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Do Not Dispose My Future!

Raising Ecological Awareness Through Participation of Children

TR2016/DG/03/A3-01/483
Civil Society Support Programme III

TRAINING ON ENVIRONMENT & CLIMATE CHANGE TRAINING BOOKLET

Flying Balloon Child and Youth Association
Çukurova Young Businessmen Association
Development Policy Foundation (Poland)

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PART I

BASIC DISCUSSIONS AND CONCEPTS

The training booklet supports the program by presenting a compilation of key concepts and discussions involved in the Stakeholder Environmental Education Program process.

Education Approach

It is aimed that the stakeholders will have a common learning, discussion and sharing platform with the content of the training, which focuses on ecological environmental awareness and climate change issues. After this training, an applicable environmental education program will be prepared for children and youth. We consider it important to adopt a common approach and strengthen our knowledge transfer before this preparation process, in which all stakeholders can contribute, to ensure the local sustainability of the project.

1. Basic Concepts Related to Environmental Problems and Climate Change

While defining the concepts, it also includes some important discussions that we will make during the education process, along with how they relate to climate change and the crisis.

Climate change: It is the increase in the global temperature and the change in the average climate values with the increase in the concentration of greenhouse gases (carbon dioxide, methane, nitrous oxide, ozone, etc.) in the atmosphere, which are mainly caused by human activities.

The fact that climate change has become an 'emergency' that cannot be ignored anymore is called the **climate crisis**.

Global warming: The increase in the average temperatures measured in land, sea and air throughout the year is called global warming because of gases emitted into the atmosphere because of human activities such as industry, energy, transportation and agriculture. Warming above 1.5 degrees Celsius brings numerous risks to the world: rising sea levels, increased extreme weather events, loss of biodiversity, extinction of some species, food shortages and worsening economic and social conditions for millions of people.

Sea level rise: The rise in mean sea level since the beginning of the 20th century because of climate change. It is known that the increase in the 20th century is mostly due to the thermal expansion of sea water with the effect of global warming, the melting of ice sheets and glaciers on land.

Drought: It is a recurring and often considered normal climatic event. However, it is predicted that climate change will increase the frequency and severity of drought events in many parts of the world. Climate change increases the time between precipitation and disrupts the precipitation pattern. Rare and more heavy rains make it harder for the soil to absorb water, resulting in reduced soil moisture. Groundwater is also not sufficiently fed. Due to the increase in average temperatures, the water loss of the soil increases.

Extreme weather events: Weather events that go beyond the usual seasonal situation and occur with unexpected changes in amount, severity and duration are called extreme or severe weather events. This includes weather events such as floods, droughts, excessive precipitation, tornadoes, hurricanes, heavy snow, and sandstorms. It is predicted that the number of extreme weather events has doubled in the last 10 years and the number and severity will increase even more. According to the data of the General Directorate of Meteorology, 2020 was the year in which the most extreme weather events occurred in Turkey.

Ecological equilibrium: A state of dynamic equilibrium in which a community of organisms can remain stable in genetic, species and ecosystem diversity in the face of gradual changes. The constant number of each species in an ecosystem forms the basis of ecological balance. Ecological balance may be disturbed due to changes in relations between species, sudden deaths or human-induced dangers. For example, overheating of aquatic ecosystems due to global warming causes damage to plankton, reduced productivity of fish, migration and ruptures in the food chain.

Biodiversity: Biodiversity is the name given to the diversity of ecosystems (natural capital), species and genes all over the world or in a particular habitat. With the climate crisis, where we are witnessing a continuous loss of biodiversity affecting natural life and human well-being, it is necessary to embody the main causes of this loss. Mainly: Changes in natural habitats due to intensive agricultural production systems; construction, quarrying activities; increased pollution in forests, oceans, rivers, lakes and soil.

Ecosystem: Terrestrial ecosystems (forest, steppe, etc.), semi-terrestrial and aquatic ecosystems (wetlands, sea, oceans, etc.) store significant amounts of carbon. However, with land use changes and deforestation, terrestrial ecosystems can become a source of greenhouse gases. In the evaluations made by the United Nations Food and Agriculture Organization (FAO), it is revealed that despite the increase in the forest areas in the temperate climate zone, the tropical forests are constantly decreasing and there is a worldwide deforestation. The most important contribution of ecosystems in the fight against climate change is that they act as carbon pools and have significant carbon stocks. The destruction of ecosystems results in an increase in the amount of CO₂ in the atmosphere. More carbon storage can be achieved through forestation and reforestation, rehabilitation/restoration of degraded ecosystems.

Ecosystem services: Another contribution of ecosystems to the fight against climate change is realized through the ecosystem services they provide. Ecosystem services are defined as the benefits or goods and services that people directly or indirectly derive from ecosystems. Not only humans but also other living things benefit from ecosystems. For example, ecosystems provide habitats for living things and produce food for their nourishment. Goods and services provided by ecosystems to living things arise from processes such as material cycles, energy flows, and food chains in ecosystems.

Carbon footprint: The total greenhouse gas emissions caused by a person, an activity, an institution, a service or a product, measured in units of carbon dioxide. When calculating the carbon footprint, direct carbon emissions from the combustion of fossil fuels are measured, including energy consumption in residences and buildings, and transportation (cars and airplanes). In addition, indirect carbon emissions related to the manufacture and eventual deterioration of the products we use are considered.

Greenhouse Gas: Gases or compounds such as Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (NO₂), Hydrofluoride carbons (HFCs) that cause the atmosphere to warm up by holding infrared rays are called greenhouse gases. The main problem is not the existence of greenhouse gases, but the fact that they are over-condensed as a result of human activities, warming the world even more. Greenhouse gases cause some of the solar energy reflected from the earth's surface to be absorbed before it reaches space. This heats the atmosphere and the earth's surface.

Fossil Fuels: Fuels such as coal, oil and natural gas are called fossil fuels. Fossil fuels, which are mostly used for electricity generation, transportation and heating purposes, met 84 percent of the world's primary energy consumption in 2019. The energy sector is responsible for 75 percent of greenhouse gas emissions that cause global warming. Therefore, the top priority among the goals of combating climate change is to end the use of fossil fuels. Instead, it is recommended to encourage renewable energy sources.

Renewable energy: Unlike fossil fuels, it is the energy obtained from renewable sources in the natural cycle and does not release carbon dioxide into the atmosphere when consumed. Sunlight, wind, rain, tides, waves and geothermal heat are examples of renewable energy sources. These resources, unlike fossil energy resources, are inexhaustible and their usage areas are quite wide. There is a trend towards renewable resources all over the world. However, large investments are still being made in energy production with fossil fuels, and failing to prevent this makes it difficult to reach climate targets.

2. Basic Approach and Discussions

The concept of sustainability: Focusing on the rational use of resources, based on the fact that the resources in nature are exhaustible. Sustainable economic models focus on providing economic growth that will bring prosperity to societies without harming the environment. At this point, it is necessary to discuss the concept of sustainability with life-centered and human-centered ecology approaches.

Ecological Awareness: An ecology approach based on the idea that humanity is an equal stakeholder in nature and that people should not use their own species or any other living or non-living species for their own benefit and desire does not take much place in the public.

Some examples we will discuss:

- "Unless we reduce carbon emissions very quickly, ecosystems from tropical coral reefs to polar ice caps will face much more severe impacts."
- The interaction between Havran Dam, bat cave, olive fly, olive cultivation and climate change with the broken cycle.

Effects of climate change on public health: Climate change directly threatens human health by changing weather conditions and the spread of other vector-borne diseases and increasing air pollution. 95% of the world's population lives in areas that do not meet the minimum healthy air limit recommended by the World Health Organization (WHO). Climate change is increasing ozone pollution, which causes asthma attacks and other ailments, while weakening climate systems that can clean polluted air in densely populated areas. Rising temperatures, famine and severe weather conditions are harming food production.

Unless adaptation is achieved, each degree rise in global temperature can reduce crop yields and reduce crop nutritional values worldwide. In many regions, drought can threaten food security. Fisheries and aquaculture are already threatened by warming and acidification of the oceans. These effects are expected to worsen as temperatures rise.

Climate Action: It is necessary to discuss climate action taking into account the objectives of realizing that we are the bearers of an agency responsibility in the current situation, transforming our lives and habits, and transforming ourselves and macro-structures in a way that will minimize the damage we do to life.

Although climate strikes create an important public opinion, climate strikes should not be limited to this. Until climate-friendly steps are taken, a mass climate struggle that will affect the world must be established. With climate mobilization, we can talk about the improvements we aim for in our own individual lives, and beyond that, minimizing

human-oriented ecological damage by limiting activities that endanger the future. For this, it has been increasingly discussed recently that we should aim for an ecologically and socially just and restorative economy, a consumption economy that will strengthen relations based on goodness and mutual trust, instead of consumption that consumes life, and which aims to maximize the value of sharing, knitted with solidarity relations.

Climate Justice: This age, where the planet's life support units are being damaged day by day, is defined as the age of multiple crises. Climate and biodiversity crises, social injustices, and livelihood problems are also the main crises that breed each other. The negative economic effects of climate change are felt more directly in the daily lives of populations living in disadvantaged areas at local scales as well as disproportionately hitting the poorest countries in the world. It is predicted that by keeping the warming at 1.5°C, the cost of climate change will be more evenly distributed between developed and developing countries.

3. Reports, meetings, and formations

COP: Conference of the Parties is an abbreviation for the United Nations Climate Change Conference, which is held every year and is held for the 26th time this year. COP26 is the first summit to evaluate progress since the Paris Climate Agreement was signed in 2015. At COP21, where the Paris Agreement was signed, the targets that were decided to be complied with by everyone were as follows: Reducing greenhouse gases, accelerating the production of renewable energy, reducing global warming to "well below" 2°C and limiting it to 1.5°C if possible, helping poor countries to combat the effects of climate change.

IPCC: The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by the United Nations, the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP). The aim of the organization is to evaluate scientific, technical and socioeconomic studies on climate change caused by human activities, and to guide decision makers in combating and adapting to climate change in line with scientific research.

Turkey is among the IPCC member countries.

Association of Carbon Neutral Cities (CNCA): CNCA is a collaboration of leading global cities working to reduce or zero their greenhouse gas emissions by 80% to 100% by 2050 and/or before. The long-term vision of the Carbon Neutral Cities Association is that member cities will achieve carbon neutrality by 2050 or less, resulting in greater economic well-being, social equity, quality of life and climate resilience for people and businesses. Especially on carbon emissions, the Paris Agreement gained momentum with the promise of being "carbon neutral" by many countries. Countries focusing on this goal aim to zero their carbon emissions by the investments and laws they will make in their countries or cities by 2050. In this context, managers are turning to technologies that will reduce or neutralize carbon emissions. It is argued that a transition to a carbon-neutral world can be achieved by giving importance to sustainable technologies and vision and investing in these areas such as renewable energy technologies, fossil fuel reduction and termination, support for zero waste projects, the use of environmentally friendly technologies in transportation, recycling, etc.

4. Environmental Movements in the World and in Turkey

The “environmental struggle” is the “living space struggle” on a global scale. These activities, which we can define under the environmental movements headline, also include ecology and climate activism.

Examining the historical process of environmental movements in the world, starting from the "Not in my backyard" approach and extending to the demand for climate justice, will make it easier to understand climate actions with different approaches that are still intertwined today.

It is seen that the demands for the local right to the city, the right to food and the right to life, which have developed in the face of prominent urban and rural environmental problems in Turkey, and the struggle for climate change have become common in time.

When we look at the prominent local ecology movements and their achievements, it is seen that the environmental movement is not only an awareness movement, but also reveals its transformative potential, its focus on making a difference in laws and administration, pressure with direct political or supra-political approaches and advocacy mechanisms.

5. Goal of Resilient Cities and Communities

The concept of resilience, that is, resilience, stands out as a topic that is discussed for individuals, societies and cities and covers the gains that need to be achieved in all three areas, especially despite the climate crisis. With this concept, which is defined as the ability to cope with difficulties and crises positively, the necessity of realizing and developing citizens' rights, healthy and well-being, community skills and solidarity while establishing the physical, economic and social infrastructures of cities and societies come to the fore. For example, if we evaluate it on the scale of the urban resilience approach, sustainability, disaster management, comprehensive planning and strategic spatial planning approaches are evaluated. On the other hand, when we think that our ability to cope with the climate crisis will be achieved through some awareness and achievements in the society, it is possible to support our daily life and the organizational processes of the communities we live in with learning processes that care about advocacy, participation, ecological literacy skills and awareness of ecophobia.

Ecological literacy: It is expressed as an individual's understanding of the natural processes that keep life on earth livable. An ecologically literate individual is one who can relate to natural places, internalizes that he is a part of nature, is aware of the positive or negative effects of his choices in his daily life on nature, and acts for a sustainable life in harmony with nature. Ecologically literate people are sensitive in their relationship with nature, sensitive to environmental problems and tend to seek solutions. The importance of the existence of ecologically literate individuals emerges in the creation of sustainable societies.

Famous physicist Capra says about ecological literacy: "The life of humans and other living things in the coming period will depend on our being ecologically literate, that is, understanding the basic principles of ecology and living accordingly." An important consideration in the discussions in this field is that ecological literacy should be the most important skill of politicians, the business world, and professionals in every field.

The goal of forming an important part of education programs at all levels, from kindergartens to universities, is on the agenda of important non-governmental organizations. Because it is claimed that the climate crisis is primarily an education crisis.

Awareness of ecophobia: The concept of ecophobia, which is defined as the anxiety caused by climate change and the accompanying depersonalization and inaction, is a concept that should be at the center of environmental problems and climate change education. In our living spaces under the effects of the climate crisis, which we cannot directly remedy and are increasingly alienated from, it is encouraged to take action, if necessary, by taking steps of "participatory democracy" to protect the nature in the

immediate environment with the awareness of eco-phobia, and to develop creative projects instead of alienation. In the book "Overcoming Ecophobia", written by educator David Sobel on nature and environmental education for children, the suggestion "start with your immediate environment first" draws attention to processes that are relatable and applicable.

6. Rethinking Systems

Thinking about, learning about and reorganizing systems from the body to the planet, from ecosystem cycles to cities is seen as part of the process of tackling the climate crisis. In this context, it becomes more possible to discuss sustainability with the awareness to be obtained, for example, by examining the ecology of the food web.

We come across food chains and the food webs they are a part of in the process of learning about the food cycle, which is one of the most basic areas of the ecosystem. A detailed assessment of human impact on feeding webs provides an important opportunity in the goal of creating an ecological curriculum. Trying to feed at the top of the food web is not sustainable. A new generation of ecological literacy, which is more aware of the key roles of food webs for sustainability and considers food web ecology together with other systems, should be targeted.

Considering the cities as important areas where the fight against the climate crisis will begin, as well as the existing systems that reinforce the climate crisis, seems possible as the experiences of restorative practices and the organization of solidarity communities become widespread. In this context, some examples will be included in the training presentation, and the feasibility of applications at different scales in terms of localities will be discussed.

PART II. THE SCOPE OF THE CLIMATE CRISIS AND EXAMPLES OF SOLUTIONS FROM THE WORLD

AGRICULTURE IN FIGHTING CLIMATE CHANGE

Global climate change affects the entire ecosystem as well as the agricultural production processes. Disruptions in agricultural production, which is one of the areas most affected by climate change, are of critical importance for humanity. Therefore, it is necessary to determine how climate change affects agricultural production processes and to offer environmentally friendly solutions against them.

First, let's look at the negative effects of these changes. With climate change, waterways that have been used in agricultural production for hundreds of years are deteriorating and relocating. Extreme natural events are becoming more frequent due to extreme weather conditions, while drought increases, on the other hand, excessive precipitation causes floods. While this situation brings along desertification, dangers such as soil erosion increase.

A. DISCOVER THE PROBLEM AND BE RESPONSIBLE; HOW DO WE ADAPT?

The ecological problems mentioned above, which have started to make themselves felt, will affect our agricultural areas and production with all their weight in the very near future. Therefore, first, we must understand the problems in question, find out what their sources are and be able to develop sustainable solutions against them.

The first thing we can do for this is to observe how the crisis affects family farms. We should then be able to measure agricultural vulnerability by assessing current climate change risks. Thus, we should think about what practices we can develop to prevent these vulnerabilities and plan the adaptation processes. We must be able to mobilize the mass that can plan and act for the adaptation in question.

We can briefly summarize these actions as follows; We can conserve soil and water by minimizing tillage. Turning to temporary irrigation, known as complementary irrigation, increases the amount of harvest on the one hand, and on the other hand helps us to overcome the drought during the periods with low rainfall. Using modern technologies such as dripping saves water. Increasing the fertility of the soil allows plants to absorb water better, so that times of drought can be overcome more easily.

B. EXAMPLES OF ADAPTABLE FARMS FROM THE WORLD

1. Vertesacsza, Hungary;

In this family garden, which was plowed and planted intensively with traditional methods before, ecological planting methods are tried with various methods later on. Thus, a part of this large family garden is planted with red pine trees, while others are turned into orchards, using a method called agricultural forest. Various wild fruits were planted in this orchard, which was created on 3 hectares of the farm, which consists of 12 hectares in total. Among these, various products such as 9 kinds of wild rose, wild apple, wild pear, bird cherry known as aronia, stone pear, cranberry, mulberry are grown. After this diversified assortment has been harvested and passed through the fruit processing plant, the remainder is converted back into quality feed for farm-raised animals.

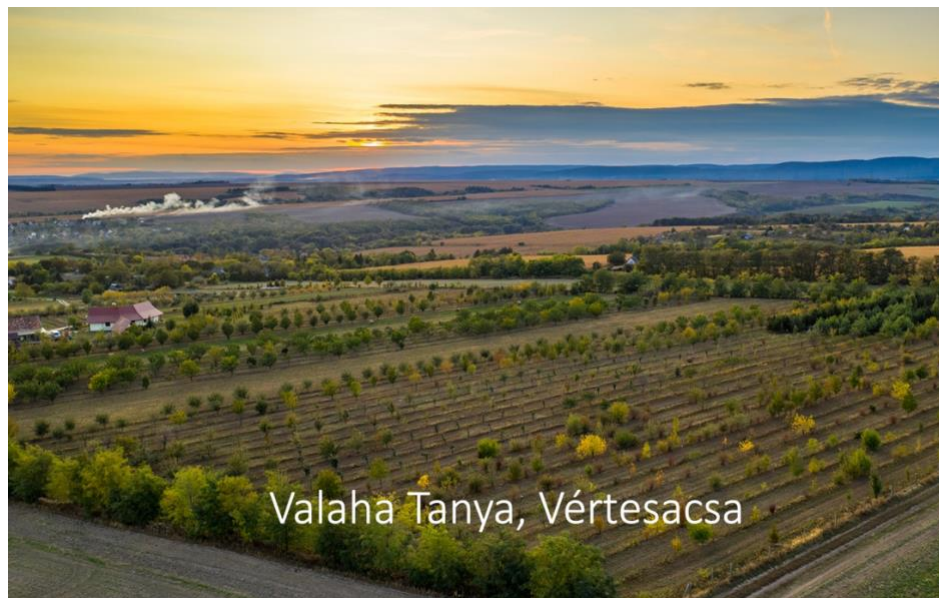


Figure 1: A small village in Székesfehérvár, Hungary.

The system in question has the efficiency to be pruned many times and harvested many times. At the same time, the pine forest planted in the farm has many benefits; These pines can be sold as Christmas trees, while the cones are used to make syrup. Pine leaves and branches, which are cut and crushed and laid on the ground, increase the quality of the soil by making the soil more acidic. At the same time, various mushrooms which has economic value grow around these pines. Weeping grain fungus (*Suillus granulatus*), sycamore mushroom or red pine mushroom, *Lactarius deliciosus* are some of them. Blueberries are also produced in this area.

On the other hand, windbreaks are created thanks to the tree paths planted around the farm. Thus, the microclimate of the environment is softened. At the same time, Black Acacia (*Robinia Pseudoacacia*) has been planted for nectar production in the

environment. Flowers are harvested from Black Acacia and elderberry to make various syrups. At the end of all these harvests, active firewood is obtained from the pruned bushes.

As can be understood from all this transformation, this farm has a self-sufficient transformation. The farm has its own well, its own firewood, thermal pipes, solar panels with spare batteries, biological treatment systems and compost facilities. But the farm that is self-sufficient in energy use and recycling but is not self-sufficient when it comes to food. For example, grain is not produced on the farm, it is not self-sufficient in this respect. However, for example, the syrups produced generate income by being sold, so they can sustain themselves. However, in such family farms where the surplus value is produced by the employees, the main purpose is not growth, the aim is to produce quality handmade products.

2. Döbrokoz, Hungary;

In this farm, instead of plowing the soil, a system called "cover cropping" is used. Planted in the off-season after the crop is harvested, these cover crops prevent soil erosion, improve soil fertility, improve soil quality, conserve water, prevent weeds and pests, reduce diseases, increase biodiversity, and aid the wildlife cycle in an agro-ecosystem.



Figure 2: Pine branches milled for mulch.

In this farm, agriculture is done with a method called "conservation farming" (CV). Conservation agriculture, as defined by the Food and Agriculture Organization of the United Nations, is "An agricultural system that promotes minimal soil degradation (i.e., no-till farming), maintenance of a permanent land cover, and diversification". This

system preserves biodiversity, natural biological processes on and below the earth's surface. Thus, water and nutrients are used more efficiently, contributing to sustainable crop production.

Grains such as maize, cereals and soybeans are planted on 30 of the 50 hectares on the farm. 5 hectares were parceled out in a mosaic manner and allocated as a trial area. The other five hectares are allocated as forestry, perm culture, floriculture, greenhouse cultivation, fruit growing and pasture. Again, a certain area is reserved for livestock and 40 pigs, 5 cattle and 40 dairy goats are raised here. Products with added value such as artisanal smoked meat and smoked goat cheese are obtained from these animals.



Figure 3: Livestock that are part of permaculture farming on the farm

Various methods are being tried in order to use the land sustainably and to produce suitable for conservation agriculture. One of them is crop rotation, different crops are grown on the farm each term, thus maintaining the mineral balance in the soil. On the other hand, alfalfa is planted every four years. The land is parceled in mosaic type so that water retention and savings can be made naturally. Natural mulching is done to maintain the moisture balance and yield of the soil. At the same time, the soil is plowed very little or not at all to prevent water loss.



Figure 5: Straw from farm harvest is used for animals.

There are 9 members working on the farm and three of them are young farmers. This farm also receives subsidies from the government. The farm's future plans include creating a larger cheese making facility, a larger fruit and vegetable processing facility, a facility for preparing smoked products, and new potential markets.

3. Hosszuheteny, Hungary

This is an exemplary perm farm, which has the diversity, stability and resilience of natural ecosystems. It is based on the conscious design of agriculturally productive ecosystems. This five-hectare farm is a pesticide-free, diverse agro-ecosystem free of invasive species.

The basis of this method, called regenerative agriculture, is a sustainable relationship between the people living there and the land. People who cultivate the land produce food, energy, shelter and other material and spiritual needs in line with the principle of sustainability. Thus, this entire cycle of production and consumption can be integrated into the existing natural cycle by exhibiting a harmony.

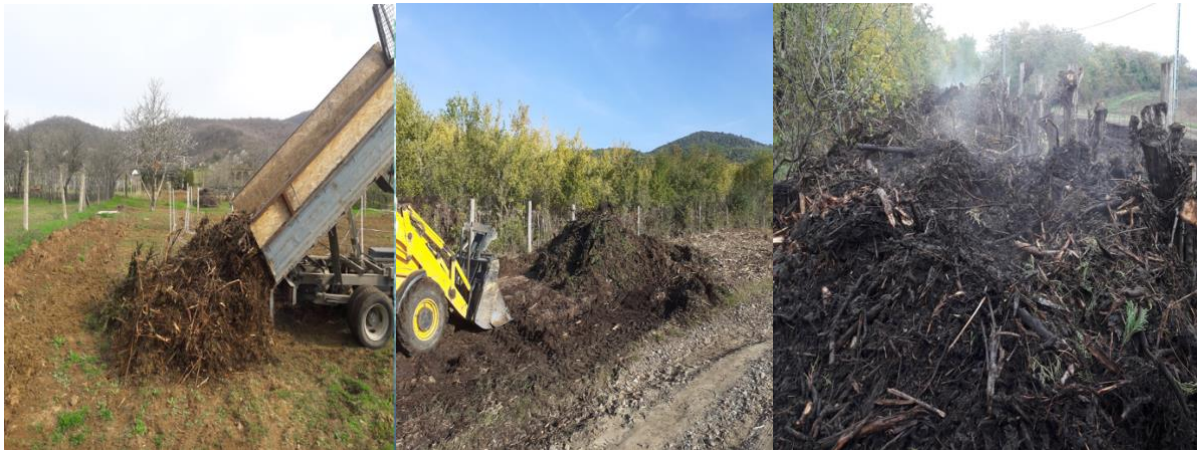


Figure 6: Making mulch compost.

This farm uses natural mulch. All kinds of organic vegetable wastes such as branches, grass, straw, sawdust, logs, leaves are collected in a 400 m² green waste box and then used as mulch. All tools and gardening services used here are covered by the municipality.

Herbal wastes, which are ground by a tractor with blades at the end, are distributed and laid on the field. Manure is laid under the mulch in question, and a mulch of at least 40-50 cm thick is laid on top of this manure. Thus, the soil holds more water and moisture on the one hand, and on the other hand, the diversity of microorganisms increases thanks to rotting plants.

Every product produced in this cycle can be recycled later. The leaves falling from the trees are used as mulch, the excrement produced by the horses is used as fertilizer, natural afforestation is made in the forests of black trees, figs are planted around, mixed pastures are used for hay and grazing.

C. INNOVATIVE SOLUTIONS FOR SUSTAINABLE AND HEALTHY WATER MANAGEMENT TO FIGHT CLIMATE CHANGE

Introduction

Among the problems caused by the climate crisis, the one that will affect our lives the most is the water crisis. The total amount of accessible fresh water on Earth is less than 1 percent of the world's total water supply. Despite this scarcity, the sustainability of our water resources is the basis of many areas such as our food security, economic growth, and combating climate change. However, at the point we have reached today, water scarcity stands out as one of the biggest problems experienced by the whole world.



Figure 7: One of the most obvious indicators of the climate crisis is water scarcity.

Rainforests, which are the lungs of the world, regulate the rain balance of the earth and provide oxygen to the atmosphere, have one of the most important functions in terms of maintaining the water balance of the world. So much water vapor rises from these vast forests that huge rain clouds form over the forests. That's why we call these tropical forests "rainforests". When these self-producing forests disappear, the water cycle is disrupted and the climate in the region changes.

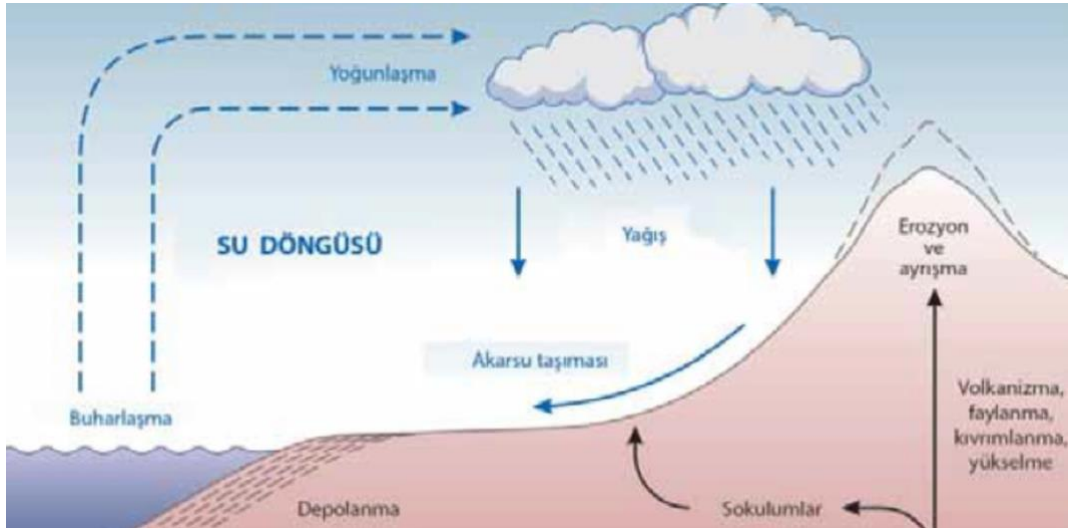


Figure 8: The world's water cycle is vital for ecological balance

With the deterioration of the water cycle in the world's ecosystem, usable ground and surface waters are gradually decreasing. Lakes, streams and seas are becoming increasingly polluted and access to water, which is essential for life on earth, is becoming increasingly difficult. It is predicted that this access problem will lead to great water wars and famine in the very near future.

A number of start-up projects and various private initiatives have prepared effective projects to provide sustainable solutions to the water problem. Some of them are listed below.

SOLUTIONS

1. PROTE-MOS;

Innovative Solutions for Sludge Reduction in Waste Water Treatment Plants

This innovative technology can be installed at zero investment cost. The technology, which guarantees at least 20% reduction in the amount of sludge produced by the Wastewater Treatment Plant, promises that it can increase up to 70%. Moreover, this technology promises a significant reduction in waste sludge from the first month of use. Moreover, it is promised that the costs in the businesses that use it will decrease. Another positive aspect of this technology is that it improves the existing wastewater quality.



Figure 9: Sludge accumulated in treatment plants can be recycled and used in various fields.

On the one hand, electricity consumption in the waste facility is reduced by up to 62%, on the other hand, it reduces the need to use various chemicals used to reduce phosphorus. Thus, measurable financial and organizational benefits can be directly accessed from the first month of implementing this technology.

2. PROTE-POS ;

Transformation Of Unwanted Bio-Waste Into High Quality, Certified Agricultural Fertilizers

Thanks to this technology, it is possible to completely transform the sludge from the wastewater into a quality and certified agricultural fertilizer. Thus, the sewage problem, which is a very big problem, is solved and quality fertilizer is obtained as a by-product of this solution.

In this way, unwanted wastes are transformed into new generation agricultural fertilizers with added value and become marketable. Moreover, these fertilizers can be shaped according to the needs of the crop to be grown and produced in optimal balance and granule form, considering the structure of the soil. To do this, the construction of the necessary technological line can be designed as modular and scalable and ensures the use of 3,000 tons of sewage sludge per year in total. It is a modern, safe and environmentally friendly technology for converting unwanted waste into demanded agricultural fertilizer. Moreover, the company also guarantees increased revenue for its distributors compared to conventional fertilizers available on the market.

3. PROTE-FOS;

Efficient way to get crystal clear water in lakes. Innovative vessel PROTEUS as a patented system for the complete rehabilitation of aquatic reservoirs

Thanks to this innovative and cost-effective boat, phosphorus can be easily removed directly from the bottom sediments of polluted lakes. Thus, the food sources of cyanobacteria and algae that cause water pollution are eliminated. In this case, the lack of oxygen caused by algae explosions in the lake and the death of the ecosystem can be prevented, and the lake can be cleaned. This special boat, which lays a special kind of sea sponge at the bottom of the lake, can clean the lake through these sponges.



Figure 10: Algal blooms in lakes can cause the entire lake to die.

At the end of this process, the transparency in the lake can be increased and the oxygen conditions in the lake basin can be improved, which allows aquatic plants to re-colonise on the lake floor and helps the diversity of the ecosystem. This technology stands out as an effective and permanent method in eliminating the eutrophication¹ process in the lake. The project, which presents the innovation in question, promises to provide biological balance by increasing the self-cleaning and biological regeneration capacities in aquatic ecosystems.

4. SEMBIO ;

Controlling the Cleanliness of Potable Water with Bio-Observers

Accessible safe drinking water is very important in big cities today. Although drinking water suppliers periodically perform lab reversals, this innovative technology can work as an adjunct and complementary monitoring mechanism to these tests. Thanks to the shelled mussels that SYMBIO uses, sudden and significant toxic changes in water parameters can be measured instantly and precisely.

¹ *Eutrophication*; In large aquatic ecosystems such as lakes, it is the name given to the excessive proliferation of plankton and algae as a result of a large increase in the nutrients included in the lake from outside and for various reasons. This may lead to the death of the aquatic ecosystem in the long run by reducing the dissolved oxygen content in the water.

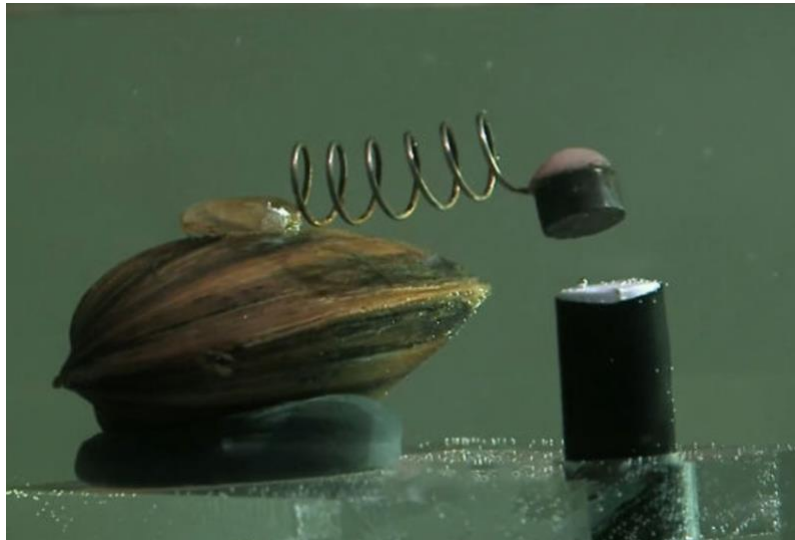


Figure 11: Mussels used to check the safety of drinking water.

These highly sensitive mussels are followed online and digitally with sensors after they are left open in a water-specific mechanism. These mussels, which close quickly in sudden changes in water, can work as a preliminary alarm mechanism for the safety of drinking water.

5. SeaQuest;

Cleaning of Water Supply Pipes and Prevention of Secondary Pollution

Thanks to this innovative solution, it is aimed to stop and clean the corrosion in the water mains system and to prevent the formation of corrosion again. Thus, it can be ensured that the water in the entire water network and finally in the line extending to the tap of the consumer is cleaner. At the same time, incorrect reading problems in water mains caused by corrosion can be eliminated.



Figure 12: Drinking water pipes can corrode over time.

Thus, the technical and sanitary condition of the network can be improved while ensuring continuity and cleanliness in the water supply. In this way, various disinfectant doses to be mixed with water can be reduced. Thus, the proper functioning of the water supply network is ensured and its life is extended. On the one hand, electricity consumption is reduced, on the other hand, significant savings are made in operating costs. To date, SeaQuest has cleared approximately 20,000 kilometers of water supply lines.

D. SMART AND COST CREATIVE SOLUTIONS TO FIGHT CLIMATE CHANGE

In this section, we will cover small but effective solutions to the climate crisis in small farms around the world. All these small-scale creative solution proposals are both cost-effective and easy-to-make solutions that can be applied to everyone's daily life. Each of us can apply these little practices to better realize what climate change is causing and to find solutions to it. Only by applying these small and simple solutions directly can we understand what the climate crisis really means, and by involving those around us in these practices, we can realize the reality and destructiveness of the problem.

1. Underground Greenhouses

Underground greenhouses are an economical solution that is established slightly below this depth by calculating the freezing point of the soil, and by combining the heat from the sun with the soil's own heat, it creates a suitable environment for plants to live with high energy efficiency. The thermal heat of the soil prevents frosts during the winter and ensures that the greenhouse remains at ideal temperatures. The same geothermal heat can keep the temperature at an ideal level by preventing the greenhouse from overheating in summer.

The installation of an underground greenhouse is quite simple and inexpensive. On the other hand, building the greenhouse underground may offer a more aesthetic solution than building it on the ground. On the other hand, it requires very little maintenance compared to the above-ground greenhouse, and its maintenance is much easier and inexpensive. Moreover, while keeping the soil moisture underground for a longer time, the weed problem is less experienced. Another important advantage of underground greenhouses is that they can protect the product from pests and chemicals. Moreover, it can be used for livestock under the same productive conditions in an additional shelter that can be built next to the greenhouse.

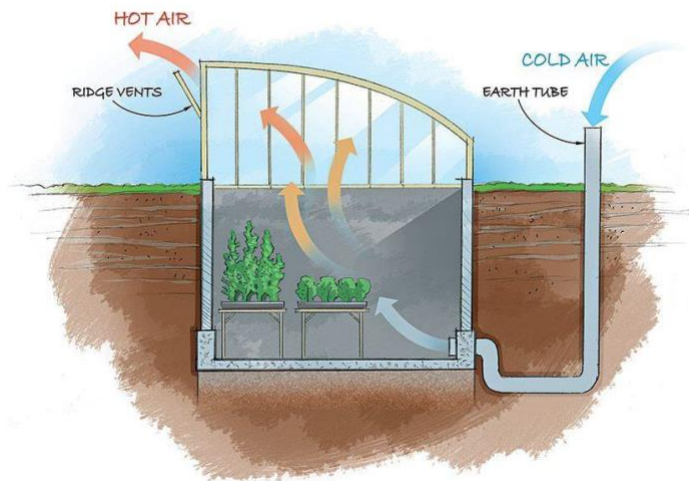


Figure 13: An example of an Underground Greenhouse

2. Thermo-solar Sleeves

While this new technology beehives offer an ecological solution, it can also offer an important opportunity for organic honey production. At the same time, one of the biggest problems of beekeeping, varroa, is dealt with thanks to this technology. These beehives, the front of which consists of a completely transparent glass, are covered with solar panels. Thus, the farmers can monitor the status of the colony and intervene in case of potential problems without ever opening the hive. At the same time, the solar panel on the top ensures that the hive always remains at the ideal temperature. Thanks to the ideal temperature maintained throughout the winter, the farmers do not have to add extra sugar to the hive.

While increasing the inner comfort of the colony, much higher quality and organic products can be obtained. Moreover, an increase in yield from 25% to 75% was observed in the amount of product obtained.



Figure 14: An example Thermosolar-hive

3. Using Bumblebees for Pollination

We often hear about the vital importance bees have for our ecosystem. This vital role that bees play in the ecosystem does not only come from producing honey. They have a much more important task than that. The bees collect the pollen, that is, the pollen that allows the plants to reproduce, and they play an important role in pollination. Because plants need the help of wind, water and some living things in order to transport their pollen and seeds to other places. Although flies, butterflies and birds are also carriers, bees are the creatures that can pollinate the most in nature.

Therefore, bees are frequently used for pollination in modern agriculture, greenhouse cultivation and orchards. While growing eggplant, strawberry, pepper, various fruits and vegetables, the bees released into the environment can increase pollination and provide great improvements in the quality and yield of the product. The bumblebee hives specially designed for this job have been developed to provide optimum conditions for the development of bees. Thus, the pollination process can be carried out in a healthier and safer way by protecting it from external pests. At the same time,

these hives are enriched with various nutrients so that the larvae of the bumblebee can grow and work in a healthy way.

The effects of bumblebee on pollination are much more efficient than normal honey bees or manual pollination by humans. At the end of these processes, great differences were observed in the aroma, shape, quality, and yield of the products in question. A bumblebee can pollinate more than 3,000 plants after 8 hours of work. Therefore, these bumblebees used for pollination are a very effective method as well as being a natural solution.



Figure 15: An example wasp hive

4. Drying Fruits and Vegetables in the Sun

Thanks to this very cheap and simple technique that we can do ourselves at home, we can prevent the waste of fruits and vegetables and preserve our nutrients in a healthier way for a much longer time. In this system, which we can solve with a dark surface under a glass and ventilation, we need a cold air inlet and a hot air outlet. While the sun heats the inside and dries our product, excess moisture will be thrown out from the ventilation gap.

Thus, the products we try to dry will be protected from rain and insects and turn into quality and healthy products.

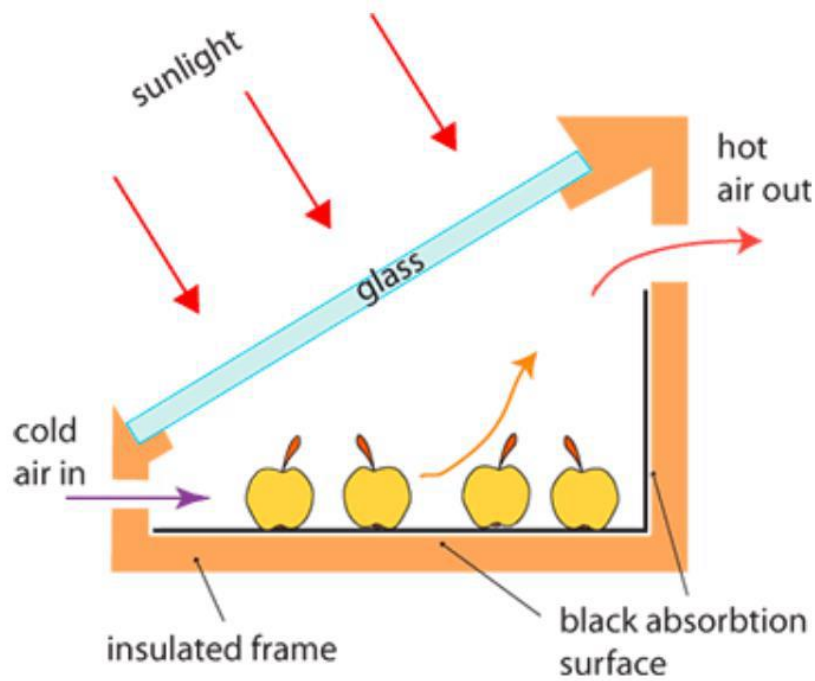


Figure 16: An Example Drying Chart

5. Intelligent Rainwater Collection Tanks

One of the biggest problems of the climate crisis is possible water shortages. That is why it is essential to collect the rains that fall in cities, households and public spaces and reuse them according to our needs. These rainwater collection tanks can grow, shrink, and change shape according to the size of the buildings, according to the needs of the households according to the parks or, for example, in irrigation of the medians. However, the basic logic is the same in all these examples. A large surface that can be opened and a tank where the waters come and collect are required. This technology has the capacity to be used very effectively at a very cheap cost.



Figure 17: An Example Rainwater Collection Mechanism

E. FIELD TO FORK ACADEMY: Local Food and Short Supply Chains – Processing and Food Incubation Centers: Case Study

1. What is Manufacturing Incubators?

These incubation centers are places where a farmer, an agro-tourist or raw material facility owners can run their business using the infrastructure, machinery and equipment and consultancy services of the incubation center.

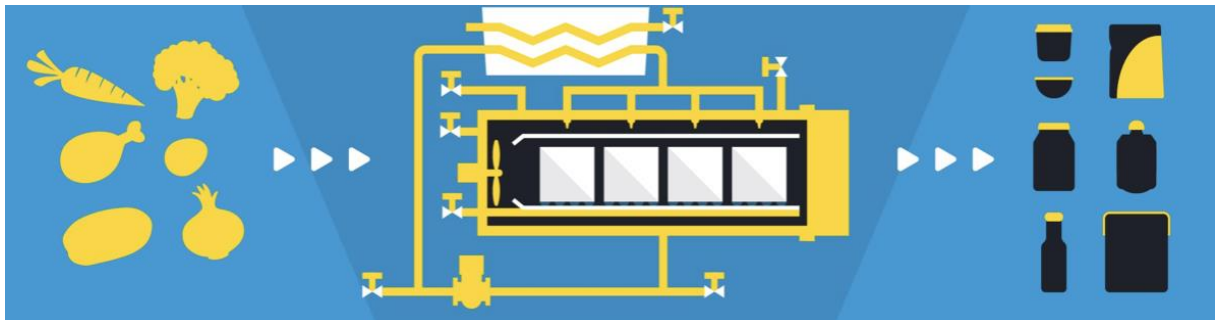


Figure 18: The processing scheme of the incubation center

These incubation centers can, for example, lead a food manufacturer to set up its own facility. Instead of starting with a costly investment such as building a new facility, raw food producers can try out the skills and marketability (packaging, labeling, distribution and sale) of their products in these centers to process their products in compliance with sanitary regulations.

2. Why Manufacturing Incubators?

The processing and introduction of new products to enter the food market require certain safety and health inspections. In the event of a possible uncertainty regarding the market success of the product to be marketed, novice manufacturers may not be able to fulfill it and these attempts may not be fruitful.

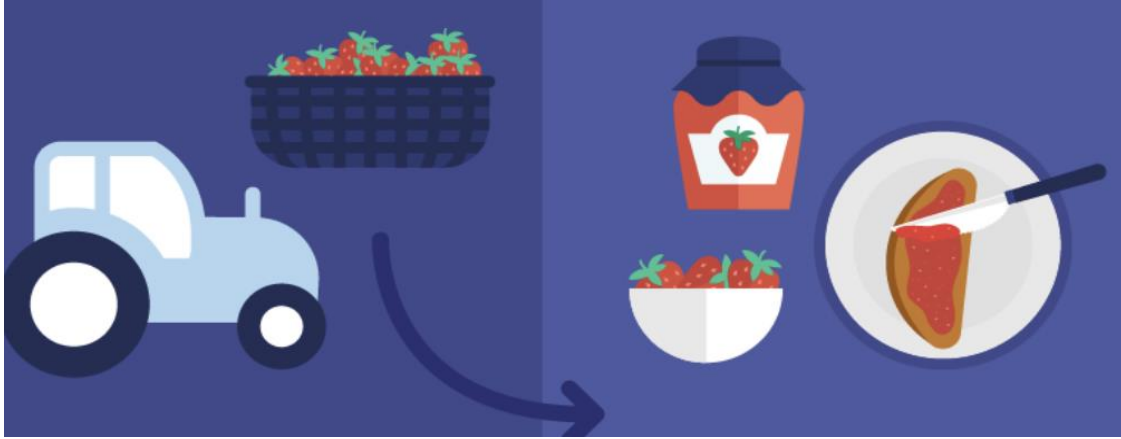


Figure 19: The Farm to Fork initiative targets safe food.

On the other hand, to introduce a new product to the market, it may take some time to select the best production technology and the best devices before the final purchase. Re-engineering or building an entirely new facility, or purchasing equipment from scratch, may not be profitable for small producers. Manufacturing Incubators were created for such needs. The possible demand and profitability of a new product can be easily tested in these incubators. This center allows us to test the possible success of new ideas while helping to produce and launch a new product.

3. Key Goals

The main goal of incubators is primarily to ensure that farms have access to the necessary infrastructure to produce their local products. Thus, farmers who produce using traditional methods using local products are supported to sell their products. Thus, domestic products can be sold to both tourists and local people at certain sales points. This supports the growth of both local produce and the high-quality traditional healthy food market.



Figure 20: Supporting local farmers is important to access healthy, safe and inexpensive food.

The primary aim is to mobilize, incubate and assist farms in the production process and marketing of local products, giving them access to the full technical infrastructure that meets the sanitary and hygienic requirements for production.

4. An Example from the Dwikozy Commune

Working in partnership with the Dwikozy Commune, the Center for Business Development and Entrepreneurship in Sandomierz aims to establish and operate a processing incubator, also called a kitchen incubator, in Dwikozy. The aim of this incubation is to lead and accelerate the economic transition in rural southeast of Poland. These efforts have extended in recent years to public sector economic development planning and non-governmental organizations as well as general business development.

Incubation Facilities in Dwikozy;

- Multi-purpose compact machines for physical (vacuum and high pressure), mechanical (mixing and homogenization) and thermal (+120oC sterilization temperature) processing of fruits and vegetables
- Hopper type dryer can be used to dry 4500 kg of herbs, fruits and vegetables in one go.
- Apple peeler
- Stone fruit drill
- Slicer - replaceable disc slicer
- Fruit crusher
- Juice extractor

- Pasteurizer for juice
- Pasteurizers for canned jars
- Oil press
- Quick freeze freezer (quick cooler)
- Packaging machines for products
- Sherbet ice cream machine
- Convection steam oven
- Gas oven
- Heating stools



Figure 21: Various equipments are available for food processing in incubation centers.

Inside the building, there are rooms adapted to the needs of incubation operations. It includes the preparation of raw materials, a production room, packaging warehouses, accessories and finished products, as well as cleaning and socializing rooms, toilets and a small training room. There is also an independent drying room for fruits and vegetables, working with heating fuel, at the back of the building.

On the other hand, there is a separate entrance and maneuvering area, which is used for safe unloading of raw materials, parking of vehicles during production, parking of those who come to training courses and study visits.

5. The products processed in the incubation are as follows;

1. Dried fruits (apple, pear, apricot, plum),
2. Jams, marmalades and fruit preserves
3. Vegetable Pickles



Figure 22: Various products can be produced in the incubation centre.

Products are made from raspberries, currants, apples, plums, apricots, strawberries, tomatoes, cucumbers, peppers, cabbage, onions and many other local raw materials from the region. On the one hand, fruits and vegetables are processed in the incubation center, on the other hand, other products (dried herbs, fruit mousse, vegetable sauces, cakes, etc.) can be produced to the extent that technological equipment allows.

6. Purpose of the Incubation Center in Dwikozy

One of the aims of the center is to facilitate the sale of local products, including eco-products produced by 80 traditional farm owners and operators using local raw materials. The aim is to sell these locally produced canned and delicatessen products to tourists and local people, and to enrich and expand the local product supply at the sales points.

this incubator also promotes the growth of market share of local produce and high quality traditional healthy food. It is among the objectives of incubation to help with new businesses to produce and find markets, and to test the success of new ideas.

7. Benefits of Incubation Center in Dwikozy

With the establishment of the incubation center, new products could be introduced to the market with the rich fruit and vegetable resources in the region. Thus, potential

increases were achieved in the supply of local products. In this way, both local people and tourists had the chance to taste the famous fruits and vegetables of Sandomierz. Farmers who produce and sell their own fruits and vegetables with added value have achieved significant economic gains.



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