

The conventional production model and its consequences

Conventional agriculture and livestock are intensive production systems that use large-scale technologies to fully exploit the means of production. Pesticides, fertilisers and other agrochemicals and a high amount of fuel in intensive agriculture, or a high overcrowding of livestock in intensive livestock are elements that increase the productivity of the system. But at the same time, this model causes significant negative consequences, including the **excessive use of synthetic agrochemicals, an increase in greenhouse gases, the contamination of aquifers and the depletion of water resources, as well as numerous health and food system problems.**

■ Characteristics of conventional agriculture and livestock

The traditional agriculture and livestock that operated until the 1960s were characterised by having **very little technology and a very low use of machinery**. Their purpose was a small-scale production mainly for their **own consumption** that depended on internal resources, the recycling of organic matter and the weather associated with each season. Production was ensured by planting **more than one crop in space and time to reduce the impact of severe weather**. Nitrogen fertilisation was achieved with legume crop rotation, and crop rotations suppressed or reduced pests and diseases. Livestock often lived on the land where the crops were to use the manure as compost. Therefore, **both the performance and the optimisation of resources** to obtain better products **were low**. But, in turn, the environmental impact produced by the farms was also low.

Nowadays, **conventional agriculture and livestock are intensive production systems** characterised by the large-scale use of technologies that allow the means of production to be exploited to the maximum. **This intensive use of the different elements** favours **large farms, specialisation of production, monocultures (Figure 1) and mechanisation**. The use of pesticides, fertilisers and other agrochemicals and a high amount of fuel in intensive agriculture, as well as overcrowding of livestock in intensive livestock farming, are essential to increase the productivity of the system. The main advantage of this system is that **the productivity of companies is greatly increased** and this allows them to respond to the needs of the market by trading thousands of tonnes of food at national and international level at an affordable price. However, **this production model has also been shown to have significant negative consequences**, such as the excessive use of synthetic agrochemicals, increased greenhouse gases, contamination of aquifers and depletion of water resources, as well as multiple health and food system problems.



Figure 1. Intensive monoculture lettuce plantation. Photo: CC0, pxfuel



Figure 2. Intensive chicken farm. Photo: Larry Rana, public domain, via Wikimedia Commons.

■ Mechanisation, energy costs and incorporation of agrochemical inputs

In the conventional agricultural system, the plant feeds mainly on soluble nutrients that are provided by means of **external fertilisers**, and pest control is carried out with increasingly powerful **synthetic agrochemicals**. In this type of agriculture, the habitat conditions necessary for the growth of plants are not achieved with the formation of a soil, but by working the land with **increasingly heavy machinery**. In the same way, in intensive livestock (**Figure 2**) animal production is maximised with **increasingly processed feed** and many antibiotics to prevent any disease. In both cases, **a system dependent on the increasing consumption of external energy** (machinery, fertilisers, herbicides and insecticides) is created which, without this important input of energy, collapses and stops producing.

The current model is marked by large companies, which manufacture the machinery necessary to drive the system, synthetic fertilisers to replace the nutrients removed from the soil, the seeds that allow the production of high-yield plants and the pesticides that are used to control adventitious plants, pests and diseases. The costs of these products are the highest production costs. To maintain profitability, the farmer or rancher has a **continuous increase in external costs**, as they are dependent on large industry to produce and sell. Many small farmers cannot afford these costs and end up closing.

■ Greenhouse gas emissions

Intensive agriculture and livestock make a significant contribution to anthropogenic greenhouse gas emissions.

- **Carbon dioxide (CO₂)** is the gas that contributes the most to global warming. Two of the main causes that cause the release of CO₂ into the atmosphere are the **excessive consumption of fossil fuels** to maintain very intensive agricultural systems, and the destruction of the soil structure, which favours the mineralisation of organic matter and the release into the atmosphere of the carbon that was retained in it.

- **Methane (CH₄)** is the second most important greenhouse gas, with a heat retention power 21 times higher than that of CO₂ (Steinfeld et al. 2006). The role of livestock in methane emissions has long been well known, as 35-40% of global CH₄ emissions come from the decomposition of fertilisers and animal manure.

- **Nitrous oxide (N₂O)** is the third greenhouse gas with the greatest potential for global warming, with a reduced concentration in the atmosphere, but a heat retention capacity 296 times higher than that of CO₂ (Steinfeld et al. 2006). **More than 65% of the total N₂O of anthropogenic origin is produced through intensive livestock and agriculture.** Most of it is released during storage and application of organic manures and nitrogen fertilisers.

■ Soil and water pollution and depletion of water resources

Large-scale monoculture farms and intensive livestock farms are among the main sources of soil and water pollution. Thus, **agriculture releases large amounts of manure, fertilisers and pesticides** into water sources.

Agrochemicals pollute the environment due to their excessive application and the fact that crops use them inefficiently. Similarly, **livestock is also a major cause of water contamination** with microorganisms, parasites and antibiotics that are massively administered to livestock. This contamination of water by agricultural production causes a loss of its value for the supply and contributes to the depletion of the resource (Steinfeld et al. 2006). Today in many industrialised countries drinking untreated water is a hazard. In Catalonia, for example, 41% of the underground water bodies are contaminated, mainly by slurry.

In addition to the impoverishment of water quality, conventional agriculture and livestock are also contributing to a **depletion of water resources**. Intensive agriculture promotes water losses mainly because it destroys the structure of soils that, consequently, lose a large part of their water retention capacity because they have practically no organic matter. In addition, **conventional agriculture** uses inefficient irrigation techniques and makes poor crop selection, which also contributes to water loss. Intensive livestock farming also has a high-water consumption, which exceeds the volume of water used for human needs, mainly destined for the production of feed, by 8%. As a result, **most of the largest aquifers are at serious risk of depletion**, as water is being withdrawn at a rate that exceeds its capacity to replenish.

■ Environmental and food system problems

The intensification of food production through **conventional agriculture and livestock is mainly responsible for the current environmental crisis** that we are suffering. The main environmental problems that are increasing in recent decades are:

- The **loss of biodiversity** due to the increasing pollution and degradation of natural ecosystems due to the current production system.
- The **erosion and loss of soil fertility**, due to the intensive agricultural practices applied.
- **Pollution of waters** by toxic chemicals released to improve production from intensive agriculture and livestock.
- The **greater susceptibility of crops to pests**, linked to the adoption of extensive monocultures and the elimination of natural enemies of pests.
- The spread of **foodborne illnesses and drug-resistant bacterial infections** to humans.
- The **expansion of zoonoses**, since intensive activities facilitate pathogens being passed from wild animals to farm animals and, from these, to humans.