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SOIL AND AGRICULTURE

Principles of sustainable and smart agriculture
Croatia-3.2



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Introduction

Over the last 200 years human race has done more and more damage to nature, and ever since we've been looking for different solutions to fix the problem. One of the ways to do that is called sustainable and smart agriculture.

Sustainable and smart agriculture is a commonly used term in today's world that was just recently discovered and discussed in scientific community where it has gained a lot of attention.



Picture 1. Tea fields in Nuwara Eliya (Sri Lanka) photo by Fran Glušac

But, what does it actually mean? It refers to a type of agriculture that respects and protects its natural resources, uses no harmful substances, and tries to keep and improve current state of our environment. The goal of sustainable and smart agriculture is to meet society's current food needs without exposing nature to danger. Intensive agriculture can be used as an opposite term to sustainable agriculture. It can be defined as a system of cultivation that overuses fertilizers, insecticides, fungicides, and herbicides. Sustainable agriculture is an economically dominant production model for workers, because of its objectives to improve the quality of their life and the conditions they are working in ¹.

There are 5 key points which sustainable agriculture must follow as they are set out by the Food and Agriculture Organization (FAO) ². These are:

1. – Increase productivity, employment and value addition (change in the physical state or form of the product) in food systems.
2. – Protect and enhance natural resources.
3. – Improve livelihood and promote inclusive economic growth (conditions must be created to allow people to have quality jobs that stimulate the economy while not harming the environment).
4. – Enhance the resilience of people, communities and ecosystems.
5. – Adapt governance to new challenges. Sustainable and smart agriculture means that farming techniques do no harm to the environment, biodiversity and earth's natural waste absorption capacity. Sustainable and smart agriculture includes more than only one model.

Such models are organic farming, permaculture, biodynamic farming and fair trade farming. The term CAP is also commonly used when talking about sustainable and smart agriculture.

CAP (Common Agricultural Policy) defines the set of social, economic and environmental methods that have a goal to achieve a sustainable and shared agricultural system within the European Union ².

The main goals of Common Agricultural Policy are social sustainability, environmental sustainability, economic sustainability.

Sustainable and smart agriculture is necessary if we want to preserve our nature and environment.



Picture 2. Arable land in Dugo Selo (Croatia)
photo by Lukas Cajner

Problem description

Agriculture has been practiced for many centuries, providing employment, food, and other necessities to most of the world's population. Agriculture is flourishing and gradually increasing demand for agricultural land as food demand rises. Aside from the positive aspects of agriculture, there are several negative environmental effects of agriculture that are causing serious problems for a sustainable environment.

Researchers are now attempting to identify problems and possible solutions in order to reduce the negative effects of agriculture. Agriculture is the world's largest industry, with the highest employment rate. However, it still carries enormous environmental risks. The most significant of those are: soil degradation, deforestation, biodiversity, climate change, etc.

Land degradation is one of agriculture's most serious environmental consequences. It jeopardizes agricultural sustainability and increases water and soil erosion during rains and floods. Due to uncontrolled deforestation, overgrazing, and the use of inappropriate cultural (it is customary in certain communities for farmers to scatter seed and plough it into the soil), approximately 141.3 million hectares of global land are facing serious erosion issues ⁴.





Picture 3. Wheat fields in Normandy (France) photo by Fran Glušac

Rising groundwater tables along the rivers are negatively impacting the ability of the land to hold plants and allow the application of cultivation practices on approximately 8.5 million hectares of land ⁵. Similarly, intensive agriculture and increased irrigation use cause soil salination, waterlogging, and other problems. Deforestation is a major contributor to climate change and the extinction of millions of species.

As a result, it becomes one of the most significant negative environmental effects of agriculture. Trees absorb CO₂ from the atmosphere and act as carbon sinks for this major greenhouse gas. Cutting trees means removing natural absorbers and allowing CO₂ to enter the atmosphere, increasing CO₂ concentrations in the air, and greatly intensifying climate change.



The removal of trees causes a loss of shade, causing the soil to dry quickly and failing to restore the natural water cycle by recycling water vapors into the environment. Potential and fertile landscapes will become barren deserts without trees, causing extreme temperature fluctuations in the environment. Removing trees may result in faster evaporation of water due to a lack of shade, as well as a decrease in water quality.

Later, poor water quality will have an impact on the rest of the ecosystem, resulting in uneven watering, increased salinity, and plant death. Agricultural expansion is destroying native species' habitats.

In order to increase profit and production, farmers are increasingly turning to hybrid seeds and genetically modified crops, which are systematically killing off native species. Other living communities are facing survival issues or genetic modification as a result of the loss of native plant species, making them more harmful to the natural ecosystem. Agriculture has a significant impact on global climate, primarily through greenhouse gas emissions such as CO₂, methane (CH₄), and nitrous oxide (N₂O).



Furthermore, modern agricultural practices such as the use of synthetic fertilizers, tillage, and so on emit ammonia, nitrate, and a variety of other synthetic chemical residues that have a negative impact on natural resources such as water, air, soil, and biodiversity.



Picture 4. Sunflower fields in France photo by Fran Glušac

Possible solutions

In today's world where everyone has access to anything, there should also be a solution for every problem. Maybe that's how it works in some perfect world, but in real life it is a bit different, but still there are some solutions. For agricultural problems there are several solutions. Providing farmers with adequate education is crucial. Efforts should be made to ensure that both rural and urban residents receive free or very low-cost basic education. This will make it easier for them to learn about advanced farming techniques that increase efficiency.

Continuous learning is also essential for farmers in the agricultural sector to ensure that they are currently implementing the best practices on their farms. Rainwater collecting, precision farming (precision farming is an agricultural management concept based on observing, measuring and responding to crop variability between and within fields) and modification of livestock habitat (let the livestock walk freely, more natural food etc.) can be considered as solutions for the climate change problem.



These can be done alongside studies on climate specifics of farming areas with research on farming needs and potential.



Picture 5. Neretva Valley (Croatia) photo by Fran Glušac

Ecological farming allows farmers to control pests and weeds without the use of costly chemical pesticides, which can harm our soil, water, and ecosystems, as well as farmers' and consumers' health. Ecological farming protects and improves soil fertility by promoting appropriate farming practices and eliminating those that consume and pollute the soil. Smarter food production and consumption are now possible with minimal environmental and health impacts, ensuring food safety and combating food waste.

We must reduce meat consumption while also reducing land use for bioenergy. We must also achieve higher yields where they are required – through environmentally friendly means.

Ecological farming promotes nature's diversity throughout the supply chain, from seed to plate, through various actions ranging from seed production to consumption education ³. Ecological farming supports a world where producers and consumers, not corporations, control the food chain.

But, to ensure the existence and sustainability of the agricultural sector, public and private estates must collaborate in developing policies that ensure equality, transparency, and the rule of law.



Picture 6. Lavender fields in Provence (France) photo by Fran Glušac

Of course, there are many ways to help and solve agricultural problems, as it was said in this paragraph already, but the main thing is that humans have to act because otherwise, nothing will change, and we will continue to harm the environment.

Conclusion

The issue regarding one of the most important aspects of human life, being agriculture or food production in general, should be one of our greatest concerns. Because, in its current destructive form, it presents a great threat to the world as we know it carrying many negative effects on soil, waters and whole ecosystems. This could have devastating consequences unless drastic large scale measures are taken and the currently most prevalent system of intensive agriculture is dismantled and replaced by an ecologically viable alternative, sustainable agriculture.

Sustainable agriculture is beneficial for mankind because it makes use of the land; leads to reduction of pollution; plays a role in creating a stable food supply and promotes local communities. Technology has enhanced the growth of sustainable agriculture and with new innovations coming out all the time the future of sustainable farming will continue to grow, so the constant development of new modern agricultural technologies is crucial for the growth of sustainability in agricultural methods.



Picture 7. Vineyard in summer in Motovun (Croatia) photo by Fran Glušac



Picture 8. Sustain soil and start living! (Vineyard in autumn in Motovun, Croatia) photo by Fran Glušac

Some methods of sustainable agriculture and regenerative farming include crop rotation (growing different plant cultures on the same plot of land throughout to seasons to optimize usage of nutrients found in soil), permaculture (agricultural systems whose characteristics reflect those of natural ecosystems like diversity, stability and resilience), conservation tillage (a method of land preparation for growing crops in which the soil surface remains covered by crop residue to reduce water and wind erosion), cover crops (vegetation planted solely for the purposes of improving soil health, slowing down erosion of soil and suppressing diseases and pests) ¹.

Sustainable agriculture is a complex system that brings together water management; maintenance of soil; and minimization of pollution or other damaging environmental factors.



Putting into action such a large and extensive system on a larger scale might seem like an impossible feat, but it is important to start step by step, firstly by educating about the problems and possible solutions then progressively introducing and realizing the ideas in the spirit of sustainable and smart agriculture, that being those that are realistically achievable in the current conditions.

A worldwide implementation of even a few of the sustainable farming methods mentioned throughout this essay should result in a better world for future generations by reducing the burden on our environment set by the current system of intensive agriculture. The future of our agriculture might be brighter than we think if we start heading in the right direction and take the sustainable path of progression.



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