

# GUIDANCE ON SUSTAINABLE FOOD SYSTEMS

INCREASING FOOD LITERACY  
COMPETENCIES OF ADULTS



**FOODTR**

2020-1-TR01-KA204-092828



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## FOODTR - INCREASING FOOD LITERACY COMPETENCIES OF ADULTS

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# GUIDANCE ON SUSTAINABLE FOOD SYSTEM

Partners



Central Research  
Institute for Food  
and Feed Control  
(COORDINATOR)



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## **1. ABOUT PROJECT (FOODTR)**

“Increasing Food Literacy Competencies of Adults” Project is coordinated by Central Research Institute of Food and Feed Control and funded by the Erasmus+ Program of the European Union in the field of Strategic Partnership for Adult Education.

Food literacy is having the knowledge, skills and attitudes necessary to access to and evaluation of the information related to food and nutrition, to make appropriate choices for a healthy and balanced diet, to prevent food waste and to have positive consumption attitudes towards sustainable food systems. With the "Enhancing Food-Literacy Competencies of Adults" project, it is aimed to increase the food literacy skills of individuals, to ensure their access to healthy and reliable food, to understand the importance of food literacy within the society.

### **1.1. Objectives of the Project**

- To enhance skills and competencies of adults related to food literacy
- To help and encourage adults to start home-based food business in Europe
- To transfer home-made cooks in a food safety-oriented and regulated environment
- To educate people against myths through label reading
- To increase knowledge of target group about sustainable food system
- To diminish outbreaks of foodborne disease by increasing food safety and hygiene knowledge
- To enhance knowledge of target groups about homemade food processing techniques
- To increase incomes of adults with low skills
- To inform target groups about healthy eating pattern
- To educate people about ideal food packaging and storage
- To promote health and prevent diseases like obesity
- To enhance social inclusion of adults by increasing their job finding opportunities

- To develop Easy-used, Free of charge, Understandable and Innovative guides or digital training materials for the target group

Main objectives of the project are to enhance skills and competencies of adults related to food literacy, to help and encourage them to start home-based food business, to increase their knowledge about sustainable food system, food safety, hygiene, and home-made food processing techniques. With the help of the newly acquired skills and knowledge, the "students" can gain work and income from home and improve their labour market situation and find work easier. In addition, the knowledge provided by the project can also help to prepare healthy, safe food for ourselves or our families, thus helping to maintain health and prevent diseases.

"Food literacy" means much more than knowing what ingredients and how to make a meal. The term food literacy means having the knowledge, skills and attitudes necessary to access to and evaluate the information related to food and nutrition, to make appropriate choices for a healthy and balanced diet, to prevent food waste and to have positive consumption attitudes towards sustainable food systems.

The "Enhancing Food-Literacy Competencies of Adults" project is aimed to increase the food literacy skills of individuals, to ensure their access to healthy and reliable food and to understand the importance of food literacy within the society.

## 1.2. Guides Prepared Within The Scope of The Project

- ✚ Practical Guide for Healthy Eating
- ✚ Food Packaging And Storage Guide
- ✚ Guide to Production Techniques for Homemade Food Products
- ✚ Food Regulations Guide
- ✚ An Entrepreneur's Guide to Homemade Food Production
- ✚ Food Labeling Guide
- ✚ Food Safety And Hygiene Guide
- ✚ Guidance on Sustainable Food System

**Guidance on Sustainable Food System** has been prepared by the academicians from Bioengineering and Food Engineering department of Bursa Technical University, which is the one of the project partner.

### **1.2.1. About the Guidance on Sustainable Food System**

A sustainable food system is a food system that ensures food security and nutrition for all and is profitable throughout (economic sustainability); have broad-based benefits for society (social sustainability); and have a positive or neutral impact on the natural environment (environmental sustainability).

Food systems have an important impact on human and planetary health by shaping and enabling producers' decision and consumers' choices. At the same time, consumers decisions on what to consume can also have an impact on food systems and improve their ability to deliver healthy diets. To promote sustainable consumption and production of foods all stakeholders should be adopted to a sustainable food systems approach.

Innovative and apparent "Guidance on Sustainable Food System" will be a reference document for adults living towards more sustainable consumption and production patterns. The objective is to contribute to promoting food systems to ensure that the food that contributes to healthy diets is available, affordable, acceptable, safe and of adequate quantity and quality.

This guidance will promote awareness raising activities, strengthen capacities and increase access to information, knowledge, focusing on the areas of resilient food production systems, environmental and economic impacts of current practices in food production and processing.

The increased knowledge of target groups will influence their consumption habits by considering their environmental and economical impacts. The guidance will help consumers to have an understanding of how the broader food system and society as a whole impacts their decisions about food and how an individual's food choices impacts the broader food system (e.g., buying local food and the impact on the local farms or food industry).

The guidance will be available for public in Turkish and English in the project website.

## 2. GUIDANCE ON SUSTAINABLE FOOD SYSTEM

- ✓ **A food system** is a broad concept that includes all the nutritional processes of the Society and all related infrastructure systems.
- ✓ Food-related elements such as growing, harvesting, processing, packaging, transportation, marketing, consumption and disposal of waste all make up the food system. It also includes the inputs required and the outputs produced in each of these stages.
- ✓ A food system operates within and is influenced by social, political, economic and environmental contexts. It also requires human resources that provide labor, research and education at every stage.
- ✓ Food systems are basically divided into conventional (traditional) or alternative food systems. When describing food systems, the term "traditional" is used as a comparison in the sense of continuing with known functions throughout society. Today's population growth, resource depletion, climate change, economic problems reveal the search for alternative systems for global food systems.
- ✓ Today, an approach to the creation of **sustainable food systems** has emerged all over the world.





## 2.1. What are the Problems of Conventional Food Systems?

**The traditional food system** operates primarily to produce high supply and to meet the market demand as a result of this produced supply. This situation creates a continuous storage and stocking approach and causes both food wastage and food access problems in case of supply-demand imbalances in the processes from production to our table.

On the other hand, many people probably do not know how any food product they consume is produced, what chemicals it is exposed to during the production phase, and through which stages does the food go through while it reaches our home.

- **Traditional foods are foods produced using various chemicals in agricultural production.**

In fact, it can be said that there were almost no chemicals used in agriculture until the 1940s before World War II. However, despite all the warnings about the negative effects of chemical fertilizers and pesticides on health, farmers began to give up on organic practices that require intensive labor.

**Today, there are many inputs (genetically modified seeds, chemical drugs, chemical fertilizers, synthetic food additives, industrial solvents, gamma and UV rays) that adversely affect human health in foods produced by traditional methods.**



In many scientific studies, it has been determined that plants grown with chemical fertilizers and pesticides and the nutrients obtained from them cause health problems in humans and animals. Accordingly, there are many risks in traditional foods.

These can be said;

- The amount of nitrite / nitrate in the structure of foods,
- Agrochemicals (pesticide) contamination,
- Heavy metal residues

For example, **excessive use of fertilizers** and growing plants in environments containing excess nitrogen cause nitrate accumulation in their structures. Nitrate taken into the human body with food poses a serious health risk. Because nitrate is converted into harmful nitrite ions. The nitrite formed reacts with hemoglobin and causes Methemoglobinemia, a dangerous disease in infants, children and the elderly.

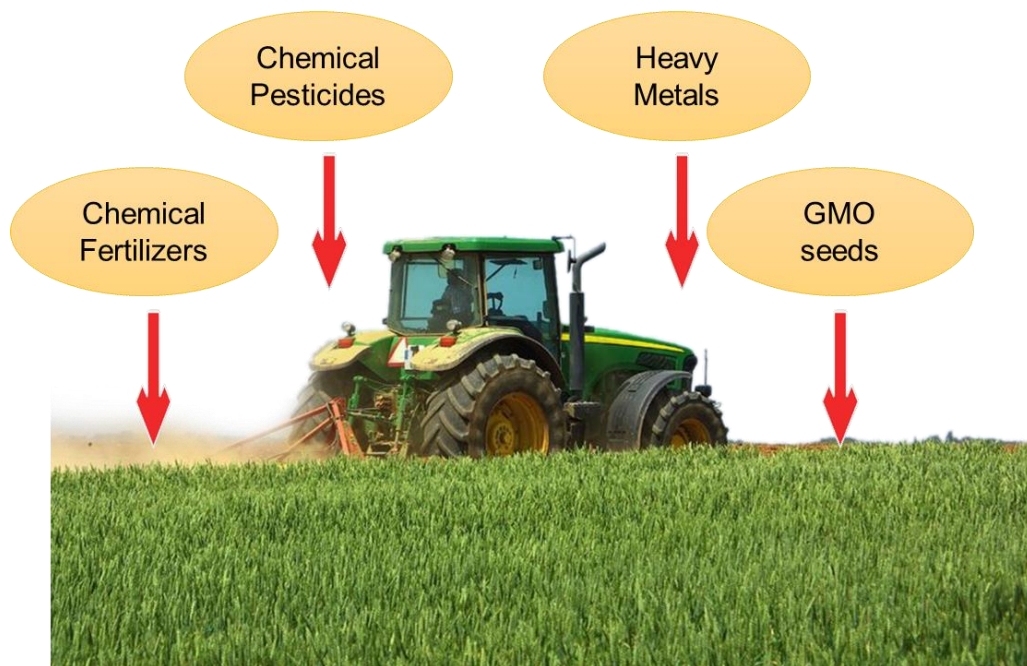
Methemoglobinemia is a disease that occurs when the amount of methemoglobin, an abnormal form of the hemoglobin protein responsible for transporting oxygen within our blood cells, increases and can lead to death if left untreated. In addition, carcinogenic and mutagenic substances formed as a result of the reaction of amines with nitrites cause leukemia and cancers of the digestive system. This process poses risks for individuals of all ages, including young children.

**Pesticides** are substances or mixtures of substances used to prevent, control or reduce harmful organisms. However, it is also known that the amount of pesticides that can be found in certain amounts in foods causes health problems, including cancer and many diseases. Pesticides also cause soil, air and water pollution and lead to extinction of non-target creatures.

**Reducing heavy metal uptake by plants** is another important problem to be solved in agriculture. Heavy metals such as cadmium, lead, arsenic, mercury and zinc; enters the food chain from various sources such as industry, transportation, waste, agriculture. For example; the use of mineral phosphorus fertilizers in conventional agriculture may cause passing of cadmium in the soil to the plant.

Additionally, the metal industry and shipping situation cause cadmium contamination in plants and soil.

The new challenges we face today, with rapidly changing conditions on a global scale, crises and ultimately the pandemic, reveal the necessity of transforming traditional food systems more than ever. It is necessary to take precautions now to create a food system that eliminates health and environmental problems for the future of societies all over the world, and tries to create healthy individuals and a livable world. This highlights the concept of “**sustainable food system**”.



## 2.2. What is a Sustainable Food System?

After the industrial revolution, as a result of the increasing energy need in agricultural production processes, population growth and the change in the amount of consumption of people, natural resources on earth have started to be consumed rapidly. This situation began to be seen more clearly after the 1950s and it soon came to the fore that a solution should be found.

The concept of “**sustainability**” came to the fore in the report of the World Environment Conference held in Stockholm in 1972.

The concept of sustainability, which can be defined in many different ways,

- ✓ can be expressed as a way of thinking that adopts the goals of ensuring that future generations can reach the resources they will need without reducing the quality of life within the scope of social responsibilities and economic goals, and that aims at universal solidarity.
- ✓ This concept is used in many different areas, and food is one of these areas as the most important target in our vital processes.



Today, more than 800 million people still suffer from hunger, despite the fact that enough or more food is produced for all people. Including those who are malnourished, this number is estimated to be around 2 billion. Hunger; can be caused by environmental reasons such as lack of land and water, climate change, as well as the control of markets and food systems by companies, unfair income distribution and high prices.

The fact that there are individuals who want to consume safe food in the world, to cause the least damage to the environment, natural life, that is, to the ecosystem, and to support local production and farmers, has enabled the implementation of sustainable food systems developed as an alternative to existing systems.

- ✓ **Sustainability in food** is a system in which social, economic and environmental dimensions are taken into account in the process from production to consumption of food.

- ✓ Sustainable food systems are defined as civil society or a group process in relation and cooperation with each other and forming their own structures on food.



Sustainable food systems, as seen in the concept of sustainability, while providing access to sufficient amounts of safe food, represent a long-term structure that will provide the next generations with what they will need and that will enable the protection of natural resources.

These systems are also of great importance for everyone in terms of

- The protection and development of health,
- Disease prevention,
- Conservation of agricultural biodiversity,
- Correct use of natural resources,
- Strengthening local and rural areas and
- Ensuring socio-economic development.

Sustainability in the field of food can be defined as a food system that is culturally acceptable, accessible, economically fair and feasible, and that provides the consumer with nutritionally adequate, safe, healthy and affordable food (ERA-Net, 2015).

- Transition to sustainable food systems can be said as an important way to solve climate change and many problems it brings.

The examinations made by the European Union reveal that 37% of global greenhouse gas emissions originate from agriculture and animal husbandry. From production to the harvest, from transportation to storage, the petroleum-dependent agricultural system is no longer sustainable. This concept is also affected by different problems of food systems such as deforestation due to land use, food loss and waste. In this respect, sustainable food systems are at the center of sustainability-oriented policy programs all over the world.

In the United Nations "Agricultural Development, Food Security and Nutrition" Report, it is stated that a world without poverty, hunger and malnutrition would not be possible without efficient and strong agriculture and food systems, including sustainable natural resource management and reducing food losses and waste.

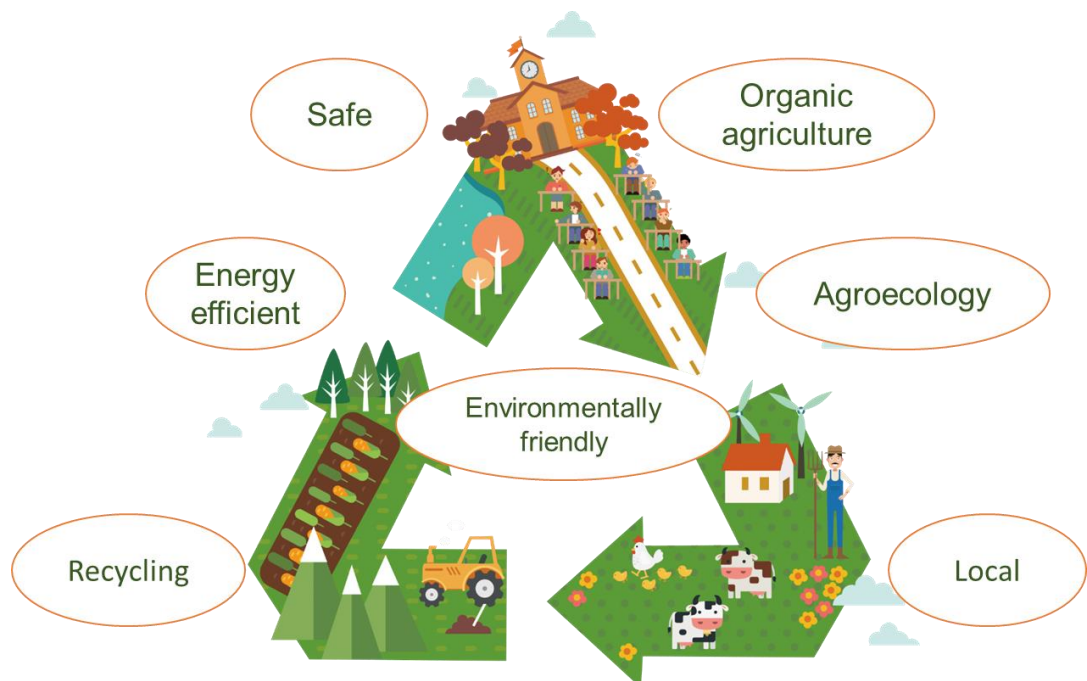
Therefore, sustainable food systems; It concerns all units from the small scale structures that are part of the food chain, from the producer to the consumer, to the global food system.

***There are many different definitions of a sustainable food system:***

- ✓ From a global perspective, the Food and Agriculture Organization of the United Nations describes the sustainable food system as: "A sustainable food system is a food system that provides food security and nutrition in a way that does not compromise the economic, social and environmental foundations that will ensure food security and nutrition for future generations."
- ✓ This means:
  - It is profitable (economic sustainability);
  - It provides broad-based benefits for society (social sustainability);
  - It has a positive or neutral effect on the natural environment (environmental sustainability).



- ✓ The American Public Health Association defines a sustainable food system as: “Systems that provide healthy food to meet current food needs, while maintaining healthy ecosystems that can provide food with minimal negative impact to future generations and the environment.”



A sustainable food system economically fosters local production and distribution infrastructures and makes nutritious food accessible and affordable for all. It also protects farmers and other team workers, consumers and communities in a humane



and fair manner.



### 2.3. Components of a Sustainable Food System

Sustainable nutrition and sustainable food systems are increasingly being explored with an interdisciplinary approach. It is recognized by the international community and guides actions towards the elimination of hunger and malnutrition and the achievement of sustainable development goals.

- ❖ There is now widespread acceptance that the global food system is not sustainable.

Food production and consumption are among the main drivers of environmental degradation and threaten their own resources. One third of the food produced is either lost or wasted. According to the reports released by the Food and Agriculture Organization (FAO), global food demand is expected to increase by 60% by 2050 due to changing consumption patterns and population growth.

**Food and nutrition in all its aspects are both the result and the driving force of food systems.** For those involved in this system in various ways, consumers and individuals, the drivers of change are different and can be triggered by different factors (health, environmental, social and cultural). Combining different dimensions and reasons for change can help facilitate the transition to sustainable food systems

by recognizing the characteristics of the food system. The adoption of sustainable nutrition can be facilitated and enabled through food systems and appropriate policies and incentives.

In this respect, as the basic components of sustainable food systems,

- Sustainable agriculture and ecological food systems,
- Sustainable food distribution,
- Sustainable nutrition and
- Waste reduction

approaches should be activated.

## Components of a sustainable food system



### 2.3.1. Sustainable Agriculture and Ecological Food Systems

Agricultural production is of great importance as the most basic and first step of the food chain and is an area that directly concerns everyone in terms of all factors in order to ensure sustainability in the food system.

In simpler terms, the production of agriculture and food makes us dependent on it for our survival.



On the other hand, agricultural production can be considered as a large industry, from farmland owners to farmers and workers working at different stages.

Today, humanity is faced with multifaceted challenges related to food production. There is an urgent need for a transition towards production and consumption systems that will allow us to make it compatible with nature. The approach here is “**sustainable agriculture**”.

- ✓ Sustainable agriculture is the systems and practices made in sustainable ways that will meet the current food needs of the society without compromising the ability to meet the needs of future generations, the production of sufficient and quality foodstuffs at affordable costs, the protection of agricultural land, farmers, the environment and natural agricultural resources.
- ✓ The aim of this system is to increase its contribution to the economy by maintaining productivity in agriculture and to increase the welfare level of the people engaged in agriculture.

It is necessary to protect valuable resources such as soil and to prevent environmental pollution. Affordable prices for producers, intermediaries, credit institutions and consumers, reducing poverty, the relevant economy dimension including environmentally friendly economic regulations in the production process and the selection of appropriate technology in agricultural production are very important parameters in ensuring sustainability.



**Agroecology (ecological agriculture)** is an approach and a social movement that offers viable ways to transition to a food system where safe and nutritious food is produced in nature-friendly ways and accessible to all.

Agroecology aims to balance food systems in such a way that they are ecologically sensitive, economically viable and socially just. It promotes social justice, nurtures cultural identities and strengthens rural life.

Scientifically, it processes the interactions between the components of agro-ecosystems, while in practice, it creates resilient and stable production systems that protect and improve natural resources.



### **2.3.2. Sustainable Food Delivery**

In food systems, the supply chain begins with production and ends with consumption. However, there are many different stages between these two stages.

Sustainability of every stage in the process of planting, collecting and processing agricultural products, packaging, distribution and reaching our homes as consumers creates a sustainable food distribution system.

Sustainability in the food chain can be achieved if everyone involved in the food system shares this responsibility.

By planning the food chain at every stage, healthier, safer and sufficient food can be

left to future generations.

In sustainable food systems, the attention shown in the production step must continue successfully until the last link of the chain. For this, the infrastructure in the transportation networks must be strong. A poor infrastructure, long storage period and transportation prevent the crop from being sold at a good price. In addition, food losses will be reflected in prices as suitable buyers will decrease when difficult conditions prevail. In most developing countries, farmers can get half the world market price. In addition, the urban consumer price can be limited when the value chain is more efficient. With a better infrastructure in terms of dissemination of information, knowledge of the market will also increase, and the relationship of dependency will decrease.



### **2.3.3. Sustainable Nutrition**

Nutrition, or in other words diet, is a very important element for effective food systems and ensuring food safety. As it is well known by everyone, a balanced and adequate diet is a basic need for the protection of health and the prevention of diseases. However, it is an action that should be done consciously in all aspects. However, nutrition with this approach can ensure that the nutrients required to increase the quality of life are taken in sufficient quantities and at appropriate times.

Sustainable healthy nutrition is defined by the Food and Agriculture Organization

(FAO) and the World Health Organization (WHO) as "diets that have low environmental impact, support food and nutrition security and a healthy life for present and future generations".

Sustainable healthy diets are those that

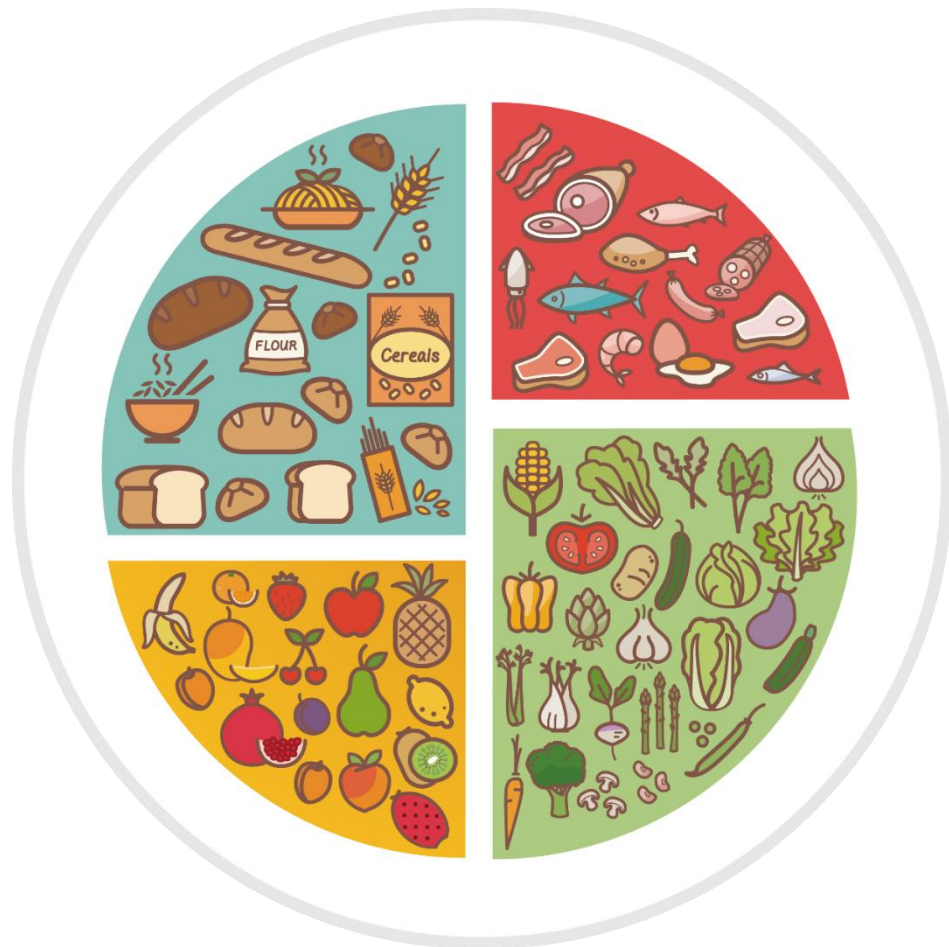
- improve the health and well-being of individuals in all aspects,
- have low environmental pressure and impact,
- are accessible, affordable, safe, adequate and
- culturally acceptable.

## What is a sustainable diet?



The goal of sustainable healthy nutrition is to ensure the growth and development of all individuals, to support the next generations physically, mentally and socially, and to contribute to the prevention of all types of malnutrition (malnutrition, micronutrient deficiencies, overweight and obesity), nutrition-related non-contagious diseases to reduce the risk, thus supporting the protection of public health.

Sustainable diets attract attention because they are respectful and protective of biodiversity and ecosystem, culturally accepted, accessible, economically viable and affordable, nutritionally adequate, safe and healthy. Sustainability for community health refers to the ability to maintain food system capacity while maintaining the ecological systems that produce food to support the healthy nutritional needs of current and future populations.



A healthy and sustainable diet;

- should contain high energy.
- should minimize the consumption of processed and packaged foods.
- should contain less animal food and more plant-based food.
- should encourage exceeding the recommended daily energy intake.
- should contribute to food and nutrition security.
- should have low environmental impacts.
- should promote wellness for current and future generations.

Sustainable diets support public health with low environmental impact, economically stable and affordable, accessible foods.



The concept of sustainable nutrition was defined in 2010 by combining two completely different perspectives. These approaches are a nutritional perspective that focuses on individuals and a global sustainability perspective with all its environmental, economic and social dimensions.

The nutritional perspective can easily be associated with health outcomes. It is more difficult to directly analyze the global sustainability perspective. It is recommended to measure nutrition as its contribution to the sustainability of food systems. Such an approach, which encompasses three dimensions of sustainability, enables the identification of interactions and interrelationships between food systems and diets.

#### **2.3.3.1. Food systems and nutrition**

Dietary patterns and food systems are closely linked. However, the concept of the food system is often food-oriented. A diet or diet is a choice of food eaten by an individual and chosen from among those served by the food system. The sum total of diets creates the overall food demand that drives food systems. Diets are, in this



respect, both a consequence and a driving force of food systems. Therefore, approaching food systems from a dietary perspective can bring operational insights into the evolution of food systems towards sustainability. Preferred foods can be a good entry point to see what can be done individually and collectively to improve food systems.



Researchers have proposed an integrated conceptual model of the food and nutrition system that focuses on nutrition and the links between food production, food consumption, and nutritional health.

The food and nutritional system is defined as 'the set of processes and processes involved in converting raw materials into food and nutrients into health outcomes', all of which function as a system in biophysical and sociocultural contexts.

Three subsystems are identified:

- ✓ producer subsystem,
- ✓ consumer subsystem, and
- ✓ nutritional subsystem.

Each of these progresses to the next. In addition, several systems can be identified that interact with the food supply system at many points. These systems, including health care, economic, cultural, ecological, transportation systems, have their own specific orientation and interact with each other.

This approach places the consumer at the center of the system as an intermediate step between food production and nutritional output. Therefore, it is important to consider diets within food systems. More recently, the Panel of Senior Experts on Food Safety and Nutrition has proposed a comprehensive and explanatory definition based on these and a number of other studies: 'A food system includes all elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities related to the production, processing, distribution, preparation and consumption of food and the outputs of these activities, including the socio-economic and environmental consequences.

### ***Sustainable nutrition***

It is important to delineate the relationships between diets and food systems in order to be able to concretely assess the sustainability of diets intended as their contribution to the sustainability of food systems and ultimately to food security and nutrition.

The internationally accepted definition of **food security** is based on the 1996 World Food Summit: 'Food security should at all times have physical and economic access to adequate, safe and nutritious food that meets nutritional needs and food preferences for an active and healthy life.

This definition defines four dimensions of food security:

- availability of food,
- accessibility (economic and physical),
- use (how it is given) and



- stability of these three dimensions.
- Food security for now and future generations: “A sustainable food system is one that ensures food security and nutrition for all without compromising the economic, social and environmental foundations that will ensure food security and nourishment for future generations”.



### ***How does sustainable nutrition relate to a sustainable food system?***

First, diet is a person-centered concept. It is the whole of food, drink and nutrients consumed by an individual or a group of individuals in a certain time period. However, when the question is which diet to choose or follow, or what the optimal diet is, it is necessary to consider factors such as economic, social and cultural conditions and constraints in each individual's preferences, going beyond the concept of diet, which is both influenced by the diet and determining the scope of the potential diet.

Sustainable diets, as defined in 2010, are diets that have low environmental impact and contribute to food and nutrition security and wellness for present and future generations. Sustainable diets are protective, culturally acceptable, accessible, economically fair and affordable, respectful of biodiversity and ecosystems while optimizing natural and human resources; It is nutritionally adequate, safe and healthy. By introducing the experts' definition of a sustainable food system and its relationship to food security and nutrition, a relationship can be drawn between the definition of a sustainable diet (with the dual dimension of sustainability for individual health and impact on global sustainability) and a definition of a sustainable diet.

A sustainable diet is a diet that contributes to and is provided by sustainable food systems that contributes to the good nutritional status and long-term health of both the individual and society, thereby contributing to long-term food security and nutrition. '

There are two important implications for understanding the relationship of a sustainable diet to a sustainable food system: First, the two concepts are very interconnected, which can aid their mutual assessment. It is the strength of the diet's contribution to the sustainability of the food system that characterizes the sustainability of the diet. Second, it is both a goal and a key driver for transforming food systems necessary to achieve sustainable diets, food security and nutrition.

❖ **The global food system is currently unsustainable!**

As can be understood from the above definition, the function of food systems is to provide food security and nutrition. As current hunger and malnutrition figures show, the global food system is not functioning.

Today, there is a concern, firstly, from **hunger**, defined as **chronic malnutrition** from deficiencies in dietary energy intake, and secondly, the **malnutrition burden, which is caused by nutrient deficiencies** of iron, iodine, and vitamin A, which affects nearly two billion people worldwide. Third, it leads to **excess weight from overeating**.

These different malnutrition problems, which often coexist in countries, can also be at the individual level in connection with individual and public health problems. For example, obesity may be a condition that occurs with nutrient deficiencies as opposed to good nutrition.



#### 2.3.4. Waste Reduction

While there are more than 800 million hungry people worldwide, 1.3 billion people are reported to be obese or overweight. World hunger is caused not only by a lack of resources, but by the loss, waste and lack of fair distribution of food.

**Food loss is defined as the loss that occurs from agricultural production until it reaches the table, and food waste is defined as the loss that occurs at the table after it is taken from the market.**



According to the data of FAO, approximately 1.3 billion tons of 4.5 billion tons of food produced in the world is wasted as waste and loss. It is calculated that the value of food waste and loss in the world is approximately 1 trillion dollars and causes 3.3 billion tons of carbon dioxide emissions.

It is stated that the world population will exceed 9 billion in the next 30 years and food production must increase by 60% in order to meet the needs of this rapidly increasing population.

On the other hand, it is predicted that 65-70% of the world's population will live in cities by 2050. Considering this situation, increasing production by 60% is not a realistic figure for now. Because all this will mean that billions of people who do not participate in production in cities must be fed.

In order to feed the growing population, it is necessary to minimize waste and save food from being garbage. **Zero waste and sustainable nutrition** are two complementary approaches. Many principles of sustainable nutrition include the zero waste approach.

Some of the sustainable nutrition principles that overlap with the **zero waste approach**;

- Adequate and balanced nutrition,
- Not wasting any food,
- Evaluating the water or parts of food such as stems and leaves,
- Preferring recyclable products that can be used repeatedly and do not harm the environment, by reducing the use of packaging, bags and plastics.

## 2.4. Advantages of Sustainable Food Systems



In this section, the advantages of sustainable food systems will be examined in terms of economic, social, environmental and food and nutritional aspects.

### 2.4.1. Economic

Agricultural practices form the basis of food systems and the food chain. Sustainable agricultural practices are very important in terms of the food chain. Sustainable agriculture protects farmland, farmers, the environment, and natural resources. At the same time, it is ensured that economical and high-quality agricultural products are produced.

We can see food security, economic security, and social development as the main reasons for the transition to urban agricultural practices. Urban agriculture allows for healthy eating and strengthening social ties. It is also an area that can support household income, balance expenditures on food and create employment.



The quantity and quality of food in a household are factors that affect food security. Food insecurity or lack of food for a healthy life is a problem even in developed countries. Food insecurity can cause problems in children and adolescents. Urban agriculture practices can be beneficial in improving food security and eliminating food distrust in rural areas. Urban agriculture can also increase the quantity and quality of food in low-income urban households.

Urban agriculture can support household budgets in different ways. This may be related to product preference and production volume. For example, staple foods such as rice can cover the household budget, but mostly vegetables can be sold at higher market values. Livestock, on the other hand, can offer high profits in terms of dairy products and fertilizers.



Urban agriculture can sometimes be used as the sale of surplus products to contribute to the household budget, and sometimes as the sole source of income for the household and has a powerful effect on reducing the poverty level.

In households selling products, capital is obtained for other uses. This may lead to the expansion of the household budget, the purchase of other different essentials, or it may contribute to economic freedom for women in regions where the household budget is dominated by men.





### 2.4.2. Social

Sustainable food systems are based on ecosystems, social equity, and welfare. Therefore, it aims to achieve affordable cost, cultural harmony, adequate nutritional value, and safe food by balancing the agro-ecosystem and social welfare.

Social sustainability reflects acceptable results in terms of both cultural and social benefits and food value chain.

The following items are among the indicators of social sustainability.

- ✓ Human rights
- ✓ Human resources management
- ✓ Occupational health and safety
- ✓ Customer health and safety
- ✓ Marketing communication
- ✓ Social contributions



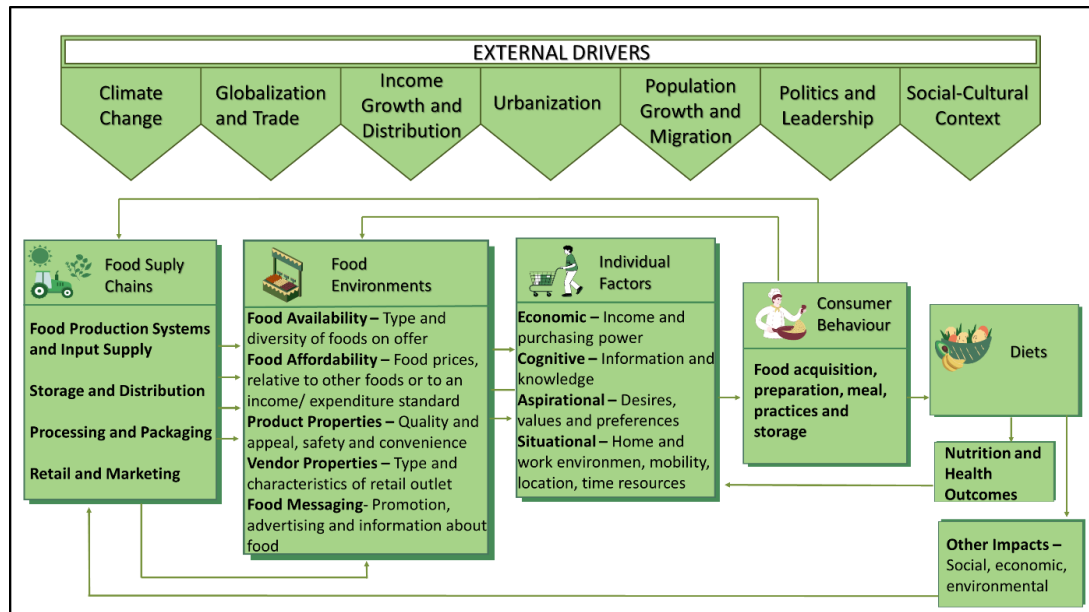
### 2.4.3. Food and Nutrition



healthy life.

Nutrition is an indispensable part of daily life, covering all humanity. The purpose of nutrition is to get the energy and various nutrients that the body needs in line with factors such as age, gender and working status. It is very important to have a balanced and adequate diet to lead a

The United Nations emphasizes the importance of sustainable food systems, as it leads to healthy diets. These systems include food systems that ensure food safety and diet for all. Food systems encompass everything from food production to the processing, packaging, distribution, retail, and consumption of food, and it has profound implications for sustainable development. In this direction, it provides benefits to factors such as providing diets, supporting livelihoods and environmental and social contributions.



One of the basic components of human nutrition is foods of animal origin. They are both high-quality protein and rich sources of micronutrients. Micronutrient deficiency is a worldwide problem. While there is iron deficiency in some regions in Western cultures, carbohydrate-centered and low-quality diets in southern countries cause serious micronutrient deficiencies (zinc, iron, vitamin A or vitamin B-12). With foods of animal origin, both national and global nutritional needs are met, and the sustainability of the agricultural industry is supported.

The sustainable food value chain focuses on improvements that increase food access so that households can obtain more food. However, as household incomes increase, it has been observed that instead of increasing the amount of food consumed, there is a tendency to buy foods with high nutritional value and beneficial for health. The differentiation of consumers' demand in this direction has become a trigger for innovation and increasing value in all areas of the food chain. Thus, it has ensured a continuous improvement in food supply and an increase in the level of benefit for consumers.

## 2.5. Challenges to Achieving Sustainability Goals

Sustainability of food systems is a global priority. There are different opinions on ensuring sustainability. According to these opinions, there are different perspectives that center efficiency, limit demands, and transform food systems. Each perspective



has strengths, weaknesses, or inconsistencies. To overcome the problems in food sustainability, a single approach that covers all perspectives is needed. To combine these perspectives in a practical way, it is necessary to keep personal opinions in the background and to better understand the factors that create disagreement among stakeholders. Although everyone wants and expects the same result, not everyone has an equal vision for providing solutions. Ethical perspectives presented for food sustainability problems affect both the use of evidence and the proposed solutions. Stakeholders often argue cross-purposes because of this, and the result can lead to conflict or inaction.



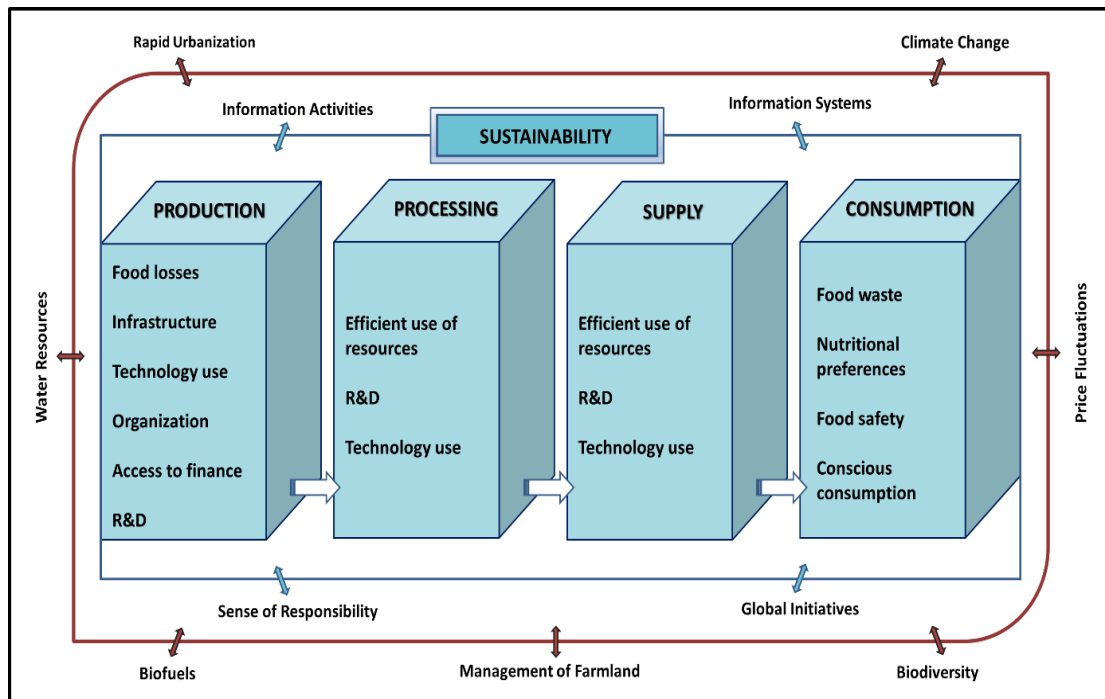
More work is needed to understand the underlying values of different approaches to food sustainability challenges. Better understanding of the background of the approaches can help shed light on why stakeholders differ, how to come together on common ground, and where the going forward might lie.

Many factors in different fields, but fundamentally interrelated, are effective in ensuring the sustainability and effectiveness of food systems. This may be the cause and consequence of advances in sustainable food systems.

In 2011, the European Commission's report titled "Sustainable food consumption and production in a resource-constrained world" addressed the interconnections of various biological, social, and economic factors within the framework of sustainable food systems. According to this:

- The quantity, method and type of food production can negatively affect biodiversity and global climate by causing high amount of natural resource use and environmental pollution.
- In most cases, water and energy problems arise not from the inadequacy of natural resources, but from faulty and inefficient use.
- Changes in climate and reduction of biodiversity are factors that affect each other, and these factors weaken food systems and cause vulnerability to shocks.
- With economic development, the demand for foodstuffs is increasing, which becomes one of the main causes of famine. Although the use of resources increases with development, the negative impact can be reduced by factors such as efficiency and recycling.
- Governments are seen as both the driver and solution provider of scarcity problems. Because administrations reflect the combination of market functioning, consumer trends and decision mechanism.

Sustainable food systems and the summary relationship of the different parameters affecting them are given in the figure below.



### 2.5.1. Urbanization and Faulty Agricultural Practices

Along with the change in the economic structure throughout the world, the urban-rural population distribution has also been affected. While the ratio of the urban population to the total population was about 2% in the 1800s, it increased to 30% in the 1930s. It is expected that the upward trend will continue in the coming years. According to the data of the United Nations Population Department, it is estimated that the rural population will be half of the urban population in 2050s.



With the increase in urbanization, incomes increase, and this has an increasing effect on the demand for agricultural products. Farmers, food businesses, local and national economies need to be able to meet this increase in demand. Urbanization has also increased the demand for meat products on a global scale. This situation requires the strengthening of infrastructure elements such as the cold chain.

The increase in the urban population also has a significant impact on the ecological system. Food, energy, water, and land consumption are used and consumed more in urban areas than in rural areas. For example, studies have shown that in the 1990s, the urban population in China was 2 times more likely to have televisions, 8 times more washing machines and 25 times more refrigerators than the rural population in their homes. Energy consumption is also higher in cities, and studies indicate that per capita coal consumption is 3 times higher than in rural areas.

The increase in consumption of natural resources due to the increase in urbanization and reduction of agricultural workforce due to the decline in rural population will increasingly negatively affect food security in the coming years.



The protection and management of agricultural lands is very important in providing the needed food to the society. Because most of the food, which is essential for the continuation of life, is met from agricultural lands. While we meet 99.7% of the food we consume from the soil, we only meet 0.3% of the food from the water.

Although agricultural lands are very important, agricultural lands are becoming increasingly unproductive due to natural reasons such as erosion, the use of fertile agricultural lands in non-agricultural practices, and the shrinking of land parcels due to heritage reasons. It has been stated in the studies that 2-5 million hectares of arable land are lost and out of agriculture every year due to erosion and drought.





According to some research results, it was determined that while the arable area per capita was about 5 hectares in 1959, this amount decreased to 2.5 hectares with a 50% decrease in 2006. It is estimated that these rates will decrease further to 1.1 hectares in 2040.

Mismanagement of agricultural lands also reduces productivity and has a negative impact by causing unnecessary resource use. This situation creates the ground for malfunctions in food systems. By raising awareness in line with the principle of sustainability, food systems can put pressure on the right management of lands.

Increases in agricultural production do not guarantee healthy and sustainable nutrition. There is a reference diet recommended by the EAT-Lancet for adequate nutrition. The diet in question is based on nutritional characteristics, not environmental factors. For example, in parallel with this diet, an increase of more than 150% is expected in hazelnut production.

Agricultural production has different challenges. Food needs that increase with population will have to be met by land and labor, which often falls at the same rate. Agricultural production is expected to continue to reduce the rate of malnutrition by increasing the amount of food available. On the other hand, considering the increasing population rate, it will be expected to increase access to food.

Expected benefits of sustainable agriculture strategies include increasing earnings by reducing rural poverty, creating new jobs, improving agricultural production, protecting natural resources, and ensuring food security.

### **2.5.2. Climate Change and Drought**

Climate change is one of the leading global problems. With the deterioration of the ecological system, it is seen that they have negative effects on all living things, and these are felt more over time. One of the most important areas of influence is



agriculture, which has a large share in food sustainability. Changes in agricultural production and arable land have a serious impact on food availability worldwide.

It is expected that the changes that may occur in food production due to various factors will also be reflected in food prices in the coming years. It is thought that this situation will limit the access of families and societies in need to sufficient and quality food.

According to many studies, it is thought that the expected climate changes will increase the negative effects on water and soil resources compared to today. Some scientists argue that climate changes will affect the whole world, but their effects will occur in different ways. According to some studies, it is reported that regions located at low latitudes will face the negative effects of global warming, while regions at high latitudes will have a positive effect on agricultural production in the short term.

The IPCC Climate Change Report states the effects of climate change on food security:

- As of 1950, sea creatures migrate, and biodiversity decreases due to climate change. This situation negatively affects the sustainability of seafood.
- Compared to the end of the 20th century, increases in temperatures of 2 °C and above in tropical and temperate regions will negatively affect barley, wheat, and millet production.
- Global temperature rises of 4 °C and above compared to the end of the 20th century will increase the likelihood of global food security being damaged by the increase in food demands.
- Underground and surface renewable water resources in subtropical areas will decrease due to global warming. This situation will increase the competition in water resources more.



In 2030-2049, an increase in the harvest rate of more than 10% is predicted compared to the 20th century. More than 25% harvest loss is predicted for the same period. In addition, it is estimated that the risks in agricultural products will reach more critical points after 2050 due to the increase in product demand and the rise in temperatures.

In the "Climate Change and Food Systems" report published by FAO in 2015, it is estimated that natural events such as excessive rain, drought and storm will be experienced more frequently in the coming years due to climate changes. In addition, it is stated that food trade will cause negative effects in the fields of supply chain, distribution, and logistics. Also, it was emphasized that global trade and climate change affect each other in terms of food security.

With the increase in trade, production and transportation will also increase globally. For this reason, carbon monoxide emissions will increase, and the greenhouse effect will be strengthened. With the increase in trade, it is seen that wrong agricultural practices increase in countries where legal regulations and inspections are insufficient. Excessive use of agricultural lands, loss of land, decrease in biological diversity and deforestation are observed with the wrong agricultural practices carried out to increase exports.

However, on the one hand, with the increase in global trade, it is possible to supply food from places where food is produced more efficiently and at low cost in places that are negatively affected by climate change. Thus, the increase in trade in these regions can act as a balance factor between supply and price.

The decrease in water resources and drought are one of the biggest problems that threaten the life of living things. This situation affects the basic areas of life such as economy, urban and rural life, nutrition, and cleaning. Drought is an important issue that needs to be tackled in terms of ensuring and improving food security.



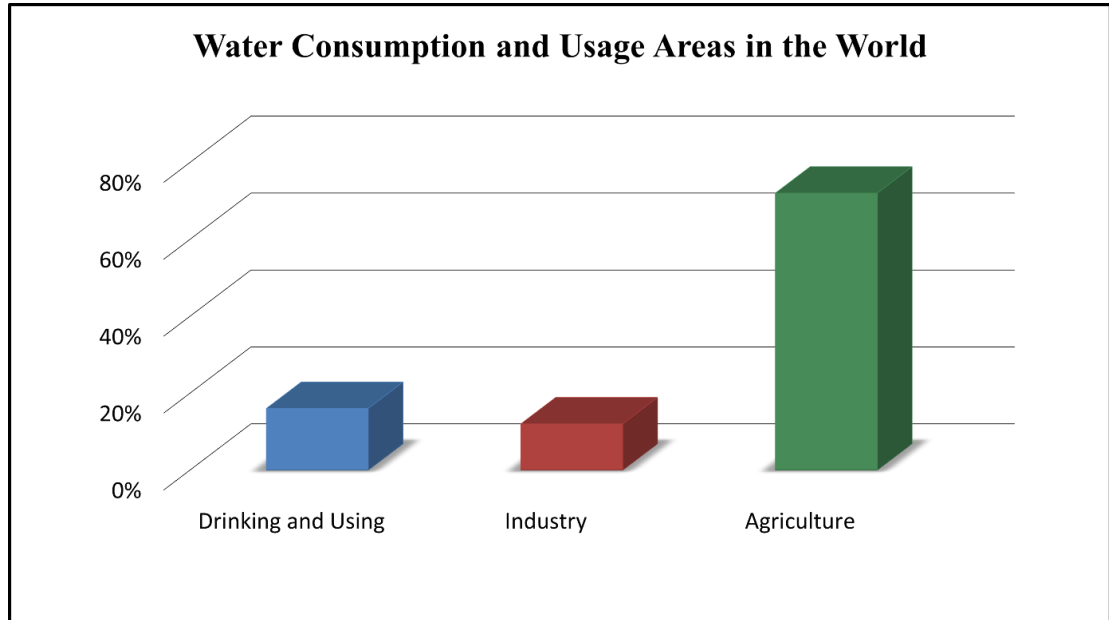
Drought negatively affects food production. The following items can be given as examples of these situations.

- Reduction in crop quantity
- Low production efficiency
- Rise in animal deaths
- Insect infestations
- Increase in plant and animal diseases
- Negative impact on marine life
- Forest fires
- Destruction of land areas
- Soil erosion

Consumption of water, which is an indispensable resource for the continuity of



agricultural practices, mostly occurs in agricultural areas. Sustainability of agricultural production is necessary to meet the food needs that will increase in the coming years. Purification of water resources is of great importance in this regard.



Safe and clean drinking water is a fundamental criterion in terms of nutrition and food safety. When we look at the world population, it is seen that a significant mass is in danger in terms of food safety. For example, the biggest problem in the world in terms of access to water resources is experienced in the African continent. A large part of the continent uses developed water resources at a rate of less than 75%.

The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) prepared a report called "Drinking Water and Sanitation" in 2014. In this report, it is stated that at least 700 million people around the world have difficulties in accessing drinking water. In the same report, it was stated that at least 2.5 billion people could not benefit from healthy water systems.

When we consider the use of water on the food chain, we can see that water is needed at every stage. Therefore, the effect of efficient use of water resources in food systems will be very important. It will be important to use technologies that minimize water use in food processes and to design irrigation systems in agricultural production by considering resource limitations.

### 2.5.3. Ecosystem Degradation



Biodiversity has a significant impact on the sustainability of food systems. Biodiversity refers to the diversity in genes, species, and ecosystems. Animal and plant genetic resources face the danger of extinction due to reasons such as differentiation of production systems, faulty breeding, differentiation in cultural structures, population growth, diseases, urbanization, and climate change.

If biodiversity is preserved, countries will be able to develop foods that are compatible with their specific conditions, and thus food demand will be able to grow in a balanced way. In addition, based on the amount of food used, the continuity of the species specific to the region and soil will be ensured. Increasing research and positive activities in terms of plant and animal genetic resources will have positive returns to food systems. In this respect, the use of sustainable agricultural practices in the food system, especially in the production phase, will be very effective.

### 2.5.4. Biofuel Production

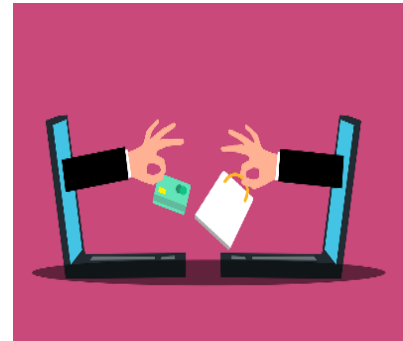
Biofuels can be produced by treating agricultural products, wood, animal and vegetable wastes and food residues with various biochemical and thermochemical processes. As we know, biofuels are considered more environmentally friendly than fossil fuels. However, the increase in biofuel production is becoming a risk to food security. Because the use of agricultural production as an energy raw material rather than food is gaining momentum. This situation negatively affects the access and affordability of food. The total of agricultural lands used for biofuel production increased from 0.72% to 2.33% between 2010 and 2020. In the coming years, this rate is expected to increase even more.

It is important for food systems to closely monitor the supply-demand balance, and to operate on biofuels by prioritizing food availability and access.



### 2.5.5. Price Instability

One of the most important factors of food security is food prices. Because it directly affects the income and purchasing power of the society. Increasing food costs make it difficult to reach healthy nutrition. According to FAO data, it is observed that food prices tend to increase



e significantly around the world. The rapid increase in food prices in 2007-2008 increased the number of malnourished populations worldwide from 850 million to 1023 million between 2007-2009. There are several reasons for this rise in prices:

- Decrease in global food stocks
- Insufficient investment in agriculture
- Demand and supply imbalance in agricultural products
- Volatility in oil prices
- Financial speculations

Price fluctuations are a very important factor in ensuring food security. Price instability seriously affects the extent of access to food and ensuring stability. Among the duties of food systems are the ensuring the flow of information about the markets by developing initiatives that exist in the national and international arena, and involvement of risk management at every step of the value chain.



## 2.6. Examples of Sustainable Food Systems Around the World

With the rapidly increasing population and industrialization, natural resources are gradually decreasing, and the risk of extinction is increasing. In parallel with this situation, the demands are constantly increasing. Production and consumption wastes cause environmental pollution if precautions are not taken.



Today, different institutions and organizations are working on various measures to prevent the excessive consumption and destruction of natural resources such as oceans and forests.

Packages are materials that are produced from natural resources and have effective use in food systems.

Along with various factors such as urbanization, global food supplies and the development of food processing processes, it is seen that many foods consumed are supplied in packaged form. The issue of food packaging waste is very important in terms of environmental pollution. Packaging wastes in daily life pose a danger when they are disposed of uncontrollably with the increasing population.



- Paper and cardboard packaging used in foods such as milk, yogurt, egg boxes and fast food, and
- Plastic bags used in shopping can be given as an example.

In 2004, the packaging waste control regulation came into effect. With this legal regulation, the environmental criteria determined in the European Union harmonization process were tried to be fulfilled, and the recycling of packaging and packaging wastes increased its importance.

Sustainable packaging designs, which have come to the fore in recent years and studies have increased, are very important in reducing pollution. Biodegradable and environmentally friendly packages should be used instead of packages that can stay for years without dissolving in nature.

The issues to be considered in packaging materials to be used for sustainability purposes can be listed as follows:

- Unnecessary packaging, extra boxes or layers should be removed
- Packaging should be reduced by using optimum size packages
- Reusable packaging should be promoted
- Use materials produced from renewable resources, choose biodegradable or composted materials
- Recyclable packaging should be used
- Packaging should be used at optimum cost by applying the above principles.
- Sustainability training should be provided



Paper industry is one of the 10 industries with the most damage to nature. Compared to plastic, it causes a 70% and 50% increase in air and water pollution, respectively. 50 times more water is used than a plastic bag for the manufacture of a paper bag. In addition, 40% more energy is consumed in the paper production process compared to plastic bags. In addition, trees are cut down, causing significant damage to forests.

**3 tons of trees were cut down**

**only**

**1 ton of pulp is obtained!**



According to research, only 5.2% of plastic bags are recycled in the world. Depending on the condition of plastic bags, the biodegradation period varies between 100 and 10000 years. About 10-15% of paper waste is recycled. However, more energy is consumed during this

process compared to plastic.

Some examples of sustainable food systems around the world are given below.



“Good Food Strategic Action Plan” was implemented in Brussels. With this plan, items such as introducing a new food culture, increasing the demand for local products, increasing the demand for good food products by creating awareness among the public, and encouraging innovation to improve food systems are targeted.



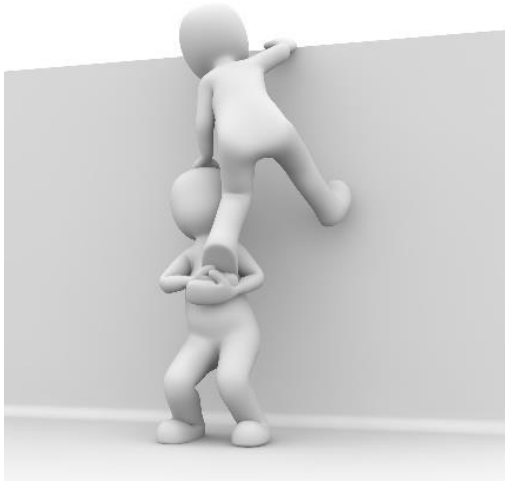
With the Plus Supermarket project carried out in the Netherlands, local and sustainable foods became a priority in the product range and brought positive regulations on the food system chain such as supply and distribution.

In the Netherlands, projects related to food education were carried out in primary schools. For example, under the name of “Pancake Safari” activity, students prepared their own pancakes. They visited a local farmer and mill to obtain the necessary materials and were informed about the compositions of the dishes and gained awareness about the factors of food sustainability.

## **2.7. Promoting Sustainable Food Systems**

According to a study carried out in Brussels, it has been observed that 80% of the people have small areas for fruit and vegetable cultivation, but they cannot spare time for cultivation. For this reason, the following practices were carried out to encourage the public to production.

- Free trainings were provided on kitchen gardening that could contribute to their own growing their own food,
- Some activities were organized by a group of gardener experts, recommendations were made,
- Help desks have been set up to answer specific questions.



An eco-dynamic labeling study with a three-star rating system was conducted for businesses. With this study, businesses have a label between one and three stars over a three-year period, and this shows the success of the business. A ranking system built in this way encourages improvement over time. The Eco-dynamic Corporate Label, an official and free accreditation,

encourages and rewards companies in the public or private sector that take initiatives to minimize the impact of practices in Brussels on the environment.



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