

# **Syngenta Public Policy Position on Diverse Agricultural Systems**

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The Syngenta logo is positioned in the bottom right corner of the page. It features the word "syngenta" in a white, lowercase, sans-serif font. A small, stylized leaf icon is placed above the letter 'g'. The logo is set against a solid green background that spans the width of the page at the bottom.

# Syngenta Public Policy Position on Diverse Agricultural Systems

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## Introduction

Farms can be some of the most diverse environments in the world; from their shape and size, the agricultural traditions they follow, the crops they grow, and the local weather or climate conditions they experience. Despite their variety, they all have a common purpose: to grow the food, feed, fuel, fiber, and related inputs that society needs.

As an agribusiness and biotechnology company, Syngenta supports all farmers, everywhere, to safely and sustainably feed a growing world population.

What is an agricultural system? To us, it is the blend of farming techniques and inputs used to grow, protect, and harvest plant products. These systems are not necessarily mutually exclusive from one another, and it is typical for farmers to combine and borrow methods and technologies to suit their needs and circumstances.

To make the most out of food systems, and ensure production within planetary boundaries, we believe it is important for these systems to co-exist and synergize – improving the efficiency of supply chains at each step of agriculture. We are working to understand the world's different agricultural systems better, learning how we can help all farms to become more productive and sustainable.

Every system has its advantages and disadvantages, relating to factors such as environmental impact, regulatory context, inputs needed, ability to meet market demands, productivity, and cost (see **Annex 1** for more details). Similarly, some systems are known to have more of an impact on the landscape and land use than others, but these impacts can often be reduced.

In this policy position, we outline some of the major systems used today and discuss how we make a positive impact on each and every one. This list is non-exhaustive, as farm systems exist across a broad spectrum, though these are some of the systems that have particular relevance to our business and global food supply. Although we cannot offer an equal range of products to each system, we are working to develop sustainable solutions to meet the changing needs of farmers, as well as investing in systems, solutions, and partnerships that will have a positive impact across agricultural value chains.

## Contents

<b>Introduction</b> .....	<b>2</b>
<b>Agricultural systems</b> .....	<b>4</b>
<b>Agroforestry</b> .....	<b>4</b>
<b>Conservation agriculture</b> .....	<b>5</b>
<b>Greenhouse agriculture</b> .....	<b>6</b>
<b>Open-field cropping</b> .....	<b>8</b>
<b>Organic agriculture</b> .....	<b>10</b>
<b>Plantation agriculture</b> .....	<b>11</b>
<b>Regenerative agriculture</b> .....	<b>12</b>
<b>Urban or vertical agriculture</b> .....	<b>14</b>
<b>Conclusion</b> .....	<b>15</b>
<b>The way ahead</b> .....	<b>16</b>
<b>Annex</b> .....	<b>19</b>

***Important: Products should only be used for approved diseases and crops. Always read and follow label instructions. Some products may not be registered for sale or use in all locations. Please check with your local extension service to ensure registration status.***

## Agricultural systems

### **Agroforestry**

Agroforestry describes any deliberate combination of farmland, whether pasture or crop, with trees or shrubs. As farmers can produce a mix of products on the same portion of land, agroforestry helps diversify farm output and can reduce their reliance on any one type of production.<sup>1</sup>

Farmers can often benefit from a variety of ecosystem services unique to agroforestry systems. Firstly, the interspacing of trees on or around crops offers plentiful habitat for insects, birds, and other small animals.<sup>2</sup> These animals can serve to pollinate crops and surrounding flora, thereby improving local biodiversity, and can act as natural pest predators. Farmers can even enhance the nutrient cycle on their farms using certain tree species, with some varieties able to fertilize the soil as effectively as inorganic fertilizers when grown as a cover crop or fallow.<sup>3</sup>

#### **What does Syngenta do?**

We view agroforestry as especially beneficial in our aim to *Help biodiversity flourish* in agricultural contexts, one of our commitments in [The Good Growth Plan](#). Growing trees, shrubs, and other vegetation inside and around farmland in the form of a Multifunctional Field Margin, is one of the methods we have been employing to improve biodiversity on farms. So far, this has been implemented to the benefit of around 6.4 million hectares of farmland. This process began as part of our [Operation Pollinator](#) project, giving growers the opportunity to purchase seed mixes comprised of native flora, helping create and manage biodiversity-rich set-asides on their land.

Our Crop Protection business provides critical support to both dedicated fruit farmers and farmers incorporating fruit trees as part an agroforestry model. Syngenta has a wide range of products available for use in fruit production, with prominent examples including our AMISTAR® Technology. Products in the AMISTAR® range offer robust broad-spectrum control of a variety of fungal diseases affecting fruit. Due to its low use-rates and low risk factor for beneficial insects, AMISTAR® also contributes well to a range of Integrated Pest Management strategies.

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<sup>1</sup> FAO and ICRAF (2019).

<sup>2</sup> Arcadis, Bioversity International, and Syngenta (2018).

<sup>3</sup> Pretty and Bharucha (2014); Jama *et al.* (2008).

## Case studies

### **Partnering for coffee agroforestry in Vietnam**

Our impact in agroforestry has benefitted from our partnership with the Louis Dreyfus Company (LDC), with projects around the world to promote the development of agroforestry systems and protect natural forest habitats. In Vietnam, [Syngenta and LDC](#) have been collaborating to demonstrate the business case of agroforestry in coffee production, using local fruit trees to provide shade to coffee crops.

### **Restoring riparian forests around plantations in Colombia**

For around 24 years, Syngenta has been working with Columbian farmers to restore riparian forest environments through the Ecoaguas project. The project covers high and lowland areas in the countryside, aiming to sustainably enhance the efforts of farmers in the highlands while reforesting riparian habitats in the lowlands. Farmers here produce a range of crops, with coffee, sugar cane, rice, and maize comprising some of their largest products.

As of 2019, the area covered by our Ecoaguas project benefits around 19,787 hectares of forest and farmland across Colombia, having planted over 1.2 million trees from over 100 protected native species.

## **Conservation agriculture**

Conservation agriculture is a system that seeks to protect or restore soil health and describes any farm that applies the following three practices:

1. Minimum soil disturbance (e.g. by minimum or no tillage);
2. Keeping soil under permanent cover (e.g. by leaving crop residues or cover cropping);
3. Diversification via crop rotation, whether annual or multiannual.<sup>4</sup>

These practices have a number of advantages to the soil that can support the long-term survivability of the farm itself. For instance, by planting cover crops, farmers are able to enhance soil carbon sequestration, making the soil richer. By implementing crop rotation, which is the sequential growing of different crops on the same plot of land over different periods, growers can also rejuvenate the soil by allowing it to recover lost nutrients. These factors make the soil less vulnerable to degradation, and allow it to maintain its structure for longer.

Although some of these approaches could be employed in other contexts, the combination of all three can be interpreted as a unique system in and of itself.

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<sup>4</sup> Corsi (2019).

## **What does Syngenta do?**

We provide growers, large and small, with the products and advice they need to develop their businesses profitably and sustainably using conservation agriculture. Through studies in our reference farm network, we have shown that farmers go as far as doubling their harvested yield by implementing these practices, providing a simple but strong business case for adopting minimum tillage, cover cropping, and crop rotation.

As a part of The Good Growth Plan commitment to *Rescue more farmland*, we have been training farmers to practice conservation agriculture, based on minimum tillage, permanent soil cover, and crop rotation, and have been promoting its adoption around the world. As of 2018, Syngenta have improved the fertility of around 10.8 million hectares of farmland on the brink of degradation; exceeding our 2020 goal by almost a million hectares. We also actively promote conservation agriculture techniques as a central element to climate-smart agriculture, helping to reduce emissions, prevent land degradation, and improve food security.

### **Case study**

#### **Supporting conservation agriculture in Mexico**

Syngenta and the International Maize and Wheat Improvement Center (CIMMYT) have been working together on the MasAgro project, aiming to promote the sustainable intensification of maize and wheat production systems around the world.

Through our strategic alliance, Syngenta has been able to support the promotion and adoption of conservation agricultural practices on more than 1.2 million hectares, having reached over 300,000 farmers in Mexico in the process. Additionally, through our alliance with CIMMYT, Syngenta has been able to promote responsible practices for crop protection products by training more than 100 technicians, giving them the means to share that knowledge with other technicians and farmers.

Not only this, but as a research partner of CIMMYT, we have been collaborating to discover new means to raise yield stability and crop profitability for maize and wheat using our improved seed technology.

### **Greenhouse agriculture**

Greenhouse agriculture refers to the growing of crops within the confines of a glass or plastic screen structure, and is primarily used to produce fruit and vegetable crops that thrive in particular conditions.

The primary role of the greenhouse structure is to protect crops from abiotic stress factors, such as excessive cold or heat, dryness or humidity, or exposure to wind, rain, or hail. Greenhouses help growers

to ensure a longer growing window for their crops, so they can remain productive in months where that would not be possible outdoors.<sup>5</sup>

### **What does Syngenta do?**

Greenhouse growers can benefit from a wide range of Syngenta products, not least being our Vegetable Seeds portfolio, which sells seeds for hundreds of high yield fruit and vegetable crops that are perfect for greenhouse conditions.

Our greenhouse tomato seeds offer some of the most advanced genetics available on the market, producing fruit with high quality, high yield, and long-lasting shelf life – helping to reduce food waste. One of our most recent additions being the [YOOM™ tomato](#), which is specifically designed to perform well in the greenhouse environment and yield high quality healthy fruit all year round. Its higher vitamin, mineral, and antioxidant content, along with its remarkable flavor, enabled YOOM™ tomato to receive the gold Innovation Award at Fruit Logistica 2020, held in Berlin.

In the humid conditions many greenhouses create, fungal infection can be a common yield-compromising issue for producers of fruit, vegetables, and berries. SWITCH® uses two highly effective active ingredients to control fungal diseases, such as grey mold (*Botrytis*), *Sclerotinia*, and other diseases in a range of fruit and vegetable crops – and is usable in both open field and protected conditions.

The Syngenta Professional Solutions business also caters well to greenhouse growers – namely producers in the ornamental flowers market. These growers can benefit from HICURE®, an ornamental crop enhancement derived from organic protein nitrogen and amino acids. HICURE® is widely used on cut-roses and other ornamental crops, where it can be relied on for restoring vitality during times of stress. Its high flexibility means that HICURE® can be applied directly to the soil like a fertilizer, where it helps to improve soil vitality, or included in hydroponic arrangements as a nutritional additive. Of particular importance for ornamental growers is making sure that the plant looks healthy and appealing – HICURE® helps growers achieve this with greener leaves and more attractive flowers.

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<sup>5</sup> Castilla and Baeza (2013).

## Case study

### **Building a climate-smart greenhouse in The Netherlands**

Set to open in spring 2020, Syngenta's new Maasland tomato greenhouse will serve as a Research & Development facility and a demo greenhouse for fruit and vegetable growers. It is planned to cover a total area of around 14,000 m<sup>2</sup>, and it will feature a reception area where value chain partners can be invited to take part in the development process.

This investment represents a part of our goal to *Accelerate Innovation*, expanding our rate of research to gain insight on the best solutions for growers, retailers, consumers, and the environment. In addition to this, the facility itself looks to set a high standard for greenhouse sustainability, with investments into new energy infrastructure to use geothermal power for heating and electricity.

### ***Open-field cropping***

Open-field cropping is generally characterized by the growing of food, feed, fuel, or fiber products on open spaces of arable land. This represents one of the largest forms of agricultural production in the world today, occupying over 1.5 billion hectares of land globally.<sup>6</sup>

The type of plants grown, as well as the shapes and sizes of the fields themselves, can vary significantly from region to region and farm to farm. However, in any case, this farming system requires farmers to choose plants that can grow well in local environmental and geological conditions, and are conducive to farm machinery use.

### **What does Syngenta do?**

Syngenta provides a wide range of products for field growers both large and small. We are a leading developer and producer of seeds, bringing farmers more vigorous, stronger, resistant plants, including innovative hybrid varieties and biotech crops that can thrive even in challenging growing conditions. We have a particularly significant offering in corn, soybean, sunflower, cereals, and vegetables, with resulting produce that are healthy for people, good for the environment, and last longer on the shelf.

Hybridization is one of the latest and most innovative concepts to enter the seed market, offering farmers improved agronomic features and an unprecedented level of plant fitness. It works by crossbreeding plants of the same species that come from genetically diverse lineages; maximizing the genetic diversity of parent lineages forms the basis for producing *heterosis*, or hybrid vigor, in the resultant offspring – leading to higher yield.

Syngenta Seeds is leading the change in this technology. Our HYVIDO™ hybrid barley range sets a new standard in growing cereals, offering growers consistently high performing crops in all conditions – even in sub-optimal soils and difficult weather conditions. Higher water-use and nitrogen efficiency, powerful

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<sup>6</sup> Deppermann *et al.* (2019).



hybrid vigor, and longer root systems mean that HYVIDO™ grows stronger, larger, and healthier than standard inbred barley varieties.

Based on our trademarked ADEPIDYN™ fungicide active ingredient, MIRAVIS™ is the most potent solution available for difficult-to-control diseases, such as *Botrytis*, *Sclerotinia*, *Fusarium*, and more. MIRAVIS™ is outstandingly efficient and offers long-lasting and rainfast protection across a wide range of crops, including many fruit, vegetables, and cereals, allowing growers to avoid repeat spraying even after heavy rain – its high potency, likewise, means that MIRAVIS™ can offer effective protection at low usage rates. MIRAVIS™ has an exceptional safety profile and a favorable ecotoxicology profile, so much so that it is considered reduced risk by the United States Environmental Protection Agency. In cereals, it is also proven to help prevent dangerous mycotoxin contamination caused by *Fusarium* head blight, something which has become increasingly hard to control using standard triazole chemistry; as a result, farmers deliver more, and safer, feed and food.

Along with being a world leader in the crop protection and seed markets, Syngenta invests a significant amount towards digital technology, with a large range of digital farm management tools and software available to complement growers' farm systems. The ability to monitor crops remotely, as well as sustainably track farm and input expenditure or productivity, helps farmers to optimize their businesses to achieve more. Alongside Farmshots™ and [AgriEdge Excelsior®](#) in North America, Syngenta also has access to leading farm management platforms in other top agricultural markets: Brazil with Strider®, China with MAP (Modern Agricultural Platform), and Eastern Europe with [Cropio™](#).

## Case study

### Fighting weed resistance in North America

Weeds prove a yield-threatening problem for most field crops around the world, having the potential to sap soil nutrients away from growing crops and make them more vulnerable to disease. This problem is compounded as the weeds develop genetic resistance to modern weed-control techniques, further draining farm productivity and resources. For decades, Syngenta has been working with North American farmers to maintain the efficacy of the tools they depend upon to manage weeds in their field crops.

Syngenta's [Resistance Fighter®](#) program delivers localized weed control recommendations to farmers based on the problem weed species in their area. The solutions we recommend focus on reducing the overall weed seed bank in the soil through a combination of crop rotation, including cover crops; mechanical weed control, pre-season scouting, plant population management, and rotated herbicide timing with different modes of action. We complement this program with an advice on Integrated Pest Management (IPM) and the rotation of chemistries.

## **Organic agriculture**

There are many definitions for organic agriculture, though they are generally characterized by the limited use of synthetic inputs, such as chemically derived crop protection products and inorganic fertilizers. GMOs are typically excluded as well. Organic agriculture could also be described as an approach to farming rather than a farm system, as it is not mutually exclusive from the other systems described.<sup>7</sup>

Organic systems are typically self-regulated, using regional organic farming standards. The inputs used are based on convention and often exclude synthetic chemistry, while permitting 'organic, fertilizers, controls, and pesticides, such as those derived from naturally occurring minerals, or of plant or animal origin. Copper is widely used as the basis of many organic fungicide treatments, having high relative toxicity to many common pathogens; many regulatory areas allow up to an average of 6-8kg of copper to be applied per hectare each year.<sup>8</sup>

Some jurisdictions are also more flexible on the use of otherwise non-organic production methods, with exceptional production rules protected in the event that wholly organic production is interrupted or constrained – as is present in the European Union and United States.<sup>9</sup>

Often, organic certification also specifies the need for particular agronomic practices to be performed on-farm. As an example, in the European Union, growers are required to recycle organic materials and nutrients, practice multiannual crop rotation, and employ tillage systems that maintain or improve soil structure.<sup>10</sup> These practices are often recommended elsewhere to protect crops from pests and maintain adequate nutrient balance without the use of inorganic additives or solutions.

### **What does Syngenta do?**

Under normal circumstances, organic farmers have fewer options when choosing inputs to use on their crops than most conventional farmers. We are proud to offer growers a choice of both conventional and organic production methods, with a selection of products compatible with organic requirements and certified for such use, as well as our standard range of highly effective conventional technology.

Some biological products are also authorized for use by organic farmers; these are crop protection and enhancement solutions based on naturally occurring, genetically unaltered organisms or their extracts. In our range, these are classified as either biocontrols, which protect crops, or biostimulants, which improve health, growth, and productivity.

QUANTIS™ is a biostimulant that combines environmentally safe and completely biodegradable organic carbon with nutrients and amino acids produced during yeast production processes. It works by prolonging and improving plant photosynthesis, while preventing nutritional deficiencies by providing the potassium and calcium that plants need to survive. Extensive field trial research shows that QUANTIS™ reliably

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<sup>7</sup> FAO (1999).

<sup>8</sup> Lamichhane *et al.* (2018)

<sup>9</sup> Marchand (2019); OJ L 264 (2018).

<sup>10</sup> OJ L 189 (2007).

mitigates crop damage from abiotic stresses, such as heat or drought, and nurtures plants to become healthier and yield higher quality produce.

Organic production can still defer to otherwise non-organic crop inputs in instances where completely organic methods are disrupted, not possible, or become temporarily unviable. Syngenta's conventional Crop Protection and Seeds products offer organic growers sustainable and precise alternatives to remain productive throughout.

### **Case study**

#### **Investing in the future of biologicals**

Having a positive impact on organic agriculture also means investing in relevant solutions for farmers. Syngenta Ventures, our corporate venture capital group, has been investing in the research and development of innovative non-chemical pest management strategies through research partners at **AgBiome™** and **BioPhero**.

[AgBiome™](#) is a biotechnology company heavily involved in microbial research. AgBiome™ complements and empowers our own research processes, helping to identify and isolate new microbe strains for use as a biological pest control.

[BioPhero](#) is a pioneer in insect pheromone research and reproduction. Their innovative techniques allow for the production of insect sex pheromones using yeast fermentation, offering a natural and sustainable means to reduce pest pressure on crops.

### ***Plantation agriculture***

Plantation agriculture generally refers to the growing of trees or of cash crops such as cocoa or sugar and orchards for fruits, nuts. What often defines plantation agriculture is the growing of a single crop on the same piece of land for multiple consecutive harvest seasons; however, this can be inevitable depending on the type of crop, for instance, in the growing of perennial plants.

Perennial plants are able to produce successive harvests without needing to be re-sown for multiple seasons. As they can take years to become productive, it would be neither practical nor sustainable to uproot and replace them post-harvest. Common examples include banana and cocoa trees, where the plant survives each growing season to produce more fruit the following year.

### **What does Syngenta do?**

Syngenta supports plantation growers to sustainably enhance their productivity with a range of solutions for plantation and commodity products.

VIBRANCE® is the first Syngenta molecule developed specifically for the seed treatment market, where it offers broad-spectrum protection against important fungal diseases in all major crops. VIBRANCE®,

based on the active ingredient sedaxane, offers growers long-lasting early protection from diseases like *Rhizoctonia* – notoriously difficult to control for its direct and lethal impact on a plant’s roots. VIBRANCE® helps plants to develop healthier and stronger root systems, setting the foundation for a robust yield and a stable return on investment.

## Case study

### Enabling sustainable cocoa production in West Africa

As much as 70 percent of the world’s cocoa production originates from smallholder plantations in West African countries like Côte d’Ivoire and Ghana. The warm and humid environment most cocoa trees are grown in is highly conducive to a number of diseases and pests; in fact, up to 40 percent of annual cocoa production is lost to just five diseases; one of these diseases, black pod disease, accounts for over half of this loss by itself.

PERGADO® Cocoa fungicide, launched last year, offers growers a sustainable and effective solution to fungal diseases, it prevents the germination of fungal diseases, stopping them from penetrating plant tissues in the first place. PERGADO® helps to increase yield by as much as 40 percent and having the potential to add up to US\$300 to average family income.

Beyond our commercial offering, we are working on stewardship efforts to help cocoa growers in Côte d’Ivoire improve their yields and secure a more stable income; to this aim, we have partnered with Cargill for our “Yiri+” project. “Yiri” is the word for “tree” in one of the local languages, symbolizing our aim to make cocoa trees more productive for growers. The project trains farmers in disease and pest management, as well as safe product use and good storage practices.

## Regenerative agriculture

Regenerative agriculture sets out to have a positive impact on the environment while remaining conducive to long-term economic potential.<sup>11</sup> Definitions vary, though there is a general consensus that farming can be considered ‘regenerative’ when all or most of the following principles are simultaneously taken into account:<sup>12</sup>

1. Minimum or no tillage;
2. Permanent soil cover;
3. Encouraging plant biodiversity;
4. Encouraging water percolation;<sup>13</sup>
5. Integrated rotation of livestock and cropping for improved nutrient circulation.

Regenerative agriculture may be viewed, like conservation agriculture, as more of a philosophy to practice agriculture with a more beneficial impact on the environment than as a system of practices in itself. There

<sup>11</sup> FOLU (2019).

<sup>12</sup> Following the definition of regenerative agriculture from Burgess *et al.* (2019).

<sup>13</sup> Water percolation, in this context, refers to the flow of water through the soil into underground water channels.

is a huge degree of variety in farming methods around the world and the challenges that farmers face around the world are equally diverse; for agriculture to have a positive impact, as such, it is necessary to accommodate the type of challenges that need to be met where, and how. Farming systems, of any type, can therefore be regenerative, when they either have or are working towards resolving some of the issues facing food production today.

### **What does Syngenta do?**

Syngenta strives to help farmers achieve more success while delivering greater benefits to the environment; this is why we are targeting some of the issues most critical to food system sustainability and offering science-based solutions to help resolve them. Any farmer, with the right tools at their disposal, can incorporate regeneration into their farm philosophy.

Poor soil health and inadequate water percolation mean that previously productive pastures and croplands are now unable to produce food as efficiently. As the effects of climate change become more apparent on farms, the ability to restore degraded or dry land is becoming increasingly important to prevent further expansion at the expense of native forests. Farming regeneratively, by making use of productive and sustainable technology and applying climate smart agronomic practices, has the potential to bring positive effects that extend far beyond the farm.

Our patented Spiropidion insecticide active ingredient, based on the keto-enol chemical class, offers a great deal of potential for regenerative growers with its revolutionary efficacy and safety profile. With its first launch planned for 2021, Spiropidion will offer growers next generation broad-spectrum control against sucking pests, such as aphids and white flies, for a wide range of crops. Spiropidion is translaminar and fully ambimobile, meaning that it can diffuse throughout the whole plant to offer complete, long-lasting, and rainfast protection even to untreated new growths on the plant.

Extensive field trials show that Spiropidion is safe for pollinators and beneficial insects and can even be applied to flowering crops. This profile allows regenerative growers to benefit from robust yield protection while guaranteeing the safety of local biodiversity. Not only is Spiropidion more sustainable, but it also acts as an ideal complement for Integrated Pest Management (IPM) strategies – being highly compatible with beehives for natural pollination in greenhouses, as well as with many wild pest predators.

In our Seeds business, our hybrid technology is quickly setting the standard for more sustainable and more resilient crop production. The elite genetics behind ARTESIAN™ corn hybrids are focused on selecting genes that will deliver a higher yield and a superior water efficiency profile. Having been tested over an extensive trialing network in varied soil and climate conditions, ARTESIAN™ has been shown to offer growers a crop with unparalleled resilience to abiotic stress and the ability to produce stable yields in sub-optimal conditions.

Rainfall and weather variability, drought, and intense heat can cause plants to wilt and curl, potentially killing the chlorophyll that enable a plant to photosynthesize. ARTESIAN™ helps growers and rural communities manage this risk and remain productive in such conditions, with a corn plant that can maintain normal growth and development in a dry spell for much longer. ARTESIAN™ makes this possible with its

enhanced ability to allocate resources within the plant, converting water and nutrients into grain more effectively than competing hybrids.

### **Case study**

#### **Regenerating a million hectares of degraded pasture in Brazil**

We have begun a large-scale regenerative project on degraded pastureland in Brazil, known as Reverte. Forming part of our shared vision with The Nature Conservancy, Reverte applies conservation and regenerative agriculture techniques, including livestock integration and crop rotation, to restore soil vitality to over a million hectares of Brazilian pasture in the Cerrado ecoregion by 2025. With the opportunity to produce food on otherwise degraded land, this project aims to reduce pressure on local woodlands and prevent deforestation. As part of this ambition, growers first need to ensure their farm is in compliance with the Brazilian forest code before they can be accepted on to the program.

The Reverte program is the culmination of over a decade of work with The Nature Conservancy (TNC), beginning with the mapping of rural properties and training of local farmers to restore degraded areas and connect fragmented habitats.

For the first phase of Reverte, Syngenta and TNC are working to identify available financial mechanisms to aid farmers in adopting the program. As a unique part of our contribution, we are developing products and seeds designed to be productive on the drier and less fertile soils of the Cerrado.

#### ***Urban or vertical agriculture***

Urban agriculture is designed for city or near city contexts, as well as other locations where land use is restricted. Such systems tend to be employed to make otherwise unproductive spaces, such as rooftops or vacant plots, useful for food or fuel production. Farmers can likewise use the sides of buildings or indoor shelving units to grow plants upwards rather than outwards, in a manner often referred to as “vertical agriculture”. The direct implementation of these systems varies from farm to farm.

#### **What does Syngenta do?**

Syngenta provides a small range of solutions well-suited for urban agriculture by taking into account the smaller scale required when growing plants in urban environments. Our home and garden brands include [Floranova](#), a new part of our Flowers business acquired in 2018, and [Maag](#)™ in Switzerland, which makes a selection of our plant protection products available in smaller size packaging. These businesses enable professional, part-time, and hobby gardeners to make use of our innovation in the context of home gardens, urban allotments, or vertical farms.

## Case study

### Making small-scale farming consumer friendly

[Vegetalis](#) is a new addition to our Syngenta Flowers business that allows us to make a range of our high quality and easily grown herb and vegetable seeds directly available to growers. An important quality in these products is their ability to grow in high density planters or containers, maintaining high yield while being more compact than regular field. This is something we have made possible with shorter vined plants and more compact bushes – some examples, including our F1 Peticue cucumber, requiring as little as 1/3<sup>rd</sup> the space that a standard cucumber variety requires to produce similarly large and high yielding fruit.

## Conclusion

Farmers around the world are adapting to the unique cultural, economic, and geographical circumstances they find themselves in, with the development of systems and practices that provide the most value to themselves and their communities. Syngenta works to help farmers meet the challenges they face, and realize their opportunities for profitable and sustainable businesses. It is our privilege to provide solutions for all circumstances and needs, while acknowledging that personal choice and belief play a large part in contemporary food production and consumption.

Sustainable science-based solutions are crucial to making more without compromising the health of our environment and our communities. Agricultural technology must be a part of this, helping us to accommodate a growing population without exacerbating the pressure our society places on biodiversity and the climate.

We have a strong pipeline in seeds, based on advanced plant breeding and biotech innovation; our cutting-edge technologies, and the advanced crop genetics we make available through our Seeds portfolio, give growers a choice from a variety of high-performing field crops that thrive in complex environments. Based on retail location, the seeds we have available can also be designed to thrive in specific climate and soil conditions, helping farmers and commercial growers get the best results at harvest.

As a world market leader in crop protection, Syngenta Crop Protection helps farmers ensure enough safe, nutritious, affordable food for all. Farmers need to protect their crops, both from yield and quality compromising pests and diseases and from abiotic stress factors, such as drought. Our diverse toolkit provides growers with extensively tested and highly efficacious innovations that help them face their farm's challenges, including herbicides, insecticides, fungicides, and crop enhancements.

The value that our technology holds is also extended to pre-commercial smallholder farmers through our collaboration with the [Syngenta Foundation for Sustainable Agriculture](#). The Syngenta Foundation is a non-profit organization that works with resource-poor smallholder farmers in developing countries to establish economically viable professional farms; their work, as such, supports rural communities to



achieve self-sufficient food systems and incentivizes agricultural entrepreneurship.<sup>14</sup> As an example, the Syngenta Foundation's Access to Seeds workstream introduces new and more effective crop varieties for seed companies in smallholder markets, making the working capital, training, and investments necessary to enable profitability. Not only this, but this workstream also works towards introducing Syngenta's advanced seed treatment and seed products, helping to expand the technological portfolio available to smallholder farmers.

### **Making agriculture more sustainable with The Good Growth Plan**

Since 2013, Syngenta has strived to help farmers meet the challenge of sustainably feeding a fast-growing world population with [The Good Growth Plan](#). It defines six commitments in areas where improvement is essential to secure the future of agriculture and our planet's ecosystems. Each commitment sets hard, stretch targets to be achieved by 2020. We report our progress against these KPIs each year and provide additional progress information online at [www.data.syngenta.com](http://www.data.syngenta.com).

### **The way ahead**

As a global agricultural technology company, we provide leading seeds and crop protection innovations to help millions of farmers around the world to grow safe and nutritious food, while taking care of the planet. Innovation, integrity, responsibility and collaboration will always be at the core of what we do. We will continue to provide the crop protection and seeds technologies, and digital solutions, needed to safely and successfully produce food crops to all farmers.

We already invest US\$1.3 billion into Research & Development each year as we strive to improve the efficacy and safety of our portfolios, and we are hard at work to expand the contribution we make to sustainability in agriculture as we *Accelerate Innovation*, having [recently committed USD \\$2 billion](#) towards the development of solutions that have clear and provable break-through benefits to sustainability. We will also continue to invest in our projects and partnerships, so that we can continue to drive step-changes in agricultural sustainability and productivity around the world.

Collaboration is critical to achieving our goals. We invite interested stakeholders to join with us to address the interconnected environmental, societal, and economic challenges that both society and agriculture face. By living up to our purpose of bringing plant potential to life, we can change the way our food is grown for the better while making a positive difference for all systems of agriculture.

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<sup>14</sup> Winter *et al.* (2019).



## Abbreviations

- FAO – Food and Agriculture Organization of the United Nations
- FOLU – The Food and Land Use Coalition
- ICRAF – International Center for Research in Agroforestry
- IFAD – International Fund for Agricultural Development
- OJ L – Official Journal of the European Union

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## Annex

### Annex 1: Qualitative comparison of global food and agriculture systems.

<b>Farming system</b>	<b>Advantages</b>	<b>Disadvantages</b>
Agroforestry	<ul style="list-style-type: none"> <li>Beneficial to local biodiversity and soil structure – long-term ecological benefits for farmers.</li> <li>Diversified crop outputs reduce reliance on individual products and services.</li> <li>Higher productive per hectare than segregated crop or forestry systems.</li> </ul>	<ul style="list-style-type: none"> <li>Variable profitability, often associated with higher maintenance costs.<sup>15</sup></li> </ul>
Conservation agriculture	<ul style="list-style-type: none"> <li>Long-term ecological benefits for farmers.</li> <li>Lower reliance on purchased inputs.</li> </ul>	<ul style="list-style-type: none"> <li>Higher labor requirement.</li> </ul>
Greenhouse	<ul style="list-style-type: none"> <li>Can have a longer growing window than open-air systems.</li> <li>Can be more profitable than comparable open systems.<sup>16</sup></li> </ul>	<ul style="list-style-type: none"> <li>High initial capital investment.</li> <li>More expensive to scale-up than open-air systems.</li> <li>If conditioned: higher carbon footprint.</li> </ul>
Open-field cropping	<ul style="list-style-type: none"> <li>Easily scaled up.</li> <li>Field machinery allows for much more efficient use of labor.</li> </ul>	<ul style="list-style-type: none"> <li>Productivity and feasibility dependent on local environmental and geological conditions.</li> <li>Can lead to soil erosion</li> </ul>
Organic	<ul style="list-style-type: none"> <li>Generally more profitable than non-organic farming.<sup>17</sup></li> <li>Lower reliance on purchased inputs.</li> <li>Often highest biodiversity on farmed land</li> </ul>	<ul style="list-style-type: none"> <li>Higher labor requirement.</li> <li>Lower yield per hectare compared to non-organic farming.<sup>18</sup></li> <li>High land use</li> </ul>
Plantation	<ul style="list-style-type: none"> <li>High global demand for agricultural commodities.</li> <li>Variable depending on crop type – generally more productive in the short term</li> </ul>	<ul style="list-style-type: none"> <li>Perennials are invariably grown as monocultures, which can be more vulnerable to pests and diseases.<sup>19</sup></li> </ul>
Regenerative	<ul style="list-style-type: none"> <li>Beneficial to soil health and organic matter content – more carbon sequestration.</li> <li>Lower reliance on purchased inputs.</li> </ul>	<ul style="list-style-type: none"> <li>Initial requirement for investment and training for farmers without prior experience with livestock.</li> </ul>
Urban and vertical	<ul style="list-style-type: none"> <li>If conditions are controlled, can have a longer growing window than open-air systems.</li> <li>Social benefits for surrounding communities (e.g. access to food; recreation, etc.).</li> </ul>	<ul style="list-style-type: none"> <li>Generally less profitable than other forms of agriculture due to high maintenance cost.<sup>20</sup></li> <li>If conditioned: higher carbon footprint (can balance with carbon savings from shorter transport to consumers).</li> </ul>

<sup>15</sup> Sereke *et al.* (2015).

<sup>16</sup> Ozkan, Fert, and Karadeniz (2007).

<sup>17</sup> Nemes (2010).

<sup>18</sup> Ponisio *et al.* (2015).

<sup>19</sup> Brockerhoff, *et al.* (2017).

<sup>20</sup> O'Sullivan *et al.* (2019).