicholson 2016, p.6). Why is this item placed here? Why do the puzzles follow a specific order? Why is this theme important for my ER? This happens because every item, puzzle or task has a reason to exist in an ER, and this reason should be related to the overall idea of the game. In case this protocol is not followed, the room might be confusing and inconsistent. It will not entertain the players; it will annoy them instead.

According to Nicholson (2015, p. 30), each puzzle and tasks must lead the player to a well-designed adventure that follows a narrative that amuses the players, gives an a-ha moment in the game and helps the participants to develop a sense of cooperation. After taking into consideration the project's proposal, to create an ER, we have to follow the next four objectives:

- The development of a consistent, educational and enjoyable experience.
- The designing of ERs relevant to AE (either AE themed rooms or having related puzzles)
- The creation of something compact and portable, so that the experience can be easily transferred from place to place.
- The limitation of the expenses and the production of something affordable. In terms of materials, tools and printing costs, the cost must not exceed 100 euros.

The following pillars - the participants; the objectives; the theme and narrative; the puzzles and tasks; the equipment; and the evaluation process - are adopted in this Guide after the careful examination of IO2 of "ER-SE project: ERs for Social Entrepreneurship" led by CIP Citizens In Power.

1. Participants

The target group is very important in order to create an ER. Therefore, the designer needs to always bear in mind the demographics of the people who will participate. Age, social background, studies and occupation are key information that need to be taken into consideration before we build an ER. Our current target group are youth workers dealing with AE, learning disorders, NEET (Not in Education, Employment or Training) and long term unemployed; all of them 18-35 years old.When a designer of an ER defines the target groups, they basically help themselves decide on the overall duration and the difficulty of each task. Hence, the educational needs of our target groups must also be addressed through the following question:

-How much do they already know about AE and what knowledge or skills do they lack? Depending on the participants, the mode of the experience can either be based on cooperation, competitiveness and/or score. Cooperation-based experience is when the participants from a team must all work together in order to solve the mystery. Competitive-based experience is when different teams compete with each other and one has to escape first. Lastly, score-based experience is when there is a scoreboard that shows in detail all the achievements that the teams or the players have recorded. As regards to our project, it will be good if the ERs have a cooperation-based character that will help the participants to strengthen their teamwork skills.

2. Objectives

The designers must have clear learning objectives regarding the educational purpose of the game. In this way, the objectives will allow the designer to draw up the learning outcomes of the game and define the knowledge and soft skills that the participants will gain after completing each task. For example, if the game's objective is for the players to learn about permaculture, one of the tasks can introduce them into some of the practices or the principles of permaculture by throwing around different words written on papers which can later be used to fill the gaps on a text about the practices and principles of permaculture; this text will later allow them to unlock the next task. Something similar can be with different types of human impact on the environment through agriculture, where the participants will have to pick up an agricultural enterprise to give the prize of "the most environment friendly agro-enterprise" to.

Additionally, stable objectives can contribute into the evaluation process which will later help into obtaining the desired outcomes of the game. In other words, concrete learning goals are vital for the educational results of the game and the foundations of the evaluation plan.

3. Theme and Narrative

This pillar is one of the most important ones for the design process. A good theme and narrative can make the participants engage in the game and offer a nice experience by making the players lose track of time. In other words, themes and narratives are used in order to throw the players deeper into a backstory. A story can usually orbit around different subjects, historical events, or even fictional ones that can set a theme. Inspiration is usually drawn from the geographical location of the room, already existing facilities that the designer perhaps is aware of, the news, or the interests of the target group. A theme example for AE can be the adaptation of a dystopian future where an ecological disaster occurred. As for narratives, they can follow right after the adoption of a theme, and they mainly stimulate the participants' and the designers' fantasy; and they usually include solving a crime, inventing a cure and so on. In our project, this can be the discovery of what led humanity into the disaster that has been mentioned above in order to regain and maintain a prosperous agricultural production.

Here are some tips that help to create a good scenario:

- Include a backstory that can explain to the participants the narrative of the room. This will help the participants to transport into a new reality.
- Pick up a mission that needs to be accomplished as soon as possible and that can help the players engage easily.
- Compose a direct and logical ending to the story. The players must understand that once they find the solution to the problem, they will be treated as heroes by the habitats of the new reality which needs them urgently.
- Surprise! This is one of the most important aspects of every ER. Add an a-ha moment or a plot twist into the scenario in order to captivate the participants' interest. Use some room decoration or special effects that will make the participants talk about the ER experience even after days!

It is also important to keep in mind that the plot of each ER must be written in a simple, clear and straightforward way, so, the players do not get confused and they are able to understand everything about their mission. To achieve such a thing, the designer has to be clear about the purpose of the game and the team's mission. In other words, the designer must clearly state whether the team has to escape the room in order to successfully finish the game, or solve a mystery, or find a cure, etc. According to Nicholson's survey in 2015 (p. 15), the concept of approximately half of the ER facilities around the world that took part in his survey was to escape the room. Meanwhile, the other half was to solve a mystery or something equivalent. So, escaping does not have to be an ER's ultimate goal or fundamental concept.

One more element that adds to the overall experience and it is important for an Escape to captivate the participants' enthusiasm is the decoration and everything else that can contribute to the design of a room. Also, the puzzles and the activities that are included in the room have to be coherent with the theme of the room, as well as the narrative of the scenario that is being followed in order to give an authentic and convincing experience to the participants. If the participants approach the room in an engaging way, it will add to the educational value of the game.

4. Puzzles and Tasks

The fourth pillar of our methodological framework is about the puzzles that make up one of the most important features of the room and the design process. The puzzles are the backbone of the overall narrative, they are as crucial as the narrative itself for an ER to be coherent. They do not only link the overall theme with the narrative of the room, but they also create a connection between them – the puzzles themselves – and the ultimate goal which is completing the entire mission. For this part of the Guide, Wiemker's guide on how to construct an ER was very important and it has been used to its full length.

A good puzzle must consist of three main components, a challenge, a solution and a reward (Wiemker et al. 2015, p. 3). For example, a challenge can perhaps be a box that needs to be unlocked, the solution is essentially the combination that unlocks the box, and the reward is whatever is hidden inside the box.

Figure 34: The Puzzle Composition. Wiemker at al. 2015, p. 4

"To expand on the example, the locked box (the challenge) may have a three-digit lock on it. On the box is a picture of a sun, moon and star. The puzzle presented to the player is how the picture of a sun, moon and star relates to a three-digit code (the solution) to open the combination lock. In this simple scenario, the room could hold a scene of the night sky, and in the sky would be a sun, two moons, and four stars. The solution to open up the combination would be 124."

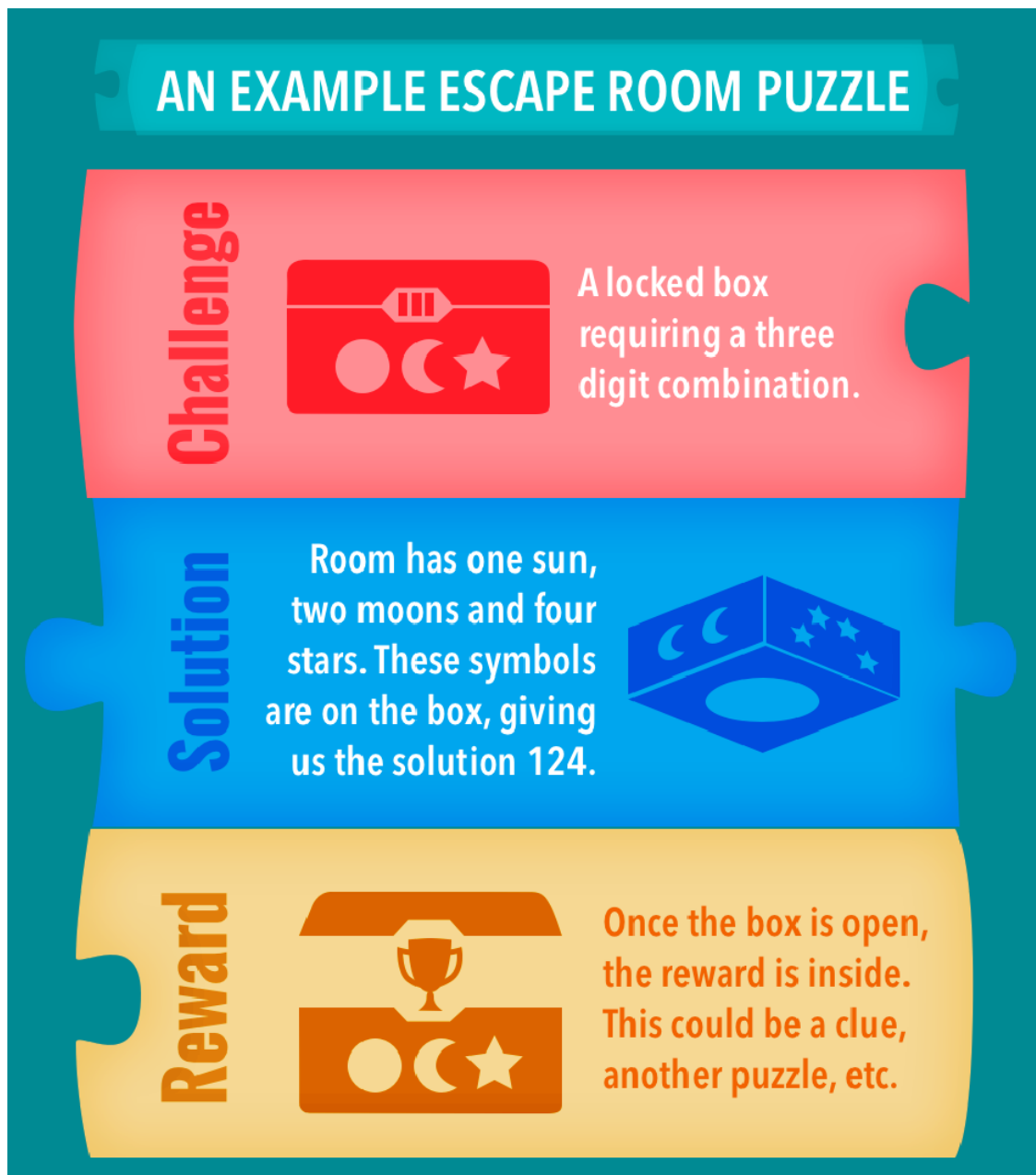(Wiemker et al. 2015, p. 4)

Figure 35: An example Escape Room puzzle. Wiemker et al. 2015, p. 5

A puzzle can either have a mental or a physical character. This means that a mental puzzle is used to utilize the players' mental skills, such as thinking and logic. Some mental puzzles can introduce to the game riddles, crosswords, mathematical equations, etc. Meanwhile, a physical puzzle is used to challenge the players into using physical force in order to overcome the obstacles, such as mazes, climbing a wall, trap doors, turning two or more keys simultaneously, etc. The latter ones are usually used to delay the players or to help participants who are not fond of mental puzzles to engage more in the game; this is why a good ER combines both types of puzzles in order to include every person in the game.

Another feature of an ER is the path of the puzzles. There are mainly three different puzzle paths that designers often use. The linear path, where the puzzles need to be solved in a specific order. If an ER follows a linear path means that the solution of the first puzzle leads to the second puzzle, the solution of the second puzzle leads to the third one, and so on. This path is the most used because it is the easiest one to design an ER. A negative element of this path is that if the team gets stuck and no hint helps them, then there is nothing else to do.

The open path is the path where all the puzzles are available for the team to start working with, in any given order. In such a scenario, the last puzzle can be solved first, but in order to make sense, all the other puzzles need to be solved too. A designer usually can use the open path when the teams are large and it can provide the opportunity to everyone to engage in the game. It also decreases the chances for a single person to solve all the puzzles and the rest of the team to be simply spectators in a one-man show.

Lastly, the multi-linear path is fundamentally the combination of linear path and open path. Just like the linear path, the puzzles can be solved one after another. However, it is also possible that the puzzles intersect with one another and they provide multiple endings. To help you understand the different puzzle paths, we include an infographic by Wiemker et al. article (2015, p. 9)
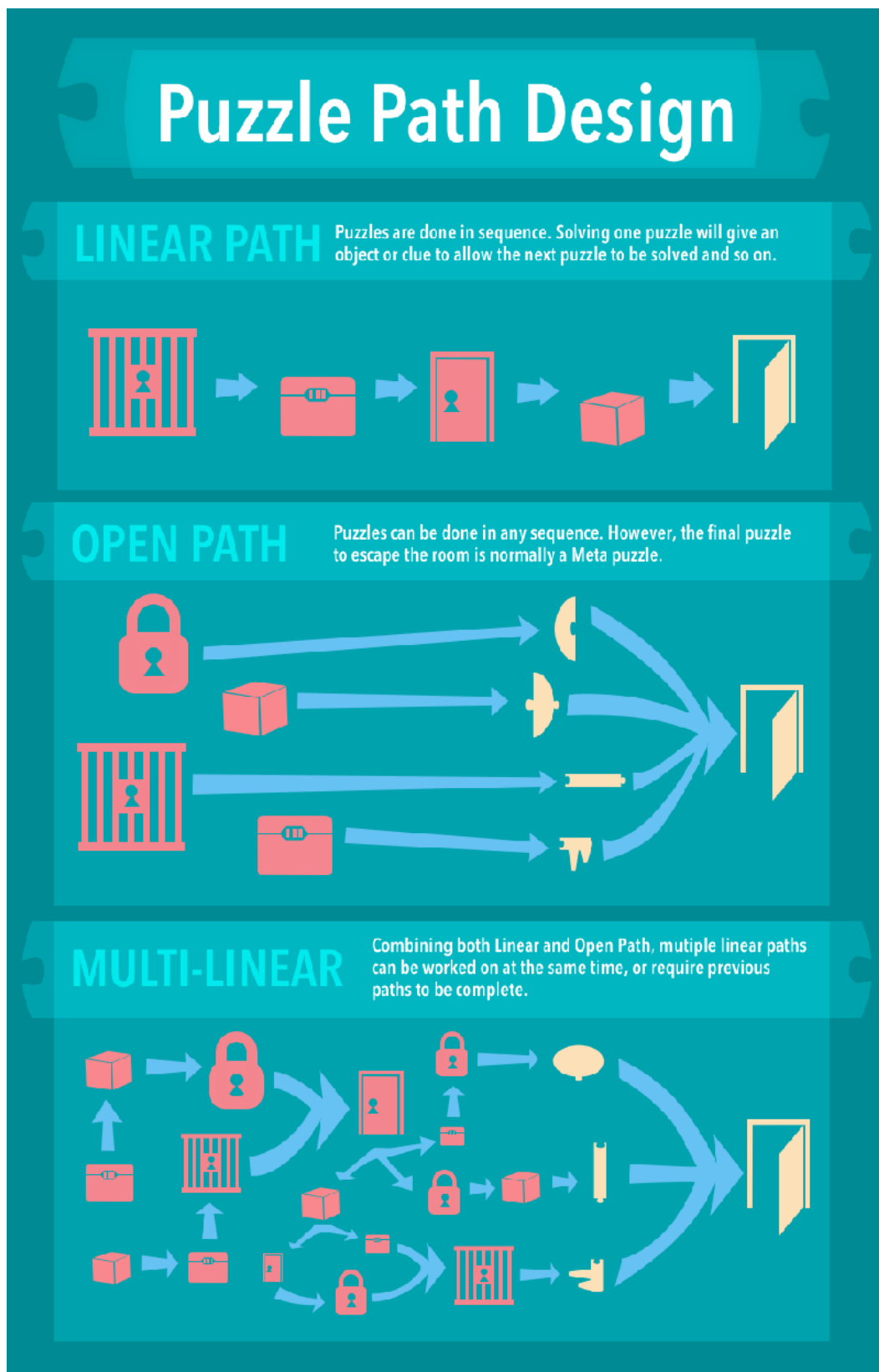
Figure 36: Puzzle Path Design. Wiemker et al. 2015, p. 9

Game Master's role and hints

Even if the puzzle path is clear to the players, they still need a Game Master who can navigate them through the challenges and offer hints when needed. The hints are provided to the teams only when they get stuck at any point of the game. As we mentioned on a previous page of this chapter, the rules regarding the hints vary. For instance, participants can either use a hint and get a time penalty too – it is as if they buy a hint in exchange for time – but they can also earn a hint by solving a specific puzzle. Some facilities have as a rule that hints can be provided to the teams only in the final 20 minutes of the game.

A Game Master' role during the game is not just to provide hints. A Game Master needs to be there in order to monitor the overall situation, prevent the players from destroying things that are found in the room, ensure that no one is using a smartphone during the game to find the solutions, make sure that the room is set up in the correct way for each team, and also to conduct the debriefing session once the teams have escaped or failed to escape the room. These are the key responsibilities of the Game Master.

A Game Master can also control what the participants know and what they do not know. In other words, if the participants must have specific knowledge regarding the theme of the narrative of the room, the Game Master must provide this information and not just rely on the assumption that they already have the information. Additionally, the Game Masters must question themselves the following question in order to be sure about the quality of the puzzles in the room: (the following questions are taken by ER-SE Project)

1) Does the puzzle carry the message of the game?
2) Is the puzzle connected to the overarching theme? Is the goal of the puzzle linked and consistent with the objective of the mission?
3) Is the puzzle integrated into the storyline? Does it propel the narrative?
4) Are the clues to the puzzle logical?
5) Does the puzzle reflect the learning objectives?
6) Can the puzzle be solved using only the information within the room?
7) Is the puzzle suitable for your target group?
8) Does the puzzle communicate to your players how far into the solution they are? Does it have a clear starting and ending point?
9) Does the puzzle add to the atmosphere of the room?
10) Are the instructions regarding the puzzles clear and understandable to the players?
11) Does the puzzle entail an element of surprise?

In case one of these questions has a negative answer, then the puzzles need to be re-examined and adapted respectively.

Use the following links in case this is the first time designing puzzles for ERs and draw inspiration:

- https://breakoutedu.com/
- https://escaperoomtips.com/design/escape-room-puzzle-ideas
- https://lockpaperscissors.co/escape-room-puzzle-ideas/
- https://www.goguardian.com/blog/learning/escape-rooms-in-the-classroom/
- https://www.quora.com/My-friend-I-want-to-have-escape-room-nights-once-in-a-while-One-of-us-will-modify-a-room-in-his-house-with-puzzles-and-riddles-and-all-the-others-will-try-to-escape-We-have-plenty-of-time-some-money-What-are-puzzle-ideas-for-real-escape-rooms
- https://nowescape.com/blog/101-best-puzzle-ideas-for-escape-rooms/
- http://puzzlemaker.discoveryeducation.com/
- https://escapehour.ca/blog/27-top-11-puzzle-ideas-for-escape-rooms/
- https://brilliant.org/

5. Equipment

The fifth pillar of the methodological framework is about the equipment that is needed for the creation of ERs. Same as in theatre, the designer of an ER can develop a vibrant environment that can support the overall theme and narrative, using props, costumes and supporting materials that will help the participants to engage easier in the game. It has to be realistic but also not exceeding the budget.

One way to add to the authenticity of the adventure is to pick up a suitable physical location that corresponds to the ER's overall theme. For example, if the theme takes place in a greenhouse, then a greenhouse can be found and used for the game's needs.

Another way that adds to the theme and the experience, in general, is the props. Props can either be physical ones or technical ones, but bear in mind that they have to be transferable, durable and rebuildable because many participants tend to destroy a few of them when they examine them under pressure. Also, keep in mind that a lot of props can be considered mainly as red herrings by the participants and they will not be examined, so the designer must always add equipment that is related to the theme and the puzzles.

Lastly, background music and sounds can contribute to the adventure and create a more emotional and intense experience.

6. Evaluation Process

The sixth and last pillar of the methodological framework for constructing an ER is the Evaluation Process. This process usually takes place in two different ways. It can refer to the general testing of the ER once the design and construction of the game are over, but it can also be part of the debriefing session that is conducted with the players right after they manage or not to escape the room. The former is to assess the ER's efficiency and the knowledge that the project wants to deliver to the participants. This also happens in order to trace technical and mechanical malfunctions (Pedersen 2018). This stage is when the designer gets feedback on whether or not the instructions are clear or confusing and if they are also related to the educational purpose of the project; in this case, AE. For the designers to get all this information, they need to create forms of evaluation of the learning objectives.

Now, moving on to the 2nd way of evaluation – the one that occurs after the ER is officially launched and during the debriefing of each team – its purpose is to answer any possible questions that the participants have regarding the room, reveal possible missed puzzles, as well as to gain the participants' feedback. The Game Master's job during debriefing is to answer the participants' questions and unfold the logical way of the puzzles. It is also an opportunity for the Game Master to listen to the participants' criticism and reconsider possible mistakes that have been missed in the primary evaluation session mentioned in the previous paragraph.

Lastly, every ER must adopt some guidelines that will ensure the participants' safety, but also the facilities rules. The following rules are gathered from the IO2 of the ER-SE Project (p. 36-37):

- No personal items are allowed in the room
- If at any time you feel scared or panicked, let the game-master know
- No running; it can be hazardous for the props and the players
- Anything marked with a "Do not touch" sign is not to be touched
- Do not force items to open; in case it feels like it could break, do not try harder
- No more than two hints (explain how the hint system operates)
- Items can only be used once
- Players can take bathroom breaks but the clock won't be paused
- Do not remove/steal anything from the room
- Players are responsible for their own safety

2.5.The emergence of Escape Games as a pedagogical tool

ERs and EGs have recently monopolised the interest of many educational associations, but also, they can be found in many EU funded projects due to their pedagogical orientation. As a gamified method, it is very popular and widely used. It can be connected to nearly any field due to its ability to address different targeted issues and various target groups. However, it comes as a surprise that there is no previous attempt of connecting AE and EGs through Erasmus+ projects.

The idea of this project derived from a similar Erasmus+ project that the leading organisation of this project - CIP Citizens In Power - is currently leading now related to Social Entrepreneurship. EGs can be applied through Erasmus+ projects in both physical and digital learning environments. In this way, the players / participants are asked to play the games that are related to the topics of their interests, but also to create their own EGs.

ERs are often used as a non-formal form of education that aims to provide the opportunity or the chance to the players / participants to increase their competencies in a creative way. Such projects funded by the EU are "Critical Escape: Educational ERs for young people" and "Creative Learning", both with good practices, and both focussing on encouraging young people to develop soft skills outside of their traditional classroom-based environment. Another field that ERs have proved to raise awareness is about human rights issues regarding minorities or vulnerable groups, such as people with disabilities, children's rights, gender equality, migrants and refugees and other marginalized groups. A few examples are "Exit for human rights" and "Escape gender inequalities".

According to UNESCO, education is about increasing knowledge among people which also allows informed decision-making, awareness and encourages changes in attitudes and behaviours (Ouariachi & Wim, 2020). However, the current pedagogical model has drawn much attention and criticism around its lack of interaction. Therefore, new methods of education have arisen to fill this gap of traditional classroom pedagogical models. One of these methods is ERs which is defined as a live-action team-based game; and where the players have to discover clues, find solutions to puzzles and accomplish missions, all in one room. According to Ouariachi and Wim (2020, p. 1194), "the application of […] ERs to educational contexts has become more popular as a way to engage students in their learning environment, and encourage both hard skills and soft skills such as collaboration, communication and leadership".

Nicholson (2018, p 45) argues that an ER is an environment where learners can work in a team in order to win or lose together, but they work in a context that has a specific learning outcome, which means that by the end of all the tasks in an ER, the players will gain some knowledge on a specific topic that the designers decided on prior to the development of the room.

It is obvious that there is an existing trend regarding the use of ERs as a pedagogical method in many and different topics. Surprisingly though, there is no other Erasmus+ project that combines EGs and AE. This is a void that Agro_EduGames will attempt to fill.

What are some factors in AE that can be benefitted from this project?

If we deconstruct AE, we can find some factors that affect the management efficiency and the development of Agricultural Enterprises. These factors are crucial for entrepreneurs in agriculture and they are essential to decide on key aspects of Agricultural Enterprises. Therefore, we can use these factors in our ERs in order to enhance our educational purposes through gamification. According to Bryzhko and Kosheleva (2012, p. 193), these factors are economic, social, legal, technical, technological and of course ecological. Hence, skills and competencies related to these factors can be gained, discovered or improved by linking ERs with AE and consequently, using ERs as a pedagogical method. The table below explains how these factors can affect positively and negatively AE (adopted by Bryzhko's and Kosheleva's, 2012).

Factors	Positive impact	Negative impact
Economic	Specialisation and concentration of agriculture, multiform agriculture, competition in the market of agricultural products.	Instability and inoperativeness of prices for agricultural products, low level of investments, lack of finance.
Social	Improving the qualification of agricultural specialists.	Poor condition for rural development, low salaries and deficit of labour resources.
Legal	Legal provision for the interests of agricultural producers.	Insufficient development of modern legal base.
Ecological	Availability of natural resources necessary for agriculture functioning and development.	High level of environmental pollution including the land resources.
Technical	Improvement of hardware, mechanisms, equipment for production, storage and processing of agricultural products.	Lack of agricultural equipment, mechanisms and techniques.
Technological	Scientifically based development in agricultural production.	Non-use of innovative technologies in agriculture.

Figure 37: Bryzhko's and Kosheleva's, 2012

2.6 Possible Tools related to AE that need to be integrated into an Escape Room

In this last part of the second chapter of our Guide, different tools related to AE can be mentioned that can be integrated into the educational goals of ERs. Such a tool can be short informational videos, aka infomercials, or other online tools that can help a designer to develop an ER based on the information that they can find in these videos and online tools.

Firstly, such infomercials about Agriculture and AE can be found on online platforms, such as YouTube, but also, they can be found on other Erasmus+ projects related to agriculture. Such a project is "Grow Green" which tries to help young people to construct their own business ideas related to agriculture through the provision of some guidelines that help on the development of some essential skills and competencies. By visiting the "Grow Green" website (grow-green.org), one can find videos related to Agriculture Entrepreneurship in Greek and Spanish languages (all with English subtitles). These videos cover issues such as the process of planting leafy vegetables, rolling and placement of irrigation systems for leafy vegetables, the process of producing organic milk, as well as the producing of organic eggs, and the production of organic grapes. These videos can be integrated into the EGs of this project and provide important information to the players that will help them solve a puzzle or a task. Another tool that can be found on this project's website is online tools about pesticides, soil, irrigation, water, climate change and organic farming. These online tools – that the users first have to register in the "Grow Green" website in order to access them – are brief informational text and graphs that provide more details about the topics that I mentioned above. Tools like this can be integrated with ERs with the help of technology. A good idea can be to load the tools on a smartphone's browser or provide a QR code that the participants will be able to scan after they find a hidden smartphone in the ER.

A very useful tool that can be used in this project is the platform developed in the Skills for Future Farmers project, funded by the Erasmus+ Programme of the European Union. It is a platform that provides various training modules such as Organic Farming, Rural Development, Agricultural Markets, Farming Management, Biobased Economy, and ICT in Agriculture. The program offers a tailor-made multilingual mobile app for farmers containing news and facilities. (Useful Alerts for farmers, weather information, personalized content based on the user's location and a free e-commerce platform that can be developed as a full-functioning e-shop).

Additionally, the SAGRI Erasmus+ project developed a Training Module for farmworkers. More specifically participants will gain more knowledge by using this module, understand and analyse existing agri-environmental systems as natural ecosystems that are affected by human activity. Special emphasis will be given to certain environmental technologies for sustainable production by means of improved systems' management.

With the right preparation, it can be appropriate to use every tool in the project. Accessories and office objects can be easily arranged in the game. As for items related to agriculture, all kinds of pots, seeds, soil, padlocks, gardening tools, foils, etc. As far as AE is concerned, an interesting tool could be sample application forms with an appropriate level of difficulty to fill in, in electronic form of course. Logos of specific organisations dealing with AE or photos depicting AE related scenes could also be used.

 Examples of the use of the above-mentioned tool for creating puzzles:

- Photos/logo-may be used as puzzles, rebus to move on to the next stages;
- Sample registration form - can be used as a task to check whether the participants can leave (e.g., whether they have collected all the data necessary to fill in the form while solving particular puzzles so that they can leave the ER);
- Listed elements of equipment in the office/physical room, individual elements which make it possible to solve the puzzle;
- A maze in a field of corn - it is grown in Poland and can be used as an element of the puzzle (example: http://www.labirynt-wladyslawowo.pl/)

ERs can be based on various tasks and puzzles; it only depends on one's imagination. As for AE, it could be an online game with a corn maze where the user must complete a few tasks in order to escape. The first task could be that the users receive cards with various seeds on them, and they must make decisions about growing food to cooperate with their opponents. For example, it is given on the cards that carrots do not go along with potatoes but are beneficial for broccoli. They must put their cards in the right order and make a perfect match. The next exercise could be that the users receive 20 seeds and earn as high a profit as possible from the crops. Still, to make it harder, the weather changes every 30 seconds, and they must be careful because if they plant a "summer" seed in winter, they lose it, which means that they lose income, they cannot go further in the maze, and must play again.

Chapter 3:
Integrating Game-Based Learning Methods and Escape Games into Agricultural Entrepreneurship

3.1.Expectations, Expected Results and Impact of the project

The Guidebook concludes with this third chapter. Here the reader can find the expectations and the expected results of the partner organisations. The consortium of this project consists of four organisations from four different European countries – Cyprus, Greece, Poland and Spain – that covers a variety of expertise related to the aims of "Agro_EduGames". The partner organisations come from different geographical and professional backgrounds, although they all concentrate on the area of modernisation of different educational methods. The applicant organisation – Citizens In Power – through this project brought together countries who are lagging behind in the area of AE (such as Cyprus, Greece and Spain), and countries who are a positive example in the same field (such as Poland).
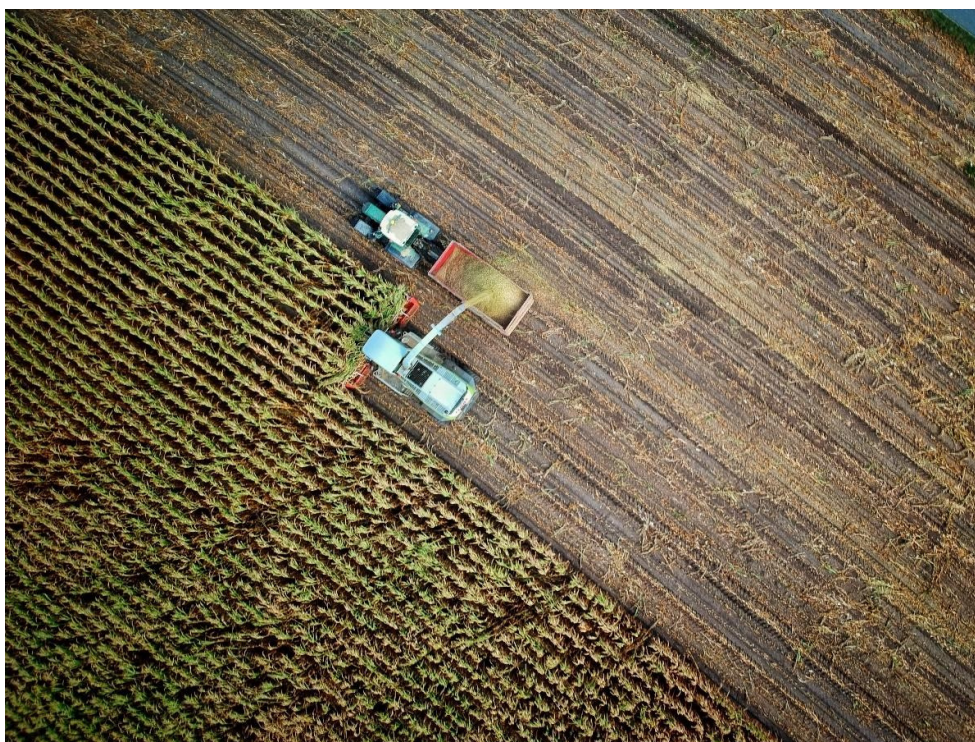
Figure 38: Warendorf, Germany. Photo by no one cares

Further, the four organisations – namely CIP Citizens In Power, Polish Farm Advisory and Training Centre (PFA), Challedu and Dramblys –put their own signature in this project. CIP is an expert in Game-Based Learning and ERs and it is already participating in numerous other projects in Entrepreneurship and Agriculture (i.e., Grow Green, Green STEAM Incubator, Living STEM, etc). This makes CIP capable of leading this project. Challedu, on the other hand, pioneers in new models of learning and its team consists mainly of educators, teachers and game designers. This is what makes Challedu the perfect partner to take over IO3 'Escape Card Game'.

Then, PFA, as the leading organisation in agriculture and entrepreneurship of this consortium due to its team of academic researchers and PhD holders. This will be done through PFA's quality management and content and training evaluations; as well as its leading role in IO4's training. Lastly, Dramblys is an organisation that implements numerous projects around social and technological innovation and sustainable development in the Sector of Youth Education. Its experience is the key to a successful dissemination and exploitation plan for a sustainable project.

Throughout the entire duration of the project, some practical results are expected. These results are the design and the creation of Open Educational Resources (OERs) in the four main languages of the consortium and the people involved in the project and in the Youth Sector. All the OERs will be developed and tested during the realisation of the project. They will also be adapted and verified by specialists and researchers to guarantee their inclusiveness and accessibility.

The OERs include:

-IO1: Guide "The educational bearing of Game-Based Learning in AE for the Youth Sector"

- 1 guide published in four languages (in digital format- epub) aiming at explaining the concepts of AE and GBL, the benefits of this teaching methodology as well as providing examples of its possible applicability in youth education through variations of EGs.

-IO2: Module: Escape Rooms/Break-out Boxes on AE

- 1 learning module in four languages (in digital format), including 5 ER/Break-out box scenarios along with all the materials, blueprints, multimedia and the digital material to be used. In addition, each scenario will be accompanied by advice for youth workers and all the ready-made material to ease the adoption by the target group. The topics of the game will be centred on the AE.
- Video trailers to guide the youth workers in the delivery of the ERs/BoBs.

-IO3- Agro_EduGames Escape Card Game

- 1 Escape Card Game for 2-6 players, which will enable trainers to engage young people in AE and teach them how to overcome various daily challenges through an innovative, playful and portable way.
- 1 guide in four languages explaining the implementation of the Escape card game.

-IO4- Agro_EduGames Booklet of Good Practices

- 1 Booklet of good practices (Do's and Don'ts) presenting the trials, errors and successes throughout the project, so as to help youth trainers grasp better the provision of AE education through GBL processes and the EGs methodology;
- 4 videos showcasing the delivery of Local Training Sessions in the four consortium countries.

Figure 39: Bonstetten, Zurich, Switzerland. Photo by Ricardo Gomez Angel

IO1

The first output is led by CIP and its final product, which is this guidebook, is an innovative tool which is based on CIP's already existing knowledge in Permaculture and Green Policies, as well as ERs since there is no other book or tool, that correlates the applicability of EGs and ERs with the AE. The entire Guidebook will be available in four languages; English, Greek, Polish and Spanish, therefore, all four outputs will be translated into these four languages.

IO2

Moving on to the second output, also led by CIP, it starts in May 2021 and it must be done by September 2022. This output's result is a module that takes IO1's theoretical explanations a step further, and it provides a more practical and hands-on material for facilitating the utilisation of the method. Within this e-learning module, there will be the development of 5 ready-to-use ERs (and/or BoBs). These EGs will mainly be made of scenarios, riddles, challenges and enigmas related to AE. Each partner will create one ER/BoB, while CIP, as the leader of the second output, will create two. Their creation will be accomplished by project managers who have created or at least consulted the previous output in order to validate their quality and relevance. Of course, for the creation of the ERs/BoBs, the second chapter of this guidebook must be taken into consideration and it must be read thoroughly by the designers of the EGs, aka Project Managers.

Each ER must consist of relevant scenarios, tasks, riddles, enigmas, hints, printable and digital graphic material and other digital tools. The ERs developed within the IO2 framework are addressed to young people between 18-35 years old who are working in the farming industry and they are interested in AE. Each ER experience will have the capacity to host groups of 2-5 people.

The ERs scenarios could focus on different topics related to AE, such as: (i) Be Entrepreneur, A Business Plan for Agricultural Enterprises, (ii) The Business Model Canvas, (iii) Agricultural Marketing (iv) Networking. These topics will be tightly related to the thematic pillars of IO1 which was analysed in chapter 1 of this Guidebook.

IO3

Agro_EduGames Escape Card Game will be addressed to 2-6 players. Using this game enables trainers to engage young people in AE in an innovative way. Players will learn how to overcome various daily challenges in agro-enterprises through a creative, playful, and easy-to-carry way.

The game will be based on the outcomes of the IO1 guide. The players would be asked to take specific roles during the game, which will present them with more clues as the game progresses. The player will attempt to search scenes, people, and objects to solve the mystery and escape. The players will collaborate as a team to win the game. In others, they will either escape together or not. Through this game, competencies such as time management, critical thinking and planning, networking, communication and leadership, flexibility and creativity will be tested. By succeeding in exercising all these competencies, they will be able to escape.

The players will use two types of cards during the game: the role cards and clues cards. The characters of role cards will be inspired by the positions and functions of people working in the agro-entrepreneurial sector, such as business/farm owners, conventional or organic farmers, stock breeders, marketing experts, engineers repairing the technological equipment of a farm etc.

By using role cards, players will be allowed to unlock more clues relevant to the character they represent only after reaching a specific score. In contrast, clues will revolve around a simulation of realistic challenges encountered at an agro-enterprise/ farm and how to use the clues, involving scenes, objects, people, to solve the mystery and escape. Depending on the desired learning outcome, which the partners and the IO leader will decide, the clues could take into account challenges faced by agro-entrepreneurs in terms of their national context, technological equipment, market restrictions, types of agricultural activity

(crops, stock breeding) and approaches towards agriculture (conventional/organic farming/permaculture) among others.

Each clue card will give points to the players, which will allow them to discover new clues. There will be a specific time limit and clue limit for the players depending on the game's mode (easy, medium, and hard).

Challedu created many relevant escape card mystery games played in events and workshops on a national level. In those games, each player takes a role and tries to find the solution to a mystery to escape on time.

IO4

The Polish Farm Advisory will supervise the training sessions where the partners will test all 5 ERs/BoBs, designed in the context of IO2 and the first version of the Escape Card Game IO3. To ensure that all materials are tested, PFA will oversee all partners' selection and propose arrangements if necessary. Each ER/BoB and card game will be tested with at least 20 youth workers/educators in each national context. Each trainee will document their experience by taking notes and multimedia content such as video recordings. The four partner organisations will be responsible for recording one video and taking photos of the Local Training Sessions materialisation process each time participants experience ERs/BoB and play cards. Based on the notes made during the Local Training Sessions and their experience in preparing and observing the activities after their completion, youth trainers and youth educators will present their case studies using a standard template to ensure comparability of experiences and equal quality of feedback. The PFA will ensure that all content has the same structure and style to create a coherent brochure.

At the end of each section, the content will first be analysed by the project leader and then peer-reviewed by the other staff/youth educators trained during the project based on these evaluations; the content may be modified if necessary. The content of the brochure will be translated into all project languages. The translation will start once independent experts have approved the content. The results have been determined as the creation of an educational ER with an exact inclusive aspect to allow equal participation for the learners with a specific learning disorder, and especially 'Dys' youngsters; development of soft skills by making the learners collaborate during the challenge that will be presented to them during the educational EGs activities. During the project, the project's most important practical results will be the design and creation of OERs in four languages (English, Greek, Spanish, Polish).

Last but not least, through the creation of the IO4 booklet with good practices deriving from the project's unfoldings, the consortium and the participants will engage in the process of self-reflection, through a perpetual process of evaluating, testing, improving and re-examining the derivatives, experiences, trials, errors and successes that occurred during the life of the project.

This intends to facilitate youth trainers to grasp the provision of AE education in the best manner through the game-based learning processes and the EGs methodology.

The PFA has experience in creating training materials of the Booklet of Good Practises type. The organisation has previously produced similar materials, such as educational posters and an animated educational film aimed at children for the Food-Aware project, which raises awareness among young European children of the issues surrounding food production and consumption; the environmental and other consequences of food production and consumption; and the possible behavioural changes they or their parents can make now to improve the sustainability of food production in the EU and globally.

Through the creation of the project's Intellectual Outputs that have been mentioned above, there are three main results that are expected by the end of this project. The first one is the modernisation of the teaching and training material that youth organisations and centres introduce frequently in their core routines and they are also interwoven with the reinforcement of the field of AE. The second expected result is the creation of a new generation of agro-entrepreneurs and their empowerment. These agro-entrepreneurs will be fully trained to tackle a variety of modern farming challenges and also to be able to invent and introduce more sustainable and structured solutions in order to create their own agricultural enterprises. The third and final expected result is the full exploitation of all the possibilities that will be provided through the Game-Based Learning processes. Specifically, the EGs methodologies. Through this result, the consortium expects EGs to become an effective and efficient educational tool. Additionally, the project team expects two secondary results mainly focused on the pedagogical aspect of the project. The first one is the development of educative ERs which will be inclusive and allow equal participation for people with learning disorders, such as dyspraxia, dysphasia and dyslexia. Finally, the project will contribute to the development of soft skills by helping the learners to learn how to collaborate during the activities of the EGs.

3.2 Methods of promoting GBL in AE

The partners who are included in the consortium, as mentioned above, are very well familiar with the notions of Game-Based Learning, ERs and Agriculture and Entrepreneurship. With all the partners' experience, knowledge and expertise in the youth sector, young adult education and innovation, the specific activities and events that are planned for 'Agro_EduGames' based on the notions that I mentioned already will promote AE and its relevant practices that will be integrated into GBL methodologies. After an in-depth study of the existing literature on GBL processes, the project partners realized the range of possibilities that the applicability of the EGs approach could potentially offer to the educational community of youth organizations that primarily deal with AE, thus deciding to work on the current application.

Figure 40: Photo by Jaciel Melnik

The features below characterize the consortium partners and they are all very much needed in a project like 'Agro_EduGames'.

-Responsibility for delivering training initiatives in entrepreneurship.
-Accessibility to Youth Associations and NGOs.
-Training provider for youth.
-Provision of entrepreneurial support.
-Knowledge of AE and innovative skills on a European level.
-Knowledge of Game-Based Learning methods, techniques and tools (both digital and physical).
-Strong relations with other organisations who are related to entrepreneurship and innovation.
-Strong relations with stakeholders and policymakers.
-Experience in the field of development of online content and online tools.
-Human Resources management
-Expertise in research-oriented material.
-Strong presence in social media as a means of dissemination.
-Outstanding communication skills.
-Expertise in organising local, regional and international events for dissemination and exploitation of the produced results.
-Specialising in learning disorders and disabilities that prevent learners, especially those at a young age, from the absorption and assimilation of knowledge.

The features mentioned above are not randomly stated in this part of Chapter 3. Of course, all four partner organisations have proved throughout the last years that they are hardworking organisations and that their hard work paid off many times. The fact that they are well established in their field of expertise ensures not only the high quality of the outcomes but also the successful implementation and promotion of the project and its results in GBL in the field of AE. This, as stated already, will be promoted as an informal educational method through EGs appealing to university students, young adults, youth organisations and centres through the training sessions under IO4. The expected number of participants by each organisation during these sessions are 20-25 individuals; particularly youth workers.

According to small research that has been done for this part of Chapter 3 of the Guide, another way of promoting GBL in general, according to the XLPro E-Learning website, is to follow a few specific tips. First things first, the launching of GBL must be big. A big launch will attract more people and it will help in engaging with the methods. Then, we have competition. Competition, as it has been already mentioned in Chapter 2, is a big contributor to engagement. Adrenaline and thrill produced by competition promote engagement. Rewards can also be a factor that will help in the promotion of GBL.

Either small or big, rewards matter to players / participants. Their use enables the learners to repeat the process that allows them to win the rewards again. This repetitive method is also something used to set milestones. Another way to promote GBL is by keeping the momentum alive. This can be achieved with the use of Social Media, forums and discussion groups – such as messaging applications like WhatsApp – to encourage discussions among players / learners.

Figure 41: Photo by Zachary Keimig

3.3. Perspectives and possibilities that EGs and GBL could bring to AE

Through EGs and Game-Based Learning, the consortium tries to address youth unemployment. Youth Organisations must have access to relevant training to the needs of the labour market, and furthermore, to establish links with businesses, so as to be able to find effective routes into employment. Agricultural enterprises are increasing at a fast pace and its growth is one of the ways to achieve the target that has been already mentioned above. In this way, young people will gain direct access to the labour market and, at the same time, their development is set forward.

The entire European economy is vastly affected and influenced by AE and Agro-entrepreneurs can help with their contribution to the creation of new opportunities in employment. Since 1963, the agricultural sector has been at the forefront of EU policy-making and it is one of the sectors that receive a significant part of the EU's annual budget. However, there is a particular need to increase youth employability within agricultural entrepreneurs, due to the ageing farming population. This phenomenon is seen mainly in Europe, as stated by Eurostat (2017); in numbers, this phenomenon is explained as currently for each farmer younger than 35 there are 5.6 farmers older than 65. Among those young farmers, only one in five has followed a full agricultural training cycle and over two-thirds of them exercise farming out of the practical experience. This is why the applicant organisation and the consortium are trying to promote AE among young adults, 18-35 years old, and they decided to do so through Game-Based Learning that can attract younger generations.

Further, the problem of the increasing unemployment among young Europeans can be solved through the promotion of farming to young people, and it can also contribute to sustainable development goals. This is a win-win situation. Indeed, the dire situation of young people and the need to counter risks of exclusion, marginalization or unemployment, calls for giving priority to integration in society and the market, with the ultimate purpose of allowing all young people to become active and engaged members in the labour market and the society.

 'Agro_EduGames' tries to provide youth workers and educators, as well as youth organisations, with up-to-date educational and training tools on AE, but also to promote all the contemporary digital possibilities and educational processes through an innovative way in order to reinforce the absorption of relevant knowledge. These tools that will be developed in the current project's context will be entirely supported by the web and they will be accessible through the 'Agro_EduGames' interactive electronic platform. This electronic platform will focus on how youth trainers could teach AE

through Game-Based Learning methods. Such methods are EGs which will be redefined under the scope of youth education. the digital integration in learning, teaching and training at all levels and supporting its sustainability and compatibility with upcoming learning challenges of NGOs' practitioners. The collaboration between educational experts from various institutions will lead to the design of powerful educational tools on AE.

The project's aim is the next generation's education on AE. GBL tools and educational material's integration will help agro-entrepreneurs to become more capable of identifying the challenges of our times which will then enable them to develop solutions and models for sustainable agro-enterprises.

Figure 42: Photo by Dan Meyers

3.4. Evaluation Criteria & Requirements for all the IOs

All project derivatives in terms of quality of educational materials/training courses and relevance to the agricultural sector's needs will be evaluated and validated by the research staff of The Polish Farm Advisory and Training Centre not-for-profit Sp. z o.o., who are experts in related agricultural topics. This activity ensures that all training activities of the project will be well organized, according to a commonly accepted model and will be evaluated using specifically designed questionnaires and interviews; e.g. video recordings. Google Drive folders created in A1 will be used to share and store the collected results.

Quality assurance and evaluation will include formative assessment and verification of both processes - effectiveness, collaboration, valorisation, etc. - and outcomes; results. Achieving high-quality standards at various stages of the project will be promoted through close collaboration, frequent communication and hard work. For this activity, a Quality Assurance and Evaluation Plan will be developed and implemented to ensure that both the process and outcomes of the project are consistent with quality expectations; and a project evaluation strategy and methodology will be established and agreed upon by all partners so that a culture of continuous evaluation and continuous improvement is at the heart of the project.

The proposed quality assurance and evaluation plans are one of the mechanisms to be used to ensure a high-quality project. An overview of some of the major aspects of the project to include the following:
- Project management guidelines to be established by the proposing organization at the first meeting, clearly defining the purpose and scope of each deliverable required, tasks and conditions of each Partners' tasks and conditions, dissemination and implementation issues;
- Develop indicators for ongoing quality control and evaluation by PFA;
- Draft and document each report (first meeting);
- Understanding the quality standards set by the project leader;
- Process for establishing policies and procedures to be followed for delivery of each deliverable and completion of each task.

A review of all deliverables will be conducted and feedback will be gathered from all partners regarding:

- Scientific content;
- The scientific data collection and analysis process;
- The reporting process;
- Content-based on project requirements;
- The overall quality of the report Quality control and assessment.

The activity leader will be responsible for collecting the evaluation data, its analysis and presentation at each regular meeting during the development of each deliverable; document control - managing printed and electronic documents; acceptance of results through F2F and online meetings; finalisation of each deliverable based on feedback and suggestions gathered through the review process, pilot testing and questionnaires. The requirements and guidelines established during the development of the plan are appropriate and realistic for the particular development conditions of each output and activity; ensuring that the development of each product is based on sound methodology and scientific principles; ensuring that all evaluation activities are applied regularly; identifying possible fragments and deficiencies to introduce imitative corrective measures.

PFA will establish a Quality Assurance Committee, if necessary, to provide high-level advice for the project. The Quality Assurance Coordinator, who will be drawn from the PFA research team, will be tasked with overseeing and assessing project products' quality and activities. A project manager from each organization and a senior researcher will be involved in all project activities to ensure project quality.

Additionally, PFA will be responsible for the qualitative assessment of IO performance in a report that will focus on (i) didactic and pedagogical usefulness; (ii) content; (iii) language; (iv) structure & organisation; (v) aesthetics; and (vi) illustrative material. These aspects will be addressed through the following questions template.

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