



FOOD SYSTEMS

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GLOSSARY

LIST OF ABBREVIATIONS

- BMI: Body mass index
- FAO: Food and Agriculture Organisation of the United Nations
- FSS: Food Systems Summit
- IFAD: International Fund for Agricultural Development
- IFPRI: International Food Policy Research Institute
- INGO: International non-governmental organisation
- NGO: Non-governmental organisation
- SDG: Sustainable Development Goals
- UN: United Nations
- UNEP: United Nations Environment Programme
- WHO: World Health Organisation
- WFP: World Food Programme





INTRODUCTION

Can the food system feed the planet?

The food system, in all its steps in the supply chain, uses our world's resources, freshwater, land, energy... It can be seen the summary of the food and agriculture's effect on the environment:

- Food accounts for over a quarter (26%) of global greenhouse gas emissions
- Half of the world's habitable (ice- and desert-free) land is used for agriculture
- 70% of global freshwater withdrawals are used for agriculture
- 78% of the global ocean and freshwater eutrophication (the pollution of waterways with nutrient-rich pollutants) is caused by agriculture.
- 94% of mammal biomass (excluding humans) is livestock. This means livestock outweigh wild mammals by a factor of 15-to-1.4 Of the 28,000 species evaluated to be threatened with extinction on the IUCN Red List, agriculture and aquaculture is listed as a threat for 24,000 of them.

Our Data, <https://ourworldindata.org/environmental-impacts-of-food>

We are depleting our world's most valuable resources just by eating. Today our food system neither feeds humanity nor the planet and the population projection says the world population will reach nearly 10 billion by 2050.

Here is the question:

How are we going to feed 10 billion people when we can't feed the current world population and the world has already reached the end of its boundaries?

When we talk about global food systems, we are using a more holistic lens, expanding the conversation to include the entire value chain—not only production and consumption, but also food processing, packaging, transport, retail and food services. By considering the entire system, we are better positioned to understand problems and to address them, in a more connected and integrated way. The use of animal transport, sailing ships, and trains to move a larger volume of agricultural products; and increasing political and military conflict for resources all have been developments of agriculture.

WHAT IS A FOOD SYSTEM?

In school, you might have learned about food webs in your science class. A food web is a natural detailed interconnecting diagram that shows the overall food relationships between organisms in a particular environment (National Geographic).

So, then, what is a food system? If food webs are the natural interconnection of food chains and a graphical representation of what-eats-what in an ecological community, then, a food system is a human-constructed complex web of activities involving the production, processing, transport, and consumption of the food we consume at our level in the food chain (National Geographic). Our food systems therefore include not only the fundamental elements of how we get our food from farm to fork or ocean to plate, but also all of the processes and infrastructure involved in feeding a population (Youth Power).

For us to talk about food systems, we need first to develop systems thinking. When you think of a system, what comes to mind?

In ecology, an ecosystem is a group of interconnected elements, formed by the interaction of a community of organisms with their environment (National Geographic). In astronomy, a solar system is a group of planets, meteors, or other objects that orbit a large star. Our solar system includes everything that is gravitationally drawn into the sun's orbit and the interactions between these elements. Your family is also a system! Therefore, systems are all about where elements or even yourself sit in relation to them (Norman, 2014).



Systems thinking in practice enables us to explore inter-relationships (context and connections), perspectives (each actor has their own unique perception of the situation) and boundaries (agreeing on scope, scale and what might constitute a positive change or solution). Systems thinking is especially valuable in addressing complex or wicked problem situations. No one actor can solve these problems any more than a complex system can be fully understood from only one perspective - just like in your family (Learning for Sustainability).

Food systems include the nuts and bolts of the journey from Plot to Plate. The food system therefore includes not only the basic elements of how we get our food from farm to fork, but also all of the processes and infrastructure involved in feeding a population. What it takes to move food from point A to point B along a supply chain. From labor and transportation to policies and climate, many factors influence how food gets from plot to plate. It includes:

- the chain of activities from producer to consumer;
- the factors that influence the chain of activities and are influenced by it.

These are drivers and outcomes of the food chain, which have economic, political, environmental, health and social dimensions(Center for food policy-University of London).

In other words the food system encompasses the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, and parts of the broader economic, societal and natural environments in which they are embedded (FAO, 2018). The food system further encompasses the public officials, civic organizations, educators, researchers, and all other parties that influence it through policies, regulations, or programmes. On the highest, most abstract level, the food system includes the frameworks, belief systems, and paradigms that define its rules and invisibly control its functioning.



PITFALLS OF FOOD SYSTEM

The global population is forecast to be over 9 billion by 2050, leading to an increasing demand for food and placing further pressure on finite resources. This raises questions for the types of food production we have and the choices that will be available for consumers (TNS BMRB, 2014). Food system is rife with inequalities and issues that prevent adequate food security for all, and have consequences for individuals as well as our global environment (O'Boyle Toni, 2019). Food systems are deeply entwined with many social issues. Moving toward a healthier and more sustainable food system will involve tackling long standing challenges and addressing new and evolving demands. Food is essential to our survival, yet its production is undermining the environment upon which this survival is based.

The next chapter will explain the proximate causes. Here are the top five problems with the global food system (SPACE):

- **Seafood Products:** Farmed catfish are the most taxing on the environment. Nutrient buildup happens when there is a high density of fish in one area. Fish produce waste, and their waste has the potential to build up in the surrounding area. This can deplete the water of oxygen, creating algal blooms and dead zones (Global Aquaculture Alliance, 2019).
- **Population Factor and Planetary:** The food system affects everyone. It has been proposed that global food production will need to increase 50% by 2050 to feed this growing population. As a result there will be an extra 219,000 people to feed each day and we will need to produce more food in the next 50 years than we have ever done before! It is important to ensure this growth is achieved responsibly, without jeopardizing the future of our natural resources (Future Learn). Food security has become an increasing concern of urban populations. Urban centers have expanded enormously, in population and in size. Majority of the world's population moves to urban areas which result in unevenness of access to food. Feeding a growing population and achieving food security has been defined as one of the most significant challenges for the next three decades due to the rapid rise in population. By 2050, global food systems will need to feed and nourish more than 9 billion people in a safe, responsible and sustainable way.
- **Agrofuels:** Agriculture is a big source of greenhouse gases. Biofuels are fuels derived from organic matter, such as plant and animal materials, as opposed to fossil fuels. These biofuels can be crop-based, and can be made from corn, palm oil, sugarcane, and soybeans. Thought to be a valuable alternative to fossil fuels, many farm subsidies have been put into place to promote the production of these crops. Yet not only have biofuels proven to be more harmful to the environment than expected, they can also be potentially devastating to the food system. Increased devotion of agricultural land to produce food-based biofuels has resulted in global displacement of people and rise in food prices(O'Boyle Toni , 2019)

- **Climate Change:** Food systems are a major driver of environmental effects, including climate change. Food systems rely on natural resources, which are extremely vulnerable to rapidly changing climatic conditions. Agriculture's effect on climate change is caused both by emissions (such as burning fossil fuels) and reduced storage of gases in soils and other media. Climate change will continue to impact food production in unpredictable ways.

Environmental Public Health Impacts/ Exploitation of Workers: Excess fertilizer runs off the field and pollutes waterways. Pesticides have been linked to multiple health problems, including neurological and hormonal system disorders, birth defects, cancer and other diseases.. Fertilizers pose direct and indirect risks to human health. Animal waste can contain harmful bacteria, which can infect workers or spread into nearby water systems. Fertilizers and pesticides contaminate soils, groundwater, and streams. Furthermore, farmers are exploited, farmers often work just as hard and can't feed themselves or their families. Farm workers are also regularly exposed to toxic chemicals, whether from applying pesticides or from handling produce that has been recently sprayed, or, in some instances, from being directly in the path of a pesticide application. Farmers often have no other option than to enter into unfavorable contracting arrangements that limit their choices in how they produce and entrench them in cycles of debt and dependency (Friends of the earth international, 2019).

SOLUTIONS FOR THE PITFALLS

FAIR-TRADE

Transforming the way we use land to grow food and fibre has a huge role to play in addressing three critical planetary boundaries of climate, biodiversity and oceans.

FAIRTRADE is an acronym that is easy to remember when thinking about the solutions:

- **Food Distribution:** Food distribution is the process where a general population is supplied with food. For example in Africa, The heart of the political problems and economic failures affecting food distribution included poor agricultural pricing and a lack of state involvement with rural development.(https://en.wikipedia.org/wiki/Food_distribution). We need more organizations that focus on distributing food that work independently e.g. food banks organised by governments that contribute to distributing food to help with the issue of food insecurity.
- **A New Path:** If we want to build a healthier, greener, kinder, more sustainable future that gets us closer to the UN Sustainable Development Goals (SDGs), we must follow a new path. Coordinated action is needed at many levels, from local food webs, to national policy, to international agreements. Industrial Animal Production and Consumption: A sustainable, kind, and equitable future food system capable of achieving the SDGs will require immediate and lasting global reductions in industrial livestock production, (Laura Driscoll (2021). Production change must go hand in hand with consumption shifts toward diets that de-emphasize meat and animal products now and in the future.

- **Reverse Corporate Concentration and Consolidation:** If we want to increase economic well being for farming communities, we must reverse the trend toward rising corporate control and concentration in food supply chains. We need a diverse array of community-oriented alternatives. These can include fair trade supply chains, secure land tenure and support for global subsistence food production and farmers cooperatives.
- **Technology Innovation:** Technology has revolutionized agriculture at regular intervals. Technology continues to create opportunities to improve the productivity and sustainability of the food system for example; promote linkages along the food value chain, through mobile service delivery, big data, the Internet of Things (IoT) and blockchain-enabled traceability; and create effective production systems, through water sensors, gene-editing and other scientific advances that make agriculture more precise and high-yielding. Together, these innovations will transform a sector too often characterized in too many parts of the world by poverty and waste.
- **Reducing Waste:** Food systems are consistently shaping our culture and traditions and vice versa. More than 1bn tonnes of food are wasted every year, a third of the total produced (Damian Carrington (2018)). Tackling waste across the food chain is considered to be a high priority to address challenges affecting food sustainability.
- **Agriculture:** Culture is inherent in agriculture (Glenn Denning and Jess Fanzo). Smallholder farmers are important actors in the transition toward sustainable food systems; they are the focus of SDG 2 with its goal of doubling smallholder productivity and income by 2030 (Edward Grumbine R, Jianchu Xu, and Lin Ma, 2021). Farmers should adopt precision technology so that they can more accurately deliver the right amount of fertilizers and pesticides to arable crops. Another way is to grow our own support neighborhood and school gardens, and urban agriculture. Furthermore, farmers can create new value in agricultural systems by working together in farmer groups example (Girls Farmers Club in Nigeria).
- **Declining Fish Stocks:** We eat too many of a very few species of wild fish – mostly the ones that are higher on the food chain. Continuing in this vein will cause the eventual decimation of our oceans (Taras Grescoe). We need to eat fishes that are more sustainable, more plentiful, more resilient, and healthier for us, for example sardines, and small Spanish mackerel.

Equal Access to Nutritious Foods: Consumer groups are an important way to get good food to urban groups with no direct access to farms and the countryside. Some of these have had a remarkable effect on farming, as well as on other environmental matters. Local shops are the social centers of communities – they keep an eye on the elderly and inform them they provide notice boards for advertisements; they keep in touch with local people. They provide diverse foods and connect producers with consumers (Jules Pretty (2001). Don't buy packaged, processed food. Buy fresh, local foods grown by farmers with diverse operations (Vanessa Barrington, (2010), Grow and Eat Local.

No single solution will solve the problem of food insecurity. Our goal was to create a forum by inviting people who share similar concerns and a similar desire to achieve a sustainable food system. We must transform our food systems to achieve healthy people and a healthy planet.

WHY SHOULD YOUTH BE INVOLVED IN FOOD SYSTEMS?

This question is important, owing to the size of the current demographic cohort of youth, globally but especially in the majority world, as well as the large stake, and strong influence, that today's youth will have in the development trajectories and future sustainability of food systems. The interests and needs of this youth generation are important, not only because they are many, but because they will need—indeed, they are entitled to expect—decent work and livelihoods, as well as long and healthy lives; yet, to achieve this objective for so many people will be challenging in an era of ecological stress. (Glover and Sumberg 2020)

Youth is better understood relationally, as a transitional phase within the life course. While every human being depends on consuming food, their individual transition from childhood to adulthood involves—as a very stylized generalization—a significant enlargement of autonomy and independence, as well as an increased likelihood of being substantially and directly involved in the production, distribution, procurement and/or preparation of food, as well as its consumption. However, each person's youth transition and their relationship with food systems is uniquely shaped by specific intersections with multiple factors including gender, class, wealth, health, location, intergenerational relationships, and many others. (Glover and Sumberg 2020)



Source: *International Science Council* 2021

Youth in rural communities are already integral contributors to local food systems whether on family farms, fishing boats or post-harvest activities, in livestock husbandry, in processing and transport, and as part of household livelihood strategies. Young men and boys are most often responsible for herding livestock, using tools, operating machines, transporting goods to market, and preparing land. Young women and girls may be in charge of collecting water, raising small animals, tending household gardens, trading, and selling and processing fish, as well as selling and processing horticulture at local markets.

However, for women especially, many of these are subsistence level activities and are unpaid, understood more as household chores or activities. Indeed, there is an opportunity to enhance and expand the contributions of young women and men within households as well as across agriculture and seafood systems (Feed the Future). As the Feed the Future projects, young people make important contributions to sustainable food systems objectives and goals, including:

- Contributing their entrepreneurial talents to value chain upgrading,
- Engaging in mixed livelihoods strategies that contribute to household resilience,
- Acting as early adopters of new technologies that contribute to food systems resilience.

WHAT DOES THIS HAVE TO DO WITH THE UN?

The UN Food Systems Summit was announced by the UN Secretary-General, António Guterres, on World Food Day last October as a part of the Decade of Action for delivery on the Sustainable Development Goals (SDGs) by 2030. The aim of the Summit is to deliver progress on all 17 of the SDGs through a food systems approach, leveraging the interconnectedness of food systems to global challenges such as hunger, climate change, poverty and inequality. (Joshua 2021)

According to the United Nations, young people from Brazil to India, Cameroon to Fiji, and more than 100 countries around the world have been engaging in public debates across the five priority areas or Action Tracks, which include food security and nutrition, sustainable consumption, environmental protection, poverty and resilience. (Joshua 2021)



Source: *Scaling Up Nutrition 2020*

Youth empowerment is so important to food systems transformation that it has been placed into all Summit work streams and structures. Young leaders have been included among the vice-chairs for the Action Tracks, while youth empowerment is a common theme across four “levers of change” identified by Summit organisers as among the most influential factors for delivering the Sustainable Development Goals (SDGs) by 2030. (Joshua 2021)

When it comes to food systems, where do you sit in relation to the food on your plate? This training manual serves as a tool for exploring food systems, their challenges and possible youth-driven solutions for sustainable, equitable food futures. It looks backward to the drivers of change and forward to the challenges faced by producers, consumers, and policy makers of tomorrow.



HISTORY OF FOOD SYSTEMS

This section will look at how food was produced, distributed and consumed. Since the conception of agriculture and fishing, food systems have been in a constant state of change. Each change has given rise to new opportunities and advantages, as well as challenges with an ever greater diversity and complexity. Each country and population group has its own trajectory of change in food supply, but there are also many global interlinkages. Each country and population group has its own trajectory of change in food supply, but there are also many global interlinkages. The road to the present food system has not been smooth. There has been resource degradation, disease, rapid population growth, changing climates and other factors that have occasionally crippled food supplies. The world still faces many similar challenges as our ancestors did in the past. However, some of the threats to the food system we are facing are new and even greater. For the future of food systems, we need to look and learn from the past in order to have food security for all.

HISTORY OF AGRICULTURE OR LAND-BASED FOOD SYSTEMS

About 11,000 years ago, mankind went from being hunter-gatherers to understanding how to grow and harvest wheat, corn, spelt, kamut and other grains. This is known as the agricultural revolution or the first agricultural revolution. Food systems emerged with the dawn of civilization when agriculture, including the domestication of animals, set the stage for permanent settlements. Inhabitants could grow more crops and raise more animals than necessary to feed those who tended them. This changed human culture; unlike earlier hunter-gatherers, agriculturalists did not need to be in constant motion to find new sources of food. Due to the ability to grow and eventually store food, man developed surpluses. When certain groups had too much food, they could trade it for food grown by other populations or could trade it for other goods. Such early commercial transactions led to the spice trade, which connected various countries and eventually developed into the global trade system of today. This approach would be what some call the "standard food system" or "basic food system." It has been prevalent throughout the second half of the 20th century and to some extent in the 21st (Rick LeBlanc, 2019).

The major drivers of food systems over time and space covers from Science and Technology, preservation and storage etc. This will be discussed further.

1. Science and technology represent another major driver, changing the way that food is grown, processed, preserved, and transported. The Industrial Age brought a transition from manual labor and draft animal-based economies to machines. Further increases in agricultural productivity brought about by technology such as the seed drill, the iron plow, and the threshing machine freed up labor for the factories in the 1700s. The Industrial Revolution also created per-capita income growth. The emerging middle class had discretionary income to spend on its food preferences (Will Hueston and Anni McLeod, 2012).
2. Food preservation, important to both storage and transport of food, also changed over time. Drying was one of the early food preservation methods, certainly known in ancient times. Fermentation also was an early method of food preservation, with pasteurization. Salting of food was a method of preservation of food. Now the two preservation methods, canning and freezing, allowed food to be stored and transported in an almost-fresh state. Now refrigerated and frozen food products are traded globally.
3. Supply-driven to demand-driven until the 20th century many countries had supply-driven economies, where policies favored increased agricultural production to ensure adequate domestic supplies of basic feedstuffs. Increasing the supply and reducing the costs of food were politically popular national priorities. Food self-sufficiency was a powerful motivation, especially for countries that had experienced food shortages in the past. Countries that exceeded domestic demand used export markets and food aid programs to deal with the excess (Will Hueston and Anni McLeod, 2012).

Food systems appeared with the dawn of civilization when agriculture created permanent settlements. People could now grow crops and raise more animals to better feed their families and themselves. They did not need to move around in order to find new sources of food. (Hueston and McLeod) More abundant food supplies meant that people were tied to the land, therefore small settlements could grow into towns, and towns into cities. (John Hopkins



Source: Samara Attard through Sutori

University). Cultivating grain enabled people to dry and store some of the harvest for later consumption. Various grain cultures surfaced in each of the cradles of civilization: rice in China, wheat and barley in the Middle East and maize in Mexico. (Hueston and McLeod)

With the Iron Age and the Roman Empire came the global food system as empires were expanding beyond their boundaries. This brought about the regional specialisation in products that could be traded across empires. Food systems started to be organised on a major scale to feed larger cities and power local economies. Trading networks were established for goods such as grain, oils, nuts, wine and fruit. These were transported on newly constructed road systems and sailing routes. In order to ensure fair trade, standardised weights and measures were created which lead to the formation of accounting and money. (Hueston and McLeod)

The Middle Ages saw an emergence of a wealthy class who had more sophisticated food preferences. This resulting demand leads to an increase in trade and a change in the supply. During the Industrial Age, how food was grown, processed, preserved and transported changed with the advancements made in science and technology. There was a transition from manual labour and draft-animals to machines. In the 1700s, increases in agricultural productivity were brought about by technology such as the iron plow, the seed drill and the threshing machine. Innovation in transportation was introduced in the Industrial Age such as improved roadways, canal systems, and steam engines used in traction, railroads and steamships. (Hueston and McLeod)

Food preservation which is essential in the storage and transportation of food advanced over time. During ancient times, drying was the only food preservation method. Then came fermentation which has been used in food preservation in China from as early as 1117. Salting was the next method to be used. For more than 500 years ago, fishermen from Europe have used a combination of salting and drying to store fish caught way out at sea. Canning and Freezing, were next, and made it possible for food to be stored and transported in an almost-fresh state. Canning was invented in 1810 through military research. Freezing or ice storage was formed in colder northern climates where ice could be cut from lakes in winter for use at a later time. Commercial refrigeration was invented in the 1800s. Refrigerated and frozen food products were now able to be traded globally. (Hueston and McLeod)



In the 20th Century, there was an intensification of agricultural production with mechanisation of planting and harvesting, more attention was given to animal nutrition, and selective breeding of animals and plants. There was an increased scale of production pushed down the per-unit cost of products and advanced greater specialisation in food systems, such as the movement of poultry indoors.

One of the most influential innovations in agriculture was the introduction of synthetic fertilisers in the 1900s. Before this, farmers used natural fertilizers such as wood ash, manure, fish or fish parts, ground bones and guano (bird and bat waste). (National Geographic Society) Synthetic fertilisers substantially increased the crop yields and have been recognised as providing the lion's share of the world's food over the 20th century. (Hueston and McLeod)

In the 1800s, farmers were now able to selectively breed their livestock which increased the size and productivity of their livestock. In the late 1800s, genetics was introduced to the world of agriculture, through Gregor Mendel's heredity studies in pea plants. This was then improved on in the 1950s and 1960s by scientists who developed new strains of high-yield rice and wheat. Production of grain soared in the areas where these grains were introduced, Mexico and some areas of Asia. This is now known as the 'Green Revolution'. (National Geographic Society)

People could now scientifically choose select characteristics they wanted to reproduce due to the greater knowledge of genetics. Starting from the 1970s, scientists could now rearrange genes and add new, desirable traits that promote productivity, disease resistance, or any other desired characteristic in crops and livestock, and are called genetically modified organisms (GMOs or GM foods). Transgenic organisms were then introduced that used genetic material or DNA from other species. This has led to plants and livestock that are larger, grow faster than their ancestors and substantially greater yields. (National Geographic Society)

Presently, agricultural methods vary extensively worldwide depending on climate, terrain, traditions and available technology. Many of the world's farmers live in developing countries or emerging markets where they cultivate land as their ancestors did for hundreds or maybe thousands of years. The agricultural advancements are not available to them or too expensive to use. These subsistence farmers, as they are referred to, mainly grow food to feed themselves and their families and the surplus is sold at local markets unlike commercial farmers who grow their crops mainly for market, not personal use. (National Geographic Society)

With these new methods of farming, there has been a tremendous loss to the biodiversity of local flora and fauna. The introduction of pesticides has been amongst the most damaging to the environment and controversies surrounding the use of genetically modified foods is enormous and the nutritional value is highly questionable. (National Geographic Society) This brings up the question of what the future of food systems will be and can it be made sustainable in order for the environment to be safeguarded for future generations.



BRIEF HISTORY OF AQUATIC & SEAFOOD SYSTEMS

While the emergence of food systems is often attributed to agriculture and the domestication of animals at the dawn of human civilizations, fisheries' contributions as seafood systems are often overlooked. Archeological evidence suggests that around 6500 BCE, the earliest large, fixed human settlements appeared in wetlands, such as the Mesopotamian alluvium. Apart from hunting, gathering, foraging, human residents benefited from these uniquely diverse and productive aquatic ecosystems by fishing.



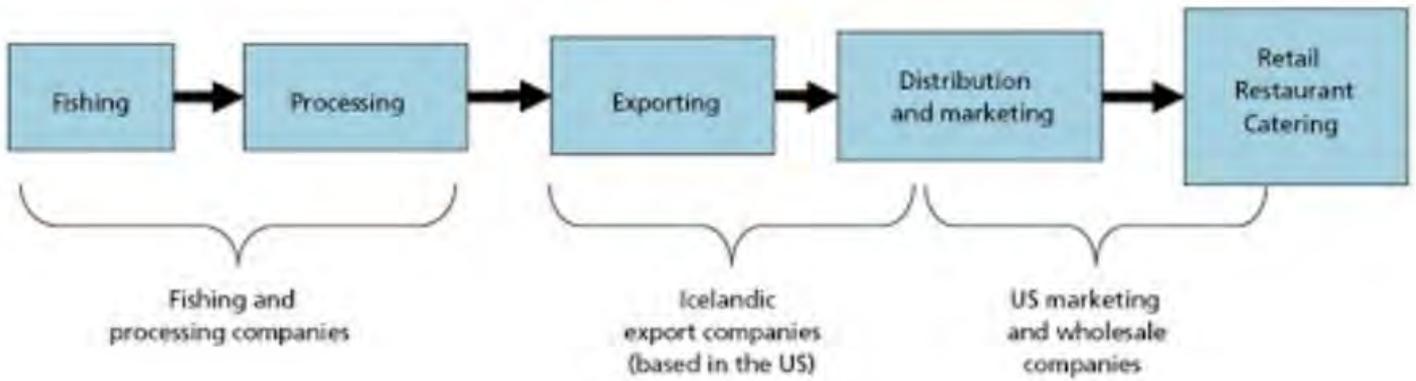
Local sea and freshwater food systems developed as humans continued to settle near water supplies and along coastlines. For thousands of years, riparian civilizations have relied on fish and even seabirds, mollusks, turtles, and mammals such as otters or seals for their food and nutritional security. Today, fishing is interwoven into riparian and seaside villages' sense of place, social capital, gender roles, natural-cultural heritage, and livelihoods; examples of a food system woven into the fabrics of communities.

For centuries, humans believed the ocean was so vast and plentiful that mankind could never deplete it of its resources. However, as human populations grew and migrated to urban centers, demand for fish increased as a comparatively easy source of protein to secure. Driven by international commercial trade and supported by technological innovations, such as nylon nets, freezers, and engine-powered vessels, fisheries rapidly expanded its geographical reach to become a monumental global force causing unprecedented shifts in aquatic ecological interactions and feedback loops. Exponential growth fueled by governments' financial investments, fishing capacity and global reach, the systematic development of fisheries as seafood systems after the 1950s is described as the sequential depletion of marine biodiversity across trophic levels.

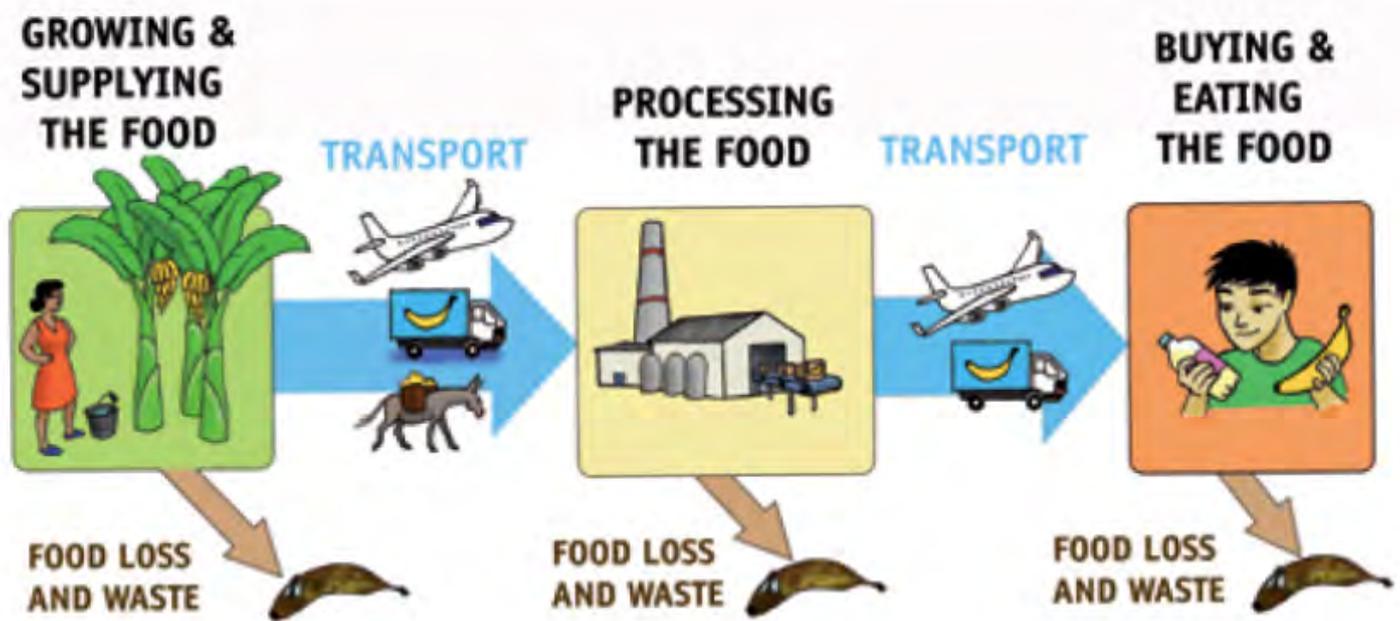


It is now estimated that industrial fishing is taking place across more than 55 percent of the oceans covering a greater surface area than agriculture. Yet only 10 percent of the 120 million employed in fisheries work in industrial fisheries. This means that the remaining 90 percent of fisheries stakeholders are still considered traditional or small-scale fishing near shore. Moreover 97 percent of fisheries actors live in the world's Tropical Majority countries. Small-scale fisheries actors often experience marginalization, left out of conversations about the ocean's future and competing for dwindling resources in what is known as a "closure of the commons" - what is left of their cultural-natural heritage. About half of those working in the fisheries sector are women, mostly engaged in post-harvest activities such as marketing and processing. Many small-scale fishing communities have high levels of poverty and experience marginalization. Fish provides vital nutrition to billions of people and is essential to the diet of the poor. For three billion people — the populations of China, India, and Brazil combined — fish provide an essential daily source of protein. Currently, the world population is 7.6 billion and expected to reach 9.8 billion in 2050. In order to feed a significant portion of that future, a serious increase in fish catches must be secured.

Between historical market demands for low-priced seafood and contemporary ecological challenges such as warming seas, plastic pollution, and habitat destruction, small-scale fisheries are facing unprecedented challenges. Often isolated in rural areas or marginalized with little access to external markets, adaptation information, and secure infrastructure, fishing communities face the planet's greatest challenges on a daily basis with little support.



Source: FAO



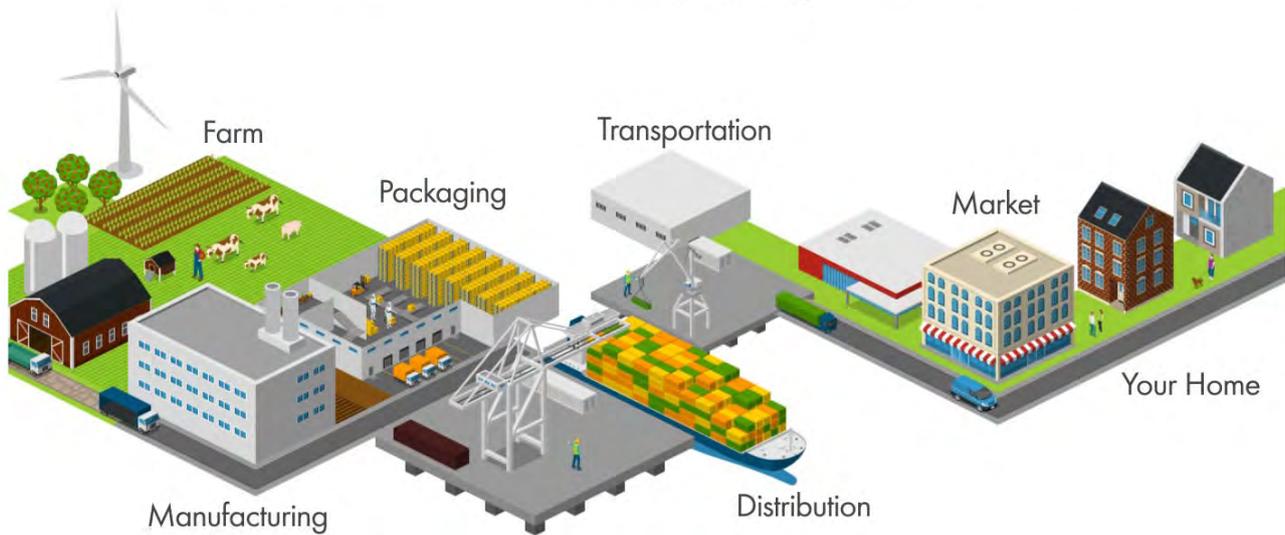
A simplified roadmap of the current food system that includes subsistence and commercial farming.

Source: YUNGA, Emily Donegan

CURRENT FOOD SYSTEM CHALLENGES AND OPPORTUNITIES

As the world moves more towards a Globalised food chain, there are factors that are stressing the supply chain and producing opportunities and challenges that need government and international intervention. Moreover, these external factors have affected and continue to affect the food system.

The Food Supply Chain



Source: HowStuffWorks

External drivers affect food systems and their diet, nutrition, and health outcomes. Here are some external drivers:

- **Climate Change:** Climate change is a significant, long-term shift in global weather patterns and sea levels. Climate change will likely affect the whole food system from the production level to people's diets. The effects of unmitigated climate change will likely cause increased food insecurity. At the production level of the food system, climate change can lead to declines in fish populations and crop yields. Staple crops grown in high carbon dioxide conditions will likely have reduced nutrient content (e.g. protein, iron, and zinc) which affects the quality of people's diets.

At the storage and distribution stage of the food system, climate change leads to more crop losses due to increased disease susceptibility and extreme weather events. Food prices may increase because of agricultural losses and declining crop yields. Staple crops grown in high carbon dioxide conditions will likely have reduced nutrient content, which affects the quality of people's diets (GAIN, John Hopkins University).

- **Globalization and Trade:** Globalization makes people and countries more interconnected and interdependent. It shapes local economies and affects human health and nutrition in both positive and negative ways. Trade may create new employment opportunities, but it can also increase competition for local producers, which may reduce prices for domestic products and threaten the livelihoods of smallholders. Trade can allow people to access foods that may not be easily grown where they live or are less available during a particular season. This increases the diversity of the food supply and access to seasonal foods year-round. It also makes foods less expensive through efficiency and competition. The lowered cost of imported food and animal feed can increase access to animal source foods and lead to higher protein intake, which is important for areas with high rates of undernutrition.

Globalization and trade can also have adverse effects on diets and nutrition. Unhealthy foods have become increasingly accessible and inexpensive around the world, partly due to trade policies and widespread advertising. People's diets have changed from more traditional ones high in minimally processed foods to those high in animal source foods and highly-processed foods with a lot of salt, unhealthy fats, and added sugars. People are also less physically active as a result of globalization. All of these changes have contributed to the increasing burdens of overweight/ obesity and non-communicable diseases.

- **Income growth and distribution:** As a country's average income grows, nutritious foods – like animal source foods (e.g. meat, dairy) and fruits – become more accessible. Income growth can also lead to greater demand for animal source foods, which can stress food systems by putting more demands on land and water resources, and increasing greenhouse gas emission. Rising incomes can also lead people to buy more unhealthy foods, such as sodas and highly-processed, packaged foods.

People may not have equal access to healthy foods because of increased income inequality. In high-income countries, healthier foods – like fresh fruits and vegetables – are typically more expensive than highly-processed, packaged foods. These less expensive foods tend to be higher in saturated fat and sodium. In low- and middle-income countries, highly-processed foods and animal source foods are linked to wealth, which may make these foods socially desirable

- **Urbanization:** Urbanization shapes a country's food system – it creates longer food chains and limits agricultural land. However, urban areas are also typically centers of food technology innovation. This is because there is an increased need for processing, packaging, and refrigeration, and more food losses.

Urbanization changes the food environment by increasing the number of supermarkets in an area. Additional supermarkets can increase access to both healthy and unhealthy foods. Urbanization provides easier access to all foods, including more processed foods. In low- and lower middle-income countries, street vendors, not supermarkets, provide easier access to food.

For people with low incomes, urbanization can lead to food deserts and swamps. In these areas, access to healthy, fresh food is limited, but unhealthy fast foods and highly-processed, packaged foods are plentiful.

Urbanization is also linked to increased incomes, demand for convenience foods, and eating outside of the home. Increased attention is being placed on the way that linkages between cities and rural areas can be leveraged to revitalize rural economies and increase access to healthy diets for both urban and rural populations.

- **Population growth and migration:** Increases in population will put more stress on the current food system. Due to global trade and migration, population growth in one country can affect the food system in other regions as well. Additionally, countries may not be prepared for the influx of migrants fleeing conflict or severe weather events. Food systems may not be able to supply everyone with a healthy diet.
- **Politics and leadership:** A region's policies on agriculture, nutrition, and trade affect food systems. Economic policies on agricultural subsidies and trade can influence the availability and affordability of certain foods, which in turn can affect dietary intake.

Governments can implement dietary guidelines to shape policies and promote healthy diets. For example, tax policies can be used to discourage eating unhealthy foods like soda and highly-processed, packaged foods. Political will and investment are needed to make sure that there are sufficient resources to create a sustainable food system

- **Sociocultural context:** Social and cultural traditions shape diets by influencing what foods are desirable, when and how meals are prepared, and what traditions are practiced. In some cultures, food may reflect a person's social status in society or the household. Foods associated with a higher wealth status may be more desirable.

In most cultures, food is a central part of holidays and traditions. Strong cultural ties to traditional foods and meal practices could work to prevent the shift to diets high in highly-processed foods and reliance on fast food. In many cultures, certain foods are avoided for reasons such as life stage (adult vs. childhood foods) or gender. In particular, culture has a strong influence on what people eat while pregnant or lactating (GAIN, John Hopkins University).



SDGS RELATED TO OR IMPACTING ON SUSTAINABLE FOOD SYSTEMS

SUSTAINABLE FOOD SYSTEMS

There is a causal relationship between sustainable food systems and healthy diets. (World Health Organization, n.d.). For the global food system to be able to rise up to the challenges of population growth, hunger, malnutrition, increased pressure on natural resources, the loss of biodiversity and climate change, a transition is needed to more sustainable food systems. A regenerative, productive farming sector can provide environmental benefits and services while creating rural employment and sustaining livelihoods. (FAO 2021) To move forward, we need to address food systems in their entirety to find “openings” for change.

This chapter will focus on examining the concept of sustainable food systems and introduces the notion of a Sustainable Food Systems Approach. It concludes with an overview of some of the main strategies for achieving the transformation to more sustainable food systems.

WHAT IS THE GOAL OF TRANSITIONING TO SUSTAINABLE FOOD SYSTEMS?



SDG 2

Zero hunger by 2030



EAT-Lancet

Dietary targets



Global Commission on Adaptation

Build resilience of 300+ million small-scale agricultural producers by 2030



Science Based Targets Initiative

Reduce agricultural emissions by 1 Gt by 2030



SDG12

Halve per capita **global food waste** by 2030



FAO

Zero deforestation

SDG15



Halt biodiversity loss and, by 2020, protect and prevent extinction of threatened species

Source: (Steiner A, Aguilar G, Bomba K, Bonilla JP, Campbell A, Echeverria R, Gandhi R, Hedegaard C, Holdorf D, Ishii N, Quinn K, Ruter B, Sunga I, Sukhdev P, Verghese S, Voegelé J, Winters P, Campbell B, Dinesh D, Huyer S, Jarvis A, Loboguerrero Rodriguez AM, Millan A, Thornton P, Wollenberg L, Zebiak S., 2020)

A Sustainable Food System is quite important to realise the Sustainable Development Goals. As you have learned, the food system comprises different elements from farm to table and all these elements affect and are affected by the SDGs. SDGs call for major transformations in agriculture and food systems in order to end hunger, achieve food security and improve nutrition by 2030. To realise the goals, the global food system needs to be transformed to be more productive, more inclusive of poor and marginalized populations, environmentally sustainable and resilient, and able to deliver healthy and nutritious diets to all (OnePlanet Network 2020).

	Food systems outcomes	Relevant SDG targets
Socio-economic	Livelihoods and well-being (profitability for farmers, living wages)	2.3, 2.4, 8.2, 8.5, 10.1
	Social justice and equality (incl. gender)	1.4, 2.5, 4.4, 5.5, 8.5, 8.6, 8.7, 8.8, 10.2, 15.6, 16.7, 17.16
	Economic development and poverty alleviation	1.1, 1.2, 8.1, 9.3
	Human health	2.4, 2.5, 3.4, 3.9, 6.3, 8.8, 12.4
	Resilience and climate change adaptation	1.5, 2.4, 2.5, 11.5, 13.1
Environmental	Resource efficiency	2.4, 3.9, 6.3, 6.4, 6.5, 7.3, 8.4, 9.4, 12.2, 12.3, 12.4, 12.5, 14.1
	Ecosystem services	2.4, 6.6, 12.2, 14.5, 15.1, 15.2, 15.3, 15.4
	Conservation and sustainable use of biodiversity	2.4, 2.5, 11.4, 12.2, 14.4, 15.4, 15.5
	Climate change mitigation	2.4, 6.6, 12.2, 12.3, 15.2
Food security and nutrition	Food availability	2.1, 2.2, 2.3, 2.4, 2.5, 3.4, 12.2, 12.3, 14.4 ³⁶ , 15.3
	Food utilization	2.1, 2.2, 3.4, 12.3
	Food access	2.1, 2.2, 3.4
	Food stability	2.1, 2.2, 2.3, 2.4, 2.5, 3.4

Figure 3: Linking Food Systems Outcomes to the SDGs

Source: One Planet network Sustainable Food Systems (SFS) Programme, 2020

WHAT ARE SUSTAINABLE FOOD SYSTEMS?

There are different definitions related to sustainable food system however FAO Sustainable Food System (SFS) Concept and Framework paper defines SFS as “A sustainable food system (SFS) is a food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised. Sustainable food systems are therefore protective and respectful of biodiversity and ecosystems, as well as human well-being and social equity. As such they provide culturally acceptable, economically fair, affordable, nutritionally adequate, safe and healthy foods in a way that balances agro-ecosystem integrity and social welfare. Therefore a sustainable food system involves economic, social and environmental factors (FAO 2018)

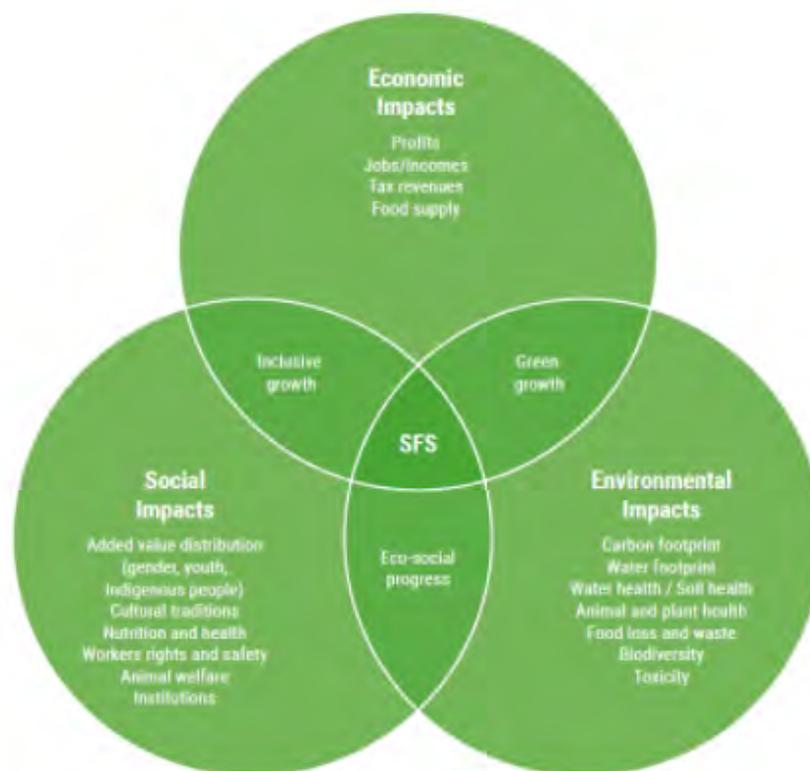


Figure 2: Sustainability in Food Systems (Adapted from FAO 2014)

To be economically sustainable, we need incomes and create jobs. To be socially sustainable, they must include poor and vulnerable communities and reduce levels of hunger and malnutrition. To be environmentally sustainable, we must safeguard our land, water, soil and air quality while minimizing greenhouse gas emissions, and food loss and waste. Sustainable food systems are interconnected and represent the full agri-value chain, from pre-production and production to supply chains and consumption.



The “pre-production” stage includes innovations in agricultural inputs, such as fertilizer or crop protection products. It also includes advances in agricultural practices themselves to ensure that farmers can continue to thrive in the face of climate change and other increasingly unpredictable conditions. In the “production” stage, farmers must contend with the myriad challenges involved in growing and harvesting, including pests and disease, severe and unpredictable weather, food loss management and fluctuating market conditions. The “supply chain” stage refers to the steps taken to deliver food from the farm gate to the plate. These products can be processed, packaged and stored before eventually being transported to market. The consumption” have broader implications to our food and nutrition security, the well-being of our communities and to the wider environment and natural resource base (Farming First).

In a nutshell: In a sustainable food system, all people would at all times eat sufficient safe, healthy, and nutritious diets, which are produced and consumed within planetary boundaries, while all producers are able to make decent livelihoods.

THE PATHWAY TOWARDS SUSTAINABLE FOOD SYSTEMS

THE SUSTAINABLE FOOD SYSTEMS APPROACH

Sustainable Food Systems Approach considers food systems in their totality, taking into account the interconnections and trade-offs among the different elements of food systems, as well as their diverse actors, activities, drivers and outcomes (One Planet). The concept of a Sustainable Food Systems Approach and the need for it is embedded in the SFS Programme such as Sustainable diets, Sustainability along all food value chains, Resilient, inclusive, and diverse food production systems and Reduction of food losses and waste.

4 APPROACHES TO THE FOOD SYSTEMS APPROACH:

1. Sustainable diets: The concept of healthy diets through sustainable food systems entails the following elements. Sustainable food systems provide food and enable healthy diets, while achieving the three dimensions of sustainable development, for current and future generations (CFS Voluntary Guidelines on Food Systems and Nutrition). Sustainable and healthy diets have co-benefits for the health and well-being of both consumers and producers, as well as for planetary health.
2. Sustainability along all food value chains: One way to promote sustainability in the food system is along the food value chain through “green” value chains such as short supply chains. These are value chains where environmental and social indicators are taken into consideration in determining the sustainability of the supply chain.
3. Reduction of food losses and waste: Combating food loss and waste requires different approaches. Most food waste occurs at the consumption stage, whereas food losses arise from inadequate infrastructure, technologies and practices along the value chain. Food loss and waste occurs along all parts of the food value chain, with impacts on food security and natural resources. A number of efforts are aimed at providing guidance on how to measure food loss and waste accurately and systematically. Example the Food Loss Index, developed under the lead of FAO, focuses on food that is lost early in the supply chain, from harvest to processing, while the Food Waste Index, developed under the lead of UN Environment, focuses on consumer and retail waste. (CFS Voluntary Guidelines on Food Systems and Nutrition).
4. Resilient, inclusive, and diverse food production systems: the ability to prevent disasters and crises as well as to anticipate, absorb, accommodate or recover from them in a timely, efficient and sustainable manner (The Food and Agriculture Organization (FAO), 2016). In our view, resilience in relation to food systems: “encapsulates the relationship of cities to their food sheds in terms of environmental sustainability, and stability of production of diverse foodstuffs in the face of economic, political, or environmental shocks and climate change (CIAT 50). As the COVID-19 crisis has shown, the ramifications of disruptions to food production systems can be dire, with impacts on the productivity and stability of agricultural production systems, food security, and household income, and increased uncertainties and risks for producers and consumers. This translates into disruptions in the value chain that may affect an entire global or national food system. Resilience is a key component of a sustainable food system, enabling it to absorb shocks and recover.

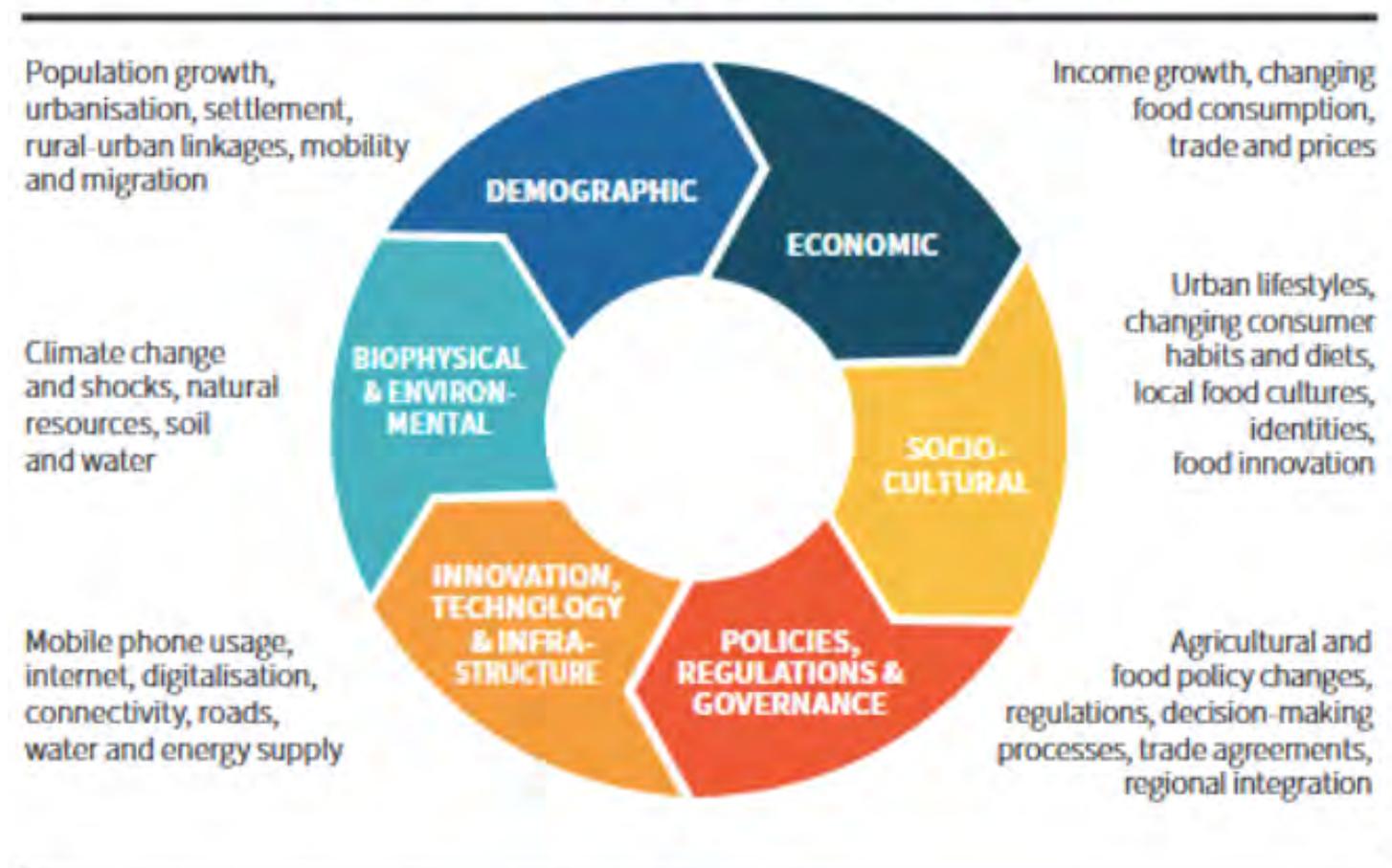
DRIVERS OF FOOD SYSTEM TRANSFORMATIONS

Six categories of drivers that will shape the future of food systems. A better understanding of these drivers and their interactions will be central to informing and designing food system policies and the future of food systems (Sahel and West Africa Club Secretariat (SWAC/OECD, 2021).

These drivers include:

- Demographic
- Economic
- Socio-cultural
- Policies, regulations & governance
- Innovation, technology & infrastructure
- Biophysical & environmental

Figure 4. Drivers shaping the future of food systems



Source: Based on Dury et al. (2019) and Tefft et al. (2017); **Figure:** SWAC/OECD.

STRATEGIES TO PROMOTE SUSTAINABLE FOOD SYSTEMS (PEAS)

Public-Private Partnerships: The private sector is a major stakeholder in the transformation to sustainable food systems. The public and private sectors can collaborate in terms of research and development, infrastructure, and other services.

Education: Research and extension services, school programs, public campaigns, training of government agents and forums for exchange among different stakeholder groups to enable understanding of interdependence, commonality of purpose, are vital for mutually supportive, sustained efforts for sustainable food systems. The School Feeding Programme is also a priority, with a focus on primary school-aged children as agents of change.

Ambassadors: Identify an individual or ambassadors of food systems and build momentum. Organize training on a food systems approach. Ambassadors will raise awareness and speak at public events to spread the message concerning the key benefits of sustainable food systems while advocating for the need to adopt a food systems approach.

Strengthen Institutions: Working together to develop a platform where policies, laws, regulations, and programs are continually reviewed, improved, and implemented.

AGRICULTURAL TRANSFORMATION TO ACHIEVE SUSTAINABLE FOOD SYSTEMS

Agriculture and food are at the core of the resilience of our systems and sustainable food systems are critical in delivering progress on all 17 Sustainable Development Goals. From ending poverty and hunger to responding to climate change and sustaining our natural resources, food systems lie at the core of the United Nations 2030 Agenda for Sustainable Development.

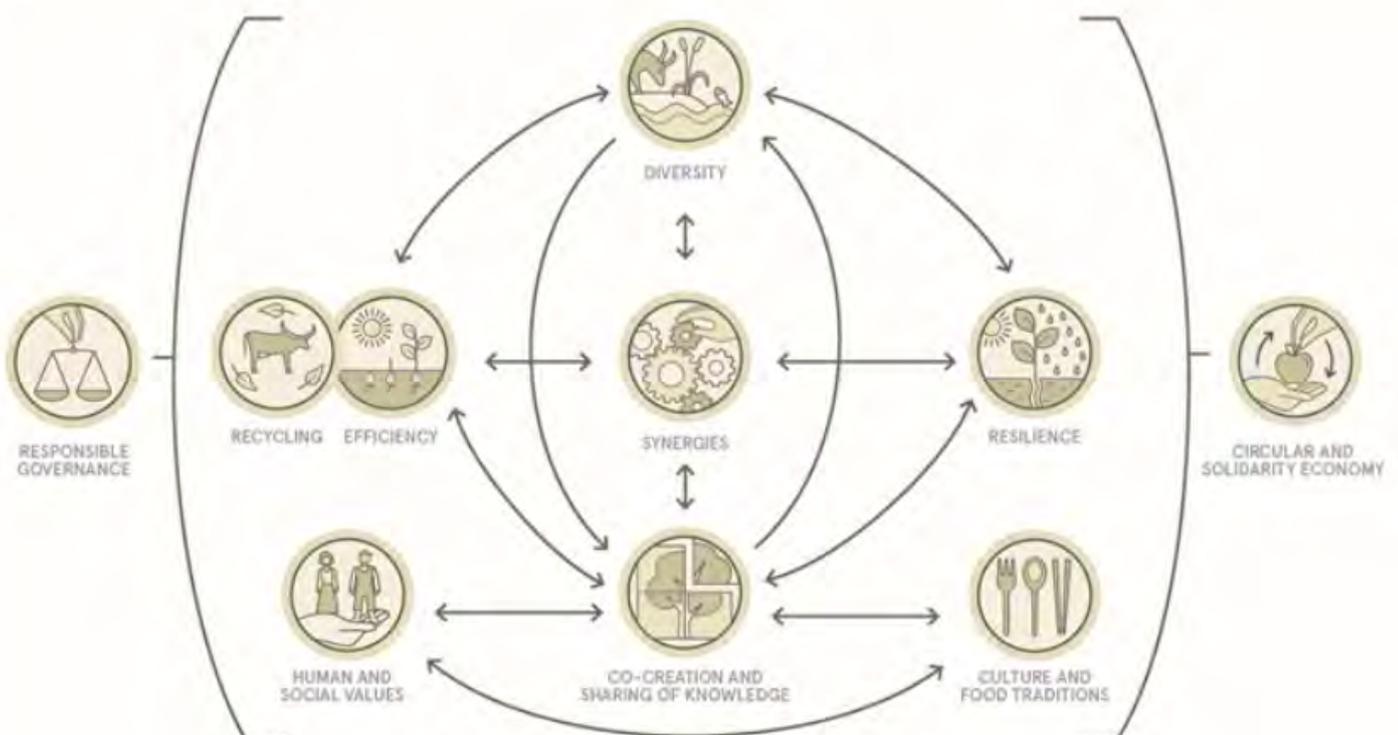
FOOD SYSTEMS TRANSFORMATION FOR SUSTAINABLE DEVELOPMENT HAS FOUR PARTS (HACA)

Healthy and sustainable food consumption patterns: Malnutrition irreversibly prevents hundreds of millions of people from reaching their full potential capabilities of living a healthy and productive life. Therefore, Sustainable and nutrition-sensitive food consumption patterns should be supported through a favorable food environment and the SDG goals.

A new vision of sustainable agricultural production and food value chains: This involves the promotion of inclusive, sustainable, and nutrition-sensitive agricultural production, processing, distribution, and marketing. This must be implemented in ways that are tailored to each other.

Contributing to mitigate climate change: climate change is central to the 2030 Agenda for Sustainable Development. There should be a shift to healthy and sustainable climate-friendly diets by incentivizing dramatic reductions in beef and dairy consumption in 15 high- and middle-income countries and all C40 cities by 2030. Also, reduce food loss and waste: By 2030, target 50% reductions in food loss and waste in five major supply chains where both greenhouse gasses and loss or waste are high(Steiner A, et al, 2020)

A renaissance of rural territories: We have to realign policies, finance, support to social movements, and innovation. We have to implement policy and institutional changes that enable transformation: By 2025, we have to transform innovation systems to deliver impacts at scale: By 2025, significantly change the approach of public agricultural research for development, with at least 50% of public investment in this research providing end-to-end solutions that support meeting the SDGs related to food (Steiner A, et al. 2020).



AN AGRICULTURAL ALTERNATIVE APPROACH TO SFS

Sustainable Food Systems also encompass existing solutions such as resilient food systems, an example that will be examined in detail is Agroecology.

Agroecology

Agroecology is the basis for evolving food systems that are equally strong in environmental, social, economic and agronomic dimensions. It can play an important role in building resilience and adapting to climate change. It checks for local solutions and linkages with the local economy and local markets. It additionally allows farmers to continue working in the field with improved livelihoods and a better quality of life. (FAO 2021)

Vast numbers of small-scale food producers all around the world, including peasants, herders and pastoralists, hunters and gatherers, family farmers, fisherfolk and indigenous peoples have been for centuries the custodians of ancestral agricultural practices and food systems based on holistic views of ecosystems and their components. This understanding is at the root of sustainable natural resource management strategies, seeking maximization of positive synergies among species and minimization of negative externalities of economic activities on the environment, which have been applied throughout history and lie at the basis of modern approaches to agroecology. (FAO 2021)

Agroecology, as a highly varied and diverse set of local practices and systems around the world, is necessarily a social construct and a dynamic concept collectively defined both within a given community and between communities through a processes of intra- or inter-national, intra- or inter-sectoral and intra- or inter-generational horizontal exchanges and continuous mutual learning among food producers committed to implementing and promoting its core principles. The fact that agroecology is based on applying and adapting universal principles to the specificities of local realities implies that local knowledge systems, as well as the dialogue among these, are essential building blocks of the concept of agroecology. The diverse and complementary in-depth knowledge available within rural families and communities on what works and what doesn't within a given territory, and the ingenuity and capability of farmers and small-scale food producers to innovate and adapt through on-farm experimentation, sharing and mutual learning. (FAO 2021)

Agroecology is based on applying ecological concepts and principles to optimize interactions between plants, animals, humans and the environment while taking into consideration the social aspects that need to be addressed for a sustainable and fair food system. By building synergies, agroecology can support food production and food security and nutrition while restoring the ecosystem services and biodiversity that are essential for sustainable agriculture. Agroecological producers recognize that a highly successful methodology for promoting farmer innovation is farmer-to-farmer learning and sharing. Agroecology is based on context-specific design and organization of crops, livestock, farms and landscapes. It works with solutions that conserve above and below ground biodiversity as well as cultural and knowledge diversity with a focus on women's and youth's role in agriculture. (FAO 2021)

THE 10 ELEMENTS OF AGROECOLOGY



Source: (FAO 2021)

According to FAO, there are 10 elements of agroecology. These are interlinked and interdependent. These elements are: diversity, resilience, co-creation and sharing of knowledge, human and social values, efficiency, synergies, culture and food traditions, responsible governance, recycling, and circular and solidarity economy. As an analytical tool, the 10 Elements can help countries to operationalise agroecology. By identifying important properties of agroecological systems and approaches, as well as key considerations in developing an enabling environment for agroecology, the 10 Elements are a guide for policymakers, practitioners and stakeholders in planning, managing and evaluating agroecological transitions. (FAO 2021)



Source: (FAO 2021)

A persistent debate in the literature on agroecological farming, and on the impact of agricultural research in general, has been the question of scaling out (broad adoption over wide areas and by many farmers) and scaling up (institutionalizing supportive policies for alternatives) successful experiences. (Rosset and Martinez-Torres 2012, 5)

SUSTAINABLE FISHERIES FOOD SYSTEMS

Aquatic environments host innumerable species of fish and invertebrates, many of which provide coastal to inland communities and urban centers with a key source of protein and healthy fats. However, as demand for seafood rises and technology advances in our efficiency to catch it, industrial fishing has led to depletion of wild populations.

Purse seining, bottom trawling, and longlining are examples of efficient fishing methods that are not necessarily sustainable. For example, purse seine fishing uses a net to herd fish together and then envelop them by pulling the net's drawstring. The net can scoop thousands of fish at a time, and is typically used to catch schooling fish or those that come together to spawn, a critical moment to ensure future populations. Bottom trawling is a fishing practice that herds and captures the target species, like ground fish or crabs, by dragging a net along the ocean floor. A sweep attached to the net's footrope collects marine animals as they lay on the bottom or gather before the trawl opening. Longlining refers to a type of fishing that tows an exceedingly long line, at times up to 100 kilometers, behind a fishing vessel. Thousands of baited hooks are attached to smaller lines stretching downward provoking any hungry species to catch a bite and consequently, snag a hook.

These nonselective fishing techniques can catch hundreds or thousands of marine species all at once. Catching massive amounts of fish in one day of fishing can result in quick financial payoffs for fishing vessels. However, fishing this way continuously leaves marine species left in the ocean. Small-scale fisheries, often from isolated or rural villages dependent on a consistent supply of fish interwoven into their social-ecological wellbeing, compete for dwindling stocks to feed their communities and secure income in the same space as commercial fisheries trawl coastal waters.

When a fish stock is small, the population cannot fluently reproduce and replenish its numbers. Overfishing refers to taking wildlife from seas, rivers, and lakes faster than populations can reproduce. Purse seining, bottom trawling, longlining, and many other types of efficient, nonselective fishing can also result in a lot of bycatch, the capture of unintended species, including endangered animals.

Fishers remove more than 96.4 million tonnes of wildlife from the sea each year. This equals roughly the weight of two Great Walls of China. According to the United Nations Food and Agriculture Organization's (FAO) latest assessment of world fish populations, 33 percent of marine and freshwater fish stocks are overexploited while 60 percent are at maximum capacity with no possibility to increase catches without crossing into a state of overfishing.

In terms of biodiversity loss, the bleak status of global fish populations is troublesome. However, per the FAO's mandate, the assessment considers fish not simply as species but rather, as food for people with complex consequences if there are not enough.

For 3 billion people — the populations of China, India, and Brazil combined — fish provide an essential daily source of protein. Currently, the world population is 7.6 billion and expected to reach 9.8 billion in 2050. In order to feed a significant portion of that future, a serious increase in fish catches must be secured. However, this effort is near impossible. Scientists predict continuing to fish at this rate may quickly destabilize critical aquatic ecosystems and result in a collapse of the world's fisheries.

In order to continue relying on the ocean and inland waterway systems as an important food source, ecologists, anthropologists, economists, and conservationists alike advocate for immediate implementation and enforcement of sustainable fishing practices. Sustainable fishing seeks to guarantee there will be populations of ocean and freshwater wildlife for future generations' food and livelihoods security. There are techniques to fish sustainably, enabling fish-dependent communities and consumers to enjoy seafood while ensuring that freshwater and marine species' population numbers remain healthy. Today's sustainable fishing practices reflect some best practices learned from indigenous cultures and artisanal fishing communities.

The most noted historical fishing practices are hook-and-line, spearfishing, and cast nets. Hooks were once carved from bones, shells, and stones designed to catch specific species. Today, small-scale fisheries still utilize specific gear to catch certain species. Spearfishers in artisanal fishing communities dive underwater or spear fish from above, again targeting specific animals. Cast nets are still used by fishers working collectively or alone, throwing nets from the shoreline or small canoes to catch groups of fish. All of these methods target fish needed for fishers' families and local communities to meet nutritional security, aiming for specific fish and result in little by catch.



SMALL-SCALE FISHERIES AS SUSTAINABLE FISHERIES

Sustainable fishing practices leverage the unique skill and capabilities of traditional fishing communities as small-scale fisheries to enable a transition to a post-growth and renewable energy use of aquatic and marine environments.

Dynamic and diverse, the small-scale fisheries sector engages both men and women throughout its value chain and provides food and livelihoods for hundreds of millions of people around the world. Small-scale fisheries contribute around half of global fish catches and employ more than 90 percent of the world's captured fishers and fishworkers, half of whom are women. The important role of small-scale fisheries for human well-being and sustainable development is increasingly recognized, especially in the Tropical Majority countries, because of their contribution to food and nutrition security and the opportunity they represent for poverty eradication (Kurien 2017).

The Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines), endorsed by the 31st Session of the FAO Committee on Fisheries (COFI) in 2014, were developed to daylight small-scale fisheries importance as a pathway towards sustainable fisheries.

The SSF Guidelines are unique in that they represent the first international instrument dedicated entirely to small-scale fisheries. The objectives of the SSF Guidelines – to contribute to equitable development and a sustainable future – are to be achieved by applying a human rights-based approach. The key elements include participation, accountability, nondiscrimination, transparency, human dignity, empowerment and the rule of law (FAO, 2021).

The SSF Guidelines were developed through a participatory process, with around 4,000 small-scale fisheries representatives and other stakeholders in over 120 countries sharing their views and input on the contents of the document (FAO, 2021)..

The SSF Guidelines are based on international human rights standards, responsible fisheries governance and a balance of the three dimensions of sustainable development: economic, social and environmental (FAO, 2021).

The SSF Guidelines consider sustainable fisheries within a human-rights based framework. Rather than address symptoms of poverty that may drive overfishing, the SSF Guidelines focuses on root causes including discrimination, marginalization, exploitation and abuse, by realizing systems-level social-ecological changes in policy, regulatory and institutional frameworks (FAO, 2021).

SUSTAINABLE FISHERIES REQUIRE CO-MANAGEMENT

Managing fish populations sustainably requires commitment and cooperation at all levels, including from individuals, local communities, governments, and institutions across the globe. Co-management describes the organization of power structures and sharing for resource management between resource-dependent actors or beneficiaries and scaled governance levels from local to regional. As Dr. John Kurien describes, “the process of co-management is dynamic and involves wide ranging discussions, capacity building and collective learning in which rights and responsibilities are jointly crafted.” (Kurien, 2017). Co-management for sustainable fisheries is described as a dance involving numerous actors from the fishers to state actors and civil society organizations to discuss the sustainable use of a resource in which every actors’ interests are met into the future. Fishing communities are interested in securing cash and calories for their families today but at the same time, ensuring that fish populations remain for generations into the future. Environmentalist’s focus is on protecting marine and freshwater environments and therefore, regulating fishing or preventing the removal of wildlife from their habitats. Urban and inland consumers seek to continue purchasing their seafood preferences while scientists are concerned with securing the health of fresh and saltwater ecosystems. Communication is key through a collaborative process in which rules are constructed: “who participates, how debates are structured, how knowledge is employed, how conflicts of interest are addressed, and how agreements are reached” (Jentoft, S., et al. 1998).

One example of a sustainable fisheries management system is area-based fishing rights, commonly referred to as Territorial Use Rights for Fishing programs, or TURFs. Area-based fishing distributes secure, exclusive rights to fish in a designated area to specific communities, often fishing in this area for generations. Well-designed TURFs have appropriate controls on fishing mortality and hold fishermen accountable to comply with these controls. TURFs are usually allocated to and managed by an organized group of fishermen called a Cooperative.

Beyond the nearshore environment or inland water systems are the “high seas” — the majority of the world’s oceans beyond national waters, beyond 200 nautical miles out to sea. Regulating fishing in international waters is difficult and requires countries to rectify competing agendas and economic needs to arrive at agreed upon management approaches for sustainable resource use that knows no borders.

International agreements exist in the form of 17 Regional Fisheries Management Organizations (RFMOs) composed of nations with shared economic interests in a particular area. Bounded by a set of agreed upon rules, member nations abide by RFMO regulations which may include catch limits and specifications on the types of gear used. Evidence suggests these regulations have led to decreased bycatch (such as dolphins in tuna nets), but maintaining healthy fish stocks has remained a challenge. Yet enforcement of fishing regulations on the high seas remains extremely difficult. Member nations continue to work with maritime law agencies to tackle the problem of illegal, unreported, and unregulated fishing, piracy, and human rights abuses within fisheries and prevent illegally caught seafood from being imported.

The goal of fisheries management is to develop regulations based on scientific data. These regulations may be based on knowledge of species' life histories, migration patterns, or other information.

Solutions that aim to transform fisheries systems rooted in food sovereignty begin with place-based initiatives that involve those actively engaged in working towards social and ecological justice. Initiatives must also be part of regional, national and global efforts that aim to scale solutions up and out and address fisheries policy and regulation through building social movement networks connected to efforts to transform food systems. Food sovereignty calls for conservation and rehabilitation of fish populations and for fishing communities to have direct control over fishing ecosystems. Sustainable fishing practices ensure that fish populations remain healthy and productive, environmental impacts are minimized, and that those who depend on fishing can maintain their livelihoods.

AQUACULTURE AND FOOD SECURITY

Aquaculture is the fastest growing food-producing sector in the world, contributing one-third of global food fish production (Sinéad Lehane, 2013). Aquatic food security is achieved when a food supply is sufficient, safe, and sustainable to meet needs and preferences of people and the environment (Simon Jennings, 2016). The nutritional benefits of fish consumption have a positive link to increased food security and decreased poverty rates in developing countries.

According to the United Nations Food and Agriculture Organization (FAO) total aquaculture production in 2011 was over 63 million tonnes. A significant trend in much of developing Asia is the growth in commercial and small farm aquaculture, spurred by increasing demand. The Asian region contributes over 90 per cent of global production, while China remains the world's largest producer in the sector with 47.5 million tonnes produced in 2004 (Sinéad Lehane, 2013).



ROLE OF AQUACULTURE FOR FOOD SECURITY AND NUTRITION (SUN)

SMALL FARM AQUACULTURE: In rural populations, aquaculture, in addition to increasing food production, is often undertaken as a secondary source of income. In developing states the role of fish farming has increased exponentially, with many agricultural farmers discovering that the integration of aquaculture into their production systems leads to increased land and yield productivity. Aquaculture presents an opportunity to diversify income and protect against market fluctuations in the prices of agricultural products (Lehane, Sinead 2013).

URBANIZATION & DEVELOPMENT: Aquaculture for poverty reduction and food security is developing fast. Over half a billion people (workers and dependents) are wholly or partly supported by fisheries, aquaculture and related industries, 95 percent of them in developing countries, with increases in aquaculture likely (Allison, Edward, H 2011).

NUTRITIONAL BENEFITS: In Nigeria, like many coastal developing countries, fish is an important source of food for the population, which is currently estimated at 186 million people (World Bank, 2016). According to the FAO, over one billion people worldwide rely on fish as their primary source of animal protein. Today, capture fisheries and aquaculture provide 3.0 billion people with almost 20 percent of their average per capita intake of animal protein, and a further 1.3 billion people with about 15 percent of their per capita intake (The High Level Panel of Experts on Food Security and Nutrition, 2014). Fish provides a similarly significant proportion of protein in the human diets.

YOUTH AND FOOD SYSTEMS TRANSFORMATION

Youth is an important demographic in sustainable development. How can we engage Youth in food systems? Our generation of youth is the largest in history and has a valuable role to play in making our food systems more sustainable, resilient and effective (Global Nutrition Report, 2020). What are the implications of their variety of patterns of engagement for young people themselves, for their families and dependents, for their communities and societies, for food systems and for sustainable development? However, each person's youth transition and their relationship with food systems is uniquely shaped by specific intersections with multiple factors including gender, class, wealth, health, location, intergenerational relationships, and many others (Dominic Glover and James Sumberg, 2020).

ENGAGEMENT WITH FOOD SYSTEMS

The role of young people in transforming food systems is critical. Globally, young people account for approximately 24% of the working poor, particularly in Africa (IMuiderman Karlijn, 2016). Youth empowerment is so important to food systems transformation that it has been placed into all summit work streams and structures. It has been acknowledged that there is a need for inclusive support mechanisms that ensure youth continue to amplify efforts collectively and individually to restore the planet and protect life, while integrating biodiversity in the transformation of food systems. With the world's population expected to increase by 2 billion people in the next 30 years, it has become recognized by numerous stakeholders that simply producing a larger volume of healthier food more sustainably will not ensure human and planetary wellbeing (UNITED NATIONS Department of Economic and Social Affairs Youth). However, it is not obvious that youth are likely engaged in various dimensions of youth in food systems.

Biophysical Dimensions: Young people's food choices and behaviors are shaped by the food environments in which they live. The biophysical objectives and interests that are linked to food systems include basic food and nutrition security. Youth have interests in food safety (e.g., chemical composition and contamination of foodstuffs; toxicity, etc).

Economic Dimensions: The nature and dynamics of youth engagement in food system-related economic activities differs between rural and urban areas, and between male and female youth. Within rural areas, the type of food system-related activity in which young people may be involved is shaped by the mix of agricultural and non-agricultural livelihood opportunities that confront a given household.

Cultural Dimensions: Ethnic, cultural and religious meanings, norms and values are attached to many food stuffs, dishes, beverages and styles of food preparation, and to the places, occasions and peoples with which they are associated.

Social Dimensions: Many social roles, relationships and statuses are expressed through food and engagement in food systems, such as professional and artisanal work (e.g., baker, butcher, food safety inspector), reproductive roles (e.g., motherhood, breadwinner, and provider) and types of traditional livelihood (e.g., herder, forester, hunter, fisher).

WAYS TO INTEGRATE YOUTH INTO GLOBAL FOOD SYSTEM TRANSFORMATION THROUGH DAY

DAY involves the Decision Point, Advocacy and Youth Leadership.

Decision Point: More than half of the world's population is under the age of 30. As a collective force, young people have extraordinary potential to mobilize and influence global movements, which can be initiated in the form of a simple pledge (Global Alliance for Improved Nutrition). Youth Stakeholders should be engaged in consultations with other engaging other actors who affect the role of youth in agriculture systems through consultations and meetings.

Advocacy: Girls Farmers Club (GFC)- GFC is a youth empowerment and food justice organization using food, through sustainable agriculture and health, as the vehicle for growing strong, healthy, and resilient teens. We create a safe space for youth and support getting their hands dirty and experiencing the farm and garden in this way will create many opportunities for impact and advocacy. The pandemic has exposed deep-rooted inequities, including in food systems. According to Agnes Kalibata, the UN Secretary General's Special Envoy to the Food Systems Summit, stressed that it would be impossible to hold the event without engaging with youth. “This is about the future”, she said. “The future is youth. The future of our world is our youth.”(UN News).

Youth Leadership: Millions of people aged between 15 – 34 are moving towards a more plant based diet and millions more are holding leaders around the world to account for their failures to act fast enough (Ford foundation). We should create a global network of organisations working with food and young people. We need to mobilise their networks and youth groups to lead a global consultation with young people. For example Rita Entrepreneurship Day (RED) Program through BigSistah Academy is the first step in mentoring and training young girls through sustainable agriculture. 10 to 20 youth meet in small groups one day per week for mentorships.

To harness the multiple sustainability benefits that arise from agroecological approaches, an enabling environment is required, including adapted policies, public investments, institutions and research priorities. (FAO 2021)



NUTRITION AND HEALTH

Nutrition is everyone's business and one of the world's greatest challenges is to secure sufficient and healthy food for all, and to do so in an environmentally sustainable manner. Our food system is broken: children have been one school meal away from hunger; one can only look at the high rates of malnutrition and poverty among farming communities as a stark reminder that the link between agriculture and nutrition must be fixed (Smith, Luke, 2018). According to Hachem, Fatima et al., (2020), 821 million people have hunger, 2 billion people have micronutrient deficiencies; and over 2 billion persons are overweight or obesity (Hachem, Fatima et al., 2020). Food systems and nutrition patterns is one of the six entry points identified by the Global Sustainable Development Report (GSDR) 2019. Many of the Sustainable Development Goals (SDGs), especially SDGs 1 (no poverty), 2 (zero hunger), 5 (gender equality), 12 (responsible consumption and production), 13 (climate action), and 17 (partnerships for the Goals), are pillars of a sustainable food system (Choudhary, Neetu, 2021).

The focus on nutrition and diets echoes similar calls to action by several international global goal setting agendas, including the United Nations Zero Hunger Challenge, the United Nations Decade of Action on Nutrition and the SDGs. Reorienting food systems to better support nutrition will be essential to meet – among other SDGs – goal 2 (zero hunger) and goal 3 (good health and well-being). (HLPE 2017)

By almost any measure, human health is better now than at any time in history, life expectancy has risen, death rates in children younger than 5 years of age have decreased. However, these gains in human health have come at a high price: the degradation of nature's ecological systems on a scale never seen in human history. A growing body of evidence shows that the health of humanity is intrinsically linked to the health of the environment, but by its actions humanity now threatens to destabilise the Earth's key life-support systems. There is a new concept called "Planetary Health". Planetary Health refers to 'the health of human civilization and the natural systems on which it depends'. (Lancet, Planetary Health)

Imbalances in the current global food system are major drivers of dietary and nutrition inequities. This results in low-quality diets and restricted access to healthy diets. () Agriculture is essential to meeting this simple directive. Yet, in many ways, our current systems of agriculture have not been designed for the production of a diversity of nutrient-dense foods.(Jones & Ejeta 2016) There is a need for the Global food system to step away from the dominance of cereal production, such as maize, rice and wheat, and to step up on the availability of healthy foods such as fruits and vegetables, nuts and whole grains. () More than three-quarters of a century ago, the League of Nations recognized the importance of agricultural adaptation for dietary diversification, noting that changes in production decisions that supported more protective foods (i.e. fruits and vegetables), could lead to nutritional benefits. (Jones & Ejeta 2016)

The interconnection of the causes of inequities in access in food systems require an integrated response at the local, national and global levels. It also requires bringing together the capacity of multiple sectors. Addressing inequities within food systems boils down to addressing power imbalances. This would require amplifying the voice of those who are excluded access to healthy foods and holding the powerful to account.

In this section, we first discuss nutrition and health and how food choices affect our environmental health. We then highlight how transitions to healthier diets could help meet environmental targets. Third, we use a series of 2 case studies to discuss how adoption of healthy diets might contribute to a sustainable food system in our lives. Fourth, we discuss how governments and businesses can shift individuals toward sustainable healthy diets. We conclude by discussing outlining initial steps towards promoting more integrated territorial planning for nutrition, while also encouraging further thinking, initiatives and research in this direction of creating sustainable food systems as well as some unanswered questions that might hinder or facilitate their development. In order for us to live a healthy and productive life, we will require nutritious diets.

COMPONENTS OF FOOD SYSTEMS

There are components of food systems that impact consumers' capacity to adopt sustainable diets. These include: food systems that are protective and respectful of biodiversity and ecosystems; foods that are culturally acceptable and accessible, economically fair and affordable; and nutritionally adequate, safe and healthy, while optimizing natural and human resources. (HLPE 2017)

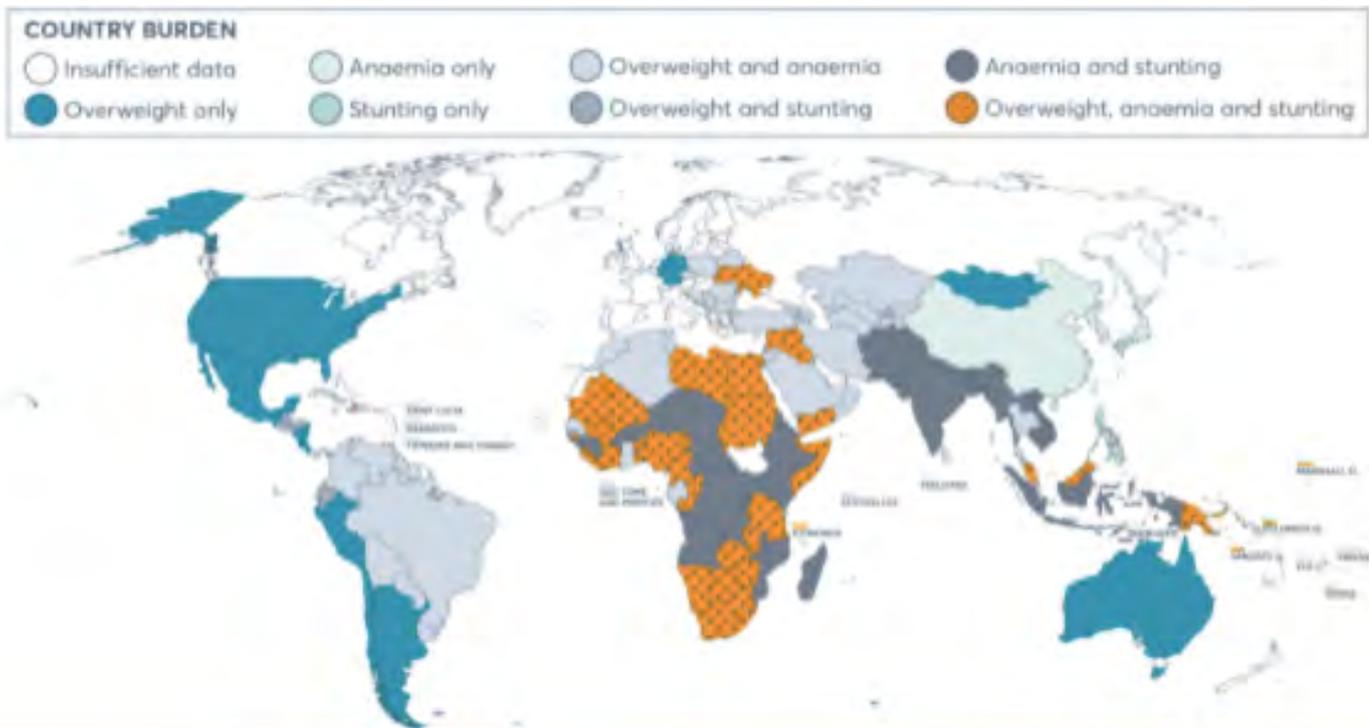
Food systems have the potential to affect food safety, exposure to infectious illness, food prices, household incomes and women's access to productive resources – all of which are key mediators of nutrition and health. Since agriculture contributes up to one-third of global greenhouse gas emissions, new and improved climate-smart food production and processing systems could have a particularly positive impact on both the environment and the many human health and nutrition outcomes that otherwise would be negatively affected by extreme weather. (Jones & Ejeta 2016)

A productive, diverse, ecologically and socially sustainable agricultural sector has long been recognized as crucial for improving human nutrition and shaping healthy diets. Observers today continue to call attention to the importance of food systems for shaping human health and nutrition. That our systems of food production should be designed to meet recommendations for healthy diets seems obvious. Yet, the goals of agriculture and nutrition have often diverged. Agriculture has increasingly become an engine not for producing food, but for generating animal feed, biofuels and industrial ingredients for processed food products e.g. sugar-sweetened beverages, ready-to-eat meals and snacks. (Jones & Ejeta 2016)

Malnutrition

Globally, one person in three is malnourished. Malnutrition can take different forms: undernutrition (stunting, underweight and wasting), micronutrient deficiency and overweight and obesity. These forms of malnutrition affect all countries, whether developed or developing and can also co-exist within countries, communities, households and individuals. (HLPE 2017) Countries that have made impressive strides in reducing undernutrition (e.g. Brazil, China and Chile) have also experienced rapid increases in the prevalence of obesity and related chronic disease. Unfortunately, many countries now face a double burden of undernutrition and obesity as economic development, changing diet patterns, sedentary lifestyles and urban migration have outpaced efforts to develop infrastructure, strengthen institutions and expand provision of health services. (Jones & Ejeta 2016)

The Global Nutrition Report evaluated 194 countries and compared 143 countries with available data on three indicators of malnutrition. According to the report, all 143 countries experience at least one form of malnutrition at high levels. Of the 143 countries, 124 experience high levels of at least two forms of malnutrition (56 countries: anaemia and overweight; 28: anaemia and stunting; 3: overweight and stunting). The below image shows a map of countries that face at least one burden of malnutrition.



Map of countries with overlapping forms of stunting in children under 5, anaemia among women of reproductive age, and overweight in adult women (Global Nutrition Report, 2020)

All forms of malnutrition are the result of poor diets, inadequate knowledge and resources, and unhealthy environments, all of which have underlying causes. Food systems influence the types of food produced and the nature of their journey from farm to fork. The failure to make food systems deliver better nutrition while at the same time minimizing their environmental impact is costly. The human health, economic, social and environmental consequences of malnutrition are crippling. (HLPE 2017)

Malnutrition affects the entire life cycle and its effects can extend across generations. Some groups are particularly vulnerable to malnutrition, including those with specific nutrient requirements at critical stages of their life cycle (such as young children, adolescent girls, pregnant and lactating women, the elderly and people who are ill or immuno-compromised) or marginalized groups that have less control over their diets (such as the urban and rural poor, as well as some indigenous peoples). (HLPE 2017) Now more than ever, integrative solutions are needed that are able to combat malnutrition on multiple fronts, across the spectrum from deficiencies of energy and micronutrients to overconsumption, obesity and related diseases. The food and agriculture sectors are uniquely positioned to provide such solutions. (Jones & Ejeta 2016)

Global dietary patterns have been changing rapidly in recent decades. With globalization, urbanization and income growth, people are experiencing new food environments, expanding their food choices and diversifying their dietary patterns in both positive and negative directions. The nutrition transition refers to changes in lifestyle and dietary patterns driven by urbanization, globalization and economic growth, and their resulting impacts on nutrition and health outcomes. As countries urbanize and become wealthier, in general, obesity rises. However, these global trends should not hide the significant diversity of diets around the world, reflecting the diversity of food production landscapes and ecosystems, socio-economic conditions, cultures and beliefs. Studies of food systems adapted to their local context and of the associated traditional knowledge built up over millennia can provide new insights and pathways towards more sustainable food systems. (HLPE 2017)

POVERTY AND NUTRITION

A vital relationship exists between malnutrition and poverty. Poverty creates unstable and unfavorable conditions that may contribute to fueling the problem of malnutrition. A lack of nutritious food leads to micronutrient deficiencies such as Vitamin A, iron, zinc, and iodine, which are the most widespread nutritional deficiencies globally, affecting both women and young children. In rural areas life is largely centered around the agricultural sector. Many rural poor suffer from malnutrition. Poverty can contribute to worsening malnutrition by compromising the quality of food intake and bolstering hidden hunger which is the deficiency of essential vitamins and minerals (Siddiqui, Faareha et al., 2020). The impact of poverty on individuals can be seen through multiple manifestations and includes poor nutritional status, food insecurity and vulnerability to disease. Additionally, people living in poverty are unable to access necessities including nutritious food, hygienic environment, appropriate shelter, and adequate health care. In transitioning towards sustainable food systems, the focus must be on safe and equitable global access to nutritional foods, maximizing the nutritional value chain, sustainable agricultural practices and food systems, including both production and consumption, must be pursued from a holistic and integrated perspective while minimizing the climate and environmental impacts of production.



Source: IFAD RDR, 2021

HOW CAN AGRICULTURE AND FOOD SYSTEM POLICIES IMPROVE NUTRITION?

Food and agriculture policies are critical in influencing what foods are available and accessible to consumers. To improve nutrition for all, we need these four aspects of the food system that will shape the food environment within which people make food choices, which in turn determines the quality of their diet. Diet quality is a measure of good nutrition.



Source: Global Panel on Agriculture and Food Systems for Nutrition, 2014

OUR CHANGING WORLD TO FAST FOOD

Food during WW2 was often a lot higher in unhealthy fat. People would roast potatoes in lard, eat bread and butter with every meal and use bread for many meals. Part of the reason for this was because these ingredients were cheap to use and in good supply, also, people were less educated about nutrition. Also, During the Second World War, foods that were rationed included fresh meat, cheese, sugar, butter, jam and tea. In fact, the food rationing for one person for a week was tea, cheese etc. The idea of fast food was first popularized in the 1950s in the United States and is still popular in today's society as a quick alternative to a home-cooked meal. Fast food has become a significant part of the American diet. In the United States, more than 200 people are served a hamburger every second of the day (Sherwood, Nancy, E, Story, Mary & Neumark-Sztainer, Dianne (2001).

It is evident the world today is changing on many fronts. With fast food chains constantly arising and filling our surroundings, the consumption of fast foods is increasingly becoming popular. Fast food includes food such as hamburgers, pizza, or fried chicken. First, many people like to eat fast food because of its easy access and their appetizing taste. Secondly, one of the main reasons people have turned to consumption of fast food is highly demanding work schedules. Long working hours as well as commuting time increases the chances of individuals opting for fast foods. Thirdly, given the fact that today's generation is always busy, most people consider fast food as a convenient source of food. Fast food can be prepared and served within a very short time, thus is more convenient for those people who are not willing to cook. Despite warnings from the nutritional specialists that fast foods pose many health risks, these foods continue to become popular. Fast foods are unhealthy and lead to health conditions like obesity and weight gain. Despite the fact that fast food restaurants have added healthier items, overall fast food is unhealthy; fast foods contain excessively high quantities of trans-fatty acids, which are produced scientifically.

Many pioneers in the nutrition field promoted supplementation and fortification programs to treat obvious deficiencies, such as vitamin A to treat night blindness and iodized salt to treat goiter (Burchi, Franceso, Fanzo Jessica and Frison Emile 2011).These programs are still ongoing and have demonstrated improvements in select micronutrient deficiencies in the developing world. Examples of such programmes are what Beau Haven Farms and Harvest Plus Nigeria is doing in Nigeria to feed people with nutritious meals rich in vitamins and minerals.

Drivers of Food Systems Changes



Source: Van Berkum et al. 2018

There are five main categories of drivers of food system changes that influence nutrition and diets:

- biophysical and environmental;
- innovation, technology and infrastructure;
- political and economic;
- socio-cultural; and
- demographic drivers.

Biophysical and environmental drivers include natural resource and ecosystem services, and climate change. Political and economic drivers include leadership, globalization, foreign investment and trade, food policies, land tenure, food prices and volatility, conflicts and humanitarian crises. Socio-cultural drivers include culture, religion, rituals, social traditions and women's empowerment. Finally, demographic drivers include population growth, changing age distribution, urbanization, migration and forced displacement. The relative impact of each driver will depend on the type of food system in question, the type of actors involved, and the type of actions and policies that are decided upon. (HLPE 2017)

Food Processing

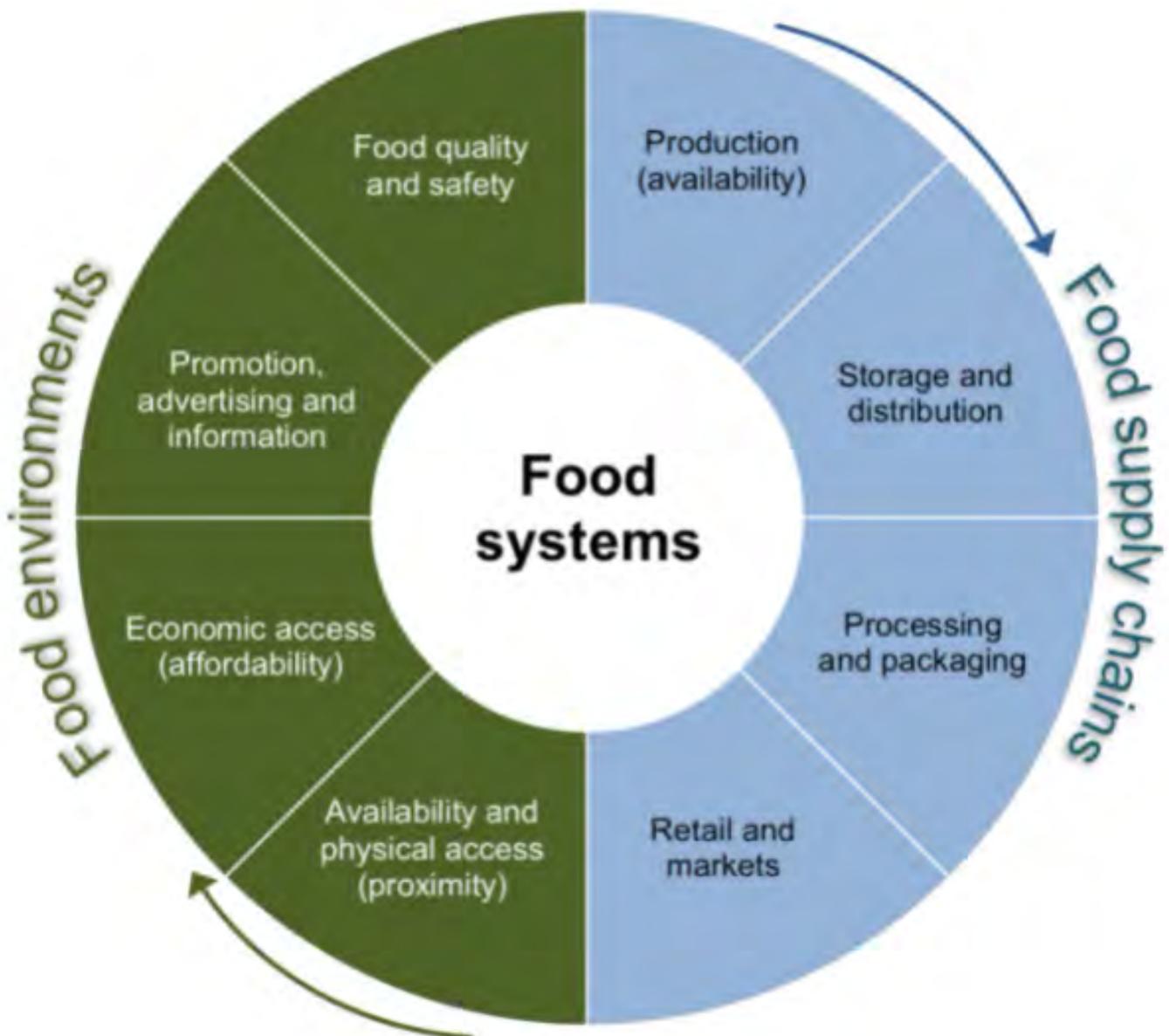
Food processing and packaging contribute to food systems and nutrition (FSN) by preventing food quality losses and waste (FQLW) and extending shelf-life, by increasing the bioavailability of nutrients and improving the sensory characteristics and functional properties of foods, by destroying food-borne microbes and toxins and improving food safety. Food processing can alter the nutrient content and bioavailability of foods, and improve their palatability and convenience. However, processing may also decrease the nutritional value of food by removing fibre and key nutrients, which then need to be added back into the foods, or by adding ingredients that normally should be limited for health reasons, including unnecessary high levels of sodium and sugar and unhealthy fats such as trans fats. (HLPE 2017)

The table below explains the classification by degree of processing of food and beverage products:

CATEGORY	DEFINITION	EXAMPLES
UNPROCESSED/ MINIMALLY PROCESSED	<ul style="list-style-type: none">• Single foods, no or very slightly modified.	<ul style="list-style-type: none">• Fresh or frozen produce, milk, eggs, fresh meat, fresh fish.
BASICALLY PROCESSED	<ul style="list-style-type: none">• Single foods, processed as isolated food components or modified by preservation methods	<ul style="list-style-type: none">• Sugar, oil, flour, pasta, white rice, unsweetened canned fruit, unsalted canned vegetables.
MODERATELY PROCESSED	<ul style="list-style-type: none">• Single foods with addition of flavour additives	<ul style="list-style-type: none">• Salted nuts, fruit canned in syrup, vegetables canned with added salt, whole- grain breads or cereals with no added sugar.
HIGHLY PROCESSED	<ul style="list-style-type: none">• Multi-ingredient, industrially formulated mixtures	<ul style="list-style-type: none">• Pre-prepared mixed dishes, refined-grain breads, ready-to-eat cereals, salty snacks, cookies, candy, sugar sweetened beverages (SSBs), ketchup, margarine, mayonnaise

Source: Adapted from Poti et al. 2015, Moubarac et al. 2014

Once food has been processed, it moves to formal or informal markets that may be near to or distant from communities and households. These markets and the retail of selling food, shape the environment in which consumers make purchasing decisions. The rapid spread of more formal supermarkets and fast food chains influences consumer behaviour and food consumption patterns. There is evidence that this so-called “supermarket revolution”, while offering consumers a wider range of products at a lower price than traditional retailers, also entails rapid organizational changes in the whole food supply chain. Small farmers are particularly challenged to meet the requirements and standards of supermarket chains, their centralized procurement systems and large-scale agro-processors in terms of volume, cost, safety, quality and consistency. This revolution also impacts power relationships within food supply chains. The locus of power and decision-making is moving from farmers and producers to traders and retailers, and from governments to the private sector and multinational corporations. Therefore, food supply chains and food systems now need complex and multi-scale governance mechanisms, which should involve a range of actors across public, private and civil society. (HLPE 2017)



Source: Adapted wheel concept from Ranganathan et al. 2016.

FOOD ENVIRONMENTS

Food environment refers to the physical, economic, political and socio-cultural surroundings, opportunities and conditions that create everyday prompts, shaping people's dietary preferences and choices as well as nutritional status. It serves as an interface that mediates the acquisition of foods by people within the wider food system. For many communities, the food environment consists of the foods they produce and those they purchase from their local markets. For others, the food environment is more global, with increasingly interconnected local, regional and international markets. (HLPE 2017)

Enabling environments are those in which governments have the political will as well as the coordination, accountability and effective responses necessary to improve nutrition and meet the needs of the marginalized and the most vulnerable. The multi-sectoral nature of malnutrition requires individual, institutional and system-level collaborative engagement and coordination. Coordination is necessary both vertically (among different ministries and from the national to the local level) and horizontally (across sectors and multiple stakeholders). Effective implementation further requires clear definitions of the roles and responsibilities of all stakeholders and accountability based on trust, inclusiveness, transparency and verification. Effective responses also depend on surveillance and monitoring. Success will require more investment in nutrition, financially and in human capacity and social movements, coalitions and networks. (HLPE 2017)

The complex nutritional challenges that we now face – reflected in the double burden of undernutrition and obesity – are daunting, but not insurmountable. These challenges defy solutions that rely on conventional sectoral approaches, but in doing so, invite new thinking that could afford multiple benefits. For example, there is enormous unrealized market potential in the production of pulses, fruits, vegetables and ancient grains that could contribute to new livelihood opportunities for millions of smallholder farmers. These same crops are essential for preventing undernutrition, obesity and diet-related disease that together are contributing to increase in health-related costs and lost productivity. (Jones & Ejeta 2016)

While food systems are critical, they alone will not fully solve the multiple burdens of malnutrition. To provide maximum benefit for the global population, policies and programmes must be coordinated across multiple sectors, including for instance agriculture, food industry, trade, environment, energy, health, water and sanitation, education, social protection, gender equity and women's empowerment. The global community should embrace the SDGs as interlinked and address simultaneously all forms of malnutrition. This will require everyone who interacts with food systems and the food security mandate to act. Food supply chain and food environment actors, whether small or large, need to be valued and supported to shift towards nutrition-sensitive agriculture and food systems. Solutions need to be adapted to fit changing consumer demands, preferences and tastes. (HLPE 2017)

NUTRITIONAL SECURITY THROUGH FISHERIES

“Voluntary Guidelines on Food Systems for Nutrition (VGFSyN) and the draft of these guidelines defines that “Food systems are complex webs of activities and actors involving the production, processing, handling, preparation, storage, distribution, consumption and ultimately waste of food. They are constantly being shaped by different forces, drivers and decisions by many different individuals. Every food system has the capacity to be equitable and to produce healthy diets needed for optimal nutrition. But, they can also be shaped by power concentration and imbalances, which may not be inclusive and equitable. Some food systems are sustainable while others show their limits in terms of sustainability and inefficiency in natural resource utilization, and in the use of labour and energy, leading to environmental degradation, water pollution, and loss of biodiversity as well as to excessive food consumption and food waste patterns.”



Beyond cash, small-scale fisheries also provide millions of people with calories. In Africa and Asia, fish accounts for more than 50 percent of the total animal protein intake. In southeast Asia alone, possibly a billion people rely primarily on fish for animal protein. In this region, small-scale fisheries contribute over three-quarters of the domestic fish supply and 90–95 percent of this is consumed locally in rural settings where poverty rates are high and quality nutrition is sorely needed.

Small-scale fisheries products provide a large amount of people with vitamins such as D and B, calcium, phosphorus and minerals, such as iron, zinc, iodine, magnesium, and potassium. This is particularly important in the first 1,000 days in the life of a child.

Small-scale fisheries provide nutritious food, either directly for household consumption, or through the marketplace, from informal seaside markets to highly sophisticated global markets. Concurrently, there seems to be a steady shift towards better facilitating fisheries and food security and nutrition.

In Angola, Honduras and Peru, fish is integrated into national school feeding programs. National policies and strategies offer small-scale fishers a chance to contribute to their community's socioeconomic development and be acknowledged for their important contributions to food security and nutrition.

Given environmental and climate change stressors on rural coastal and riparian communities around the world, the fisheries sector plays a critically important role in food systems in addressing complex and evolving nutritional priorities.

In Zambia, fish from artisanal or small-scale fisheries are regularly traded extensively in dried form. Without spoiling easily, dried fish provides an accessible and nutritious food source for everyone, encompassing vulnerable rural and urban populations, and is especially vital during times of climate-induced agricultural sparse periods. Still and all, the catches and services of small-scale fisheries are underreported and continuously undervalued.

Small-scale fisheries can also play an enormous role in attaining a country's food and nutrition security needs and objectives because fishers catch aquatic species that are high in key missing micronutrients that are local, culturally appropriate, and feasible to store and transport. Yet, today's policies that define fish essentially as a commodity to be exported sabotage the ability of small-scale fisheries to achieve this potential.

WHAT IS A SUSTAINABLE DIET AND WHAT DOES IT HAVE TO DO WITH FOOD SYSTEMS?

FAO defines Sustainable Diets as those diets with low environmental impacts that contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.

ENVIRONMENTAL AND HEALTH IMPACTS OF OUR DIETS

The environmental impact of food production and dietary habits is enormous. Dietary patterns are shifting world-wide, and diets have changed rapidly over the past several decades. The shifts in how we eat and drink and energy imbalance, overweight and obesity, and the vast array of other nutrition-related cardio metabolic problems have shifted so greatly in the past half century (Popkin, Barry M. et al., 2012). Here, we discuss the contribution of these 4 diets to health and nutrition and to environmental, sociocultural, and economic sustainability proposing pertinent indicators.

CULTURAL FOOD TRADITIONS

Dietary patterns across the world have seen a rapid shift from plant-based diets to diets with a higher proportion of energy from animal-source foods, added sugars and fats and other foods of high energy density and minimal nutritional value (FAO and WHO, 2019). The different cultural food traditions and how it affects the food system and the environment is discussed below.

THE MEDITERRANEAN DIET

The Mediterranean diet implies a common dietary pattern in Mediterranean countries. The Mediterranean diet reflects a way of eating that is traditional in the countries that surround the Mediterranean such as olive oil and nuts, and calls for eating fish more frequently than red meat. The Mediterranean Diet is a diet with high consumption of whole cereals, legumes, vegetables, fruits, nuts and olive oil, a low to mild consumption of dairy products, and a low consumption of meat and poultry. The Mediterranean diet is transmitted from generation to generation, and is constantly recreated by communities and groups in response to the change of their environment and their history (FAO, 2015). However, diets can have a low environmental impact and still be harmful to human health. Furthermore the Mediterranean Diet was the Best Overall Diet in 2021, 2020, 2019, and 2018, according to U.S. News & World Report. In 2021, the Mediterranean Diet was ranked #1 Best Plant-Based Diet, Best Heart-Healthy Diet, Best Diabetes Diet, Best Diet for Healthy Eating, and the Easiest Diet to follow, according to U.S. News & World Report. According to (Oldways cultural food traditions) starting at the base of the pyramid, it can be explained that:

- Core foods to enjoy every day: whole grains, fruits, vegetables, beans, herbs, spices, nuts and healthy fats such as olive oil.
- Twice weekly servings of fish and seafood.
- Moderate portions of dairy foods, eggs, and occasional poultry.
- Infrequent servings of red meats and sweets.

ENVIRONMENTAL IMPACT OF THE MEDITERRANEAN DIET

Limiting red meat is good for the environment because beef is a major contributor to environmental problems. Mediterranean Diet is better for mind, body, and planetary health, its nutrient-rich foods—helps increase longevity and because it is plant forward and may help improve environmental sustainability.

AFRICAN HERITAGE DIET

The African Heritage Diet is a way of eating based on the healthy food traditions of people with African roots. This healthy way of eating is powerfully nutritious and delicious, and naturally meets the guidelines experts recommend for supporting good health. Across Africa, a variety of whole grains and starchy vegetables serve as the base for meals. “Millet and sorghum are found in the area around Mali; rice in Senegal, Guinea, Liberia, and Sierra Leone. The African Diet Heritage Pyramid is a very healthy way of eating and it is affordable as well. It is based on nutritious, healthy foods and traditions that stretch back for centuries.



Source: African Diet in Akwa Ibom State, Nigeria: Edita IWA

DASH DIET

The DASH diet is high in fruits and vegetables, low in fat, and includes nuts and assorted beans, protein, and heart healthy fats. The Dietary Approaches to Stop Hypertension (DASH) diet is a proven way to prevent and control hypertension and other chronic diseases such as type 2 diabetes and certain cancers. The meal plans are designed to keep blood sugar at a relatively steady level. By avoiding the rise and fall of blood sugar levels, cravings are easier to control. In doing so, the diet plan reduces belly fat, the risk for diabetes, triglycerides, and low-density lipoprotein (LDL's) (National Heart) (Vance, Kalah & Elantra, 2018)

One of the drawbacks of the DASH diet is its relative cost. This study found that higher accordance with the DASH diet was associated with higher dietary costs, with the average cost of diets costing 18% higher than of those with the least adherences. This is particularly pertinent in the UK where food prices rose over 30 percent from 2007 to 2013. This trend has coincided with deterioration of diet quality, particularly among lowest-income groups (CEDAR, 2015).

ENVIRONMENTAL IMPACT OF THE DASH DIET

The DASH diet has subsequently been included as the current clinical guidelines for blood pressure control.



ENVIRONMENTAL IMPACT OF THE DASH DIET

Traditional diets are patterns of eating inspired by the rich culinary histories of cuisines around the globe. Traditional diets are a delicious roadmap to healthy eating. Traditional diets are a delicious and pleasant way of enjoying healthy food for the rest of our lives. Traditional diets also differ from the Western style of eating in that they emphasize the cultural aspects of eating, such as cooking meals at home, and enjoying food in the company of friends and family (Oldways cultural food traditions).

Source: (Oldways cultural food traditions)

ENVIRONMENTAL IMPACT OF TRADITIONAL DIET

Local traditional foods are an important component of a sustainable food system. The general concept of traditional foods includes the preservation of traditional farming knowledge, local crop and animal varieties, and native forms of socio-cultural organization. Traditional foods, apart from being vehicles of our culture, may also possess health qualities, since tradition rarely honours foods that are not palatable and healthy (CABI, 2021).

VEGETARIAN & VEGAN DIET

Vegetarian diet is a plant-based diet or a plant-rich diet consisting mostly or entirely of plant-based foods with occasional inclusion of meat or poultry.



ENVIRONMENTAL IMPACT OF VEGAN DIET

Shifting to a plant-based diet has the potential to lower greenhouse gas emissions, reduce environmental degradation, and promote a healthy diet. However, the reduction of meat consumption has implications for farmers' livelihoods, among other considerations that decision makers should address (Konrad, Nathaniel et al., 2021)

Vegans can miss out on important vitamins, proteins and fatty acids, and eat too many saturated fats without the right food balance. Additionally, there are some vegan foods which aren't great for the planet, such as alternative milks (almond, rice & soy milk), avocado, palm oil, imported fruit and soybean. (Paul Allen n.d)

ALTERNATIVE MILKS

Did you know that it takes 74 litres of water to make a single glass of almond milk? That's more than a typical shower. Rice milk is also quite 'thirsty', needing 54 litres of water per glass. These numbers are still low compared to dairy milk, but they're far higher than soya or oat milk.

NEW NORDIC DIET

The NND is a new constructed diet built with strong anchorage onto the Nordic food traditions to positively contribute to both health and the environment. The New Nordic Diet (NND) is a new constructed diet built with strong anchorage onto the Nordic food traditions. This diet positively contributes to both health and the environment. The NND was launched in 2004 by a group of reputable chefs from the Nordic region. With the incorporation of concerns for environmental sustainability and planetary health they embarked on rediscovering local produce. It is characterized by a high content of local fruits and vegetables (especially berries, cabbages, root vegetables, and legumes), fresh herbs, potatoes, plants and mushrooms, whole grains, nuts(native), fish and shellfish, seaweed, free-range livestock (including pigs and poultry). It comprises foods traditionally sourced in the Nordic countries and focuses on those from the wild countryside and from the sea and lakes

HEALTH BENEFITS OF NND AND ENVIRONMENTAL IMPACT

The NND benefits from well-established and substantial evidence of health-promoting properties. NND improves blood pressure, cholesterol, and triglycerides in comparison to a control diet. The New Nordic Diet (NND) is associated with lower environmental pressures. A study evaluated the environmental impact of the Average Danish Diet (ADD) and the NND. By choosing the NND it results in a cost saving of 32% of the overall environmental cost of 835 €/person/year associated with the ADD. This reduction is caused by a reduction in meat consumption favoring higher quality meat consumption and less imported foods from long distances (Moreno, Luis A. and Ribot, Margarita,(2021).

HOW CAN WE TRANSFORM FOOD SYSTEMS FOR IMPROVED NUTRITION (FISHER) MODEL

The coronavirus pandemic is a global threat to healthy and nutritious diets and could increase all forms of malnutrition now and for years to come. A great food transformation is necessary. To begin this process, we have six strategies as general starting points in order to best achieve these synergies moving into the future.

- **FOOD FORTIFICATION:** Staple food fortification is an extremely effective, low-cost, food systems intervention with enormous potential to reduce micronutrient malnutrition across large populations (GAIN, 2021). Food fortification policies that add essential micronutrients to inexpensive, staple food have a positive effect on the food environment. Nutrition education, sensitization, training, social media campaigns, marketing techniques, as well as economic incentives and disincentives can help to shift demand. The scientific targets set out by this Commission provide guidance for the necessary shift, recommending increased consumption of plant-based foods – including fruits, vegetables, nuts, seeds and whole grains – while in many settings substantially limiting animal source foods.

This concerted commitment can be achieved by making healthy foods more available, accessible and affordable in place of unhealthier alternatives, improving information and food marketing, investing in public health information and sustainability education, implementing food-based dietary guidelines, and using health care services to deliver dietary advice and interventions. There is a need for demand creation for healthy foods among children and adolescents, as well as their caregivers (GAIN, 2019). Example HarvestPlus Nigeria and People Environment and Sustainability Foundation is working hard in providing nutritious foods (Vitamin A cassava and Orange Flesh Sweet Potatoes to children and mothers in Nigeria.

- **INNOVATION ALONG THE VALUE CHAIN:** Innovation can along the value chain (e.g., sugar reduction, or fortification with vitamins and minerals), as well as innovative technologies that improve productivity and safety of healthy, affordable foods should be encouraged. Shift the emphasis in food and agricultural policy from high volumes of a few crops to greater diversity of nutrient-rich crops. As well as Inclusive food systems, engaging smallholder farmers in (efficient) food production and enabling affordable access to diets by disadvantaged groups of consumers. Specific policies, such as school feeding programmes, may subsidize nutritious foods for key target groups, including women and children.
- **SEEK INTERNATIONAL AND NATIONAL COMMITMENT TO SHIFT TOWARD HEALTHY DIETS:** We should strengthen and expand coverage of targeted social protection programs, including cash and food transfers, to support healthy diets through, for example, direct incentives such as vouchers for healthy foods, and improving the quality of school meals for school feeding programs adopted in Nigeria, Establishing of Nutri-School farm by Semek farms and BEAU Haven Farms where students can have access to healthy meals while in school and policies are needed to improve the availability, access, and affordability of healthy foods while disincentivizing the consumption of unhealthy and unsustainable foods.

This implies feeding humanity on existing agricultural land i.e. by implementing a zero-expansion policy of new agricultural land into natural ecosystems and species-rich forests, aiming management policies at restoring and reforesting degraded land, establishing international land use governance mechanisms, and adopting a "**Half Earth**" strategy for biodiversity conservation (i.e. conserve at least 80% of preindustrial species richness by protecting the remaining 50% of Earth as intact ecosystems). Moreover, there is a need to improve the management of the world's oceans to ensure that fisheries do not negatively impact ecosystems, fish stocks are utilized responsibly, and global aquaculture production is expanded sustainably.

- **HALVE FOOD LOSSES AND WASTE (HFLW):** HFLW differ widely along the food supply chain and may be directly or indirectly linked to a specific loss point. Food security and nutrition improves by reducing losses, as in principle more food becomes available at lower prices, benefiting households that are net buyers of food.

Substantially reducing food losses at the production side and food waste at the consumption side is essential for the global food system to stay within a safe operating space. Both technological solutions applied along the food supply chain and implementation of public policies are required in order to achieve an overall 50% reduction in global food loss and waste as per the targets of the SDGs. Actions include improving post-harvest infrastructure, food transport, processing and packing, increasing collaboration along the supply chain, training and equipping producers, and educating consumers. (EAT Lancet Commission Report)

- **EMPOWERING WOMEN:** Women's participation, which is a crucial driver to better nutrition. Women make up a large percentage of the agricultural labour force in developing countries, and the resources and income flows that women control have disproportionately positive impacts on nutrition security.
- **RESEARCH:** Policies that support quality enhancement, food safety and profitability of small and medium-sized enterprises can pay important dividends to consumers through low prices and enhanced food quality. Governments can help reduce hunger, improve nutrition and transform food systems by reviewing national policies and investments and integrate nutrition objectives into food and agriculture policy and programming to ensure food security and healthy diets. Agriculture and fisheries must not only produce enough calories to feed a growing global population but must also produce a diversity of foods that nurture human health and support environmental sustainability. Alongside dietary shifts, agricultural and marine policies must be reoriented toward a variety of nutritious foods that enhance biodiversity rather than aiming for increased volume of a few crops, much of which is now used for animal feed. Livestock production needs to be considered in specific contexts. The food we produce, how it is produced, how we ensure it reaches the people who need it and at prices that are affordable. All of this must be a part of any equation to scaling up nutrition (Smith, Luke 2018).

What is the difference between biodiversity conservation and food security?

RECOMMENDATIONS

The EAT-Lancet Commission convened 37 leading scientists from 16 countries in various disciplines including human health, agriculture, political sciences and environmental sustainability to answer the question above, develop global scientific targets for healthy diets and sustainable food production. This commission and the report is important because this is the first attempt to set universal scientific targets for the food system that apply to all people and the planet. The EAT-Lancet Commission report developed 2 targets to achieve the goal of a Planetary Health Diet for nearly 10 billion by 2050 (Food in the Anthropocene, 2019)

TARGET 1: HEALTHY DIETS

A healthy diet should optimize health, defined broadly as being a state of complete physical, mental and social well-being and not merely the absence of disease. Healthy diets have an optimal caloric intake and consist largely of a diversity of plant-based foods, low amounts of animal source foods, contain unsaturated rather than saturated fats, and limited amounts of refined grains, highly processed foods and added sugars.

Planetary Health Plate is developed by the commission to define planetary health. A planetary health plate by volume should consist of approximately half a plate of vegetables and fruits; the other half, displayed by contribution to calories, should consist of primarily whole grains, plant protein sources, unsaturated plant oils, and (optionally) modest amounts of animal sources of protein.

TARGET 2: SUSTAINABLE FOOD PRODUCTION

The Commission focuses on six processes (climate change, land system change, freshwater use, nitrogen cycling, phosphorus cycling, biodiversity loss), which are the main systems and processes affected by food production and for which scientific evidence allows the provision of quantifiable targets. These systems and processes are being increasingly recognized as necessary parameters for a system-wide definition of sustainable food production.

The below diagram illustrates scientific targets for six key Earth system processes and the control variables used to quantify the boundaries.

Earth system process	Control variable	Boundary (Uncertainty range)
Climate change	 GHG emissions	5 Gt CO₂-eq yr⁻¹ (4.7 – 5.4 Gt CO ₂ -eq yr ⁻¹)
Land-system change	 Cropland use	13 M km² (11–15 M km ²)
Freshwater use	 Water use	2,500 km³ yr⁻¹ (1000–4000 km ³ yr ⁻¹)
Nitrogen cycling	 N application	90 Tg N yr⁻¹ (65–90 Tg N yr ⁻¹) * (90–130 Tg N yr ⁻¹)**
Phosphorus cycling	 P application	8 Tg P yr⁻¹ (6–12 Tg P yr ⁻¹) * (8–16 Tg P yr ⁻¹)**
Biodiversity loss	 Extinction rate	10 E/MSY (1–80 E/MSY)

*Lower boundary range if improved production practices and redistribution are not adopted.

**Upper boundary range if improved production practices and redistribution are adopted and 50% of applied phosphorus is recycled.

Achieving Planetary Health Diet (AIR)

Achieving a sustainable food system that can deliver healthy diets for a growing population presents formidable challenges. Finding solutions to these challenges requires an understanding of the environmental impacts of various actions. The readily implementable actions investigated by the Commission were:

1. **A** global shift toward healthy diets;
2. **I**mproved food production practices;
3. **R**educed food loss and waste

Applying this framework to future projections of world development indicates that food systems can provide healthy diets (defined here as a reference diet) for an estimated population of about 10 billion people by 2050 and remain within a safe operating space.

Through less export and less industrial fishing, fisheries can continue to provide millions of people with nutritional security.

Integrate small-scale produced food into school feeding programs.

As Kakwasha et al. (2020) state, “Future investment priorities need to shift to safeguard and enhance fisheries, such as through effective governance and reductions in waste and loss, to secure the flow of benefits that underpin sustainable development.” (Kakwasha K, Simmance FA, Cohen PJ, Muzungaire L et al., 2020).





CASE STUDIES

For this section of the document, case studies will be presented that will showcase various food systems in Nigeria, Kenya, Peru and Turkey.



CASHEW NUTS IN KENYA

BY ANNITA MWAGIRU

Domestic & International Food System Case Study

Swahili- Mkorosho, Mmbibo (derived from a local dialect- MijiKenda)



Source: Greenspoon

KEY FACTS:

- Most of the country's cashew nuts are grown in the coast region of the country.
- Most of the cashew nut produced is from small-holdings involving about 68,000 farmers.
- With 10 million kilograms in terms of current production levels, Kenya generates over \$2.65 million annually from the sale of the nuts.
- Brokers offer as low as KSH 20 (\$0.2) for each kilo of cashew nuts, which demotivates family growers to maintain their fields. In the world's leading production sources of Ivory Coast, Mozambique and other West African nations, farmers get anything from an average \$0.3 to \$0.4.
- Kenya has a reliable cashew nut processing capacity, the production of raw cashew is still low compared to other African Countries.

ORIGIN AND DISTRIBUTION

Cashew nut is scientifically known as *Anacardium occidentale*, and locally known as Mkorosho, or Mkanju (Swahili). The crop originated from the Northern part of South America. The Portuguese introduced cashew nut to Mozambique where it flourished, forming extensive forests; eventually spread to the East African region. Cashew nuts come from the cashew apple tree that features the seeds at the lowest end of the big yellow fruit above it. The shells are usually curved and triangular even when they have undergone processing. The origin of the 12 to 14-meter high tree may have been in the tropical climate of Brazil's northeast, but it is now exotic to Africa. In Africa, this crop has spread for over 500 years either naturally or through smallholder cultivation. In Kenya, cashew nut is grown along the coast primarily in Kwale, Kilifi, Tana River and Lamu Counties. Some production also takes place in Taita Taveta and Tharaka Nithi Counties. (Muniu et al. 2019)



Source: United Nations 2015

USES

It is grown for its fruits as well as nuts. The kernel is obtained by shelling the roasted nuts. The shells yield oil which is used as medicine, preservative and water proofing agent. The oil is also used in the manufacture of insulating varnishes and acid proof cements, tiles and inks. The raw cashew nut apple is edible and is a valuable source of sugar, minerals and vitamins. Nutritive values of cashew apple and nuts are very high. Cashew nut apple is a very good source of Vitamin C. It contains 12.3% carbohydrate and 10% phosphorus and calcium. Cashew nuts (kernel) contain protein (21.2%) and fat 46.9% and carbohydrate (22.3%). It also contains a comparatively good amount of minerals, iron and phosphorus. The wood and shells are used as fuel. (Muniu et al. 2019)

PRODUCTION, HARVEST & PROCESSING

Most local family growers have their nuts ready between January and March each year, after the flowering period of November through December. They grow about ten trees per every acreage of their land. (Wamucii 2021) The duration of harvest extends from 45-75 days and the nuts should be collected daily during this period. (Ireru 2016)

Before packing Kenyan cashew nuts, they are processed for their oil through a kernel loading machine. Once the shells enter into the chute that has hot blown air, they go through a sieve. The sieve separates the shells from any foreign particles that are lighter than them, including dust and leaves. The next process involves the steam roasting of the outer kernel. First, the cashew nuts are boiled in a deep drum for about twenty minutes. Then they are removed once ready and dried for the next full day for ease of cutting the shells in the next stage in the warehouse. The third step involves peeling the inner membrane covering the hidden white content of the nuts. Again the oven is used to soften the shells and then each of the nuts undergoes hand-shelling to retain only the white content. (Wamucii 2021)

The final step is that of grading the processed cashew nuts, which are now only in the form of white, oil-rich seed. They are usually sorted into 9 grades inclusive of size, white color and texture. They are usually graded according to the accepted international guidelines. After choosing the best and the least in the highest and lowest grades, they are roasted in the oven for crisp enhancement of the color right before packing. The nuts are stored with moisture content of at least 8%. (Wamucii 2021) They are then distributed locally through trucks and internationally via air.

A large number of cashew nuts grown in Kenya are for export primarily, with world demand for cashew kernels growing and African raw cashew production rising to meet this growth. Kenya also capitalizes on this demand. (Ireru 2016) Cashew nuts have been a favourite snack for Kenyans for centuries and has only grown as a domestic product through the wellness conversations of the last few years, as nuts have replaced sweets for many people.

ENVIRONMENTAL IMPACT OF CASHEW NUTS

As with all mass grown and produced products, cashew nuts have an environmental impact, they consume a lot of water to grow. Cashew trees are quite water intensive. It takes around 6450 litres of water to produce 1 pound of cashew nuts. Additionally, due to their suitability to grow in tropical areas only, they have to be shipped to the US and Europe, where they are eaten mostly. (Green Eco Friend 2021)

	Water Footprint m3 per ton*	Grey water	Water Footprint; litres per pound**	CO2e footprint kgs per 1kg	Mainly grown in...
Almonds	16095	3015	7302	3.56	USA
Cashew Nuts	14218	444	6450	0.76	Vietnam, India
Pistachios	11363	666	5155	1.11	USA, Turkey, Syria, China, Greece
Brazil Nuts	256	8	4937	2	Brazil, Ivory Coast, Peru
Pine Nuts			4937	2	Korea, Russia, China
Macadamia Nuts			4937	2	Hawaii
Pecans			4937	1.61	USA
Hazelnuts	5257	709	4769	2	Turkey
Walnuts	4918	1536	4209	2	USA
Peanuts			1513	0.57	India, China, USA
Chestnuts	2750	144	1500	2	China

Source: Green Eco Friend 2021

The table above showcases not only cashew nuts but all nuts consumed worldwide. To better understand the table, here are the definitions. Water Footprint measures the amount of water used to produce each of the goods and services we use. CO2e is a carbon dioxide equivalent or CO2 equivalent, abbreviated as CO2-eq is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential. Green, Blue and Grey Water: Green refers to rainwater, blue is the surface and groundwater used for irrigation, and grey is the freshwater used to disperse fertilizer and pesticides.

A Kenyan recipe to better enjoy Cashew Nuts is also included in the next page.

ENVIRONMENTAL IMPACT OF CASHEW NUTS

RECIPE: CHICKEN AND CASHEW BIRYANI

Ingredients:

- 1 tbsp ghee or butter
- 4 (about 300g) chicken thigh fillets, cut into 2cm pieces
- 1 brown onion, finely chopped
- 2 garlic cloves, crushed
- 2 tsp ground cumin
- 1 tsp ground fennel
- 1 tsp garam masala
- 3 tbsp curry powder
- 1 cup (200g) Basmati rice
- 1 1/2 cups (375ml) water or chicken broth
- 1/2 cup (80g) toasted cashews
- 1 cup coriander leaves
- Natural yoghurt, to serve

Method:

Step 1: Heat half the ghee in a large, deep frying pan over high heat. Add half the chicken and cook, turning occasionally, for 5 minutes or until brown all over. Transfer to a bowl. Repeat with remaining chicken.

Step 2: Heat remaining ghee in pan; add onion. Cook, stirring, for 3 minutes or until onion softens. Add garlic, cumin, fennel, garam masala and curry powder and cook, stirring, for 1 minute or until fragrant. Add chicken and rice and stir to combine. Add stock and bring to a simmer. Reduce heat to low and cook, covered, for 10 minutes or until rice is tender and liquid is absorbed. Remove from heat and set aside, covered, for 10 minutes.

Step 3: Add cashews and use a fork to gently toss. Spoon among serving bowls. Top with coriander and natural yoghurt, if desired.





SMALL-SCALE FISHERIES

CASE STUDY

LOBITOS, PERU

BY EMI KOCH

Settled on an isolated, bone-dry stretch of Northern Peru's coastline, Lobitos is a small-scale fishing (SSF) village that once played host to pioneering British and American oil companies. In 1968, the Peruvian military-led government expelled foreign enterprises. The army quickly moved into Lobitos, destroying all leftover infrastructure. Today, the region is home to several key industries, including Peruvian oil exploration and extraction, surf tourism, ecotourism, but none more significant than the small-scale fishery sector. In Lobitos, there are 1,300 residents and most people secure their cash and calories from the community's artisanal fishery. Yet still, residents live on the poverty line with 30% below and 14% below into extreme poverty. Fishermen equate this with the decline in fish stocks due to overfishing, warming seas, illegal, unreported, unregulated (IUU) fishing and other unprecedented anthropogenic stressors.

For generations, the local Lobitos community has depended on fishing dating back to the Tallán culture which existed along the northern coast and in the Piura region between 1000-1476 CE. The ancient Peruvians, especially those who lived along the ocean, ate straight from the sea; their main source of protein was fish and shellfish. That turned ancient populations into fishing villages even before knowing agriculture. Even with the passing of time as their culture progressed and diversified diets, the ancient inhabitants of Lobitos and the Piura region never left the sea and rather became sophisticated fishers. The Tallán not only fished for their own food, but also scaled their production to trade it with inland populations. The fish that they did not use, they salted, dried and smoked. This preservation technique enabled the Tallán to send their catches into the mountains of Ecuador and the rest of Peru.

While Tallán civilizations disappeared after the Incan conquest and furthermore, with the Spanish invasion of Peru, Tallán fishing culture can still be found in the small-scale fisheries sector of Lobitos. While often overlooked and undervalued by modern society, artisanal fishing remains integral to ancestral artisanal fishing village's identity, social-ecological wellbeing, and resilience.

Today, Peru has one of the largest fisheries catch globally (FAO, 2018), although most of it is anchoveta (*Engraulis ringens*), a low-value fish mainly caught by industrial fishing vessels and used predominantly for fishmeal production (Gutiérrez et al., 2017). However, the majority of Peru's marine landings are used for direct human consumption and caught by the local small-scale fleet. This fleet is composed of small vessels. The total length of each artisanal fishing vessel is less than 15 meters and each has a holding capacity of less than 32.6 cubic meters. Small-scale fishing flights are equipped with one or multiple manually operated fishing gears that target marine living resources (SPDA, 2019).



Peruvian small-scale fisheries like Lobitos play an important role in the national economy. In 2009, 54 thousand people were employed as small-scale fishers generating a revenue of 0.61 billion USD (Christensen et al., 2014). However, given that small-scale fisheries are often overlooked and undercounted for, this number could be much higher. Moreover, as artisanal landings provide additional incomes generated through seafood value chains from ocean to plate (Christensen et al., 2014). However, small-scale fisheries remain relatively understudied. This is due to the relative size of the small-scale fishery in comparison to the industrial fishery, the high environmental variability of the Peruvian marine ecosystem, the large number of stakeholders involved in addressing small-scale fisheries management, the limited resources allocated to strengthening and enforcing regulations, and the lack of clear objectives and indicators to assess the success of management strategies over time (Sueiro and De la Puente, 2015). Tulio is a local small-scale fisherman from Lobitos, Peru. Tulio fishes with his sons and at times, a friend.

Tulio uses selective fishing techniques to target specific species of fish such as Doncella or “Maiden” (Rose thread-fin bass, Splittail bass), Cabrilla (Peruvian rock seabass), and Diablito or “Little Devil” (Semaphore rockfish).



Tulio lands his catch at the local pier and with his moto goes door to door in the community selling his fish. Depending on the amount of fish caught that day, he may keep the catch to feed his family. On days with a sizable catch, Tulio also sells to local restaurants especially during the summer months when more tourists come to Lobitos to enjoy the warm water and sunshine.

Lobitos’ small-scale fishery not only feeds the local community but supports income for families who have depended on the sea for generations. Small-scale fisheries, and their sustainable development, are critical for Peruvian food security, economy and natural-cultural heritage. However, fishing effort by industrial fleets has significantly increased over time, negatively impacting target stocks, fishing efficiency and small-scale fishers’ livelihoods. These findings are alarming and require immediate action, as small-scale fishers are a vulnerable population and growing into poverty could drive them further away from becoming resource stewards.



WHEAT IN TURKEY

BY DAMLA CEYHAN

Some background reading:

- Mezitli: <https://www.milanurbanfoodpolicypact.org/mezitli-mpa19/>
- Turna: <http://www.fao.org/news/countries-good-practices/article/en/c/1410477/>

The history of wheat in Turkey dates back to at least 10 000 years ago, when it first entered the life of human beings. Wheat has been a driving force for formation and development of cultures: it represents fertility, it is sacred, and it is something that should not be dropped on the ground and wasted.

Turkey is known as one of the centers of origin and genetic diversity for wild wheat, and species related to wheat. These species are of great importance for the adaptation, spread, and evolution of wheat, particularly for the genetic improvement of bread wheat.



Fertile crescent

Archaeological studies show that the Fertile Crescent, which includes southeastern Turkey, is the motherland of wheat. Many remains relating to wheat have been found in excavations. For example, wheat silos of 4 200 to 5 900 tonnes dating from the XIII century BCE have been found in Hattuša near Çorum, the capital of the Hittites who established the first empire in Anatolia. İvriz Rock relief near Konya by the Hittites also shows the social and religious importance of wheat. The wheat silos and remains of wheat found near the temple and palaces of Urartu in Patnos, a district of Van, dating from 800 to 700 BCE, indicate that similar traditions have gone on for thousands of years. Wheat has kept its importance throughout the civilizations of Anatolia.



Wheat is the main staple crop and an indispensable part of Turkish life. The most important value connected with wheat is bread which has an important place in Turkish people's food consumption. Wheat produced with local varieties have different tastes and several production methods are used in the many Anatolian cultures. Among bread types, the *somun* is contemporarily the most common but *bazlama*, *tandoori*, *saç*, *fetir*, and *top* are also popular in different regions.

Turkish bagel simit, tea and bosphorus

Wheat is the main staple crop and an indispensable part of Turkish life. The most important value connected with wheat is bread which has an important place in Turkish people's food consumption. Wheat produced with local varieties have different tastes and several production methods are used in the many Anatolian cultures. Among bread types, the *somun* is contemporarily the most common but *bazlama*, *tandoori*, *saç*, *fetir*, and *top* are also popular in different regions.

Potato, chickpea, and other ingredients can also be added to breads depending on the customs of specific regions. Anatolian wheat culture is not limited to bread alone, but also includes *yufka* (flat bread), *kadayıf*, *bulgur*, *erişte* (noodles), *kuskus* (couscous), *makarna* (pasta), and *keşkek* as popular products.

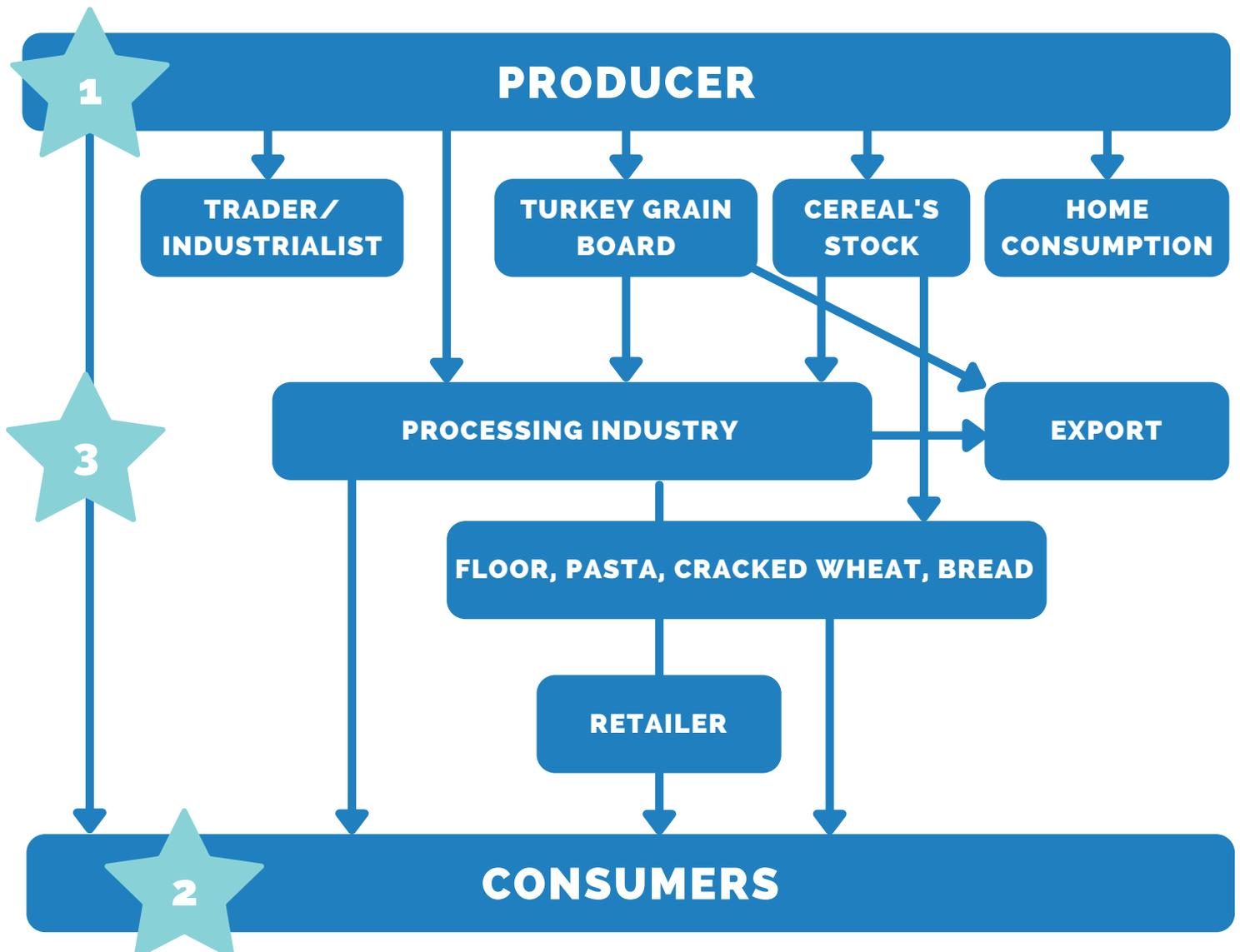


Boiled and pounded hard (durum) wheat, called bulgur in Turkish, is another common name for this traditional meal. Bulgur plays an important role in Turkish cuisine. It has a high nutritional value and it is also considered an ideal grain for a vegetarian diet. A popular soup, the traditional Anatolian winter soup tarhana or sourdough soup, although varying from one region to another in Turkey, usually consists of a combination of cracked wheat (or flour), yogurt, and vegetables. The bulgur or flour is kneaded, proofed, and fermented, and then it is dried and ground into a "meal". Portions of the meal are rehydrated by adding water or milk, vegetables, and spices and boiled for serving as a soup.

According to Turks, bread symbolizes human existence and the “human battle with life” as expressed by the proverb “battle for bread” (*ekmek kavgası*). The man/woman of the house earns bread for his/her family. This is always hard because they have to “obtain their bread from stones” (*ekmeğini taştan çıkarmak*), as the common Turkish proverb says. Sometimes it is difficult to “earn the bread” (*ekmeğini kazanmak*), because “the bread is in the mouth of the lion” (*ekmek aslanın ağzında*), as described in another common Turkish proverb. In Turkish culture, when a child gets its first tooth, it is an occasion of joy and excitement especially for mothers. A dish made of boiled, hard wheat plays an important role in this event. Both the meal and the ceremony are commonly named the same: “*diş buğdayı*” or “*diş hediği*” (tooth wheat). *Hedik* refers to the traditionally cooked wheat dish eaten on this specific occasion.

The most-planted cereal species for Turkey is wheat, of which Turkey provided about 2.3% of the world’s overall production in 2016. Wheat accounts for 67% of all area under cereal crops, by far the largest share. About 21.5 tonnes of wheat were produced on 7.67 million ha in 2017. Today, in Turkey three out of every four farmers grow wheat.

Wheat is produced on small scale family farms, which tend to be very fragmented. These farms tend to allocate a portion of their wheat production for home consumption. Wheat enters the market via one of three channels; i.e. through a trader or processing industry, the Turkish Grain Board (TGB) or the Cereals Stock Exchange. Wheat processed as flour, pasta, cracked wheat, bread etc. reaches to consumers via wholesalers and retailers.





CASSAVA IN NIGERIA

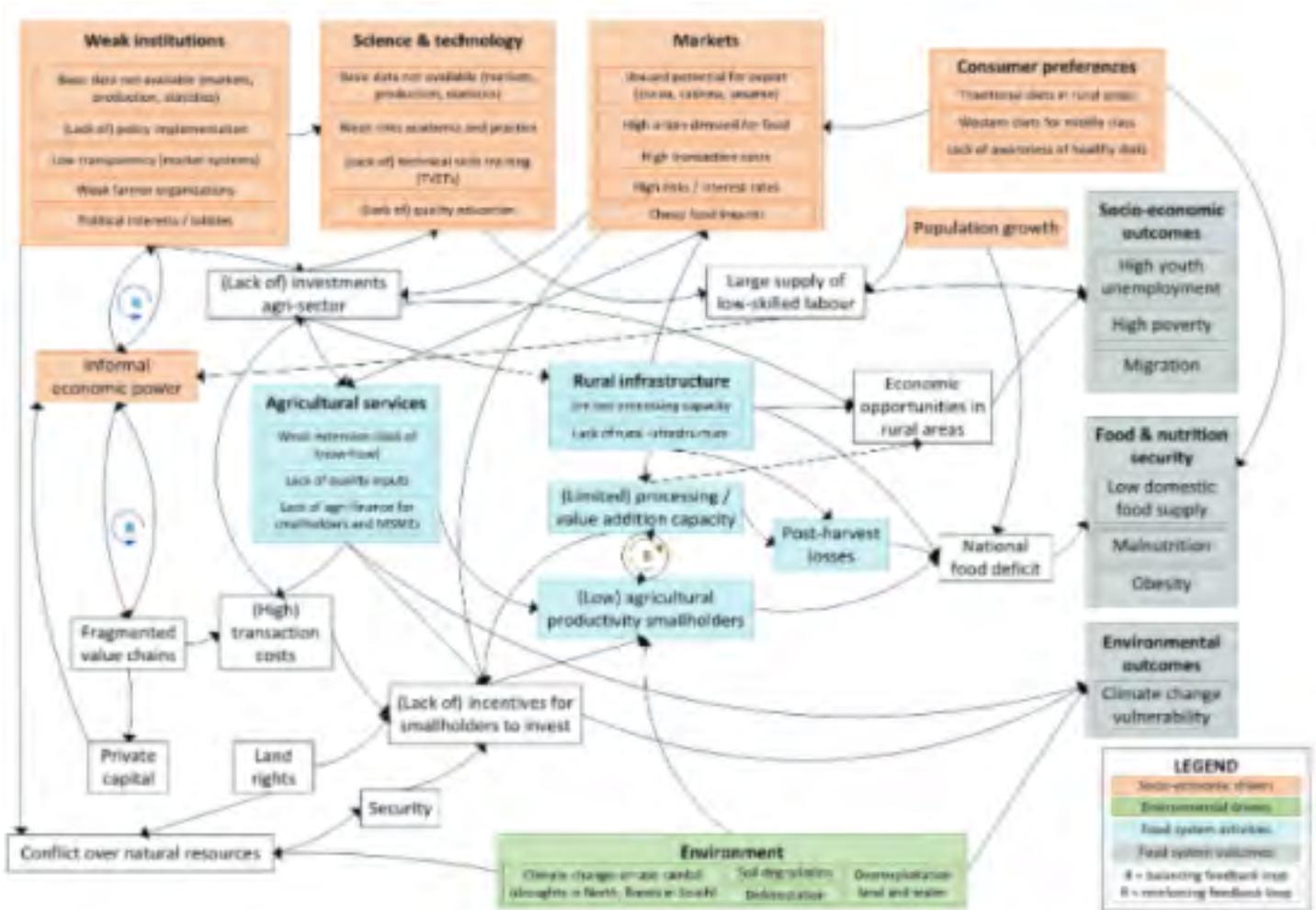
BY RITA OTU

VITAMIN A CASSAVA: LOOKING BEYOND

EXPLORING THE NIGERIAN FOOD SYSTEM

Nigeria's food system is complex, encompassing all the people and processes from plot to plate. Recent data show that 37 percent of children under five years of age are stunted while 68 percent suffer some degree of anemia, while approximately one-third of adults are overweight or obese (CGIAR, 2021).

In this section, we identify and discuss how Biofortified Vitamin A Cassava can support the operationalization of food systems approach to improving the quality of diets in Nigeria. To address this gap, the case studies on Cassava aim to promote sustainable and nutrition-secure city food systems. As the food system does not produce enough food to feed everyone, Nigeria depends on food imports to help meet the growing demand. The most available staple foods providing energy in Nigeria are rice (14.8%), cassava (12.9%), maize (10.6%) and yam (10.1%) (Helena Posthumus et al., (2019)). Thus diagram shows the different parts of the Nigerian food system, describing the main dynamics in the system.



Source: Helena Posthumus et al., (2019).

HISTORY OF CASSAVA

Cassava (*Manihot esculenta*), also known as manioc, manioc, and yuca, is a woody perennial plant in the spurge family (Euphorbiaceae). Cassava originated from tropical America and was first introduced into Africa in the Congo basin by the Portuguese around 1558. Today, Cassava supports the livelihood of over 300 million Africans (IITA). Cassava or manioc (*Manihot esculenta*) Cassava” is one of the major food crops in Nigeria and it is mostly grown for home consumption because of its usefulness in making several safe foods and ability to grow in harsh environments (diseases, drought, or flood). Looking beyond cassava as a product for direct human consumption, the resilient crop has a high potential as a money earner. Once processed further, cassava products can profitably be used as a vital ingredient in many industries; more than most crops grown by resource poor farmers in Africa. Today, Nigeria ranks number one as the top ten cassava producers in the world, ranked by mean cassava production in 2011–2015 (Gorm E. Shackelford, 2018).

VITAMIN A CASSAVA VALUE CHAIN

Cassava is a major staple food in Nigeria, consumed daily by more than 100 million people. However, while the commonly available white cassava can provide most of the body's daily energy requirements, it lacks micronutrients, such as vitamin A, that are essential for a healthy and productive life. Vitamin A deficiency can impair the body's immunity to infectious diseases and cause eye damage that can lead to blindness and even death. Nearly one in three Nigerian children under five and one-quarter of all pregnant women in the country are vitamin A deficiency (HarvestPlus, 2014). To bridge the gap, Biofortified Vitamin A Cassava was introduced. Biofortification is the process of increasing the density of vitamins and minerals in a crop, through plant breeding or agronomic practices, so that when consumed regularly it will generate measurable improvement in vitamin and mineral nutritional status. The process of biofortification is to reduce malnutrition and improve the lives of millions of people around the world.

The varieties are : NR 07/0220 – UMUCASS 44, TMS 07/0593 – UMUCASS 45, and TMS 07/539 – UMUCASS 46, TMS 01/1368 – UMUCASS 36, TMS 01/1412 – UMUCASS 37, and TMS 01/1371 – UMUCASS 38.

Looking beyond cassava as a product for direct human consumption, the resilient crop has a high potential as a money earner. This type of cassava contains Provitamin A carotenoids that could contribute to reducing vitamin A deficiency. So far, we have empowered more than 500,000 Nigerian households with vitamin A cassava through an innovative e-market system. In addition to empowering smallholder farmers to grow biofortified crops, this project has linked farmers to crop aggregators, food processors, retailers, and others in the food value chain to catalyze downstream markets for surplus crops that farmers sell for income to improve their livelihoods.

BENEFITS OF VITAMIN A CASSAVA

1. Provides up to 100% of daily vitamin A needs
2. Farmer Benefits: High yielding, virus resistant
3. Vitamin A cassava varieties also boast improved pest- and disease-resistance traits, and are high yielding.
4. The garri has the signature yellow color imparted by the vitamin A, signaling better nutrition for the millions of Nigerians who are expected to include vitamin A cassava in their diets in the years to come.
5. By-products: vitamin A cassava stems, tubers, and ready-to-eat products such as pies, cakes, garri and fufu.



NUTRI-GARRI AND SUSTAINABLE FOOD SYSTEMS

Garri is a popular food across Nigeria. Many consumers have a preference for the yellow Garri. The yellowish colour is often imparted through the use of palm oil. This is often added to impart the distinctive colour on the end products as well as provide vitamin A. But this option causes garri to deteriorate fast due to rancidity of the oil. Today, bio-fortification provides one of the best ways to achieve improvements in nutrition. Crop breeders at the National Root Crops Research Institute, in collaboration with the International Institute of Tropical Agriculture, and the HarvestPlus, have worked assiduously to develop cassava varieties that serve as sources of vitamin A.

Every year we celebrate the cassava (USORO IWA), a famous root crop. The Cassava Festival activities include: farmers and small businesses sell cassava-based items, cooking contests, cooking exhibitions and art contests. Once processed further, cassava products include garri (fried cassava granules), fufu (cassava dough), lafun (fermented cassava flour), tapioca (cassava flakes), starch, cassava chips (Edita IWA), cassava Pasta (cassava flour plus egg), cassava bread made from flour, cassava paste (cassava roots or tubers either fermented or unfermented). One of the most popular Cassava food-products with several advantages is Nutri-Garri. It is stored and marketed in a form that it is ready to eat. It has a long shelf life.

RECIPE OF EDITA IWA (NIGERIAN WET CASSAVA CHIPS)

This is a popular Cassava flaked meal eaten by The South South people of Nigeria. It's eaten in different styles according to cultures. Some cultures have special ways of slicing the boiled cassava.

This method is the Ibibio proper way of slicing and preparing the chips.

Equipment:

1. Pot
2. Cooking stove
3. Knife
4. Spoon

Ingredients:

1. Cassava
2. Water
3. Grinded fresh or dry pepper
4. Seasoning cubes
5. Fresh Fish
6. Salt
7. Onion

PREPARATION

Peel the cassava, then cut the cassava into big round pieces. Wash the cassava and boil with some water. Allow cassava to boil until it is soft. Then soak in a normal temperature water to cool. When boiled cassava is no longer hot, using your knife, slice the cassava into long tiny vertical chips as seen in the photo.

Then allow it to soak in water overnight to reduce the acidic concentration.

Wash your fresh fish and cut into small sizes. Season with seasoning cubes, onion, pepper and salt. You can roast your fish or steam it.

Put your desired amount of the cassava chips on the plate, add a pinch of salt and using your hands, mix it to circulate into all parts. Add little dried or fresh pepper and using a small spoon, turn until the pepper has been circulated around. Then serve this meal with your prepared fish. Some people do not mix the cassava chips with pepper, but the choice is yours. You can eat Edita IWA with groundnut, coconut or pepper sauce.

CASSAVA PRODUCTION AND THE ENVIRONMENT

Cassava processing is generally considered to contribute significantly to environmental pollution and to depletion of water resources, due to the strong and unpleasant odor and the visual display of waste products. Some forms, especially starch extraction, also require large volumes of water. Cassava production, however, does seem to cause serious erosion when the crop is grown on slopes (FAO, 2000).

Most cassava is produced by smallholder farmers living in marginal and fragile environments in Africa, Asia and Latin America. The crop is usually grown on very acid and infertile soils (often prone to erosion), where other crops would not grow well. But few farmers apply animal manures or fertilizers to their cassava crop, and those who do usually use only low rates. Carbon dioxide emission from fire and internal combustion engines are problems to our environment. The world's average temperature is rising because we are adding more carbon dioxide or other greenhouse gases to the atmosphere (Oladele Peter Kolawole, 2014).

CARBON FARMING THE NEW WAY FOR AGRICULTURE

Carbon farming is agriculture's answer to climate change. There are many ways of common agricultural practices, including driving a tractor, tilling the soil, overgrazing, using fossil fuel based fertilizers, pesticides and herbicides resulting in significant carbon dioxide release. Also, carbon can be stored long term (decades to centuries or more) beneficially in soils in a process called soil carbon sequestration. Carbon Farming involves implementing practices that are known to improve the rate at which CO₂ is removed from the atmosphere and converted to plant material and/or soil organic matter (Carbon Cycle Institute). Simply put, the goal is to take excess carbon out of the atmosphere, where the element causes global warming, and store it in the soil, where carbon aids the growth of plants. The principle is pretty straightforward – the practice, not so much. Plants add organic matter to the soil when they decompose, and photosynthesis, by definition, removes carbon dioxide from the air and pumps it through the roots of plants and into the soil.

When we implement carbon farming, we also address many of ecosystem health impacts related to agriculture, including: groundwater and surface water degradation. Converting manure and other organic waste into high-quality compost, avoids the methane and air quality issues of conventional on-farm nutrient and waste management, and, improving soil health and soil organic matter directly improves the water holding capacity of soils.

The goal is to take excess carbon out of the atmosphere, where the element causes global warming, and store it in the soil, where carbon aids the growth of plants. Most folks understand that burning fossil fuels puts carbon that was once buried deep beneath the earth into the atmosphere, turning the planet into one big greenhouse in the process. But in addition to petroleum underground, the soil on the surface of the earth contains a sizable store of carbon in the form of organic matter – the stuff that environmentally aware farmers and gardeners are always striving to maximize. Plants add organic matter to the soil when they decompose, and photosynthesis, by definition, removes carbon dioxide from the air and pumps it through the roots of plants and into the soil. (Brian Barth ,2016).

CARBON SEQUESTRATION TECHNIQUES WITH REPAIR APPROACH

With carbon sequestration (CS) techniques we mean farming practices that store carbon in agricultural soils for the longer term. Higher carbon content in the soil offers many benefits for soil health and fertility: improved soil structure, increased soil biodiversity and a better water holding capacity and nutrient availability. Some examples of CS techniques are:

- **Reduction of soil tillage:** Tillage is normally used to loosen and aerate the soil and to remove initial weeds. Additionally, it increases C mineralization leading to CO₂ emissions from the soil. Reducing soil disturbance therefore is a useful tool to protect soil organic matter.
- **Enriched crop rotation:** When growing a wider diversity of crops and perennial forage crops, a more diverse agro ecosystem is created. With increased diversity of soil life, roots and improved soil structure as a consequence. Such soils have a greater ability to store carbon. Introducing less intensive crops, such as cereals and grass and clover species, in the crop rotation, increases the carbon content in the soil through the extensive rooting system.
- **Permanent grassland:** Below grassland, organic matter is building up. When grassland is renovated (and therefore ploughed), the soil gets in contact with more air and the organic matter mineralizes.
- **Agroforestry Systems:** Agroforestry is the practice of introducing trees in agricultural systems. This can be in grasslands, but also on arable fields. Trees fix CO₂ from the atmosphere in stems, leaves and their extensive rooting system. Especially roots will increase the soil carbon content also in deeper soil layers.
- **Integrating cover crops:** Cover crops can be integrated in crop rotations at different times and positions and for multiple agricultural usage. When introduced additionally to the crops which are normally grown, cover crops bind additional carbon from the atmosphere and offer additional biomass to the soil. They protect soils against erosion, can break infections with soil borne diseases, increase infiltration of water, bind nutrients and might increase agro biodiversity and resilience of agricultural systems.
- **Rock Solutions:** CO₂ is naturally removed from the atmosphere every day through reactions between rainwater and rocks. CO₂ is removed from the atmosphere through artificial measures such as crushing rocks and exposing them to CO₂ in a reaction chamber or spreading them over large areas of land or ocean, increasing the surface area over which the reactions can occur.

In conclusion, the tide is turning. We must eat what we produce, and produce what we eat. We should advocate for dietary diversification and training programmes that will equally promote biofortified foods and vitamin A-rich- local foods. We have Eat Local, Grow Local and Go Global.



Credit: Sophie Casson for Nature



SOLUTIONS

In this section, we will be looking at solutions that can be used by individuals, communities, organisations and governments. We will address how water security can be achieved while making food systems more sustainable. We will look at how youth can be crucial to the changes needed in the Global Food System, why there are barriers currently and how these barriers can be overcome in order for Youth to take action towards a sustainable and resilient future for food systems.

Repairing or reforming our food systems may seem like a daunting task and one that only governments can accomplish through policy change or new corporate practices at the national and international levels. However, there are simple steps we as young people can take within our local food systems for sovereignty and sustainability.

Have you ever thought that every dish you put on your plate is a choice? And your choice can change the world? We can save the World just by eating healthy and sustainably. Food is simply the solution. Do you wonder how? How can you eat more sustainably and healthily?

There is no ‘one size fits all’ as individual countries are at different stages of economic and food system development, and this influences the available opportunities for transformative processes (Development Initiative, 2018; HLPE, 2017).

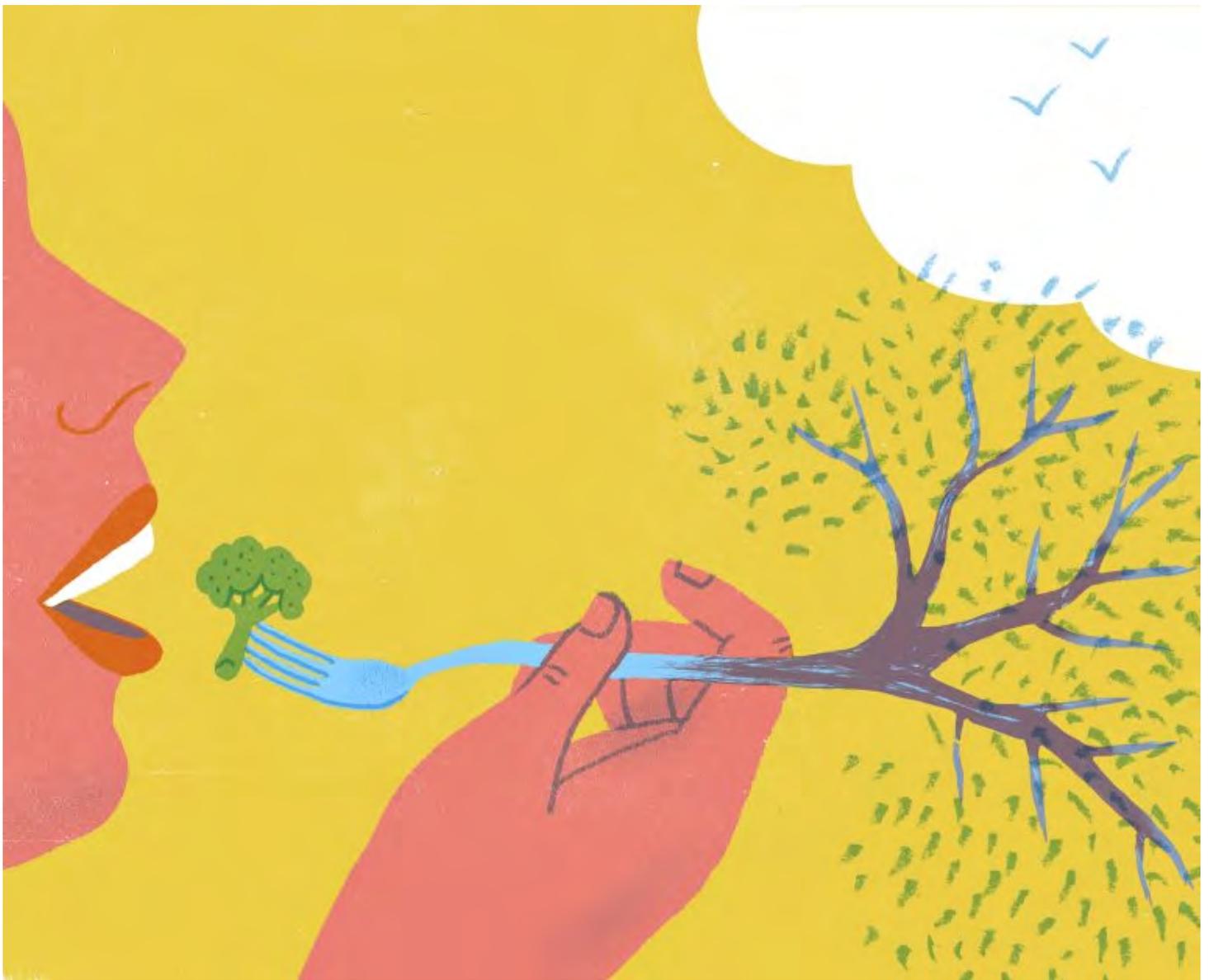
Individual consumer behaviours matter — more than we might think. Our diets are likely one of our biggest sources of climate emissions, for example. As food systems transform in response to macroeconomic change and the climate emergency, the next generation will be called upon to undertake new kinds of activities and adopt novel practices. We can start today. The good news is that a sustainable diet is an easy road to take. You just need to follow a few simple rules:

- **Consider the true cost of food:** When we talk about the “true cost” of food, we’re referring to the often hidden environmental and social impacts that mass food production creates. While unsustainable or processed foods may be cheaper at the grocery store, they ultimately have a higher “true cost” in their negative impact on people and the planet. It’s important to keep this issue in mind when we buy food.
- **Eat locally or seasonally:** Foods on our plate travel so many miles to reach us. Make sure your meal is locally produced so you can lower your carbon footprint. In addition, when you prefer the local products in local shops, you support the local farmers. Also, when you buy your products in season you can buy the tastiest and the freshest food at low prices. When we buy food from our local farmers or fishermen, we contribute to our community’s economy and also decrease our impact on the planet. It is a win-win! We’re able to enjoy seasonal fruits and veggies year-round because we import foods from all over the world. Our modern unsustainable food systems seek to gratify the appetites of consumers. However, if we as consumers commit to seasonal produce like our ancestors, we are able to contribute to our local economies and our carbon footprints while boosting our health.
- **Avoid ultra-processed foods!** Eat more unprocessed and plant-based foods: Eating more fruits, vegetables, whole grains and pulses are good for your health and also lower your carbon footprint. Packaged, ultra-processed foods like chips, chocolate, biscuits especially rich in high sugar, sodium and trans-fat. They cause obesity and chronic diseases. Moreover, these packages are plastic and that means plastic waste. Avoid these foods and cook your own meal as much as possible. A plant-based diet contains more fibre, vitamins, and minerals. Also, plant-based foods are really emission-efficient, for example, it takes about 50 onions to produce a kilogram of greenhouse gas, but only 44 grams of beef to produce the same amount. It’s a win-win approach. Did you know, if the world reduced meat consumption by 15% (by doing meatless Monday) it would have the same impact on greenhouse gas emissions as taking 240 million cars off the road each year. And research says you can reduce your carbon footprint by half by limiting your meat consumption to twice a week (Ruini, 2016). Meat is the most greenhouse-intensive food we eat. We should limit our meat intake, it’s clear. However, you don’t need to be vegetarian overnight, but you can choose to be a weekday vegetarian or you can plan some days as meatless days, you can try vegetarian options like bean burger.

- **When you eat, think about the variety:** Every food group is unique and has a different effect on your health and planet health. The interaction in between brings out the best in these food groups. For example, pulses and whole grains are more beneficial together because when they are together their protein quality becomes higher. Also, pulses and vegetables are good ideas too, you can absorb iron more efficiently in this way. All over the world, consumption of whole wheat grains is not enough. Since, whole wheat grains are great sources of fibre, vitamins, and minerals. In addition, the carbon footprint of grains is lower compared to other food groups. The easiest way to be sure about the variety is by looking at the colours on your plate. Colourful plates are the best!
- **Increase your intake of pulses and beans:** Pulses and beans are ‘superfoods’ because of their nutritional profile and low carbon footprint. Pulses and beans are the most important sources of plant-based protein and amino acid. Vegetarians and vegans can get adequate protein, vitamins and minerals they need by eating pulses and beans. Pulses are mostly mentioned about their protein content, but pulses also contain high fibre, phytochemicals, calcium, iron, folate; low glycaemic index and low saturated fat. Also, they are gluten-free and gluten intolerant people can consume easily. In addition, pulses are so versatile; you can use them in every meal.
- **Make sure you eat 5 portions of fruits and vegetables every day:** Fruits and vegetables are the most delicious and healthiest gifts of nature to us. They contain lots of vitamins, minerals, fibre, and antioxidants which are essential to our body. Fruits and vegetables are protective against chronic diseases such as diabetes, heart diseases, cancer etc. You can eat fruits as snacks and also your side dish. Also, don’t forget to make half your plate fruits and vegetables. Lastly, you know each fruit and vegetable grows in different seasons so try to buy fruits and vegetables in season. You can also freeze your veggies in season so you can eat other seasons, too.
- **Avoid sugary drinks like sodas and fruit juices:** Prefer water instead of coke! Overall, to reduce your sugar intake you should consider all day routines such as how you take your coffee and tea, do you add extra sauces or cream in your meal, which snacks do you prefer, do you read sugar content on the label when shopping... I know it is hard to avoid all of them all the time but do your best!
- **Buy sustainable and eco-friendly products:** Don’t forget consumer choices are a changemaker for the food industry and have an effect on our ecosystem. So, next time look for a sustainable, eco-friendly, fair trade product.



- **Learn to cook at home! Avoid big-box and fast-food retailers:** Since sustainability promotes better health among consumers, learning to cook at home more skilfully — and more frequently — is an essential component. When we have control over our own food, we can eliminate ingredients like added sugars and fats. This, in turn, creates a healthier public. If you cook from scratch that means you cook healthy and lower your plastic waste. Synthetic pesticides, fertilizers and antibiotics take a toll on the earth and on animals, but are used frequently by primary producers and livestock farmers in conventional farming to ensure produce and animals grow – and turnover profit – as quickly as possible. When we have the option, we can try to buy organically grown and additive-free produce and grass-fed meats where possible. This should be clearly marked on the packaging. If you have trouble locating the product’s source, ask your local shop clerk.



Credit: Sophie Casson for Nature

- **Aim for zero food waste:** Globally, we waste a third of all food produced and the natural resources involved in its production. That means 1.3 million tonnes of food. Food waste alone accounts for around 6.7% of global greenhouse emissions. You can do something about it. We can strive to toss out less food at home and make the most of our weekly groceries. A great recommendation is to create a weekly meal plan, so you can shop according to your plan. Also, love your leftovers, you can reconsider your leftovers as your lunch meal. We can also advocate for businesses, supermarkets and food industries to stop throwing out edible food and rather, donate to charity or other organisations.
- **Acknowledge the inconvenience:** Supporting a sustainable food system isn't easy. When you commit to buying locally-produced foods and Fair Trade foods and adhering to other tenants of sustainable living, these conscious choices may cost you time and money. But ultimately, you're working toward a greater cause that will ensure you pass on a healthy earth to future generations.

Contributing to a sustainable food system may require a personal investment on your part, but when you weigh the benefits, it's well worth the effort. With just a few minor tweaks to your daily life, you could have a huge impact on the way the food system develops in the coming decades. So pick one or two of these steps that you can take to do your part in living (and eating) more sustainably.

These are some solutions that we can individually and collectively as communities contribute to the Global Food System transformation. Start small and test your individual limits as well. Do not rush the process or cause yourself undue stress. Get support from a friend or family member to help with the transitions. We can all contribute in our own small way!

GOVERNMENTS & STAKEHOLDERS SOLUTIONS

Finding solutions to provide nutritious food to nearly 10 billion people by 2050 without destroying our planet is one of the greatest challenges and leadership opportunities of our generation. It is not made a priority for policymakers despite its impact on the wellbeing of people and the planet is unsurpassed. For governments and various other stakeholders, there is an opportunity to improve the current situation and create a sustainable food future. For this to happen, there are four action areas that Voegele and Nelson (2019) state should happen:

- **Leverage technology innovation:** these technologies range from innovations to change the shape of food demand (alternative proteins and nutrigenetics), to those that can make food systems more resource efficient and climate resilient (precision agriculture, gene-editing and biological-based crop protection), and technologies that improve traceability. The leadership challenge would be for governments and policymakers to develop their supportive policies, investments and capacity-building to scale their implementation in ways that are equitable, efficient and environmentally sustainable in order to agree on the appropriate combination for different food value chains and geographic contexts.

- **Turbo-charge food research hubs and networks:** there is a need to scale up the ambition of agricultural and nutrition facilities and alliances. National and regional research institutions are equally important to the food system because they deliver solutions that are customised to local needs and realities. Additionally, there is a need for agricultural, nutrition and health research centres to develop closer links both nationally and globally. Leadership in this area would help vastly increase the funding, efficiency, relevance and connectivity of existing research centres and initiatives. This would allow the food system to be where we want it to be.
- **Unlock finance for small and medium enterprises:** the current food system is extremely riddled with inefficiencies and this has led smart investors and disruptive entrepreneurs to take notice. Small and medium enterprises (SMES) provide crucial jobs in rural and urban areas and provide the bulk of the food inputs, production, processing and distribution systems in developing economies. Despite all this, investment in them is minimal. Exciting alliances and financing mechanisms are starting to emerge to address the challenges of insufficient financing for SMEs in developing countries. Leaders should seek to maximise finance for the inclusive and sustainable development of agricultural value chains. Deliberate policy actions that allow food and agricultural businesses of all scales to thrive will make for a more dynamic and responsible sector.
- **Restructure agricultural support to deliver public goods:** directing public support towards public good outcomes, specifically climate-smart agriculture, opens up opportunities to create a substantial impact. The same holds for nutrition goals, given that current support disproportionately favours grain and meat over legumes, fruits and vegetables. The leadership opportunity is for countries to urgently examine the structure of their spending in agriculture in light of their 21st century goals. Learning from other countries' successes and weighing pros and cons, policymakers may consider shifting from market price supports to direct producer payments that better target rural poverty, decoupling payments from production, and incentivizing agricultural and natural resource management practices that are better for the environment. (Voegelé and Nelson 2019)

SOLUTIONS TO IMPROVE WATER SECURITY & FOOD SYSTEMS

Water is essential to food systems as a basic component of food and drink, and in production, processing, and preparation of food. Additionally, water is necessary for human health and nutrition. Agriculture consumes most of the world's freshwater resources. Currently 85% of all freshwater and withdrawals are used in agriculture, mostly for the production of cereals, sugarcane and cotton. Food systems cannot be transformed without factoring in water. Environmental and societal changes are affecting the dynamics of natural water cycles and water resource availability, which affects food systems. The UNFSS has outlined some solutions to improve food systems outcomes and water security:

- **Address social inequities in water-nutrition linkages:** Vulnerable communities must be actively involved in the design and implementation of water systems. Designs should consider multiple uses of water, such as drinking, irrigation, and livestock watering, to meet the needs of rural smallholders who are most vulnerable to both water and food insecurity. With women making up a large share of the agricultural workforce, their productive roles should be promoted, and they should be trained in irrigation and water management.
- **Increase the environmental sustainability of food systems:** Wide disparities exist between the water footprints of diets in rich and poor countries, and across socioeconomic groups within countries. Food-based dietary recommendations should consider the environmental impact of diets and technologies, and consumer awareness should be improved to reduce food waste and losses.
- **Coordinate water with nutrition and health interventions:** improving food security, nutrition, and health outcomes, and enhancing women's agency, all depend on better coordination between WASH (Water, Sanitation and Hygiene) and irrigation at the government and management levels. To improve positive transmission pathways between these often competing water uses and nutrition and health outcomes, nutrition and health experts must collaborate with water managers at the farm, household, community, and government levels.
- **Improve data quality and monitoring for water-food system linkages, drawing on innovations in information and communications technology (ICT):** To fully understand the water footprint of diets and formulate policies that co-maximize water, food security, and nutrition goals, more and better data are needed. This will help to improve water management and food systems, as well as accountability of related policy decisions. This requires long-term investments in global monitoring of a variety of hydrological and food-related parameters.
- **Strengthen efforts to preserve water-based ecosystems and their functions:** Deforestation and destruction of water-based ecosystems should be stopped, while increasing water supplies, improving water quality, and mitigating risks associated with water-related hazards and climate change. Limits to water consumption should be developed and monitored in water stressed regions.
- **Reduce water and food losses beyond the farm gate:** To maximize the benefits of irrigated, perishable high-value crops such as fruits and vegetables, market linkages to consumption centers should be strengthened. This requires investing in physical infrastructure that supports on-farm production, efficient trading and exchange, value addition, and improved transportation and bulk storage.

- **Improve agricultural water management for better diets for all:** climate change threatens rainfed food systems which produce the bulk of food, fiber, fodder, and animal feed. To counteract the effect that climate change poses to rainfed food systems, there needs to be better incentives for farmers to conserve upper watersheds, investing in more water-efficient crop varieties, improved agronomic practices, and strong institutions. Additionally, irrigation development should be kept in line with environmental limits. There is also huge potential for increasing water and nutrition productivity in irrigation. Finally, addressing water pollution in food production, food safety, and water-based ecosystems is pivotal to improving agricultural water management. (Ringler and Wilf 2021)





YOUTH AND FOOD SYSTEMS

Currently, the world faces a rapid increase in youth populations as well as a critical demand for sustainable food production. Right now, one-third of the world population, over 2.3 billion people, are between the ages of 15 and 34. Through empowering and engaging youth around the world, countries and communities can improve global food security through innovative approaches to agriculture and food production. Low and Middle Income Countries (LMICs) report the highest population growth rate. Agriculture remains the largest single economic sector and source of employment in LMICs. If young people can be trained and empowered to take a central role in agriculture and food production, this could be an effective approach for building a resilient food system and creating economic opportunities for youth in these countries. Governments and INGOs need to provide educational and vocational training, investing in human capital development in food insecure regions through nutritional programs, access to land and financial services, support international regulatory norms for business and trade that creates job opportunities for youth in food insecure regions, and access to markets. (Muiderman, n.d.)

For youth in emerging market countries, working the land has become highly unpopular as it is associated with hard physical work, low wages, uncertainty and dirtiness. Rural areas lack the facilities that are offered in urban areas. Young people prefer white-collar jobs in the cities. Currently market structures are not favourable to youth. The agricultural sector needs to transform into a youth friendly and stimulating environment in order for youth to see the potential and want to work in the sector and have access to the market after growing their produce. (Muiderman, n.d.)

The pandemic has exposed deep-rooted inequities, including in food systems. (“Youth as the Future of the Global Food System” 2018) The world’s food system is at a crossroads. How we respond to its multiple challenges will make or break the next generation. If the solutions highlighted in this document are implemented, then the agricultural and fisheries sector will be able to create jobs, respond to consumer preferences, and be better able to take on health, nutrition and environmental considerations. Our actions or inactions may pave the way for hunger, disease, conflict and migration on a massive scale, or help restore productive landscapes and food to their life-sustaining, carbon-stocking, health- and wealth-giving potential. (Voegelé and Nelson 2019)

STRENGTHS PROBLEMS OPPORTUNITIES AND THREATS (SPOT) ANALYSIS OF YOUTH IN FOOD SYSTEMS

Young people are the inheritors of global food systems and have the greatest stake in their future. To address the critical issues of hunger and malnutrition, it is imperative that we harness the passion, creativity and collective will of the world’s youth to drive meaningful and equitable transformation of our agri-food systems.

The world’s food is produced by (ageing) smallholder farmers and older farmers are less likely to adopt the new technologies needed to sustainably increase agricultural productivity, and ultimately feed the growing world population while protecting the environment. Hence, we need to re-engage youth in agriculture. How can that be done? This chapter provides real life examples of how this can be done. It shows how RURAL EDUCATION AGRICULTURAL PROGRAMS (REAP) such as the Girls Farmer’s Club (GFC) approach can provide rural youth with the skills and insights needed to engage in farming and adopt environmentally friendly production methods.

1.8 billion Young people between the ages of 10 and 24, according to UN estimates. Youth are dynamic agents of positive change, yet their role is too often overlooked. Agriculture is one of the sectors that have the greatest potential to create jobs for youth in sub-Saharan Africa (CTA, 2019). SPOT analysis makes it possible to assess the various strengths, problems, opportunities and threats within the agriculture and food systems.

Strengths Problems Opportunities and Threats (SPOT) is an analytical technique that provides answers to the questions related to each of the four words; Strengths relate to advantages, areas of excellence, and available institutions. Problems include problems, and areas of poor performance. Opportunities are enabling factors and comparative advantages while Threats are obstacles that hinder success, and areas to avoid. Carrying out an analysis using the SPOT framework helps to focus activities into areas of strengths and where the greatest opportunities lie for youth in food systems. Over the course of the project, six Strengths, Problems , Opportunities and Threats (SPOT) challenges were identified. For each challenge, this publication presents a series of relevant case studies that serve as examples of how this challenge may be overcome.

Strengths of the SPOT Analysis

1. Youth earn “mixed livelihoods” from various sources — on-farm, off-farm, and non-farm.
2. Self-employment.
3. Availability of raw materials.
4. Gender Transformation.
5. Large domestic demand
6. Huge natural resources

Problems that cause barriers for Youth in Food Systems (6A's)

- Acquisition of skills and engagement in policy dialogue
- Access to financial services
- Access to Green jobs
- Access to knowledge, information and education
- Access to land
- Access to markets

Opportunities for Youth

- Essential driver of economic development and an area of great opportunity for young people.
- Youth employment and income
- Building skills and capacity, and linking youth to market opportunities in growth sectors that have potential for job creation.
- Green Economy
- Value addition
- Increasing market span

Threats to Youth taking part in Food System Transformation

- Global competition
- Bad trade policies
- Huge cost of modern technologies
- Price fluctuations.
- Unorganized market
- Climate change

HOW CAN YOUTH DELIVER AGRICULTURE TRANSFORMATION? THE DAYSTAR APPROACH

- **Decisions:** More than half of the world's population is under the age of 30. As a collective force, young people have extraordinary potential to mobilize and influence global movements, which can be initiated in the form of a simple pledge (Global Alliance for Improved Nutrition). Youth Stakeholders should be engaged in consultations with other engaging actors who affect the role of youth in agriculture systems through consultations and meetings. Currently very few youths understand how policies are made and how they can engage and use their experiences to contribute to evidence-based policies that address their challenges. Young people are keen to participate in the decisions and policies that impact their lives and can give practical, valuable advice on how to make youth and employment policies and programs more impactful.
- **Advocacy:** Youth can be agents of change in food systems. For example, Girls Farmers Club (GFC) - GFC is a youth empowerment and food justice organization using food, through sustainable agriculture and health, as the vehicle for growing strong, healthy, and resilient teenage girls. We create a safe space for youth and support getting their hands dirty and experience the farm and garden in this way will create many opportunities for impact and advocacy. The future of our world is our youth).
- **Youth Leadership:** We should create a global network of organisations working with food and young people. We need to mobilise their networks and youth groups to lead a global consultation with young people for the Youth Think Tank Forum. For example Rita Entrepreneurship Day (RED) Program through BigSistah Academy is the first step in mentoring and training young girls through sustainable agriculture.
- **Support Prosperity Through Public, Private and Social Sectors :** Involving the private sector, identifying synergies between agriculture and other sectors helps enable youth to engage and participate in the value chain more proactively, which can have the ripple effect of creating more jobs. By incorporating a value chain approach and not just focusing on farming as a program can create space for innovation, entrepreneurship, employment, access to markets, and increased productivity and efficiency.
- **Technology:** In designing rural entrepreneurship programs, we need to find ways to improve Total Factor Productivity across the agrifood systems. We can do this with “advances in science and technology. The world is changing fast and it is thus essential that they learn how to access knowledge and how to apply it. They need to develop a culture of life-time learning, adaptability and innovation (Leresche Kay,2017).

- **Access to Land, Financing and Capital:** Rural agricultural entrepreneurs have the potential to spark economic growth in their communities, but often have trouble accessing financing to launch or develop their business. Young entrepreneurs who use personal or family savings to start an enterprise may eventually encounter limits on how much their business can grow if it is not supplemented with outside investment. The N-Power and Survival Fund grant in Nigeria helps young entrepreneurs and youth-led organizations in Nigeria create employment for themselves and their peers, by challenging youth to develop innovative ideas and providing capacity building and implementation support. Furthermore, due to land scarcity and land market restrictions, youth seldom have sufficient access to land to set up or expand agricultural businesses. This lack of access can lead youth to abandon agriculture. A large proportion of the poor, however, lack adequate access to quality land, and when they do have access, they have limited rights to it. For example, they might be able to use land for cultivation but not be able to use it as collateral, rent it, sell it, or hold the land for a long enough period to recoup labor and capital investments (Roth, Mike, 2013). The World Bank supports and consistently recommends government policies that implement systematic land surveying and titling programs that recognize all forms of land tenure: public and private; formal and customary, including those of pastoralists or others with weak formal rights; collective and individual, including women's rights; and rural and urban. At the same time, respect for customary and traditional land rights should be looked at dynamically, focusing on the shortcomings (e.g. women's access to land) and striking a balance between what needs to be preserved and what needs to be changed (World Bank, 2014).
- **Research and Rural Development:** The base of agriculture remains in the rural areas. There is, however, a lack of good infrastructure and institutions to attract the youth to stay in the rural areas. Research is hugely important for ensuring food security, but the challenges and the research needs are not simply about how to produce more food but much more. Research has a central role in creating new knowledge to tackle the challenges. Therefore, strong research frameworks based on holistic and participatory approaches involving all stakeholders may help to identify opportunities in the system, which are vital starting points from which to formulate resilience strategies. As farmers we need to rebrand our identity in order to make agriculture "SEXY".

BEST PRACTICES FOR YOUTH ENTREPRENEURSHIP AGRICULTURAL PROGRAMS (YEAP)

Young rural women and men do not have a voice in formulating agricultural policies in order to be able to actively participate in policy dialogue, rural youth need the right skills. Not all rural youth are born leaders; therefore organizations that represent their interests and which can lobby on their behalf have an important role to play.

As Youth Leaders for Nutrition, we know that the role of young people in transforming food systems is critical. Our generation of youth is the largest in history and has a valuable role to play in making our food systems more sustainable, resilient and effective. Case studies at national and local levels. This section offers five case studies that provide insight into how the principles and actions discussed in this document have been partially implemented in practice. It also presents examples of youth-led agri-enterprise creation, particularly in Nigeria.

CASE STUDIES

1 - INTEGRATING FOOD SECURITY AND NUTRITION INITIATIVES INTO URBAN AND RURAL DEVELOPMENT PLANS: THE AWARD-WINNING MUSICAL AGRICULTURE (USORO IWA BUYER SELLER MEET -) INITIATIVE.

This was set up in 2018 with the support of Niger Delta Development Commission (NDDC) and People Environment and Sustainability Foundation. The festival celebrates the nutrients of cassava and the value addition through festival recipes. The intent of the cassava festival is to greatly encourage the practice of cassava farming in a view of educating



Source: Rita Otu. USORO IWA-BUYER SELLER MEETS, (2018). www.beauhavenfarms.com.ng

all stakeholders in the cassava value chain about the need for a perfect and harmonious bridge in communication. The Festivals promote diversity, they bring neighbors into dialogue, they increase creativity, they offer opportunities for civic pride, and they improve our general psychological well-being.” Over the years, USORO IWA has contributed to the economy's growth. Meet the Buyer’ allows start-ups and SMEs to engage with large corporations buyers to introduce and sell their products. This festival provides smaller companies a platform to do exactly that, offering events with buyers with budgets that are only open to the small business community. The reality is, buyers are genuinely interested in the quality, authenticity and innovation smaller firms can offer – and we know they are willing to strike deals.

2 - REBRANDING AGRICULTURE IN SCHOOLS: FOOD SYSTEM MODELING THROUGH ESTABLISHMENT OF NUTRI-GARDENS IN SCHOOLS.

To encourage youth involvement in agriculture, two organisations Beau Haven Farms and Semek farms, founded the Nutri-Gardens in Schools project in 2014 with the support of HarvestPlus Nigeria. The project aims to improve nutrition, environmental awareness and food traditions through the establishment of school gardens in two primary and two secondary schools in Akwa Ibom state, Nigeria. Our agriculture team works to blend innovations in sustainable agriculture with time-tested local farming practices to help every family make the most of the land and resources available to them. As a result, we are able to bring cutting-edge agricultural solutions to bear on some of the most persistent challenges farmers we work with face, such as poor soil quality and erosion, while improving health outcomes for student families in our program. Our peer-led program was developed with and for the students we serve. It addresses the complex factors that contribute to malnutrition, from hygiene to mental health. By investing in both the agricultural capacity and health knowledge of youth, we arm them to win the fight against malnutrition. Students learn about food production from farm to table as they cultivate cassava in their school gardens and they learn how to cook from the school chefs.



Source: www.peasfoundationng.org

3 - BREAKING BREAD AS A DRIVER FOR FOOD SYSTEMS TRANSFORMATION: THE WOMEN'S WAY

Women, therefore, play a key role in implementing a healthy nutrition policy, both in the family and in society as a whole. The woman breastfeeds the newborn baby and prepares meals for members of her family. The woman can ensure the implementation of a healthy nutrition policy in her family. Women employees in food manufacturing, trade, public catering, health care and education account for the majority. In 2021 during the pandemic, the People Environment and Sustainability Foundation (PEAS FOUNDATION) launched a programme to address these issues. The curriculum of the breaking Bread was developed through consultative workshops with participants from different communities, including teachers and local government representatives as well as other NGOs active in the areas. In addition to health and hygiene and income generation activities, 300 women from the same or nearby villages come together to learn and to increase their confidence. Young literate women aged 18–40 years from farming families were trained to become independent and run their own farms. These young women not only actively participated in the training but also convinced other women to join the programme. As a result of the training, young women were empowered as we fed 300 women.



Source: Rita Otu. *Breaking bread to end hunger, 2021*

4 - FINANCING YOUTH AND SMES FOR IMPROVED NUTRITIOUS FOOD SYSTEMS: THE CASE OF NIGERIA-NDDC OR N-AGRO.

N-Agro is one of the many categories under npower Nigeria; it means "Npower Agriculture". Here, beneficiaries are taught how to become agric extension officers, farm developers and farmers themselves (agric entrepreneurship). Nigerian graduates are trained in the following field; Agriculture Extension Services Consultant, Seed fertilizer and other input aggregators, Farm managers, Public sector jobs in agriculture, Farming cooperatives management. N-Power main objectives are to: promote a younger and more innovative agricultural sector across Nigeria and establish better working and living conditions for young people both setting up in farming and already young farmers. The N-Power cause is highly relevant to today's Nigerian economy, considering that only 80 percent of the youth working in agriculture in Nigeria are younger than 35 years. The programme started in 2016 and so far 800,000 young Nigerians have benefited from it. N-Power Agro Volunteers will provide advisory services to farmers across the country. They will disseminate the knowledge that has been aggregated by the Federal Ministry of Agriculture and Rural Development in the area of extension services.

5 - CHANGING FOOD SYSTEMS THROUGH INCLUSIVE MULTI-STAKEHOLDER DIALOGUE: NUTRI-MEAL HUB

Nutri-Meal Hub was conceived by Beau Haven Farms in partnership with HarvestPlus Nigeria and HEMADEP. The project is designed to promote entrepreneurship among under-40s by creating new markets for Nutri-Meal. Many of the youth businesses supported by the project are related to agro products or agro processed products. It also uses social media to urge consumers to shop with a conscious mind-building awareness, establishes corporate buying programmes (Agro Ambassadors) and sets up Girls Farmers Clubs to educate the next generation.

Nutri-Meal Hub also targets youth involvement in agricultural policy by advocating for young people to live healthy. Our biofortified products are rich in vitamins and Minerals. Nutri-Meal Hub also organizes gastronomic events and tasting sessions in order to present products to consumers and tell the stories behind their taste. The target groups are men, women and children. The final goal is to connect them directly with young farmers producing with respect for sustainability, ethics and tradition. Our success is due to a number of factors:

- There is growing consumer interest in the stories and origins of nutritious food, not only in Nigeria, but Africa. Through our advocacy programme with HarvestPlus Nigeria, we encourage our consumers to live and eat healthy biofortified meals. So far we have empowered more than 200,000 Nigerians.
- We have excellent knowledge and expertise, covering a wide range of topics in food, gastronomy and agriculture.
- We use ICT technologies and the Internet to provide excellent opportunities for producers to connect directly with consumers.

CONCLUSION

Youth plays an important role in the multifaceted challenges that global food systems face. We need to ignite the imagination of young people and we need to stimulate governments to invest in agriculture, boost human capital and knowledge, improve communication infrastructure and access, and ensure an environment that supports and encourages youth to play a lead role in positioning African agriculture into the global knowledge economy. Furthermore, it is important to recognize, celebrate and encourage youth efforts to promote a more sustainable, equitable and nourishing food system for all. We should invest in transportation and renewable energy to include inclusive food system opportunities.

Access to markets is crucial for young farmers all over the world, it is necessary to enhance productivity, generate increased incomes and thereby reduce poverty and food insecurity. Also, to gain access to markets and commence production, access to resources (e.g. land and financial Services) are needed. Programmes, initiatives and schemes specifically directed at young people, such as start-up funding opportunities and competitions should be made available to youth.

There is enormous potential for growth in the creation of new green jobs and for upgrading of existing jobs to become greener, contributing to sustainable development, poverty reduction and better inclusion of young people in society. It is increasingly clear that investments must be made in training and education opportunities so that young people can acquire new skills or upgrade their existing skills in order to have access to “green” jobs. NGOs should promote agriculture as a business and organic farming to young people, including out-of-school youth, through learning-by-doing and experiential learning.

Additionally, there are small actions that we can all take to promote sustainable food systems. We also need to call our governments and policymakers to account to protect our planet while feeding and sustaining people. Sustainable food systems are possible, we all need to play a role, whether great or small. We also need to support our local farmers who despite fighting climate change and reduced prices, still provide the population with food. Our food systems are critical and can help tide the change to protect the world from climate change but it requires us all to make a change, however small it may be!

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KEY CONCEPTS

AND DEFINITIONS

Agriculture: the art and science of cultivating the soil, growing crops and raising livestock. It includes the preparation of plant and animal products for people to use and their distribution to markets. Agriculture provides most of the world's food and fabrics. Cotton, wool, and leather are all agricultural products. Agriculture also provides wood for construction and paper products. (National Geographic 2011)

Agroecology: the application of ecological principles to the interactions between human beings and their environment, as well as to their consequences, with the goal of minimising the negative effects of certain human activities.

Aquaculture: the farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated. (Edwards and Demaine 1998)

Biological diversity or 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 within species, between species and of ecosystems. Diversity indices are measures of richness (the number of species in a system); and to some extent, evenness (variances of species' local abundance). They are therefore indifferent to species substitutions which may, however, reflect ecosystem stresses (such as those due to high fishing intensity).

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Biological resources: these include genetic resources, organisms or parts thereof, populations or any other biotic component of ecosystems with actual or potential use of value for humanity.

Bycatch: species taken in a fishery targeting other species or on a different size range of the same species. That part of the bycatch which has no human value is discarded and returned to the sea, usually dead or dying.

Cattle: animals raised either for draft purposes or for meat and dairy production or kept for breeding.

Community-based management: a form of co-management where a central role for management is delegated to a community and where Government would usually have a minor role.

Diet: with every person, there is a different diet. A balanced diet varies depending on the individual's needs. Our bodies need about 40 different nutrients to maintain health. These nutrients can be taken in through macronutrients: carbohydrates, fats and protein which are needed in large amounts as well as micronutrients: vitamins, minerals, and trace elements needed in small amounts. Diets vary hugely depending on habits, beliefs and trends and dietary requirements can be consumed in different ways.

Dietary Guidelines/ Food-Based Dietary Guidelines: They provide “advice on foods, food groups and dietary patterns to provide the required nutrients to the general public to promote overall health and prevent chronic diseases.

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Exclusive Economic Zone (EEZ): 1) A zone under national jurisdiction (up to 200-nautical miles wide) declared in line with the provisions of 1982 United Nations Convention of the Law of the Sea, within which the coastal State has the right to explore and exploit, and the responsibility to conserve and manage, the living and non-living resources. 2) The area adjacent to a coastal state which encompasses all waters between: (a) the seaward boundary of that state, (b) a line on which each point is 200 nautical miles (370.40 km) from the baseline from which the territorial sea of the coastal state is measured (except when other international boundaries need to be accommodated), and (c) the maritime boundaries agreed between that state and the neighbouring states.

Environment: the totality of all the external conditions affecting the life, development and survival of an organism. (OECD 2001)

Farming: the practice of agriculture or aquaculture (Merriam Webster, n.d.)

Fisher: a person (male or female) participating in a fishery (in preference to the previously used term 'fisherman'). An individual who takes part in fishing conducted from a fishing vessel, platform (whether fixed or floating) or from the shore.

Fishery: can refer to the sum of all fishing activities on a given resource, for example a hake fishery or shrimp fishery. It may also refer to the activities of a single type or style of fishing on a particular resource, for example a beach seine fishery or trawl fishery. The term is used in both senses in this document and, where necessary, its particular application is specified.

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Food: the fuel of life. All creatures need food to live, grow and reproduce. Food is something that provides nutrients. Nutrients are substances that provide: energy for activity, growth, and all functions of the body such as breathing, digesting food, and keeping warm; materials for the growth and repair of the body, and for keeping the immune system healthy.

Food access: access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources).

Food availability: the availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).

Food safety: all those hazards, whether chronic or acute, that may make food injurious to the health of the consumer.

Food security: Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (World Food Summit, 1996). Food security comprises four components: availability, access, utilization and stability.

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Food stability: to be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

Food utilisation: utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.

Genetic diversity: the sum of the actual or potential genetic information and variation contained in the genes of living individual organisms, populations or species.

Healthy diet: one that is human health promoting and disease preventing, and safeguarding of planetary health.

Household: a basic unit for socio-cultural and economic analysis. It includes all persons, kin and non-kin, who live in the same dwelling and share income, expenses and daily subsistence tasks. The concept of household is based on the arrangements made by persons, individually or in groups, for providing themselves with food or other essentials for living. (FAO/DANIDA 1999)

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Malnutrition: refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. The term malnutrition covers 2 broad groups of conditions. One is 'undernutrition'—which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). The other is overweight, obesity and diet-related noncommunicable diseases (such as heart disease, stroke, diabetes, and cancer). (WHO Team 2020)

Marine protected area (MPA): a protected marine intertidal or subtidal area, within territorial waters, EEZs or in the high seas, set aside by law or other effective means, together with its overlying water and associated flora, fauna, historical and cultural features. It provides degrees of preservation and protection for important marine biodiversity and resources; a particular habitat (e.g. a mangrove or a reef) or species, or sub-population (e.g. spawners or juveniles) depending on the degree of use permitted. The use of MPAs (for scientific, educational, recreational, extractive and other purposes including fishing) is strictly regulated and could be prohibited.

Non-Governmental Organisation (NGO): any organisation that is not a part of federal, provincial, territorial, or municipal government Usually refers to non-profit organisations involved in development activities.

Nutrition: the act or process of nourishing or being nourished. (Merriam Webster, n.d.)

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Organic agriculture: a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasises the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system. (“Organic Culture FAQ”, n.d.)

Overfishing: catching too many fish at once, so the breeding population becomes too depleted to recover.

Policy: the course of action for an undertaking adopted by a government, a person or another party. Instruments that exist to support policy and tools used to achieve policy objectives comprise some or all of the following: societal instruments, economic and command and control instruments, direct government involvement and institutional and organisational arrangements. It is to be mentioned that although law may be used as a policy instrument, there are cases where law may impose constraints on what policies may be adopted. (FAO/DANIDA 1999)

Poultry birds: include chicken, ducks, geese and turkeys.

Rural aquaculture: the farming of aquatic organisms by small-scale farming households using mainly extensive and semi-intensive husbandry for household consumption and/or income. (Edwards and Demaine 1998)

Short supply chain: those with few intermediaries between farmers and consumers.

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Small-scale fisheries: broadly characterized as a dynamic and evolving sub-sector of fisheries employing labour-intensive harvesting, processing and distribution technologies to exploit marine and inland water fishery resources. Other ancillary activities such as net-making, boat-building, engine repair and maintenance, etc. can provide additional fishery-related employment and income opportunities in marine and inland fishing communities.

Stakeholder: a large group of individuals and groups of individuals (including governmental and non-governmental institutions, traditional communities, universities, research institutions, development agencies and banks, donors, etc.) with an interest or claim (whether stated or implied) which has the potential of being impacted by or having an impact on a given project and its objectives. Stakeholder groups that have a direct or indirect stake can be at the household, community, local, regional, national, or international levels.

Stock: a group of individuals in a species occupying a well defined spatial range independent of other stocks of the same species. Random dispersal and directed migrations due to seasonal or reproductive activity can occur.

Subsistence farming: farming or a system of farming that provides all or almost all the goods required by the farm family usually without any significant surplus for sale. (Merriam Webster, n.d.)

Subsistence fishery: a fishery where the fish caught are consumed directly by the families of the fishers rather than being bought by middle-(wo)men and sold at the next larger market. (FAO/DANIDA 1999)

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Sustainable development: FAO defines sustainable development in agriculture, forestry and fisheries as conserving land, water, plant, and animal genetic resources; promoting environment conservation; and choosing approaches that are technically appropriate, economically viable and socially acceptable. (Neufeld, Hendricks, and Hugas 2020, 5)

Sustainable use: The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations. (FAO/DANIDA 1999)

Target species: those species that are primarily sought by the fishermen in a particular fishery. The subject of directed fishing effort in a fishery. There may be primary as well as secondary target species.

Traditional ecological knowledge: the local knowledge held by a group of indigenous people and passed from generation to generation on the nature and functioning of the ecosystem.

Yield: the amount of biomass or the number of units that can be harvested currently in a fishery without compromising the ability of the population/ecosystem to regenerate itself.

