



GUIDEBOOK TO SUSTAINABLE DEVELOPMENT GOALS

a practical guide to
sustainable development
for smallholder farmers



Co-funded by the
Erasmus+ Programme
of the European Union

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This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use, which may be made of the information contained therein.

INTRODUCTION



**10.5 million
farms in the
EU in 2016**

Who are Smallholders?

The Food and Agriculture Organization (FAO) of the United Nations defines smallholders as small-scale farmers, pastoralists, forest keepers and fishers who manage areas of less than 10 hectares. Smallholder farms are characterised by family-focused motives and it is the families who are responsible for everything from production to farm maintenance. Part of what is produced is consumed by the family itself. Smallholder farming is about a third less productive than large-scale farming.

Smallholders are key contributors to food security and nutrition, producing most of the food in many regions of the world and producing more food and nutrition in the world's most populous, and food-insecure regions. Their farms are better at promoting social equity and community well-being and

have advantages in terms of environmental sustainability and addressing climate change. This in part derives from their greater attachment to local communities and landscapes, which foster a higher level of interest and care for the natural environment and climate upon which they rely for agricultural production.

In a Eurostat survey from 2016, it was revealed family farms dominate the structure of EU agriculture in terms of their numbers, their contribution to agricultural employment and, to a lesser degree, the area of land that they cultivate and the value of the output they generate. There were 10.5 million farms in the EU in 2016, with the vast majority (95.2 %) classified as family farms. Most farms (93 %) in the EU in 2016 were farms with only family workers.

Changes in the global agricultural trade environment are providing smallholders with new opportunities to access markets that also correspond to new constraints (Markelova and Meinzen-Dick 2009). Smallholders tend to be disadvantaged due to small size of operations, weak technical capacity, high vulnerability to risks, and lack of capital (Bijman, Ton et al. 2007).

The main challenges facing smallholder farms often reflect issues that are common for all types of small business:



access to resources
(such as land and capital)



access to markets
(particularly in relation to the bargaining power of small farms in the food chain)



The Sustainable Smallholders EU project

Sustainable Smallholders EU (SSEU) is an adult education initiative to empower and equip smallholders (and those who educate/support them) with skills and knowledge to improve the viability of their holdings by championing the local/heritage value of their produce, transforming their supply chain management and enhancing their environmental/climate action contributions in line with the UN's sustainable development goals. Funded by Erasmus +, SSEU wants empower and equip smallholders with skills and knowledge to:

1

future proof their smallholdings by improving their long-term viability to not just protect the heritage value of their produce and livestock but use it as their USP

2

increase their profitability via

- a. more efficient and lucrative distribution channels such as collective supply approaches/routes to market and
- b. more conscious approaches/responses to consumer demand for sustainable, local and heritage products

3

to improve their ongoing environmental, climate action and biodiversity work by focusing in on their approaches to food security, food waste; and sustainable agriculture

4

increase and diversify the way they contribute to global food demand in a resource-scarce world



The SSEU project specifically targets:

Owners/staff of the smallholding sector, who have not traditionally had access to sustainability training.

Not only is there a lack of training available, there is also a lack of published best practice SDG approaches for smallholders. While many smallholders are aware of the need for increased sustainability and climate action etc. they are unsure how to implement sustainable development principles in their smallholdings. For low skilled and/or low educated smallholders, in fact, understanding, making sense of and implementing the SDG's is a big ask.

Sustainability, Farming and Community Education Bodies

Many farming and community education bodies offer training and supports to the farming sector, but lack the knowledge/pedagogical strategies to provide niche outreach support, training and guidance to promote the economic viability and sustainability of smallholdings.

Based on the needs of these target groups, SSEU wants to:

1

increase knowledge of sustainability practices

2

understand of the implications of sustainability/climate change with a focus on smallholder/local communities

3

enable the groups involved to embrace sustainable development and implement new or improved approaches to Food Security, Sustainable Agriculture, Food and Health, Food Waste, Climate and Environment and Innovative Technologies

4

empower and equip learners with skills and knowledge to become empowered sustainability changemakers with the ability and confidence to share their learning with other smallholder farmers resulting in the wider implementations of SDG's and the creation of a small but powerful ripple effect across Europe that creates powerful, sustainable change.



SUSTAINABLE DEVELOPMENT

1



WHAT DO WE MEAN BY SUSTAINABLE DEVELOPMENT ?

Sustainable development can be defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.¹ It is an organizing principle for meeting human development goals, while simultaneously sustaining the ability of natural systems to provide the natural resources and ecosystem services on which the economy and society depend. The desired result is a society where living conditions and resources are used to continue to meet human needs without undermining the integrity and stability of the natural system.

Three Pillars of Sustainable Development

Sustainable development is the international community's most urgent priority, and can be thought of in terms of three spheres, dimensions, domains or pillars:²

1

Social equity: covering aspects such as education, health, personal safety and leisure. The aim is to maintain social cohesion and it relates to respecting the environment and the economic resources of the place.

2

Economic feasibility: a productive system must meet the needs of that society without jeopardizing the natural resources and wellbeing of future generations. Therefore, its application will be closely related to the needs of the population and environmental limits.

3

Environmental protection: in order to exploit natural resources without exhausting them and contributing to their recovery for subsequent uses, a special environmental protection is required which, as occurred in previous cases, must also take into account the needs of the population and the economic resources of the society in which they are applied.

¹Sustainable Development. UNESCO. 3 August 2015. Retrieved from: <https://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd>.

²United Nations, Working Arrangements for the 2016 Session of the Economic and Social Council (2016), 24 July 2015-27 July 2016. Retrieved from: www.un.org/ecosoc/en/sustainable-development.

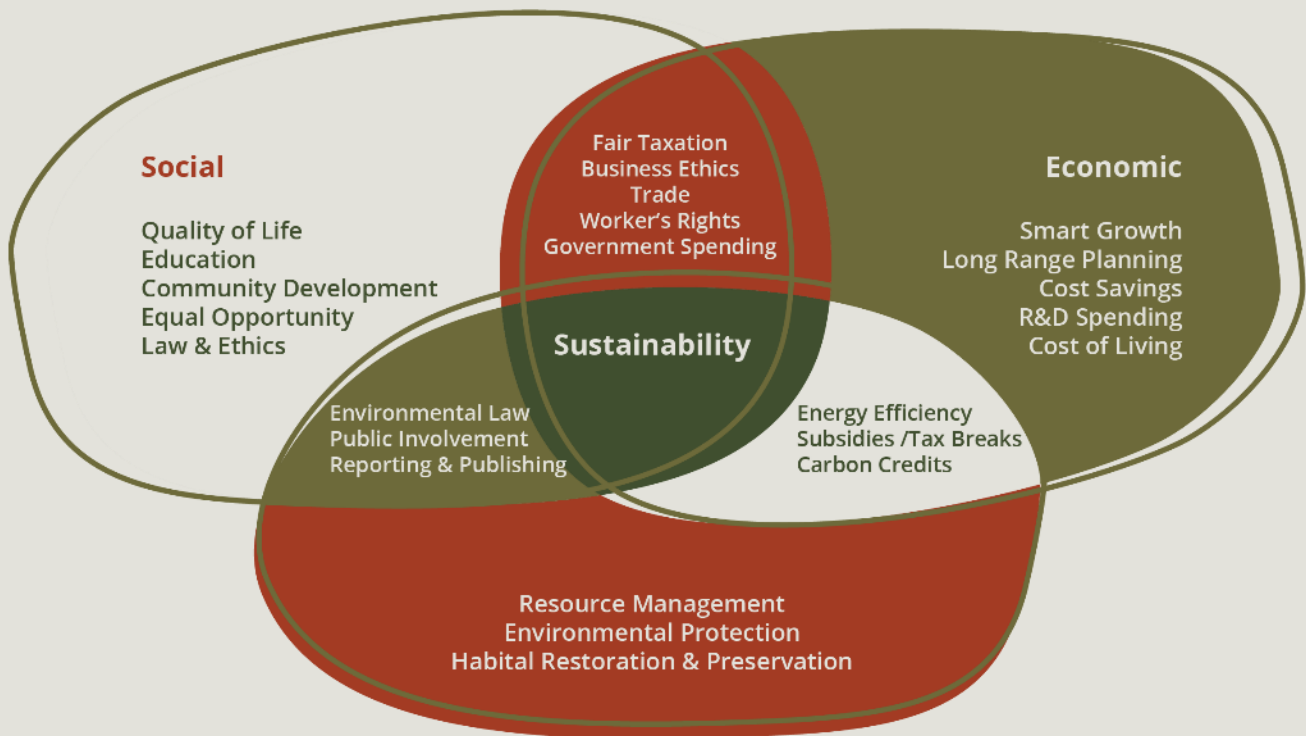


Figure 1: Relationships among social, environmental and economic sustainability.³

The main complexity in terms of implementing these concepts is that they cannot be applied independently, but rather they must be combined together. This leads to a second level of ideas that put the main ones into context:⁴

Supportable: the ratio between the actions aimed at respecting the environment and implementing social measures must be balanced.

Feasible: the respect for the environment and economic development must be possible, pragmatic and away from unrealistic and unachievable objectives, in order to continue gradually achieving objectives.

Fair: the ratio between economic development and social benefits must satisfy both parties, who must receive in accordance with their requirements and provide in accordance with their possibilities.

A Typology of Innovation for Sustainable Development

A typology of innovation for sustainable development is proposed as a way to describe how these innovations vary in terms of their nature and the primary challenges they aim to address. The notion of innovation refers to initiatives that are new to the organization that is adopting them. Figure 2 presents four distinct types of innovations: traditional, green, social, and sustainable innovations.

³Justice Mensah | Sandra Ricart Casadevall (Reviewing editor) (2019) Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review, Cogent Social Sciences, 5:1, DOI: [10.1080/23311886.2019.1653531](https://doi.org/10.1080/23311886.2019.1653531)

⁴The three principles of sustainability and how to implement them in cities, 8 March 2021. Retrieved from: <https://tomorrow.city/a/the-three-principles-of-sustainability-and-how-to-implement-them-in-cities>

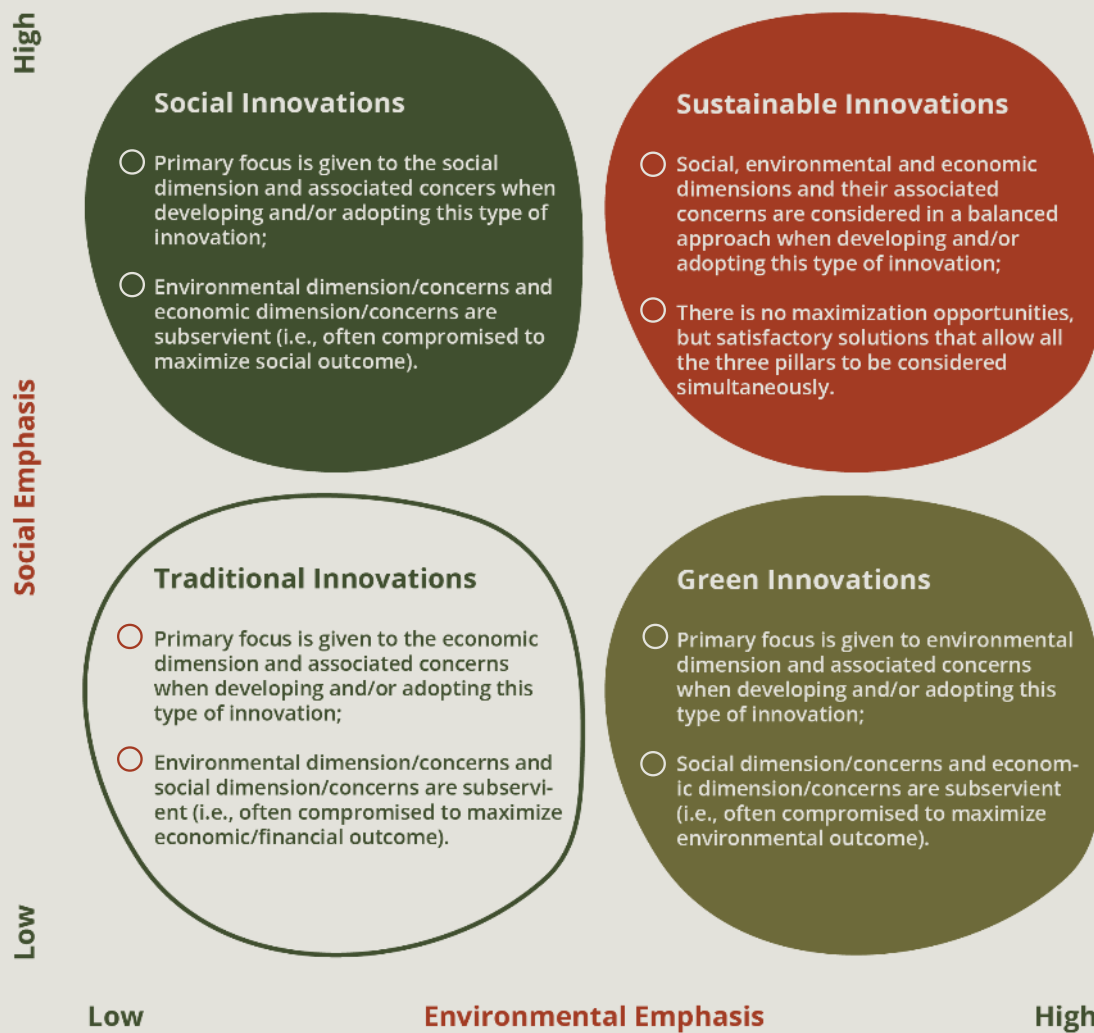


Figure 2. Typology of innovations for sustainable development⁵

The 2030 Agenda for Sustainable Development

In September 2015, a new roadmap to achieve sustainable development, was approved by the United Nations. The **2030 Agenda for Sustainable Development** sets out 17 **Sustainable Development Goals**, a series of common goals to protect the planet and guarantee social well-being. By adopting this new strategy, the states committed themselves, over the next fifteen years, to mobilize all the necessary means for its implementation. From ending poverty and hunger to responding to climate change and sustaining our natural resources, food and agriculture lies at the heart of the 2030 Agenda.



⁵Silvestre, B.S., & Țîrcă, D. (2019). Innovations for sustainable development: Moving toward a sustainable future. *Journal of Cleaner Production*.



The 2030 Agenda for Sustainable Development

The proposal for a new **European Consensus on Development** reflects a paradigm-shift in development cooperation under the 2030 Agenda, responding to the more complex and interconnected challenges the world faces today. The proposal puts forward a shared vision and framework for action for all EU Institutions and all Member States, with particular emphasis on cross-cutting drivers of development, such as gender equality, youth, sustainable energy and climate action, investment, migration and mobility.

The aim is to increase the credibility, effectiveness and impact of EU development policy, based on shared analysis, common strategies, joint programming, joint action and improved reporting. The new Consensus should frame all development policy activities of the EU and its Member States. An example of this approach is the proposed European External Investment Plan which will use Official Development Assistance to leverage funding from other sources to generate sustainable growth for the benefit of the poorest.

Your Notes.....

The background features a large, solid red circle in the upper half. Below it, a stylized landscape is depicted with dark brown, wavy lines representing hills or fields. On the left, a section of the landscape is filled with a pattern of small, dark brown triangles pointing right. To the right, a series of small, dark brown dots are scattered across the landscape, suggesting a field of crops or a path. The overall design is minimalist and modern.

SUSTAINABLE 2 AGRICULTURE

SUSTAINABLE AGRICULTURE

Sustainable agriculture is farming in sustainable ways meeting society's present food and textile needs, without compromising the ability for current or future generations to meet their needs.⁶ Sustainable agriculture is defined by three interactive components: economic profitability, environmental stewardship and social responsibility. The term "sustainability," as it applies to agriculture, describes a holistic, long-term approach to business on-farm, that means maximizing economic and environmental stability, equity and health of the farm, business and family. A sustainable approach to farming involves more than talking about environmental actions or maximizing profits. Sustainability focuses on business processes and practices, rather than a specific food, fiber or feed output. It integrates economic, environmental and societal values to create a "triple bottom line" (TBL) when reviewing the impacts of the business as a whole. This is very different from a purely profit-driven approach, where businesses benefit economically but often at the expense of the environment and society.⁷

Topics in sustainable agriculture:

- Addressing Food Insecurity
- Agritourism
- Agroforestry
- Biofuels
- Conservation Tillage
- Controlled Environment Agriculture (CEA)
- Cooperatives
- Cover Crops
- Dairy Waste Management
- Direct Marketing
- Energy Efficiency & Conservation
- Food and Agricultural Employment
- Food Labeling/Certifications
- Food Waste Management
- Genetically Modified Crops
- Global Sustainable Sourcing of Commodities
- Institutional Sustainable Food Procurement
- Biologically Integrated Farming Systems
- Integrated Pest Management (IPM)
- Nutrition & Food Systems Education
- Organic Farming
- Precision Agriculture (SSM)
- Soil Nutrient Management
- Postharvest Management Practices
- Technological Innovation in Agriculture

⁶What is sustainable agriculture | Agricultural Sustainability Institute. Retrieved from: www.asi.ucdavis.edu

⁷Introduction to Sustainable Agriculture. Ministry of agriculture, food and rural affairs. Retrieved from: <http://www.omafra.gov.on.ca/english/busdev/facts/15-023.htm#Intro>

⁸<https://sarep.ucdavis.edu/sustainable-ag>



- Urban Agriculture
- Value-Based Supply Chains
- Water Use Efficiency
- Water Quality Management
- Zero-Emissions Freight Transport

Sustainable agriculture consists of environment friendly methods of farming that allow the production of crops or livestock without damage to human or natural systems. It involves preventing adverse effects to soil, water, biodiversity, surrounding or downstream resources—as well as to those working or living on the farm or in neighboring areas. The following list summarizes key components of sustainable agricultural systems:

- A careful stewardship of the earth,
- The maintenance of the earth's biological systems,
- The maintenance of nutrient cycles,
- An ability to meet the need for food indefinitely,

- A system that produces food at a socially acceptable environmental cost,
- An acceptable balance of environmental and economic concerns,
- An incorporation of biological processes such as: nitrogen fixation and beneficial insects into food production,
- Minimal use of off-farm inputs,
- Use of crop rotations to control weeds, diseases and insect pests,
- The use of integrated pest management,
- The use of no-till or minimum-tillage cropping systems.



SDGs RELEVANT TO SMALLHOLDERS





SDGS RELEVANT TO SMALLHOLDERS

Given that the SDGs were designed to take a holistic approach to addressing the social, economic and environmental aspects of sustainable development, of the 17 goals, 9 goals directly pertain to the agricultural sector and have relevance to small farm growth and development. With over 1.5 billion people living in small producer households globally, their development is crucial for income growth, poverty reduction, food security, gender empowerment and environmental sustainability (Byerlee et al. [2009](#); Pingali [2010](#)). Therefore, the growth and development of small producer agriculture are central to meeting the SDGs. In developing countries, multiple stressors (climatic and political), economic and social conditions affect food security (Leichenko and O'Brien 2002). Today, however, due in part to climate change, the agricultural sector is joined at the global level, and Western and developed countries are also beginning to feel the negative impacts. The agricultural sector contributes largely to climate change, leading to a vicious circle.

Poverty Goals

In 2020, 96.5 million people in the EU were at risk of poverty or social exclusion, representing 21.9% of the population. The role of agriculture development in poverty reduction is well established in economics literature. There is overwhelming evidence that, with very few exceptions, sustained reduction in poverty cannot be achieved without productivity increases in the agricultural sector (Timmer and Akkus [2008](#)). Time series data used in various studies have shown the marginal effects of agricultural GDP growth on poverty reduction to be significant. Thirtle et al. ([2003](#)) estimated that with a 1% increase in crop productivity in Asia, poverty reduced by 0.48%. In the context of India, Fan et al. ([2000](#)) show a decrease of 0.24% in poverty with 1% growth in agricultural productivity.

Thus, growth and development of the agricultural sector are central to achieving the poverty goals (**SDG 1 - No poverty** and **SDG 8 - Decent work and economic growth**). These goals are also interlinked with the other group of goals, as improved income is crucial to improving access to nutritious food, to end hunger and to reduce inequality both within and between countries.

Reducing social inequality through empowerment of women and marginalised groups expands access to resources and services, which in turn can improve farm-level productivity. The urgency of climate action and conservation is also significant and inextricably linked to agricultural production. Along with increasing and sustaining growth, ensuring responsible production and consumption is important for reducing externalities such as emissions, soil degradation, water contamination and climate change, which ultimately put agricultural production at risk.

Nutrition Goals

The goal to end hunger, achieve food security and improve nutritional status is urgent. According to the FAO, 795 million people globally are undernourished; a majority of them live in Asia and about 281 million reside in SSA (FAO, IFAD and WFP [2015](#)). Micronutrient deficiencies were a major issue that was under-addressed in the MDG and WFS goals of halving the prevalence and instances of the hungry (Pingali et al. [2016](#)). The SDGs, however, are explicit in their aim to improve nutrition and to end all forms of malnutrition, focusing especially on wasting and stunting and also on the needs of adolescent girls, pregnant and lactating women and older people. Not only problems related to malnutrition in developing countries, but also

in the western world, like in Europe, where food is not scarce, there are problems related to malnutrition. In Europe in 2019, 45% of European adults were normal weight, while 53% were overweight, with 17% obese.⁹ Smallholder agricultural production is closely linked with nutrition and food security in three ways. Firstly, it makes food available through production; secondly, it reduces the real cost of food, making it more affordable; and thirdly, it improves incomes of farming households, enabling them to access nutritious foods (Ivanic and Martin [2008](#); Pingali et al. [2015](#); Swinnen and Squicciarini [2012](#)). Sufficient evidence exists to validate the relationship between agricultural growth and nutritional outcomes.

Social Goals

Achieving the social goal of reduced social inequality—especially gender inequality—depends on improved access to economic resources including land, natural resources, financial services and technology, for women and marginalised groups. Emancipation of these groups will be important to improve

agricultural productivity, reduce regional inequalities and achieve sustained income growth. Women comprise 43% of the total agricultural labour force across the globe (FAO [2014](#)), although there are variations in this composition across the developing world.



⁹[*Over half of adults in the EU are overweight - Products Eurostat News - Eurostat \(europa.eu\)*](#)



Environmental Goals

The environmental goals, including **climate action (SDG 13), responsible production and consumption (SDG 12), and the management and preservation of natural resources and biodiversity (SDG 15)** are integral to small farm development. Temperature rises, and the unpredictability of floods, droughts and other extreme weather events resulting from climate change, influence the costs and conditions in which agricultural production takes place. At the same time, managing the environmental externalities of agricultural production, such as greenhouse gas (GHG) and non-GHG emissions, groundwater depletion and soil degradation, are also important concerns to increase food production for a growing population. Sustainable production and consumption therefore become an integral part of mitigation and adaptation strategies in the fight against climate change and wastage (especially for food and natural resources).

Changes in temperature increase the risks of pest attacks and disease outbreaks (O'Brien et

al. [2004](#)). This increases the cost of cultivation, due to the need for pest and disease management, and also escalates the risks of crop failure. Morton ([2007](#)) states that even a slight increase in temperature affects the conditions under which the major staples such as wheat, rice and maize are grown. Livestock production will also be impacted by climate change, posing significant and diverse challenges for food security. Quality and quantity of feed crop and forage, water availability, animal and milk production, livestock diseases and biodiversity are all important factors that will affect animal husbandry (Rojas-Downing et al. [2017](#)). Temperature rise and humidity have an additional impact on food safety as they increase the risk of mycotoxin contamination in cereals and pulses (Paterson and Lima [2010](#)), and of contamination of drinking water (Paerl and Huisman [2009](#)), which in turn impacts nutrition outcomes (**SDG 2 - Zero hunger and SDG 3 - Good health and wellbeing**).



4

SUSTAINABLE SMALLHOLDERS EU topics

SUSTAINABLE SMALLHOLDERS EU TOPICS

This Sustainable Smallholders EU Guide book has identified specific topics relevant to increasing and stimulating sustainable approaches in small-scale agricultural production. The topics identified are: **Food security, Agroforestry, Sustainable agriculture, Food loss and Food waste, Innovative Technologies for Smallholders - Precision Agriculture.** In order to make concepts such as the Sustainable Development Goals (SDGs) usable, this guide incorporates real case studies of smallholder farmers across Europe who have implemented sustainable activities, outlining the context, the problem that drove smallholders to develop sustainable practices and what the impacts were.

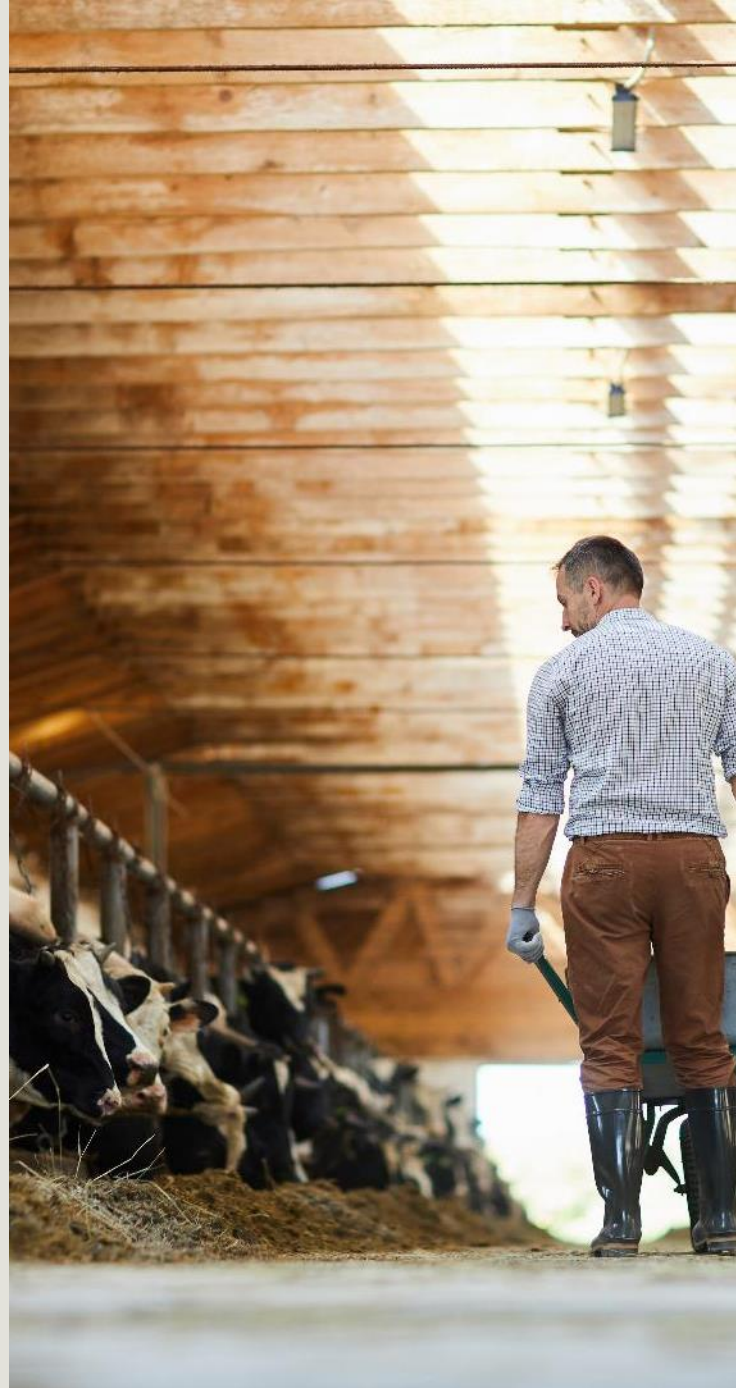
Food security

In the context of food security, the SDGs challenge nutrition professionals and policy makers to think broadly about potential solutions that encompass non-traditional approaches.

The definition of food security is much more nuanced: it is the availability of adequate food stocks worldwide to support the steady increase in food consumption and to compensate for fluctuations in production and prices.

According to FAO, food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. In this definition, there are four dimensions of food security: access, availability, use and sustainability. All these dimensions are important and form part of the SDG2.

We need a paradigm shift that is in symbiosis with nature and its ecological processes.



In recent years, a different paradigm is emerging, one that is scientifically well-founded and that focuses on biodiversity, ... and organic regenerative agriculture

“

the ecological science applied to agriculture. Instead of favouring the use of synthetic chemicals that damage the environment and public health, this paradigm is based on biodiversity: the diversity of plants, animals and micro-organisms, and their different ecological functions

”

"In recent years, a different paradigm is emerging, one that is scientifically well-founded and that focuses on biodiversity, ... and organic regenerative agriculture". which aims to tackle the climate crisis and access to quality food. This new approach is called agroecology. "the ecological science applied to agriculture. Instead of favouring the use of synthetic chemicals that damage the environment and public health, this paradigm is based on biodiversity: the diversity of plants, animals and micro-organisms, and their different ecological functions."

A definition of agroecology is given to us by Vandana Shiva: "Agroecology is the holistic study of agroecosystems, including all environmental and human elements. It focuses on the form, dynamics and functions of their interrelationships, and on the processes in which they are involved". It is based on an awareness that sees everything as part of a system. We are all an integral part of nature and its processes. It is a response to the agribusiness promoted by industrial agriculture on the basis of technology and trade for profit in the hands of a few.

A key principle of agroecology "is the diversification of agricultural systems" through "crop variety mixtures, intercropping systems, agroforestry systems, and the establishment of integrated crop and livestock systems". A key assumption of agroecology, addressed by both agronomist Altieri and Vandana Shiva, is to change the method of measurement: quality instead of quantity. From a market perspective, where the producer maximises profit based on what he sells, since he cannot rationalise inputs, which are crucial for high yields of marketable varieties, measurement is based on yield per hectare. Vandana Shiva and with her the science of agroecology, measure yields by nutrition per hectare: "intensive and biodiverse agriculture can feed twice the population of India, while preserving the natural resource base".

Principles of agroecology as a sustainable agriculture system

Agro-ecological principles revolve around the agroecosystem, an interdependent community of plants, animals and microorganisms that

interacts with the physical and biological environment on which the farmer operates to produce food and raw materials.

Below are some of the basic principles of agroecology as defined by Altieri and other scholars in the field.



Encourage biomass recycling, optimise nutrient availability and balance the flow of nutrients.



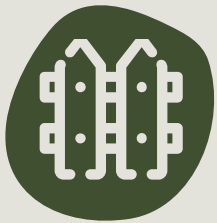
Improving ecological integrity for sustainable food production



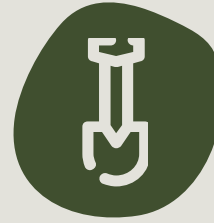
Ensure favourable soil conditions for plant growth, in particular by managing organic matter and improving soil biotic activity.



Creating a socio-economic cultural environment conducive to the establishment of food sovereignty



Increase soil cover to minimise organic matter losses from the soil due to leaching.



Building microclimates



Diversify crop varieties over time and space. Enhance beneficial biological interactions and synergies between agro-ecosystem components, thereby promoting key ecological processes and services.



Increasing carbon sequestration to effectively address the emerging climate change scenario

All this can be translated into increased biodiversity, with it, increased resilience of ecosystems to climate change.



Agroforestry

Agroforestry – the integration of trees with annual crop cultivation, livestock production and other farm activities – is a series of land management approaches practised by more than 1.2 billion people worldwide. Integration increases farm productivity when the various components occupy complementary niches and their associations are managed effectively (Steffan-Dewenter et al. 2007). Agroforestry systems may range from open parkland assemblages, to dense imitations of tropical rainforests such as home gardens, to planted mixtures of only a few species, to trees planted in hedges or on boundaries of fields and farms, with differing levels of human management of the various components. Agroforestry systems provide a variety of products and services that are important locally, nationally and globally (Garrity 2004); but their role is not always fully acknowledged in development policies and practices, reflecting the difficult-to-measure, diverse pathways by which trees affect people's lives. Women who are unable to afford high-cost technologies due to severe cash and credit constraints often favour relatively low-input agroforestry options (Kiptot and Franzel 2012). Agroforestry has an important role in increasing the yields of vegetables that, with fruit, provide varied and nutritionally-balanced diets rather than calories alone (Susila et al. 2012). Trees can modify the microclimate for garden crops under harsh climates and support climbing plants such as yam (Maliki et al. 2012). In an initiative in East Africa, more than 200 000 smallholder dairy farmers are growing fodder shrubs as supplementary feed. The typical increase in milk yield achieved is enabling smallholders to raise extra revenue from milk sales of more than USD 100 per cow per year, and allows farmers to provide more milk more efficiently to urban consumers (Place et al. 2009).

CASE STUDY for inspiration

Name: Basquet at home: we are your conscious food

Country: Spain, Valencia region of Ribera Xúquer

Website: [Basquet a Casa - Agroecología - basquetacasa](https://basquetacasa.com)



Basquet a Casa: Purpose

Basquet a Casa has a **threefold mission**: to offer real food at a fair and affordable price, reduce food waste and foster the local economy. Almost half of the food grown by farmers in Spain is never sold, eating is becoming more expensive, and food waste must end. Intermediaries in the long food distribution channels multiply their sales value to the final consumer, while the farmer hardly recovers his investment.

Basquet a Casa offer a new model of seasonal consumption through **home** baskets from **local agriculture**, of course **organic** and **fair** for all. Which makes eating well easy and affordable. That is why our commitment is both with health and with the local society and economy.

They are dedicated to breaking the cycle of food waste by helping real, tasty food find a good home. Your home.

What they do

It is an agro-ecological initiative that arises from the Valencian region of Ribera del Xúquer and offers a subscription box of ecological, healthy and real quality products. The idea is to offer a new model of seasonal consumption through Basquets home delivery from local, ecological and sustainable agriculture. This makes eating easy and affordable for everyone. To this end, they are committed to health, society and the local economy. All products are certified organic. Their consumption model is designed to break the cycle of food waste, support the local economy and encourage healthy eating. They currently sell a seasonal basket of traditional varieties

grown by Valencian farmers and another offer consisting of a basket of oranges grown in local fields.



CASE STUDY for inspiration

Food security is also about changing the way we look at food. Due to the exponential growth of world food demand, we have now look at the quality of the food (in terms of nutrient per food product) rather than the quantity.



Name: Garryhinch Wood Exotic Mushrooms

Country: Ireland, Garryhinch, Portarlington, Co. Offaly

Website: [Organic Exotic Mushrooms \(garryhinchmushrooms.ie\)](https://garryhinchmushrooms.ie)

Background

85% of Ireland's agricultural export is dominated by beef products. However, beef production is one of the least resource-efficient means of food production and produces a higher amount of carbon per kilo than any other mainstream product. With a growing popularity in plant-based diets, there is a need for the development of less carbon-intensive and more nutritious alternatives to beef production to meet market needs.

What they do

Joe & Dolores Gorman, of Garryhinch Wood Exotic Mushrooms, are one example of a smallholder farm who are addressing this problem and are now supplying a more sustainable and nutritious source of high-quality protein for food service providers in Ireland and the UK. Mushrooms are low in calories, high in good fats, fibre and contain natural flavour enhancers offering a healthy and environmentally friendly alternative to meat in many dishes. Mushrooms are sustainable in their nature as they convert low-quality organic matter into high-quality food products. Garryhinch Wood grows their mushrooms as sustainably as possible, using sustainably sourced wooden blocks as their base and organic substrate, which when spent gets cycled back to nature as fertilizer on local land.

As a smallholder business, Garryhinch Wood Exotic Mushrooms have been mushroom

farming for over 30 years supplying mushrooms for the retail sector, food services sector and farmers markets all across Ireland. Their focus on exotic mushrooms came in 2018 and they opted to produce smaller quantities of a higher-end product; they sought and secured various routes to market to minimise their exposure to risk; and they went down the organic route, which they recognised as a growth area. They also launched an online shop.

By offering a wide range of high-quality mushrooms, Garryhinch Wood is providing a more sustainable protein source while upcycling otherwise waste products as substrate. Mushrooms also have a number of claimed health benefits providing a nutritious smallholding output.



CLICK
TO
VIEW





Sustainable Agriculture

The environmental goals, including climate action (SDG 13), responsible production and consumption (SDG 12), and the management and preservation of natural resources and biodiversity (SDG 15) are integral to small farm development. Temperature rises, and the unpredictability of floods, droughts and other extreme weather events resulting from climate change, influence the costs and conditions in which agricultural production takes place. Changes in temperature increase the risks of pest attacks and disease outbreaks (O'Brien et al. 2004). This increases the cost of cultivation, due to the need for pest and disease management, and also escalates the risks of crop failure. Morton (2007) states that even a slight increase in temperature affects the conditions under which the major staples such as wheat, rice and maize are grown. Livestock production will also be impacted by climate change, posing significant and diverse challenges for food security. Quality and quantity of feed crop and forage, water availability, animal and milk production, livestock diseases and biodiversity are all important factors that will affect animal husbandry.

Intensive practices mean increased inputs for farmers, at higher costs as petrol prices increase. Fertilizers show decreasing performance on yields as soils and water become saturated and organic matter and life in soils are destroyed by an excess of these

chemically based compounds.

It is now time to invest in sustainable agricultural practices, which have proven to be less costly for farmers and are bringing back natural fertilizers and increased soil life in the longer run. They are the key to the sustainable productivity of farms. Integrated organic practices, like composting, permaculture, multi-cropping and agroforestry, have multiple positive impacts on farmers and their ecosystems. They reintegrate agriculture within the natural life cycle of plants, enriching the soil with the dead leaves and branches of that same ecosystem – for free and forever, as long as the ecosystem is preserved. It is much more cost-effective than introducing artificial compounds from outside of the farm every year.

Soils are enriched naturally, and plants and trees bring in organic matter, maintaining water and moisture in the soil thanks to their rooting systems. They diversify farmers' revenues (fruits, timber, medicinal plants and trees), sequester carbon and participate in better biodiversity preservation. Natural ecosystem regeneration through these practices is also the key to long-term food security.

CASE STUDY for inspiration

Name: The Tattie Hoaker

Country: Ireland, North Sligo

Website: <https://www.tattiehoaker.farm>



Background

Ireland relies on a significant amount of imported fruits and vegetables to meet market's need, consequently contributing to large scale overseas mono-cropping (growing a single crop year after year on the same land, in the absence of rotation through other crops) and increased carbon footprint. In addition, cultivars selected for export normally lack flavours and are less nutrient dense. Importation of unseasonal products can cause consumer confusion and leads to further disconnect with food and seasonality. Lack of small-scale growers in Ireland is another critical issue.

Activities implemented

Aidan Gillen has been running Tattie Hoaker farm (2.5ha) in North Sligo for the last 20 years. It is the first organic farm in the area, growing a wide range of fresh fruits and vegetables for local markets while promoting the importance of locally produced organic food through farm activities such as provision of horticulture courses in situ and farm walk. The Tattie Hoaker farm runs a community-supported agriculture project (CSA) and loves to have local people and visitors come and get involved.

Aidan started off selling produce through an honesty box at the farmgate and then progressed to holding stalls at 3 different farmer's markets. However, some of the produce was imported from abroad at that time and access to larger farmer's markets was time-consuming that it was neither economically viable nor environmentally sustainable.

Learning from experience, Aidan changed to business supply model to focus on local distribution, providing vegetable boxes for member of CSA customers that are collected at the farmgate every Saturday. Customers pay in advance for either

The produce is also sold to one grocery shop in the nearest town. In addition, noticeable change in farming practices is now seen such as developing an orchard and no-dig herb garden to add more crop diversity in a sustainable manner and to build biological resilience within the farm at the same time. Further, Aidan has established a supporting system along with local organic growers by trading certain crops which one farm can produce well but the others cannot. This enables them to increase the content of vegetable box thus maintain customer satisfaction without relying on foreign imports.

Tattie Hoaker Farm





What kind of outcomes the actions had and how this affects today

Since the business philosophy of the farm has shifted towards more community-based model the role of the farm has multiple functions. For instance, the provision of a weekly horticulture course (5 week course; 1 day/week), farm walk, and hosting work experience for woofers and international students give people an opportunity to learn how to grow organic food throughout the year. These education events helped to raise awareness of local food security and increase number of CSA customers (66 members) when

Covid-19 outbreak first occurred in the spring of 2020.

The introduction of therapeutic horticulture at the farm as part of a social farming project supports people with physical and mental health challenges and benefits their well-being. Farmgate-sales has now become a venue for social interaction. Aidan started collaborating with local food producers and craftsmen to create more vibrant atmosphere in the community, contributing to bond relationship between the elderly and the youth.



Food loss and Food waste

Food loss refers to food that is spoiled, lost, or incurs reduction of quality or value between harvest and the markets — meaning food never has the opportunity to reach the table. This typically takes place during various stages in the supply chain, including production, postharvest processing, storage, and distribution.

Food waste: losses occurring at the final stage of the supply chain (waste in the strict sense of the word, regardless of whether or not the product is kept beyond its expiry date), due to incorrect supply management or bad eating and purchasing habits.

As stated in the 2018 ISPRA (Istituto Superiore per la Protezione e la Ricerca Ambientale) report on food waste, the most effective prevention measure is the "reorganisation of food systems on the basis of coordinated local sovereignty and autonomy". Food sovereignty offers a *de facto* strategy to dismantle the dominant, failed agri-food system by creating an alternative that focuses not on the needs of the market, but on those of local populations. Food sovereignty is in fact based on the right of each people to take care of its own food and to freely and democratically choose the type of agriculture it wants to pursue, meeting its domestic food needs. By contrast, global financialisation and waste in the North create vulnerability in the South. According to the path outlined by the ISPRA report, it is necessary to encourage not only the relocation of food systems, but also small-scale agroecological production, plant-based diets, reproductive health, short supply chains and the solidarity economy, which wastes one-eighth of the conventional economy.



Research shows that agroecological and small-scale systems produce 2 to 4 times less waste than agro-industrial systems and consume far fewer resources, thanks in part to internal and quasi-circular regeneration of resources. Agroecological practices are in fact much more resilient in the face of disease or climatic adversity, since they are based on diversified and sustainable production. Agroecological soil management also guarantees soil fertility for longer periods than conventional methods and, therefore, higher and more stable production in the medium to long term.

In addition, the principles of agroecology provide for a direct relationship between producers and consumers, which allows for more efficient product management: there are fewer intermediaries, fewer foodstuffs are passed on and there is a greater chance of considerably reducing waste. This human contact also raises awareness of the issue and encourages more responsible behaviour, such as rebelling against useless aesthetic canons and choosing to buy that slightly twisted carrot that will probably be discarded by most and eventually thrown away.



CASE STUDY for inspiration

Name: Giovanni Calitri

Country: Italy, Panni in Monti Dauni area, province of Foggia

Contact: (3) [Valmela](#) | [Facebook](#)



The context

Agriculture in the Daunian mountains is mainly characterized by cereal cultivation, also driven by the European CAP contributions for these crops. The last few decades have seen a constant instability in wheat prices, making this crop less and less economically viable. The type of farming used for wheat is intensive, requiring large quantities of chemical inputs which are reflected in higher production costs. Due to industrial agriculture, many of the native varieties have been lost or are in danger of extinction.

Mr. Giovanni Calitri, a farmer from the town of Panni in the Daunian mountains, decided to diversify his production, as wheat is not very profitable, opting for sustainable agriculture, based on the rediscovery of an ancient variety of apple (Limoncella apple), an indigenous variety, robust and well adapted to the local arid climates, requiring few chemical inputs. Mr Calitri has therefore rediscovered this versatile local variety which, in addition to its fruit, produces excellent fruit juices and jams. The limoncella apple is an irregularly shaped fruit, between ellipsoidal and cylindrical in shape and of small to medium size. Its skin is yellow to green and has numerous rusty lenticels. The flesh is white, compact and aromatic, characterized by a slightly acidic aftertaste. It is rich in nutritional and beneficial properties. It contains a high amount of pectin, a natural antioxidant that allows it to be preserved for a long time. Also rich in calcium.

Activities implemented

Giovanni Calitri started producing Limoncella apples in 2003, in order to diversify his production from the increasingly unprofitable

wheat. The basis of his experience is the field study, which lasted 5 years to select the best and most suitable plants for the territory, observing the iteration of the plants with the soil and in which type of soil they grow best.

His work has not gone unnoticed, attracting the cooperation of the University of Foggia, which has studied the properties of this apple and its possible uses. The Gal Meridaunia also believed in the potential of the rediscovery of the Limoncella apple, offering its organisational but also financial support, bringing together the various producers of this apple variety and trying to create favourable market conditions for this crop.

Giovanni Calitri is now able to exploit the full potential of the Limoncella apple, producing not only the fruit, but also apple extracts, cider, jams and even perfumes made from the apple skin.





Unique in the territory

The experience of the limoncella apple is unique in the Monti Dauni, which then became a broader project, ValMela, aimed at relaunching apple production in the Monti Dauni and involving various local players, from the Gal Meridaunia to the University of Foggia, creating a synergic system to safeguard this variety of apple, which, thanks to its robustness and ability to adapt to the clay soils of the Monti Dauni, is well suited to sustainable agriculture with minimal use of pesticides and chemical fertilisers.

Tackling food loss and waste

The limoncella apple, as mentioned, is a hardy apple and no chemical fertilisers or pesticides are used in its production. In order to be sold on the market, the apples must be aesthetically perfect. This leads to a huge waste of food in the first step of the food chain: apples with irregularities in the skin are simply thrown away, even if these imperfections do not affect the healthiness or nutritional quality of the product.

Mr Calitri succeeds in reducing this great waste of food, not only from an ethical-environmental point of view but also from an economic one, by transforming apples that are not accepted by the market into lemon-apple fruit juices. It has also managed to increase its market offer.





Innovative Technologies for Smallholders – Precision Agriculture

The primary sector is facing a profound new revolution. New technologies promise to increasingly change the way of 'doing agriculture', with the aim of optimising the use of production factors to the benefit of farmers' income and the environment.

Precision Agriculture is a farm management strategy that uses information technology to acquire data that leads to decisions aimed at agricultural production. The aim is to match land and crop management with the specific needs of a heterogeneous field in order to improve production, minimise environmental damage and raise the quality standards of agricultural products.

The use of new technologies contributes to a series of economic benefits resulting from the optimisation of inputs, as well as from the reduction of pressure exerted by agricultural systems on the environment. The precision introduced by the technologies, in fact, makes it possible to make a targeted distribution of the main factors of production (water, fertilisers, plant protection products) only where it is needed and in the quantity corresponding to the real needs of the crop in progress. In addition, the use of sensors also allows real-time monitoring of crop health, controlling for example the onset of phytopathogens or unfavourable environmental conditions or rationalising agronomic practices that, if not well calibrated, could induce pathogenesis in the plants themselves. This also means saving synthetic chemical substances needed for defence and control.



The need to improve productivity, competitiveness and environmental performance is not just about economics. With some 805 million people in the world suffering from chronic malnutrition, a large proportion of whom live in developing countries, Europe certainly has a moral obligation to optimise agricultural production and to do so in the most sustainable way possible. Smallholders, who are the backbone of the European agricultural sector, can become the main actors of change if they are well supported by institutions and communities. Sustainable farming methods such as agroecology, for example, can have even higher yields in crops than conventional methods that use a lot of chemical inputs. On the other hand, there is also a need to change the point of view of consumers, who should not look at the quantity of products they buy cheaply but at their quality in terms of the nutrients they contain.

There is no single 'precision agriculture', but general principles are applied to each crop (and also apply to animal husbandry, aquaculture and forestry). However, it is possible to identify two key technologies within precision farming: semi-automatic guidance and variable metering. The first involves installing semi-automatic guidance systems (via GPS) on tractors so that they can move more precisely in the field than is possible with an operator. This eliminates overlaps and thus saves on seeds, fertilisers, plant protection products, etc. It is estimated that the degree of overlap is around 10% at best and 25% at worst.

Variable rate dosing, which is considered to be the next step after the first one, allows to

provide the plants with the inputs they need (water, fertilisers, plant protection products) with precision: not uniformly throughout the field, but taking into account the real needs, which differ within the same plot. To this end, maps are created ad hoc with the help of instruments such as satellites, drones, proximity sensors, etc.

The introduction and integration of technological processes in agriculture and, more generally, in the main management systems of the primary sector, has made it possible to assess and classify the benefits expected in different farm realities, which are often still too uneven, in order to evaluate the best strategies for introducing innovation. In general terms, the expected benefits are

- 1** **Optimisation of production and quality efficiency**
- 2** **Reduction in costs**
- 3** **Optimisation of inputs, minimising environmental impacts.**

CASE STUDY *for inspiration*

Name: Marcello

Country: Italy, Monti Dauni area



The background

To cope with falling wheat prices, Mr. Marcello uses sustainable farming methods, reducing tillage and reducing the use of pesticides against weeds. He has introduced local varieties of wheat that are more resistant and require fewer chemical inputs. Marcello has also introduced the use of high technology to rationalize and limit waste in cultivation using GPS technology.

Activities implemented

Mr Marcello's identification of the best sustainable practices in agriculture are the result of years of experiments and observations in the field. From the selection of the best cultivars that require fewer chemical inputs to the best natural fertilization techniques.

The application of GPS in farmland management has done nothing but avoid the occurrence of double fertilization in some areas and no spraying in others. In fact, GPS has enabled operators to cover the ground with all the necessary operations and above all to do so in the shortest possible time. The aim of using a GPS in the agricultural sector is, in fact, to ensure that every area of land is subjected to the same work. As well as ensuring that all the land receives the same treatment, the use of GPS makes it possible to store data on all the work carried out, to map the land to be subjected to agricultural activities, to reduce management costs and thus obtain a higher income. In general, a cost saving of about 10% can be achieved.

Marcello's technological innovation may be one of the few examples in the area. The GPS system makes it possible to minimise waste

and to know in detail what needs to be done in the different parts of the field. According to him, the investment in the GPS system will be returned in two years.

The outcomes

The less chemical inputs use has not only the immediate cut of production costs but also a long-term impact. The increase of chemical pesticides makes the weeds more resistant to them and every year farmers must use more and more pesticides to kill the weeds, in a vicious circle that brings farmers to spend more money to buy chemical inputs against a decreasing price of the final product.

The advantages of GPS in agriculture:

- Less consumption of plant protection products, fertilizers and pesticides;
- Lower management costs;
- Greater time savings;
- Higher profitability;
- Ability to operate at any time of day or night: the operator is guided by GPS and does not need to see.

CASE STUDY for inspiration

Name: Oranges from Cullera

Country: Spain, Cullera (València)

Contact:

Who we are: family with orange orchards (naranjasdecullera.com)



Innovative technology in agriculture could also refer to the new channels of selling (online). They give a big support to farmers to not depend on large-scale retail trade by the direct sale of their products to the customers and make the theme known.

We are a family from Cullera (Valencia) that have orange and mandarin orchards.

I am Ruth Palomero, a graduate in pharmacy. In 2011 I decided, with the help of my family, to launch myself to sell our crops online to self-employ and try to get a fairer price for our oranges, and in this way be able to keep our orchards in production.

Our orchards are located in the municipality of Cullera, in Valencian lands, some of them within a privileged natural environment such as the "Parc Natural de l'Albufera". From my father-in-law Joaquin we have inherited the love of our garden and we have taken his witness taking care of him. Unlike him, who depended on intermediaries to sell his crops, we are able to sell them directly from our website. Uncle Tomàs has also helped

us a lot and continues to do so by taking care of his clementines and late-harvest for our store. Currently, we have help in Joan's field. He now takes care of our fields, also with much love and technical preparation. He is a country man who loves his job.

With our proposal, we make it possible for our customers to enjoy, like our family, the best oranges with all the properties of freshly harvested fruit, oranges that ripen on the tree, not in cold rooms or warehouses and that we are committed to taking home in the shortest possible time.





Outcomes

Buying oranges and mandarins on the Internet is a common, easy and very satisfying practice for many families all over Europe. They invite you to taste quality oranges and mandarins, freshly picked and sent directly from the orchard to your home, from the farmer to the consumer, without post-harvest treatments or preservation methods. They are fresher, more natural, with all their flavour and vitamins. The orange trees are located in the municipality of Cullera, in the region of Ribera del Xúquer, about 40 kilometres south of Valencia and next to L'Albufera.

They make it possible for their customers to enjoy the best oranges with all the properties of freshly picked fruit, oranges that ripen on the tree, not in cold stores or warehouses, and they undertake to deliver them to your home in the shortest possible time. So with this they support both the product and the local economy, making Mediterranean gastronomy known not only nationally, but also in Europe, thus helping gastronomic tourism in an indirect way.



REFERENCES

- 2016 Food security, food systems and food sovereignty in the 21st century: a new paradigm required to meet Sustainable Development Goals Karen E. Charlton University of Wollongong.
- Published: 18 March 2021, Does smallholder farmers' awareness of Sustainable Development Goal 2 improve household food security in the Northern Region of Ghana?, Franklin Nantui Mabe, Eliasu Mumuni & Nashiru Sulemana

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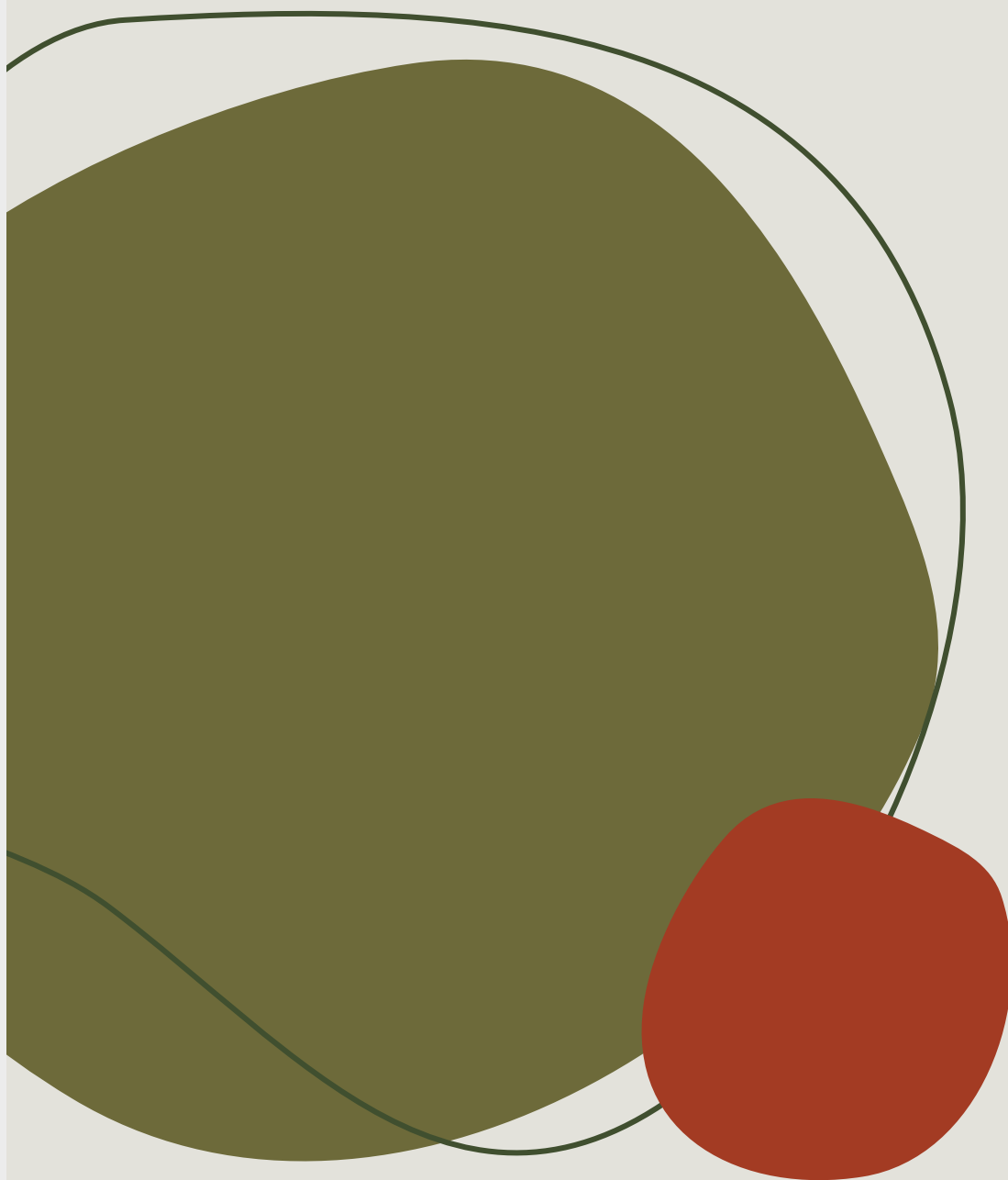
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