Can regenerative farming replace conventional farming?

Handout[1]

Principles of regenerative agriculture

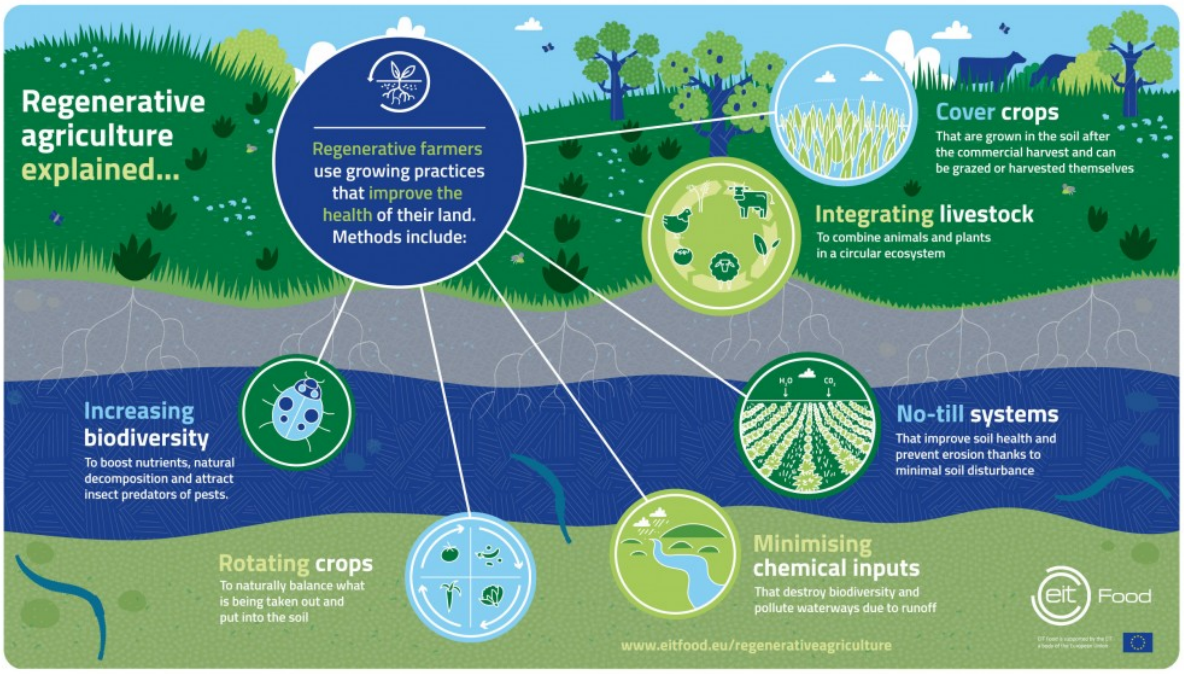
Here are the 5 principles of regenerative agriculture:

1. Minimising soil disturbance
2. Minimising the use of chemical inputs
3. Maximising biodiversity, both animals and plants
4. Keeping the soil covered with crops as long as possible
5. Adapting to the local environment

These are put into practice under a general, guiding principle of integrating all the farm's operations as far as possible. In today's conventional farming approach, crops and livestock production are typically kept separate. Regenerative agriculture combines them in circular ecosystems; essentially, the animals feed the plants, and the plants feed the animals. The regulated grazing of sheep or cows, for example, encourages plant growth, and distributes natural nutrients back over the land in the form of manure. Poultry also fertilise land, as well as eating unwelcome bugs and weeds.

Some regenerative farmers also look to build stronger links with workers and local communities, adding a social dimension to their vision.

[1] based on the article: *Can regenerative agriculture replace conventional farming?* by EIT-FOOD



Questions to discuss:

- Which elements of regenerative farming can you remember from the video *A Happy Chicken Farm*?
- How does conventional farming relate to biodiversity?
- Why should we keep the soil covered?

Does regenerative agriculture reduce yields?

In the latter half of the 20th century, global crop yields increased on an unprecedented scale. The world's average cereal yield, for example, has increased by 175% since 1961 (9). In 1950, 1 hectare of apple trees in the Netherlands yielded 6 tonnes of apples, yet by 2015 that yield was 44 tonnes (10). However, those gains have mainly been achieved using fossil-fuel-based inputs that are not sustainable in the long term (11), and via methods that can lead to soil degradation and erosion (12). Since the 1990s some crop yields have plateaued (13, 14), and while this is partly a consequence of policy changes, climate change and farming practices have also been found to be contributing factors (15, 16).

Perhaps the greatest challenge facing farming in the 21st Century is to maintain production levels to provide affordable food for the world, while making methods and inputs sustainable. Research shows that while regenerative methods, which minimise or avoid tilling and chemical inputs entirely, can reduce yields, this varies greatly depending on the crop and local conditions (17). In some cases, regenerative and organic methods can lead to similar or even greater yields (18).

"The Rodale Institute has been running side-by-side field studies for the last 30 years, comparing organic and conventional agriculture. Results show that after a 1 to 2 year transition period, when yields tend to decline, there is no difference between conventional and regenerative farming in terms of yields. In stressful conditions, particularly during droughts, the regenerative fields perform better because they are more resilient – the soil can absorb more water because it contains more biomass. And certainly farmers we work with say the yields are the same, while their input costs go down."

- Philip Fernandez, Agriculture Project Manager at EIT Food

Crucially, even where yields are lower, the price premium on regenerative and organic food can make the crops more profitable than their conventionally-grown counterparts. In 2018, US researchers showed that on farms in the Northern Plains of the USA, regenerative fields had 29% lower grain production but 78% higher profits over conventional corn production systems (19). The picture can be complex, and there are differences when it comes to input costs (20): regenerative and organic farming tend to have higher labour inputs, while conventional farming uses more pesticides and fertiliser.

The focus of regenerative farming is generally to improve the quality and performance of the soil. In 2017 the United Nations Global Land Outlook report found that a third of the planet's land was severely degraded through erosion, salinisation, compaction, acidification, and chemical pollution (21), and fertile soil was being lost at the rate of 24bn tonnes per year. This confirmed the risk alluded to two years earlier in 2015 by UN Director-General José Graziano da Silva when he warned at the time that "Further loss of productive soils would severely damage food production and food security, amplify food-price volatility, and potentially plunge millions of people into hunger and poverty." (22)

Growing crops can also remove and add nutrients, and regenerative farmers use growing practices that improve the health of their land. The more common regenerative farming methods include:

- No-till systems, which heavily reduce the digging and ploughing that can lead to loosened topsoil being blown away by wind or carried away by water
- Cover crops, which are grown in the soil when the main commercial crop has been harvested, and can be grazed by livestock or harvested themselves
- Increasing biodiversity, which increases the variety of nutrients going into the soil through roots and natural decomposition and, if well-managed, attracts insects which are the natural predators of pests
- Rotating crops, so that what is being taken out and put into soil naturally by plants is balanced
- Integrating livestock, so as to combine animals and plants in a single ecosystem
- Minimising chemical inputs, to minimise negative impact on biodiversity and pollution of waterways due to runoff when it rains.

There is now evidence that this approach can enrich soil and improve watersheds, which reduces topsoil runoff.

Questions to discuss:

- How can regenerative farming create new business opportunities? (think about the Happy Chicken Farm video)
- How is the question of food waste related to the necessity to improve yields?

The advantages of regenerative agriculture

Soil nutrients

Important to the success of regenerative agriculture will be the ability of farmers to charge a premium for their produce, as they often can for organic food.

Organic producers can use various certification schemes that confirm to consumers that the producer followed agreed rules and procedures, but other than the currently small-scale Regenerative Organic Certified scheme, there is nothing comparable for regenerative food producers. Philip Fernandez, EIT Food's Agriculture Project Manager, believes that regenerative certification might not necessarily be entirely beneficial, however.

"There are arguments for and against it," he says. "One problem is that it could potentially confuse people, as the average consumer doesn't yet know what regenerative agriculture is. Also, it would entail many rules, and until now an advantage of regenerative has been its flexibility. The case for certification is that regenerative agriculture is after all a different approach to farming - so why not recognise it appropriately?"

One alternative would be to hope that technology enables greater communication and information exchange between producers and consumers. At a simple level, the internet already allows farmers and producers to explain their principles to potential customers. Uri Rosenzweig, Head of Product at the EIT Food-supported tech startup Trellis, foresees farmers and food manufacturers sharing more data with the public online, and people taking that information into account when buying food.

"Remember that organic was a bottom-up movement, with consumers creating the demand as they found out more about food. Technology now allows us to have more traceability and visibility of how much energy is used to produce food, and how much waste has been involved, for example. I would hope the sort of consumers who pushed for organic would care about such issues."

Climate change

In the 21st century conventional agriculture incurs other indirect costs that cannot be ignored. The long-term threat of climate change to the natural environment is well established, and agriculture bears much of the responsibility for this. In its latest report on climate change, the IPCC states that 23% of the total global greenhouse gas (GHG) emissions are directly

related to “agriculture, forestry and other types of land use” (24). Conversely, regenerative agriculture seeks to increase the organic matter in soil, which makes it better able to sequester carbon from the atmosphere, meaning it has the potential to reduce climate change instead of contributing to it.

The soil scientist Dr Rattan Lal, winner of the 2020 World Food Prize (25), claims that increasing the carbon content of the world’s soil by just two per cent would entirely return greenhouse gases in the atmosphere to safe levels.

Some regenerative farmers argue that their grazing techniques can play a significant role in reducing the carbon intensity of agriculture, and while some of these claims have been credibly disputed, other scientists endorse the findings (26, 27).

Infiltration and biodiversity

Regenerative farming has other demonstrable benefits besides improving soil health and helping to fight climate change. Improving the soil not only increases fertility in a sustainable way, but also tends to improve water infiltration. Better infiltration means less runoff, and also less erosion and pollution from soil being carried away in the runoff water. In some areas, water springs that dried up several years ago have begun to flow again due to new regenerative farming approaches (28).

An increase in biodiversity also tends to make ecosystems more sustainable and resilient. Dan Kittredge, the US-based organic farmer and executive director of the Bionutrient Food Association, has observed that regenerative agriculture focuses more attention on the quality of life and growth on a farm, contrasting this with organic farming which, he says, can focus on policing inputs (29). However, some argue that disadvantages of regenerative agriculture do indeed exist.

Questions to discuss:

- How would you convince a farmer to choose regenerative methods?
- How would you explain regenerative agriculture to a child?
- What kind of ad campaigns would you run if you had to promote regenerative agriculture? (think about the Happy Chicken Farm video for inspiration)

The disadvantages of regenerative agriculture

In integrating different elements on the farm, the regenerative farmer seeks to revive the classic mixed-farm model, which is an important consideration in a post-COVID food industry. By producing a greater diversity of foodstuffs on one site, a farm can reduce external inputs and outputs, and thus reduce the risk of contamination.

However, to practice regenerative agriculture effectively, many farmers will need to acquire new knowledge and skills, particularly with regards to soil management. Managing farmers' expectations of results might be difficult, as critics have accused exponents of overstating yields and benefits. By not tilling the soil, farmers can save between 30 and 40% of hours worked, and can decrease the amount of soil erosion in certain terrains. However,in many cases, more unwelcome plants grow on the land, which some farmers compensate for by increasing their use of herbicides.

It is also possible that the extent of soil degradation is exaggerated too. The degradation of soils is difficult to measure, and there are huge variations between estimates by different bodies.

Therefore, the main disadvantages of regenerative agriculture are:

- Farmers will need to acquire new knowledge and skills
- Less tilling may lead to more unwelcome plants
- Some farmers compensate by increasing their use of herbicides
- Potentially lower yields, dependent on crop and local conditions
- The transition away from conventional methods will take time

Questions to discuss:

- If you were a politician or the Minister of Agriculture, how would you help eliminate disadvantages and support regenerative farming?
- If you had to convince a farmer to adopt regenerative methods, what would you say about the disadvantages?