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(XXXI CYCLE)

A sustainable organic production model for 'Food Security' in Abu Dhabi Emirate and Sicily

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Presentation

The research program of the doctorate was designed and developed as part of a Memorandum of cultural and scientific cooperation between "ABU DHABI DEVELOPMENT GROUP" (United Arab Emirates) and the University of Catania (Luciano Cosentino, scientific coordinator).

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In the Ph.D. period some activities were developed as an internship at the Biotechnology College Modern Science University - Dubai United Arab Emirates (UAE), under the coordination of Professor Reda E.A. Moghaieb, dean of the College. The activities concerned food security, food sovereignty, organic agriculture, sustainable assessment of food and agriculture systems and sustainable development.

Doctor Paolo Caruso and doctor Giuseppe Stella collaborated as a research support group in the two territories.

The following chapters have found valorisation in accredited journals:

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Riassunto

La ricerca si propone di analizzare il collegamento tra sostenibilità e sicurezza alimentare, in due aree studio – gli Emirati Arabi Uniti e la Sicilia – caratterizzate da numerosi elementi di similarità (dal punto di vista climatico; nella disponibilità per qualità e quantità di risorse idriche; diffusa sensibilità nell'adozione di metodi di coltivazione in biologico o sostenibile; elevata immigrazione demografica, di natura politico-economica e turistica, con riflessi nell'organizzazione del sistema socio, culturale e lavorativo territoriale, ecc.) e di diversità (nei redditi medi pro capite; nelle disponibilità di risorse finanziarie per investimenti; ecc.).

Questo collegamento è stato studiato attraverso l'agricoltura biologica che, com'è noto, costituisce una possibile soluzione per entrambe le problematiche, sia nei paesi avanzati sia in quelli in via di sviluppo. Infatti, la sicurezza alimentare di qualsiasi territorio non è semplicemente legata alla capacità di produrre abbastanza cibo per soddisfare la domanda interna, ma anche alla possibilità di avere accesso alla tecnologia ed alle conoscenze per produrlo sul territorio, al potere d'acquisto, ecc.. Da questo punto di vista, la letteratura dimostra come il successo dell'agricoltura biologica si fondi proprio su cinque beni capitali (capitale naturale, sociale, umano, fisico e finanziario), producendo svariate esternalità positive (nella disponibilità di cibo attraverso la rigenerazione della sostanza organica dei terreni; nel contrasto all'erosione del suolo e nella salvaguardia della biodiversità; nella creazione di

organizzazioni sociali sempre più numerose a livello locale, nuove regole e norme per la gestione delle risorse naturali collettive; nell'abilità e capacità degli agricoltori di sperimentare e risolvere diverse problematiche; nel sostegno a gruppi emarginati o a bassa contrattualità; nella migliore salute e nutrizione dei bambini; nei premi di prezzo per le produzioni certificate biologiche; ecc.). Per queste premesse, l'agricoltura biologica permette di realizzare sistemi alimentari sostenibili, in grado di assicurare la sicurezza alimentare di un territorio e, di conseguenza, la conservazione e la riproduzione culturale delle conoscenze indigene caratteristiche del concetto di "sovranità alimentare".

La stesura del testo procede in parti tra loro coordinate. Dopo aver definito il concetto di sostenibilità nel moderno sistema agroalimentare, si è passati ad analizzare le caratteristiche delle aree in studio, il livello di sicurezza alimentare, lo stato dell'agricoltura e la diffusione dell'agricoltura biologica, secondo le più accreditate fonti statistiche internazionali. Si è poi passati all'esame della sostenibilità dei due sistemi produttivi territoriali in studio, mediante metodologia SAFA (*Sustainablility Assessment of Food and Agriculture Systems*) della FAO e delle conseguenze sulla sicurezza e sovranità alimentare locale. Successivamente, mediante impiego di metodologie di Social Network Analysis (SNA), si sono studiate le relazioni nel collegamento tra produzione, distribuzione e consumo con l'obiettivo di valutare la capacità delle imprese di comunicare i valori di sostenibilità ai potenziali acquirenti. Infine, si è provveduto ad analizzare il comportamento di un campione di consumatori con lo scopo di analizzare comportamenti e preferenze, nella consapevolezza del ruolo

che questo attore esercita all'interno del sistema agroalimentare.

Abstract

The research aims to analyze the link between sustainability and food security, in two study areas - the United Arab Emirates and Sicily - characterized by numerous elements of similarity (from the climatic point of view, in the availability for quality and quantity of water resources; widespread sensitivity in adopting organic or sustainable methods of cultivation, high demographic immigration, of a political-economic and tourist nature, with repercussions in the organization of the socio-cultural, territorial working system, etc.) and of diversity (in average incomes per capita, in the availability of financial resources for investments, etc.).

This link has been studied through organic farming which, as we know, is a possible solution for both problems, both in advanced and developing countries. In fact, the food security of any territory is not simply linked to the ability to produce enough food to satisfy domestic demand, but also to the possibility of having access to technology and knowledge to produce it on the territory, to the purchasing power, etc.

From this point of view, the literature demonstrates how the success of organic farming is based on five capital goods (natural, social, human, physical and financial capital), producing a variety of positive externalities (in the availability of food through the regeneration of the substance organic land, in contrast to soil erosion and

biodiversity protection, in the creation of increasingly large number of local social organizations, new rules and rules for the management of collective natural resources, in the ability and ability of farmers to experiment and solve various problems, in support of marginalized groups or low-level contracts, in the best health and nutrition of children, in price premiums for certified organic products, etc.). For these premises, organic farming makes it possible to implement sustainable food systems, capable of ensuring the food security of a territory and, consequently, the conservation and cultural reproduction of the indigenous knowledge characteristic of the concept of "food sovereignty".

The drafting of the text proceeds in coordinated parts. After defining the concept of sustainability in the modern agri-food system, we have analyzed the characteristics of the areas under study, the level of food safety, the state of agriculture and the spread of organic agriculture, according to the most accredited international statistical sources. . We then proceeded to examine the sustainability of the two territorial production systems under study, using the SAFA (*Sustainablility Assessment of Food and Agriculture Systems*) methodology of the FAO and the consequences on local food security and sovereignty. Subsequently, through the use of Social Network Analysis (SNA) methodologies, relationships were studied in the link between production, distribution and consumption with the aim of assessing the ability of companies to communicate sustainability values to potential buyers. Finally, the behavior of a sample of consumers was analyzed with the aim of analyzing behavior and preferences, in the awareness of the role that this actor plays within the agri-food system.

1. The complexity of agri-food system and the request for sustainability: an analysis of the current literature

Abstract

The paper aims to develop an updated reflection on the state of socio, cultural, environmental and economic sustainability of the planet. To this end, the latest evolutionary trends are resigned on the path that has led to the affirmation of the concept of sustainable agriculture, proceeding on the impact of human activity on air, water, soil and fertility, and then examine the models of sustainability measurement disseminated in literature. The chapter concludes with the examination of organic agriculture as a tool for the design and implementation of an elected model of sustainable agriculture, for the known benefits produced.

Key words: Sustainable Development; food safety; socio-economic development; environmental impact; regenerative agriculture; sustainability measurement methods; biological agriculture.

1. Introduction

Sustainability is a complex concept, applicable to many sectors and disciplines. Over the years, many definitions have been given and the most mentioned is the one often proposed by the Brundtland Commission in 1987 on the report “Our Common Future”: *“Sustainable development is development that meets the needs of the present without compromising the ability of the future generations to meet their own needs."*

This definition has many connotations, including, not only the protection of environment but also social, ethical and economical aspects, that allow the well-being of everyone, in every moment.

The concept of Sustainable Development was established between the '70s and' 80s of the past century as a result of the need to put a brake on the immoderate use by man of the resources offered by the earth. In this period the awareness arises that the model of production and consumption of the Industrialized Countries can no longer be considered "compatible" with the environment. In the 1990s, a vision was created that places the environment, society and the economy as dimensions closely linked by indissoluble links so that a real and truly sustainable development can be implemented.

The main steps that led to the definition of the concept of sustainability are the following:

Stockholm 1972

The first major conference on the themes of Sustainable Development is held: the United Nations Conference on the Human Environment.

In the Stockholm Declaration (United Nations Declaration on the Human Environment), drafted on this occasion, these principles are expressed, among others:

- man has a fundamental right to freedom, equality and satisfactory living conditions ... He has a solemn duty to protect and improve the environment for present and future generations.
- natural resources must be preserved through adequate planning and management.
- the ability of the Earth to produce essential renewable resources must be maintained
- nature conservation must play an important role in the legislative and economic processes of states
- economic and social development is indispensable
- we must stop the forms of pollution that can damage ecosystems in a serious or irreversible way
- in policies and actions to preserve and improve the environment, it is necessary to keep in mind the particular situations and needs of developing countries
- international environmental problems should be addressed in a spirit of cooperation by all states, large or small, on an equal footing.

Among the results of the Conference, UNEP (United Nations Environmental Program) is born, that is the United Nations program on environmental problems with the aim of coordinating and promoting the UN initiatives related to environmental issues.

Bruntland Report 1987

In the following years the world community questioned itself more and more on the relationships existing between the environment and economic-social problems such as poverty and underdevelopment.

These reflections resulted in the publication of "Our Common Future", the so-called Bruntland Report, developed by the World Commission on Environment and Development (WCED, World Commission on Environment and Development).

The WCED concluded that environment and development could not be considered two separate challenges: the Commission embraced a type of development approach that took into account existing environmental, economic, social and technological relations.

An approach of this kind was called "Sustainable Development" and defined by Gro Harem Brundtland (Norwegian Prime Minister, President of the Commission) as: "development that responds to the needs of present generations, without compromising the ability of future generations to meet their needs. needs".

Caring for the Earth 1991

The publication of "Caring for the Earth: A Strategy for Sustainable Living" defined in 1991 provides a further definition of Sustainable Development understood as:

- "The satisfaction of the quality of life, keeping within the limits of the carrying capacity of the ecosystems that sustain us";
- "Caring for the Earth" was published by the World Conservation Union (IUCN), the United Nations Environment Program (UNEP) and the World Wide Fund for Nature (WWF).

If the definition of the Brundtland Commission focused on the link between the satisfaction of human needs and "intergenerational responsibility", the one provided by IUCN underlines the importance of improving the quality of life of man, while respecting the capacity for regeneration of the earth.

The two definitions together give a clear understanding of the concept of Sustainable Development as a benefit for people and for ecosystems.

Rio de Janeiro 1992

The Conference of Rio de Janeiro or UNCED (United Nations Conference on Environment and Development, 3-14 June 1992, also known as the Earth Summit) was the first major conference following the collapse of the Soviet Union and required two years of intense negotiations for its preparation.

Representatives from 172 states participated, including 108 heads of state and government and tens of thousands of people and there was considerable coverage by the media (10,000 journalists present).

In Rio the environmental problems of the planet and their links with the problems of social and economic development were discussed.

Over 150 countries signed two International Conventions:

- one on climate change,
- the other on the protection of biological diversity.

All delegations present approved:

- the Rio Declaration, a commitment to environmental protection and sustainable development
- a Declaration of Principles without legal value on the management, conservation and sustainable development of forests
- Agenda 21, a broad and articulated action program that constitutes a sort of manual for the sustainable development of the planet from here to the 21st century.

With the Rio Declaration, made up of 27 principles, the concept of Sustainable Development was further defined, which included an integration of the themes of development (economic-social) and the environment.

Agenda 21, also signed by Italy, can be considered as the concrete passage from the scientific and cultural deepening of the concept of Sustainable Development, to the assumption of political commitments worldwide.

This document, structured in forty chapters, therefore represents an action plan, in which operational criteria, objectives and reference strategies are established, addressed to the whole international community and in particular to public authorities at all levels, with the aim of to promote full cooperation for the pursuit of genuinely sustainable development.

The Rio Summit highlighted the need to integrate the different dimensions of development. This means taking into consideration also the multiplicity of the subjects carrying the requests (the so-called "stakeholders") both environmental, economic and social.

To make effective participation possible, in which everyone can critically express their point of view, citizens need to have access to relevant information and can take advantage of valid educational programs aimed at sustainability.

Johannesburg 2002

The World Summit on Sustainable Development or WSSD (World Summit on Sustainable Development) was held in Johannesburg, South Africa, from 2 to 4 September 2002.

On this occasion, especially through the document "Plan of Implementation" of the World Summit on Sustainable Development ", the commitment to promote the principles of sustainability, defined ten years earlier in Rio de Janeiro, to ensure continuity in the implementation of the Agenda 21 projects and is also given particular importance to the achievement of the "Millennium Goals" established by the "United Nations Millennium Declaration" (Millennium Declaration).

An important aspect of the Summit is the integration of the three closely linked dimensions of sustainable development:

- economic development
- social development
- environmental protection

In fact, the topics dealt with in the document concern

- peace,

- the security,
- respect for human rights and fundamental freedoms,
- respect for cultural diversity,
- poverty eradication,
- change in unsustainable patterns of production and consumption,
- protection and management of natural resources,

thus recognizing in these issues the essential basis for achieving sustainability (economic, social and environmental) as a benefit for all and especially for women, young people, children and the most marginalized people in society.

In particular, the 2030 Agenda for Sustainable development, adopted by the world leaders in September 2015, contains 17 development goals in order to achieve three extraordinary results in the next 15 years (Figure 1):

- End extreme poverty
- Fight inequality & injustice
- Fix climate change

It is interesting that goals 2 and 12 are specific to agri-food systems, as evidence that agriculture and food sectors can play a key role in sustainable development.

Sustainable food production and consumption are, in fact, even more discussed themes, due to food importance for human health, economy, society and environment.

Goal 2 refers to “end hunger, achieve food security and improved nutrition and promote sustainable agriculture”,

while goal 12 is addressed to “responsible consumption and production”.

Figure 1: Sustainable Development Goals (Source: www.un.org/en).

2. Old and new problems at the center of the global agri-food system

The term agri-food system is about the complex aggregate of activities involved on flows of food goods and services, from the farmer to the final consumer.

The principal actors of the agri-food system are:

- producers
- processors
- business men

- consumers
- state institutions
- surrounding economic environment

The last three parts are usually considered as members who do not completely belonging to agri-food system, but their roles have recently been fully investigated. Especially, the consumer is considered to be an agent of change for the entire agri-food system because of his capacity to guide the food demand and the public operator acts by regulating market transitions and avoiding any unfair behaviors.

Each component is able to influence the others and a more or less long chain is established among them.

By a sustainable point of view, a short chain, as the direct sale from the factory, is certainly preferable. In fact, the absence of transport allows not only the sale of km 0 products, but also the effective interaction between producer and consumer and the setting up of a trustworthy relationship between them.

The common notion of food system is focused on food, although many researchers have proposed definitions linked to environment, health and consumer.

The High Level of Experts on Food Security and Nutrition (HLPE) has proposed the following definition: *"A food system gathers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to production, processing, distribution, preparation and consumption of food and the outputs of these activities, including socio-economic and environmental outcomes"*.

As we said above, the current model of agri-food system is not able to ensure food security and good nutrition in the world today, although enough food is being produced.

To reach food security, these principal requirements must be satisfied: availability of food, accessibility (economical and physical), utilization and stability of these three dimensions.

Today we are witnesses to some paradoxes that are symptoms of the food system failure.

In this moment, if we focus on health problems, we realize that there are more than 1 billion overweight and obese people, 868 million people suffering from hunger and two more billions suffering from micronutrient deficiencies.

If we focus, instead, on environmental degradation, we understand that the current food system is estimated to contribute to 30% of global greenhouse gas emission. They arise from the diverse stages of the food chain (cultivation, production, processing, transportation, storage, packaging) and have the capacity to boost many environmental threats, like climate change, biodiversity loss, degradation of land, soil and freshwater.

Continuing to produce and process food in this way will pave the way to the degradation and the incapacity of the world to feed future generations.

The actual food system is, therefore, unsustainable due to the following reasons:

- It degrades the entire ecosystem
- It does not guarantee everybody the same food safety and security
- It causes health problems

- It weakens local economies and cultures

In this contest, the theme of sustainability turns out to be central. Only by redesigning food system with sustainable criteria, it will be possible to produce sufficient, safe, affordable and nutritious food, respecting, thus, the whole ecosystem.

To fulfill the objectives previously discussed, a transition from global and industrial to local, agro-ecological and biological systems will have to be pursued.

There is an urgent need to develop low-input systems, limited animal husbandry, short-distance from production to consumption, biodiversity preservation, minimal food processing and refined.

It is known, in fact, that the industrial system depends on fossil resources and consumes more energy than it produces: many studies have established that it takes 7.3 calories from fuel fossils to produce 1 food calorie.

Although the industrial food system has clearly permitted to get a huge production in short time, it now presents many limits that make it unsustainable.

On the contrary, the key attributes of a sustainable food system are:

- the ability to offer adequate nutrition and health
- biodiversity and diversity of landscapes
- reduced ecological and environmental impacts.

3. Main issues linked to food production and consumption

3.1 Environmental degradation

It is possible to analyze the most alarming problems on environment by taking into account the principal nature resources as soil, water and air.

2.1.1 Soil pollution and reduction in fertility

Referring to soil, its pollution represents a worrying threat for agricultural productivity and human health. "Soil pollution" refers to the presence of a chemical or substance out of place and/ or present at a higher than normal concentration that has adverse effects on any non-targeted organism (FAO and ITPS, 2015).

It does not have a single source but it is due to many factors like:

- industrial activities such as extraction, fusion and production of materials
- domestic, husbandry and urban refusals
- the pesticides, the herbicides and the fertilizers used in agriculture
- oil products released or destroyed in the environment
- emission generated by transport
- pesticides, fertilizers, animal manure are the most blamed agricultural soil pollutants.

Pesticides are substances, or mixtures of substances, intended for preventing, destroying or controlling any pest causing harm or interfering with the production, processing,

storage, transport or marketing of food, agricultural commodities, wood and wood products (FAO, 2006). They are classified in accordance with their chemical nature (organic or inorganic) and their target (insecticides, fungicides, herbicides, rodenticides, molluscicides, nematicides, and plant growth regulators). They have negative effects on soil and its organisms, on food products, that become dangerous to consume, and on human health.

Even the excessive application of fertilizers arises reasonable concerns. They are used in order to supply the nutrient needs of the several deficient soils around the world, but, if applied in excess, they turn into lower crop yields. Nitrogen and phosphorus could become pollutants, if applied in an excessive quantity because of their capacity to be transported by surface water bodies. It has been demonstrated that nitrogen pollution influences soil organic matter decomposition, microbial community composition and activities, as well as soil acidity and salinity.

Other soil pollutants, also connected with food security and human health, are trace metals. Their anthropogenic sources are different: industrial areas, mine tailings, application of fertilizers and pesticides, animal manures, wastewater irrigation, coal combustion residues, spillage of petrochemicals etc.

These elements (Pb, Cd, Cu, Hg, Sn, Zn, As and Se) can be naturally found in soil at low concentrations and are essential for plants, animals and human. At high concentrations, instead, they accumulate in the tissues of living organisms, causing toxicity for plants and humans.

Applying untreated manure to soil can cause heavy metal pollution and influence the activity of the microbial soil

community. Furthermore, if manure contains veterinary antibiotics, often indiscriminately administered to livestock to prevent all possible diseases, these will move on soil, rapidly increasing the transference of antibiotic resistance to soil-dwelling organisms. In this way, also plants products may directly contribute to the spread of antibiotic resistance.

For all these reasons and many others, soil is poor, infertile and very stressed. During the 55th session of the FAO Council, The Voluntary Guidelines for Sustainable Soil Management (VGSSM) were endorsed: these are the recommendations on how to achieve sustainable soil management.

3.2 Water pollution

Water quality undergoes pressures from cropping, livestock systems and aquaculture. While cropping systems contribute to water-quality degradation by the intensive use of agrochemicals, agrotechnologies and irrigation, industrial and intensive livestock production systems produce manure, slurry and wastewater strongly pollutants because contaminated by high quantities of nutrients, heavy metal, pathogens, drug residues, hormones and antibiotics.

Aquaculture produces currently about half the total quantity of consumed fish and, to respond to the growing demand of fish, the intensity of production is more and more increasing, threatening to destruct the natural cycles and degrading water quality.

Water quality is connected to quantity: any given environment needs clean and sufficient water to support its life forms. Today most of the productive sectors, including the food system, manage the water resources in an incorrect way, wasting a very large amount. In some areas, up to 80

percent of the available water is used for irrigation, due to precipitation reduction and warming-enhanced evaporation. Thus, the overall health of water depends on its pollution and its quantitative use: of course, it would be useful if future food operations could pay attention to the maintenance of water quality and quantity. Given the limited and fragile nature of water resources, the water demand management, water saving and rational water use, especially for agriculture, should be improved.

3.3 Air pollution and climate change

Many studies and researches have shown that clean air can mitigate climate change and protect human health, including food security. Given the link between air pollution and climate change, it is possible to regard jointly air pollutants and greenhouse gasses (GHGs) and their negative effects.

Air pollutants encompass particulate matter (PM), ground-level ozone (O3), nitrogen dioxide (NO2), and sulfur dioxide (SO2). Greenhouse gases are defined as carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4) and fluorinated gases (F-gases).

Food production and distribution emit air pollutants and GHGs, which are toxic and dangerous for human health, and destructive for ecosystem.

For example, the deposition of ozone makes plants weaker and reduces crop yields and, if inhaled, causes asthma and other respiratory diseases. CO_2 and other greenhouse gasses, instead, are responsible to boost global warming, that is to say the increase the temperature of the Earth's surface.

A study has demonstrated that food, drink, tobacco and narcotics cause global warming for at least 22-31%.

Furthermore, among food products, meat products are certainly the most responsible for this percentage.

Global warming is an emerging issue that is giving rise to increased scientific community concern, because it causes unexpected and dangerous effects on natural resources, such as desertification, increased melting of snow and ice, sea level rise and many others. Agriculture and food sector themselves are, in fact, encountering major problems, due to this phenomenon.

3.4 Human health and diseases

The capacity of food to determine state of good health or illness nowadays is more and more investigated: many studies, in fact, have correlated to diets the actual rise on obesity, cardio-vascular diseases and neoplasm in rich countries and nutritional deficiencies and hunger in underdeveloped countries.

The first kind of pathologies, also called illnesses of abundance, are partly caused by the diffusion of refined food products with high sugar and fat contents, often contaminated by persistent pesticide residues and toxic compounds such as mycotoxins and nitrates. Furthermore, these products often have a minimal content in minerals, antioxidants, vitamins, bioactive compounds.

Hunger and nutritional deficiencies are, instead, the consequence of food insecurity, that is to say the physical and economic impossibility for poor people to access to sufficient, safe and nutritious food.

In this dramatic scenery, organic food can be a solution because it guarantees nutritional quality and food safety. Scientific literature demonstrates that organic food is

nutritionally better than the conventional one because it contains a higher level of dry matter, minerals, anti-oxidant micronutrients and polyunsaturated fatty acids. Furthermore, although the content in mycotoxins is comparable to conventional products, organic food is certainly safer because it does not contain any pesticide residues and has markedly less nitrates.

3.5 Socio-cultural and economic impacts

Agriculture, food transformation, retail and food preparation are extremely important sectors for national and local economies, as well as eating represents an important moment of social interaction and dialogue.

Focusing on economic aspects, it is important to highlight the considerable diversity of food chain even in the same space, where big participants coexist with small-scale units, whereas working conditions are different.

There are many economic issues linked to food production and consumption: some of these are of global interest, others more specific for each country.

Issues like “food security” and “food safety”, as well as “food losses” and “food waste” are certainly of global importance and request the commitments of all people: everyone is responsible, regardless the role played and different social and political measures are implemented every day to reduce all these threats.

The terms “food security” and “food safety” are often used indifferently, but, instead, they have different meanings.

A study by World Bank (1986) defines food security as “the access from all people, in every moment of their own existence, to a sufficient quantity of food in order to conduct

an active and healthy life". This concept is more used to designing countries endowed with scarce economic resources and it is linked to other important problems such as poverty, food deficit, hunger and malnutrition. Asia is the country that poses the highest percentage of people suffering hunger in the world.

Food safety is referred, instead, to the respect of special health standards and so it coincides with the absence of any toxic substance on food products.

Food losses are considered as losses down the agri-food chain and occur during the stages of seeding, cultivation, harvest, treatment, storage and agricultural transformation.

The term food waste, instead, is used for all wastage that take place during industrial transformation, distribution and final consumption.

From a more local point of view, it often happens that small farmers and producers are excluded from the retail trade, because they cannot meet certain requirements and cannot even create their loyal customers. In this way, many of them are forced to close their activity, cutting down any chances of distributing their local products in supermarkets.

Land abandonment and rural depopulation are some of the consequences of this huge problem and happen on a par with desertification and soil erosion. Thus, it is necessary to combat rural abandon, reduce unemployment and allow small producers to reclaim their economic space and decision-making power.

Referring to socio-cultural aspects, today we are witnessing with the progressive disappearance of traditional food cultures, recipes and customs.

This is the consequence of many factors, like:

- The new method of food assumption, which does not include any cooking but only consuming ready-to-eat food in places which are not always peoples' kitchen tables, in an individual way, within the shortest possible time;
- The vision of food like a form of "nourishment", that is to say the mere necessity to assimilate a set of substances, deprived of every proper characteristic;
- The tendency of the new generations not to eat their ancestors and parents' same food and to adopt conformed food styles;
- The diffusion of the "Western pattern diet" or "Standard American Diet" in many countries;
- The consumer's difficulty to make food choices, because of the excessive quantity and type of food in supermarkets on one hand and lack of adequate interpretation keys on the other, that makes the act of eating a source of apprehension and anguish rather than of pleasure and contentment.

It is certainly necessary to adopt a new way of looking at the relationship between man and food, so that food can become the fulcrum of society again.

4. Indicators and methods to assess food sustainability

The international scientific community and institutions have designed multitudes of indicators, capable of measuring sustainability.

They can be suitable for different fields, including the food sector and can be used according to many approaches or methods.

Among the most important, certainly there are Carbon Footprint, Water Footprint and Ecological Footprint that consider the emission of greenhouse gasses, the use of water and the use of land, respectively.

These three indicators complement each other and allow to evaluate the total environment impact of an agri-food chain.

The extent of the methods includes two approaches set out below: LCA (Life Cycle Assessment) and SAFA (Sustainability Assessment of Food and Agriculture systems).

4.1 Carbon, Water and Ecological Footprint

Carbon Footprint is referred to the emission of greenhouse gasses and it is expressed in mass of CO_2 equivalents.

As well known, greenhouse gasses, produced in agri-food chains, mainly come from the use of fossil fuels, the methane arising from the enteric fermentation of animals, the use of fertilizers nitrogen-based.

This indicator can be used, as the others, according to LCA approach, to measure greenhouse gasses emission throughout the entire food chain and it has now become more and more used. In this sense, particular standards have been established to calculate correctly this indicator.

Water Footprint, instead, is a specific indicator that gives information about the use of fresh water, both in quantitative and qualitative terms. Through it, it is possible to know how fresh water is effectively used and for what purpose. In the analysis of an agri-food chain, both water for irrigation and water for industrial production should be taken into consideration.

Ecological footprint is able to measure the amount of land required to meet the increasing demand for resources and to absorb the emissions and waste resulting from their use and its unit of measurement is the global hectare.

Given the diversity of the purpose for which land is used, scientists and researchers of the Global Footprint Network have distinguished different components, that should be included in the calculation of the ecological footprint: energy land, crop land, grazing land, forest land, built-up land and fishing ground. Forest land and built-up land are usually negligible in food systems.

4.2 Life Cycle Assessment

Life Cycle Assessment (LCA) is a method capable to evaluate objectively the sustainability of a process, using energetic and environmental terms.

Thus, it can be also used for agri-food chain and all its stages as cultivation and treatment of raw materials, transformation, packaging, distribution, use, recycle and final disposal.

This term was coined for the first time in 1990, during the congress SETAC at Smuggler Notch (Vermont, U.S.A.) in order to indicate the object of the method, that is to say the entire life of a product or a process.

Before that, other terminologies like “cradle to grave analysis”, “resource and environmental profile analysis”, “life cycle analysis”, “eco balance”, “energy and environmental analysis were used.

LCA is nowadays regulated by international standards ISO 14040 and 14044, issued in 2006. The only limit of LCA method is the difficulty to communicate its results; the indicators, in fact, are used to make results more comprehensible to people. Four main phases marked a LCA study (Figure 2):

Goal and scope definition

Analysis of the inventory or Life Cycle Inventory (LCI). It consists of collecting data and calculation methods and quantifying the incoming and outgoing flows of a product system

Evaluation of the impact of the cycle of life or LCIA, Life Cycle Impact Assessment. It uses the results of the inventory analysis to evaluate the size of the associated impacts.

Interpretation of data and findings in order to draw conclusions and recommendations.

After the interpretation, results are presented and communicated by a final report and a critical review of the study can be carried out to ensure coherence with the principles of ISO 14040.

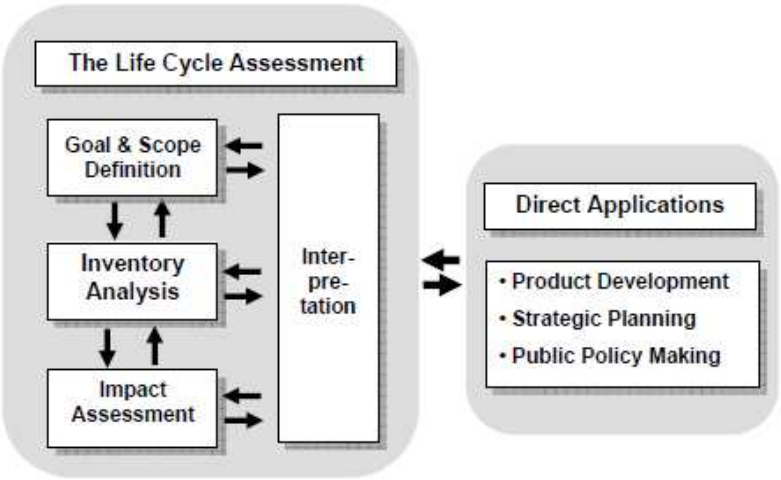

Figure 2: LCA phases (Source: ISO 14040, 1997)

4.3 Sustainability Assessment of Food and Agriculture systems

SAFA is defined as a holistic global reference framework for the assessment of sustainability along agriculture, forestry and fisheries value chains (FAO) (Figure 3).

Its application is possible thanks to SAFA Guidelines, that describe the framework objectives and purposes and are aimed at food entrepreneurs, NGOs, tools community, governments, investors and policy makers.

Differently from LCA, that analyzes products, SAFA focuses on enterprise and supply chains. What characterizes this approach is the vastness of the sustainable aspects it includes. Four principal dimensions are taken into account: good governance, environmental integrity, economic resilience and social-wellbeing.

Each dimension comprises themes, detailed into sub-themes, which in turn can be measured by appropriate indicators.

Figure 3: SAFA framework (Source SAFA Guidelines 3.0, 2014).

Twenty-one themes were formulated into the different dimensions:

- Good governance: corporate ethics, accountability, participation, rule of law, holistic management;
- Environmental integrity: atmosphere, water, land, biodiversity, materials and energy, animal welfare;
- Economic resilience: investment, vulnerability, product quality and information, local economy;
- Social well-being: decent livelihoods, fair trading practices, labour rights, equity, human safety and health, cultural diversity;

Subthemes, instead, identifies individual real issues, specific to supply chains and sustainable performance for that issues.

SAFA indicators are default indicators, applicable at the macro level that can be used, if no other more appropriate indicators are available.

The results obtained by the combination of more than 100 indicators and 58 sub-themes, are made easier to understand by the use of a graphical form, that is to say a data visualization.

This form is a sphere, in which all the themes appear and follow a traffic light color code: best/good (green), needs improvement (yellow/orange) or unacceptable (red). By translating SAFA results into dots on the sphere and connecting these, it is possible to trace a polygon of the hypothetical enterprise, which shows strengths and weaknesses of the same enterprise in term of sustainability.

An example of an enterprise performance is shown in figure 4.

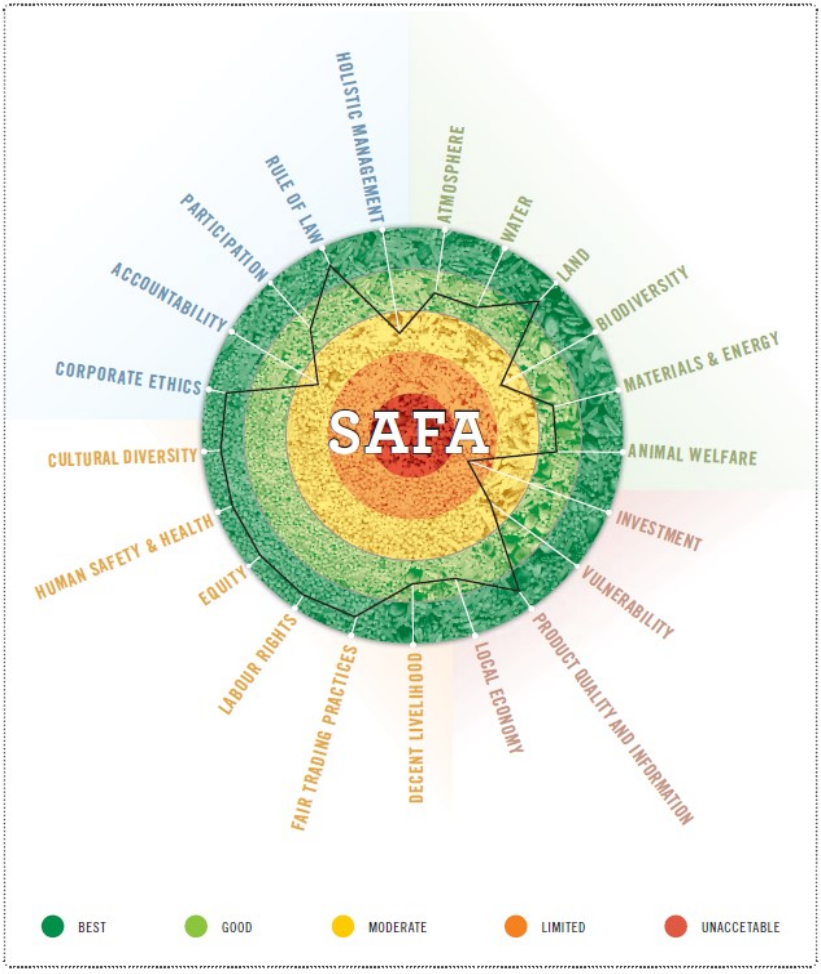

Figure 4: SAFA sustainability polygon (Source: SAFA Guidelines 3.0, 2014)

5. Ways to achieve sustainable food system

The principal question is 'how to achieve a sustainable agri-food system?': the transition requests the commitment of all the stakeholders.

Especially, producers, consumers and public institutions should act together with an eye towards sustainability.

While producers could redesign their own systems choosing cultivation, productive and processing practices more respectful of the environment and human health, consumers could modify their dietary patterns buying and consuming eco-friendly, local, seasonal and fresh products and undertake to reduce food waste.

Public institutions, instead, have the role of plan, regulate and invest on sustainable food chains.

5.1 The sustainable food planning

As already shown, the importance of the food is tied up to its ability to influence a lot of behaviors, like social, health, environmental and economic ones. Despite this, food is often completely excluded from the policies dealing with the urban planning. Probably this is due to the conception of food as "rural" issue.

In this way, distance between food production and food consumption, that is to say between rural areas and city, has significantly increased over the years, causing a situation in which rural areas, once depopulated, have lost their ability to produce enough food to meet food needs and consumers have bought more and more imported food, ignoring their local products.

Nowadays, several important studies are being made about food planning. They are based on the concept of "Sustainable Food Planning", a planning sector oriented towards the search for new paradigms for urban and rural planning, able to support sustainable and fair food systems. Differently from traditional policies that consider the food theme from a sectoral point of view, Sustainable Food Planning policies tackle food problems together with environmental, health, social and economic ones, through a multidisciplinary approach.

Important types of tools that can integrate local planning are represented by Food Policy Councils (FPC), voluntary forms of collaboration between citizens, public actors and companies, that provide ideas and innovative solutions to improve local food system.

One concept that focuses on the need for a multidisciplinary approach of food strategies is that of integrated territorial food geography, proposed by Wiskerke. It basically involves the development of new agri-food models along three main axes of the society, which must work together.

Figure 5 is a schematic representation of the same concept.

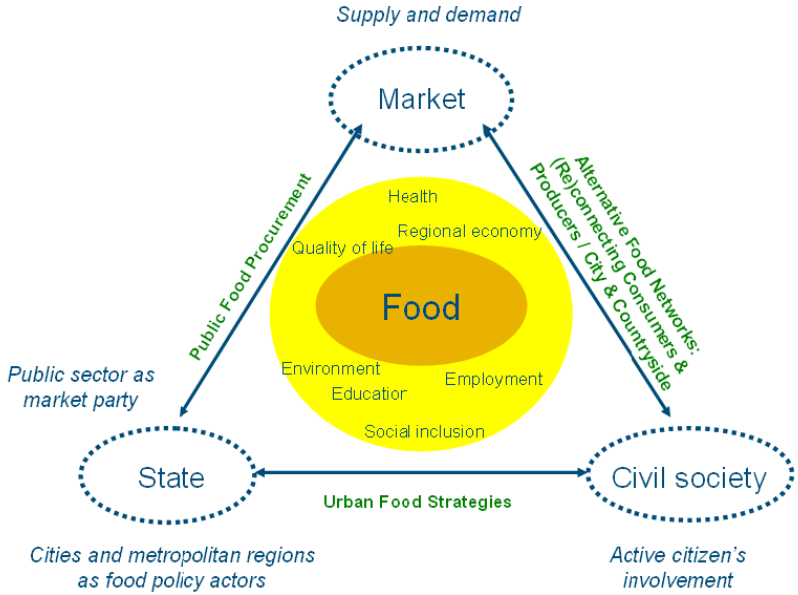

Figure 5: The schematic representation of the concept of integrated territorial food geography (Renting and Wiskerke, 2010)

Food planning means allowing the community of a territory to improve their quality life, by the creation of an eco-friendly and socially fair agri-food system, able to stimulate the development of their territory under several aspects.

The plans of the food of the different provinces or regions differ from each other, because of the different contexts and problems that they must face, but they have in common the purpose to promote a healthy and sustainable nutrition for everybody. Other important common objectives regard:

- The protection of the natural resources;

- The creation of urban gardens and the application of organic practices;
- The reduction of food waste;
- Equity and social responsibility of food sector;
- The promotion of local products through farmer's markets;
- Food education at school and communication on healthy foods.

The document which states values and principles that drive food policies in a community is usually a "food charter" and by means of its signature all the parties involved undertake to constantly foster the common goals. It is possible to mention two important events for Italy in this context: *the Food Plan of the province of Pisa (2013), that is to say the first example of territorial food planning in Italy and the Milan Charter, launched and signed by citizens, start-up, entrepreneurs, associations, governments and institutions during the EXPO 2015, in order to build and to win the challenge of the right to the healthy, sure and nourishing food for everybody*.

After these, many other cities have provided themselves with food plans. It is interesting to note that right food plans could be developed within bio-districts, which will be dealt in the next section.

5.2 Bioregionalism and Biodistricts

A new and innovative tool for a sustainable, integrated and participatory territorial development has recently taken hold in many countries: it is about bio-district.

Bio-districts have developed after the establishment of another very similar concept, that of Bioregionalism. Bioregionalism can be seen as comprehensive way of thinking and living in a place sustainably and respectfully. Peter Berg firstly developed the concept of Bioregion in the early 70'.

According to his theory "*A bioregion is defined in terms of the unique overall pattern of natural characteristics that are found in a specific place. The main features are generally obvious throughout a continuous geographic terrain and include a particular climate, local aspects of seasons, landforms, watersheds, soils, and native plants and animals. People are also counted as an integral aspect of a place's life, as can be seen in the ecologically adaptive cultures of early inhabitants, and in the activities of present day reinhabitants who attempt to harmonize in a sustainable way with the place where they live."* (Peter Berg, 2002).

Bio-districts are, mainly, based on the same ecological, social and cultural principles. A bio-district is, in fact, a geographical area where farmers, citizens, tourist operator, associations and public authorities reach an agreement for the sustainable management of local resources, based on organic principles and practices, aiming at the fulfillment of the economic and socio-cultural potential of the territory.

Organic agriculture represents a model of natural, sustainable, equitable and social agriculture. The principles on which this model and bio-districts are based are:

- The adoption of soil tillage techniques and cultivation practices suitable for safeguarding or elevating the organic matter content of the soil and

preventing its compaction and erosion and increasing biodiversity;

- The aid of the multi-annual rotation of different plant species;
- The choice of naturally resistant species and varieties;
- The fertilization with natural substances of animal origin or with organic matter;
- The limitation of plant protection products, as agrochemicals to cases of extreme danger for crops.

Given the many actors involved in a bio-district, it is possible to affirm that it has really many objectives and aims, along with the promotion of the organic local products, such as:

- Saving and making use of the local biodiversity;
- Reducing environmental impacts and building up a diversified landscape;
- Helping public authorities by ensuring food security and favouring rural employment;
- Improving citizens' life quality;
- Making tourism sector more competitive;
- Educating citizens to a healthy and responsible food consumption, through school canteens and other similar activities.

In this sense, bio-district can be seen as a multifunctional approach that combine organic farming with eco-tourism, culture, education, landscape preservation and other farming activities.

The Italian Association for Organic Agriculture (AIAB) launched the first bio-district in Italy, the Cilento Bio-district, in 2009 in the Campania Region.

Then, many others bio-districts were born in Italy and for this reason AIAB has created a mark, called “Bio-distretto”, shown in figure 6. This mark can be used only by the districts that are part of the AIAB Network and that adhere to their guidelines.

Each user of the mark, public authorities, agricultural and food entrepreneurs and of other sectors as universities, research and training centers, associations must have specific requirements, amply described in the AIAB bio-district specification.

Twenty-four bio-districts have been established in Italy and this number is expected to increase.

Many other experiences of bio-districts have developed across Europe as the evidence of the fact that the bio-district approach is efficient worldwide. France, Austria, Switzerland, Hungary, Slovak, Portugal, Albania, Senegal, Morocco have bio-districts. Some of these as “Biovallée” in France have demonstrated an unthinkable territorial development.

At international level, the International Network of Eco Regions (IN.N.E.R) allows the cooperation between the bio-district in order to achieve a sustainable international development of the Territory. The supranational mark established by the IN.N.E.R is shown in figure 7.

Figure 6: “Bio-distretto” mark.

Figure 7: “International Network of Eco regions” mark

5.3. Food system and agroecology

Many different approaches of agriculture like conservation agriculture, regenerative agriculture, organic agriculture and agroecological systems, are proposed as bases for a sustainable food production strategy. Each one has the same goals, but with different methodologies, technologies and scales.

Today, agroecological systems seem to be the most effective approach of all. To understand that, it is necessary to do a more accurate description of this applied science.

Agroecology uses ecological concepts and principles for the design and management of sustainable agroecosystems where external inputs are replaced by natural processes such as natural soil fertility and biological control (Altieri, 1995).

The main principles are shown in table 1 and allow farming systems to become diversified, productive, resilient and efficient.

Table 1: Agroecological principles for the design of biodiverse, energy efficient, resource-conserving and resilient framing system (M.A. Altieri and C.I. Nicholls).

Enhance the recycling of biomass, with a view to optimizing organic matter decomposition and nutrient cycling over time
Strengthen the "immune system" of agricultural systems through enhancement of functional biodiversity – natural enemies, antagonists, etc.
Provide the most favorable soil conditions for plant growth, particularly by managing organic matter and by enhancing soil biological activity
Minimize losses of energy, water, nutrients and genetic resources by enhancing conservation and regeneration of soil and water resources and agrobiodiversity
Diversify species and genetic resources in the agroecosystem over time and space at the field and landscape level
Enhance beneficial biological interactions and synergies among the components of agrobiodiversity, thereby promoting key ecological processes and services.

The diversification obtained, for example, with mixtures of crop varieties and livestock integration, is able to reinforce biodiversity and its positive effects on productivity. Many studies and projects, involving small holder farmers throughout Africa, Asia and Latin America, in fact, have demonstrated the ability of agroecological systems to produce more food, using less land, water and energy and emitting far fewer greenhouse gasses. Unfortunately, so far there has been not a big application of agroecological techniques, because of many different constraints such as technical issues, policy distortions, market failure, lack of land tenure, infrastructural problems, powerful economic and institutional interests.

Despite the above obstacles, now agroecology is back to be a central theme and also the international community starts to be in favor of the statement that agroecology is probably the most sustainable path to food production.

Rapid solutions, based on intensive use of external inputs like chemical fertilizers, are no longer feasible because, differently from agroecological practices, they do not solve but rather worsen the already critical climate, energy, financial and social scenarios.

In April 2018, FAO hosted the "2nd International Symposium on Agroecology: Scaling Up agroecology to achieve the Sustainable Development Goals (SDGs)", in order to make agroecology a reality and to spread its importance in achieving some policy, environmental and food security targets all over the world. According to FAO, in fact, agroecology embraces the spirit of the 2030 Agenda and could contribute to many of SDGs like the eradication of poverty and hunger, increasing water-use efficiency, promoting decent jobs, ensuring sustainable consumption

and production, building climate resilience, halting the loss of biodiversity and others.

5.4 Retro-innovation and the Rural Social Innovation System

Retro-innovation means taking traditional sectors and hook them to social and technology innovations. Generally retro-innovations are defined as a well-established system updated to the new conditions (Loucanova and Walburn, 2014). These systems could be those of fashion, tourism, furniture and living, as well as food one. Figure 8 shows the strategy of retro-innovations.

The Rural Social Innovation System, a new model of rural economy oriented to Societing conceived and carried out by the Rural hub association, is an example of retro-innovation. It, in fact, is a project that provides the return to rural areas through social means. This model brings past values belonging to rural areas such as frugality, solidarity, respect for the ecosystem and biodiversity protection to the present thanks to current technologies. In this sense, rural social innovators turn out to be central: they are talented young people who take into the rural areas and in the agricultural context their high skills, in order to create businesses able to combine environmental needs, economic sustainability and social responsibility. The “triple bottom line” proposed is composed, in fact, by People, Planet and Profit (Figure 9).

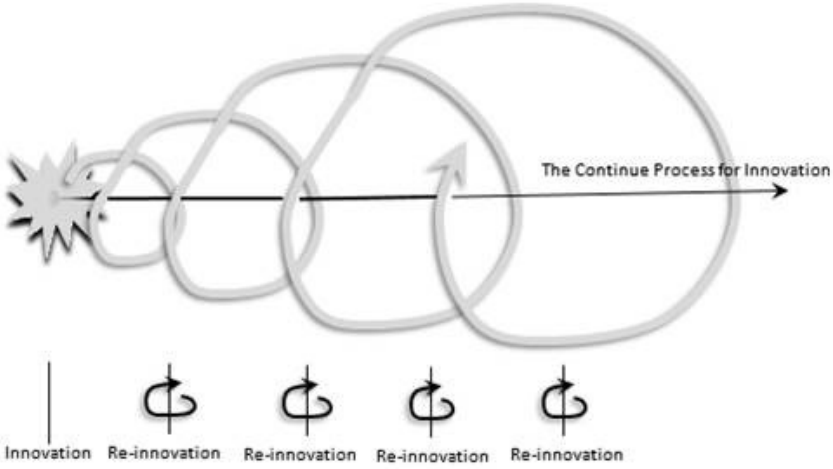

Figure 8: The continuous innovation strategy of retro-innovations (Source: Loucanova, 2014).

Figure 9: The triple bottom line (Source: "Rural Social Innovation Manifesto"

The choices and the activities carried out by these young people are communicated through social networks which allow the reconnection between rurality and metropolitan modernity, reducing the space-time distances.

Subverting the conventional food chain, the Rural Social Innovation System replaces the disintermediation to logistics, the story-telling to marketing and the redistribution of value to finance.

The Disintermediation coincides with short chains, that have a lower environmental impact than that of logistic.

The Story telling is to transmit to the market the historical and cultural value of the traditional products.

The Redistribution of value regard both material and immaterial value and active a mechanism of return of these to the community. Especially the whole material value or however an elevated part of it to goes back to the initial producer.

5.5. Producer's responsibility

Farmers, producers and processors play a central role in the achievement of a sustainable agri-food system: in fact, they are able to determine impacts on environment through their actions, society and economy. In this direction, entrepreneurs should adopt both social and environmental sustainable behaviors towards local and global context.

Thus, entrepreneurs are called upon to:

- Guarantee food safety
- Reduce food losses and food waste connected to their activities

- Provide true, complete and not deceptive information to the customer
- Be loyal in the relationships with all the stakeholders
- Choose sustainable and eco-innovative practices, processes and materials
- Valorize local resources and quality products
- Minimize external inputs and apply principles of circular economy
- Promote healthy life styles and food habits
- Stimulate employment and social-economical cohesion
- Contribute to resolve problems of poverty and of social inclusion
- Disseminate and exploit traditions as well as innovations in their communities
- Collaborate with research centers and universities, in order to solve real problems by using tools and techniques with reduced environmental impacts

An important concept, that provides for a new producer's vision, is the Corporate Social Responsibility (CSR). Defined by the European Commission as "a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis", it allows to look at enterprises as active parts in sustainable global development. The voluntary nature of this responsibility intends to respect the awareness of companies to be able to achieve a sustainable and inclusive development, as well as a profit.

Actually CSR id defined as “responsibility of companies for their impact on society”. This definition includes multiple profiles of company responsibility: that of food safety, of communication, of protection of the culture associated with food, of environmental impacts, of ethics.

All of these use different instruments such as: certification of sustainable materials, ethical codes, energy or social audit, traceability of products, new forms of work organization, refresher training of the existing professional figures and insertion of new ones.

Regarding food safety one, companies must scrupulously follow and implement specific hygiene and health standards and practices, in order to guarantee food safety to all consumers. Producers around the world recognize that food safety begins with them and take this responsibility seriously (Olson and Slack, 2006).

Communication play a fundamental role in responsibility: consumers have the right to buy food, with complete and clear information. Sustainability labels (both environmental and ethical labels) on food products are the most effective tool for producers to get closer to consumer’s new requests. There are different kinds of labels that could be used in this direction. The most important examples are the Fair Trade logo, the Rainforest Alliance logo, various carbon index schemes and animal welfare-related logos. Other important activities from producers regard the promotion of healthy eating styles through meetings, the dissemination of brochures, social media and advertising.

Environmental impacts should be made lower by the application of sustainable practices, processes and materials and the reduction of the distance traveled by the product to

reach the final consumer. Short food supply chains (SFSCs) or alternative food networks (AFNs) allow this.

A new concept of producer's responsibility in terms of environmental impacts is that of Extended Producer Responsibility. According to the OECD definition, Extended Producer Responsibility (EPR) is "an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle".

It means that producers take over the responsibility for collecting or taking back used goods and for sorting and treating for their eventual recycling. It is "extended" because it goes beyond the productive moment and is based on a financial cost for the producer: usually the producer joins a consortium and pays a contribution in reason for the waste produced and the consortium organizes the collection and recovery. In this way the environmental impact of the products placed on the market is minimized through the responsibility of their producer.

6. Organic farming as a model chosen to pursue sustainability

Organic farming is the main tool used to pursue the goal of sustainability. Its value is recognized on a global level and above all it is the small companies of the southern part of the world and the marginal areas of the latter, which adopt this method of cultivation. It is not possible to talk about organic farming, without underlining the innovative approach of business management, the contribution to the

vitality of rural communities, the use of local markets, attention to equity in working conditions and transparency in trade, characters considered as an expression of the possible ecological and socio-economic contribution of organic farming in these areas.

The European Union gives a leading role to organic agriculture, due to the undeniable environmental benefits, first of all the safeguard of biodiversity and natural resources, as well as regarding animal welfare. "This recognition is clearly evident in Regulation (EC) 834/2007, which expresses, for the first time in a European regulation, a clear relationship between the objectives of organic production and food quality (Agostino, Fonte, 2007); a recognition that is strengthened within the new CAP, where organic farming is not only automatically qualified for greening, but has a dedicated measure in rural development and also has priority access to various market measures "[1].

"The increase in awareness of the benefits of organic farming is due to the numerous studies and research that demonstrate the positive contribution of the production method to the supply of public goods, especially environmental (Cooper et al., 2009)". Reference is made to the lack of use of inputs of chemical origin substituted by rational rotations, cultural associations and careful management of the soil, which consequently lead to a substantial reduction in the pollutants found in the water and in the soil itself and in meticulous protection of biodiversity and fertility. With regard to animal breeding according to the organic method, it drastically contributes to reducing the

[1] Misurare la sostenibilità dell'agricoltura biologica, Carla Abitabile e Andrea Arzeni. INEA 2013.

emissions of greenhouse gases, but also the production of effluents and leachate.

"In this regard, the contribution of the organic production method to climate change mitigation is exemplary: the results of several long-term experiments recalled in a FAO study (Niggli et al., 2009) demonstrate the different capacity of biological agricultural systems to retain carbon"[2] (Table 2).

Table 2. Comparison between gains and losses of carbon in soils with different management systems (biological, integrated, conventional).

Fonte	Sistemi	Perdite (-)/guadagni (+) di carbonio (kg C/ha/anno)
DOK-Trial, Fibl and Agroscope ART (Switzerland); Mader et al. (2002); Fließbach *et al.* (2007). Trial start: 1977.	Bio: letame aziendale compostato	+ 42
	Bio: letame aziendale fresco	-123
	Int: letame aziendale fresco	-84
	Int: fertilizzanti minerali	-207
SADP Trial, USDA-ARS, Maryland (USA); Teasdale et al. (2007). Trial period: 1994-2002.	Bio: lavorazione ridotta	da +810 a +1.738
	Conv: semina su sodo	0
Rodale Farming Systems Trial, Rodale Institute, Pennsylvania (USA); Hepperly et al. (2006), Pimentel et al. (2005). Trial start: 1981.	Bio: letame aziendale	+ 1.218
	Bio: sovescio con leguminose	+ 857
	Conv	+ 217
Soil Tillage trial Frick, FiBl (Switzerland); Berner et al. (2008). Trial start: 2002.	Bio: con aratura	0
	Bio: lavorazione ridotta	+ 879
Research Farm Scheyern, Helmholtz Centre Munich (Germany; Ruhling et al. (2005). Trial start: 1990.	Bio	+ 180
	Int	-120

Fonte: Niggli et al. (2009)

[2] Abitabile, Arzeni, 2013, op. cit.

The social aspect of sustainability, deals with the relations between the companies and the communities of reference regarding the external front, while on the internal front it deals with the work. "Organic farming seems to give some better results than conventional agriculture, and in particular with reference to labor, for which higher employment rates and better structure and quality of the employed are found (Lobley et al., 2005) In general, the study of the social sustainability of the biological sector is based on a systemic analysis perspective that often refers to the territory, studying the relationships between this production model and the territorial communities with respect to which numerous studies show how organic farming can play a positive role. In this regard, Gafsi and Favreau (2010) suggest using the term 'socioterritorial' to indicate this dimension of sustainability, highlighting how the same principles of organic farming encourage a high integration of farmers in the territory, above all through active participation in local networks . "[3].

At the base of organic agriculture is a dense network of regulations, controls and certifications, its true distinctive characteristics. "Its contribution to sustainable development must therefore be considered from at least two perspectives. First of all, the sustainability path of the sector should be evaluated, ie the evolution of adopted practices, technologies and tools, and therefore the evolution of organic farming with respect to its own founding principles. If, on the one hand, forces inside and outside the sector push for such a path to be realized in a virtuous manner, with an

[3] Abitabile, Arzeni, 2013, op. cit.

increase in its level of sustainability, other factors exert an opposite action, as is feared in the so-called conventionalization process, according to which organic farming would lose its identity to undertake a path of development closer to that of conventional agriculture. Assuming that organic farming contains within itself (in its principles) elements of sustainability, a second perspective for the assessment of the sustainability of organic farming is that related to its possible contribution to the sustainability of agriculture in general, with the introduction of sustainable innovations in the conventional agricultural production system. This aspect of 'contamination' becomes particularly evident when one thinks of the possible contribution of this productive system to territorial sustainability and the relative reference communities: the presence of biological production units in the territory can trigger a process of transferring elements of sustainability from the "islands" Sustainability Report "(Wallner et al., 1996) to the external context with a lower sustainability content. In any case, monitoring the development process of organic farming with regard to content in sustainability is functional at several levels. If, on the one hand, responds to the needs of civil society increasingly attentive and aware of their consumption choices, on an institutional level the assessment of the sustainability of organic farming is useful for the activation of policies and effective instruments for the development of the sector. Moreover, at the enterprise level, it can represent a market opportunity since, by communicating to the citizen-consumer the sustainability characteristics of its products and the processes adopted, the 'virtuous' company can acquire the relative benefits (in terms of price, image, consumer confidence, etc.),

contributing in parallel to reducing information asymmetry. "[4].

"Organic farming represents innovation in the agricultural and food sectors of the last century based on the rediscovery of an ecosystemic, socially inclusive and sustainable approach from an economic and environmental point of view"[5] this is the reason that two years after the sharing of the "Biological Charter" at Expo Milano 2015 and starting from the experience of the G7 countries and the main international organizations, "The Organic Paper of Bergamo" is realized, to give importance to organic farming as a tool for the transformation of world agricultural systems.

7. Summary on the effects produced by organic farming

The main objective of organic farming is the health of the soil, plants and animals and consequently of man. By achieving equilibrium between these components it is possible to remedy problems such as the conservation of the productive capacity of the land and the means of production, the quality of the environment and food.

The farming method we are analyzing is based on the creation, within the company, of closed cycles to keep biological activity at adequate levels. The removal of nutrients must therefore be balanced by the use of mineral fertilizers that allow a regular nutrition of the crops, but not

[4] Abitabile, Arzeni, 2013, op. cit.
[5] Il Biologico come modello di sistemi agricoli sostenibili - A 2 anni dall'Expo l'attualità della carta del Bio "Il biologico nutrirà il Pianeta". MIPAAF.

of all those living forms that use growing residues or organic matter as growth substrates in the form of manure or compost. In addition, mineral fertilization studies emphasize that macro-nutrients are characterized by a low efficiency that rarely exceeds 50-60%, this means that the system provides the crops with a large part of the requirements in mineral elements. This is also the explanation that fertilizers give better results in low fertile soils.

Regarding the maintenance of fertility, which falls within the main objectives of organic farming, it is necessary that all crop operations such as rotations, processing and fertilization, aim to preserve this important feature of agricultural land.

The reg. 2092/91 in Annex I, point 2, reads as follows:

"The fertility and biological activity of the soil must be maintained or increased, in appropriate cases, by:

A. the cultivation of legumes, green fertilizers or plants having a deep root system within an appropriate multi-annual rotation program

B. the incorporation into the soil of organic material, composted or not, produced by companies operating in compliance with the rules of this regulation. Pending the adoption of common technical standards relating to organic livestock production, the by-products of breeding, such as animal manure, can be used if they come from farms that operate in compliance with the national legislation in force or, in the absence thereof, practices in subject of internationally recognized biological animal production.

Integration with other organic or mineral fertilizers listed in Annex II is only permitted if adequate nutrition of the

rotating plants or the soil conditioning can not be obtained by the means referred to in paragraphs A and B "

The disciplinary for plant production drawn up by AIAB (Italian Association for Organic Agriculture) in accordance with the provisions of Reg. 2092/91 and established by the International Federation of Organic Agriculture Movements (IFOAM), article 3, reports:

"Organic fertilization is the basis of soil fertility and cultivation practices must be aimed at maintaining and / or increasing the content in humus and biological activity. (Note: crop residues can be composted on the surface).

Interventions to maintain and increase fertility and biological activity of the soil must be based on:

- legume crops
- selection of crops in succession
- adequate crops (crop residues)
- incorporation into the soil of organic material from companies operating in compliance with current organic farming regulations

If these techniques do not allow to ensure adequate nourishment to the crops or a sufficient conditioning of the biological activities of the land, it will be possible to integrate the fertilization with the indicated products ".

Regarding fertilization, Steiner wrote:

"... if a normal, inorganic and mineral heap of land is erected, and it is interpenetrated with humic substance or with decomposing waste substances, the earthly element will manifest the tendency to life internally, becoming similar to the plants";

"..... it is not true that life goes out beyond the area around the plant.The life as such continues and, starting from the roots, penetrates into the earth.For many plants there is no clear boundary between life in their interior and in the surrounding area, it is necessary to understand this thoroughly in order to know the nature of a land fertilized or worked in an appropriate way.It should be known that the fertilization aims to vivify the soil so that the plant is not found in a dead land from which the vital elements could not be drawn to reach fructification, it comes to you more easily if it is immersed in life ";

"..... it is indicative that the use of the mineral, of the pure mineral as fertilizer, does not act on the earth element, but at most on the water, with mineral fertilizers we can produce an effect on the water element but we will not arrive never to vivify the real earthly element, in fact the plants that have undergone the influence of any mineral fertilizer, betray in their development the exclusive stimulus exerted on the water element, not on the vivified earth ";

"... under the influence of the materialistic conception of our time, fertilizers are mostly treated with all sorts of compounds and non-organic elements, but experience has shown that this does not produce lasting results. using mineral fertilizer, only the fluid element, the water, is vivified, while for healthy cultivation this is not enough, because the water that filters through the earth does not give rise to further vivification "... the mineral should not to penetrate the living ground with something completely dead, it must first be included in some other process ".

These passages taken from Stainer's lectures underline the importance of "keeping life". Mineral fertilization is not well-regarded either because of environmental pollution

(which at the time was poorly treated) or because of the high energy costs necessary for its construction, and because of its inability to cope with the needs of crops during their cycle. of growth.

"More recently, Alex Podolinski has taken over the Steinerian concepts emphasizing the importance of organic fertilization compared to mineral:

- Fertilization in organic-biological and above all biodynamic farming, should not be understood only as a means to bring nutrients to the soil and therefore to crops, but also and above all as an instrument to keep the soil vital and improve the biological processes that occur inside it.
- In particular, humus, with all its implications in terms of the stabilizing effect on the water balance and aeration, on the structure, on the life of the soil and on the nutrient pool, must be preserved and increased as far as possible.

In other words, the "organic-biological" and biodynamic agricultural systems are based on the rational utilization of the native resources of the agroecosystem (Canali et al., 1999) and therefore on the fertility of the land rather than on the use of fertilizers, even if of origin. natural and with high quality standards.

Overall, therefore, the technique of fertilization in organic or biodynamic agriculture, based essentially on the cyclization of nutrients and therefore on microbial activity, is more difficult to achieve than conventional (mineral). In organic organic and biodynamic method, great importance is therefore given to organic fertilization for the reconstruction, maintenance or increase of soil fertility and

with a view to reaching the closed cycle. The composted manure thus represents, in biodynamic farms, the basis of fertilization together with the organic material that derives from crop residues, from rennets and from soil crops. In addition to manure, the sewage and all other technical means authorized pursuant to Annex II of Regulation 2092/91 and subsequent additions may also be used as fertilizers. It would be logical to expect, based on the imperative of biodynamic agriculture to reach closed cycles of nutrients in the company, that biodynamic companies, unlike many organic-organic ones, did not use these products and limited themselves to the use of fertilizers. and soil improvers obtained in the company "(table 3):

Table 3. Nutrient sources in organic-biological and biodynamic agriculture.

Internal company resources	Resources outside the company
1. Land reserves	1. Compost
2. Rotations	- green compost (public)
- crop residues	- compost from organic residues
- sovesci, catch crop	2. Mineral fertilizers
4. Compost	- limestone, phosphate rocks, silicae, etc.
- compost of manure or soil	3. Special mineral fertilizers
	4. Organic fertilizers

"The importance of organic matter for the fertility of agricultural land and the life of plants is so great that their development can be much less dependent on the absorption of mineral substances than is generally believed" (Krasilnikow, 1961). Therefore, the task of organic farming is to increase the organic matter content of the soil at levels such that it is unlikely that there will be a nutritional imbalance for the crops in progress. Below this minimum value, mineral fertilization can not be dispensed with.

The content of organic matter varies according to the texture of the soil and amounts to: 2% for sandy soils, 2.2 - 3.5% for silty ones, 3.0 - 4.5% for clayey; important is also the

quantity of humus expressed through the C / N ratio: 10-14 in cultivated land, 15 in poor soils.

The particular attention that the biodynamic and organic-biological method address to the S.O. finds an explanation not only in the nutritional function performed by this component (theoretically substitutable with mineral fertilizers) but, above all, in the close relations between microbial activity and the presence of S.O; this in fact has a synergistic effect on the absorption of nutrients and other organic substances that goes well beyond the pure and simple supply of nutrients from mineral fertilizers useful to meet the needs of plants but not those of the soil as a whole (debris chain).

8. Concluding remarks

In recent years, the land for both climate change and for the obsessive and frenzied rush to high production with increasingly intensive crops that provide high income, had to make use of fertilizers and plant protection, not from nature, but from laboratories, altering the balance of biological systems. The increase in yield has formed a large quantity of surplus food that has allowed the satisfaction of the market demand. If on the one hand the productions have been increasing, it has been noticed that the consequences, harmful and harmful, have been observed in the loss of fertility with the consequent need to make up with ever greater use of chemistry, and if the quantity increases the quality it comes less, giving the consumer products that are the result of chemical research and not children of the generosity of the earth and nature.

The global agri-food policies have contributed, in part, to determining what was said above with protectionism and price support, so damage and costs poured into the various communities are huge. Against this massacre, for some time now, organic farming movements have taken place in order to draw the attention of public opinion and institutions responsible for the protection of the health and conservation of the soil as well as the resources of nature. Arousing the intervention of the authorities is the main objective of these producers. The rationalization of food consumption could be a strategy against the growing production that then, not consumed, goes to swell the cycle of waste returning to the earth as a pollutant. Produce less, produce better by letting nature take care of its times and methods. The intervention of man must be conservative and non-destructive reasoning on what he is doing, on how he is producing on what he is eating, if wheat with glyphosate or pure wheat without chemical treatments harmful to health.

The use of products not coming from nature to increase the quantity of production, are not only harmful for human health, but also for that of animals and for all that constitutes ecosystem, the aquifers certainly suffer significantly, the seas that are the guests of our holidays, which are the motorways of our world trade, present us with a sad face and spoiled by pollution without forgetting that even the sea gives us food, the poisonous residues of chemical spread in agriculture also reach the sea, Reflecting on this should be the task of politics for what is right for it. The conservation of the environment also passes through sustainable agriculture, through the use of agricultural practices that respect the environment, animal welfare and protect the health of agricultural workers and consumers. Working the earth organically does not mean going back, on the contrary,

it means turning the page, giving a new face to nature, making it rejuvenate, allowing children to play on the lawns breathing good, healthy air, allowing families to be quiet in the fill the shopping cart, go out to go out the door and take a trip to the countryside, that campaign victim of so many abuses by man. In this search for remedies for the perpetrated against nature and the earth, we often clash with lobbies who do not intend to abandon the old traditions to move towards quality rather than quantity, we do not realize that agriculture is no longer fields but almost in the laboratory, it is no longer necessary an open field, but a few square meters and produce wonderful products to the sight much less to the taste, more and more perfect to the touch but less nutritious and healthy.

Organic farming can be a valid alternative for food security, especially today - a period in which - we observe a return to the earth by the younger generations, but much still needs to be done to change consciences, working on the school to generate change cultural.

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2. Food security, sustainability and organic farming, with particular reference to the United Arab Emirates and Sicily – Italy

Abstract

The chapter focuses on the analysis of the relationships between agriculture, food security, sustainability and organic farming in two areas with a developed economy but with equivalent problems, such as the United Arab Emirates and Sicily in Italy. The role of agriculture in the two economic systems is thus highlighted, the level of availability (of food supplies), accessibility (physical and economic access to food), utilization (of food) and stability (of food supply and access). The analysis is completed by a framework on organic farming, an elected model of sustainability that represents a conscious choice, for the Emirates that in recent years have promoted a sustainable and quality agro-food policy to counteract the major food trade deficit. On the other hand, Sicily, the first region in Italy for organic production, faced consumption on the front more recently, despite the recurrent economic and financial economic crisis.

Key words: Food security; food systems; food sovereignty; poverty and hunger; sustainability of resources

1. Introduction

Sustainable agriculture goes beyond simply obtaining agri-food products and non-food products but is also economically sustainable for farmers (who do not use products that have a cost), respects the environment, improves the quality of life of both the farmer and of the

consumer who buys the products obtained from this practice. In addition, there are also ethical and moral objectives:

- guarantee a fair income for the farmer;
- guarantee the health of the farmer and the consumer;
- implement and conserve soil fertility;
- safeguard and preserve environmental and landscape resources;
- to promote biodiversity.

The meaning of sustainable agriculture encompasses a concept that is very current today, that is to be able to cope with the food demand of the countries that are under developed or developing, so it is not addressed exclusively on a local scale but also on the global one.

2. Food security and agri-food policies

A question of great importance, which can be inferred from the one previously mentioned, concerns the possibility of access to food and water by peoples, but above all access to a healthy and respectful diet of a series of fundamental principles. We identify this principle with the name of "food security". In English this concept is understood in a broader and more articulate way, identifying three terms that have different functions and meanings:

- Food Security, this term indicates the right of people to access food and drinking water.
- Food Safety, this term indicates the right of access to healthy food, which poses no risk to human health

and that does not contain contaminants (harmful or toxic).

- Food Sovereignty, the term has a political meaning, it indicates the ability of a country to define autonomously, according to its own principles, agricultural and food policies as well as models of production and consumption. For the consumer it indicates the right to choose the foods to be consumed, the right to choose a healthy food, which respects ethical values and the territory in which it is obtained.

Unfortunately, these terms are often confused and merged with each other, giving them the same meaning, also creating confusion on the regulatory level by important bodies, governmental or otherwise, of international importance (Mariani-Costantini, 2006).

The first to talk about food security understood as Food Security is the European Economic Community in 1957 with the treaties of Rome, in fact the art.39 says:

"The aims of the common agricultural policy are:

a) increase agricultural productivity by developing technical progress; ensuring the rational development of agricultural production as well as a better use of factors of production, in particular of labor;

b) to ensure a fair standard of living for the agricultural community, in particular by improving the individual income of those working in agriculture;

c) stabilize the markets;

d) guarantee security of supply;

e) ensure reasonable prices for deliveries to consumers".

Europe came out of the second world war devastated, and the first need to provide was to provide food to the population, just as established by Article 39 that the CAP (Community Agricultural Policy), which still defines the rules, regulations, aid to the agricultural sector, a sector that has always been considered strategic.

In 1992 with the Treaty of Maastricht, another article states the birth of Food Safety, the art.100/A, concerning the establishment of an internal market, in particular it establishes the circulation of products on the basis of consumer confidence in safety or wholesomeness of agricultural products. And just to ensure this trust since 1989 the first regulations on food hygiene and safety start to be issued6, up to the new CAP 2014/2020 programming in which a series of concepts and norms are sold, in many cases of nature purely technical in which food safety is treated in all its facets, which are addressed and subjected to regulations in all three pillars: direct payments, rural development, single CMO.

3. Food Safety Policy

We have previously talked about how the will of legislators is indispensable in order to take a series of decisions that address the mechanisms and methods of agri-food production. Speaking of policies focused on Food Safety, we inevitably talk about choices that have a direct impact not only on end users, consumers, but also on a series of subjects that are upstream of the entire production process.

In the agri-food sector the theme of quality involves three fundamental players: consumers, businesses and the public operator (Sodano, 2004).

- *CUSTOMERS*

The quality of the product for the consumer is expressed according to the following statement according to the single availability of expenditure, the consumer, among the goods offered, will choose those that best meet their needs. According to Sodano, the choice is divided into various sub-phases:

1) recognize the need;

2) the identification of alternative goods that satisfy that need;

3) the comparison between the various assets;

4) the choice of one of these;

5) the post purchase evaluation of the selected asset.

Having said that, and considering that the various goods have the same price among them, the choice of a particular product or good depends on two crucial aspects, namely: the importance that the consumer implicitly attaches to a particular asset, therefore considers it capable to satisfy its needs, according to some peculiar characteristics of the latter (eg the brand); the evaluation of the quality of the product based on the observation, considering a quality as close as possible to that evaluated post-purchase, this is based on qualitative aspects 'observable' and therefore quantifiable.

In short, "the possibility for the consumer to have the 'optimal' quality depends on the alternatives available on the

market, the possibility of correctly assessing the differences between the alternatives and how much the quality experienced (assessed ex-post) approaches the expected quality (assessed ex-ante) "(Sodano, 2004).

- *THE FIRMS*

For companies, the quality aspect can be traced back to two concepts:

- in relation to the type of consumer chosen, preferring to produce an asset that is capable of satisfying a need in consideration of certain business choices (technological process, investment capacity, marketing, etc.);
- make sure that the good produced maintains over time the quality characteristics that satisfy the needs of consumers who purchase it.

For these aspects, therefore, the presence of an organizational structure that intervenes horizontally in the various aspects (production, information and marketing) by implementing a Total Quality System is fundamental.

- *THE PUBLIC OPERATOR*

On the quality aspect, the public operator plays a fundamental role in three cases:

1. in the event that the market is not able to provide a suitable variety of goods, thus creating the characteristics of a bankruptcy market, caused by various aspects (incompleteness of information, goods that by their characteristics behave as public goods, the competitive capacity of companies does not allow an optimal variety of goods). In this case,

the public operator has the task of correcting the distortions and shortcomings of the market;

2. regarding social, environmental and health considerations, as part of the food policy, the public operator can decide to incentivate some qualitative aspects of an asset that the market, under normal conditions, would not produce. In short, to encourage the production of an asset whose obtainment is not economically advantageous;
3. the public operator can decide not to admit goods in the market that do not respect precise parameters, according to the laws and regulations established by it. For example, the presence of harmful substances that can damage consumer health. This can in the long term give the public operator advantages (lower public health expenditure).

The tools to achieve Food Safety are implemented both by the company and by the public operator, but the most interested in maintaining certain quality standards of the asset is precisely the company that seeks to avoid economic damage (direct losses due to expenses). for penalties and indirect costs due to loss of consumer confidence).

From the previous tables, the instruments at international, European and national level are different:

- minimum quality standards and legislation on additives, plant protection products and hygiene standards (HACCP);
- legal responsibility (tort liability);
- the labeling legislation;
- voluntary certification;
- reputation (implicit insurance contracts);
- traceability.

Therefore, as we have seen food safety, in the case of Food Safety, the quality and the wholesomeness of the produced good are not exclusively concerned, but implies more broadly the question of the healthiness and integrity of the environment, of the social and moral aspect that the production of good implies. However, the aforementioned instruments, although important and fundamental for compliance with precise standards, are for some limited and approximate cases, and enveloped old and obsolete, unable to keep up with new ways of doing agriculture (or ineffective in prevention and discovery of fraud to the detriment of the consumer). For this reason, among the actions to be promoted in the drafting of a Food Plan, in particular in the context of a territorial mark, it was decided to analyze an innovative tool for quality control from various points of view; this is called SGP or better 'Participated Guarantee' system.

4. Materials and methods

The study of the relationships between agriculture, food security, sustainability and organic farming in the United Arab Emirates and in Sicily - Italy was carried out following different sources of metadata.

Statistics on food safety and sustainability have been collated by:

- internationally through:
    - FAOSTAT (The State of Food Insecurity in the World, FAO Global Statistical Yearbook, FAO Regional Statistical Yearbooks.), per statistiche su Production (Crops, Crops processed, Live Animals, Livestock Primary,

Livestock Processed, Production Indices, Value of Agricultural Production); Inputs (Fertilizers by Nutrient, , Fertilizers by Product, , Fertilizers archive, Fertilizers - Trade Value , Pesticides Use , Pesticides Trade , Land Use , Employment Indicators); Emissions - Agriculture (Agriculture Total ; Enteric Fermentation ; Manure Management ; Rice Cultivation ; Synthetic Fertilizers ; Manure applied to Soils ; Manure left on Pasture ; Crop Residues ; Cultivation of Organic Soils ; Burning - Savanna ; Burning - Crop Residues ; Energy Use); Population (Annual population); Food Balance (Food Balance Sheets, Commodity Balances - Crops Primary Equivalent, Commodity Balances - Livestock and Fish Primary Equivalent, Food Supply - Crops Primary Equivalent, Food Supply - Livestock and Fish Primary Equivalent); Food Security (Indicators from Household Surveys (gender, area, socioeconomics), Suite of Food Security Indicators); Agri-Environmental Indicators (Air and climate change, Energy, Fertilizers, Land Use, Land Cover, Livestock Patterns, Livestock Manure, Pesticides, Soil, Water, Emissions by sector, Emissions intensities, Temperature change).

- The Global Food Security Index by The Economist Intelligence Unit (EIU) considers the core issues of affordability, availability, and quality across a set of 113 countries. The index is a dynamic quantitative and

qualitative benchmarking model, constructed from 28 unique indicators, that measures these drivers of food security across both developing and developed countries. This index is the first to examine food security comprehensively across the three internationally established dimensions. Moreover, the study looks beyond hunger to the underlying factors affecting food insecurity. The GFSI now includes an adjustment factor on natural resources and resilience. This category assesses a country's exposure to the impacts of a changing climate; its susceptibility to natural resource risks; and how the country is adapting to these risks. Using this definition adapted from the 1996 World Food Summit, the Global Food Security Index considers the core issues of affordability, availability, quality and Safety and Natural resources and resilience. The Economist Intelligence Unit (EIU) is the research and analysis division of The Economist Group and the world leader in global business intelligence.

- on the Italian level, instead:
    - ISTAT BES project, born in 2010 to measure fair and sustainable Welfare, with the aim of evaluating the progress of society not only from an economic, but also social and environmental point of view. Starting from 2016, indicators and welfare analyzes are flanked by indicators for monitoring the objectives of the 2030 Agenda for

Sustainable Development, the United Nations Sustainable Development Goals (SDGs), chosen by the global community through a political agreement between the different actors, to represent their values, priorities and objectives. The United Statistical Commission of the United Nations (UNSC) has defined a framework of shared statistical information to monitor the progress of individual countries towards the SDGs: over 230 indicators have been identified.

The statistics on organic farming were thus collated:

- internationally through:
    - IFOAM - Organics International and FiBL Research Institute of Organic Agriculture, that togheter works towards true sustainability in agriculture, from the field, through the value chain to the consumer. In particolar, IFOAM since 1972 has been the early pioneers (‘Organic 1.0’) paved the way for the formation of the organic movement and the codification of standards and enforced rules that have established the organic sector and helped it grow to a market value of over US$80 billion per year (‘Organic 2.0’). Now the organic movement is entering a new phase that we call ‘Organic 3.0‘. Organic 3.0 positions organic as a modern, innovative system that has positive impacts on global environmental and social challenges. It is the overall strategic plan of the global organic movement for further

growth and sustainability in order to increase the positive impact on the planet and the people. FiBL is an independent, non-profit, research institute with the aim of advancing cutting-edge science in the field of organic agriculture.

- International Organic Trade Resource Guide. The U.S. Department of Agriculture's Foreign Agriculture Service (FAS) provided funding for the site, which is administered by the Organic Trade Association's Organic Export Program.
- The Organic Trade Association's mission is to promote and protect ORGANIC with a unifying voice that serves and engages its diverse members from farm to marketplace. OTA's vision is to grow ORGANIC to achieve excellence in agriculture and commerce, protect the environment and enhance community well-being.

- on the Italian level, instead:
  - SINAB or National Information System on Organic Agriculture carried out by the Ministry of Agricultural, Food and Forestry Policies in collaboration with the Regions. The SINAB project is managed by IAMB (Mediterranean Agronomic Institute of Bari) and ISMEA (Institute of Services for the Agricultural Food Market). It offers information and services to operators in the sector for the development and enhancement of Italian organic farming.

5. Situation of agriculture in the study areas

5.1. United Arab Emirates

The United Arab Emirates, with their strategic geographical position at the center of the main east-west routes and the abundant reserves of fossil fuels that have driven economic growth, have quickly become one of the most developed states in the world (Figure 1). The states of Abu Dabi, Ajman, Dubai, Fudjairah, Rasal al Khaimah, Umm al Qwain, and Sharjah form the United Arab Emirates Federation. These states are part of the Gulf Cooperation Council which is a Customs Union and also includes Saudi Arabia, Barhrein, Kuwait, Oman and Qatar; they have free zones, with the exception of Abu Dhabi.

Figure 1. Location of the United Arab Emirates

The per capita GDP of the United Arab Emirates is estimated at about $ 41,000 (at purchasing power parity) and is among the highest in the world and significantly higher than the average of advanced economies (table 1).
With reference to the main economic indicators, it should be noted that:

- Real GDP growth in the UAE grew by 1.3% in 2017 and is expected to grow by 3.4% in 2018, driven by increasing oil prices, increased exports and investments associated with the Dubai 2020 World Expo.
- Dubai contributes to quarter of the country's GDP and functions as the commercial center.
- The UAE is highly dependent on exports, acting as a re-export hub for other countries in the region.
- The UAE is the second largest FDI recipient among Arab countries after Saudi Arabia.

Table 1. General characteristics of United Arab Emirates

Indicator	Value	Source
Country Area	8,360 (1000 ha)	FAO estimate, 2014
Land Area	7,102 (1000 ha)	Official data, 2014

Agricultural Area	387.5 (1000 ha)	FAO estimate, 2014
Population - Est. & Proj.	8.843millions	FAOSTAT. 2018
GDP (current US$)	382 575millions	World Bank 2017
GDP per capita (current US$)	40 699US$	World Bank 2017
Agriculture, forestry, and fishing, value added	0.76% of GDP	World Bank 2017

The evolutions on population demographics, instead can be summarized as follows:

- In 2017 the population of the UAE was 8.8 million, up from just 3.0 million in 2000.
- Expatriate citizens make up around 80% of the total population and are mainly responsible for the rapid gains in population.
- A large influx of immigration in recent years has also led to an imbalance between the evil and female populations.

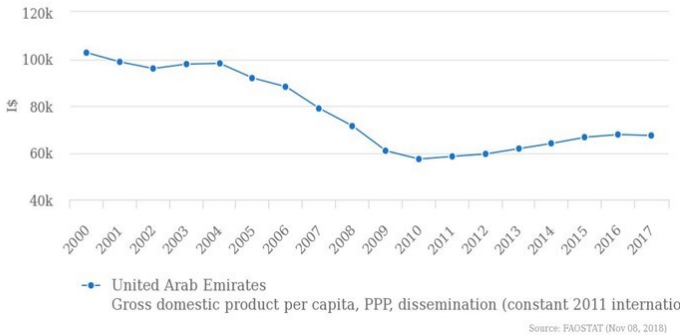
Consequently, consumption of food products benefits from the high levels of wealth in the country that feed large import volumes as well as foreign direct investments aimed at achieving food security for the country.

The population of the Emirates is expected to expand at a rate of 3 percent a year to exceed 11 million inhabitants in 2020, compared to the current 10.1 million. Above all young people and the working classes are progressively developing new tastes and preferences pushing the demand for international food products transformed in constant population growth (due to one of the highest birth and immigration rates in the world).

Consequently, the following reflections can be made on the income and expenditure:

- Per capita disposable income in 2017 was US $ 26.176, and total disposable income is expected to grow at an annual average rate of 2.5% through 2030 (Figure 2).
- In line with rising disposable income, total consumer spending is projected to grow at an annual average rate of 2.6% through 2030.
- In the 2018-2030 period hotels and catering will be the fastest-growing consumer expenditure category.

Figure 2. domestic product per capita, PPP (constant 2011 international $



Overall, the structure of the gross domestic product (Figure 3) demonstrates the relative importance of agriculture (0.8%) and the articulated composition of the various sectors. This is the result of the scarcity of the resources available for cultivation (Figures 4 and 5) starting from the land, destined for 5.5% of agricultural activity.

Figure 3 - United Arab Emirates: Gross Domestic Product for economic activity (2016)

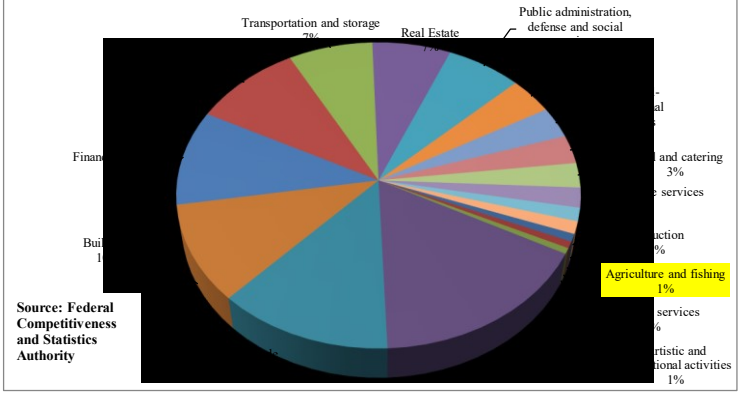
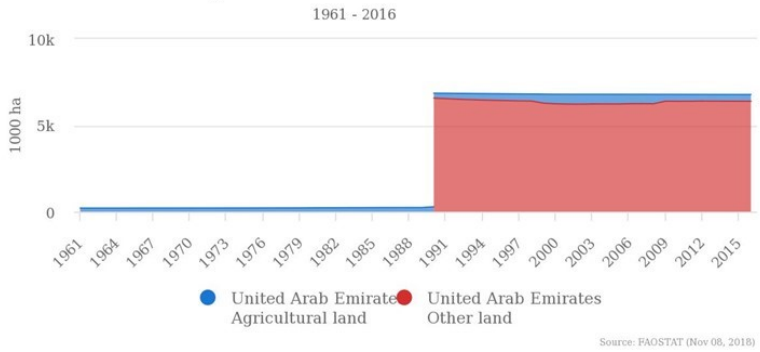


Figure 4 - Land Use



The population (Figures 6 and 7) consequently results only in a limited part located in rural areas (about 14%) and mainly in urban areas (86%).

Figure 5 - Agricultural Area

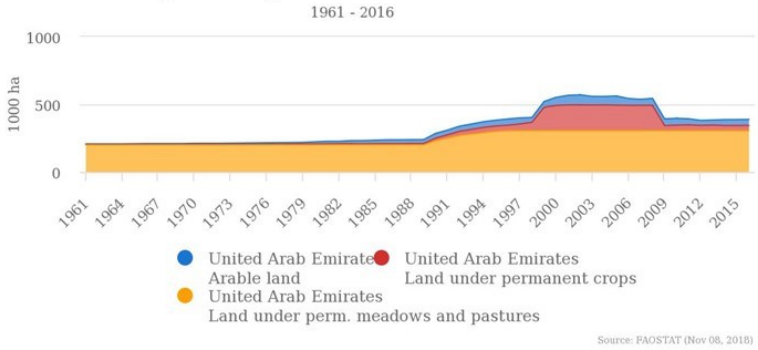
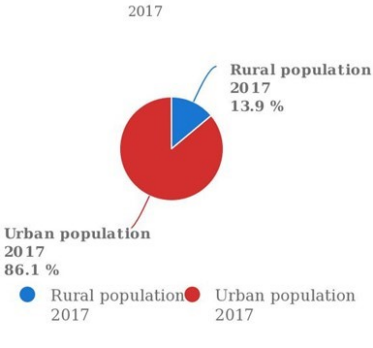


Figure 7 - Rural and urban population



The main crops (table 2) are represented by the arboreal from the dates (94 thousand hectares and 680 thousand tons of fruit) and fresh fruit (1.5 thousand hectares and 14.6 thousand tonnes); among the herbaceous, instead, we find

vegetable crops (2.3 thousand hectares and 52 thousand tonnes), followed by carrots ad turnips (2.8 thousand hectares and 39 thousand tonnes), tomatoes (about 1.3 thousand hectares and 47 thousand tonnes), onions, shallots, green (with 954 hectares and 26 thousand tons) and melons and other (908 hectares and 13 thousand tonnes).

Table 2 - Crops in United Arab Emirates

Crop	Item	Year	Unit	Value
Almonds, with shell	Area harvested	2016	ha	682,0
	Production	2016	tonnes	873,0
Bananas	Area harvested	2016	ha	11,0
	Production	2016	tonnes	200,0
Barley	Area harvested	2016	ha	16,0
	Production	2016	tonnes	127,0
Beans, green	Area harvested	2016	ha	117,0
	Production	2016	tonnes	1.598,0
Cabbages and other brassicas	Area harvested	2016	ha	412,0
	Production	2016	tonnes	13.269,0
Carrots and turnips	Area harvested	2016	ha	2.775,0
	Production	2016	tonnes	39.138,0
Cauliflowers and broccoli	Area harvested	2016	ha	231,0
	Production	2016	tonnes	5.881,0
Chillies and peppers, green	Area harvested	2016	ha	157,0
	Production		tonnes	3.983,0
Cucumbers and gherkins	Area harvested	2016	ha	709
	Production		tonnes	27.324,0
Dates	Area harvested	2016	ha	93.561,0
	Production	2016	tonnes	671.891,0
Eggplants (aubergines)	Area harvested	2016	ha	408,0
	Production	2016	tonnes	16.767,0
Figs	Area harvested	2016	ha	91,0
	Production	2016	tonnes	419,0
Fruit, citrus nes	Area harvested	2016	ha	111,0
	Production	2016	tonnes	1.376,0
Fruit, fresh nes	Area harvested	2016	ha	1.485,0
	Production	2016	tonnes	14.583,0
Grapes	Area harvested	2016	ha	24,0
	Production	2016	tonnes	60,0
Lemons and limes	Area harvested	2016	ha	132,0
	Production	2016	tonnes	1.212,0
Lettuce and chicory	Area harvested	2016	ha	38,0
	Production	2016	tonnes	773,0
Maize	Area harvested	2016	ha	131,0
	Production	2016	tonnes	3.420,0
Mangoes, mangosteens, guavas	Area harvested	2016	ha	481,0
	Production	2016	tonnes	6.997,0
Melons, other (inc.cantaloupes)	Area harvested	2016	ha	908,0
	Production	2016	tonnes	12.791,0
Okra	Area harvested	2016	ha	88,0
	Production	2016	tonnes	2.007,0
Onions, shallots, green	Area harvested	2016	ha	954,0
	Production	2016	tonnes	25.752,0
Potatoes	Area harvested	2016	ha	138,0
	Production	2016	tonnes	3.663,0
Pumpkins, squash and gourds	Area harvested	2016	ha	546,0
	Production	2016	tonnes	18.020,0
Sorghum	Area harvested	2016	ha	-
	Production	2016	tonnes	-
Spinach	Area harvested	2016	ha	119,0
	Production	2016	tonnes	3.437,0
Tobacco, unmanufactured	Area harvested	2016	ha	19,0
	Production	2016	tonnes	290,0
Tomatoes	Area harvested	2016	ha	1.227,0
	Production	2016	tonnes	47.523,0
Vegetables, fresh nes	Area harvested	2016	ha	2.334,0
	Production	2016	tonnes	51.953,0
Watermelons	Area harvested	2016	ha	110,0
	Production	2016	tonnes	2.870,0
Wheat	Area harvested	2016	ha	22,0
	Production		tonnes	82,0

(*) Source: FAO data based on imputation methodology

The few transformed productions (table 3) revolve around rapeseed oil (equal to almost 266 thousand tons), followed by soybean oil (about 31 thousand tons) and groundnut oil (440 tons), according to the latest data from the FAO statistics.

Table 3 - Crops processed in United Arab Emirates (*)

Item	Year	Unit	Value
Oil, groundnut	2014	tonnes	440,00
Oil, rapeseed	2014	tonnes	265.600,00
Oil, soybean	2014	tonnes	30.700,00

(*) Source: FAO data based on imputation methodology.

The animals bred (table 4) are mainly represented by goats (with over 2.3 million head) and sheep (2.2 million head). But the camels (with 437 thousand head), the cattle (with 121 thousand head) and the chickens (with almost 24 million head) also assume importance in the economy of local zootechnics.

Table 4 - Stocks of Live Animals in United Arab Emirates (*)

Item	Year	Unit	Value
Camels	2016	Head	436.800
Cattle	2016	Head	121.200
Chickens	2016	1000 Head	23.450
Goats	2016	Head	2.254.700
Horses	2016	Head	436
Rabbits and hares	2016	1000 Head	-
Sheep	2016	Head	2.227.400

(*) Source: FAO data based on imputation methodology.

It follows a production of animal derivatives variously represented by meat, eggs and milk. In particular, the production of meat goat stands out (with 3.4 million units), followed in order of importance by eggs (518 millions of units), by milk fresch goat (839 thousand units).

Table 5 - Livestock Primary in United Arab Emirates (*)

Element	Item	Year	Unit	Value
Laying	Eggs, hen, in shell	2016	1000 Head	2.550,0
Production	Eggs, hen, in shell	2016	tonnes	28.500,0
Production	Eggs, hen, in shell (number)	2016	1000 No	518.000,0
Producing Animals/Slaughtered	Meat, camel	2016	Head	179.600,0
Production	Meat, camel	2016	tonnes	32.330,0
Producing Animals/Slaughtered	Meat, cattle	2016	Head	82.646,0
Production	Meat, cattle	2016	tonnes	20.661,0
Producing Animals/Slaughtered	Meat, chicken	2016	1000 Head	39.968,0
Production	Meat, chicken	2016	tonnes	47.961,0
Producing Animals/Slaughtered	Meat, goat	2016	Head	3.400.170,0
Production	Meat, goat	2016	tonnes	54.400,0
Producing Animals/Slaughtered	Meat, sheep	2016	Head	218.490,0

Production	Meat, sheep	2016	tonnes	3.900,0
Milk Animals	Milk, whole fresh camel	2016	Head	280.434,0
Production	Milk, whole fresh camel	2016	tonnes	52.582,0
Milk Animals	Milk, whole fresh cow	2016	Head	20.110,0
Production	Milk, whole fresh cow	2016	tonnes	19.620,0
Milk Animals	Milk, whole fresh goat	2016	Head	838.897,0
Production	Milk, whole fresh goat	2016	tonnes	41.523,0
Milk Animals	Milk, whole fresh sheep	2016	Head	659.167,0
Production	Milk, whole fresh sheep	2016	tonnes	23.343,0

(*) Source: FAO data based on imputation methodology.

Finally (table 6), the production of processed animal farms is based on milk (skimmed cow, for 18.6 thousand tons) and butter (cow milk, per 1 thousand tons).

Table 6 - Livestock Processed in United Arab Emirates (*)

Item	Year	Unit	Value
Butter and ghee, sheep milk	2014	tonnes	749,0
Butter, cow milk	2014	tonnes	1.000,0
Milk, skimmed cow	2014	tonnes	18.600,0

(*) Source: FAO data based on imputation methodology.

5.2. Sicily-Italy

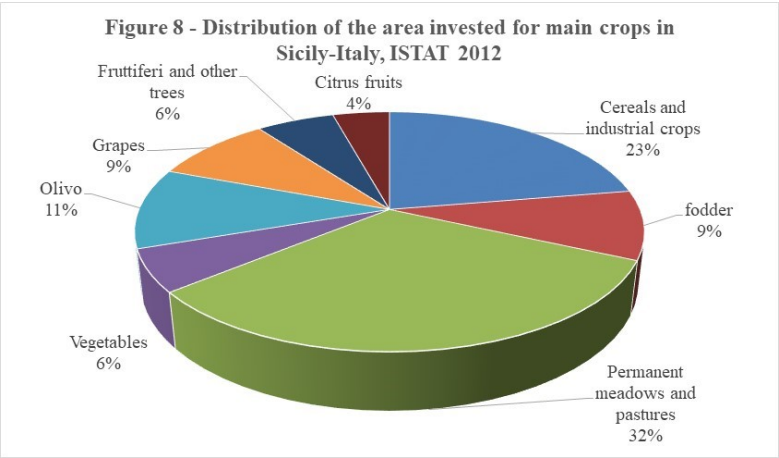
Agriculture (aggregated Agriculture, Forestry and Fisheries) in Italy has a relative impact on the entire national economic system for contained rates, both in terms of income and in terms of employment, showing a different speed of growth over time compared to other aggregates economy.

Its strategic importance is, however, to be linked to the modern Agri-food System: an expanded notion that ends up incorporating a large part of those activities located upstream, downstream and downstream of agriculture in the strict sense.

Whatever the notion of considered agriculture (sectorial or broader), the substantial criticality of a large part of the general macroeconomic indicators should be noted; critical issues expressed by the persistent differences in territorial and sectorial

and / or sectoral development, by the economic trends recorded over a period of at least ten years, as ISTAT itself documents.
By transferring the analyzes to the Sicilian territory, the scenario on the economic situation of the sector and the aggregate can emerge from the recent elaborations produced by ISTAT, INEA and the Bank of Italy[6].
The cultivations present in Sicily in 2012 are constituted for about 40%, equal to 589.065 hectares, from arable crops (figure 8), among which the durum wheat stands out (21.7% of the regional UAA and 22.6% of the national surface of the crop), for 31% (465.470 hectares) from permanent meadows and pastures and for the remaining 29% (435.025 hectares) from agricultural wood cultivations, among which stand out the olive tree (11.3% of the regional SAU and 16, 4% of the national olive growing area) and the vine (9.4% of the regional UAA and 19.1% of the national vineyard area).

[6] G. Timpanaro, *I distretti produttivi agroalimentari per lo sviluppo locale in Sicilia alla luce della Mid Term Review (MTR) della PAC e della programmazione regionale 2007-2013*, Catania, 2009.



Examining the data of the last five years (table 7), a contraction of the area destined to arable crops emerged of 6.4%, equal to 104.301 hectares. Particularly significant were the area reductions for grain legumes and vegetables in the open air, while increasing forage crops and vegetables in a protected environment increased. Overall, the trees registered a slight reduction (-1.3%), essentially due to the fall in citrus fruits which, in the five-year period, lost 6.236 hectares (-9%). The surfaces dedicated to olive trees (-0.5%), vineyards (+ 0.8%) and fruit trees (+ 0.4%) appear to be substantially stable. The most significant changes concern permanent meadows and pastures, which increased from 361.169 hectares in 2008 to 465.470 in 2012 (+ 28.9%)[7].

[7] Regione Siciliana Ass.to Reg.le dell'Agricoltura, dello Sviluppo Rurale e della Pesca Mediterranea, *L'agricoltura nella Sicilia in cifre 2013*, INEA, 2014.

Table 7 - Agricultural area used for main crops and changes%, 2012 (*)

	Agricultural Area		
	2012	Var. % 2012/10	Var. % 2012/08
Cereals and industrial crops	322,169	-2.4	-11.6
Grain legumes	11,213	-27.4	-35.8
Vegetables in full air	64,352	-14.4	-14.1
Greenhouse vegetables	5,921	59.2	11.5
Tuber plants	11,239	-2.1	-2.8
Forage alternate	120,892	8.7	11.9
Permanent meadows and pastures	465,47	2.6	28.9
Olivo	156,882	-1.6	-0.5
Grapes	130,96	5.7	0.8
Fruttiferi and other trees	84,91	2.8	0.4
Citrus fruits	62,273	-8.0	-9.1

(*) Source: ISTAT, Rome.

It should be remembered that the production processes in agriculture are carried out mainly outdoors and are exposed to numerous adversities; they also show all the rigidities connected to the development of the biological cycles of plant and animal life and, therefore, are difficult to control and / or compressible, reasons for which access to the

ordinary rate credit market is particularly burdensome, also in terms of guarantees to be provided.
The limited impact of credit facilities is due - for the short term - to the ban imposed at European level to facilitate the management credit that produces distortive effects on the conditions of competition between companies, and the so-called "de minimis rule" according to which a ceiling was set for facilitations at national level (see: EC Reg. 1535/2007; EC Reg. 875/2007).
In addition, for the medium and long term, at EU level, access to investments is facilitated almost exclusively through capital grants, which are not disclosed by the data provided by the Bank of Italy.
The factors determining the crisis of Sicilian agriculture, in addition to the international crisis that shows no sign of regressing, can be attributed to external causes such as the internationalization of markets and the increase in competitiveness between companies and countries (in the presence of minor constraints and protection imposed by the rules of the WTO); the transformation of the EU's common agricultural policy (CAP) towards reducing business support (with the advent of the so-called single payment scheme) and boosting entrepreneurial freedom; IT progress (especially IT, telematics and robotics) that promoted the differentiation and segmentation of economic activities with typical events in advanced countries; the growing international organizational dimension of food processing and distribution companies; the widening of the needs of consumers through the demand for differentiated products (at least for quality, certification, safety, environmental sustainability and information), with greater value added and available even out of season, which has contributed to increasing the distance between final consumption and

partly agricultural production through the provision of a set of services for obtaining which agriculture tends to integrate with other sectors.
The internal causes are essentially attributable to the types of organization of production processes and supply chain, for the prevalence in Sicilian agriculture of traditional forms of production that account for 85-90% of the quantity produced and 70-75% of the value of the basic agricultural production.
This production structure is made up of the individual company, with a high average age of tenants, who does not adopt quality and marketing strategies and, therefore, ends up operating on markets crowded with particularly efficient competitors. Another consequence is that this business system does not have the capacity to enhance the particular genetic heritage of typical and traditional products, as well as the Sicilian historical and cultural environment.
All this contrasts with modern, technological, competitive and multifunctional agriculture, oriented towards marketing, which operates on national and foreign markets with quality products and certified, increasingly integrated into the logics of the modern agri-food system, but which still assumes today too limited size[8].
Sicily is famous for its typical products, but this must be a stimulus to constantly strive to raise the level of production more and more, in the awareness that the qualitative element is an essential component of the challenge to the globalization of markets.
Quality also means also scientific research and transfer of research results. In this regard, it is fundamental to be able

[8] G. Timpanaro, I distretti produttivi agroalimentari per lo sviluppo locale in Sicilia, cit.

to enter the flows of technological innovation in order to transfer development and information to the agricultural world.
The competitiveness of costs and prices of the regional, national and EU economic system makes clear the need to focus on the production of excellence, meaning with this term also an ever increasing adaptation of production to demand, diversification of supply and an expansion of capacity productive.
These assumptions require that the organization of the Sicilian agricultural system presents itself with increasingly rational structures and able to identify in the territory the different forms of agriculture (industrialized and sustainable), so as to enhance their specificities.
Furthermore, the improvement of the organizational and management skills of a modern agricultural enterprise must be based on the renewal and renewal of those who must lead the company, since the involvement of young farmers is not only a sure future, but also guarantees innovation triggering a territorial dynamic capable of giving new answers to the challenges of the market[9].

6. Level of food security in the study areas

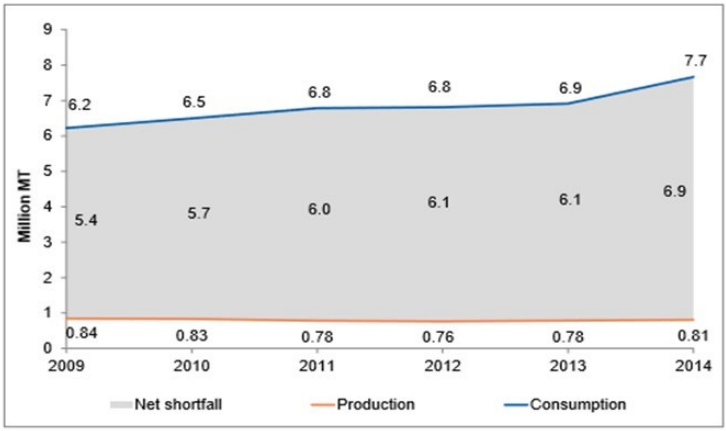
6.1. United Arab Emirates

[9] S. Zappulla, M. D'amico, *Il sistema agricolo nelle aree rurali della Sicilia*, Research within the institutional activities of the Osservatorio sul Sistema dell'Economia AgroAlimentare della Sicilia (OSEAAS), Catania, dicembre 2004.

The systematic expansion of a multi-ethnic, young and wealthy society, alongside the rapid increase in urbanization rates and the steady increase in tourist flows continue to support the growth of food consumption in the United Arab Emirates.
Despite the persistence of the demand for traditional foods, the frenetic lifestyles and the diversity of the gastronomic culture of the resident population have significantly increased the consumption of food products in recent years. In order to meet the growth in demand, there has been a significant increase in modern retail outlets, restaurants and manufacturing units along with new service delivery channels. In turn, these dynamics have led to a growing dependence on imports, due to the limited availability of arable land and water resources as well as the torrid climatic conditions and aridity of the territory.
In 2014, the latest statistics available, the production of food by the UAE amounted to 807,000 tons, sufficient to exploit only 10.5% of the total demand equal to 7.7 million tons.
The deficit between production and consumption has thus increased over time, in parallel with the expansion of the population, despite investments aimed at the use of limited natural resources (Figure 9).

[3]G. Timpanaro, I distretti produttivi agroalimentari per lo sviluppo locale in Sicilia, cit.
[4] S. Zappulla, M. D'amico, *Il sistema agricolo nelle aree rurali della Sicilia*, Research within the institutional activities of the Osservatorio sul Sistema dell'Economia AgroAlimentare della Sicilia (OSEAAS), Catania, dicembre 2004.

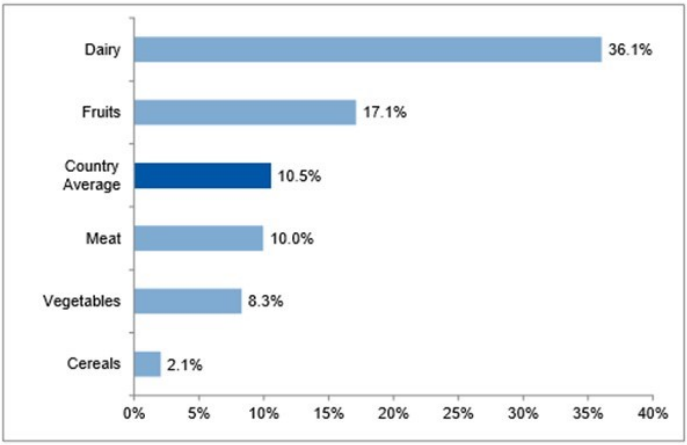
Figure 9 - The UAE Food Landscape



Source: AOAD, FCSA of UAE

Furthermore, the level of food self-sufficiency is widely diversified according to the type of product. Compatibly with the preferred diet, the self-sufficiency ratio varies from 2.1% of cereals to 36% of dairy products. On average, it is equal to 10%; but falls to 8% if compared to the single category of vegetables (Figure 10).

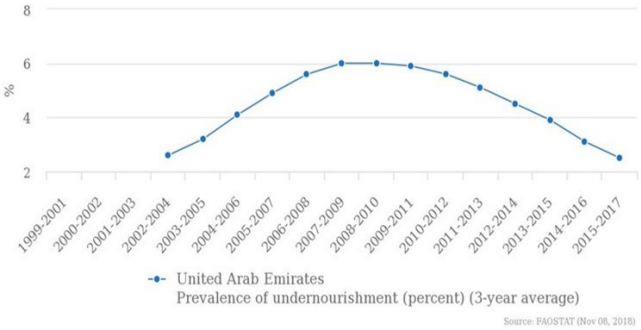
Figure 10 - Self-sufficiency Ratio in the UAE (2014)



Source: AOAD, FCSA of UAE

Overall, the undernourished population has decreased since the beginning of the third millennium, needs largely met by importing from third countries (Figure 11).

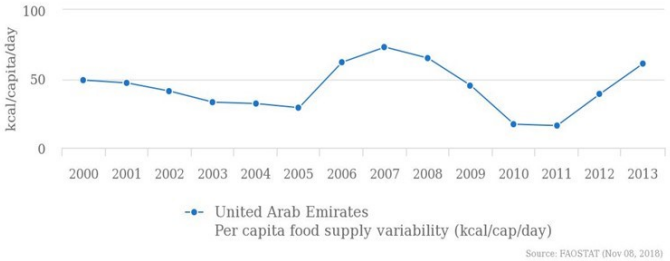
Figure 12 - Prevalence of undernourishment (%) (3-year average)



The emirin population has food diets compatible with a contribution in kcal / per capita which is growing in the last

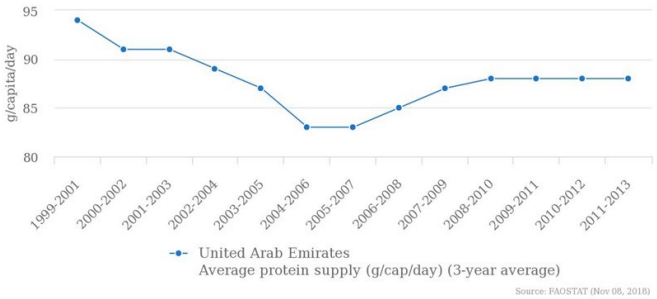
eighteen years (Figure 13), a sign of widespread economic-social well-being and attested by the high per capita income.

Figure 13 - Per capita food supply variability (kcal/capita/day)



The high caloric intake counterbalanced a choice of food policy aimed at supporting healthy diet diets, with a consequent reduction in protein intake and a parallel support of plant fibers and proteins (Figure 14), necessary to counteract the widespread problems of obesity especially infantile and allow health reflexes.

Figure 14 - Average protein supply (g/capita/day) (3-year average)



In fact, nutritional food support programs are being implemented that are slowly leading to a contraction of the average consumption of calories for animal proteins (Figure 15) with the aim of lowering the average level of energy consumed daily (Figure 16).

Figure 15 - Average supply of protein of animal origin (g/capita/day) (3-year average)

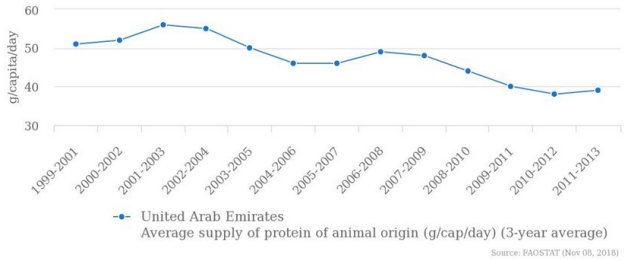
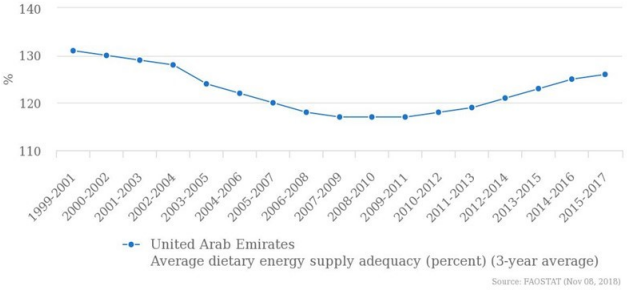


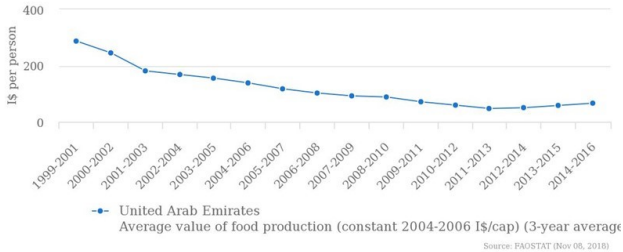
Figure 16 - Average dietary energy supply adequacy (%) (3-year average)



The average value of food production, expressed in constant dollars per capita, averaged in evident contraction (Figure 17).

In conclusion, the United Arab Emirates demonstrates the problems typical of countries with advanced economies, with the aggravating factor of the commercial dependence on other countries for the supply of food goods necessary to satisfy domestic demand. The focus shifts, therefore, from the availability of food in sufficient quantity to the availability in quality necessary to the needs of the population.

Figure 17 - Average value of food production (constant I$ per person) (3-year average)



6.2. Sicily - Italy

The study on food secutity in Sicily was conducted on the basis of data prepared by ISTAT for monitoring the objectives of Agenda 2030 and, in particular, the "*Goal 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture*".
In particular, the analysis was focused on the following indicators:

1. By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons;
2. By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons;
3. By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular

women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment;

4. By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

The data processed and summarized in Table 8 show the fragility of the Sicilian agri-food production / consumption system.

Table 8 - Main indicators for monitoring the objectives of the Agenda 2030 in Sicily and its comparison with national data (*)

Global indicator	Source	Survey Name	Name of indicator	Units	Territory	Time Series											
						2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight)	Istat	Multiscopo sulle famiglie: aspetti della vita quotidiana (PSN:IST-00204)	Overweight or obesity	%	Italy	45,0	45,2	45,5	45,3	46,2	45,7	45,4	45,3	45,0	45,5	44,1	44,8
					Sicily	49,6	50,6	53,0	49,4	50,6	48,9	48,5	49,7	50,3	50,0	47,4	48,8

Global indicator	Source	Survey Name	Name of indicator	Units	Territory	Time Series					
						2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight)	Istat	Multiscopo sulle famiglie: aspetti della vita quotidiana (PSN:IST-00204)	Overweight or obesity among children	%	Italy	26,7	26,9	26,4	25,6	24,9	24,7
					Sicily	33,2	33,3	31,9	30,7	25,8	24,4

Global indicator	Source	Survey Name	Name of indicator	Units	Territory	Time Series				
						2010	2011	2012	2013	2014
Volume of production per labour unit by classes of farming/pastoral/forestry enterprise size	Istat / CREA	Risultati economici delle aziende agricole (PSN:IST-00191)		euro	Italy	40.627	42.878	43.931	44.285	52.463
					Sicily	..	31.447	34.558	35.743	40.194

Global indicator	Source	Survey Name	Name of indicator	Units	Territory	Time Series	
						2010	2013
Proportion of agricultural area under productive and sustainable agriculture	Istat	Indagine sulla struttura e produzioni delle aziende agricole (PSN:IST-02346)	Percentage of land under organic farming	%	Italy	6,1	7,7
					Sicily	11,9	16,2

(*) Source: ISTAT, Rome "Goal 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture"

In particular, in Sicily, albeit with a fluctuating trend in the last twelve years considered (2005-2016), the prevalence of malnutrition among children under 5 years of age affects almost 49% of the realities observed through the multi-

purpose surveys of families (compared to 45% of the national data). This is a problem aggravated by unfavorable economic economic trends which saw, as many as two crisis periods spread in 2009 and 2012.
In terms of overweight among children, Sicily is perfectly in line with the national figure, with 24% of cases. The phenomenon is tending to contract following the advent of more health-fed diets.
The productivity of labor in agriculture, however, is in this area far below the national average, with a value of just over 40 thousand Euro, against 52.4 thousand Euro (-23%).
The share of utilized agricultural area invested in organic crops can help define a framework for the sustainability of the sector and, in Sicily, it is more than twice the corresponding national figure (16.2% against 7.7%).
According to the report by Coldiretti "Food poverty and waste in Italy" in 2017, 2.7 million people in Italy have been forced to ask for help for food to eat. Therefore, "Coldiretti points out" that more than half of the 5 million residents, according to ISTAT, are in a state of absolute poverty. There are just 114 thousand who have used the soup kitchens for 2.55 million who have instead accepted the help of food packages on the basis of data on food aid distributed with Fead funds through the Withdrawal Agency in Agriculture (Agea).
The problems of food security particularly affect Sicily as the poverty level reaches as much as 42% of the population, according to a study by the Alliance against poverty. Not only that, but a third of young people between 15-24 years (31.9%) do not study or work and a child born in Sicily in 2016 has a life expectancy of 2-3 years less than a child born elsewhere. The tools to combat this social and

economic phenomenon of absolute gravity are there but are not used correctly.
Although during the period of economic crisis the demand for food by the needy has increased, according to Caritas (2014) in our country we are not faced with a food emergency in the strict sense to be attributed to a reduction in the amount of food available, as for an economic emergency that has led to the reduction of all consumption: to renounce to do the shopping by contenting the food package, since other expenses such as bills or rent are difficult to compress in the family situations described above, is the signal of this phenomenon. In fact, the uniqueness of the current crisis derives from the singularity of some economic dynamics: there is a decline in income and consumption, and therefore a decline in total household spending, which, seeing their purchasing power gradually reduced, decide to reduce also the expenses destined to those goods that were once considered as "incompressible", such as food expenditure (Romano 2011).
But food poverty is not just about the level of supply. Perhaps an even more important phenomenon to underline is the possible impact on malnutrition. Diseases related to diets unfit for poor households should be considered to understand how in an advanced country, achieving sufficient energy intake does not mean automatically obtaining an adequate and nutritionally balanced diet. In this sense, recent data elaborated by Nomisma (2015) on the consumption of fruit and vegetables in Italy are of concern. If it is true that there is a certain correlation between low consumption of fruit and vegetables and diseases, the decline taking place in Italy has its origins well before the crisis of 2008. Since 2000, the annual per capita consumption of Italians has decreased by 17 kg, on average

1.5 kg less each year, but with a constant trend and therefore not only due to the economic crisis.

7. Sustainability in the study areas

7.1. United Arab Emirates

The United Arab Emirates is an essentially desert country, with an arid climate, scarcity of arable land and water resources, and a weight of the agricultural sector and fishery of less than 1% of GDP. As a result, the country is forced to import around 85 percent of its food needs.

To construct a picture on sustainability in the United Arab Emirates, reference was made to the elaboration of the "Global Food Security Index - GFSI" on measuring food security and the impact of resource risk produced by the Economist Intelligence Unit - Du Pont.

In addition to assessing food affordability, availability and quality and safety, the GFSI includes a category on natural resources and resilience. This category assesses a country's exposure to the impacts of a changing climate; its susceptibility to natural resource risks, and how the country is adapting to these risks.

Table 9 shows a summary of the main indicators developed. There emerges a framework compatible with the analyzes carried out using the FAOSTAT data, with some exceptions on the main macroeconomic data.

Table 9 - Index calculated for the United Arab Emirates under the Global Food Security Index (2018)

		2012	2013	2014	2015	2016	2017	**2018**	Source
OVERALL									
1) AFFORDABILITY									
1.1) Food consumption as a share of household expenditure	% of total household expenditure	13,9	13,9	13,9	13,9	13,9	13,9	**13,1**	National Accounts
1.2) Proportion of population under global poverty line	% of population living under $3.20/day 2011 PPP	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**	EIU Calculation
1.3) Gross domestic product per capita (US$ PPP)	US$ at PPP / capita	58.380,0	60.880,0	64.630,0	67.550,0	70.320,0	74.120,0	**75.000,0**	EIU
1.4) Agricultural import tariffs	%	6,6	6,8	5,5	5,5	5,4	5,4	**5,5**	WTO
1.5) Presence of food safety net programmes	Qualitative assessment (0-4)	4,0	4,0	4,0	4,0	4,0	4,0	**4,0**	EIU qualitative score
1.6) Access to financing for farmers	Qualitative assessment (0-4)	4,0	4,0	4,0	4,0	4,0	4,0	**4,0**	EIU qualitative score
2) AVAILABILITY									
2.1) Sufficiency of supply									
2.1.1) Average food supply	kcal/capita/day	3.245,0	3.245,0	3.245,0	3.215,0	3.215,0	3.280,0	**3.280,0**	FAO
2.1.2) Dependency on chronic food aid	Qualitative assessment (0-2)	2,0	2,0	2,0	2,0	2,0	2,0	**2,0**	EIU estimate based on OECD
2.2) Public expenditure on agricultural R&D	Rating 1-9	1,0	1,0	1,0	1,0	1,0	1,0	**1,0**	EIU estimate
2.3) Agricultural infrastructure									
2.3.1) Existence of adequate crop storage facilities	Qualitative assessment (0-1)	1,0	1,0	1,0	1,0	1,0	1,0	**1,0**	EIU qualitative score
2.3.2) Road infrastructure	Qualitative assessment (0-4)	3,0	3,0	3,0	3,0	3,0	2,0	**3,0**	EIU
2.3.3) Port infrastructure	Qualitative assessment (0-4)	4,0	4,0	4,0	4,0	4,0	4,0	**4,0**	EIU
2.4) Volatility of agricultural production	standard deviations	0,7	0,7	0,8	0,8	0,8	0,8	**0,8**	FAO
2.5) Political stability risk	Rating 0-100; 100=highest risk	50,0	45,0	45,0	45,0	45,0	45,0	**45,0**	EIU
2.6) Corruption	Rating 0-4; 4=highest risk	2,0	2,0	2,0	2,0	2,0	1,0	**1,0**	EIU
2.7) Urban absorption capacity	GDP (% of real change) minus the urban growth rate	-9,6	-4,6	-1,9	0,6	1,7	1,8	**1,3**	EIU/World Bank
2.8) Food loss	Total waste/total domestic supply quantity (tonnes)	6,9	6,9	6,9	5,9	5,9	6,1	**6,1**	FAO
3) QUALITY AND SAFETY									
3.1) Diet diversification	%	56,0	57,0	57,0	58,0	58,0	58,0	**57,0**	FAO
3.2) Nutritional standards									
3.2.1) National dietary guidelines	Qualitative assessment (0-1)	0,0	0,0	0,0	0,0	0,0	0,0	**0,0**	EIU qualitative score
3.2.2) National nutrition plan or strategy	Qualitative assessment (0-1)	1,0	1,0	1,0	1,0	0,0	0,0	**0,0**	EIU qualitative score
3.2.3) Nutrition monitoring and surveillance	Qualitative assessment (0-1)	1,0	1,0	1,0	1,0	1,0	1,0	**1,0**	EIU qualitative score
3.3) Micronutrient availability									
3.3.1) Dietary availability of vitamin A	Qualitative assessment (0-2)	2,0	2,0	2,0	2,0	2,0	2,0	**2,0**	FAO
3.3.2) Dietary availability of animal iron	mg/person/day	4,5	4,5	4,5	4,5	4,5	4,5	**4,5**	FAO
3.3.3) Dietary availability of vegetal iron	mg/person/day	15,1	15,1	15,1	15,1	15,1	15,1	**15,1**	FAO
3.4) Protein quality	Grams	70,9	73,0	70,9	69,5	69,5	69,5	**70,9**	FAO
3.5) Food safety									
3.5.1) Agency to ensure the safety and health of food	Qualitative assessment (0-1)	1,0	1,0	1,0	1,0	1,0	1,0	**1,0**	EIU qualitative score
3.5.2) Percentage of population with access to potable water	% of population using at least basic drinking water services	99,6	99,6	99,6	99,6	99,6	99,6	**99,6**	World Bank
3.5.3) Presence of formal grocery sector	Qualitative assessment (0-2)	2,0	2,0	2,0	2,0	2,0	2,0	**2,0**	EIU qualitative score
4) NATURAL RESOURCES & RESILIENCE									
4.1) Exposure									
4.1.1) Temperature rise	Index score; 0=least vulnerable	n/a	n/a	n/a	n/a	n/a	88,1	**88,1**	ND-GAIN
4.1.2) Drought	0-5, where 5=most risk	n/a	n/a	n/a	n/a	n/a	3,2	**3,2**	WRI Aqueduct
4.1.3) Flooding	Index score; 0=least vulnerable	n/a	n/a	n/a	n/a	n/a	0,0	**0,0**	ND-GAIN
4.1.4) Storm severity (AAL)	US$m	n/a	n/a	n/a	n/a	n/a	100,0	**100,0**	Global Assessment Report on Disaster Risk Reduction 2015
4.1.5) Sea level rise	Index score; 0=least vulnerable	n/a	n/a	n/a	n/a	n/a	0,0	**0,0**	ND-GAIN
4.1.6) Commitment to managing exposure	0-13, where 13=all elements are included	n/a	n/a	n/a	n/a	n/a	2,0	**2,0**	CCFAS
4.2) Water									
4.2.1) Agricultural water risk—quantity	0-5, where 5=highest risk	n/a	n/a	n/a	n/a	n/a	3,4	**3,4**	WRI Aqueduct
4.2.2) Agricultural water risk—quality	0-5, where 5=highest risk	n/a	n/a	n/a	n/a	n/a	4,3	**4,3**	WRI Aqueduct
4.3) Land									
4.3.1) Soil erosion/organic matter	1-4 scale where 1 = best soil quality (No or Slight Limitations) and 4 = worst soil quality (Very Severe Limitations)	n/a	n/a	n/a	n/a	n/a	2,3	**2,3**	Harmonized World Soil Database
4.3.2) Grassland	Net emissions/removals (CO2), gigagrams	n/a	n/a	n/a	n/a	n/a	0,0	**0,0**	FAO
4.3.3) Forest change	Change in forest area as % of total land area	n/a	n/a	n/a	n/a	n/a	0,2	**0,2**	World Bank
4.4) Oceans									
4.4.1) Eutrophication and hypoxia	0-2, where 2=healthiest oceans	n/a	n/a	n/a	n/a	n/a	0,0	**0,0**	WRI
4.4.2) Marine biodiversity	%	n/a	n/a	n/a	n/a	n/a	56,3	**67,7**	Yale Environmental Performance Index
4.4.3) Marine protected areas	%	n/a	n/a	n/a	n/a	n/a	21,0	**4,3**	World Database on Protected Areas
4.5) Sensitivity									
4.5.1) Food import dependency	Ratio	n/a	n/a	n/a	n/a	n/a	98,2	**99,9**	FAO
4.5.2) Dependence on natural capital	%	n/a	n/a	n/a	n/a	n/a	0,0	**0,0**	World Bank
4.5.3) Disaster risk management	0-7, where 7=best	n/a	n/a	n/a	n/a	n/a	5,0	**5,0**	EIU Risk Briefing; World Bank--Climate Smart Agriculture Indicators
4.6) Adaptive capacity									
4.6.1) Early warning measures/climate smart ag	0-2, where 2=best	n/a	n/a	n/a	n/a	n/a	0,0	**0,0**	CCAFS
4.6.2) National agricultural risk management system	0-6, where 6=best	n/a	n/a	n/a	n/a	n/a	4,0	**4,0**	World Bank--Climate Smart Agriculture Indicators
4.7) Demographic stresses									
4.7.1) Population growth (2016-21)	%	n/a	n/a	n/a	n/a	n/a	2,0	**1,4**	World Population Prospects
4.7.2) Urbanisation (2016-21)	%	n/a	n/a	n/a	n/a	n/a	2,3	**1,7**	World Urbanization Prospects
--BACKGROUND DATA SERIES--									
BG01) Prevalence of undernourishment	%	5,0	5,0	5,0	5,0	5,0	5,0	**3,8**	FAO
BG02) Percentage of children stunted	%	6,7	6,8	6,8	6,8	n/a	n/a	**n/a**	WHO
BG03) Percentage of children underweight	%	3,7	3,8	3,8	3,8	n/a	n/a	**n/a**	WHO
BG04) Intensity of food deprivation	kcal/person/day	30,0	26,0	22,0	22,0	18,0	18,0	**30,0**	FAO
BG05) Human Development Index	Rating 0-1	0,8	0,8	0,8	0,8	0,8	0,8	**0,8**	UNDP
BG06) Global Gender Gap Index	Rating 0-1	0,6	0,6	0,6	0,6	0,6	0,6	**0,6**	WEF
BG07) EIU Democracy Index	Rating 1-10; 10=most democratic	2,6	2,6	2,6	2,6	2,8	2,7	**2,7**	EIU
BG08) Prevalence of Obesity	%	30,7	30,9	31,1	31,4	31,4	31,4	**31,7**	WHO; World Bank

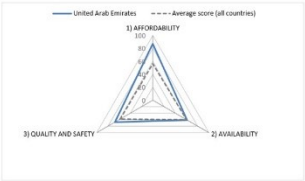
The scores achieved by the United Arab Emirates in the 2018 GFSI (Figure 18) were positive overall for indicators such as "food consuption", "presence of food safety net programs", "food safety", etc., even if a modest negative trend is recorded in "quality and safety" (-0.9%), "agricultural import tariffs" (-1.7%), in "diet diversification" (-4.1%) and "protein quality" (-0.4%).

Figure 18 - Indices of the GFSI Global Food Security Index for the United Arab Emirates (2018)

United Arab Emirates

Score = 2018 Score 0-100 where 100=best.
Δ = Change in 2018 score compared with 2017
Green= score improved
Red = score deteriorated
Rank = 2018 Rank out of 113 countries, 1=best. '=' before the rank indicates a tie.

Category	Score	Δ	Rank	Average score (all countries)
OVERALL	72,5	+0,8	31	58,4
1) AFFORDABILITY	87,0	+0,2	4	56,9
2) AVAILABILITY	61,2	+2,1	50	60,3
3) QUALITY AND SAFETY	67,7	-0,9	43	58,2
1.1) Food consumption as a share of household expenditure	87,1	+1,3	16	55,6
1.2) Proportion of population under global poverty line	100,0	0,0	1	80,9
1.3) Gross domestic product per capita (US$ PPP)	58,4	+0,2	4	16,7
1.4) Agricultural import tariffs	91,1	-1,7	7	75,4
1.5) Presence of food safety net programmes	100,0	0,0	1	65,5
1.6) Access to financing for farmers	100,0	0,0	1	62,6
2.1) Sufficiency of supply	82,9	0,0	23	56,8
2.2) Public expenditure on agricultural R&D	0,0	0,0	62	15,6
2.3) Agricultural infrastructure	89,8	+10,2	=11	58,7
2.4) Volatility of agricultural production	0,0	0,0	113	86,4
2.5) Political stability risk	47,1	0,0	50	46,8
2.6) Corruption	75,0	0,0	11	37,6
2.7) Urban absorption capacity	78,8	+7,8	50	78,9
2.8) Food loss	83,4	0,0	80	84,9
3.1) Diet diversification	63,8	-4,1	44	56,0
3.2) Nutritional standards	34,6	0,0	=101	80,1
3.3) Micronutrient availability	67,9	0,0	9	43,9
3.4) Protein quality	66,9	-0,4	31	47,2
3.5) Food safety	99,7	0,0	=28	80,3



BG01) Prevalence of undernourishment	3,8	%
BG02) Percentage of children stunted	n/a	%
BG03) Percentage of children underweight	n/a	%
BG04) Intensity of food deprivation	30,0	kcal/person/day
BG05) Human Development Index	0,8	Rating 0-1
BG06) Global Gender Gap Index	0,6	Rating 0-1
BG07) EIU Democracy Index	2,7	Rating 1-10; 10=most democratic
BG08) Prevalence of Obesity	31,7	%

VERY GOOD | GOOD | MODERATE | WEAK

However, the indicators on natural resources are clearly negative and often inadequate (Figure 19).

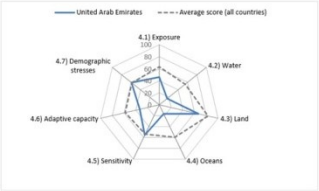
Figure 19 - Indices on natural factors presented in the GFSI Global Food Security Index for the United Arab Emirates (2018)

United Arab Emirates

Score = 2018 Score 0-100 where 100=best.
Rank = 2018 Rank out of 113 countries, 1=best. '=' before the rank indicates a tie.

Category	Score	Rank	Average score (all countries)
4) NATURAL RESOURCES & RESILIENCE	**40,7**	**113**	**62,2**
4.1) Exposure	46,0	108	83,3
4.2) Water	16,6	110	55,0
4.3) Land	66,6	112	82,9
4.4) Oceans	16,5	107	59,7
4.5) Sensitivity	55,7	=85	54,0
4.6) Adaptive capacity	33,3	=83	58,1
4.7) Demographic stresses	59,2	62	58,4
4.1.1) Temperature rise	58,7	83	70,4
4.1.2) Drought	15,9	108	64,9
4.1.3) Flooding	55,7	20	39,5
4.1.4) Storm severity (AAL)	0,0	104	56,4
4.1.5) Sea level rise	92,3	103	95,1
4.1.6) Commitment to managing exposure	15,4	81	39,5
4.2.1) Agricultural water risk—quantity	17,8	108	53,2
4.2.2) Agricultural water risk—quality	12,2	111	62,0
4.3.1) Soil erosion/organic matter	57,2	113	86,2
4.3.2) Grassland	100,0	1	97,6
4.3.3) Forest change	61,6	49	58,6
4.4.1) Eutrophication and hypoxia	0,0	100	75,2
4.4.2) Marine biodiversity	35,6	68	53,0
4.4.3) Marine protected areas	8,6	56	33,7
4.5.1) Food import dependency	0,0	112	24,7
4.5.2) Dependence on natural capital	100,0	1	88,8
4.5.3) Disaster risk management	71,4	24	57,6
4.6.1) Early warning measures/climate smart ag	0,0	66	46,0
4.6.2) National agricultural risk management system	66,7	57	70,2
4.7.1) Population growth (2016-21)	56,7	66	57,8
4.7.2) Urbanisation (2016-21)	66,7	53	60,2

VERY GOOD | GOOD | MODERATE | WEAK



The index shows, in fact, that apart from the allocation of grassland, the dependence on natural capital, the disaster risk management (with a score of 100), the evaluations on aqua, land, exposure, storm severity, sea level are very limited. laugh, soil erosion / organic matter, etc., as a result of previous analysis.

7.2. Sicily - Italy

On September 25, 2015, the United Nations General Assembly adopted the 2030 Agenda containing the global objectives for the realization of a sustainable development, called Sustainable Development Goals (SDGs). In 2017 the United Nations Statistical Commission adopted a list of 200 indicators that have repeatedly been updated. In this scenario, also our National Statistical Institute ISTAT took part, called by the United Nations to build the statistical information related to the monitoring of the 2030 Agenda in our country. The ISTAT therefore presents in its first annual

report, called REPORT SDGs 2018, an update of the indicators already disseminated accompanied by the analysis of their trend trend, with the aim of monitoring progress towards the model of sustainable development established by the global community. "The Report proposes a further expansion of the indicator landscape: with this Report, the ISTAT will provide an updated set of 117 UN-IAEG-SDGs indicators and, for these, 235 national measures, all available on the website www.istat.it . There is no univocal correspondence between the indicators defined at international level and the measures identified for Italy. For 83 measures there is a perfect coincidence with the international indicators, 96 measures partially reflect the information needs of the international indicator to which they are connected (this happens for several reasons, mainly because not all data are available in the required specificity). The remaining 56 measures have been inserted in order to provide further elements useful for understanding and monitoring the target set in the "national context": the concept of sustainable development (People, Planet, Prosperity, Partnership, Peace) of the Agenda 2030 not in fact, it can do without specific progress in the living conditions of people in their own country. For 82 measures, already disseminated in December 2017, updates were made of the time series or an increase in the breakdowns. In general, for about three quarters of the indicators it was also possible to provide the territorial breakdowns. "(Report on SDGs 2018. Statistical information for the 2030 Agenda in Italy.

The table 10 below shows the main indicators of agricultural interest with the relative percentages concerning Sicily, Italy and the difference between the two values necessary to

make the position of our region understand the rest of the national territory.

Table 10 - Sustainability indexes in Sicily, calculated in the context of the UN Agenda 2030

NAME OF INDICATOR	UNITS	TIME SERIES	SICILY	ITALY	DIFFERENCE IN VALUES (Italy- Sicily)
Production of farms per labour unit	euro	2015	34.448	53.228	18.780
Percentage of utilized agricultural area under organic farming	%	2016	26,4	12,3	-14,1
Ammonia emissions from agriculture	tonn	2015	13168,8	377937,2	364768,4
The agriculture orientation index for government expenditures	%	2016	/	0,25	/
Official Development Assistance (ODA) in agriculture	Millions of euro	2016	/	50,93	/
Wetlands of International Importance (number)	n	2013	6	64	58
Soil sealing from artificial land cover	%	2016	7,18	7,64	0,46

Although the number of indicators related to the agricultural sector is small, as shown in the table, they provide important data.

Regarding the first indicator, "Production of farms for labor units", it is possible to highlight how Sicily, with € 34,448, holds a much higher amount than the rest of Italy in the face of a gap between our region and the rest national territory equal to € 18,780, distributed among other Italian regions.
In the case of the second indicator, "Percentage of utilized agricultural area under organic farming", Sicily holds the highest percentage of utilized agricultural land invested in organic farming, higher than the total recorded throughout the national territory.
The "Ammonia emissions from agriculture" indicator shows that Sicily is in an intermediate position compared to the rest of Italy. In fact, our region is not characterized by the highest values in terms of tons, considering the other regions and moreover, compared to previous years, there has been a decrease in the ammonia emission rate produced by the agricultural sector.
As regards "The agriculture orientation index for government expenditures", the indicator was calculated on a national basis and a regional breakdown was not carried out as it concerns public expenditure for the agricultural sector. In Italy they amount to 25%, as shown in the table. While the "Official Development Assistance (ODA) in agriculture" index makes it possible to highlight how in 2016 public aid for the development of the agricultural sector was characterized by an investment of € 50.93 million.
Another important indicator, "Wetlands of International Importance (number)", shows that Sicily is characterized by a high number of wetlands compared to other Italian regions, some of which are lacking. In fact, the national territory has 64 wetlands, 6 of which fall into our region; important data for the conservation of biodiversity and for the maintenance of ecosystems.

The last indicator considered, "Soil sealing from artificial land cover", refers to the global indicator relating to soil degradation. In this scenario, Sicily is unfortunately characterized by a high percentage compared to the national territory.

8. Consistency of organic farming in the study areas

8.1. Generality

Currently in the world organic farming is applied on 50.9 million hectares (end of 2015 for most of the data). The country with the largest investment in organic farming lands is Oceania with 22.8 million hectares, followed by Europe with 12.7 million hectares, Latin America (6.7 million hectares), the Asia (almost 4 million hectares), North America (almost 3 million hectares) and Africa (1.7 million hectares) (Table 11).

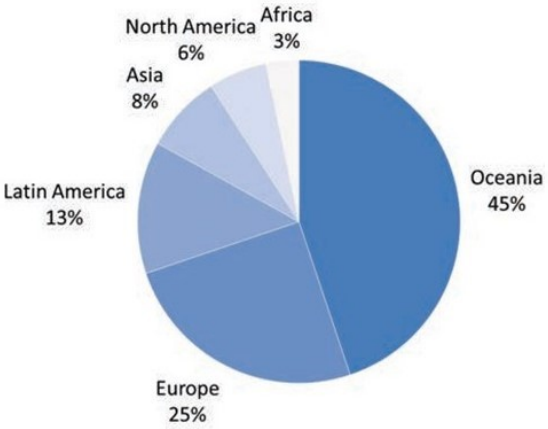
Table 11 - Organic agricultural area in the world (including the share in conversion) and distribution in the various countries

Region	Organic agricultural land [hectares]	Regions' shares of the global organic agricultural land
Africa	1'683'482	3%
Asia	3'965'289	8%
Europe	12'716'969	25%
Latin America	6'744'722	13%
North America	2'973'886	6%
Oceania	22'838'513	45%
Total*	50'919'006	100%

Oceania alone represents, for 45%, the world surface managed according to the biological method. Europe has been the protagonist of a constant growth of biological surface over the years, having a quarter of the world

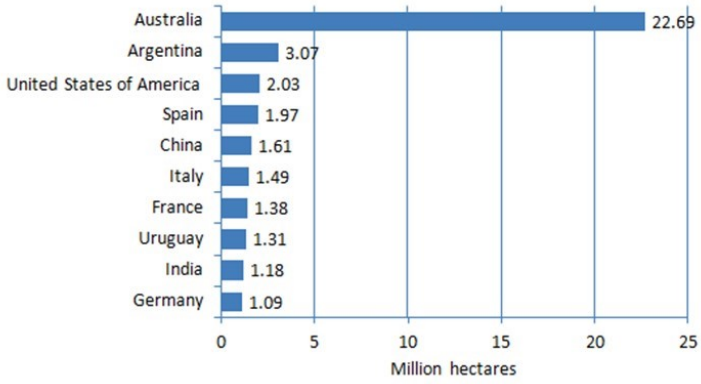
biological surface, followed by Latin America with 13%; Australia recorded an important growth in 2015 (+4.4 million hectares) where it is estimated that 97% of the cultivated lands are extensive areas of pasture. Argentina is second, followed by the United States in third place (Figure 20).

Figure 20 - Distribution of organic agricultural land by region 2015
Source: FiBL Survey 2017



The ten countries with the main agricultural areas governed according to the method under analysis have a total of 37.8 million hectares and constitute almost three quarters of the global organic agricultural area, there are also other "organic" areas ascribable to those of wild harvesting. These constitute more than 39.7 million hectares (Figure 21).

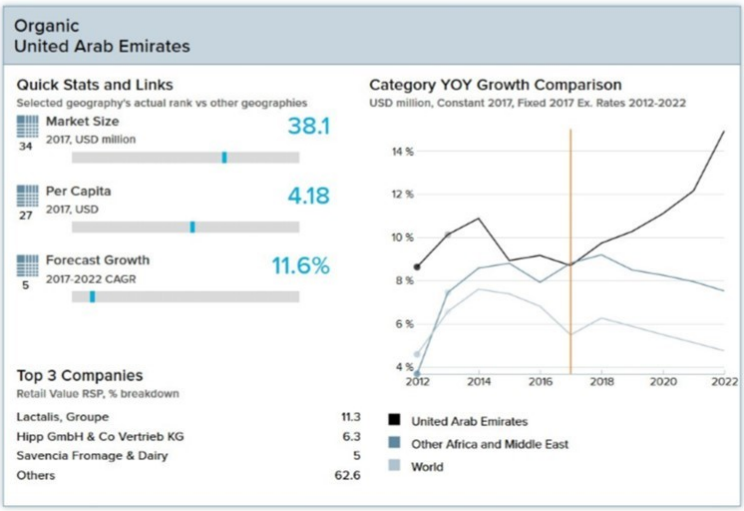
Figure 21 - Distribution of the organic agricultural area in the various countries



8.2. United Arab Emirates

The framework on organic farming in the United Arab Emirates was built on the basis of the evaluations carried out by the Organ Trade Association's Organic Export Program.
The Organic Trade Association (OTA) brings the US organic industry to emerging and established markets around the world. OTA's international programs create new opportunities for organic products through promotions, exporter education, business-to-business connections, and trade negotiations.
A complete overview of the market trend of organic farming in the United Arab Emirates is shown in Figure 22.

Figure 22 - United Arab Emirates Biological Framework produced by "Organ Trade Association's Organic Export Program" (2018)



Based on these analyzes, it emerged:

- The total market size for organic packaged food and beverages in the UAE in 2017 is US$38.1mn, making it the 34th largest market in the world by value.
- Per capita spending on organic packaged food and beverages in the UAE is US$4.18, which ranks as the 27th largest spending per capita in the world.
- The largest company by sales in organic packaged food and beverages is Lactalis Groupe, which maintains 11.3% of total sales.
- Organic packaged food and beverages in the UAE will see strong yearon-year growth of close to 10% in 2018. This is slightly faster than the rest of the

Middle East and Africa region, which will experience nearly 8% year-on-year growth in 2018.

- The UAE maintains a market size for organic packaged food and beverages of US$38.1mn in 2017, which is 0.1% of global category sales.
- Within the Middle East and Africa region, only Turkey, Morocco and Israel surpass the UAE in total value sales of organic packaged food and beverages.
- The UAE will experience strong forecast growth of sales of organic packaged food and beverages, at an 11.6% CAGR (Gulf Cooperation Council (GCC)) from 2017–2022.
- The total market size for organic packaged food and beverages in the UAE in 2017 is US$38.1mn, making it the 34th largest market in the world by value.
- Sales of organic food in the UAE have been growing in recent years, but sales of organic beverages remain negligible.
- Due to high prices, high-income Western expatriates in the UAE are generally target consumers for organic packaged food.

How much, instead, to the main market trends emerges (Figure 23):

- Sales of organic beverages are almost nonexistent in the UAE.
- Organic packaged food sales have posted strong growth rates in recent years, due to increasing awareness and product availability.
- Parents in particular tend to view organic packaged food as better options for their children.

- Organic dairy and sauces, dressings and condiments are two of the largest organic packaged food categories in terms of sales value.

Figure 23 - Main market trends of organic products in the United Arab Emirates (2018)

The competitive landscape in the Emirates looks like this:

- The organic packaged food landscape in the UAE is fragmented and competitive.
- Foreign companies dominate the landscape, as the expatriate community, who can afford organic products, seeks out the brands they trust and know from their home countries.
- Lactalis Groupe is the market leader with 11.3% value share, followed by Hipp GmbH & Co Vertrieg KG with 6.3%.

Finally, the prospects and growth opportunities are linked to:

- Sales of organic packaged food and beverages are projected to grow in coming years, driven by

increasing consumer health consciousness and environmental awareness.

- The sales value of organic dairy is projected to grow at a particularly strong rate in coming years.
- Sales of health and wellness products have grown in recent years as the UAEs increasingly urban consumer base has become more health conscious and has more disposable income to spend on products that help them maintain healthy lifestyles.
- The government of the UAE has invested in public service campaigns warning of the dangers of diabetes, obesity and heart disease, which has led many consumers to opt for food and beverages that are low in sugar.

8.3. Sicilia-Italia

According to SINAB data as of December 31, 2017, Sicily is in first place in Italy by number of operators, with 11,626 units (+ 6% compared to the previous year), followed by Calabria and Puglia (table 12).

Table 12 - Main characteristics of organic farming in Sicily - Italy (*)

Indications		2017	
		value	%
Organic surface		427,295,0	
% on Italy		22.4	
% Organic / total regional area		31.1	
% Organic / total regional farms		5.3	
Crops			
Cereals		89,916,2	21.0
Protein crops		23,932,7	5.6
Root plants		191,1	0.0
Industrial crops		1,180,6	0.3
Forage crops		107,549,6	25.2
Other arable crops		5,505,5	1.3
Vegetables		9,395,4	2.2
Fruit		6,619,3	1.5
Fruit in shell		22,408,8	5.2
Citrus fruits		39,363,3	9.2
Grapes		55,830,0	13.1
Olivo		65,402,5	15.3
	total	**427,295,0**	**100.0**

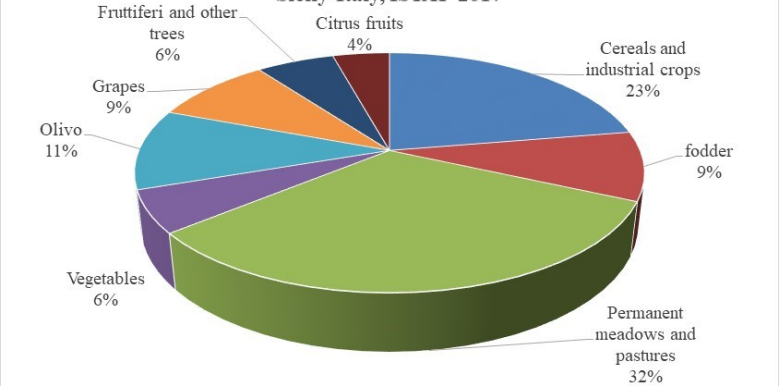
Farms			
Exclusive producers		9,385	80.7
Manufacturers / Preparers		1,327	11.4
Exclusive trainers		896	7.7
Importers		18	0.2
	total	**11,626**	**100.0**

(*) Source: our elaboration on SINAB, Rome.

If disaggregated, this figure reveals a massive presence of exclusive producers (9.385) and a much more modest presence of producers / preparers (1.327), which although up compared to previous years (over the last five years have more than doubled) represent less than 5% of the total organic producers of the Island (the national average is 9.1%). It is also noted that Sicily ranks fourth among the Italian regions, after Emilia Romagna, Lombardy and Veneto, for the number of exclusive trainers (896, equal to 9.1% of the national total), while just 18 are the importers who also carry out production and preparation activities.
In terms of area, there is an increase of 17.5% over the previous year with a total amount of 427 thousand hectares, out of 1.9 million hectares at the national level.
Sicily is a national leader in the citrus fruit sectors with 39.363 hectares (42.5% of the national total), vineyards with 55.830 hectares (27.2% in Italy), dried fruits with 22.408 hectares (20.6%) % of the national total) and root plants with 191 hectares (36%).
With reference to the crop distribution (Figure 24), 32% is represented by permanent meadows and pastures, followed

by fodder (9%), cereals (23%), olive cultivations (11%) and vine-growing (9%).

Figure 24 - Distribution of the area invested for main crops in Sicily-Italy, ISTAT 2017



Overall, the chain of organic products in Sicily is characterized by some apparently contradictory aspects. The high regional production potential does not correspond to an adequate presence of products on the markets, especially at the national level, and the share of processed products is modest also due to the obsolescence of part of the Sicilian structures. Many companies are not able to concentrate the offer and reach a critical mass adequate to the needs of the GDO, but there are cases of successful companies, especially among those vertically integrated and operating within the cooperative system. However, as highlighted by SINAB data, the number of producers / trainers has almost doubled in the last four years, as did that of exclusive trainers, highlighting a positive evolution of the sector towards greater vertical integration.

With regard to alternative marketing channels to large retailers, Sicily, albeit considerably behind the central-northern regions, has recorded significant growth over the

last few years. For example, e-commerce sites specialized in the sale of organic products have reached 11.5% of the national total. Basse, instead, are the percentages that concern the presence of organic stores (just 35, 2.7% of the national total), markets (3.4%) and organic restaurants (1.7%). The 12 organic school canteens present in Sicily (just 1% of the national total) still testify to the region's delay regarding the food and environmental education of the youngest.

9. Conclusion

The work served to create a framework on food security in the study countries, namely the United Arab Emirates and Sicily-Italy.
To this end, on the basis of official statistics, the fundamental pillars have been investigated, such as: Availability of food supplies (domestic production; import capacity; food stocks; food aid), Accessibility physical and economic access to food (purchasing power, income of population; transport and market; infrastructure), Utilization of food (food safety, hygiene and manufacturing, practical applications in: primary agricultural production, harvesting and storage, food processing, transportation, retail, households, diet quality and diversity: meeting needs in terms of energy, macro and micronutrients), Stability of food supply and access (weather variability, price fluctuations, political factors, economic factors).
An interesting picture emerged on the role of economic development, the sustainability of these economies and the adoption of organic farming.

In perspective these aspects deserve more and more a multidisciplinary study combining agriculture, ecology, biodiversity, science of climate change, sustainability, economy and community development.

In the 21st century, the world is facing a myriad of complex global challenges, including climate change mitigation, global health, coping with massive migration, preventing terrorism, ensuring cyber security and preventing abuse of human rights. Multi-stakeholder responses to these global challenges require a concerted effort, not only from governments, but also from civil society, the private sector, international organizations, private philanthropies and individuals.

Ensuring food and food security will be crucial in meeting many of the United Nations Sustainable Development Goals by 2030.

In this way food security becomes food sovereignty with its ability to promote the restoration, maintenance and conservation of indigenous food systems and the cultural reproduction of the indigenous knowledge of the production, distribution and nutrition of food.

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3. A Sustainable Organic Production Model for 'Food Sovereignty' in the United Arab Emirates and Sicily-Italy

Abstract: The aim of this research is to contribute to food security by studying the development of integrated organic production models related to the biodiversity of food sources, soil fertility and water availability, both in the United Arab Emirates (UAE) and Sicily. Using the FAO's multi-facetted approach of the Sustainable Assessment of Food and Agriculture Systems (SAFA) Tool, combined with interviews and visits to two organic farming communities in the UAE and Sicily, preliminary results were obtained consisting of: SAFA reports for each farmer and each community, and the identification of some additional SAFA Tool indicators for local markets and migrant worker relations. Overall, the two systems contain elements described in the literature, such as Short Food Local Systems, and as such contribute to territorial food support. Some best practices in organic production, direct marketing and migrant worker integration were identified and shared with farmers. The study highlights some operational issues that will be further focused upon in the future.

Keywords: organic agriculture; Sustainable Assessment of Food and Agriculture Systems by the FAO; Short Food Supply Chains.

1. Introduction

Climate change, economic crises, migration flows, quality of life considerations and the impact on human health of consuming local resources destined for competition on the global market are increasing pressure for a movement towards pathways based on sustainability linked to specific local characteristics [1].

These processes have raised awareness among policy-makers and the public of the fragility of the global food system, to the point that the concept of "food security" is now widely developed but with different meanings between the term "food security" itself (the right of access of populations to food and drinking water), "food safety" (access to healthy food with no risks to human health and no contaminants) and "food sovereignty".

Food sovereignty is a political definition referring to a country's right to autonomously define its agricultural and food policies, as well as its patterns of production and consumption, in a socially fair and environmentally friendly way, thus enabling the citizens and inhabitants of an area to access sustainable food and promote the development of the area in which they live. This concept of food planning, which is a challenge that involves both developing and developed areas, ends up - within specific geographical contexts - being dependent on sensitivity towards and knowledge of sustainable consumption (with communicational activities that exploit transversal skills), on the promotion of "social innovation" processes regarding food (with the involvement of public administrations and civil society), on the co-production of innovative services (through co-decisional processes), and on the promotion of participatory forms of governance in order to develop

agreed decisions to enable the achievement of well-defined public and private objectives [2, 3]. These types of production models activate “Short Food Supply Chains (SFSCs)” that are taken into account by various stakeholders in defining economic development policies [4, 5, 6]. SFSCs thus represent a local agri-food policy model that is able to tackle the seriousness of the challenges posed by demographic trends and by the increase in global demand for food and fibre in a way that is compatible with the planet's food security strategies and with strategies for the protection of nature and biodiversity in land use. Organic agriculture also comes into play in this context for its ability to contribute to the conservation of the natural environment and to provide - in the short and long-term - diverse ecosystem services capable of producing additional environmental benefits compared to conventional agriculture (animal welfare and rural development, for example). Although the latter gives higher productivity levels per unit of land area (thus being apparently preferable to organic agriculture in terms of food security), it does not adequately respond to consumer demand for healthy and safe food and the need to maintain and increase the levels of organic matter in the soil [7].

Closely relevant to this process are the United Arab Emirates (UAE) and Sicily, linked by similar climate, demographic and migratory issues. Food security is an important issue for the UAE [8, 9], since the country suffers from a lack of essential resources for agricultural activities - for example fertile soil, water for irrigation and labour skills [10, 11]. This is countered by a proliferation of investment in infrastructure and economic activities (also in the tourism-hospitality sector, with more than 11,000 businesses - over 4,000 in Dubai and 3,000 in Abu Dhabi) which have

attracted a high level of immigration (more than 200 ethnicities from all over the world) causing an increased demand for food that the country has tackled through imports. According to studies and research carried out by some leading international organizations (Economist Intelligence Unit), the UAE imports about 90% of its food products and finished foods, worth over USD 5.5 billion in 2015 (Table 1).

Table 1. Main macroeconomic indicators on food insecurity and organic farming in the UAE and in Sicily (*)

	UAE			Sicily		
Indications	value	period	source	value	period	source
Total population, mns	8.8	2016	FAO	5.0	2016	ISTAT
GDP per capita (USD)	40,160.0	2016	FAO	18,264.4	2016	ISTAT
Surface, hectares	98,577.0	2015	FAO	1,387.5	2015	ISTAT
Agri-food import, mio USD	14,17	2016	FAO	894.6	2016	ISTAT
Agri-food export, MIO USD	3,38	2016	FAO	1,199.6	2016	ISTAT
Consumer expenditure per capita on food and non-alcoholic beverages (USD)	3,206.9	2016	FAO	5,214.17	2016	ISTAT
Average dietary energy supply adequacy (%) (3-year average)	124	2014-2016	FAO			

Number of severely food insecure people, millions	3.4	2014-16	FAO			
Average dietary energy supply adequacy (%) (3-year average)	146	2014-16	FAO			
Organic Surface, ha	4,286	2015	IFOAM	363,639	2016	SINAB
Organic share, %	1.1	2015	IFOAM	26.4	2016	SINAB
Producers, n.	53	2015	IFOAM	9,543	2016	SINAB
Processor, n.	6	2015	IFOAM	1,890	2016	SINAB
Exporters, n.	7	2015	IFOAM	0	2016	SINAB
Importer, n.	0	2015	IFOAM	18	2016	SINAB
Health & wellness product consumption (USD)	1,338.9	2016	Economist Intelligence Unit			
Organic packaged food and	21.9	2016	Economist			

beverage consumption (USD)	Intelligence Unit

(*) Our processing. Rate change EUR/USD 1EUR=1.0701 USD.

The UAE also has one of the highest obesity rates in the world, to the point that policy makers have launched a series of countermeasures to combat food insecurity and to support healthier lifestyles and balanced diets. Recently, a new competitive environment has been created in which the government has sought alternatives in order to increase non-imported food production, concentrating on local farms (free grants of land to entrepreneurs who are willing to grow food crops; contributions of up to 50% of the cost of fertilizers and technical equipment; distribution of artificially cooled greenhouses; urban high-rise greenhouses for local food production; etc.), on new agricultural techniques and on organic farming in order to increase the sector's prosperity within the UAE [12, 13, 14].

Sicily, on the other hand, is a region rich in resources that are often under-exploited and undervalued, in which the population suffers from food insecurity and neighbourhood food access problems. According to official statistics, the average monthly spend by Sicilian households in 2015 totalled USD 1,048.9, or 27% of their total consumption; it also emerges that Sicilian households have reduced the quantity (21.8%) and quality (22.1%) of foods bought in the years following the economic recession. The region has a normalized import/export balance of 8.7%, and a widespread adoption of organic agriculture with 363.6 thousand hectares (the top Italian region in this sense, with an incidence of 26.4% of the region's land area). Organic farming is the focus point of a spread in alternative forms of consumption such as ethical purchasing groups ("Gruppi di Acquisto Solidale" - GAS), which experiment with new social paradigms to promote sustainable development in rural areas through the active reorganization of the agricultural and food industry [15, 16]. Other alternative

consumption developments are also under way in Sicily to promote direct consumer-producer relationships, such as farmer's markets, an opportunity to spread and develop a correct, healthy food culture promoted by trade associations (CIA and Coldiretti), the Italian Organic Agriculture Association (AIAB), Legambiente and the Region of Sicily.

Ultimately, therefore, these are two territories with many similarities and issues in terms of climate (mild winters, hot/scorching summers and drought), demography (net migration rates among the highest in the world), the economic-social environment (management of migratory flow and consequent issues of security, social stability and nutritional needs) and food (high import levels, also to cope with an internal demand that varies in quality and quantity). A solution to these issues can be found by adopting a sustainable agricultural development model such as organic farming, which can respond to several political-institutional, social, environmental and nutritional needs through an approach focused on local autonomies and markets and on the crucial factors required for communities to produce food locally (sustainable land and water use and agro-biodiversity, for example).

At the international level the role of organic agriculture in the development of local economies is acknowledged for its ability to bring about an increase in local income per capita, improving the quality of life for entire areas and creating local markets for sustainable agricultural products [17, 18]. A knowledge of these production systems and the sharing of know-how from these farmers thus enables the development of innovative approaches to sustainable development and food security that is more bio-diverse, resilient and socially fair.

For this reason, use has been made of the SAFA (Sustainability Assessment of Food and Agriculture systems) application - developed by the FAO and consisting of a set of indicators for holistically (environmental, social, economic and cultural) measuring the sustainability of the various production processes - to provide technical support for decision-making processes.
The general objective of the work is to analyse the relationship between sustainability, food safety, food sovereignty (local/regional) and organic production practices in the geographical areas studied through empirical analysis.
On the one hand, possible suggestions will thus be outlined for policy makers who are planning action to foster the sustainable development of territories by promoting organic agriculture and, on the other, proposals will be made for the possible implementation of the SAFA tool in order to exploit this more extensively.
The text is thus organized: begins with a review of the literature on keywords such as sustainability, food security and sovereignty and tools for the measurement of sustainability. Then continues by connecting the goals of socio-economic development of the territory with the adoption of the organic farming model, to reach a sustainability in holistic key. This part is made using the framework SAFA of FAO. Concludes with finding "SFSCs", as an instrument of support to food sovereignty.

2. Review of the Literature on Measuring Sustainability and Food Sovereignty

The link between measuring sustainability and food security in its different definitions has lost the former sharp demarcation between rich and poor countries and now applies transversally across the various territories and areas of the planet; this is also a result of wealth reallocation processes between countries and social groups and of more widespread urbanisation. An urban food security dimension has therefore been defined - using an approach that balances economics, the environment and population dynamics - which has fuelled discussion on the themes of technological revolution, new patterns of productive intensification, local production, sustainable diets from the environmental and human health point of view, waste reduction, mitigation of the impact of agri-food chains on waste produced, etc. SAFA has also been used to analyse urban food policy and food planning processes in order to achieve sustainable food security, with applications in some urban contexts that over the past few years have launched strategies for the development of healthier and more sustainable food systems [19].

Another SAFA application has been used to assess the performance of local food chains compared to the global chains, based on the increased awareness among consumers of the impacts of their choices. Some key attributes of SAFA have been selected regarding the supply chains for wheat and its by-products, and a participatory approach has been used to explore the perspectives of different stakeholders on sustainability [20, 21]. In Canada, on the other hand, a study has been made of the ability to affect agricultural development of social groups that are

committed to sustainability in terms of water, climate change and the agricultural landscape. SAFA has thus been used to show how farmers adapt their strategies both collectively and individually (e.g. socially through the improvement of working conditions; environmentally through soil conservation; innovatively by experimenting with new practices thanks to public funds and the exchange of knowledge) to take account of social needs [22]. In Austria, moreover, a study demonstrated the ability of small organic farms and local food systems, which are economically and socially resilient, to achieve a significant socio-economic and ecological performance. This offers inspiration for new, innovative and small-scale approaches that can contribute to the transition to sustainability [23].

The correlation between sustainability and food security in Italy [24] is linked to attitudes regarding ecological factors (such as climate change, soil pollution and erosion), the market (food products should circulate freely to achieve comparative advantages and bring their price down), quality (underlining the link between food production, geographical areas and cultural traditions), social factors (socio-economic inequalities and social marginalization), solidarity (specific assistance programmes for individuals, families and groups), sovereignty (so that local/regional communities can assert their right to control their own food systems in order to reduce food insecurity and vulnerability), trust in technology (which must serve to improve production efficiency and food security), and health (personal consumption choices).

The concept of “food sovereignty”, therefore, has slowly asserted itself, as demonstrated by the large amount of literature on this subject - although a uniform conceptualization does not yet exist. The different studies analyse aspects related to the “right of nations” (self-

sufficiency in food production), the "right of the peoples" (local self-sufficiency), the role of women and disadvantaged people in building food self-sufficiency, the freedom of farmers to democratically choose the species that they grow, gender equality and the role of family-run agriculture, and collective and individual rights aimed at promoting social equality and democratic choices [25]. The identification at international level of new attitudes towards food production and consumption has led to a quest for new organisational forms based on increasingly close cooperation between producers and consumers; this goes beyond the simple dimension of economic exchange and, to an increasing extent, makes reference to shared objectives of social and environmental sustainability. This phenomenon ends up also including specific social mobilization initiatives through the creation of networks with broader objectives to change lifestyles and development models [26]; in the literature these are known as "Short Food Supply Chains (SFSCs)", and are aimed at re-gaining a more direct control over food and its multiple implications [27, 28, 29].

In this context, alternative and local food supply chains become a driver of regional development via an increase in food security at the local level. Peri-urban agricultural entrepreneurs have, among other things, adopted strategies to hybridise conventional and alternative food chains (according to the proportion of products allocated to the local market, personal and professional ties, the diversification of the sales network and the assortment of products sold through SFSCs), contributing to the characterization of the range of products available locally and with benefits for community food security [30].

3. Materials and Methods

A number of international studies have demonstrated the link between food security, resilient production systems and agricultural models based upon concepts of agro-ecology. Of the latter, organic agriculture is central to the development of large initiatives in certain regions of Asia, Africa, Latin America and Europe, in the context of production systems made up of small landowners, family-run farms and those producing for the local internal market. These existing systems based on organic farming become models for resilience and for the ability to counteract the universally recognised effects of climate change and financial crises [33]. These findings, which have been predominantly observed in developing countries, can also be detected using different approaches in countries with advanced economies [34, 35]. These countries, indeed, find themselves facing the same emerging issues at international level, with concern arising from the pressure of conflicting interests linked to the predominance of intensive and industrialized agricultural models. Organic farming is, nonetheless, practised in all countries throughout the world and is becoming increasingly widespread, above all in some areas. For these reasons, two areas have been chosen within the context of advanced economies: Sicily, which is the leading region in Italy in terms of organic investment, and the United Arab Emirates, where significant growth has been recorded in organic production due to a specific interest in the food safety model offered by this system.

The research methodology adopted a holistic approach to study sustainability among a set of selected farms in the UAE and Sicily, using the SAFA system and Tool implemented by the FAO. The SAFA Tool (version 2.2.40)

is an open source, freely-available and user-friendly software package offered by the FAO to implement the SAFA Guidelines (version 3.0) and the SAFA indicators for assessing the sustainability of enterprises [36]. The SAFA protocol for selected companies or sectors is designed to be a process based on guidelines, codes of sustainability, self-assessment forms, operational plans, calculation methodologies and a system of indicators for the assessment and continuous monitoring of the business management situation. The SAFA assessment is carried out on the basis of a series of dimensions, themes, sub-themes and indicators, as shown in Table 2 [37].

Table 2. General structure of SAFA-FAO

Dimension "Good Governance"	Dimension "Environmental Integrity"
5 Themes 14 Sub-Themes 19 Indicators	7 Themes 14 Sub-Themes 52 Indicators
Dimension "Economic resilience"	Dimension "Social Well-Being"
4 Themes 14 Sub-Themes 26 Indicators	6 Themes 16 Sub-Themes 19 Indicators

This is very important to be able to define the areas in which intervention is needed to improve the impact of actions on the two geographical contexts analysed in the study (Sicily and the United Arab Emirates).
The SAFA Tool was integrated with specific questions in order to collect the data and information needed in comprehensively defining the three pillars of sustainability (environmental, social and economic). The aim was also, as much as possible, to adopt a holistic approach to prepare additional proposals and/or to improve the SAFA Tool designed by FAO and enable its wider application.
Besides applying the multi-facetted sustainability approach of environmental, economic and social health, specific emphasis was given to understanding the degree of sustainability in the production of food for the local market, identifying what is needed and how to promote it and assessing its contribution to a stable food supply.
The opinion-leading farms were selected by convenience sampling, using quota-based judgmental sampling methods. This approach was chosen due to the recent advent of organic agriculture in the United Arab Emirates and the still limited number of producers operating (54 in 2015). To define the quotas, reference was made to the representative characteristics of farms among the population reported in the main international statistical source (IFOAM). Stratification factors chosen for the selection of farms were therefore: production location address, agro-ecological approach in managing the production system, entrepreneurial characteristics and the desire to produce positive externalities (e.g. soil fertility, increase in spontaneous flora and fauna, management of hydro-geological instability, water protection, landscape protection/creation/management, containment of the effects

of climate change) and the supply of products to the local market.

Two groups of farmers were selected in the two territories, 8 farmers per region, 7 of which certified as organic according to EU production regulations regarding: open field and greenhouse vegetables (Sicily and the UAE); fruit, dates (UAE only); citrus fruits and ancient cereals (Sicily only); and livestock (mainly goats, sheep, chicken and honey). All but one farm (in Sicily, with integrated pest management and no herbicides or synthetic fertilizers, producing summer fruit and grapes for wine) shared the characteristic (to varying degrees) of directly marketing their products to the local market. All of the farms had migrant workers.

Direct interviews and SAFA Tool assessments were carried out at all the farms, collecting a great deal of information and data (fieldwork carried out from January to September 2017). Some of the data collected was confirmed by organic and ethical certification, some was verified by the researchers, while other data relied (for the time being) on the statements of the farmers. Interviews with migrant workers were carried out together with an analysis of the legal and practical situation of migrant workers in the two regions. The relevance of the Organic 3.0 research approach can be seen in the all-round sustainability approach and the special focus on food security/food sovereignty, local markets and the integration of migrant workers. Last but not least is the fact that the research itself facilitated the development of organic farmers' communities and the sharing of best practices.

The assessment of the connection between food sustainability and sovereignty was carried out by extrapolating all the possible indicators able to represent this aspect of food security. In particular, the indicators belong

to all four of the sustainability dimensions identified by the FAO in order to build the holistic approach assessed by SAFA, and regard aspects of the guarantee of production levels, the existence of local biodiversity, the connection with the market (also through hybrid, local and global approaches), gender equality, the dialogue with stakeholders, etc., as shown in Table 3.

Tab. 3. SAFA indicators considered for the assessment of food sovereignty in Sicily and the United Arab Emirates (2017) (*)

Dimensions	Themes	Sub-Themes	Indicators
ECONOMIC RESILIENCE	Vulnerability	Stability of Production	Guarantee of Production levels
			Product diversification
		Stability of Supply	Procurement channels
			Stability of Supplier relationships
			Dependence on the leading supplier
		Stability of market	Stability of market
	Product Quality and information	Product information	Product labelling
			Traceability System
			Certified Production
	Local economy	Value creation	Regional workforce
SOCIAL WELL-BEING	Equity	Gender equality	Gender equality
		Support to Vulnerable People	Support to Vulnerable People
	Cultural diversity	Indigenous knowledge	Indigenous knowledge

		Food Sovereignty	Food Sovereignty
GOOD GOVERNANCE	Participation	Stakeholder dialogue	Stakeholder identification Stakeholder engagement Effective Participation
ENVIRONMENTAL INTEGRITY	Biodiversity	Species diversity Genetic diversity	Diversity of Production Agro-biodiversity in-situ conservation Locally adapted Varieties and breeds

(*) Our processing.

Based on the SAFA methodological approach, a rating is processed for each indicator ranging between "Best" (80-100%), "Good" (60-80%), "Moderate" (40-60%), "Limited" (20-40%) and "Unacceptable" (0-20%), at a level of data reliability ranging between a score of "1 - High quality data" (for current data collected for SAFA or other sustainability measurement audits), "2 - Moderate quality data" (for secondary or two year-old data), and "3 - Low quality data" (for estimates or data over five years old). The SAFA system, finally, processes the data directly and outputs a series of graphical summaries.

4. Results

4.1. Placing of the Sample within Short Food Supply Chains

The farmers' sample surveyed shows some of the distinctive characteristics found in the literature with reference to Short Food Supply Chains (Table 4).

Table 4. Specific cases of SFSCs in Sicily and the UAE (2017) (*)

Indications	Sicily	UAE
Type	Individual and / or networked farmers under the guidance of political, social, ethical and corporate coordination (trade associations)	Group of farms
Activities	Direct selling of food products to consumers on line and at farmers' markets Adoption of FAO's SAFA Holistic Sustainability Measurement System	Direct selling of food products to consumers at farmers' markets Adoption of the FAO's SAFA Holistic Sustainability Measurement System
What is meant by short?	Direct from farmers to consumers Direct delivery to consumers of mostly regional products (contact to producer through ICT and direct)	Direct from farmers to consumers
Health and food quality	Freshness (good access to broad variety, especially vegetables and fruits) Seasonal	Freshness (broad variety) Good taste Seasonal

Sustainability aspects	Local food, (few food miles) Organic farms	Local, seasonal (few food miles) Organic farms
Growth and development	Further growth might be possible	An increase in the area invested in organic farming is underway
Innovative elements	Consumer comes to know the identity of producers through website, Facebook, WhatsApp	Micro-distribution

(*) Our processing adapted from Schmid et al, 2014.

In all cases, farmers are engaged in the local market through direct sales on the farm and at farmers' markets within a 150 km geographical radius, encouraging direct interaction with the end consumer based on trust and the assured use of organic production methods.

The result is that, in all cases, the multifunctional farms identified in Sicily and the UAE are involved in the production of fresh products and/or products with limited processing; these are placed on the local and global markets also using a hybrid approach, paying real attention to the safeguarding of all local parameters: social, cultural, economic and environmental. For producers, the benefits of participating in an SFSC are often higher prices and/or a greater assurance of successfully selling their products. In any case, companies operating through "SFSCs" are all subject to an identification and monitoring system set up by forward market operators and/or consumer networks.

An important role in the process of entering the market is played on the one hand by local institutions that are willing to support direct sales initiatives, and, on the other, by ICTs (social media and tools such as Facebook, Instagram and WhatsApp) - which are a powerful tool for engaging with potential buyers. The latter are made up of end-users and intermediate buyers (small restaurant/catering businesses, small urban retailers, local markets, collective sales outlets, organised supply and demand groups, ethical purchasing groups, sales within companies, group catering), based on geographical and also organisational proximity.

Their willingness to measure their sustainability level through the SAFA approach strengthens the ethical dimension through which their business activity is conducted. This demonstrates the extent to which the farmers are committed to achieving a vision with

environmental, social, ethical and economic dimensions in the area within which they operate. As has been observed in the literature, organic agriculture in the context of "SFSCs" contributes to an improvement in the natural, human, social, physical and financial capital of the rural communities in which these exist [**38**].The participation of the institutions and the will expressed by consumers through their buying behaviour demonstrate a local desire to adopt a participatory type of agro-food planning process based on the quality of the product, a desire to support the local economy, proximity between the places of production/consumption and the search for higher levels of quality and healthiness in agri-food products. Moreover, the SFSCs identified implicitly possess a characteristic: that of being promoters of the processes of active citizenship and local transformation by actively redefining the relationships between food and local area, producer and consumer, town and country, nature and agriculture [**39**].

It is interesting to note that organic products are often the trigger in moving towards a healthy lifestyle, which then ends up also involving other sectors and products looked for on the market. SFSCs, therefore, which revolve around the organic agro-food sector, often become the key element in the promotion, integrated support and development of an area, which then spreads from agro-food to other sectors, allowing its participants to become aware of the consequences of their choices on all the elements of the area that they belong to.

4.2. General Characteristics of the Organic Farms Sample

Altogether, the farms surveyed have an organic land area of between two and 320 hectares, with an average of

approximately 55 hectares. Sicily has a larger average farm size (Table 5).

Table 5. Main characteristics of organic farms in Sicily and the United Arab Emirates (2017) (*)

Indications	n.	Indications	n.
Localization, n.		Permanent workers, n.	
- United Arab Emirates	8	- *Family workers*	
- Sicily	8	- No units	8
		- Up to 3 units	7
Range of Total surface		- Over 3 units	1
- up to 30 ha	9	- *Non Family workers*	
- 30 ha to 100 ha	4	- No units	
- over 100 ha	3	- Up to 3 units	4
		- 3 - 10 units	6
Production typologies		- Over 10 units	6
- specialized single-crop company, n.	2		
- multi-crop company specialized in plots, n.	14	Temporary workers, n.	
		- *Family workers*	
Types of production, %		- No units	15
- Citrus fruits	11.4	- Up to 3 units	1
- Vegetables	34.3	- Over 3 units	0
- Cereals	11.4	- *Non Family workers*	
- Fresh fruit	5.7	- No units	7
- Dried fruit	5.7	- Up to 3 units	3

- Grapes and wine	2.9	- 3 - 10 units	3
- Legumes	2.9	- Over 10 units	3
- Olives and oil	2.9		
- Livestock farm	20.0		
- Grazing	2.9		

(*) Our processing.

As stated, the whole sample is involved in primary production with local direct sales for between 50% and 80% of products, with a tradition in organic production in some cases (in Sicily) of over twenty years.
There is a great diversity of vegetable crop production, including some perennial fruit (citrus fruit and almonds in Sicily, dates in the UAE); green manuring and the use of compost are some of the best practices identified by the research, giving farms a more stable environment both agronomically and economically.
The integration of livestock breeding (sheep, goats and cattle in Sicily, sheep, goats, chickens and camels in the UAE) with vegetable production, either on the same farm or in collaboration with neighbouring farms, was identified as a best practice, reducing off-farm input and, when directly managed by the same farm, increasing the product range (dairy products, meat and eggs) available for the local market.
Farms in the two contexts analysed recorded a progressive increase in productivity over time (which had sharply declined during the period of conversion to organic) as well as in natural capital (soil fertility, level of agrarian biodiversity for the cultivation of more species, etc.).
Non-family workers predominate in farm operation, ranging from a minimum of 1 to a maximum of 55 employed as "permanent workers", and between a minimum of 0 and a maximum of 30 as "temporary workers". In all cases the average amount of human capital is high and averages 12 and 10 units respectively for the two types.
Some of the farmers in Sicily take part in a regional programme, Sicilia Integra (an initiative developed by Gaia Education and the University of Catania in partnership with the Don Bosco 2000 and I Girasoli migrant welcome

centres, organic farmers' cooperatives and European ethical organic food companies) that can be identified as a best practice and through which migrants and refugees receive training on organic farming and sustainable development, including a period of internship on organic farms. The programme also actively promotes this approach in the market, enhancing the profile of the organic producers participating in the programme. Sicilia Integra aims to support the socio-economic integration of migrants arriving in Sicily through sustainable community and agro-ecology capacity building activities, with the aim of creating an alternative trading platform for the marketing of Sicilian organic products in European markets. The project also aims to foster professionalisation among migrants and unemployed young people, to create new work opportunities in regenerative agriculture and to contribute to the development of a circular economy in Sicily.

The work inclusion model proposed by Sicilia Integra and adopted by some farms in the sample can also constitute a model of best practice for the UAE. The two areas suffer from illegal immigration issues that are driven partly by the need for social and political survival (from countries such as India, Pakistan and Bangladesh to the UAE and from Nigeria, Senegal and other African countries to Sicily) and partly by the quest for work opportunities. Due to the huge flow of immigration, conditions often arise that favour employment in low-cost manual production activities, often in violation of workers' and human rights. To counter these phenomena, agriculture is called upon to play a role in combating social exclusion - particularly in relation to vulnerable groups such as minorities and the immigrant population - thus contributing to the concept of sustainability in a holistic sense.

4.3. Results of the Farmers' Sustainability Assessment Process Measured by the FAO SAFA Tool

A first SAFA Tool assessment result for each farm was obtained, as well as one summarizing each farmers' community with the relevant average scores (Figure 1). Additional indicators for the SAFA Tool were identified for the local market based on volumes, turnover and the number of different products marketed directly by the farms.

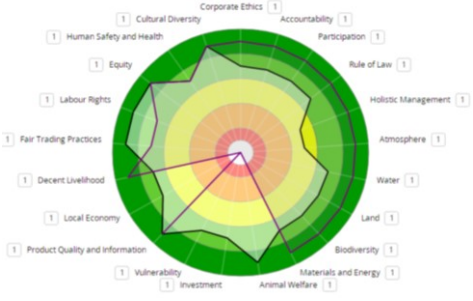
Figure 1. SAFA polygons that identify the two farmer communities with their average scores (2017)

Overall, the macro-indicators assessed show positive scores for the two areas studied, with higher ratings for aspects such as "Human Safety and Health", "Labour Rights", "Local Economy", "Product Quality and Information" in Sicily, and "Equity", "Labour Rights" and "Vulnerability" in the UAE. All of these indicators show performance scores ranging from 80 to 100 per cent (intense green area). These five indicators refer to two sustainability dimensions - “Economic Resilience” (“Product Quality and Information”; “Local Economy”; “Vulnerability”) and “Social Well-Being” (“Human Safety and Health”; “Labour Rights”) – that are directly connected with the general objective of the research, demonstrating relations with sustainability and food security, food sovereignty and organic farming practices.

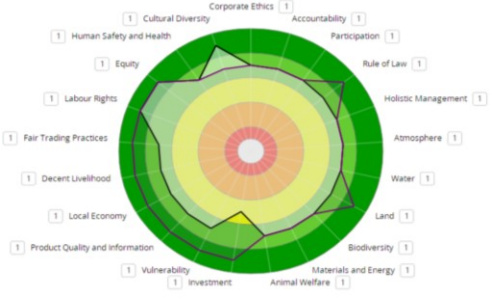
There is a certain variability within different production sectors in the two geographical areas considered (Figure 2).

Figure 2. Comparison between levels of sustainability in in farms with "vegetables and fruit" and "vegetables and livestock" in the UAE and in Sicily (2017).

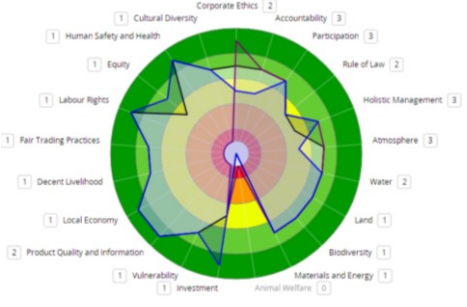
Vegetables and Fruit in the UAE



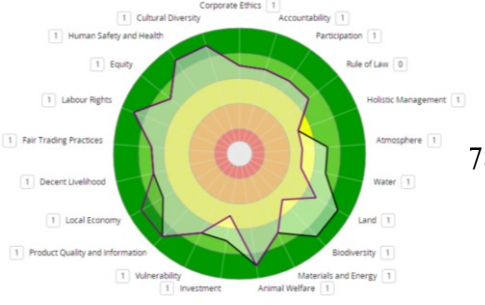
Vegetables and Livestock in the UAE



Vegetables and Fruit in Sicily



Vegetables and Livestock in Sicily



Although both have high levels of sustainability, for the "vegetables and fruit" and "vegetables and livestock" farm categories (chosen for their relative importance in the two geographical areas), the comparison reveals more well-established skills and know-how in the case of Sicily, which can boast a long tradition in organic farming matched by greater capital resources and, therefore, more technology to support investment in the productive processes.

Economic resilience indicators are closely linked to labelling, certification, origin, production method or value-based production system identification, etc., so that consumers can make a real choice [40, 41]. These are increasingly extensive processes throughout the food supply chain, with independent and collaborative verification systems, which take on increasing importance in consumer interest and the growth of the relevant market and are perfectly in-line with the organic certification system.

Support for the local economy by the enterprises surveyed was measured in terms of their ability to employ skilled labour from the micro-environment in which they operate (community, region). Indeed, local employment is seen as a valuable tool in providing value creation, support for the progression and upgrading of skills, and investment in education and training, since employment and sustainable economic development are very much mutually interconnected [42].

Other local development indicators are linked to: 1) Respect for the country of origin's tax obligations, a factor thought indispensable for the communities themselves to be able to offer high-value public services such as infrastructure, security, transport, electricity, healthcare, education, environmental protection and, ultimately, a share of the social capital available to the enterprise. 2) the ability of

enterprises to benefit from local economies through participation in supply contracts that act positively on the institutional social capital available to businesses, and on food security by reducing imports to the territory through investment, skills development and trade relations.
Moving in this latter direction, in Sicily, are numerous food education programs launched also with the support of the European Action Plan for Organic Farming (e.g. "Fruit in Schools") [43, 44, 45].
The "Social Well-Being" dimension focuses mainly on health and safety training at workplaces, and vocational training and qualifications.
Factors that need improvement to increase the level of business sustainability of the two production systems considered are the Rule of Law, Holistic Management and Atmosphere in Sicily, and "Biodiversity" and "Accountability" in the UAE.
Problems in Sicily regard operational legitimacy, assessed by the enterprise's adherence to the rule of law by adopting international voluntary codes, corporate missions and risk aversion as well as sustainability planning capabilities, integrating values or specific plans for the definition of environmental impact reduction targets (in percentages, total, etc., for each production unit).
In the UAE, problems are connected with the ability to maintain or improve complex ecosystems, given the climatic aridity, management difficulties and the need for ecosystem services that can respect semi-natural habitats and safeguard biodiversity. Finally, a lack of holistic approaches is addressed by SAFA through its ability to monitor all areas of sustainability via its dimensions for the environment, the social context, the economy and governance; this is

particularly useful in reporting on the sustainability of enterprises.

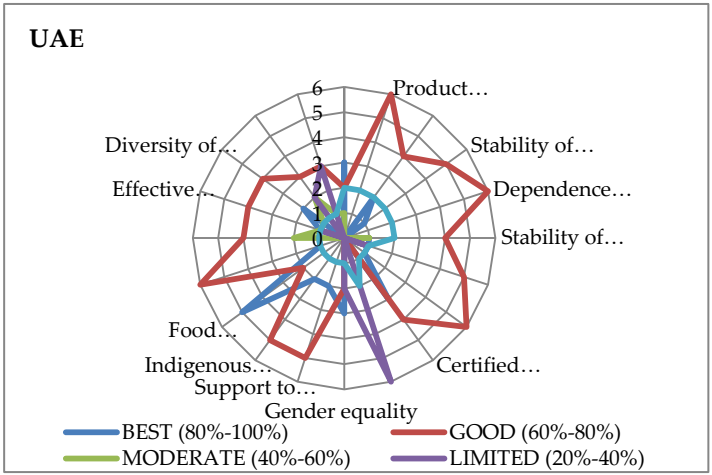
4.4. The Contribution of Short Food Supply Chains to Food Sovereignty

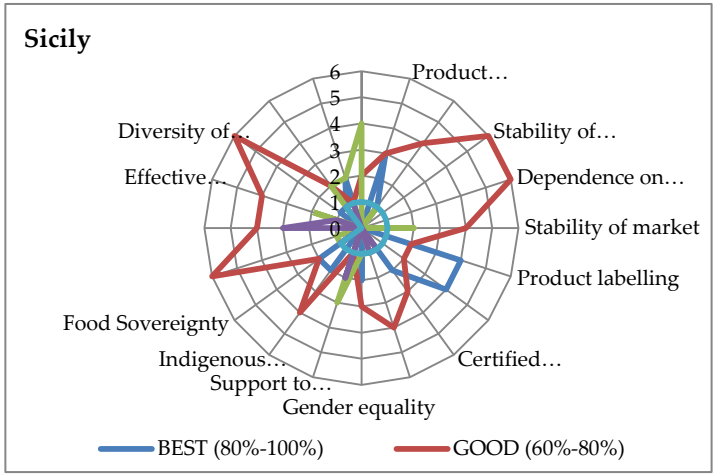
Within the group of indicators measured by the FAO's SAFA Tool, one part is devoted to the "Food Sovereignty" indicator. It appears in the "Social" dimension and in the "Cultural Diversity" theme, aimed at understanding the extent to which the need is perceived for a more just, local and sustainable food system that represents the fundamental values of democracy and self-determination. Food sovereignty involves the creation of an ecologically harmonious and local food and agriculture system derived from the right of peoples and communities to define it.

At the macroeconomic policy level (which includes indicators regarding patterns of ownership and production in communities of different ethnicities and types, both rural and urban), this theme is applied at the individual enterprise level using indicators to detect its independence and capacity for autonomy and control over its production and supply systems (availability of inputs and knowledge rooted in the collective memory, such as species and varieties, availability of seeds, animal breeds, etc., ability to penetrate the local market), as well as choices that reinforce this independence (freedom) from other operations [46, 47].

For this reason the range of indicators conventionally used by SAFA has, as mentioned, been integrated into the methodology, within the two "SFSCs" considered in the United Arab Emirates and Sicily (Figure 3).

Figure 3. Comparison between the levels of "Food sovereignty" found in Sicily and the UAE (2017)





There are some background differences emerging in the comparison related to the level of development of local economic systems and the level of awareness reached by the various stakeholders operating in the two geographical areas.

The United Arab Emirates, with high levels of economic development, has a per capita income of $67,600 (ranked 7th in the world) and high investment in technology and innovation, as well as a need to achieve adequate levels of food security [48]. In order to counter the arid environmental conditions, the past few years have witnessed an increase in the level of local political interest and openness towards organic farming, anticipating the needs and demands of the most advanced part of the market. In this country the perception of the issue of food security in terms of sovereignty appears well-defined, even more so than in Sicily.

Sicily is a land rich in contradictions, and shows strong differences between local development levels that are often not in-line with the trend shown in other areas of Italy [49]. Among the many contradictions are a great sensitivity to the adoption of an organic production system under current European legislation (being the top Italian region in terms of land area and number of operators dedicated to this), but also a considerable delay in defining a possible circular economy model that, through a "bottom up" logic, can define economic-food policy at the local level. The effects of this delay are clearly visible in aspects such as income distribution; population growth; good governance; consumption; greenhouse gases; renewable energy; employment; public debt; etc. This is shown in the first part of Figure 3, in which, with a limited sample of companies, there are still in some cases limited or unacceptable levels of

market dependence and sovereignty. Other elements of sovereignty are related to a number of aspects of relational capital, such as the stability of supplier relationships and stakeholder identification. These, together with diversity of production, characterize the local "SFSCs".

5. Conclusion

A focal point of this work is the importance of the nexus between organic agriculture and sustainability. In fact, to have a truly sustainable system it is crucial to have a low environmental impact, and organic agriculture is one of the best ways of achieving this goal [**50**]. Another relevant theme in our work is the importance of ethical and economic sectors to be able to achieve completely sustainable agriculture: in fact, at the farms that we assessed there is a close link between preference for the local market, the legality and fairness of worker conditions, and a high performance in terms of sustainability.

The study also demonstrated a link between organic farming and the development of local markets. Indeed, the initiatives linked to the “SFSCs” identified enable the reconnection of production and consumption circuits through the development of local farmers' markets and organic farming supported by the community (joint purchasing groups, for example). Within this area of solidarity-based interconnection, a network is developed between families of farmers, certification associations, processors, researchers and local consumers in such a way that local food security is ensured and the wealth produced remains in the community, as has been widely acknowledged at international level. [**51**]. Active members of “SFSCs” in Sicily and the United

Arab Emirates grow and sell various agricultural products - including citrus fruits, vegetables, cereals, fresh and dried fruit, honey, milk, eggs and meat - that reach thousands of consumers.

SAFA has proved to be a powerful tool for measuring sustainability in the two geographical cases considered, but has room for further improvement.

Firstly, it has a very complex structure in terms of the indicators/questions put to the users surveyed. In many cases the survey seemed lengthy and not always sustainable for the business. It is perhaps necessary to provide a simplified version that can be adapted to different sectors and specific purposes (as in our case it was used to analyse food sovereignty) [**52**].

Secondly, SAFA is limited to photographing the level of sustainability at the specific time of the survey, whereas it has the potential to become a behavioural protocol for businesses wishing to pursue a process aimed at improving their sustainability performance. This would make it possible to support a more accurate survey and to reduce the percentage of responses with "1 - low quality data" scores.

In terms of food sovereignty, several indicators exist within SAFA that directly ("cultural diversity") and indirectly measure this aspect of food security. However, given the importance that this issue has acquired (see the EXPO Milano 2015 declaration), and given the demand for a reorientation of public policies towards food sovereignty and the solidarity economy, the possibility is envisaged within SAFA for a "cultural dimension" of sustainability that is able to assess aspects such as local food production, participatory democratic practices and the creation of value and values. Table 6 therefore shows some possible indicators built on the assumption that food sovereignty can

take hold more easily where the existence of SFSCs is recorded and the entrepreneur shows processes of resilience [**53**].

Table 6. Proposal for Supplementary Indicators for SAFA on Food sovereignty (*)

Perspective	Attribute	Indicator
Farm resilience	land tenure	proportion of the rented and owned land on total farm land
	educational level	proportion of traditional knowledge on the total knowledge employed
	recovery, restructuring and maintenance of agricultural irrigation equipment	investments made and / or projects funded
	agricultural diversification	new crops and / or crop systems introduced
	Information exchange systems	existence of best practices
	multifunctionality and diversification of activity	proportion of alternative activities (agrotourism, energy, etc.)
Social and relational capital	networks of formal relationships	proportion of the neighbourly relations in SFSCs
	networks of informal relationships	dimension and value of indirect relationships on local market
	network of local relationships	farm participation in associations or

		cooperatives, buying groups, districts of solidarity, food councils
Contribution to quality of life	neighbourly relations	proportion of the surface area for social or social services, didactics
	local-scale design	proportion of time spent on total work time

(*) Our processing.

As well as these possible additional indicators, on which a debate would be useful, the issue of food sovereignty must be addressed through a participatory process that recognizes the centrality of the geographical area and all its elements, above all in the case of small and medium-sized farms. This political vision contrasts with the principle which holds that it is possible to acquire land on the world market to guarantee food security (for example in other areas of Asia and Africa), since it recognises the right to usage and possession and the reciprocity of this right at international level. This will make it possible to closely link food security and sovereignty to the principles of economic, social, environmental and cultural sustainability.

Work will continue with the objective of: 1) defining, from a technical point of view, indications for lower consumption of resources in the production sectors involved in the survey; 2) for the SFSCs considered, assessing their ability to bring about changes in eating habits and food education, greater attention to product safety and origin, and the rediscovery of territories while enhancing the value of their ancient local traditions.

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4. Analysis of indirect relationships and sustainability performance in organic agriculture in the United Arab Emirates and Sicily (Italy)

Abstract

Climate change, recurrent economic and financial crises and food security issues are forcing society to look towards an increasingly widespread use of "sustainable" production practices. These are often translated into innovations for businesses that are not always easily achievable other than through specific investments. This work sets out to assess the sustainability performance of organic farms which, as is well-known, represent a sustainable production model in terms of values, standards, practices and widespread know-how on the ground. The research was carried out in two geographical contexts (the UAE and Sicily - Italy) - with certain environmental and socio-economic issues in common - among productive sectors representative of organic agriculture; this was done with the help of the FAO SAFA framework and Social Network Analysis to study the sustainability performance of organic farms within non-structured local production systems in the form of formal enterprise networks that, on the contrary, operate with a recognized and common aim. The results demonstrate both their attainment of excellence and the existence of criticalities, identifying routes to possible improvement.

Keywords. SAFA-FAO, Social Network Analysis, informal relationships, organic agriculture.

1. Introduction

One of the well-known institutional tasks of the FAO is the fight against world hunger, an objective that is also included in the so-called "Sustainable Development Goals", signed by the governments of 193 UN member countries and expected to be achieved by 2030. Governments, institutions, research centers, businesses and society as a whole are called upon to act at the global level to implement these goals, gathering and making available a wide variety of know-how and resources to enable agriculture to become "sustainable". This need is partly linked to climate change, the international financial crises and migration, as well as to the increasingly widespread threat of food security issues which are generally making their effects felt across the entire planet. Sustainable agriculture and food systems at the national and urban level, the sustainable use of land and water resources, the fight against food waste, the creation of environmentally "friendly" products, the healthiness of food and the quality of nutrition, and so forth, are some of the proposals advanced in international forums to achieve this objective.

To assess the overall impact that food and agriculture-related initiatives along the entire food supply chain have on the environment and on people, the FAO has since 2009 (Scialabba and Nemes, 2012) been preparing guidelines on the "Sustainability Assessment of Food and Agriculture Systems" **(**SAFA**).** The objective of the FAO was to create an individual organic framework to unite the different experiences and methodological approaches of the various disciplines (biology, economics, ethics, the environment, etc.) and players (the political and productive world, civil society, scholars and researchers) to sustainability. A

participatory development model has led to the creation of SAFA, constituting a first step towards the international harmonization of requisites favoring the sustainable production and retail sale of food and agricultural products. According to SAFA sustainability regards 4 interrelated dimensions, namely "Good Governance" (also "corporate" ethics), "Environmental Integrity", "Economic Resilience" and "Social Well-Being". As well as the strictly environmental dimension, the modern concept is thus also underlined of sustainability through the virtuous and balanced management of human and ecological resources in its broad sense, using an approach defined as "holistic". SAFA includes as many as 116 detailed indicators across 21 themes (or sustainability "goals"), and 58 sub-themes (more detailed objectives); moreover, it is also possible to choose the appropriate indicators for the specific context as well as sustainability performance ratings (i.e. best, good, moderate or insufficient). Since its launch SAFA has rapidly attracted the interest of over 700 users (above all researchers, 41%; and private users, 31%) located - in May 2017 - in 104 countries across the world (FAO, access on 2017). Users include: producers and other operators within the agri-food system, who can in this way assess their performance and/or plan the targeted use of natural resources and/or develop partnerships with suppliers in order to improve their socio-economic and environmental performance (business-to-business and business-to-consumer strategies); consumers, who can form a critical approach to consumption; and also policy-makers engaged in defining sustainable development strategies, in evaluating the externalities of production processes and in the governance of shared policies between the players involved (institutions, economic actors, civil society and citizens).

With the objective of measuring food security and sovereignty in different geographical contexts and assessing the outlook for adopting "organic" production and consumption models, in late 2015 a collaboration was set up between the FAO, IFOAM (International Federation of Organic Agriculture Movements) and the PhD course in "Agricultural, Food, and Environmental Science" of the University of Catania. Two areas were chosen, the United Arab Emirates (UAE) and Sicily, the former because it has launched a food policy to encourage land use and the adoption of sustainable practices like organic farming in order to counter a scarcity of natural resources, excessive immigration from different geographical areas and a balance of trade in disequilibrium; the latter because, despite having the typical food security issues of areas with high urbanization, it has always proved particularly inclined to the use of organic farming (it is the first Italian region in terms of the area dedicated to this and the second in terms of the number of operators) and can therefore, for this reason, be a useful benchmark for the UAE. The two areas share a number of pedo-climatic, productive, demographic and migratory characteristics, as well as similar food-related issues (high levels of food insecurity, household spending capacity, obesity rates, etc.) and a clear desire to pursue sustainable development objectives (FAO, 2017). For these reasons, a group of organic farms representative of the main production sectors (fruit and vegetables, arable, tropical and subtropical fruit farming, etc.) in the two geographical contexts was selected and studied using the FAO's SAFA tool (Al Shamsi et al, 2018).

These are organic enterprises belonging to networks that share a common desire to improve their sustainability performance to the extent of joining the SAFA monitoring

process; their market positioning is through hybrid channels with a tendency to favor “farmer's markets”, and they appear motivated to use the strategic lever of sustainability to communicate their performance to buyers. The objective of this study, using Social Network analysis methods, is to analyze this network of farms taking part in the SAFA program, which are linked by shared company strategies regarding good governance, the environment, economic resilience and social welfare, with the aim of identifying common (or less common) weaknesses or strengths for interpretation and of proposing improvements to their approach to sustainability via the organic production method.

2. Conceptual framework for the use of SAFA

SAFA has already had food security applications at the production sector level in an evaluation carried out on the sustainability of small-scale livestock farms in Indonesia, a country in which local policy has had the objective of promoting sustainable agricultural practices in small family farms (Siwi Gayatri et al, 2016). Other applications have regarded coffee production in Uganda, with measurements to assess the effects of organic certification with positive conclusions on the effect on cooperation, on governance and on the main social, environmental and economic aspects of sustainability (Ssebunya et al, 2016); related to this is an analysis of banana production in Costa Rica carried out to holistically assess the effective sustainability performance of this production system and to identify and launch optimization initiatives for more sustainable production

(Marton et al, 2016). The FAO framework has also been used for a multi-dimensional, systematically assessed understanding of the concept of "sustainable development" in poultry production, with findings of particular interest given the importance of this sector to the worldwide food system (Vaarst et al, 2015). Numerous potential pathways to sustainable development in poultry production have been identified, linking elements such as the welfare of animals and workers (social aspects), biodiversity (environmental aspects), governance of the food chain (institutional aspects) and the development of poultry as a high-value food throughout the world (economic aspects).

Analyses of production systems using SAFA have been carried out with regard to Hungarian organic farming (Mészáros et al, 2015), aimed at defining a conceptual framework for measuring all aspects of sustainability among a sample of farms; and an evaluation of agri-environmental indicators to guide the decisions of agricultural operators through agricultural policy initiatives was also recently carried out in the Czech Republic (Hřebíček et al, 2013), a country in which a methodological difficulty in introducing and implementing sustainable farming practices emerged. An attempt to achieve a common understanding of how to measure sustainability in the food sector has been carried out in Europe and Mexico among a sample of 60 agri-food enterprises, demonstrating the practicability of the SAFA tool even in difficult circumstances (60 sustainability targets classified into 20 themes and four dimensions), involving each company choosing an individual set of appropriate indicators and a variable evaluation questionnaire length according to the size and complexity of the enterprise (Jawtusch, 2014).

A comparison between different approaches to the assessment of sustainability in farms, agricultural systems and supply chains has led to the identification of significant differences between SAFA and other models in terms of the scope, level of assessment and precision of the indicators used. Moreover, occasionally contradictory results have suggested the advisability of including a precise definition of the notion of "sustainability", together with a description of the methodology and indicators aimed at the harmonization of indicators and hypotheses (Waas et al, 2014). For this reason SAFA turns out to be a useful benchmark paradigm for highlighting the differences between the different approaches and for making the assessment results more comparable (Schader et al, 2014). A comparison of several applications for the assessment of sustainability (IDEA, RISE, SAFA, SOSTAR, MOTIFS and 4Agro) at farms in Northern Italy has made it possible to study the choice of indicators, the availability of data and the involvement of stakeholders, as well as to add more evaluation scales for agriculture (the environment, society, the economy and governance) (Gaviglio et al, 2016 a and b; Bertocchi et al, 2016).

Another interesting work has the objective of defining the contribution of organic food systems to sustainability using the SAFA guidelines applied at operator, product and spatial/political level as well as three sustainability strategies relating to efficiency, consistency and sufficiency as a framework of reference. In this way it is shown that organic food systems can provide sufficient food if demand patterns shift towards products that consume less resources (above all via dietary patterns and food waste); this confirms the importance of the social dimension in the biological system, so that innovation and further development of the

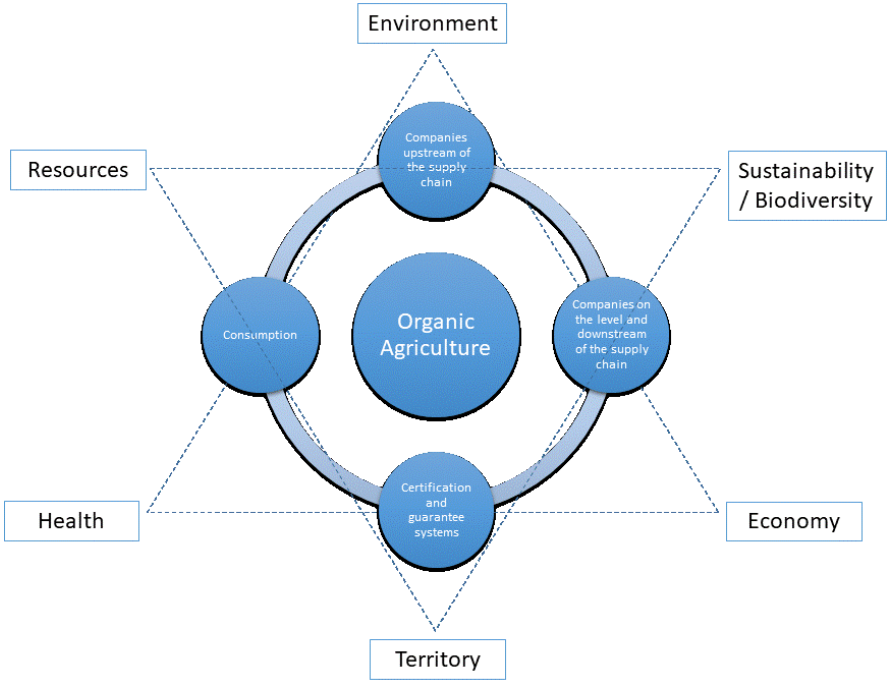
organic system are shown to be essential in tackling future challenges (Schader et al, 2015).

3. Materials and methods

3.1. Research design

Organic farming is, as is well-known, a production system that tends to encourage the building of relationships between individuals, enterprises and institutions (public and private) positioned upstream, level with, and downstream of production (figure 1).

Figure 1. Relationships between individuals, enterprises and institutions in organic sector



These relationships may or may not be strictly codified within the supply chain and address the productive, strategic and cognitive spheres to confront and/or resolve specific production and market issues (problem-solving with the exchange of raw materials, the sub-contracting of processes, the exchange of semi-finished products and services, etc.).

A number of studies have demonstrated that the existence of a network of relationships between players connected in different ways influences the creation of value for them, since it enables them to combine the differing knowledge assets of the different partners (Brown and Duguid, 1991) and to increase the value of investment in research and development. This process appears to be particularly important for small enterprises, since it is unlikely that they possess the resources to master the skills needed to compete on markets (Scuderi et al, 2015). Enterprises, however, do not necessarily have to be bound by formal links in order to enjoy the transfer of knowledge, since another triggering factor is "proximity" between players in a geographical area which favors mechanisms of cultural socialization, the sharing of values, standards and language, i.e. organizational culture pertaining to the cognitive dimension of social capital (Basile et al, 2002).

The nature and quality of direct and indirect relationships in organic agriculture is thus able to produce a multiplier effect on the sustainability performance of enterprises and on their ability to contribute in sustaining local production systems, with effects on food security and sovereignty. The attainment of a higher level of sustainability in the production process represents a real innovation for the enterprise - this often translates into a set of organizational and management changes that are essential for the

implementation, attainment and maintenance of a specific sustainability performance.
Despite being so important, few studies have focused on the measurement of relationship systems between organic farming enterprises and how these can affect their sustainability performance, other than within the limits of the stipulations of Community regulations governing organic production. With this aim two geographical areas were selected with similar environmental and socio-economic issues, namely the United Arab Emirates and Sicily, where organic agriculture is particularly widespread and of high economic importance.

Within these areas a sample of organic enterprises was selected, with this sample undergoing an assessment in terms of sustainability using the FAO SAFA application.

A sample of 15 enterprises was selected in the two production systems, taking account of:

- production sector representative of local organic agriculture;
- size of the farm/enterprise;
- the willingness of the enterprise owner to join a network specifically aimed at measuring sustainability using SAFA, providing data on the organization and management of the enterprise also as regards accounting aspects;
- active role in the local market;
- clear demonstration of economic and social resilience.

The farms were identified using a stratified random number system.

The fieldwork was carried out from September to November 2017 and was repeated over a period of 2 months to pick up any changes in the sustainable management of activities.

3.2. Measurement tools: the SAFA approach

The SAFA questionnaire addresses a number of aspects and has been subdivided into macro areas or contexts, themes and sub-themes (with each assigned an ID), as shown in table 1.

Table 1. Sustainability indicators and IDs attributed in the SNA model used

Contextualization	**Themes**	**Sub-themes**	**ID**
GOOD GOVERNANCE	Corporate ethics	Mission Explicitness	G 1
		Mission Driven	G 2
		Due Diligence	G 3
	Accountability	Holistic Audits	G 4
		Responsibility	G 5
		Trasparency	G 6
	Participation	Stakeholder Identification	G 7
		Stakeholder Engagement	G 8
		Engagement Barriers	G 9
		Effective Participation	G 10
		Grievance Procedures	G 11
		Conflict Resolution	G

			12
	Rule of Law	Legitimacy	G 13
		Remedy, Restoration and Prvention	G 14
		Civic Responsibiity	G 15
		Free, Prior and Informed Consent	G 16
		Tenure Rights	G 17
	Holistic management	Sustainability Management Plan	G 18
		Full-Cost Accounting	G 19
ENVIROMENTAL INTEGRITY	Atmosphere	GHG Reduction Target	E1
		GHG Reduction Target	E2
		GHG Balance	E3
		Air Pollution Reduction Target	E4
		Air Pollution Prevention Practices	E5
		Ambient Concentration of Air Pollutants	E6
	Water	Water Conservation Target	E7
		Water Conservation Practices	E8

		Ground and Surface Water Withdrawals	E9
		Clean Water Target	E10
		Water Pollution Prevention Practices	E11
		Concentration of Water Pollutants	E12
		Wasterwater Quality	E13
	Land	Soil Improvement Practices	E14
		Soil Physical Structure	E15
		Soil Chemical Quality	E16
		Soil Biological Quality	E17
		Soil Organic Matter	E18
		Land Conservation and Rehabilitation Plan	E19
		Land Conservation and Rehabilitation Practices	E20
		Net Gain/Loss of Productive Land	E21
	Biodiversity	Landscape/Marine Habitat Conservation Plan	E22

		Ecosystem Enhacing Practices	E23
		Structural Diversity of Ecosustems	E24
		Ecosystem Connectivity	E25
		Land Use and Land Cover Change	E26
		Species Conservation Target	E27
		Species Conservation Practices	E28
		Diversity and Abundance of Key Species	E29
		Diversity of Production	E30
		Wild Genetic Diversity Enhancing Practices	E31
		Agro-biodiversity in-situ Conservation	E32
		Locally Adapted Varieties/Breeds	E33
		Genetic Diversity in Wild Species	E34
		Saving of Seeds and Breeds	E35
	Materials and Energy	Material Consumption Pratices	E36

		Nutrient Balances	E37
		Renewable and Recycled Materials	E38
		Intensity of Material Use	E39
		Renewable Energy Use Target	E40
		Energy Saving Practices	E41
		Energy Consumption	E42
		Renewable Energy	E43
		Waste Reduction Target	E44
		Waste Reduction Pratices	E45
		Waste Disposal	E46
		Food Loss and Waste Reduction	E47
	Animal Welfare	Animal Health Practices	E48
		Animal Health	E49
		Humane Animal Handling Practices	E50
		Appropiate Animal	E5

		Husbandry	1
		Freedom from Stress	E52
ECONOMIC RESILIENCE	Investment	Internal investment	ER1
		Community Investment	ER2
		Long Term Profitability	ER3
		Business Plan	ER4
		Net Income	ER5
		Cost of Production	ER6
		Price Determination	ER7
	Vulnerability	Guarantee of Production Levels	ER8
		Product Diversification	ER9

		Procurement Channels	ER 10
		Stability of Supplier Relationships	ER 11
		Dependence on the Leading Supplier	ER 12
		Stability of Market	ER 13
		Net Cash Flow	ER 14
		Safety Nets	ER 15
		Risk Management	ER 16
	Product Quality and Information	Control Measures	ER 17
		Hazardous Pesticides	ER 18
		Food Contamination	ER 19

		Food Quality	ER 20
		Product Labeling	ER 21
		Traceability System	ER 22
		Certified Production	ER 23
	Local Economy	Regional Workforce	ER 24
		Fiscal Commitment	ER 25
		Local Procurement	ER 26
SOCIAL WELL-BEING	Decent Livelihood	Right to quality of life	S1
		Wage Level	S2
		Capacity Development	S3
		Fair Access to Means of Production	S4
	Fair Trading Pratices	Fair pricing and trasparent contracts	S5
		Rights of Suppliers	S6

	Labour Rights	Employment Relations	S7
		Forced Labour	S8
		Child Labour	S9
		Freedom of Association and Right to Bargaining	S10
	Equity	Non Discrimination	S11
		Gender Equality	S12
		Support to Vulnerable People	S13
	Human Safety and Health	Safety and Health Trainings	S14
		Safety of Workplace, Operations and Facilities	S15
		Health Coverage and Access to Medical Care	S16
		Public Health	S17
	Cultural Diversity	Indigenous Knowledge	S18
		Food Sovereignty	S19

The results of the 15 interviews were entered into the SAFA Tool software developed by the FAO (FAO, 2013). The data

entered into the system by each farm and relating to the individual sub-themes was translated into ratings. For the purposes of a SNA analysis, a value of between 0 and 5 was associated with each rating. Additionally, each rating was weighted according to the level of accuracy of the data given:

Rating	Value	Accuracy Store	Value
Best	5	Low quality data	1
Good	4	Moderate quality data	2
Moderate	3	High quality data	3
Limited	2		
Unacceptable	1		
Not relevant	0		

3.3. Analysis methodology

To analyze social structures and to measure player attributes Social Network Analysis was used which, as is well-known, employs matrix calculations and the representation of relationship characteristics through graph theory (Prell, 2012). In particular, a graph is defined as a set of ordered pairs:

$G=(V,A)$

consisting of vertices n (nodes) and arcs m (or bridges) that connect them.

SNA was chosen for its ability to explain the level of relevance of players within a given network structure or

their degree of centrality in the network (Wasserman e Faust, 1994).

The first level of analysis, represented by the "Structure" factor, was assigned to analyze the effects of the overall social network structure not only on the ability of individual players to initiate processes to achieve a higher level of sustainability, but also on their ability to assume pre-eminent positions and prestige roles within the network. The second level, on the other hand, studied the relevance (Centrality) of the player and its role in the network (Role).

The intention was thus to take into account the ability of the overall network to facilitate access to all of the knowledge assets contained within it regarding sustainability. Another relevant indicator is the density of the network (Prell, 2012), which measures the number of relationships within the network as a proportion of those that, given the number of nodes, could potentially exist. In particular, the degree of density (which assumes values of between 0 and 1) can be defined as:

D=2a/n(n-1).

in which a is the number of active relationships and n is the number of nodes in the network The degree of centrality expresses the number of relationships (or their relative importance, if expressed as intensities) referring to a given node (Freeman, 1979). For the i-th node in particular, the degree of centrality can be defined as that:

$$DC_i = \sum_{k=1}^{N} h(n_i, n_k)(N-1)^{-1}$$

in which h has a non-null value if the arc connecting the i-th node with the k-th node is active.

The centrality of the player within the network was measured using differing indicators depending on how the concept of pre-eminence was intended to be expressed, although the most widespread of these is "degree centrality" (Freeman, 1979). This is based on the player's level of activity in the network, measured on the basis of the number of relationships it establishes or, also, of its degree of popularity among the other players.

$$AC_i = \frac{1}{\lambda} \sum_k a_{k,i} X_k$$

Instead the "closeness centrality" indicator (Scott, 2000) is based on the concept that the pre-eminent players in the network are those that can most easily transfer information to all the others; these players also have the advantage of being able to learn, more rapidly and more easily, the new cognitive resources developed in the network (Friedkin, 1991). "Eigenvector centrality", on the other hand, is an indicator that identifies as most central those players that are able to establish a direct relationship with the other more prominent players within the network itself (Bonacich, 2007). Underlying this indicator is the idea that the players in a network are not all equally important, and that relationships with the pre-eminent actors are more relevant than those with the peripheral players within the network.

Finally, the “betweenness centrality” indicator measures the ability of a single player to directly influence the transit of information within the network, thus influencing the behavior of the other actors in the network and the development of the network itself (Freeman, 1979). This last indicator of centrality also takes the overall structure of the network into account, because it assigns more central positions to those players connecting parts of the network that are otherwise detached (Burt, 1992).

4. Analysis of the results of the FAO SAFA application in the UAE and Sicily

4.1. Characteristics of the farms

The sample is equally distributed between the two areas, as can be seen in table 2.

Table 2. Main characteristics of organic farms detected in UAE and in Sicily Italy (2017) (*)

Farms, n.	Localization	Total surface, ha	Types of production									
			Citrus fruit	Vegetable	Cereals	Fresh fruit	Died fruit	Grapes and wine	Leguminos	Olives and oil	Livestok farm	Grazing
1	Carlentini, Italy	36	x	x	-	-	-	-	-	-	-	-
2	San Cataldo, Italy	32	-	-	x	-	-	-	-	-	x	-
3	Butera, Italy	11	-	-	x	x	x	x	-	-	-	-
4	Aidone, Italy	21	-	-	x	-	-	-	x	x	-	-
5	Acate, Italy	70	x	x	-	-	-	-	-	-	-	-
6	Catania, Italy	32	x	x	-	-	-	-	-	-	-	-
7	Belpasso, Italy	70	x	-	x	-	-	-	-	-	x	x
8	Catania, Italy	2	-	x	-	-	x	-	-	-	-	-
9	Dubai, UAE	2,7	-	x	-	-	-	-	-	-	-	-
10	El-hain, UAE	5	-	x	-	-	-	-	-	-	x	-
11	El-hain, UAE	5	-	x	-	-	-	-	-	-	x	-
12	Abu Dhabi, UAE	2	-	x	-	-	-	-	-	-	x	-
13	Al ghaidi, UAE	4,5	-	x	-	-	-	-	-	-	-	-
14	Abu Dhabi, UAE	5	-	x	-	-	-	-	-	-	x	-
15	Abu Dhabi, UAE	2	-	x	-	x	-	-	-	-	-	-
16	Abu Dhabi, UAE	2	-	x	-	-	-	-	-	-	x	-

Farms, n.	Permanent workers, n.		Temporary workers, n.		Reference market %			Resilience actions					
	family workers	non-family workers	family workers	non-family workers	local	national	international	Crop diversification	Diversification of productive activities	Adoption of warning systems	Exchange of information on good practices	Connection with the research world	Market analysis
1	3	12	-	13	65	4	31	x			x	x	x
2	2	5	-	0	45	30	25	x	x		x		
3	2	7	-	15	75	0	25	x		x	x	x	x
4	1	1	-	5	50	30	20	-			x	x	x
5	2	19	-	11	70	0	30	x		x		x	x
6	1	2	-	4	75	20	5	-	x		x		x
7	1	1	-	5	35	35	30	x					x
8	-	6	-	-	85	15	0	-	x	x	x	x	x
9	-	25	-	-	80	10	10	x		x			
10	-	20	-	20	60	35	5	-		x	x		x
11	-	20	-	30	55	45	0	x	x			x	x
12	-	9	-	-	75	25	0	-		x	x	x	x
13	-	55	-	-	70	10	20	x		x		x	
14	1	6	1	0	90	10	0	-	x		x		x
15	-	2	-	-	95	5	0	x		x		x	x
16	-	5	-	-	65	25	10	-	x	x	x	x	x

It includes a representation of the structural characteristics of organic farming in Sicily (363,639 hectares and 9,543 farms, SINAB 2017) and the United Arab Emirates (4,286 hectares and 53 farms, IFOAM 2017). The farm areas vary between a minimum of 2 hectares and a maximum of 70 hectares in Sicily and between 2 hectares and 5 hectares in the UAE, with averages of 34 and 3.5 hectares respectively.

The predominant production sectors are vegetables (75% of the sample) and livestock (44%), but also citrus fruits and cereals (each 25%) and to a lesser degree fresh and dried fruit, wine growing, etc.

In terms of human capital, outsourced staff predominate, both permanent and occasional. For these two types of work an average of 12 and 10 workers are employed respectively, up to a maximum of 55 employees. The highest amounts of activity were found to be in intensive production sectors (horticulture in greenhouses).

The farms in the sample are mainly active on the local market (an average of 62% in Sicily and 73% in the UAE), although international export destinations are also significant (13% of the entire sample). The existence should be noted, however, of hybrid methods of selling products to the market, with a simultaneous opting for futures markets as well as other destinations (Timpanaro et al, 2016).

Finally, as regards activities undertaken to increase the resilience of the production system, by converting to organic methods farms have achieved an overall increase in the sustainability of their production, integrating activities to improve water and soil management with steps to protect biodiversity and the landscape (56% have introduced crop diversification). “Warning system” attitudes are also

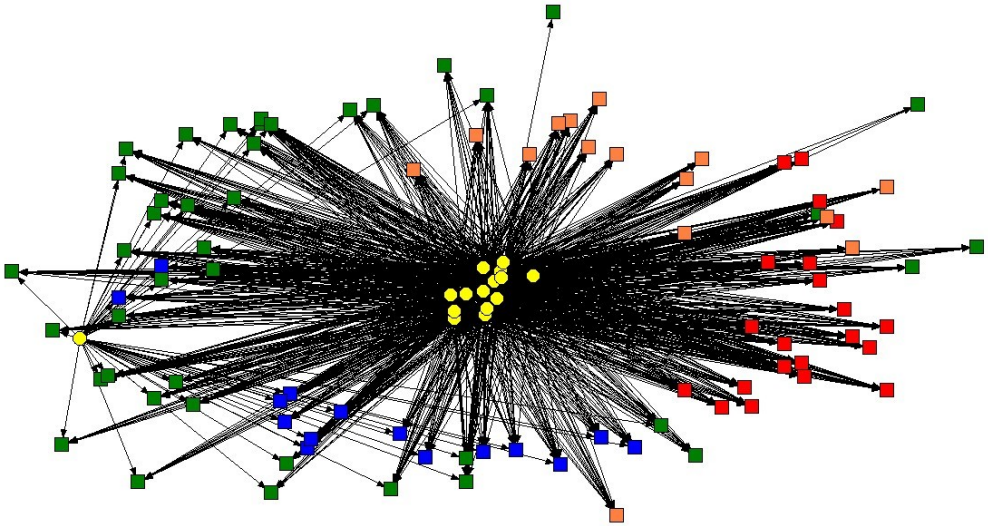
widespread, shown by a quest for innovation in the field of mechanization and also through the introduction of forms of sharing to facilitate the use of modern technologies at low cost, as well as other initiatives to improve farm management (56%); plus optimized management of farm systems, fundamental in maintaining the survival and competitiveness of the business, with investments made to develop an ability to manage changes at different levels in a non-traumatic way (about 63% showed interest both in sharing good practices and in connecting with the world of research). Finally, the diversification of production activities by creating supply chains (e.g. production of forage and related livestock breeding), was triggered by market analysis activities (82% of cases).

4.2. Analysis of the affiliation network

During the first stage a weighted affiliation matrix was built, in which the farms participating in the SAFA program were shown on each row, with the columns representing the sub-themes. Each element in the matrix showed the value attributed to the information given by the farms specifically in relation to a given sub-theme. This matrix thus had the objective of linking the Player (farm) in the network to an Event (quantified information).

The affiliation network graph created in this way (figure 2) shows yellow graphic elements to indicate the farms (players) and colored graphic elements to indicate the events, in other words the responses related to the macro-theme. In particular, the "Good Governance" macro theme was shown in blue, that of "Environmental Integrity" in green, "Economic Resilience" in red and, finally, the "Social Well-Being" theme in orange.

Figure 2. Graph of the affiliation network in the sample of organic farms that have joined the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017)



The link between players and events represents the sharing of a certain opinion rating in relation to a sub-theme addressed, while lengths and thicknesses are correlated to the rating score. In precise terms the length is inversely proportional to the rating score while the thickness is directly proportional.

From an overall glance at the Affiliate Network it can be deduced that the aspects relating to the environment have lower rating scores on average than the others; they are in fact in a marginal area of the graph, whereas aspects relating to good governance and social issues have higher ratings.

To achieve a more detailed analysis, dichotomization procedures were carried out on the affiliation matrix. This procedure involves assigning a connection value of 1 if there is sharing of an event and of 0 if there is no sharing.

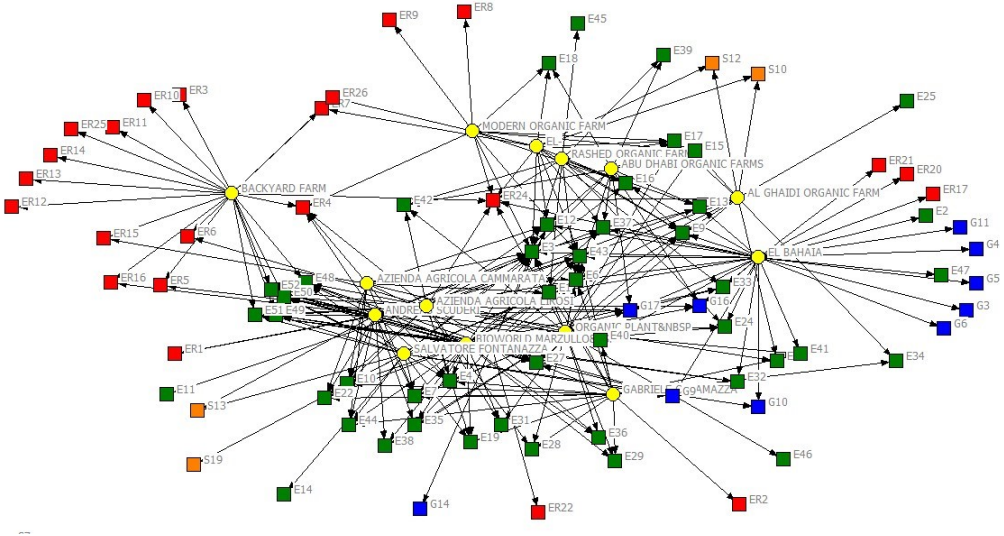
In this way an estimation of the dynamism of the network was achieved upon variation of the dichotomization "cut off" simply by measuring the density of the network itself. Density means the ratio between the number of connections existing as a proportion of the number of possible connections (the extreme case in which all farms share all information). The "cut off" offers the possibility to also distinguish the shared level of rating. A "cut off" of 1 indicates that there is a connection between two farms if they share information regardless of the level of rating quality. A "cut off" of 2 indicates that the connection exists if information is shared with a rating score of 2, 3, 4 or 5 (limited, moderate, good, best excluding unacceptable). A "cut off" of 3 indicates that the connection exists if information is shared with a rating score of 3, 4 or 5 (moderate, good, best excluding limited and unacceptable), etc.

It can be seen that networks whose connections are through information shared with a “best” rating level represent only about 10% of the possible connections. This result necessitated taking the analyses to a deeper level by using different “cut off” values: (a) 1 if the rating score is 1 or 2; (b) 1 if the rating score is higher than 4; (c) 1 if the rating score is 5. While in (a) we can observe the criticalities of the network, in (b) and (c) we can observe the aspects of excellence of the network.

4.3. Analysis of criticalities of the Network

The network exploits only about 17% of possible connections, showing a low point in the average level of general criticality (Figure 3).

Figure 3. Dicotomized matrix with the critical issues of the network in the sample of organic farms that have joined the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017).



The criticalities are related to the theme of “Environmental Integrity”, strongly shared by farms in the Emirates; thus some farms predominantly show criticalities in terms of “Economic Resilience” and, in particular, for the aspects of “Investment” and “Vulnerability”; others show criticalities above all in terms of “Economic Resilience” and, in particular, of “Product Quality”, “Information” and “Good Governance”, with reference to the aspects of “Corporate Ethics” and “Accountability”.

Considering only the shares, 62% of criticalities regard the theme of “Environmental Integrity”, 18% the theme of “Social Well-Being”, 14% “Economic Resilience” and 6% “Good Governance”.

Building now an “event by event” matrix, in which each element of the matrix is given by the sub-theme (indicated with its relevant ID) and the connection between the sub-themes is given by the number of shares, an analysis of the Network can be carried out to identify the sub-themes in which the most criticalities are concentrated and shared (figure 4 and table 3).

Figure 4. Matrix on the ties by critical sub-theme in the sample of organic farms that have adhered to the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017)

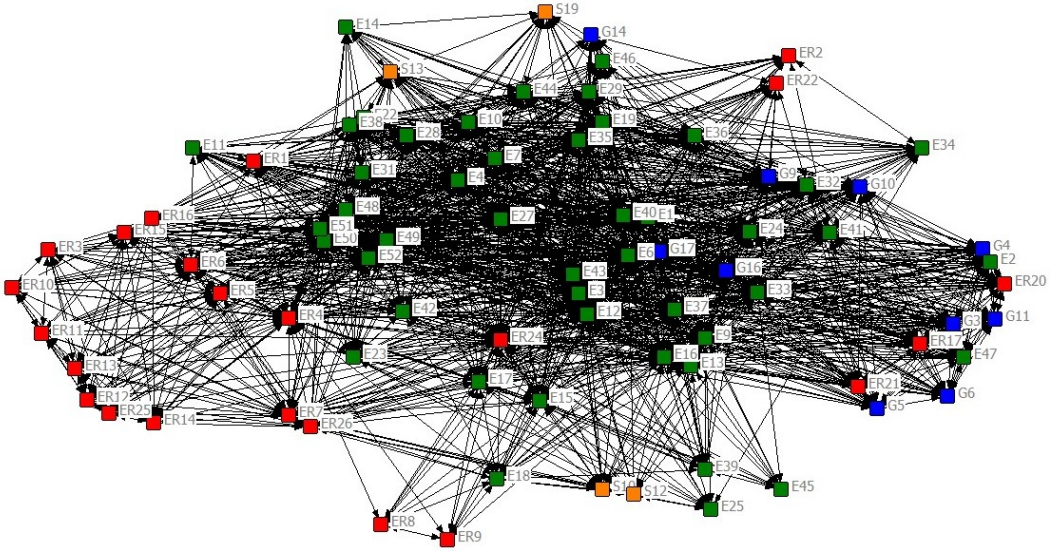


Table 3. Measurement of the degree of centrality by sub-theme of criticality through the "degree freemann" index in the sample of organic farms that have adhered to the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017)

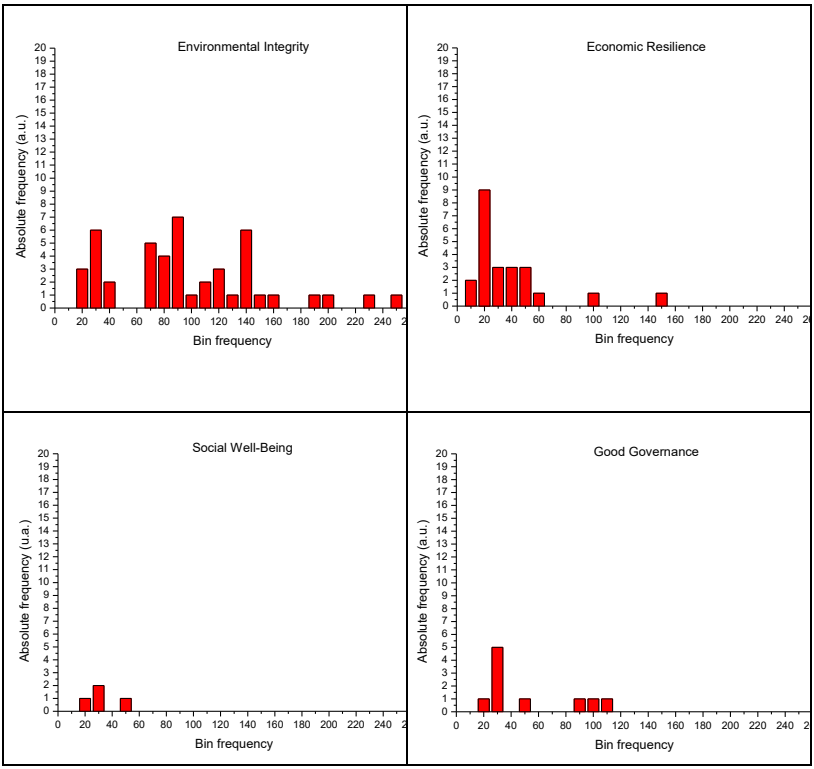
ID	**Degree**	**ID**	**Degree**	**ID**	**Degree**	**ID**	**Degree**	**ID**	**Degree**	**ID**	**Degree**	**ID**	**Degree**
E3	249	E52	132	E19	87	E36	65	ER7	33	ER20	28	ER12	19
E6	226	E10	122	G16	86	E41	65	ER26	33	ER21	28	ER13	19
E43	194	E9	118	E33	86	E28	64	ER15	31	E11	27	ER14	19
E1	183	E7	116	E16	82	E29	62	G3	28	S10	26	ER22	19
E40	152	E1	112	E1	80	ER	50	G4	28	S12	26	ER	19

		2		5		1						25	
E4	143	G17	109	E17	80	G10	47	G5	28	E39	24	S19	19
ER24	142	E22	103	E24	80	ER6	46	G6	28	E46	21	ER2	16
E27	134	E37	102	E13	79	ER16	42	G11	28	G14	19	E25	12
E48	132	E44	95	E31	73	S13	42	E2	28	E14	19	E45	12
E49	132	G9	91	E32	72	ER5	40	E34	28	ER3	19	ER8	9
E50	132	ER4	90	E42	72	E23	39	E47	28	ER10	19	ER9	9
E51	132	E35	88	E38	69	E18	35	ER17	28	ER11	19	ER12	19

From this analysis we can see that the most shared criticalities generally relate to the context of "Environmental Integrity" and, more specifically, that the pressing issues regard the "Atmosphere" (GHG Balance, Ambient Concentration of Air Pollutants, GHG Reduction Target and Air Pollution Reduction Target), "Animal Welfare" (Animal Health Practices, Animal Health, Humane Animal Handling Practices, Appropriate Animal Husbandry, Freedom from Stress) and "Water" (Water Conservation Target, Ground and Surface Water Withdrawals, Concentration of Water Pollutants).

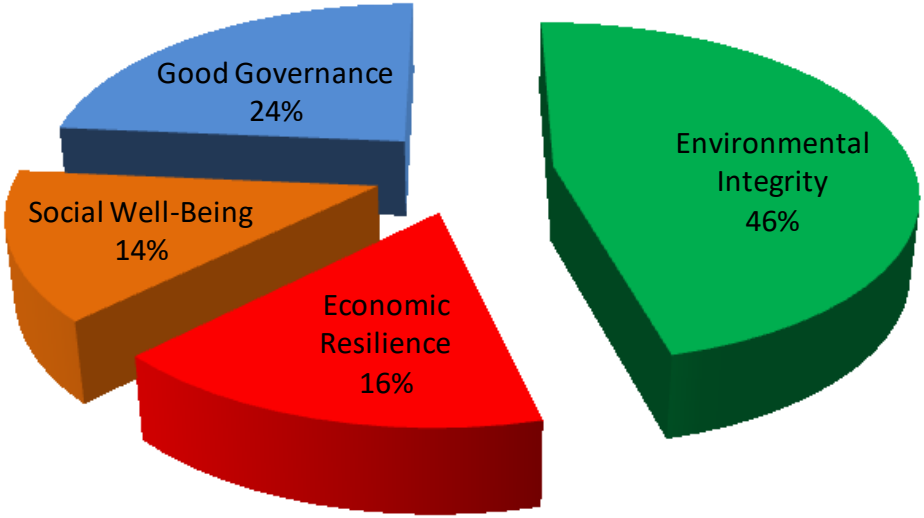
To observe how shares between criticalities are distributed within each context identified by the SAFA questionnaire, frequency distributions were calculated (Figure 5). Each Bin (of a width of 10) indicates the range of importance and the frequency indicates the number of times that they fall within the specific "criticality".

Figure 5. Critical and critical frequency ranges through the "degree freemann" index in the sample of organic farms that have adhered to the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017)



For each context, therefore, consideration was given to the level of importance in terms of Bins and the weight of the frequency, calculating a weighted average indicating the average weighted importance value of a specific context. Figure 6 shows the relative importance of the different macro-areas and the potential impact of aspects such as “Environmental Integrity”, “Economic Resilience”, “Social Well-Being” and “Good Governance”.

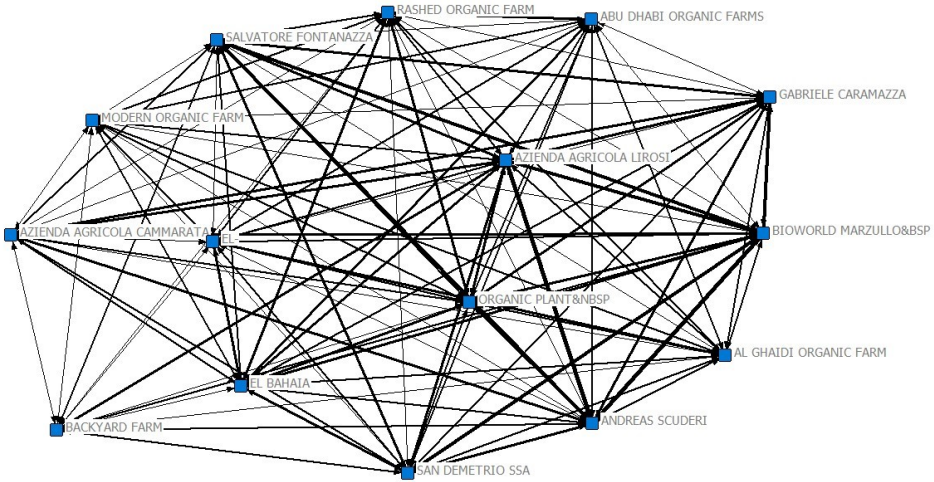
Figure 6. Weighted average values obtained and the percentage of importance weighed in the sample of organic farms that have adhered to the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017).



4.4. Network Criticalities - Networks between players

In order to identify which farm has a central role in the network created according to shared criticalities, a player-player matrix was constructed based on the dichotomized one, in which each element of the matrix represents the number of shares that each player has with the others. Sharing, as shown in figure 7, is represented by a connection the length of which is inversely proportional to its intensity.

Figure 7. Actors-Actors Matrix for the identification of the central role in the network created on the shared criticalities in the sample of organic farms that have joined the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017)



Variable	Value	Variable	Value
Density	*0.981*	Diameter	*2*
Avg Geodetic Distance	*1.019*	Degree Centralization	*0.022*

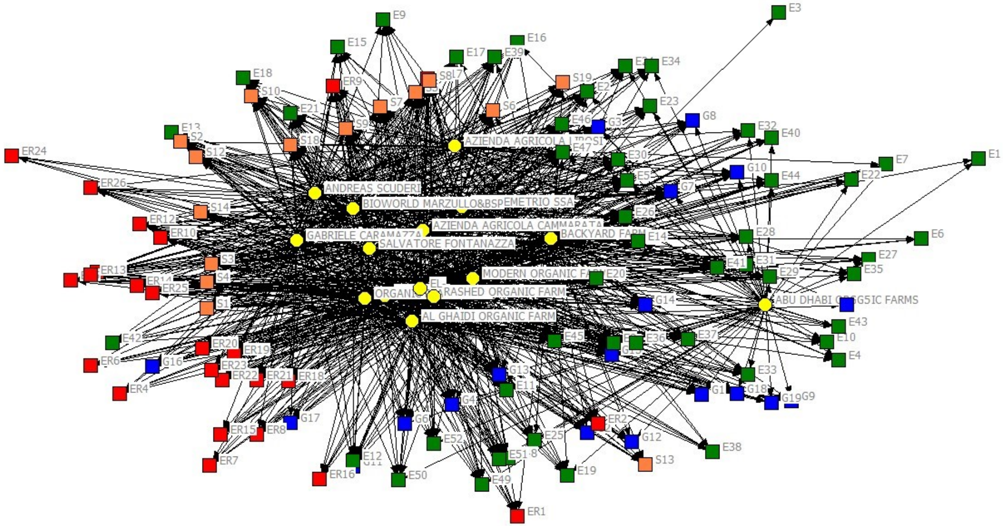
The density (98%) shows that nearly all the possible connections are used, i.e. all the players share all the criticalities. The average geodetic distance is 1.019 and the diameter is 2. The first value indicates that within the network, on average, two adjacent nodes communicate directly with each other and do not always have an intermediary. Whereas value 2 indicates that there are nodes that communicate via an intermediary. The data relating to the geodetic distances, together with the low level of centralization (0.022) indicate that the criticalities are evenly distributed across the network.

Studying in particular the degree of centrality of the individual players it can be deduced that the two farms with the lowest degree of centrality (0.157 and 0.184 respectively) are located in the United Arab Emirates. As shown previously, these in any event are the two farms showing unique criticalities compared to the others.

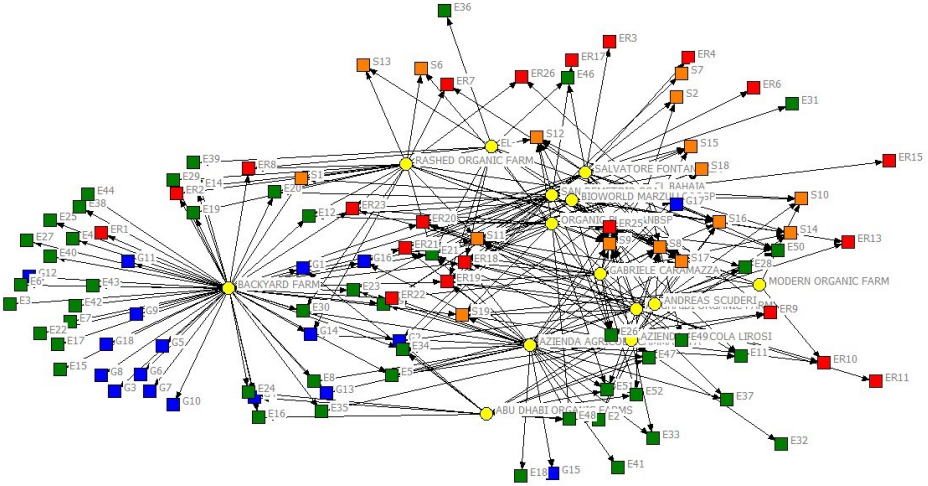
4.5 Analysis of aspects of excellence of the Network

The elements of sustainability upon which high levels of sharing were reached among the farms sampled were summarized in dichotomized matrix type (b) and (c), shown in Figure 8.

Figure 8. Graph of the dichotomized matrix of type (b) and (c) in the sample of organic farms that have adhered to the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017)



Type network (b). A binding value of 1 is assigned when the rating is 4 or 5. Value 0 when the rating values are different from 4 0 5.



Type network (c). A binding value of 1 is assigned when the rating is 5. Value 0 when the rating values are different from 5

	Density	SD
Network di tipo (b)	0.6844	0.4648
Network di tipo (c)	0.1811	0.3851

In this and, in particular, in the type (b) Network graph it emerges that the farms are very close, showing a shared rating score of 4 and 5 apart from on issues regarding "Environmental Integrity" and "Good Governance", which have a marginal position. These issues, as shown by the type (c) Network graph raising the value of excellence, are closely connected solely in one case in the United Arab Emirates.

The density values relating to the two Networks confirm a reduction in shares between players and aspects of excellence as the rating score increases. In fact this goes from 0.6844 in density (about 68% of possible connections) for ratings of 4 or 5, to 0.1811 in density (about 18% of possible connections) for a rating of 5. To identify on which sub-themes the aspects of excellence are concentrated and shared, an "event by event" matrix was created for case (c) (Figure 9), and the relevant degree of centrality was measured using the *freeman degree* index (table 4).

Figure 9. "Event X Event" matrix aimed at identifying the sub-themes on which are concentrated and shared the greatest excellences in the sample of organic farms that have adhered to the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017)

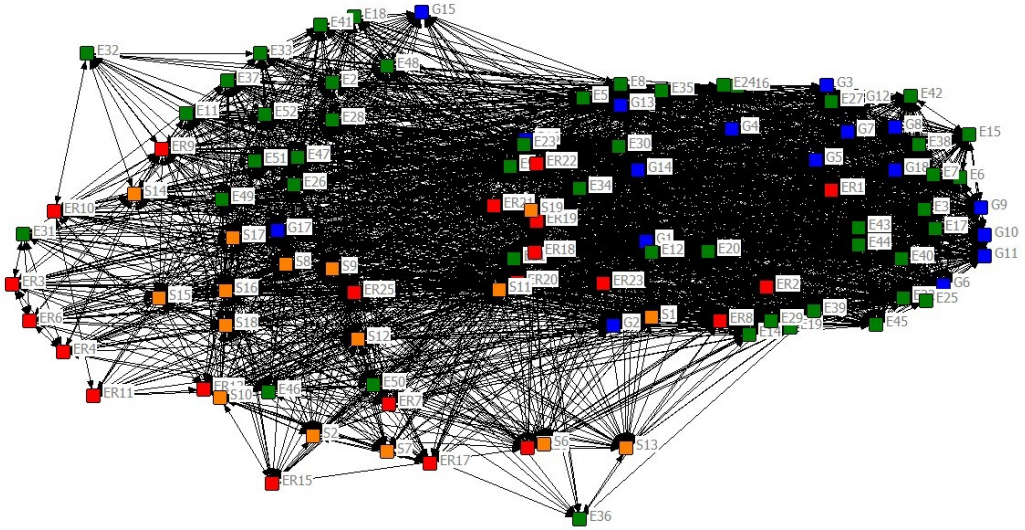


Table 4. Freemann degree index for the measurement of the degree of centrality for each sub-theme of excellence in the sample of organic farms that have adhered to the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017)

ID	Degree	ID	Degree	ID	Degree	ID	Degree	ID	Degree	ID	Degree	ID	Degree	ID	Degree
ER18	214	E34	128	E49	93	E2	74	G8	57	G6	57	ER13	40	ER3	23
ER25	206	S16	121	E20	92	E35	73	E25	57	G10	57	ER10	37	E32	16
S9	206	E5	118	E47	91	ER9	73	E40	57	E6	57	ER26	37	ER15	16
E21	193	G16	114	G13	91	E16	70	G3	57	G11	57	S6	35	ER11	16
S1	192	E2	114	E8	91	E5	70	G	57	E1	57	G1	34	E3	11

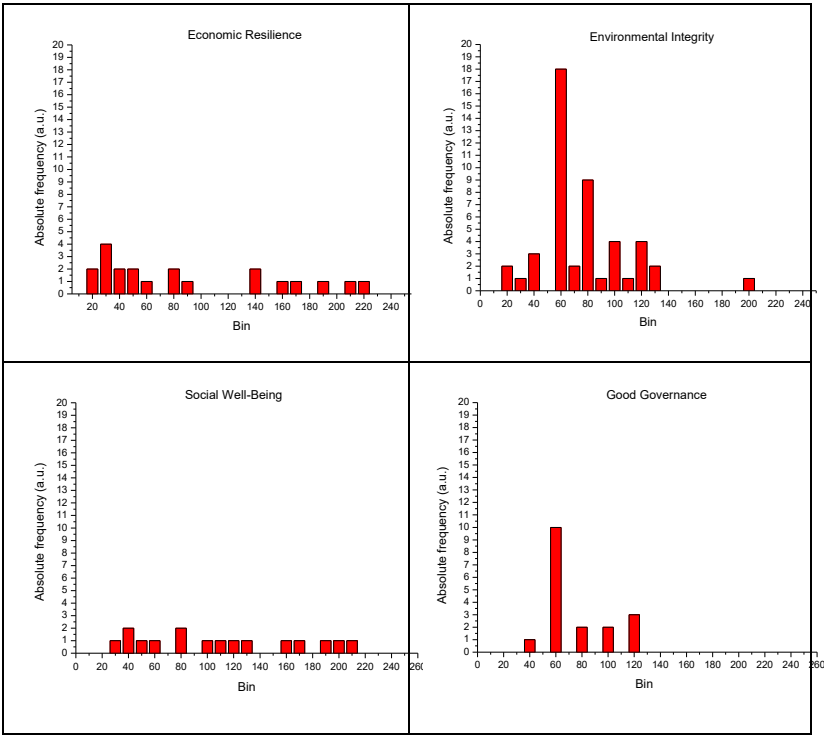
1		3				0		18		5		5		6	
S8	187	E9	114	ER8	89	G4	70	G5	57	E45	57	E18	34		
ER19	184	S12	112	E52	80	S14	70	E43	57	E38	57	E41	34		
ER20	162	E30	112	E19	78	E24	70	G7	57	G9	57	E46	34		
S17	160	G14	112	E29	78	E39	68	E17	57	S10	56	S13	32		
S19	158	G2	110	ER2	78	E48	61	E7	57	E28	55	ER17	24		
ER21	155	E12	106	E14	78	E11	59	E27	57	E37	51	S7	24		
ER	133	S1	102	S1	78	E3	57	E4	57	E3	50	E3	23		

23				5				2		3		1	
ER22	131	G1	94	G17	78	E22	57	ER1	57	ER7	44	ER6	23
E26	129	S18	94	E51	77	E44	57	G12	57	S2	40	ER4	23

From the table it can be deduced that the most shared aspects of excellence are generally related to the context of: "Economic Resilience" and, specifically, the most prominent issue of *Product Quality and Information* (*Hazardous Pesticides, Food Contamination, Food Contamination, Product Labeling, Traceability System, Certified Production*); "Social Well-Being" and, specifically, the main themes of Labor Rights (*Forced Labor, Child Labor*), Equity (*Non-Discrimination*), Human Safety and Health (*Public Health*); Environmental Integrity and specifically the main topics of Land (*Net Gain/Loss of Productive Land, Land Use and Land Cover Change*).

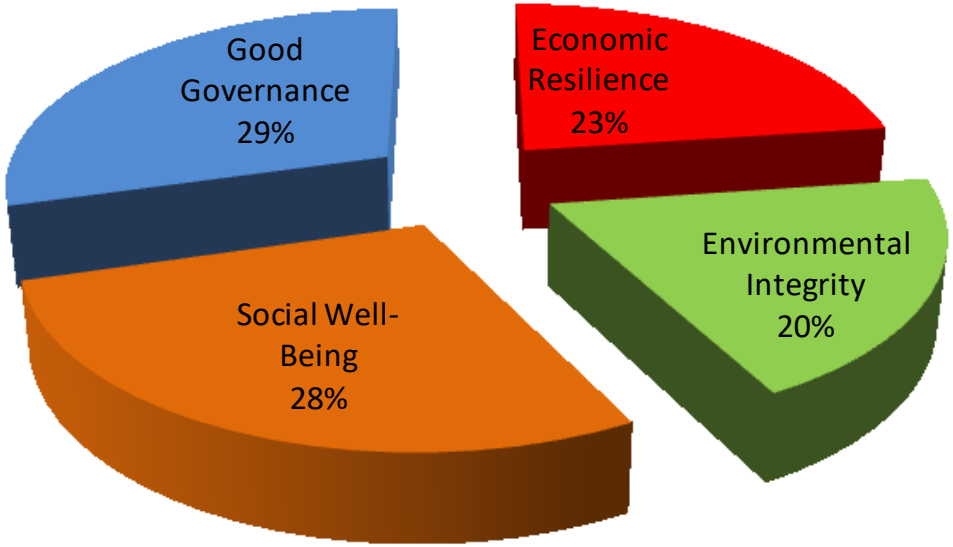
To observe how shares between aspects of excellence are distributed within each context identified by the *SAFA questionnaire*, frequency distributions were calculated. Each Bin (of a width of 10) indicates the range of importance and the frequency indicates the number of times that they fall within the specific "aspects of excellence" (figure 10).

Figure 10. Frequency distributions by macro theme of excellence in the sample of organic farms that have joined the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017)



For each context, consideration was given to the level of importance in terms of Bins and the weight of the frequency. In this way a weighted average was calculated indicating the average importance value of a specific context (figure 11).

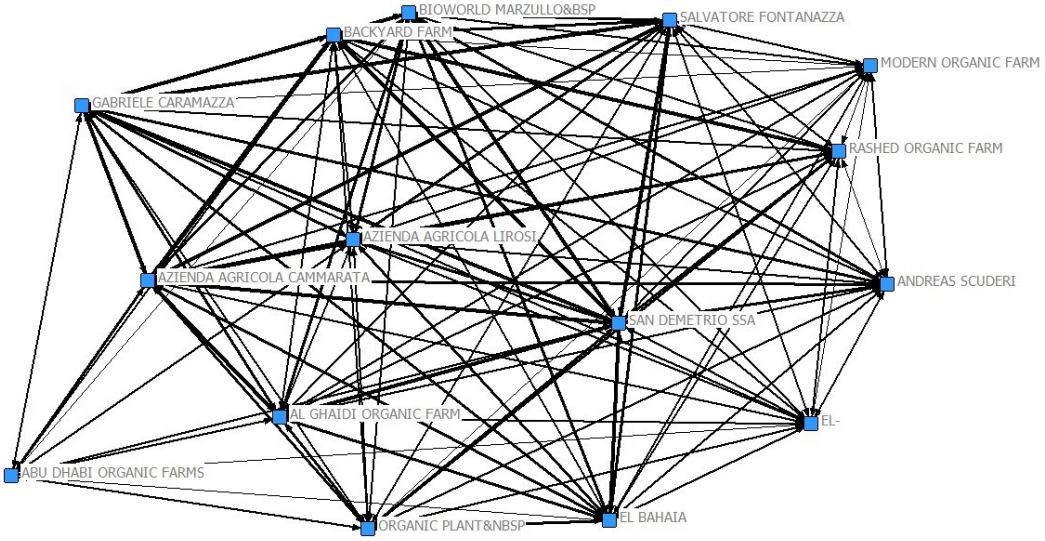
Figure 11. Average values and percentage of importance weighed by factors of excellence in the sample of organic farms that have adhered to the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017).



4.6. Network Aspects of Excellence - Networks between players

In order to identify which farm has a central role in network type (c) created according to shared aspects of excellence, a player-player matrix was constructed based on the dichotomized one, in which each element of the matrix represents the number of shares that each player has with the others. Sharing, as shown in the following graph, is represented by a connection the length of which is inversely proportional to its intensity. Its thickness also indicates its intensity (Figure 12).

Figure 12. Matrix Actors-Actors and shares for excellence factors in the sample of organic farms that have joined the measurement of sustainability with SAFA-FAO in UAE and in Sicily-Italy (2017)



The density (97%) shows that nearly all the possible connections are used, i.e. all the players share a certain number of aspects of excellence in the same way. The average geodetic distance is 1.029 and the diameter is 2. The data relating to the geodetic distances, together with the low level of centralization (0.033) indicate that the number of aspects of excellence are evenly distributed between the players.

Studying the degree of centrality of the individual players in particular it emerges, as shown in table 4, that farms Sicily 4 and Sicily 7 are those with the highest degree of centrality, while the farms UAE6 and UAE7 have a marginal role in terms of centrality.

5. Conclusions

Overall, the survey enabled the identification of a variability in sustainability performance according to production sector and geographical area.

As regards "good governance", mediocre results emerged for the operators in the two areas. These are often farms of medium size (arable and/or livestock) that, despite having clearly defined their mission by converting to an organic farming system, lack the suitable tools for promoting this to all parties involved in the supply chain and the production process as a whole (Timpanaro et al, 2018). The same results emerged from the answers given by operators regarding the responsibility process, in that the enterprise owners did not always state that they were able, through their decision-making processes, to influence all parties involved in the production process, therefore appearing unconvincing and unable to define their objectives clearly or

with the use of suitable tools. Another negative aspect of the evaluation involved the sphere of participation, in which the operators demonstrated a clear lack of understanding of how to get the interested parties involved; this is due to an inability to start a dialog with them and to reach solutions in the event of conflicts (Timpanaro et al, 2016).

In the sphere of "environmental integrity" the arable farms showed sensitivity to the theme of air pollution, but the low values of the related indicator can be traced to a lack of tools able to measure the actual pollution generated by their production activities. As for livestock farms, these demonstrated better results in relation to the quality and use of water - all the operators stated that their waters are not contaminated either by livestock raising or arable activities. Only livestock farms were asked questions related to animal welfare and all achieved excellent results, stating that they prefer prevention activities for livestock rather than using veterinary medicines; long-term observations are made of the animals to manage birthing optimally and give punctual treatment to those needing more care than others due to the practice of semi-wild grazing (Timpanaro et al, 2016).
As regards the soil the operators stated that they have excellent chemical and biological quality and a high level of organic substances in more than 80% of the land used; they also underlined that activities have been started to reduce erosion such as minimum tillage, and that the ratio between land in excellent condition and degraded land is a positive one in favor of the former. The other sub-theme analyzed is biodiversity. Despite no real programs for the protection of threatened animal and plant species having been launched, particular attention was noted towards local species (both in rotation and in mixtures) and/or native animal breeds.

As for “economic resilience”, the results highlighted excellent results among arable farms. In the two areas operators said that they had invested to improve the production process, for example by renewing their fleet of machinery and/or acquiring new land in order to increase their production capacity. In this case farms had access to formal sources of finance (often PSR Sicily 2007-2013 and specific resource for the UAE) as well as informal sources (self-financing), and as such they appeared able to sustain conditions of risk and, therefore, were suitable for the area of vulnerability . Excellent results were also obtained as regards local development, given that farm products are often destined to regional markets and are also characterized by a meticulous control process and a precise traceability system. As regards livestock farms, in this case too the economic area showed medium-high results. All the operators stated that they had made investments above all in milking equipment but also in improving the shelters used during the colder periods of the year. These farms also reported having access to sources of finance for tackling difficult situations, and in terms of product quality they all submit themselves to a meticulous system of control, certification and traceability. All the livestock farms evaluated sell their products on local markets and, unlike arable farms that are largely family-run, they take on seasonal workers - thus contributing to the creation of both local and foreign employment.

Finally, in terms of “social well-being” the results reported by arable farms for this area of sustainability were medium-high, since attention is paid to ensuring adequate sustenance for both workers and for the enterprise owner. Better results were also measured for the theme of “fair trade practices”, in which the enterprise owners stated that they maintain

relationships with 100% of their suppliers and customers based on fair contracts that make it possible to sell the product easily to market - though at an unsatisfactory price, above all for wheat.
The operators also demonstrated an appropriate respect of workers' rights. These are enterprises that support female employment in this sector, and in the future they would like to make a commitment to creating suitable facilities to accommodate workers with disabilities, thus providing adequate jobs and including them in the sector.

Their future working outlook will need to focus more on consumption at the downstream stage in order to harvest the aspects of sustainability that are most perceived by consumers and to benefit from their readiness to associate this value with the enterprise.

Acknowledgment

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5. The consumer and the role of sustainability in his purchase choices of agri-food products in the United Arab Emirates and Sicily (Italy)

Abstract

The paper starts from the assumption that a greater level of sustainability of national food systems can be achieved with the contribution of the consumer. Today the consumer is able to condition the choices of the production system, with a greater demand for reassurance on quality, safety and traceability of the food product. To confirm this hypothesis, it was found in consumer samples in the two territorial contexts in study (United Arab Emirates and Sicily), with the aim of verifying the level of sensitivity to the topic, purchasing behavior and type of sustainable products preferred. The analysis of the results shows the interest of the UAE for organic products and of Sicily for local products, of a short and zero-kilometer supply chain, an expression of the traditions and opportunities for socio-economic development in the region. The picture is enriched with some food for thought on aspects closely linked to agri-food sustainability.

Key words critical and sustainable consumption; organic products; consumer behavior; diet food; global food sustainability

1. Introduction

Before moving to the consumer's possibilities to act in the agri-food system change, it is vital to define his characteristics. This is not simple, because of his continuous evolution over the years.

The consumer of the actual society is complex, exigent, critical and competent. It is not possible to trace a typical consumer's profile, because every person is different from the others.

Each one, certainly, asks for safe products, but pays attention to the multiple aspects of the products differently from the other people, in accordance to their own and specific personality.

Many features and aspects of a food product, in fact, can be appreciated such as naturalness, functionality, low fat content, intelligent or interactive packaging, social and environmental aspects, ethical aspects, the link with the local area, time-saving service, origin of raw materials, color, form, label information, brand, price and others.

Therefore, the food demand is multi-fragmented and changeable, as well as markets are dynamic.

Focusing on the development of sustainable agri-food systems, the consumer has a key role and his ways to influence this process consist of:

- Adopting Sustainable diets
- Avoiding Food Waste

2. A path to sustainable consumption, according to recent literature and agri-food policy interventions

2.1. The concept of sustainable diet: its origins and evolutions

The concept of sustainable diets has been neglected for many years, because more attention was turned to industrialization and intensification of agricultural systems and food globalization.

Nowadays it has become essential and its final definition has been introduced and approved at the International Scientific Symposium "Biodiversity and Sustainable Diets: United Against Hunger" organized jointly by FAO and Biodiversity International in 2010.

According to these organizations, *"Sustainable diets are those diets with low environmental impacts which 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."*

Key determinants of sustainable diets are shown in Figure 1 as large green ovals, which intersect pink circle.

This representation makes the point that each component, including:

1) wellbeing, health,

2) biodiversity, environment, climate,

3) equity, fair trade,

4) eco-friendly, local, seasonal foods,

5) cultural heritage, skills,

6) food and nutrient needs, food security, and accessibility, relates to and influences the others and the sustainability of diets.

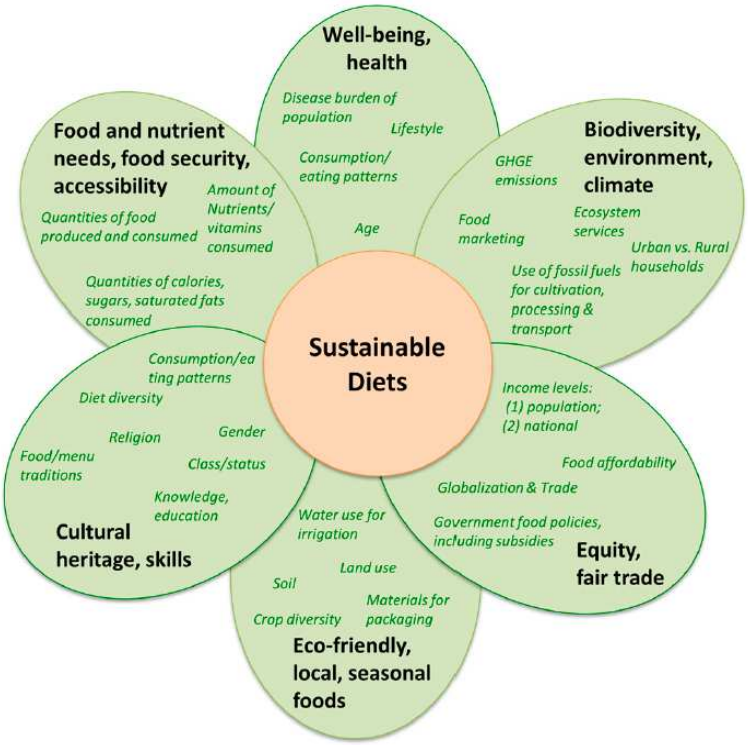

Figure 1. The key components and determinants of a Sustainable Diet (Source: Johnson et al., 2014)

In any case, it is possible to include these determinants in 4 wider areas: environment, socio-economy, culture, health and agriculture.

Agriculture is the basis of diets, because most of the products that make up diets come from this sector. This last has undergone, with the onset of the green revolution, a strong intensification and industrialization, that have allowed to produce large quantities of food and to reduce hunger and famines, but at the same time have brought to serious environmental problems and to an excessive simplification of diets. Many countries, in fact, are nowadays characterized by the production of energy-dense foods, poor in fiber and nutrient and by the spread of unbalanced diets, such as the Western Diet Pattern, that have surpassed more equilibrate and healthier ones.

Mediterranean and Asian diets, classified as "prudent" types, because of the preponderance of fruits, vegetables, nuts, wholegrain, fish and other nutrient-dense foods in their composition, are progressively disappearing. Consuming industrial food is a negative factor for human health, because it does not provide the organism with the necessary nutrients and components required to the growth and daily functioning: in this way it is possible to get undernutrition, micronutrient deficiency, overweight, obesity, stunting, anemia, diabetes and many other diseases.

Regarding economical aspects, there is certainly a considerable price difference between less healthy and healthiest products. In principle the former are less expensive than the latter: previously it was believed that the populations with higher incomes mostly bought and invested on food of greater variety and nutritional value, in reality today even the wealthier countries tend to consume

on average the same less healthy food, because of the profound changes in consumer's lifestyles.

Lifestyles, culture, habits, beliefs and aspirations greatly influence consumption patterns; for example, overweight and obesity are often attributable to overeating in conditions of stress, depression or in presence of wrong habits like eating while watching TV. In addition, religion practices can negatively or positively affect diets.

All these considerations take us to the conclusion that a sustainable diet is influenced by a multiplicity of determinants and that it must be made up of eco-friendly, local and seasonal foods.

Only through the production of these foods and their consumption within sustainable diets, it is possible to achieve sustainable agri-food system.

2.2. The concept of sustainable diet and food waste

Food waste is an important issue that nowadays is responsible of many negative impacts on environment and society. According to FAO, approximately 1.3 billion tons of food, that is to say about one third of the food produced in the world for human consumption, every year gets lost or wasted.

The waste of a such big quantity of food can be obviously translated into an equally big waste of natural resources, like water, land and air pollution. Always according to FAO, the food wasted every year emits approximately 3.3 billion tons of CO2.

Food waste is generally the result of multiple behaviors that are performed over time and this complexity of behaviors at

different time points increases the likelihood of waste (Quested et al., 2013).

Part of such waste is due to consumer's behavior and occurs both at home and out of home, that is to say at food services (bar, restaurants, take-away etc..): there are a lot of factors that cause consumer's food waste and even more experts stressed that concrete measures and actions are needed to stem them.

Some of the factors or the causes are:

Lack of planning and management of purchase, storage, preparation and reuse of food and meals

Low price level of food and big packaging sizes, that brings consumers to buy too much food

The equivalence that consumer makes between food aesthetic defects and bad quality

Confusion about and misinterpretation of the date labeling

Feelings of disgust towards leftover foods

Little awareness of the impacts of food waste

Reducing consumer's food waste is possible through a lot of measures and actions.

First, it needs to create awareness of the issue among consumers and to educate them in 'food skills'. Other measures could be: changes in the organization and phrasing of date labelling, taxing food waste, encourage the purchase of suboptimal food by lowering prices or by selling it in separate classes, social norms spread by media and books, the use of doggy bags.

2.3. Global food sustainability and international paradigms

An incredible guide towards food sustainability for consumers and not just for them is represented by the "Decalogue for Sustainable Food and Nutrition in the Community: Gran Canaria Declaration 2016".

It is a document elaborated by around thirty national and international nutrition experts, in order to improve food sustainability across the globe. The major organization and institutions worldwide have recognized its important value.

In fact, through 10 keys for healthier life and world, this document, highlights the importance of Sustainable Nutrition within the actual food era and the need for intervention and commitment on the part of everyone.

The main recommendations are summarized and shown in Figure 2. From the analysis of each one point, some themes and aspects result of fundamental importance.

10 keys for a healthier life and world
1. Select and consume locally sourced foods. Choose products produced in your own region and made available at local markets.
2. Preferentially consume foods that are in season. They are healthier, more economical and sustainable.
3. Revive traditional local foods and recipes. They are part of our culture and make up our identity.
4. Learn to buy and cook in the company of others. It's more fun and enriching. And we can learn from each other.
5. Plan menus and shopping lists. Try to reduce food waste and recycle adequately at home and in the community.
6. Prioritise plant based foods. Limit the consumption of meat, processed meat and dairy products. Your health and the planet's will appreciate it.
7. Aquatic and terrestrial biodiversity is critical and we should promote it to ensure its continuity. It's everyone's responsibility.
8. Take an interest in whether the agricultural, livestock and fishing practices which provide the foods you obtain and consume are sustainable.
9. Enjoy the companionship and pleasure of mealtimes, always within the context of balance and moderation. Reduce portion sizes.
10. Enjoy the Mediterranean diet. It is one of the best examples of healthy and sustainable food and nutrition. UNESCO has declared it an Intangible Cultural Heritage of Humanity- they surely must have their reasons for doing so.

Figure 2. Decalogue developed based on an Expert Consensus Meeting held in Gran Canaria Spain on the 8th and 9th of April 2016 (Source: Serra-Majem et al., 2016)

First of all, the calling for support local production: this makes it possible not to transport foods over long distances, saving so energy and avoiding ecological impacts, and reactivating local economies.

Then, there are the themes of seasonality and traditional nature of local foods: choosing foods that are in season is convenient both from an organoleptic and nutritional point of view and from an environmental one.

Not only do seasonal products taste better and have a higher content of nutrients, but they also need a lower use of natural resources and respect favorable climatic conditions.

Referring to traditional characters, local products emerge by the combination of gastronomic and cultural food skills and represent an effective form of food biodiversity, that can be protected only by the promotion and the valorization of the same products.

Also social interaction through food cooking and meal times is suggested, because it allows the exchange of information, knowledge and it is amusing and pleasant.

Concerning dietary patterns, Mediterranean diet is seen like the most suitable diet, because of its cultural, social, health and environment importance.

Other relevant recommendations regard the necessity to reduce the consumption of animal foods, that have a greater environmental footprint than that of plant foods; to eat with moderation and to avoid food waste by planning menus and shopping list and by implementing appropriate recycling

practices; and to promote the preservation of aquatic and terrestrial biodiversity.

In general, it is possible to affirm that all these keys are a call for the responsibility of everyone to invest in a sustainable future.

2.4. The role of the international Institutions

Public institutions influence and regulate food production and trade by global or local policies. It is possible to distinguish:

- International institutions, such as those of European Union and organizations like FAO, WHO, EFSA
- National Institutions, as Ministry of Agriculture and other Ministries
- Local Government Institutions: regions, provinces, municipalities and districts

Among the principal areas that they regulate, there are food safety, food information, food market efficiency and food quality. Regarding sustainable aspects, actually institutions are mostly investing in promoting sustainable practices and foods.

The European Union, for example, has grasped the centrality of this topic, incorporating the objective of sustainable development into its policies and taking a leading role in the fight against climate change. Rules regarding organic foods or quality food products, as well as the Rural Development Programme, have allowed the agri-food sectors of the various member countries to come closer to a sustainable development. These rules determine both a restriction of the producer's behavior and its protection, as

well as the protection of the consumer's health and of the environment. European Union agricultural policy is recently changed considerably, because of the shifting of the attention of the main reforms to greener agricultural practices, research and dissemination of knowledge, a fairer system of support for farmers and a stronger position for farmers in the food supply chain. Furthermore, it is stressing some important themes as innovation in food production and processing (through EU research projects) to increase productivity and reduce environmental impact and the use of EU voluntary quality labels in order to help consumer in food choices and companies in competitiveness.

The Rural Development Programme 2014-2020 is the community planning tool based on one of the ESI funds, the EAFRD (European Agricultural Fund for Rural Development), which allows each European State to support and finance the interventions of the regional agricultural and forestry sector and increase the development of rural areas. Six common priorities have been established:

- Fostering knowledge transfer and innovation in agriculture, forestry and rural areas;
- Enhancing the activity and competitiveness of all types of agriculture, and promoting innovative farm technologies and sustainable forest management;
- Promoting food chain organization, animal welfare and risk management in agriculture;
- Restoring, preserving and enhancing ecosystems related to agriculture and forestry;
- Promoting resource efficiency and supporting the shift toward a low-carbon and climate-resilient

economy in the agriculture, food and forestry sectors;

- Promoting social inclusion, poverty reduction and economic development in rural areas;
- Taking into account these priorities, each Member State and Region has formulated its own development rural plan, setting its objectives and measures.

European environment policy is closely connected to the agricultural one and vice versa because environmental requirements and considerations are necessary fully involved into other policies.

Another important example of international policy is represented by the Milan Urban Food Policy Pact (MUFPP). It was signed on the 15 October 2015 in Milan by more than 100 cities and expresses the need and urgency of linking food policies to many other urban policies, in order to develop sustainable food system.

The document contains a premise with all the considerations that led to the drafting of the pact, the commitments that all those who signed have promised to respect and the recommended actions about four main aspects (governance, sustainable diets and nutrition, social and economic equity, food production, food supply and distribution, food waste). For the purpose of our discussion on the policies of the institutions, it is interesting to report below the commitments that mayors and representatives of local governments, by signing this document, have made:

- *" work to develop sustainable food systems that are inclusive, resilient, safe and diverse, that provide*

healthy and affordable food to all people in a human rights-based framework, that minimise waste and conserve biodiversity while adapting to and mitigating impacts of climate change;"

- *"encourage interdepartmental and cross-sector coordination at municipal and community levels, working to integrate urban food policy considerations into social, economic and environment policies, programmes and initiatives, such as, inter alia, food supply and distribution, social protection, nutrition, equity, food production, education, food safety and waste reduction;"*
- *"seek coherence between municipal food-related policies and programmes and relevant subnational, national, regional and international policies and processes;", "engage all sectors within the food system (including neighbouring authorities, technical and academic organizations, civil society, small scale producers, and the private sector) in the formulation, implementation and assessment of all food-related policies, programmes and initiatives;"*
- *"review and amend existing urban policies, plans and regulations in order to encourage the establishment of equitable, resilient and sustainable food systems"*
- *"use the Framework for Action as a starting point for each city to address the development of their own urban food system and we will share developments with participating cities and our national governments and international agencies when appropriate;"*

- *"encourage other cities to join our food policy actions."*

Regarding national policies, it is interesting to consider the strategic plan for innovation and research in the food and forestry agricultural sector, that describes the strategy shared by MiPAAF and Regions for innovation actions and research to be undertaken in response to the first of the six priorities of the Rural Development Programme. Focusing on local context, it has been previously highlighted that food has been excluded for a long time from urban planning policies. Local institutions are nowadays became fundamental for the development and dissemination of sustainable food practices, products and habits.

As public institutions, regional and local governments increasingly claim a role in the development and implementation of new agri-food policies (Renting and Wiskerke, 2010). According to these considerations, regional and local governments should adopt policies, able to make food a lever of territorial development.

Important tools in this sense are:

- the promotion of local products through the creation of markets, fairs and festivals
- the management of farmer market areas
- food education programs
- communication and awareness campaigns to consumers
- financing for small producers
- contracts for school , hospital and prison lunches with local food growers.

With appropriate tools and through the synergy with the other levels of governance such as regional, national and European, cities are in fact the most suitable areas for the management of environmental issues, health, competitiveness of production systems, access to part of the most vulnerable groups, of the culture concerning food (Brunori and Galli, 2017).

2.5. Universities and the Participatory Action Research

Universities are important for the development of a sustainable agri-food system. The Horizon 2020 program gives tools to support research and development actions innovation in the areas of food security, bio-economy and sustainable agriculture, and in other linked issues (climate action, efficient use of resources natural, safe, clean and efficient energy). A kind of research particularly suitable for agri-food system is the Participatory Action Research (PAR). The PAR or action-research can be considered a valid tool for the development of a sustainable agri-food system. In reality, this type of research is suitable to many areas, including the agri-food one.

The term 'action research' was coined in 1946 by a social psychologist, Kurt Lewin, to describe a spiral action of research aimed at problem solving. He involved people from postwar countries in order to bringing about democracy.

The same name of this method gives a clue in line with its main characteristics:

"participatory" means that the research needs the collaboration and the involvement of the community, in which the research itself takes place

"action" is the main purpose of the research, that should produce concrete changes

In other words, by its collaborative and participatory nature, PAR moves right away from the idea of the 'outside expert' coming into a community to examine, theorize and propose solutions (Maggie Walter, 2009).

The peculiarity of this method lies on the completely equal and collaborative relationship established between researcher and community and its cyclical nature. This last is defined cyclical because researchers and community act and observe step by step until the problem is solved. Figure 3 shows just this cyclical mode.

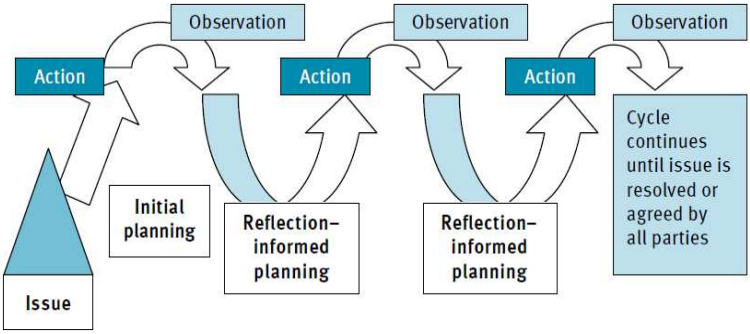

Figure 3: The iterative cycle of PAR (Source: Maggie Walter, 2009)

This research methodology is very effective in the agricultural sector, because it contemporary allows farmers to solve their concrete problems and researchers to learn a

lot of important information on the territory and on the agricultural practices by the farmers.

3. Materials and methods

A questionnaire was administered both in Sicily (Italy) and in United Arab Emirates (UAE). The chosen sample was about 100 consumers and the aim was to identify some aspects related to sustainability such as consumers' sensitivity to sustainability, their behavior and their opinion or address.

In some cases, the answers were associated with a judgment in order to weigh both the intensity with which the consumer performs certain actions that the validity. The associated judgment values range were from 1 (lowest value) to 5 (highest value).

In these cases, for the data analysis, the % weighted value expressed by the following formula was used:

$$\%value = \frac{\sum_{i=1}^{5} n_i f_i}{\sum n_{ij} f_{ij}} \times 100 \qquad (1)$$

where n_i it is the number of consumers who answered affirmatively and f_i is the weight (or judgment) assigned to response (from 1 to 5) and the sum $n_{ij}f_{ij}$ the total number of answers multiplied by the respective weights.

Per ogni risposta inoltre fu calcolato the Weighted mean judgment seguendo la seguente formula:

$$Weighted\ mean\ judgment = \frac{\sum_{i=1}^{5} j_i m_i}{\sum m_i} \times 100 \qquad (2)$$

where j_i is the intensity of judgment expressed and m_i the frequency with which it is expressed.

4. Results and discussions

4.1. Sensitivity of the territories to Sustainability.

A first aspect analyzed was that related to the sensitivity of the territories to the concept of sustainability through the interview with the consumer. These were asked: What consumption do you rationalize?, What differentiates in the collection?, Do you use ... ? when do you make food choices…

Below are the results obtained for both Sicily and UAE.

Figures 4 and 5 show that in the UAE the rationalization of energy (70%) is more attentive while in Sicily the same attention is given to both energy (49%) and water (40%).

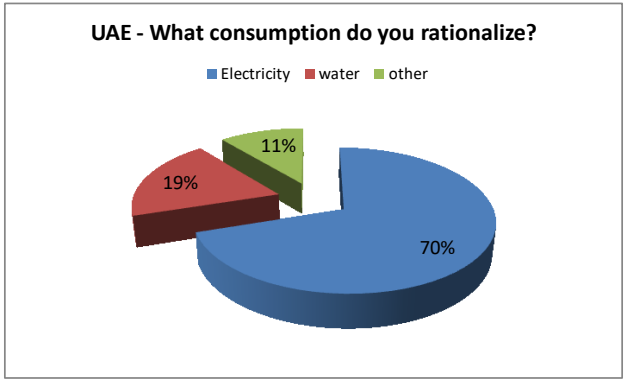

Figure 4. % distribution of consumption rationalization in UAE.

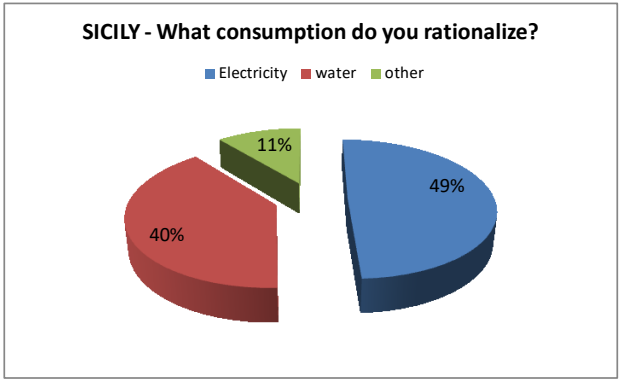

Figure 5. % distribution of consumption rationalization in Sicily.

In UAE the predominantly differentiated materials are glass (30%) and plastic (40%) (Figure 6) while in Sicily also batteries (20%) and paper (26%) have about the same attention as glass (27%) and plastic (27%) (fig 7).

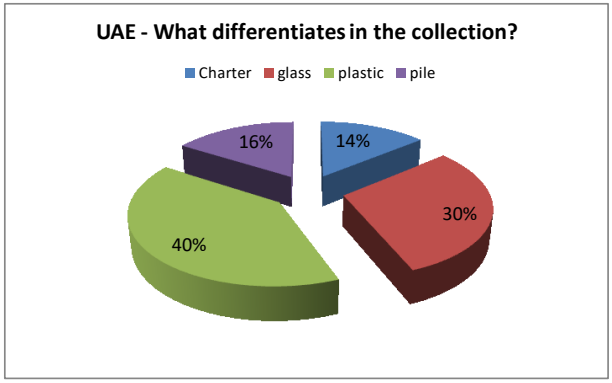

Figure 6. % distribution of differentiated materials in UAE.

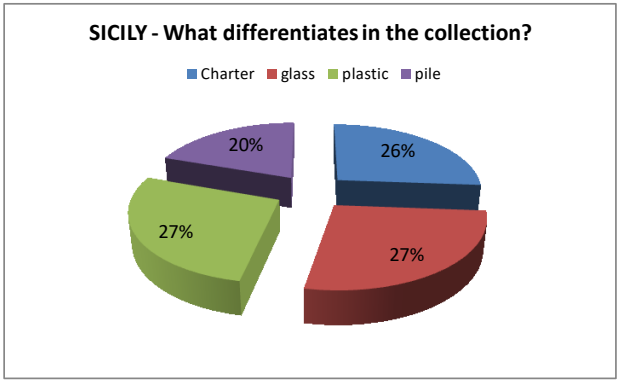

Figure 7. % distribution of differentiated materials in Sicily.

In UAE, recycled materials mainly used are shopping bags (66%) and Low consumption household appliances (34%), while in Sicily there is also a use of Products with contained packaging / packages (10%) and Ecological detergent products (12%) (figures 8 and 9).

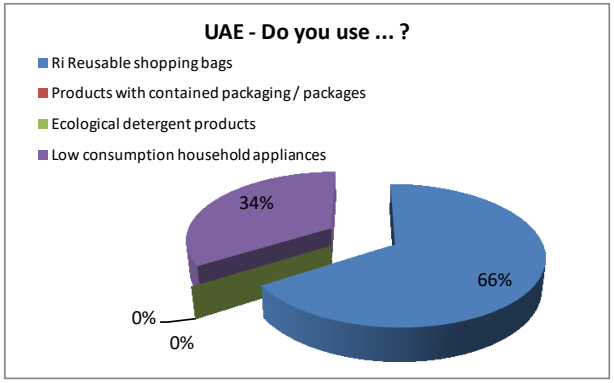

Figure 8. % distribution of reusable materials in UAE

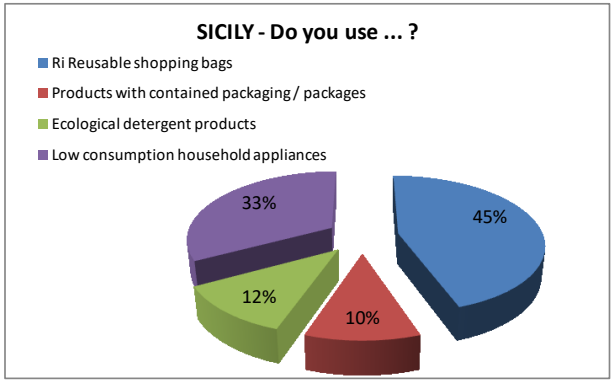

Figure 9. % distribution of reusable materials in Sicily

The choices regarding the question "When do you make food choices" are common both in UAE and in Sicily (figure 10 and 11).

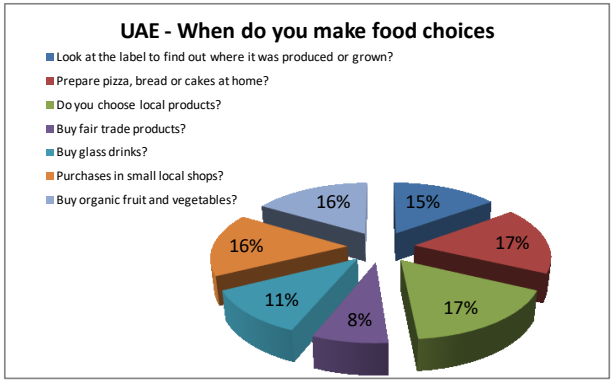

Figure 10. % distribution of food choise in UAE

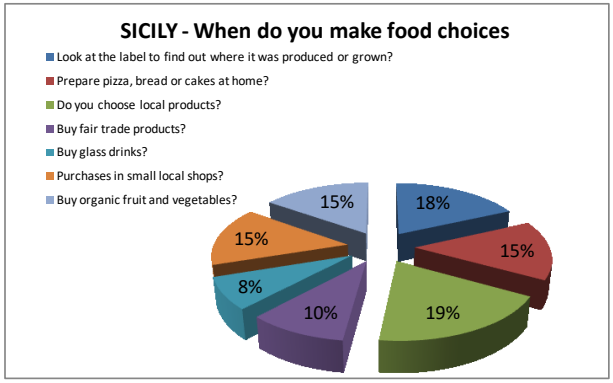

Figure 11. % distribution of food choise in Sicily

4.2 Address of consumers towards better sustainability

Another aspect analyzed is the opinion of the consumers, of the two different countries, on the actions underway, by the manufacturing companies, for a greater diffusion of sustainable products in order to have an orientation by consumers towards a better sustainability. Following are the analyzes related to single answers and the relative intensity of judgment (figure 12-21).

In particular, figures 12 and 13 compare the UEA and Sicily on the importance attributed to the presence of a logo on the packaging of products, able to certify production according to the dictates of sustainability. What emerges is a more marked level of trust in the UAE, with a greater concentration of opinions on "they are reliable" and "Sicily, a territory in which there is a greater degree of variability of responses.

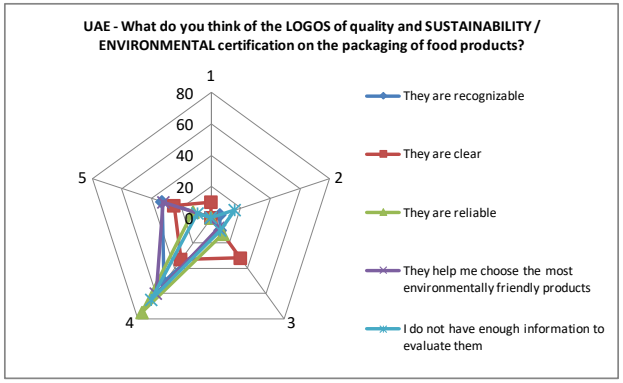

Figure 12. response with associated judgment values of what think the consumers about logos of quality sustaunability/environmental certification on the packaging of food products in UAE.

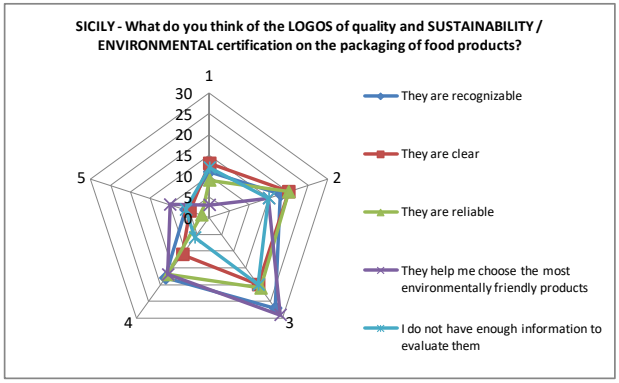

Figure 13. response with associated judgment values of what think the consumers about logos of quality sustaunability/environmental certification on the packaging of food products in Sicily.

A diversity of opinion also exists on what sustainability allows to achieve (Figures 14 and 15). For the consumer of the UAE, sustainability is considered above all a strategic lever of the economic development of the country, given the known lack of natural resources that the territory suffers from. On the other hand, the perception of the guarantee of greater food and social security appears to be modest, probably due to a limited ability to link sustainability and use of resources. Sicily, on the other hand, polarises a greater number of responses on the protection of natural resources, on the mitigation of climate change and on food and social security.

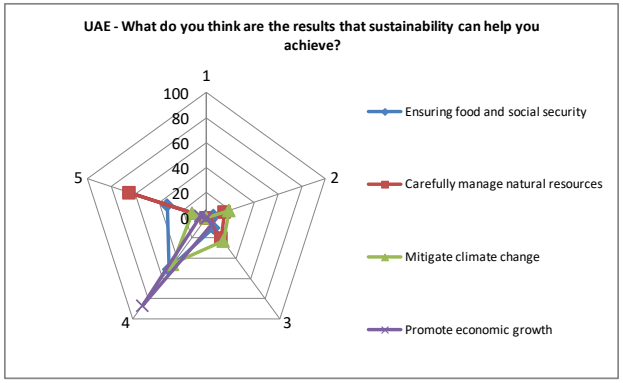

Figure 14. response with associated judgment values of what think the consumers about the results that sustainability can help them achieve in UAE.

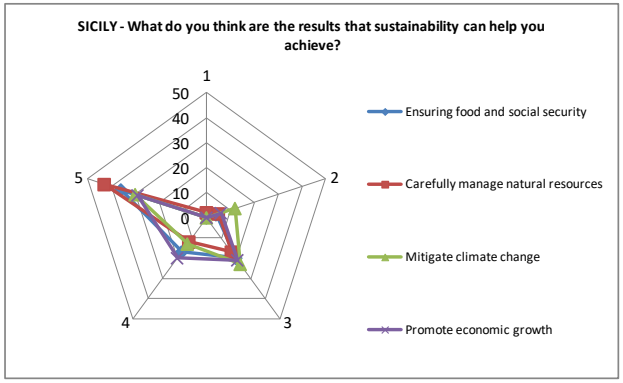

Figure 15. response with associated judgment values of what think the consumers about the results that sustainability can help them achieve in Sicily.

Greater uniformity in the responses between the two areas under study was detected with reference to the actions deemed necessary for the promotion of social and cultural innovation in consumer activities (Figures 16 and 17). In fact, important importance is attributed to the actions for the reduction of food waste in the field of commercial catering, to the promotion of initiatives for healthy and sustainable consumption, to the predisposition of incentives for the consumption of organic products. Divergent, on the other hand, was the position with regard to the need to encourage scientific research on consumer behavior.

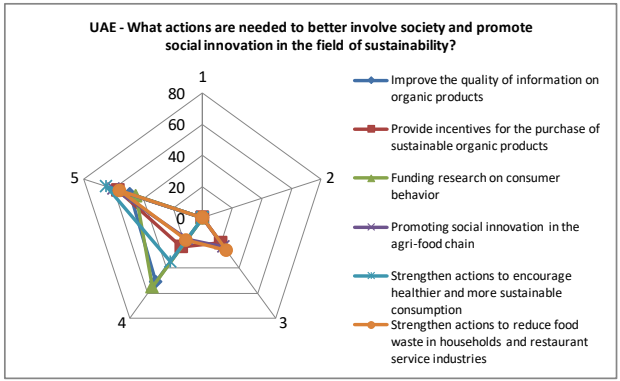

Figure 16. response with associated judgment values of actions needed to better involve society and promote social innovation in the field of sustainability by UAE consumers.

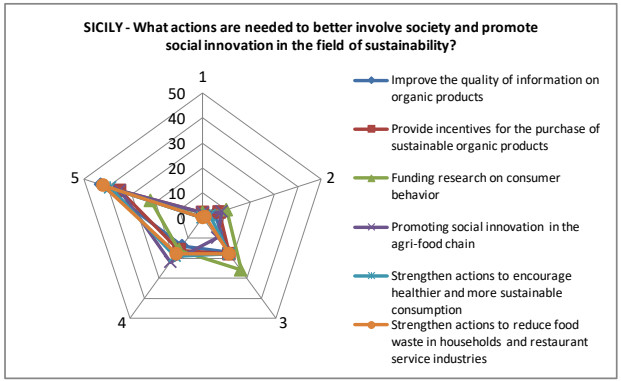

Figure 17 response with associated judgment values of actions needed to better involve society and promote social innovation in the field of sustainability by Sicilian consumers.

The value judgment associated with what consumers think, in general, of the information present on food packaging to certify respect for the environment and the characteristics of sustainability is, instead, reported in the following figures 18 and 19. For the UAE particular importance is attributed to the regulatory aspects of production according to predefined standards and known to the consumer. This aspect recalls other values, such as the authenticity of the product, its traditionality and the standardization of the control activity. For Sicily, however, a lower value is attributed to aspects such as control, the adoption of standards and the support of work in the areas of origin and counterfeiting.

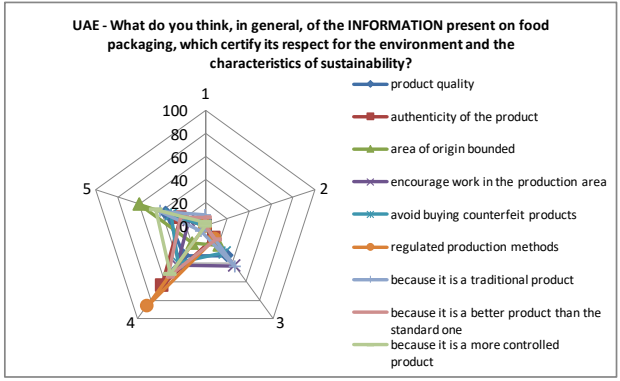

Figure 18. response with associated judgment values of what think, in general, of the information present on food packaging, wich certify respect for the envitonment and the characteristics of sustanibility by UAE consumers.

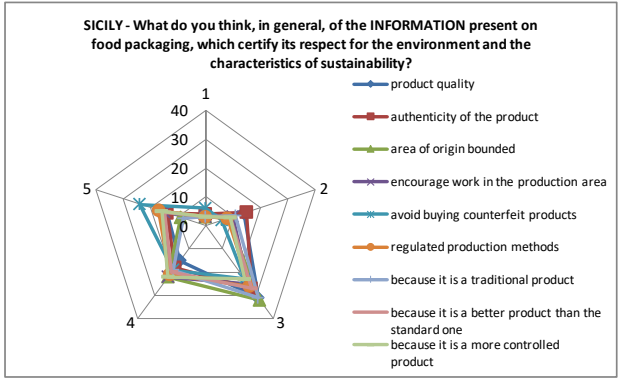

Figure 19. response with associated judgment values of what think, in general, of the information present on food packaging, wich certify respect for the envitonment and the characteristics of sustanibility by Sicilian consumers.

As for what is needed to reassure consumers on the purchase of quality food products (good and safe), two aspects are above all considered (Figures 20 and 21). For the UAE a greater value is attributed to the organic certification, while a substantial convergence of the Sicilian consumer has been on the product of the territory, from short supply chain.

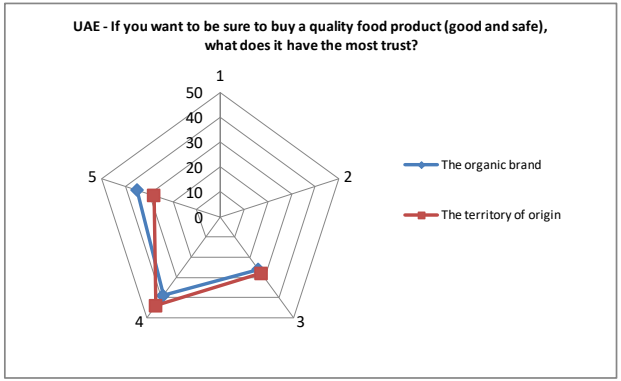

Figure 20. response with associated judgment values of what want UAE consumers for to be sure to buy a quality food product (good and safe).

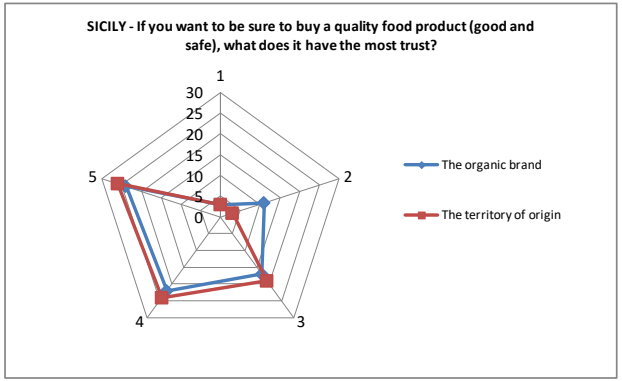

Figure 21. response with associated judgment values of what want sicilian consumers for to be sure to buy a quality food product (good and safe).

For each response the weighted judgment value was then calculated according to formula (2) and so the total average value. The results are shown in table 1.

Table 1. Question, option response, UAE and Sicily weighted mean opinion

Question	**Option response**	**UAE - Weighted mean opinion**	**SICILY - Weighted mean opinion**
What do you think of the LOGOS of quality and SUSTAINABILITY / ENVIRONMENTAL certification on the packaging of food products?	They are recognizable	4.1	3.7
	They are clear	3.6	3.5
	They are reliable	4.0	3.7
	They help me choose the most environmentally friendly products	4.2	3.9
	I do not have enough information to evaluate them	3.7	3.4
		Total mean	
		3.9	**3.6**
What do you think are the results that	Ensuring food and social	4.4	4.3

sustainability can help you achieve?	security		
	Carefully manage natural resources	4.2	4.1
	Mitigate climate change	3.5	4.0
	Promote economic growth	4.0	4.3
		Total mean	
		4.0	**4.2**
What actions are needed to better involve society and promote social innovation in the field of sustainability?	Improve the quality of information on organic products	4.5	4.3
	Provide incentives for the purchase of sustainable organic products	4.4	4.1
	Funding research on consumer behavior	4.5	4.0

	Promoting social innovation in the agri-food chain	4.4	4.2
	Strengthen actions to encourage healthier and more sustainable consumption	4.7	4.4
	Strengthen actions to reduce food waste in households and restaurant service industries	4.3	4.5
		Total mean	
		4.4	**4.3**
What do you think, in general, of the INFORMATION present on food packaging, which certify its respect for the environment	product quality	4.0	3.9
	authenticity of the product	4.1	3.9
	area of origin bounded	4.4	4.1

and the characteristics of sustainability?	encourage work in the production area	3.7	4.1
	avoid buying counterfeit products	4.0	4.0
	regulated production methods	3.9	4.1
	because it is a traditional product	3.7	4.0
	because it is a better product than the standard one	3.9	4.1
	because it is a more controlled product	4.4	4.1
		Total mean	
		4.0	**4.0**
If you want to be sure to buy a quality food, what does it have the	The organic brand	4.1	4.1
	The territory of origin	4.0	4.3

most trust?			
		Total mean	
		4.0	**4.2**

Subsequently was used, for the data analysis, the % weighted value expressed by formula (1). Figures 22-31 shown the results obtained.

Consumers in both countries have the same opinion (figure 22-23) that logos of quality sustaunability/environmental certification on the packaging of food products are recognizable (21% for UAE, 23% for Sicily) and they help them choose the most environmentally friendly products (22% for UAE, 24% for Sicily).

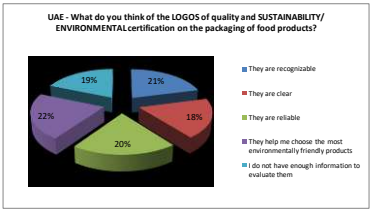

Figure 22. % distribution of what think the consumers about logos of quality sustaunability/environmental Certification on the packaging of food products in UAE.

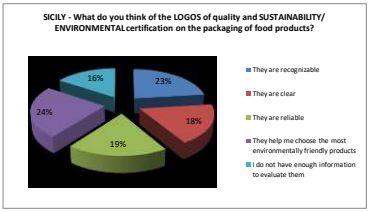

Figure 23. % distribution of what think the consumers about logos of quality sustaunability/environmental certification on the packaging of food products in Sicily.

For UAE consumers the results that sustanibility can help them achieve is ensuring food and social security (27%) (figure 24) while for sicilian consumers also carefully manage natural resources (26%) (fig. 25).

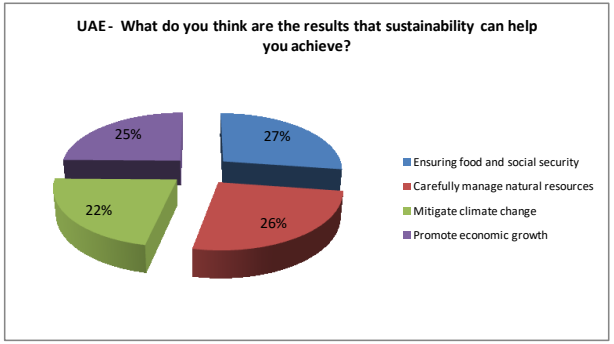

Figure 24. % distribution of what think the consumers about the results that sustanibility can help them achieve in UAE.

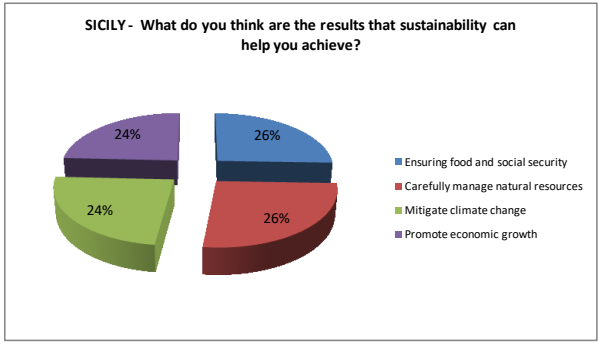

Figure 25. % distribution of what think the consumers about the results that sustanibility can help them achieve in Sicily.

The actions needed to better involve society and promote social innovation in the field of sustainability are common opnion for the consumers of both countries (figure 26-27) and are: Improve the quality of information on organic products (17% for UAE; 18% for Sicily), provide incentives for the purchase of sustainable organic products (16% for UAE; 16% for Sicily), funding research on consumer behavior (17% for UAE; 14% for Sicily), promoting social innovation in the agri-food chain (16% for UAE; 16% for Sicily), strengthen actions to encourage healthier and more sustainable consumption (18% for UAE; 18% for Sicily), strengthen actions to reduce food waste in households and restaurant service industries (16% for UAE; 18% for Sicily).

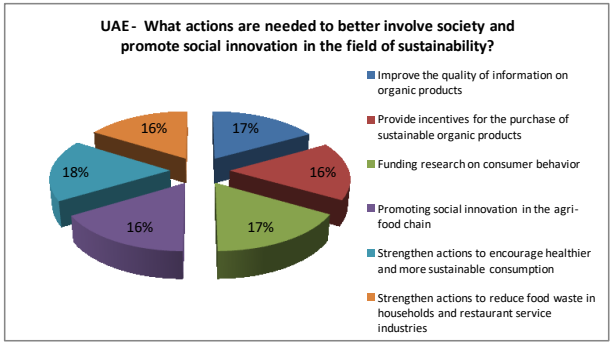

Figure 26. % distribution of actions needed to better involve society and promote social innovation in the field of sustainability by UAE consumers.

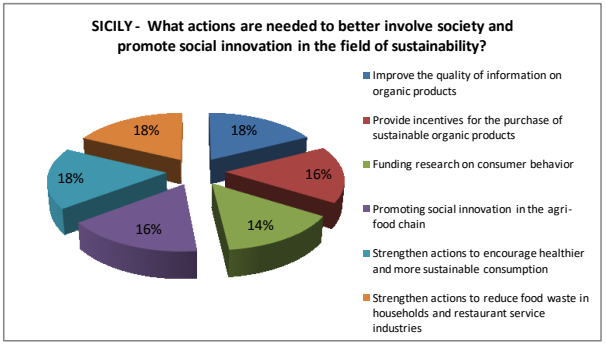

Figure 27. % distribution of actions needed to better involve society and promote social innovation in the field of sustainability by Sicilian consumers.

Also what think, in general, of the information present on food packaging, wich certify respect for the envitonment and the characteristics of sustanibility (figure 28-29) and what want for to be sure to buy a quality food product (good and safe) are common opnion for the consumers of both countries and are: product quality (11% for UAE; 11% for Sicily), authenticity of the product (12% for UAE; 11% for Sicily), area of origin bounded (12% for UAE; 11% for Sicily), encourage work in the production area (10% for UAE; 11% for Sicily), avoid buying counterfeit products (11% for UAE; 12% for Sicily), regulated production methods (11% for UAE; 12% for Sicily), because it is a traditional product (10% for UAE; 10% for Sicily), because it is a better product than the standard one (11% for UAE; 11% for Sicily), because it is a more controlled product (12% for UAE; 11% for Sicily).

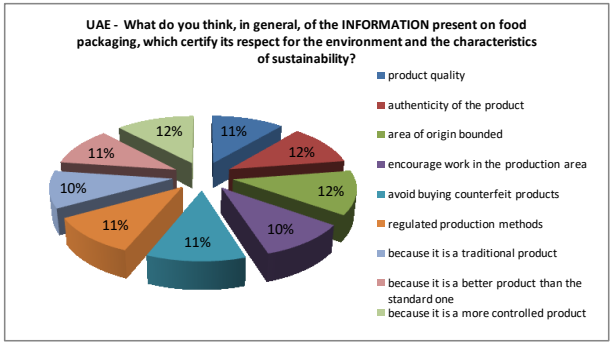

Figure 28. % distribution of what think, in general, of the information present on food packaging, wich certify respect for the envitonment and the characteristics of sustanibility by UAE consumers.

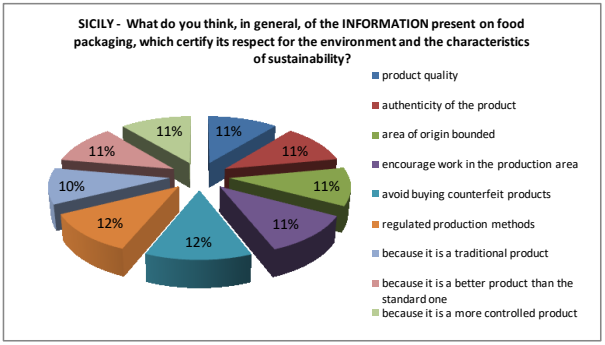

Figure 29. % distribution of what think, in general, of the information present on food packaging, wich certify respect for the envitonment and the characteristics of sustanibility by Sicilian consumers.

The organic brand (49% for UAE; 51% for Sicily) and the territory of origin (51% for UAE; 49% for Sicily) play a relevant role in the choice of purchase in the two territories (figure 30-31).

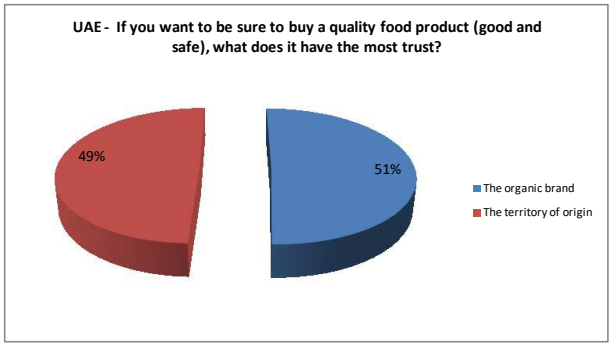

Figure 30. % distribution of what want UAE consumers for to be sure to buy a quality food product (good and safe).

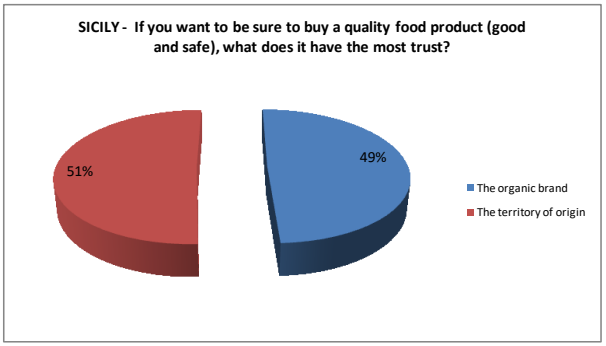

Figure 31. % distribution of what want sicilian consumers for to be sure to buy a quality food product (good and safe).

4.3. Consumers' behavior towards Sustainability products.

Finally, the behavior of consumers, from both countries, towards "sustainable" products was analyzed Following are the analyzes related to single answers and the relative intensity of judgment (fig. 29-34). The results are shown in figure 32-37.

The commercial channel of choice in the UAE was the modern one (e-commerce) and the one sold to supermarkets and specialized shops, while in Sicily the discount and the city market are more important. Equal importance - in the two areas - is attributed to the purchase of solidarity groups.

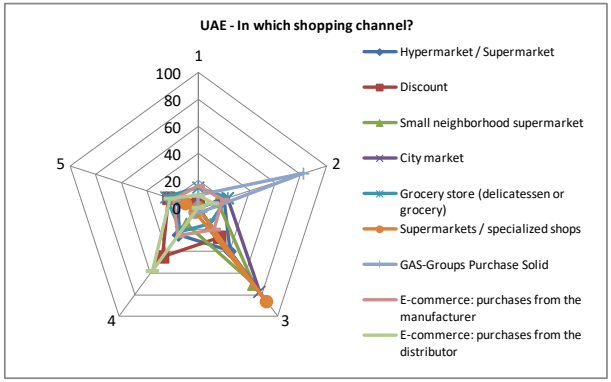

Figure 32. response with associated judgment values of the shopping channel used in AEU.

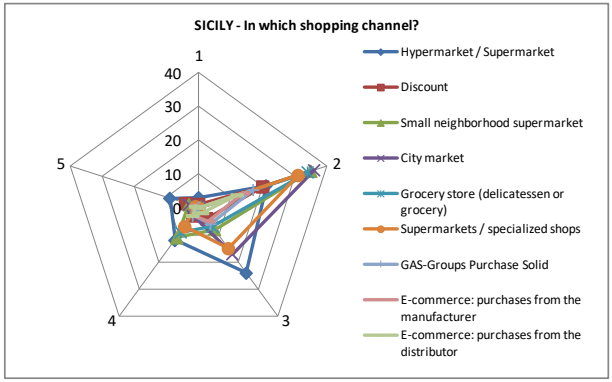

Figure 33. response with associated judgment values of the shopping channel used in Sicily.

The aspects that are given greater importance in the purchase of food products have resulted in the quality of the product, the promotional message, the information on the label and the opinion of experts and nutritionists in the UAE. In Sicily, quality stands out in other options, but the low environmental impact of the production process also takes on a certain importance (Figures 34 and 35).

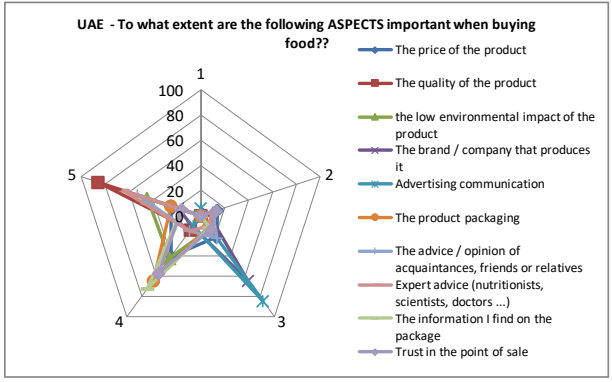

Figure 34. response with associated judgment values of the important aspects when buying food by AEU consumers.

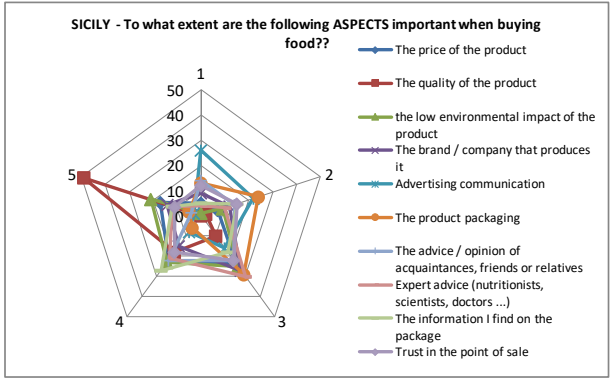

Figure 35. response with associated judgment values of the important aspects when buying food by Sicilian consumers.

The organic products of consumer interest are above all "fruit and vegetable" and "fresh meat and fish" for UAE, unlike in Sicily where there is a greater variability of situations (Figures 36 and 37). The preferred biological products must be connected to the purchase channels, because they are able to influence the choices of the consumers.

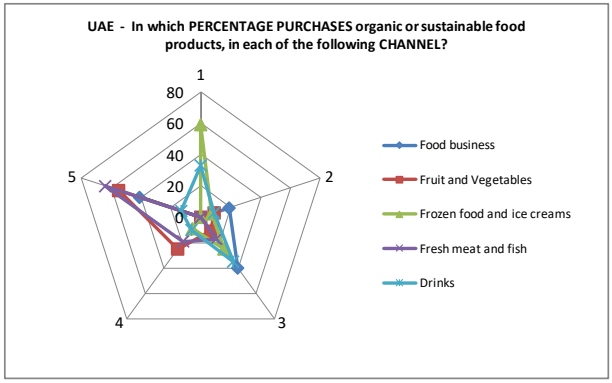

Figure 36. response with associated judgment values of the percentage purchase organic or sustainable food products by AEU consumers.

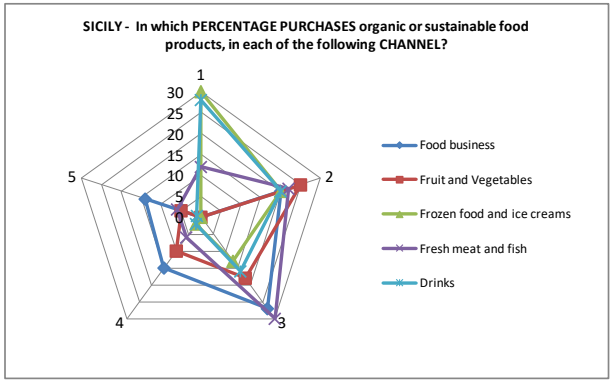

Figure 37. response with associated judgment values of the percentage purchase organic or sustainable food products by Sicilian consumers.

For each response the weighted judgment value was then calculated according to formula (2) and so the total average value. The results are shown in table 2.

Table 2. Question, option response, UAE and Sicily weighted mean opinion.

Question	**Option response**	**UAE - Weighted mean opinion**	**SICILY - Weighted mean opinion**
In which shopping channel?	Hypermarket / Supermarket	3.4	3.6
	Discount	3.8	3.0
	Small neighborhood supermarket	3.0	3.4
	City market	2.8	3.3
	Grocery store (delicatessen or grocery)	3.2	3.4
	Supermarkets / specialized shops	3.2	3.4
	GAS-Groups Purchase Solid	2.1	3.3
	E-commerce: purchases from the manufacturer	3.1	3.2

	E-commerce: purchases from the distributor	3.7	3.0
		Total Mean	
		3.1	**3.3**
To what extent are the following ASPECTS important when buying food?	The price of the product	3.8	3.9
	The quality of the product	4.9	4.0
	the low environmental impact of the product	4.3	4.0
	The brand / company that produces it	3.4	3.6
	Advertising communication	3.0	3.0
	The product packaging	4.1	3.3
	The advice / opinion of acquaintances, friends or relatives	4.1	3.6
	Expert advice (nutritionists,	4.4	3.9

	scientists, doctors ...)		
	The information I find on the package	4.0	3.9
	Trust in the point of sale	3.8	3.5
		Total Mean	
		4.0	**3.7**
In which PERCENTAGE PURCHASES organic or sustainable food products, in each of the following CHANNEL?	Food business	3.6	3.8
	Fruit and Vegetables	4.3	3.5
	Frozen food and ice creams	1.8	2.8
	Fresh meat and fish	4.5	3.3
	Drinks	2.6	2.8
		Total Mean	
		3.4	**3.2**

Subsequently was used, for the data analysis, the % weighted value expressed by formula (1). Figures 38-43 shown the results obtained.

UAE consumers buy homogeneously across all possible spending channels except for GAS where there is a 7%

preference. Instead, Sicilian consumers prefer the most classic shopping channels with a low preference for e-commerce (6%) (fig. 38-39).

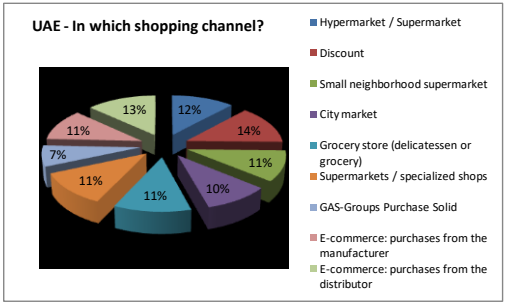

Figure 38. % distribution of the shopping channel used in AEU.

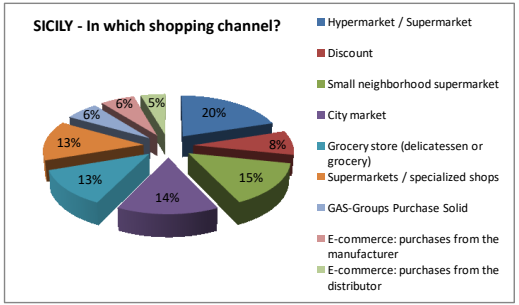

Figure 39. % distribution of the shopping channel used in Sicily.

For both UAE and Sicilian consumers, a particular aspect does not prevail when buying food (fig. 40-41).

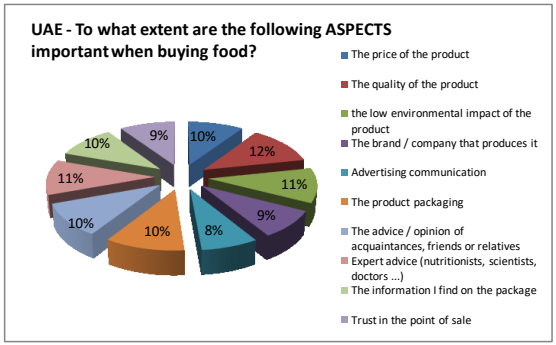

Figure 40. % distribution of the important aspects when buying food by AEU consumers.

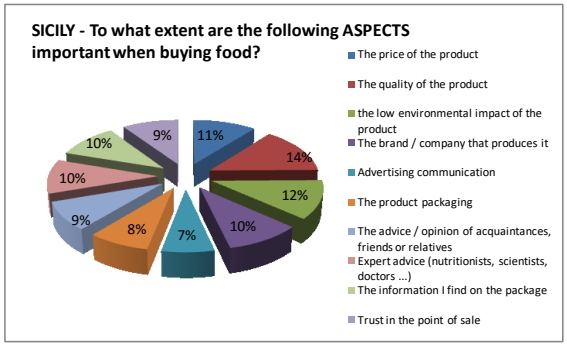

Figure 41. % distribution of the important aspects when buying food by Sicilian consumers.

As for the type of products purchased, UAE consumers prefer fresh meat and fish (27%) and fruit and vegetables (25%), while Sicilian consumers prefer food business (29%) and fresh meat and fish (20%) (fig. 42-43).

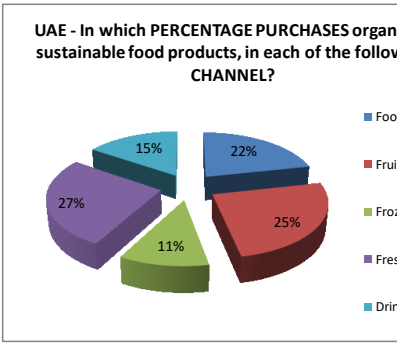

Figure 42. Percentage purchase organic or sustainable food products by AEU consumers.

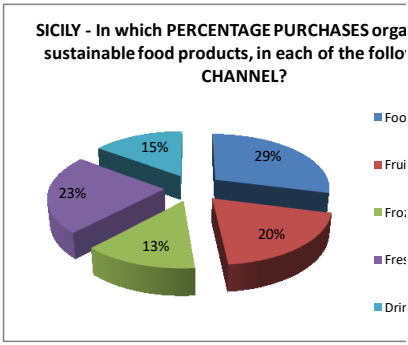

Figure 43. Percentage purchase organic or sustainable food products by Sicilian consumers.

Concluding remarks

In advanced countries, the growth of per capita incomes together with other factors and conditions (changes in eating habits, new needs for food security, climate change, sustained migratory flows, etc.) have led to a profound change in the demand for agri-food products, with the widening of consumer needs, through the demand for differentiated products (at least for quality, certification, safety and information), with a higher value added also to overcome the time limits imposed by the seasonality and perishability of production.

In such a scenario, new competition factors emerge that can determine competitive advantages for countries, such as product quality, price, logistics, traceability and sustainability of agri-food products.

On the sustainable consumption front, the adoption of the organic brand can contribute to reducing the information asymmetry that is otherwise established in the relationship between producer and consumer, a relationship that is thus focused on traceability and transparency guaranteed throughout the production cycle. (breeding / cultivation, processing and marketing). Despite the use of the brand has contributed to relaunching organic products, there are clear cognitive deficits on consumer behavior and related purchasing habits.

For these reasons, the research conducted on a sample of consumers in the UAE and in Sicily, has allowed to reach results of particular interest for scholars and operators of the sector. In particular, as many as 200 consumers were interviewed at various distribution facilities in the futures

markets, using a questionnaire specifically designed to collect data and information on the characters concerning the perception of the concept of sustainability, purchasing habits, opportunities for consumption, on the perception of the positive and negative values of organic products and on the socio-economic characteristics of the interviewees.

Ultimately, the potential of the assertion of sustainable and organic production and consumption models, in light of the changes also taking place on the regulatory level, are linked both to the implementation of policies in favor of supply and to support and promotion of demand.

In the first case it is necessary to start initiatives of a structural and infrastructural nature, to solve some technical-economic territorial and corporate problems of biological production (research and experimentation, also to adequately support the technical management of production in highly critical contexts, such as UAE; analysis of production situations, often pulverized and characterized by a combination of inefficient production factors, organization of supply, to increase the bargaining power of producers, identification of less complex distribution circuits, training and professional qualification of employees; territorial services, and of tangible and intangible resources to support production, etc.).

With regard to policies to support demand, adequate information campaigns are necessary for potential buyers and for the promotion of the quality of these products, the relative health content for a healthy, balanced and sustainable diet.

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APPENDIX

REPORTING: SAFA PERFORMANCE REPORT FOR "AA"

This Sustainability Assessment has been done on basis of indicators that have been contextualized by the assessing person / team / organization.
That means:

1. Not all subthemes proposed by FAO have necessarily been judged as relevant by the assessing person.
2. The detailed rating for each indicator has been determinated by the assessing person; accept the "best" and the lowest ("unacceptable") rating which is predefined.

Keep in mind the SAFA communication principles.

Mapping information

Assessor

Name

Please, fill out the needed information in the step "Mapping".

Organization

Please, fill out the needed information in the step "Mapping".

Contact details

Please, fill out the needed information in the step "Mapping".

Goal for doing this assessment

Purpose for doing SAFA

Please, fill out the needed information in the step "Mapping".

Intended audience of SAFA

Please, fill out the needed information in the step "Mapping".

Intended use of SAFA results

Please, fill out the needed information in the step "Mapping".

The enterprise (not only assessed entity in this single SAFA)

Name of the enterprise

Please, fill out the needed information in the step "Mapping".

Legal form

Please, fill out the needed information in the step "Mapping".

Country/ies

Please, fill out the needed information in the step "Mapping".

Primary products and services

Please, fill out the needed information in the step "Mapping".

Sphere of influence and impact

Please, fill out the needed information in the step "Mapping".

No. of needed SAFAs

Please, fill out the needed information in the step "Mapping".

Entities planned to cover with the SAFA Assessment

Please, fill out the needed information in the step "Mapping".

Sampling of value chain entity(ies);representativeness

Please, fill out the needed information in the step "Mapping".

Excluded entities and processes

Please, fill out the needed information in the step "Mapping".

The assessed entity

Assessment for the year

2016

Name of assessed entitiy

AA

Country

Italy

City / Village

AA

Sector of main activity

Agriculture

Main supply chain level

Primary producer

Primary products and services

AA

Topography

Hills

Climate Zone

Temperate

Size

32

permanent workers of which

are non-family workers	are family workers
2	1

temporary workers of which

are non-family workers	are family workers
4	Please, fill out the needed information in the step "Mapping".

Mechanization

Please, fill out the needed information in the step "Mapping".

Assessed entity considered small-scale because

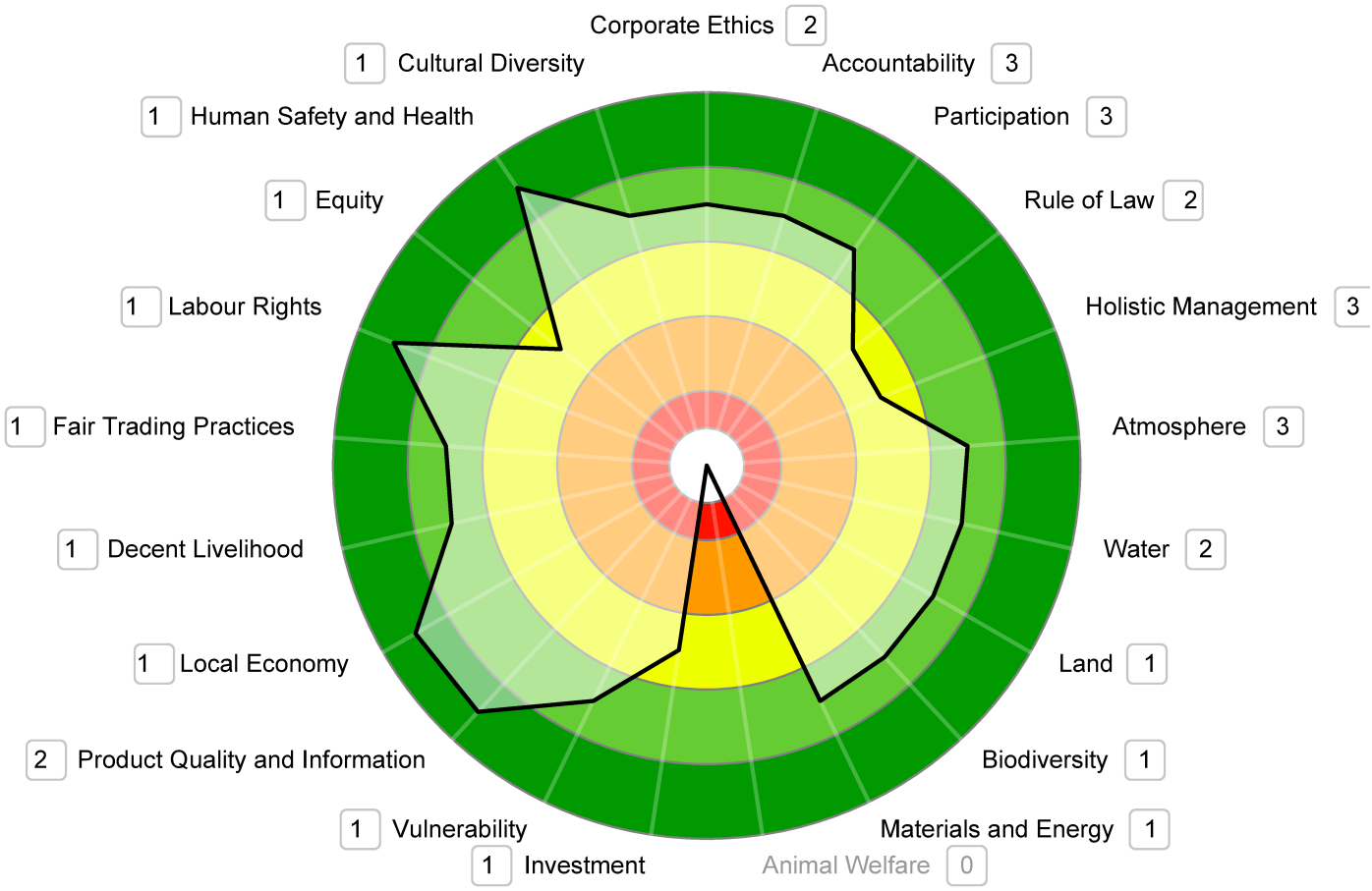
Please, fill out the needed information in the step "Mapping".

Because of the small-scale status all "Performance Indicators" in the dimension "Environmental Integrity" which are relevant but have not been answered were rated neutral instead of "unacceptable".

Results according to SAFA sustainability polygon

(with comparison option for up to three single SAFAs)

Omitted subthemes 3 / 58



Rating

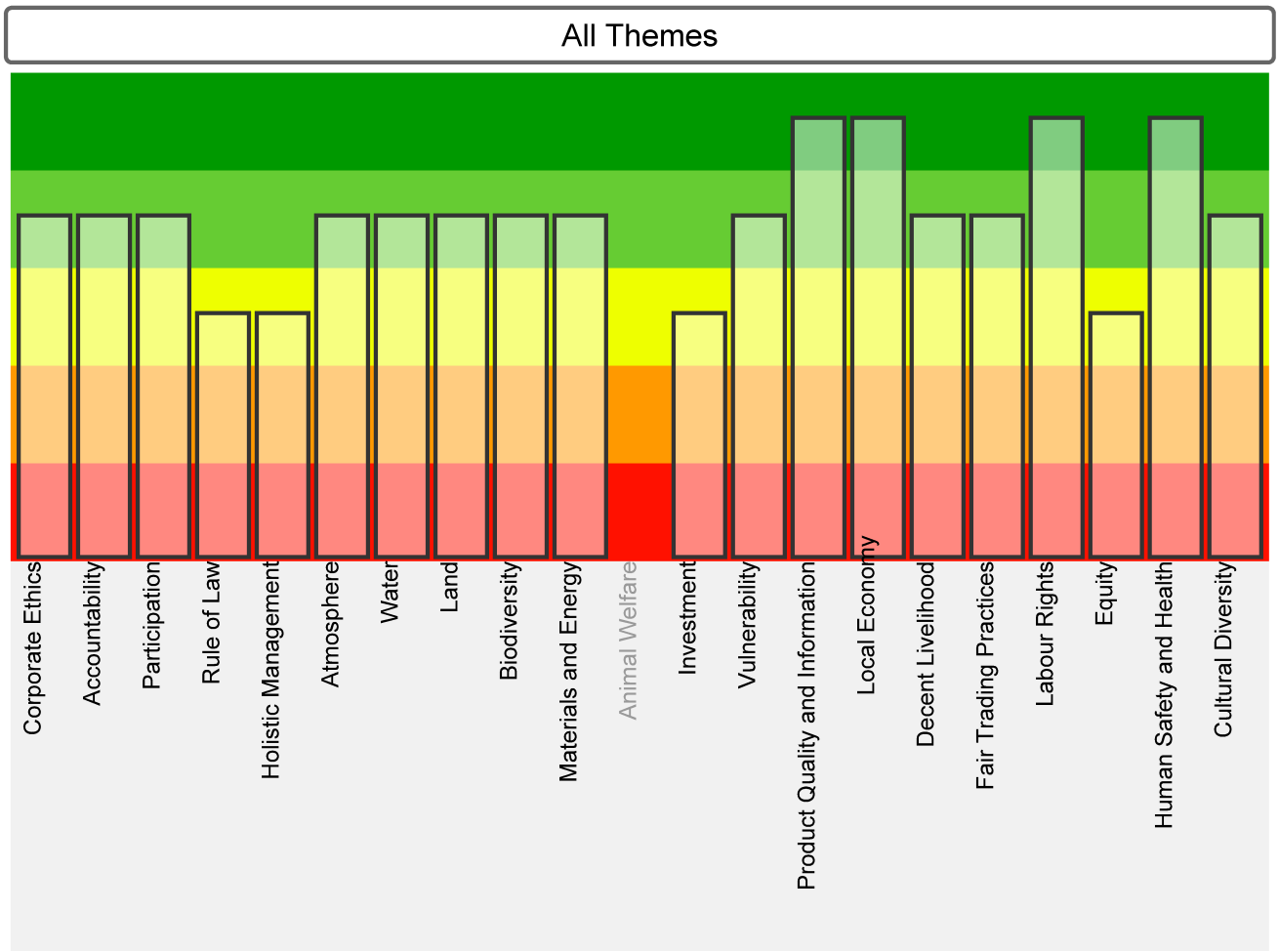
best | good * | moderate * | limited * | unacceptable | not relevant

* contextualized by assessing person / team / organization

Accuracy Score

1 Low quality data | 2 Moderate quality data | 3 High quality data

Results per theme, sub-theme and indicator



Results as complete indicator list

G	GOOD GOVERNANCE		
G1	Corporate Ethics	Accuracy Score	Rating
G 1.1	Mission Statement		
G 1.1.1	Mission Explicitness	1	MODERATE
G 1.1.2	Mission Driven	1	MODERATE
G 1.2	Due Diligence		
G 1.2.1	Due Diligence	3	GOOD
G2	Accountability	Accuracy Score	Rating
G 2.1	Holistic Audits		
G 2.1.1	Holistic Audits	3	GOOD
G 2.2	Responsibility		
G 2.2.1	Responsibility	3	MODERATE
G 2.3	Transparency		
G 2.3.1	Transparency	3	GOOD
G3	Participation	Accuracy Score	Rating

G 3.1	Stakeholder Dialogue		
G 3.1.1	Stakeholder Identification	3	GOOD
G 3.1.2	Stakeholder Engagement	3	GOOD
G 3.1.3	Engagement Barriers	3	MODERATE
G 3.1.4	Effective Participation	3	GOOD
G 3.2	Grievance Procedures		
G 3.2.1	Grievance Procedures	3	MODERATE
G 3.3	Conflict Resolution		
G 3.3.1	Conflict Resolution	3	MODERATE

G4	Rule of Law		
		Accuracy Score	Rating
G 4.1	Legitimacy		
G 4.1.1	Legitimacy	3	GOOD
G 4.2	Remedy, Restoration and Prevention		
G 4.2.1	Remedy, Restoration and Prevention	3	MODERATE
G 4.3	Civic Responsibility		
G 4.3.1	Civic Responsibility	3	MODERATE
G 4.4	Resource Appropriation		

G 4.4.1	Free, Prior and Informed Consent	3	GOOD
G 4.4.2	Tenure Rights	1	UNACCEPTABLE

G5 Holistic Management

		Accuracy Score	Rating
G 5.1	Sustainability Management Plan		
G 5.1.1	Sustainability Management Plan	3	MODERATE
G 5.2	Full-cost Accounting		
G 5.2.1	Full-Cost Accounting	3	MODERATE

E ENVIRONMENTAL INTEGRITY

E1 Atmosphere

		Accuracy Score	Rating
E 1.1	Greenhouse Gases		
E 1.1.1	GHG Reduction Target	3	LIMITED
E 1.1.2	GHG Mitigation Practices	3	BEST
E 1.1.3	GHG Balance (Performance Indicator)	1	NO DATA
E 1.2	Air Quality		

E 1.2.1	Air Pollution Reduction Target	3	LIMITED
E 1.2.2	Air Pollution Prevention Practices	3	BEST
E 1.2.3	Ambient Concentration of Air Pollutants (Performance Indicator)	1	NO DATA

E2 Water

		Accuracy Score	Rating
E 2.1	Water Withdrawal		
E 2.1.1	Water Conservation Target	3	LIMITED
E 2.1.2	Water Conservation Practices	3	GOOD
E 2.1.3	Ground and Surface Water Withdrawals (Performance Indicator)	1	GOOD
E 2.2	Water Quality		
E 2.2.1	Clean Water Target	3	LIMITED
E 2.2.2	Water Pollution Prevention Practices	3	BEST
E 2.2.3	Concentration of Water Pollutants (Performance Indicator)	1	GOOD
E 2.2.4	Wastewater Quality (Performance Indicator)	1	GOOD

E3 Land

		Accuracy Score	Rating
E 3.1	Soil Quality		
E 3.1.1	Soil Improvement Practices	1	GOOD
E 3.1.2	Soil Physical Structure (Performance Indicator)	1	GOOD

E 3.1.3	Soil Chemical Quality (Performance Indicator)	2	GOOD
E 3.1.4	Soil Biological Quality (Performance Indicator)	1	GOOD
E 3.1.5	Soil Organic Matter (Performance Indicator)	1	GOOD

E 3.2	Land Degradation		
E 3.2.1	Land Conservation and Rehabilitation Plan	1	GOOD
E 3.2.2	Land Conservation and Rehabilitation Practices	1	GOOD
E 3.2.3	Net Gain/Loss of Productive Land (Performance Indicator)	1	GOOD

E4 Biodiversity

		Accuracy Score	Rating
E 4.1	Ecosystem Diversity		
E 4.1.1	Landscape/Marine Habitat Conservation Plan	1	LIMITED
E 4.1.2	Ecosystem Enhancing Practices	1	GOOD
E 4.1.3	Structural Diversity of Ecosystems (Performance Indicator)	1	GOOD
E 4.1.4	Ecosystem Connectivity (Performance Indicator)	1	MODERATE
E 4.1.5	Land Use and Land Cover Change (Performance Indicator)	1	BEST

E 4.2	Species Diversity		

E 4.2.1	Species Conservation Target	1	LIMITED
E 4.2.2	Species Conservation Practices (Performance Indicator)	1	MODERATE
E 4.2.3	Diversity and Abundance of Key Species (Performance Indicator)	1	MODERATE
E 4.2.4	Diversity of Production (Performance Indicator)	1	GOOD

E 4.3	Genetic Diversity		
E 4.3.1	Wild Genetic Diversity Enhancing Practices	3	GOOD
E 4.3.2	Agro-biodiversity in-situ Conservation (Performance Indicator)	1	MODERATE
E 4.3.3	Locally Adapted Varieties/Breeds (Performance Indicator)	1	MODERATE
E 4.3.4	Genetic Diversity in Wild Species (Performance Indicator)	1	GOOD
E 4.3.5	Saving of Seeds and Breeds (Performance Indicator)	1	LIMITED

E5 Materials and Energy

		Accuracy Score	Rating
E 5.1	Material Use		
E 5.1.1	Material Consumption Practices	1	GOOD
E 5.1.2	Nutrient Balances (Performance Indicator)	1	NO DATA
E 5.1.3	Renewable and Recycled Materials (Performance Indicator)	1	LIMITED
E 5.1.4	Intensity of Material Use (Performance Indicator)	1	GOOD

E 5.2	Energy Use		
E 5.2.1	Renewable Energy Use Target	1	LIMITED
E 5.2.2	Energy Saving Practices	1	MODERATE
E 5.2.3	Energy Consumption (Performance Indicator)	1	GOOD
E 5.2.4	Renewable Energy (Performance Indicator)	1	LIMITED

E 5.3	Waste Reduction and Disposal		
E 5.3.1	Waste Reduction Target	1	LIMITED
E 5.3.2	Waste Reduction Practices	1	MODERATE
E 5.3.3	Waste Disposal (Performance Indicator)	1	GOOD
E 5.3.4	Food Loss and Waste Reduction (Performance Indicator)	1	GOOD

E6	Animal Welfare		
		Accuracy Score	Rating
E 6.1	Health		
E 6.1.1	Animal Health Practices	1	UNACCEPTABLE
E 6.1.2	Animal Health (Performance Indicator)	1	UNACCEPTABLE

E 6.2	Freedom from Stress		
E 6.2.1	Humane Animal Handling Practices	1	NO DATA
E 6.2.2	Appropriate Animal Husbandry (Performance Indicator)	1	NO DATA
E 6.2.3	Freedom from Stress (Performance Indicator)	1	NO DATA

C	ECONOMIC RESILIENCE		
C1	Investment	Accuracy Score	Rating
C 1.1	Internal Investment		
C 1.1.1	Internal Investment	1	LIMITED
C 1.2	Community Investment		
C 1.2.1	Community Investment	2	MODERATE
C 1.3	Long-ranging Investment		
C 1.3.1	Long Term Profitability	3	GOOD
C 1.3.2	Business Plan	3	LIMITED
C 1.4	Profitability		
C 1.4.1	Net Income	1	GOOD
C 1.4.2	Cost of Production	3	MODERATE
C 1.4.3	Price Determination	1	MODERATE
C2	Vulnerability	Accuracy Score	Rating
C 2.1	Stability of Production		
C 2.1.1	Guarantee of Production Levels	1	MODERATE
C 2.1.2	Product Diversification	1	GOOD

C 2.2	Stability of Supply		
C 2.2.1	Procurement Channels	3	GOOD
C 2.2.2	Stability of Supplier Relationships	3	GOOD
C 2.2.3	Dependence on the Leading Supplier	1	GOOD
C 2.3	Stability of Market		
C 2.3.1	Stability of Market	1	GOOD
C 2.4	Liquidity		
C 2.4.1	Net Cash Flow	1	GOOD
C 2.4.2	Safety Nets	1	MODERATE
C 2.5	Risk Management		
C 2.5.1	Risk Management	1	LIMITED

		Accuracy Score	Rating
C3	Product Quality and Information		
C 3.1	Food Safety		
C 3.1.1	Control Measures	3	GOOD
C 3.1.2	Hazardous Pesticides	3	BEST
C 3.1.3	Food Contamination	3	BEST
C 3.2	Food Quality		
C 3.2.1	Food Quality	3	BEST

C 3.3	Product Information		
C 3.3.1	Product Labeling	3	GOOD
C 3.3.2	Traceability System	1	GOOD
C 3.3.3	Certified Production	1	GOOD

C4	Local Economy		
		Accuracy Score	Rating
C 4.1	Value Creation		
C 4.1.1	Regional Workforce	1	GOOD
C 4.1.2	Fiscal Commitment	1	BEST
C 4.2	Local Procurement		
C 4.2.1	Local Procurement	1	GOOD

S	SOCIAL WELL-BEING

S1	Decent Livelihood		
		Accuracy Score	Rating
S 1.1	Quality of Life		
S 1.1.1	Right to Quality of Life	1	GOOD
S 1.1.2	Wage Level	1	GOOD
S 1.2	Capacity Development		
S 1.2.1	Capacity Development	1	GOOD

S 1.3	Fair Access to Means of Production		
S 1.3.1	Fair Access to Means of Poduction	1	GOOD

		Accuracy Score	Rating
S2	Fair Trading Practices		
S 2.1	Responsible Buyers		
S 2.1.1	Fair pricing and transparent contracts	1	MODERATE
S 2.2	Rights of Suppliers		
S 2.2.1	Rights of Suppliers	1	GOOD

		Accuracy Score	Rating
S3	Labour Rights		
S 3.1	Employment Relations		
S 3.1.1	Employment Relations	1	GOOD
S 3.2	Forced Labour		
S 3.2.1	Forced Labour	1	BEST
S 3.3	Child Labour		
S 3.3.1	Child Labour	1	BEST
S 3.4	Freedom of Association and Right to Bargaining		
S 3.4.1	Freedom of Association and Right to Bargaining	1	BEST

S4 Equity

		Accuracy Score	Rating
S 4.1	Non Discrimination		
S 4.1.1	Non Discrimination	1	GOOD
S 4.2	Gender Equality		
S 4.2.1	Gender Equality	1	MODERATE
S 4.3	Support to Vulnerable People		
S 4.3.1	Support to Vulnerable People	1	LIMITED

S5 Human Safety and Health

		Accuracy Score	Rating
S 5.1	Workplace Safety and Health Provisions		
S 5.1.1	Safety and Health Trainings	1	GOOD
S 5.1.2	Safety of Workplace, Operations and Facilities	1	GOOD
S 5.1.3	Health Coverage and Access to Medical Care	1	BEST
S 5.2	Public Health		
S 5.2.1	Public Health	1	GOOD

S6 Cultural Diversity

		Accuracy Score	Rating
S 6.1	Indigenous Knowledge		
S 6.1.1	Indigenous Knowledge	1	GOOD

S 6.2	Food Sovereignty		
S 6.2.1	Food Sovereignty	1	GOOD

Summary and implications by assessor

Assessment procedure
Describe the assessment procedure including limitations and boundaries

Data gathering
Write a summary about the collection process (method, tools and data sources) incl. limitations in data availability

Sustainability deficits and potentials
Explain based on the SAFA result where your sustainability deficits and potentials lie

Possible improvement measures
Explain whether you are planning to carry out improvements on the basis of your results and which measures you do intend to include in your next year's planning

Comments

Personal comments

Comments to verifier

Comments to FAO (in case the assessment will be send to FAO)

Give feedback on the general process including main bottlenecks encountered and number of hours/days spend on a SAFA. Send mail to:SAFA-Secretariat@fao.org

UNIVERSITÀ
degli STUDI
di CATANIA

Dipartimento di Agricoltura, Alimentazione e Ambiente (Di3A)
University of Catania

Phd course in "Agriculture, Food and Environmental Science" (XXXI cycle)

Khalid Butti Al Shamsi

Research Project on "A sustainable organic production system for 'Food Security' in Abu Dhabi Emirate and Sicily"

Survey

"Critical Consumer" and availability to purchase organic products on the local market

(degree of knowledge of the farms that have joined the SAFA-FAO sustainability measurement system)

1. AWARENESS LEVEL ON THE TOPIC OF SUSTAINABILITY

1.1 1.1 Which of these ACTIONS do you usually do or have done in the past?

What consumption do you rationalize?	What differentiates in the collection?
☐ Electricity ☐ water ☐ other	☐ Charter ☐ glass ☐ plastic ☐ Pile
Which means do you use mainly?	**Do you use ... ?:**
☐ Car ☐ Motorcycles ☐ Public means ☐ Biking ☐ other	☐ Ri Reusable shopping bags ☐ Products with contained packaging / packages ☐ Ecological detergent products ☐ Low consumption household appliances

1.2 And when do you make food choices?

Look at the label to find out where it was produced or grown?	☐ **YES**	☐ **NO**
Prepare pizza, bread or cakes at home?	☐ **YES**	☐ **NO**
Do you choose local products?	☐ **YES**	☐ **NO**
Buy fair trade products?	☐ **YES**	☐ **NO**
Buy glass drinks?	☐ **YES**	☐ **NO**
Purchases in small local shops?	☐ **YES**	☐ **NO**
Buy organic fruit and vegetables?	☐ **YES**	☐ **NO**

1.3 What do you think of the LOGOS of quality and SUSTAINABILITY / ENVIRONMENTAL certification on the packaging of food products? (1 = low → 5 = high)

	Score from 1 to 5
They are recognizable	
They are clear	
They are reliable	
They help me choose the most environmentally friendly products	
I do not have enough information to evaluate them	
I do not know what they are / I do not recognize them	

1.4 What do you think are the results that sustainability can help you achieve? (1 = low → 5 = high)

	Score from 1 to 5
Ensuring food and social security	
Carefully manage natural resources	
Mitigate climate change	
Promote economic growth	

1.5 What actions are needed to better involve society and promote social innovation in the field of sustainability? (1 = low → 5 = high)

	Score from 1 to 5
Improve the quality of information on organic products	
Provide incentives for the purchase of sustainable organic products	
Funding research on consumer behavior	

Promoting social innovation in the agri-food chain	
Strengthen actions to encourage healthier and more sustainable consumption	
Strengthen actions to reduce food waste in households and restaurant service industries	

2. FOOD PURCHASES, WITH PARTICULAR REGARDING THE PERCEPTION ON SUSTAINABILITY

2.1. In which shopping channel?

	1 (Never)	2 (Sometimes)	3 (Once a week)	4 (Twice a week)	5 (Always)
Hypermarket / Supermarket					
Discount					
Small neighborhood supermarket					
City market					
Grocery store (delicatessen or grocery)					
Supermarkets / specialized shops					
GAS-Groups Purchase Solid					
E-commerce: purchases from the manufacturer					
E-commerce: purchases from the distributor					
Other					

2.2. To what extent are the following ASPECTS important when buying food? (1 = low → 5 = high)

	Score from 1 to 5
The price of the product	
The quality of the product	
The low environmental impact of the product	
The brand / company that produces it	
Advertising communication	
The product packaging	
The advice / opinion of acquaintances, friends or relatives	
Expert advice (nutritionists, scientists, doctors ...)	
The information I find on the package	
Trust in the point of sale	

2.3. Which of the following sustainability CHARACTERISTICS are more important when choosing a food product? (max 3 answers)

- ☐ It is produced with organic farming methods
- ☐ It comes from breeding, or fishing, sustainable
- ☐ It is locally sourced or "zero kilometer"
- ☐ It is a seasonal product
- ☐ It has a recyclable, biodegradable, or less polluting packaging

- Its production has reduced emissions of polluting gases / CO2
- Its production is attentive to the saving of natural resources
- It is produced using renewable energy
- Supports / finances initiatives for the environment (safeguarding forests / animal species)

2.4. Being faced with the same kind of food product, on equal terms, would choose to buy:

The product with sustainable characteristics	The traditional product

2.5. What reasons do you think can BRAKE your purchase of sustainable food products? (max 3 answers)

- Nobody
- The negligible effect that the purchase produces on the environment
- Mistrust in company statements about the benefits on the environment
- Lower quality
- Excessively high price
- The manufacturing company is unknown
- Disinterest in environmental issues

2.6. In which PERCENTAGE PURCHASES organic or sustainable food products, in each of the following CHANNEL?

	1 (Never)	2 (Sometimes)	3 (Once a week)	4 (Twice a week)	5 (Always)
Food business					
Fruit and Vegetables					
Fresh products with a fixed weight					
Frozen foods and ice creams					
Fresh meat and fish					
Drinks					

2.7. How do you rate the QUALITY of sustainable food products?

- Less than traditional products
- In line with other traditional products
- Above that of traditional products

2.8. What do you think, in general, of the INFORMATION present on food packaging, which certify its respect for the environment and the characteristics of sustainability? (1 = low → 5 = high)

	Score from 1 to 5
product quality	
authenticity of the product	
area of origin bounded	
encourage work in the production area	
avoid buying counterfeit products	
regulated production methods	
because it is a traditional product	
because it is a better product than the standard one	
because it is a more controlled product	
Other (specify)_____	

3. CONSUMPTION OF ORGANIC PRODUCTS

3.1. If you want to be sure to buy a quality food product (good and safe), what does it have the most trust? (1 = low → 5 = high)

	Score from 1 to 5
The organic brand	
Other known brands (specification)	
The territory of origin	
Indifferent or I rely on other factors	

3.2. Has you recently purchased ORGANIC certified products?

☐ YES	☐ NO	☐ I DO NOT KNOW / DO NOT REMEMBER

If yes, why? (possible multiple answers)

- ○ product quality
- ○ authenticity of the product
- ○ delimited area of origin
- ○ favor work in the production area
- ○ avoid buying counterfeit products
- ○ regulated production methods
- ○ because it is a traditional product
- ○ because it is a better product
- ○ because it is a more controlled product
- ○ Other (please specify) _____

If NO, why? (possible multiple answers)

- ☐ I do not know the products
- ☐ I do not trust
- ☐ they cost too much
- ☐ I can not find them easily
- ☐ I do not care about the products currently available
- ☐ poor quality compared to the price

Which:

- ○ vegetables
- ○ fresh fruit
- ○ dried fruit
- ○ citrus
- ☐ potatoes
- ☐ milk
- ☐ eggs
- ☐ meat
- ☐ cheese
- ☐ more _____

3.3. Where do you prefer to buy organic products? (Made 100 the total)

	1 (Never)	**2 (Sometimes)**	**3 (Once a week)**	**4 (Twice a week)**	**5 (Always)**
Hypermarket / Supermarket					
Discount					
Small neighborhood supermarket					
City market					
Grocery store (delicatessen or grocery)					
Supermarkets / specialized shops					
GAS-Groups Purchase Solid					
E-commerce: purchases from the manufacturer					
E-commerce: purchases from the distributor					
Other					

3.4. Has it recently purchased organic fresh produce (fruit, vegetables, meat, cheese) coming from its territory on the local market?

□ YES	□ NO	□ I DO NOT KNOW / DO NOT REMEMBER

If YES, why? (possible multiple answers) (mark with an X)

Respect for tradition	Quality	Respect for the environment	Price
Safety	Promoting the territory	Other_____	

4. IMAGE AND PERCEPTION OF THE IMPACT OF ORGANIC FARMS ANY ON SUSTAINABILITY

4.1. He knows one of the following organic farms

UEA	
Al Ghadi Organic Farm	
El-Bahia	
Hamad – EcoFarm	
Hamed Alfalasi	
Khalid	
Modern organic farm	
Rashed	
Hamed Ali al Falasi	

Sicily	
Marzullo	
Ferrante-San Demetrio	
Andrea Scuderi	
Cammarata	
Caramazza	
Lirosi	
Salvatore Fontanazza	

4.2. Have you ever bought their products?

□ YES	□ NO	□ I DO NOT KNOW / DO NOT REMEMBER

If YES, why? (possible multiple answers)	***If NO, why? (possible multiple answers)***
□ product quality □ are committed to improving the quality of life in our territory □ authenticity of the product □ delimited area of origin □ favor work in the production area □ avoid buying counterfeit products □ regulated production methods □ because it is a traditional product □ because it is a better product than the standard one □ because it is a more controlled product □ Other (please specify) _____	□ I do not know the products □ I do not trust □ they cost too much □ I can not find them easily □ I do not care about the products currently available □ poor quality compared to the price

4.3. What do you know about the company or companies with which you have more relationships? _____Name of the farm

Interacts and communicates the commitment to sustainability in a clear, transparent and continuous way	□ **YES**	□ **NO**
Performs / has carried out voluntary actions or has committed to financing initiatives / projects related to local realities	□ **YES**	□ **NO**
It has activated a system for managing and monitoring its impact on the environment	□ **YES**	□ **NO**
Has defined objectives and targets for improving its environmental	□ **YES**	□ **NO**

impact		
Apply waste differentiation policies	□ **YES**	□ **NO**
He carries out analyzes, studies, research on the perception of customers with respect to the sustainability of the company or the brand or its product	□ **YES**	□ **NO**
Adopts communication and marketing policies (eg product launches, events) in which the sustainable values of the product are highlighted	□ **YES**	□ **NO**
It has activated a process of involvement / awareness raising on the issues of sustainability in its own downstream supply chain and its upstream supply chain	□ **YES**	□ **NO**
Adopt a labor policy that respects workers' rights	□ **YES**	□ **NO**

5. SOCIO-ECONOMIC CHARACTERS OF THE SAMPLE OF CONSUMERS

5.1. Gender

Male ◯ Female ◯

5.2. Age

Less than 18	Between 18 and 35	35 and 60	More than 60	

5.3. How old have you studied?

5 years (primary)	
8 years (lower averages)	
13 years (above)	
16 years (first level degree)	
18 and more years (master's degree, master's degree, doctorate)	

5.4. Type of employment

Student	
Manager	
Employee	
Worker	
Freelance	
housewife	
Retiree	
Unemployed	

5.5. Do you have children?

No		**YES**		n.	_____

5.6. Housing (predominantly)

Alone	
Together with other people (family members, cohabitants, friends)	
City of residence	_____

5.7. Indicates the average annual income category of its family unit?

Less than 90,000.00 AED	
90,001.00 – 180,000.00 AED	
180,001.00 – 270,000.00 AED	
270,001.00 – 360,000.00 AED	
360,000.00 – 450,000.00 AED	
More of 450,001.00 AED	

Which of the following sustainability brands do you know?

						
						
						
						**Nessuno tra questi**

Mark with an "X"