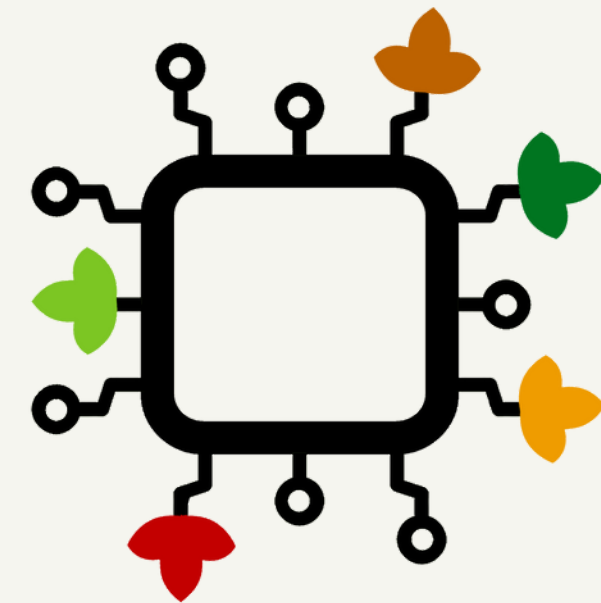


Science Concepts and Technologies in the field of Agriculture

The Green STEAM Incubator



Green
STEAM
Incubator

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Partners

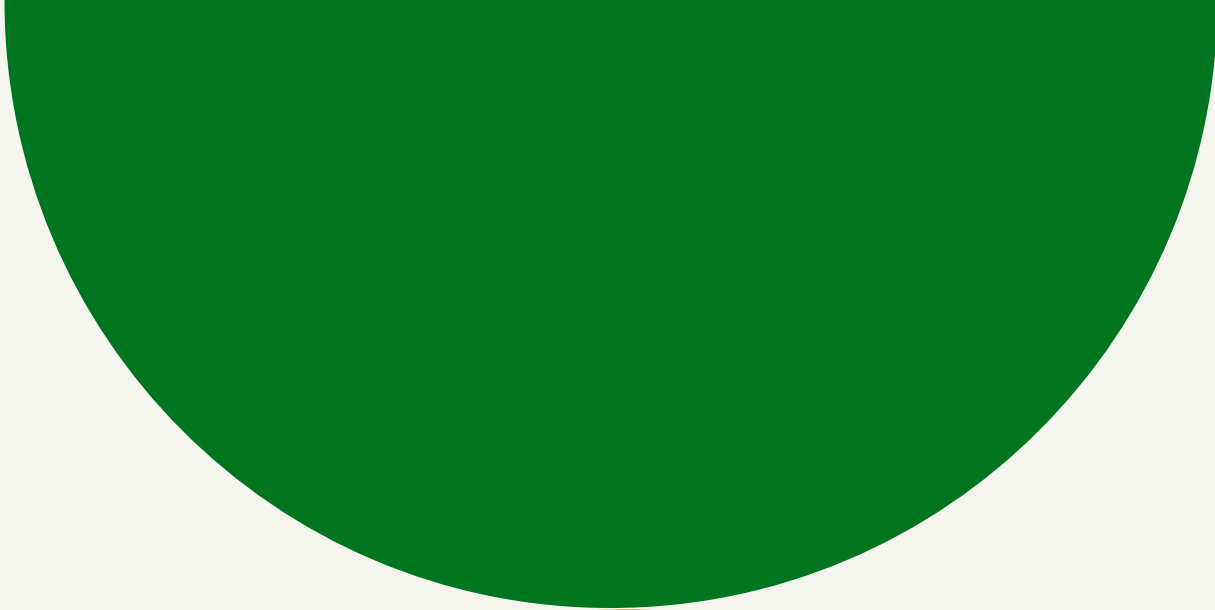
THE CONSORTIUM



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Science Concepts and Technologies in the field of Agriculture

Environmental conservation & sustainability



Preserve the fragile ecosystem that we live in from pollution and degradation and extinction of species (Ramanik P., Sharma D.K., Maity A., 2014).

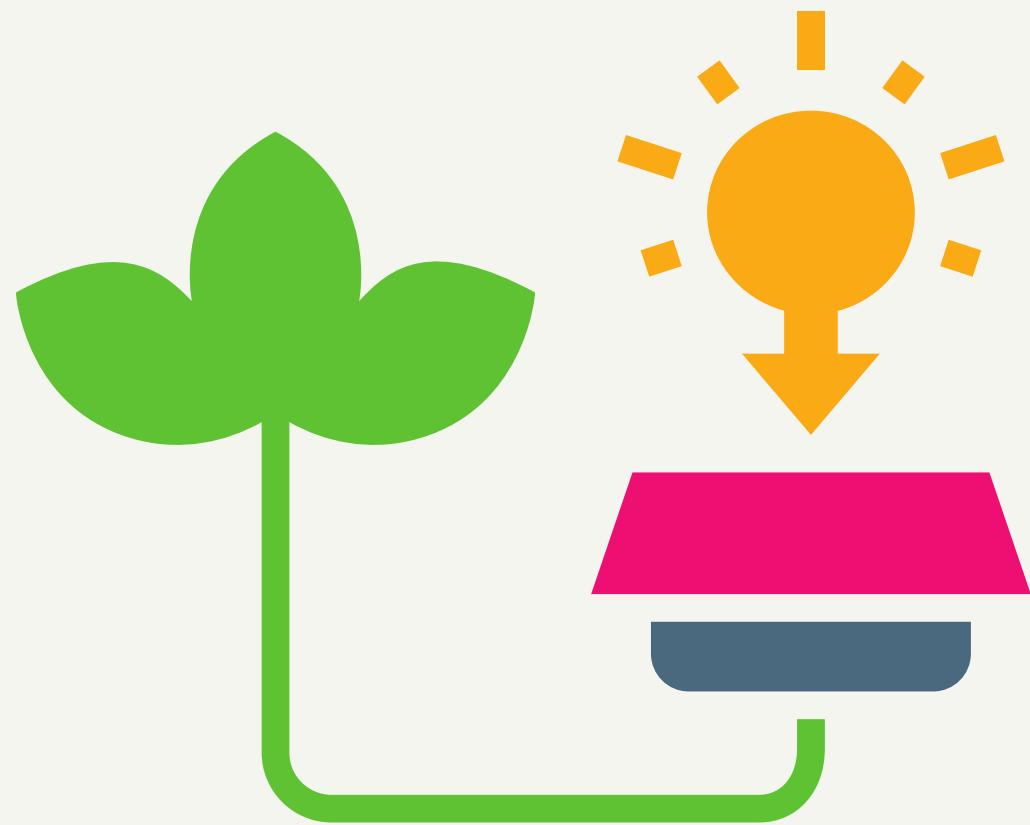
Conserve natural resources and develop alternate sources of power in a more energy-efficient and protective way

The top 5 sustainable and eco-friendly farming practices are:



- PERMACULTURE
- AQUAPONICS AND HYDROPONICS
- ▲ THE USE OF RENEWABLE ENERGY RESOURCES
- ◆ CROP ROTATION AND POLY CULTURES
- PLANTING TREES TO INCREASE CROP YIELDS

Renewable Energy Resources

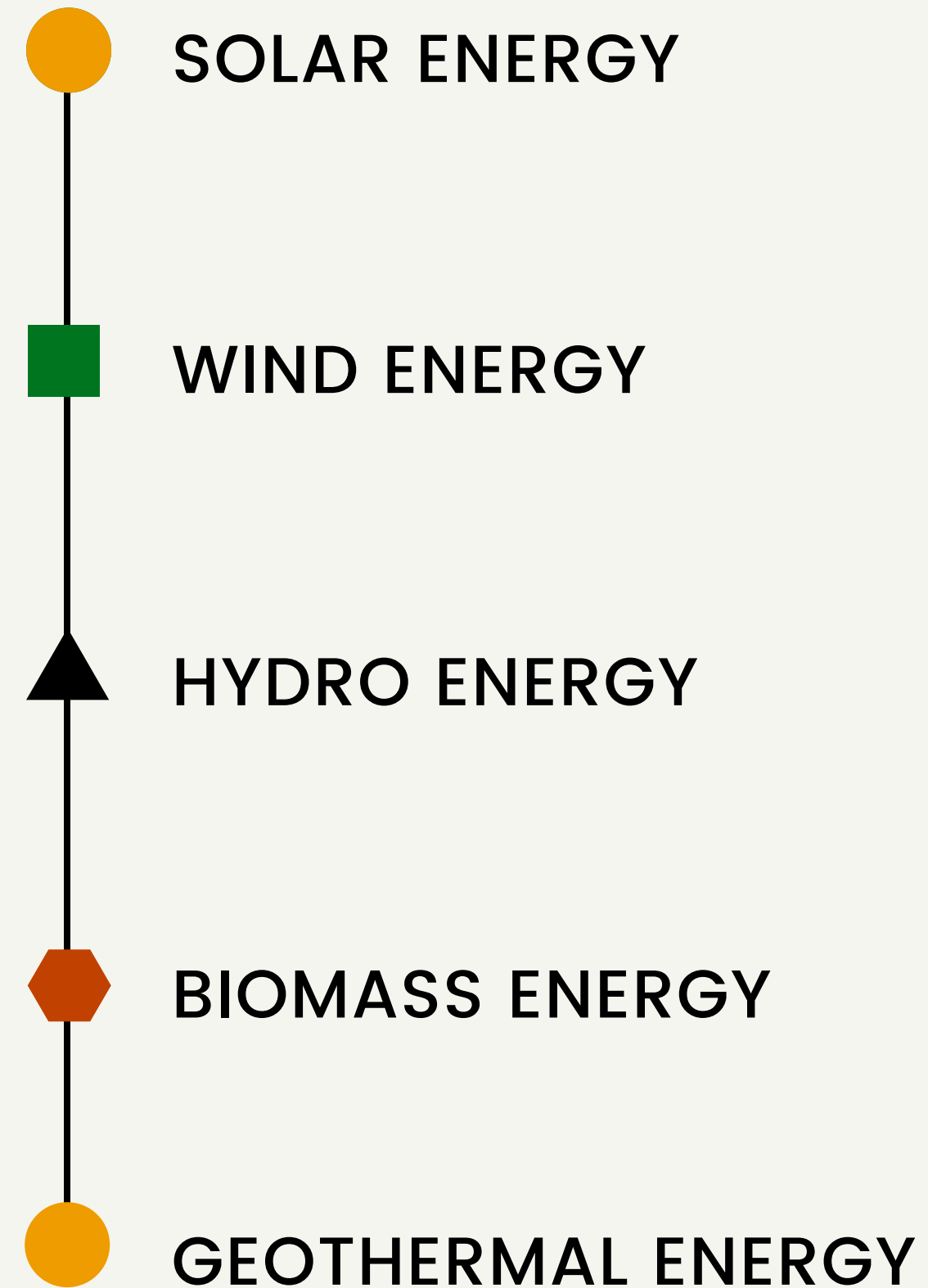


Provide a cleaner and more sustainable energy system.

Renewable energy sources may be carried out according to the climate of the country in which it is planned to be implemented.

In Cyprus, solar energy is suitable for sustainable energy development.

The most popular renewable energy sources



Keyline system

INVENTED BY THE AUSTRALIAN FARMER AND ENGINEER P. A. YEOMANS (1950S)

A contour amplification system of the land to control rainfall runoff and allow rapid irrigation without the need for terracing.
(Possible Media, 2015)

Optimizing the use of water resources of a patch by using natural topographical features and technical flow arrangements through demarcation lines.



Keyline subsoil ripping takes place every year as part of a water management system (Crkeyline, n.d.)

APPLICATIONS CAN INCLUDE

Keyline water management enhances the water efficiency of any production system.



ECOLOGICAL RESTORATION

ALLEY CROPPING LAYOUT

PASTURED LIVESTOCK & GRASS FARMING

AGRO-FORESTRY & FORESTRY LAYOUT

ORCHARD LAYOUT

URBAN PLANNING

SILVO-PASTURE LAYOUT

ANNUAL VEGETABLE PRODUCTION

WATERSHED PLANNING & MANAGEMENT

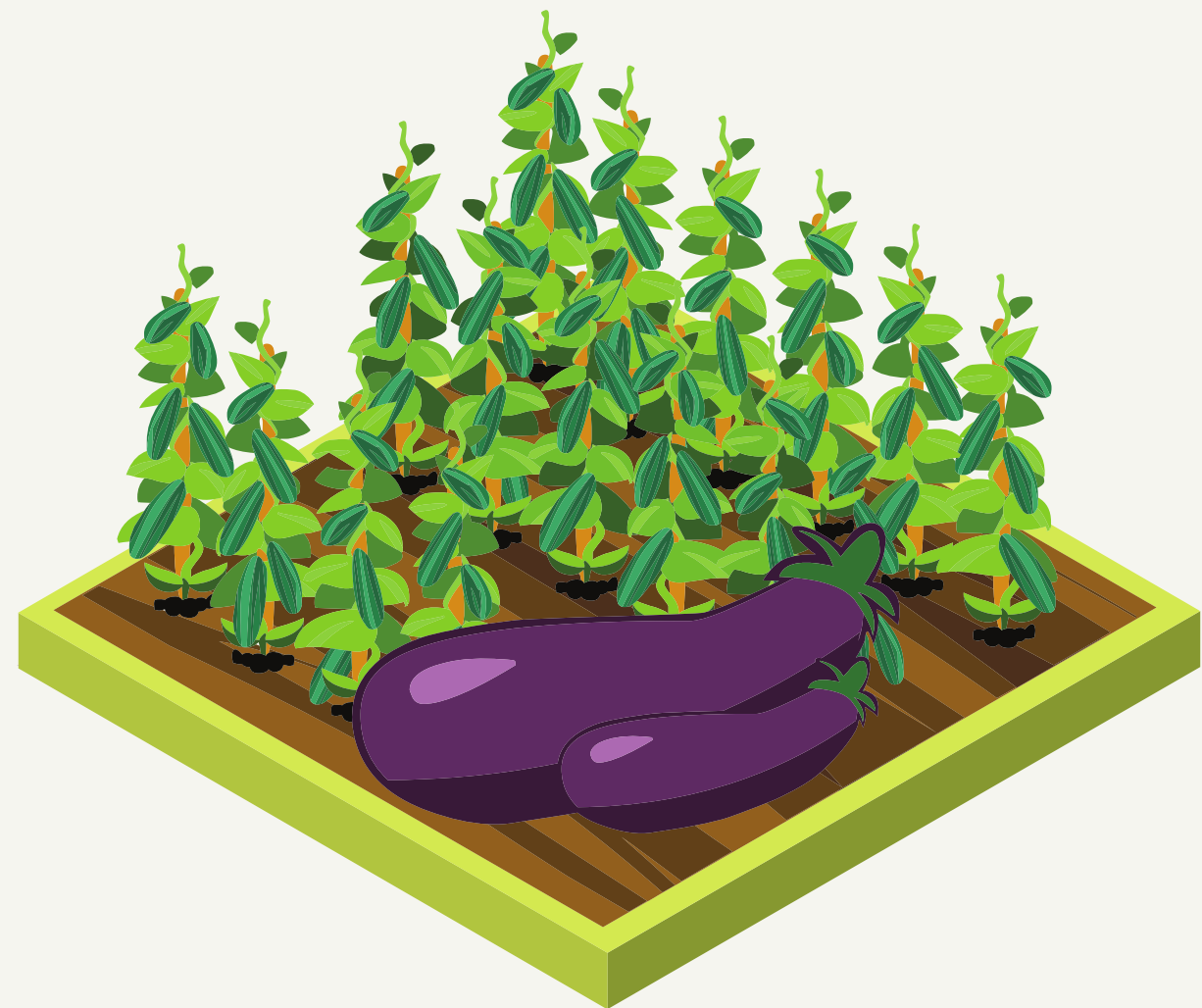
Organic Farming



An agricultural method that aims to provide food using natural substances and processes (FAO, 2018).

- The responsible use of energy and natural resources
- The upkeep of biodiversity
- The preservation of regional ecological balances
- The enhancement of soil fertility
- The maintenance of water quality.

Permaculture and differences with organic farming

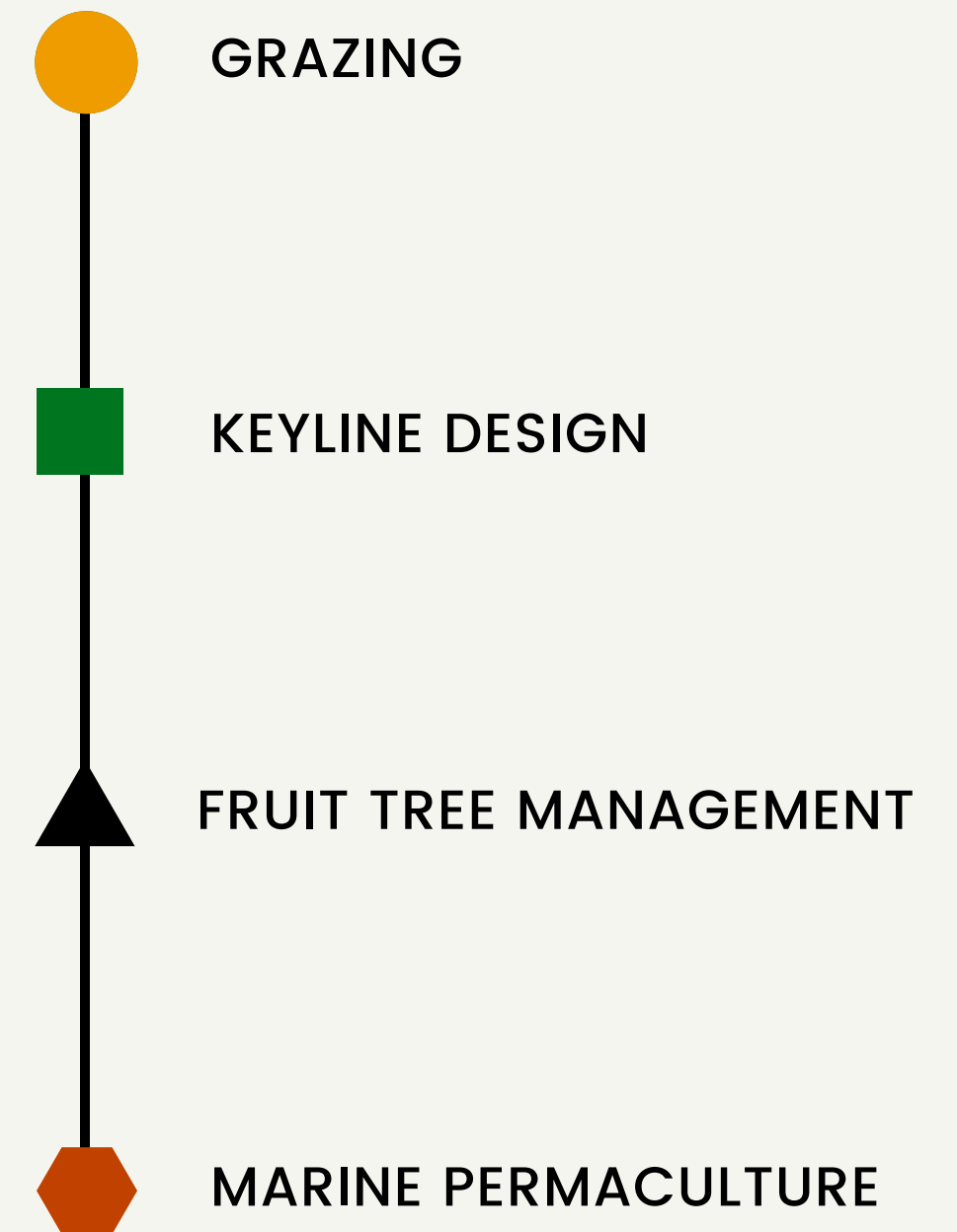
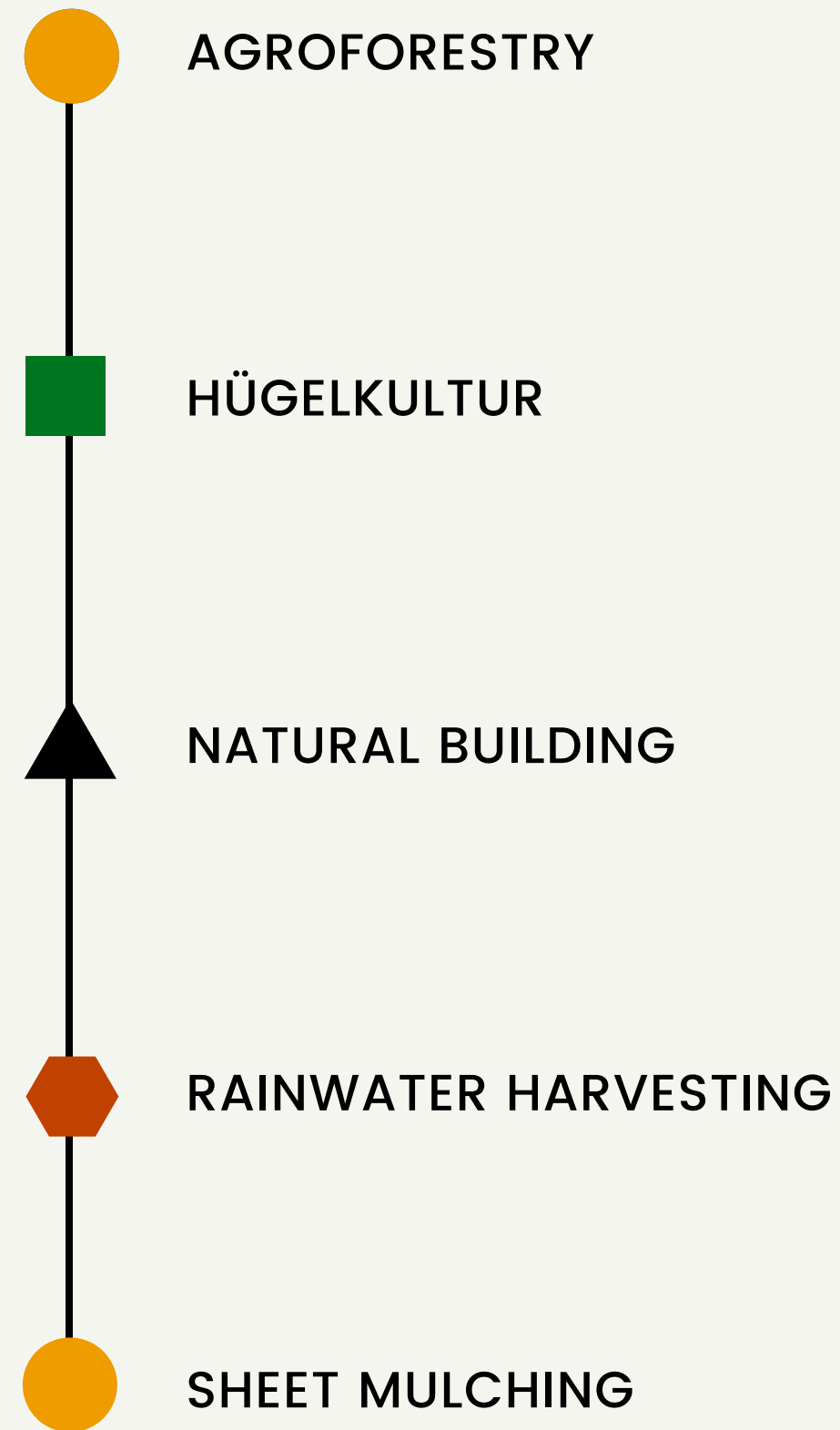


Permaculture is a set of practices that creates a lifestyle with less impact on the environment.

Method of food production that aims to imitate nature and applies natural principles, such as soil and water conservation, less ploughing, and more intricate ways of planting.

Permaculture also puts the consumer's waste back into the cycle of production and brings food directly in the nearest areas, preventing wasted energy in the transportation process.

Common practices of Permaculture.



Biodiversity

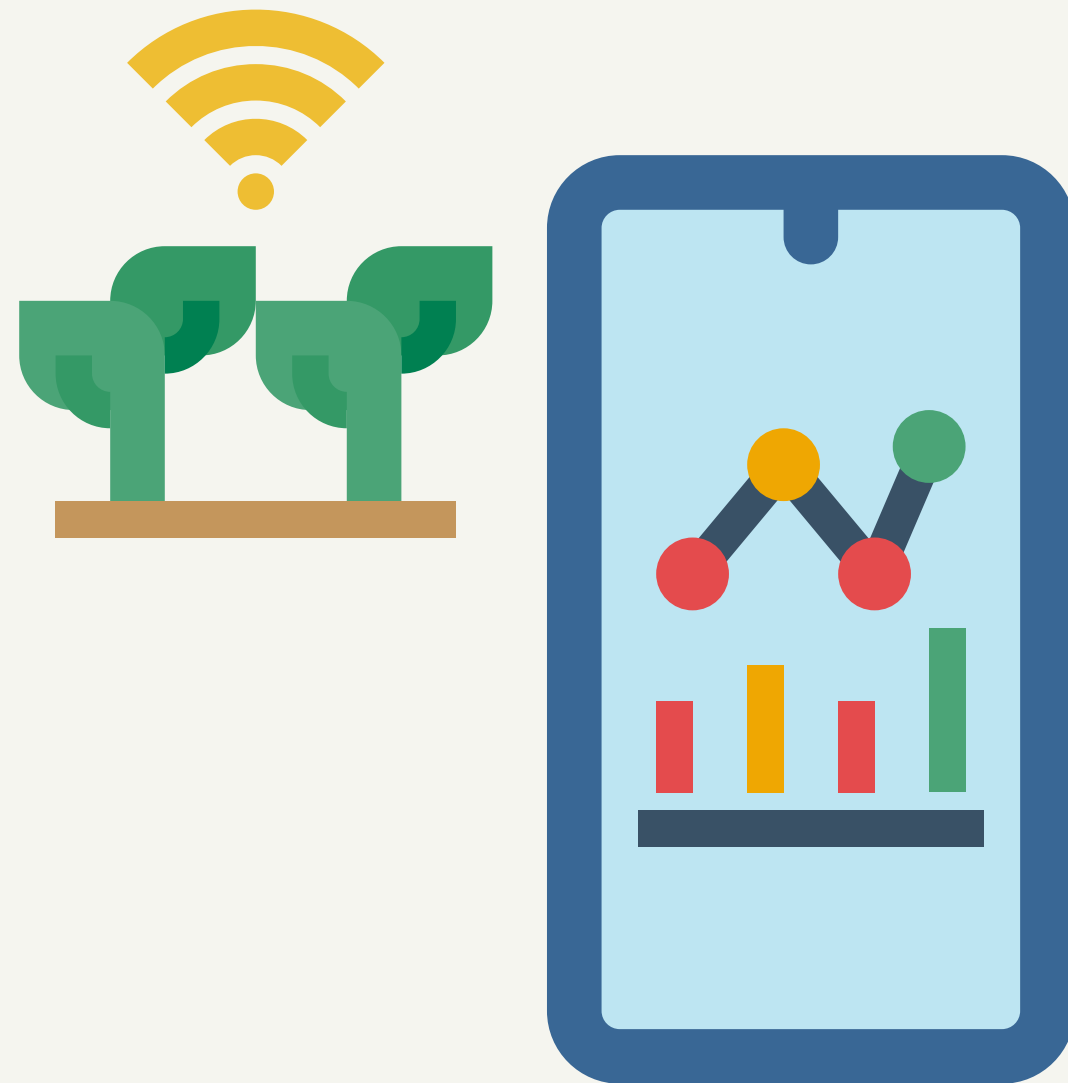
The variability among living organisms from all sources including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity between species and of ecosystems (Convention sur la diversité biologique, 2004).

Habitat conservation

The practice of protecting, restoring habitats, and preventing the extinction, fragmentation, or reduction in species distribution.

An illustration featuring a green globe of the Earth. A green water drop is falling from the top of the globe. To the left of the globe is a glass filled with green liquid and bubbles. The background consists of a large orange semi-circle on the right and a green semi-circle on the left, both resting on a dark orange horizontal bar at the bottom.

THE MOST IMPORTANT CONSERVATION ORGANISATIONS CURRENTLY IN OPERATION ARE: THE NATURE CONSERVANCY, WORLD WILDLIFE FUND (WWF), RARE CONSERVATION



Precision farming or Smart Agriculture

Monitor and act on crops in order to obtain solutions to the following problems: reducing the use of pesticides and chemical fertilizers; reducing the ecological footprint; increasing the quantity and quality of production; reducing production costs; ensuring crop information (Gondchawan & Kawitkan, 2016) (Jawad et al., 2017).



Wireless Network Systems (GIS)

An application that enables us to associate concepts like spatial information with alphanumeric information (georeferenced).

In agriculture, GIS are increasingly used for planning and management at two different levels: regional and farm; they can be used for tasks like management of irrigation perimeters, maps of agricultural potential, studies and projects for parcelling and farm management.



Global Position System (GPS)

A positioning system that is used to determine the location of an object on the Earth's surface or in the air. The GPS is divided into two distinct components: a satellite system and a signal receiver in the user

In agriculture is used because it has the function of determining the spatial variability of a crop.



Internet of Things IoT

IoT is defined by the Internet Society as "the extent of network connectivity and computing power for objects, devices, sensors and other artefacts that are not normally considered computers".

They are connected to the Internet, being able to identify themselves on the network and communicate with each other.

Smart Agriculture: Microcontrollers

Microcontrollers and three-dimensional modelling are important tools for today's agriculture, as they help with automation and the printing of tailored agricultural tools.

A microcontroller is a miniature computer, which contains a single integrated circuit with a processor core, memory and programmable input and output peripherals. It is widely used in technological equipment for monitoring weather conditions, soil humidity and other outputs that need to be measured to refine and automate agricultural processes.



Smart Agriculture: 3D modelling

Microcontrollers and three-dimensional modelling are important tools for today's agriculture, as they help with automation and the printing of tailored agricultural tools.

3D modelling consists of the mathematical representation of an object, which can be alive or inanimate, through specialized software. In agriculture, three-dimensional modelling is used in the reconstruction of plants in 3D, allowing to understand the characteristics of the plants, to detect diseases, to evaluate the quality of the crop and to differentiate between weeds and plants.



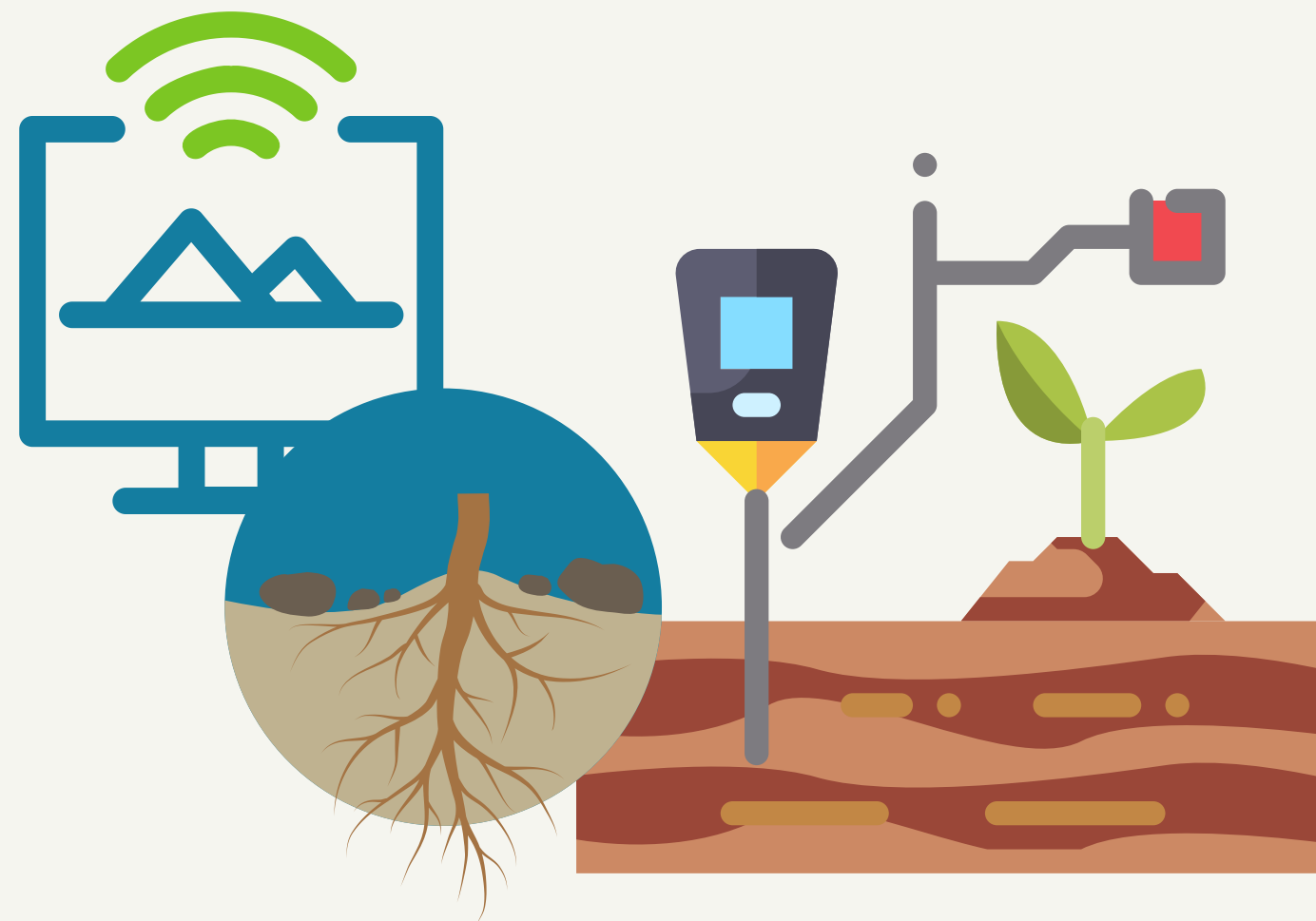


Temperature & weather monitoring

Important to analyse the weather conditions for crops for that crops and plants develop in a healthy way and with the expected performances.

it is paramount that the ambient temperature is not too different from the temperature of the plant root.

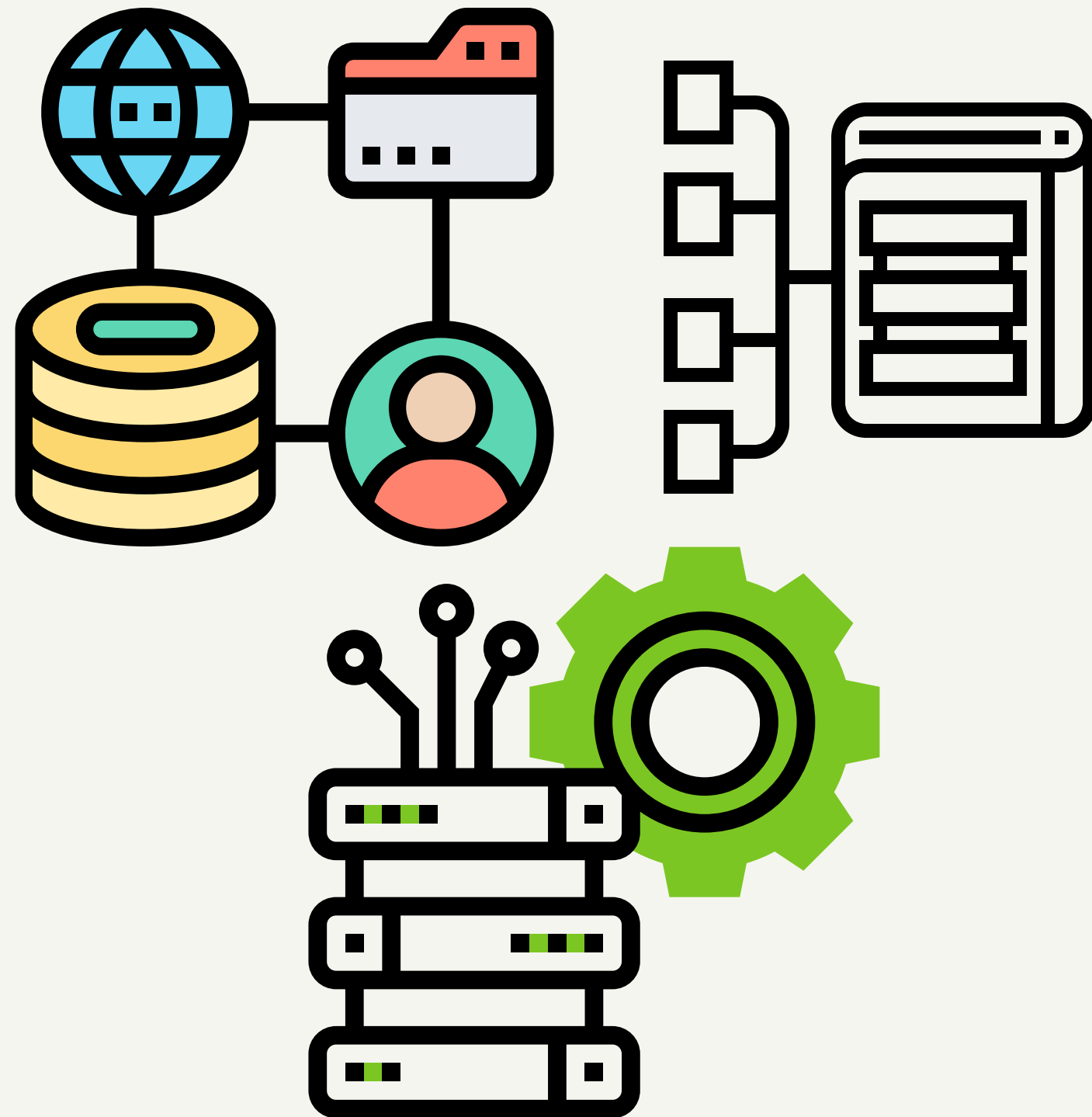
The weather conditions, measured by the weather stations, that most influence crops are air and soil temperature, wind, soil moisture, atmospheric pressure, rainfall. They consist of two main categories of equipment: sensors and central recorders. The data are transmitted to a platform or web browser.



Soil monitoring

Soil is fundamental as the germination environment that supports the roots and is the nutrient dilution medium. The proper concentration of these macro- and micro-nutrients is of extreme importance for the plants. If soil cannot provide nutrients effectively, it leaves plants exposed to a higher risk of diseases and pests.

Although fertilizers are used to meet the nutritional needs of plants, in permaculture it is not advisable. In Precision Agriculture systems it is necessary to know the spatial variability of soil. GPS is used to determine where the samples were taken and GIS to create fertility maps. Soil moisture monitoring can be used to measure efficient irrigation.



Data logging systems for farm management

We cannot have IoT without a centralized data logging system where data can be analyzed.

This is where are centrally collected and analyzed that provide precise recommendations on field treatment, helping with documentation, showing maps of agricultural land, monitoring climate risks. The farm management software assists in daily decision making, task planning and control and in defining the most appropriate organizational strategies for maximum land productivity and harvest planning.

Earthmoving and agricultural machinery

Good soil has the function of providing water, oxygen and nutrients. Land movement improves the physical properties of the soil, favour the germination of seeds, promote the reserve of water and nutrients, favour the size and shape of suitable products, promote the health of the crop and promote good soil drainage.

We can achieve this by the use of tractors, tillage implements, sowing machines and transplanter machines.



Composting

A biological and dynamic process of transformation of organic waste to organic matter present in the soil. It is a natural process in which micro-organisms, such as fungi and bacteria, transform organic matter into humus, which is very rich in nutrients and an excellent fertilizer (eCycle Team, n.d.). Humus is a natural fertiliser for plants and reduces landfill waste.

Composting machines automate and expedite this process.



Automatic Irrigation System

Some automated systems are sprinkler irrigation, self-propelled irrigation, micro-sprinkler irrigation and drip irrigation.

Automatic irrigation systems allow farmers to save time and labour and better manage water resources, both in terms of the uniform distribution of water to crops, as well as reducing water waste.



Water conservation methods

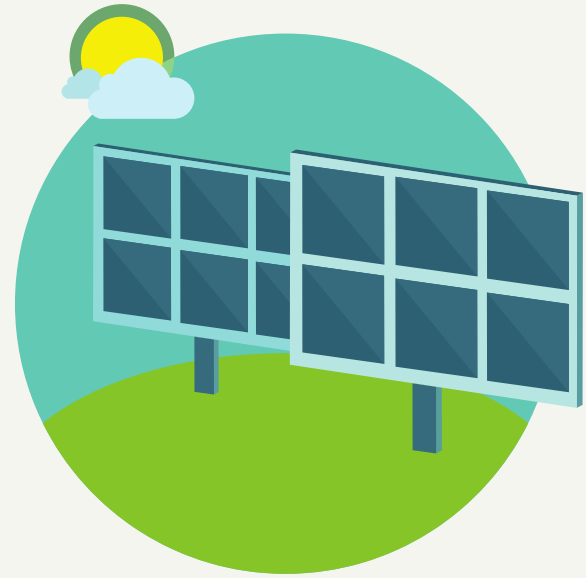
The re-use of urban wastewater is approved by the EU after this is properly treated for agricultural irrigation and meets minimum requirements.

The reuse of treated wastewater, which may contain nutrients such as nitrogen, potassium, etc., can contribute to soil nutrient recovery during irrigation (Council of the European Union, 2020).

Another method of water reuse is to store rainwater and/or stormwater for future reuse in water tanks. This type of system collects, transports and stores water in reservoirs. This is very useful in times of drought, something very common in Cyprus and climate change.



Energy saving systems



Photovoltaic panels

Solar or photovoltaic panels consist of cells that convert sunlight into electricity. It can be stored in batteries for later use or can be sold to the grid.

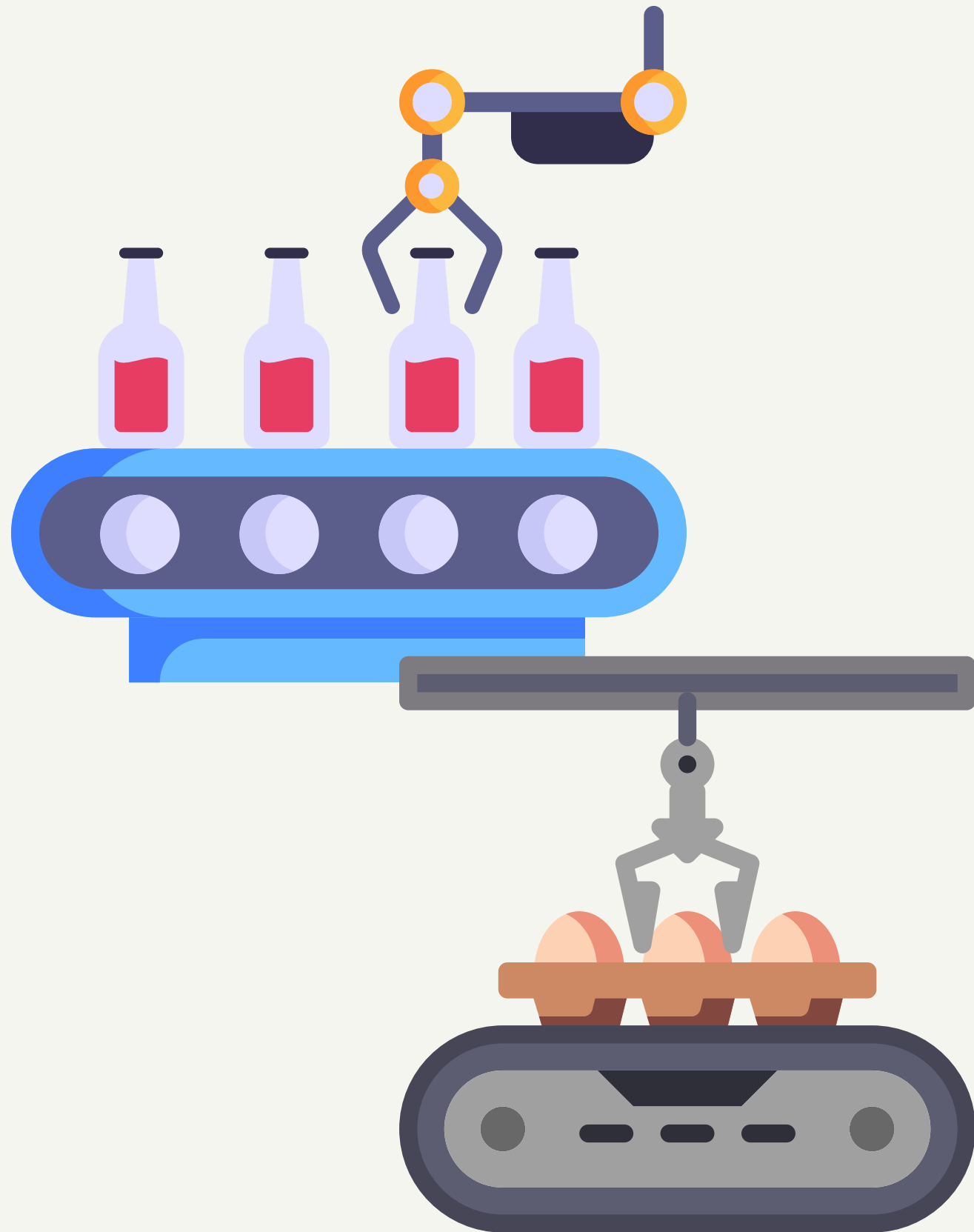
Winemakers use the energy generated by solar panels for other activities, namely to press the grapes. Energy generated can be used for irrigation, particularly in summer, when there are more hours of sunlight per day and less rainfall.



Pumped hydropower storage systems (PHS)

Systems that use water as a source to generate electricity. PHS can provide longterm energy storage at a relatively low cost and co-benefits in the form of freshwater storage capacity.

PHS systems can be integrated with battery storage; irrigation projects; with increasing the efficiency and productivity of land and water usage. Floating photovoltaic (PV) systems can be installed in the upper and lower reservoirs of a PHS facility.



Livestock farming tools

Robotic milking systems: animal is being electronically identified, the door to the milking area is opened automatically and the system checks if the animal has criteria to be milked. During milking, the robotic arm location system identifies the teats of the animal and their positioning. The mechanical arm connects them to the beginning of the milking.

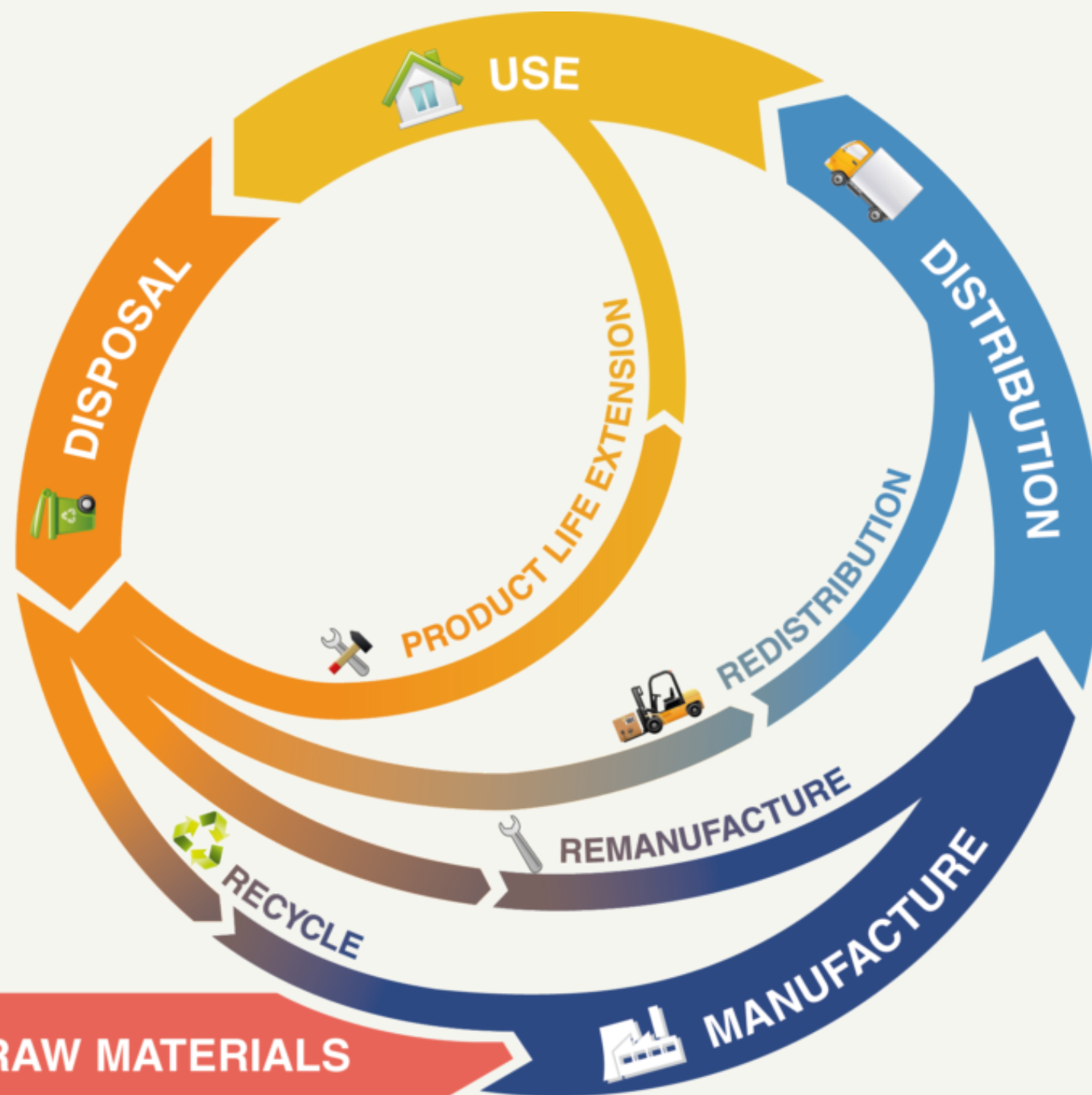
Machine packing and weighing eggs: eggs are collected, classified, broken ones rejected, packaged.

And many other problems awaiting to be solved....

Green Economy

The Green Economy is defined as "a system of economic activities connected with the production, distribution and consumption of goods and services that results in a better human wellbeing in the long term, to avoid exposing the future generations to significant environmental risks and to the ecologic shortage"

The creation and sustainability of such eco-communities or else known as "eco-cities" comply with the Green Economy. Investments in green economic sectors are renewable energy, low-carbon transport, energy efficient buildings or so-called eco-friendly buildings, clean technologies, closed-loop waste management, provision, sustainable agriculture and forest management, and sustainable fisheries.



Thank you!

QUESTIONS?



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