

Scenario 1

Navigating Storms

The EU faces weakened supply chains and water scarcity caused by extreme climate events. High energy prices hinder advanced technologies while food scarcity and land competition fuel social unrest. Regional approaches to self-sufficiency emerge, emphasising decentralised solutions and frugal digital technologies.

Overview

In this scenario, the EU finds itself in a world of continuous deprivation, weakened food supply chains, growing water scarcity, and a rapid spread of diseases. As a result, the EU adopts a self-sufficiency approach, isolating itself from the rest of the world. Trade with external partners has dwindled, and GDP is on a downward trajectory. The reduced global efforts towards climate change mitigation steer the planet to an increase in temperature of 3°C by the end of the century (compared to pre-industrial levels). This development has caused stark increases in extreme climate events, which affect the liveability of many regions.

Agriculture and rural areas

Food is considered a strategic security asset. The refocusing of the food system and supply networks to the European single market has reinvigorated agriculture in parts of Europe where abandonment was rampant. The focus is now on commodities and the availability of staple products within the EU. Exports are managed through complex quota and exchange agreements. Research and innovation focuses on adaptability to climate change and increasing yield.

The primary focus is on ensuring the production of essential food and energy resources needed to sustain Europe's citizens. Self-sufficiency drives fierce competition for land use. Agricultural practices undergo a significant shift, with the emphasis shifting towards maximising land productivity and resource efficiency. Depopulating rural areas become reoriented towards the provision of food, as farming becomes an attractive career choice.

Technology

Public policies influence the development and uptake of digital technologies that focus on productivity. Precision agriculture technologies and low-input agriculture gain prominence as farmers strive to make the most of limited land resources. The race to engineer and cultivate crops that are most suitable for the region's climatic conditions intensifies, with a strong emphasis on drought-resistant varieties and water-efficient irrigation systems.

Transformative process

As energy prices soar due to limited availability of resources and energy becomes a luxury good, the EU's self-sufficiency strategy is compromised. The scarcity of affordable energy hinders the use of advanced technologies and forces most farmers to adopt alternative low-energy and low-input production methods. Interruptions in the availability of fuel causes disruptions in food transportation across the supply chains.

Amid the energy crisis, the fight for agricultural land as a target for energy infrastructure development intensifies, leading to land grabbing in some regions and nationalisation of land as a response. This competition for land creates tension and sparks conflicts between rural and urban areas, exacerbating existing disparities and highlighting the differing priorities and needs of rural and urban communities.

The deteriorating access to food fuels social unrest and leads to conflicts. As food scarcity looms, social movements emerge, demanding equitable distribution and access to essential resources. The need for localised food systems and community-led initiatives drives food production and distribution. To address the crisis, policies promoting consumer-farmer networks gain traction, encouraging shorter supply chains and reducing dependency on external sources. With time, these measures promote a sense of resilience and self-reliance.

At the same time, local and regional approaches to agricultural self-sufficiency are emerging. The focus shifts towards innovative autonomous decentralised solutions that optimise energy usage in agricultural activities. The search for decentralised solutions extends beyond the energy sector to encompass various aspects of agriculture and rural development. While complex AI-based machinery and precision farming tools are no longer viable, open source frugal digital technologies that have low energy consumption and are suitable for local capacities play an important role in supporting local autonomy. They facilitate the sharing of knowledge, resources and best practice within the farming and rural communities.

Scenario 2

Community revival amid technological collapse

A prioritisation of economic growth triggers social inequality, environmental collapse, and a monopolised, automated food industry. Disruptions to energy and internet infrastructures cause food insecurity resulting in decentralised communities that adopt regenerative farming methods and localise energy production, leading to a more resilient food system.

Overview

With the prioritisation of economic growth and wealth generation, material standards rise for some, but social inequalities increase. Former welfare states retreat into the core tasks of providing security, because of the abundance of conflicts arising. With 4 degrees of temperature increase expected, the extreme effects of climate change become very frequent and costly. There is a collapse of natural ecosystems on land and in the sea.

Agriculture and rural areas

Thanks to efficiency through virtualisation, a service-based model, automation and high demand for synthetic alternatives to meat, the food industry is booming. Food companies compete fiercely and focus on product innovation and security of sourcing to substitute natural foods sources that are no longer viable.

Large food monopolies dominate the market, controlling what is grown and consumed. Farmers work as contracted producers, growing only what they are told by the industry. Agriculture is a domain of large automated holdings preoccupied with protecting itself from the weather – most production comes from large controlled-environment greenhouses and rural facilities for synthetic and cellular agriculture.

Rural areas have transformed into vast depopulated areas, with most land used for energy production, recreation, agriculture or industry. The biodiversity of the areas has been sacrificed for the sake of maintaining economic growth. The once-thriving rural communities have become ghost towns, as people have migrated to the cities in search of better opportunities.

Technology

Technology is also industry-driven and farmers have to buy or rent equipment and software imposed by the industry. They lack the knowledge to solve problems on their own, as agricultural knowledge and advice is monopolised.

Synthetic food, controlled-environment farming and cellular agriculture have become the norm. Crops grow in large-scale indoor facilities with little exposure to pests and diseases. Meat and animal products are produced in large centralised bioreactors. These facilities are heavily regulated, with strict guidelines on the use of pesticides and fertilisers.

The traditional concept of farming has disappeared, replaced by a highly mechanised and automated system. The use of drones and robots has become commonplace, with farmers merely monitoring the machines from afar. The industry has a tight grip on the production process, with every aspect of farming optimised for maximum profit.

Transformative process

The disruption of energy and internet connectivity infrastructure due to extreme weather events leads to frequent power outages, unstable internet connection and soaring energy prices. As the centralised energy grid becomes less reliable, the work and transportation of cellular agriculture products is heavily disrupted and food security is compromised in many parts of Europe. Deteriorating access to food leads to social unrest, which threatens stability. As food shortages and rising prices hit urban areas, protests and riots erupt in some areas of the EU. The government responds by centralising and imposing strict controls on the distribution and sale of food, exacerbating existing inequalities and leading to further social unrest.

In response to these challenges, people move back to rural areas with local communities and farmers organise themselves through town hall meetings and provide food directly to those in need, bypassing the centralised food distribution system altogether. As global connectivity is severely disrupted, most of the technological solutions are decentralised with local networks and data centres and 3D printing as the principal manufacturing method.

Farmers turn to regenerative methods and approaches adapted to local conditions. After the initial shock, a more diverse and resilient food system that is better equipped to respond to local needs gradually emerges across the EU. These efforts are supported by the newly established local autonomous micro-grid renewable energy infrastructure, which provides the necessary power to operate community-based food distribution systems. Through these initiatives, neo-rural local communities are gradually able to take control of their food and energy supply.

Scenario 3 Reclaiming digital sovereignty

Economic prosperity is hindered by governance issues, an overemphasis on climate change, and stagnation in EU agriculture due to technological constraints and heavy regulations. Satellite failure causes social unrest, prompting small farmers to form resource-sharing communities, develop their own tools, and revitalise rural areas.

Overview

The economy prospers in the Global North and large parts of the South and there is a more balanced distribution of dividends worldwide. National public bodies fight for what is nonetheless an imperfect compromise on governance, environmental and social standards in international forums, such as the WTO. The climate outlook for 2100 is 1.5°C warmer. A hasty quest for climate change mitigation left other sustainability challenges unaddressed. Too much effort was placed solely on topics such as the energy transition.

Agriculture and rural areas

Little has changed in EU agriculture and food industry due to the technological lock-ins and path dependency. Increased effects of climate change, heavy environmental regulation and pervasive “green-washing” by the increasingly consolidated food industry lead many farmers to abandon the sector and discourage new entrants. Although sustainability indicators are slowly improving, the “blame game” and issues of unfair competition with non-EU players prevent a larger consensus from emerging. A multitude of sustainability initiatives fiercely compete and strive to project their sustainability to attract consumers.

The governance system is technocratic and favours the interests of the consolidated supply chain. Diverse small-scale farm systems exist, although large corporate monoculture farms dominate, leading to a concentration of power in the hands of a few large players.

Technology

In this scenario, precision farming, carbon farming technologies, drones and sensors are widely used by corporate actors to optimise production and reduce costs. These agricultural technologies are controlled by the dominant supply chain actors, and small-scale farmers are left out of the decision-making process. Technologies help corporates maximise the efficiency of production and support their sustainability claims.

Advanced technologies are primarily used in urban areas and in agricultural production, leaving rural areas behind. As a result, people are increasingly moving to the cities, leading to a decline in rural populations. Those who remain in rural areas often commute to the cities for work, leading to a loss of community and a lack of investment in rural areas. This exacerbates the rural-urban divide.

Transformative process

Due to the loss of satellite capabilities, farms that relied heavily on complex digital tools face challenges in harvesting and monitoring their crops, and lose the ability to optimise yields and reduce inputs. The supply chain can no longer guarantee the same products, features and quality. Social upheavals increase due to rising prices and the perceived lack of progress and prospects for a better future.

Small independent farmers start to come together to exchange knowledge and share resources in the face of a harsh economic situation. They form peer-to-peer communities. These communities operate on the principle of digital sovereignty, where farmers have control over their data, tools, and technologies. Through these communities, farmers start to develop their own digital tools and technologies, based on their needs and requirements, rather than being restricted to the tools provided by the profit-driven agro-food monopolies.

The technology failure of the highly automated corporate farms increases the demand for manual agricultural labour and regenerative farming methods on smaller plots of land. Corporate farms are forced to provide better pay and working conditions to attract manual workers. The shortage of labour and stagnating economy in the urban areas encourages more people to move back to rural areas to escape poverty, leading to a certain revitalisation of rural areas.

Scenario 4

Resilient roots to withstand the shocks

Europe spearheads a regenerative alliance, fostering social equality, sustainability, and sustainable food systems through regenerative agriculture and dietary changes. Despite disruptions to technologically advanced farms due to satellite failure, the resilience of regenerative farms and support from the green tech industry ensure ongoing sustainability progress.

Overview

The world is divided into a regenerative alliance and an exploitative alliance which both try to impose their paradigm. Europe is at the forefront of a global regenerative alliance that prioritises social equality and environmental sustainability. It is on the right path to become carbon-neutral by 2050. Local ecosystems are recovering, and soil health and productivity have greatly improved. The EU exports green technologies to enable other regions to achieve similar environmental targets.

Despite greenhouse emissions reduction in some countries, the global situation is mixed, with a 2-degree increase in temperature predicted by the end of the century.

Agriculture and rural areas

Investment in regenerative agriculture, which relies on a variety of sustainable techniques, have enabled sustainable food systems to be established. Deep changes in diets, as well as a focus on self-sufficiency and health, have transformed the demand for agricultural products, with most types of intensive agriculture no longer viable. Following inflationary pressure, multi-stakeholder platforms and social innovation has brought all the participants in the food supply network together, creating feedback loops reinforcing the path to sustainability. Agri-tech start-ups play a huge role in circularity and zero waste/zero pollution solutions. There is diversity of models and structures, adapted to local circumstances. This shift also results in less livestock, as alternative protein sources gain traction, reducing the environmental footprint associated with intensive animal farming.

As rural areas gain recognition, the rural population obtains more rights and influence in decision-making processes. This empowerment helps combat rural depopulation and creates opportunities for sustainable economic growth.

Technology

Renewable energy, precision farming technologies, blockchain, AI and Internet of Things have become commonplace and enabled farmers to optimise resource use, enhance crop productivity, reduce input usage, and increase yields. Primary producers have reclaimed their power from retail, leading to shorter and local supply chains.

Transformative process

The technological disruption due to the satellite failure severely hampered the ability of technologically advanced farms to optimise irrigation, plan planting schedules and detect crop diseases or pests. It also increased the uncertainty and risk in agricultural operations, potentially leading to lower yields and reduced productivity, resulting in higher food prices. In contrast, regenerative farms were more resilient to such disruptions due to their inherent ability to adapt, the simpler farming practices used, and their increased self-reliance. Due to a high share of regenerative farms in the EU, the initial shocks to the food system were minimal and EU agriculture bounced back to normal production rates in the short term.

In the face of the crisis, the green tech industry re-oriented from technology export to supporting domestic producers affected by the technology failures. While the economic damage caused by these events diverted some resources and investment away from agriculture and rural development, the resilience of regenerative agriculture and the strong ties in rural areas made it possible to avoid social tensions and conflicts. This setback did not hinder the progress made in sustainable farming practices, renewable energy adoption, and efforts to increase social cohesion.