Knowledge grows

Scaling up regenerative agricultural practices to achieve nature-positive outcomes

Healthy soils are the foundation of our food system, playing a crucial role in the long-term sustainability and resilience of European agriculture. Balanced and efficient management of crop nutrients is key to maintaining and enhancing soil fertility and to restoring soil biodiversity. Plant nutrients, such as nitrogen, phosphorus and potassium, which contribute to human and animal nutrition, are removed from agricultural fields when crops are harvested. Only a share of these nutrients is recycled back to agricultural fields in the form of organic material such as manure or compost. If the non-recycled portion is not replaced by mineral or organic fertilizer, agricultural soil will be depleted of plant nutrients, leading to declining yields and lower soil fertility.

> **"Regenerative agriculture is not viewed as defined a priori by a given set of rules and practices..... and does not exclude the use of, for example, modern plant and animal breeding technology, tilling, use of inorganic fertilizers or pesticides, but aims for a limited, more targeted use."**
>
> – European Academics Science Advisory Council

Maintaining soil health is an essential aspect of regenerative agriculture. Although there is no universally agreed-upon definition of regenerative agriculture, there is consensus on the principles and nature-positive outcomes it must achieve. In other words, there is increasing alignment on "what" the new paradigm must achieve (the outcomes). As every region and every farm is unique, "how" to get there (the practices) is left up to each farmer to adapt based on available tools, technologies and inputs tailored to the specific context. Yara strongly believes that farmers play a central role in the shift to regenerative farming.

According to Yara's definition, regenerative agriculture is a "systematic, outcome-based approach to adopt the best sustainable farming practices that positively affect nature and climate across five recurrent themes: climate, soil health, resource use efficiency, biodiversity, and prosperity". We believe crop nutrition management practices should be tailored to take into account the specific needs of the crop, farm and region. A holistic approach that includes precision farming digital tools and agronomic advice will drive regenerative outcomes adapted to each unique farming landscape. With our deep agronomic knowledge, combined with our mineral and organic-based fertilizers and digital technologies, we support farmers in adopting and implementing science-based practices. Furthermore, Yara promotes certain practices that stimulate carbon sequestration, such as no-till or low-tillage farming, to enhance soil health and fertility.

Regenerative practices result in numerous benefits. For example, trials conducted by Yara from 2008 to 2014 on wheat fields in Germany showed that by adopting Yara's regenerative agriculture practices, farmers could reduce the carbon footprint related to fertilizers by 35 percent, boost yields by 3.6 percent and increase their net profit per hectare by 5 percent (costs included fertilizer costs only).

OUR RECOMMENDATIONS

To further expand the adoption of these practices and help achieve climate neutrality by 2050, we call on European decision-makers to:

1. Promote an outcome-driven approach that combines digital technologies and low-carbon solutions to minimize environmental impact and optimize nutrient management.

2. Improve the collection and recycling of food waste to increase the production of organic-based fertilizers and restore more carbon to the soil.

3. Encourage the use of plant nutrition practices and agronomic advice that support soil regeneration, such as the combined use of organic and mineral fertilizers.

4. Support on-farm soil health monitoring to make it easier for farmers to assess soil quality, nutrient content, and biological aspects.

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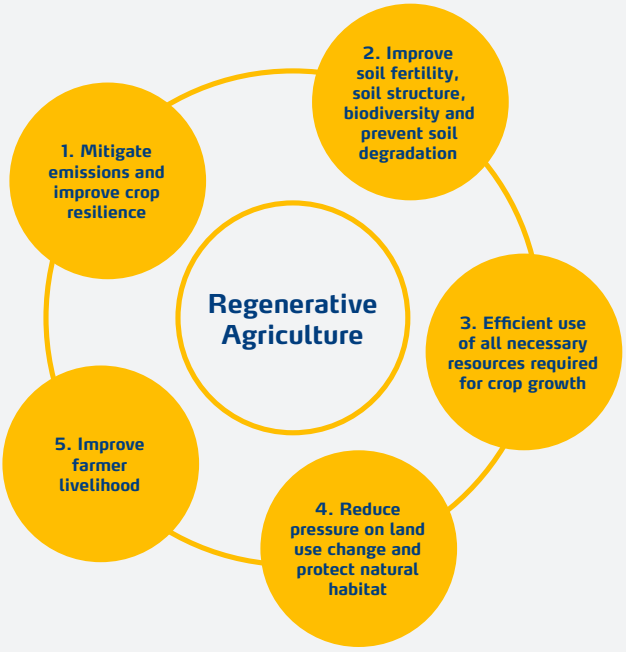
Yara's outcome-based indicators



1. To mitigate emissions and improve crop resilience

- Product carbon footprint at farm gate: CO_2eq / T of crop;
- Absolute farm GHG emissions: CO_2 eq. / ha;
- Monitor carbon stock increase/ carbon gains: Soil Organic Carbon (SOC) t / ha.

2. To improve soil fertility, soil structure, biodiversity and prevent soil degradation:

- Soil chemical composition: pH, mineral nutrients content, soil organic matter;
- Soil physical structure: compaction, water infiltration rate, soil aggregates stability;
- Time span of bare soil or soil without cover crop: days in a year;
- Percentage of fields with minimum-tillage cultivation: % of farmland;
- General soil health: Soil Health Assessment Score.

3. To promote the efficient use of all necessary resources required for crop growth:

- Yield: T of crop / ha
- Nitrogen use efficiency: N removal / N input x 100 (%)
- Water use efficiency for irrigated farm: T of crop / m^3 of water
- Land use efficiency: ha / t of crop; extra T of crop / ha vs. baseline
- Share of recycled nutrients in use: % recycled nutrients in total nutrients used on farm

4. To reduce pressure on land use change and to protect natural habitat:

- Number of crop species in the production system: no. / ha / rotation;
- Land use efficiency: ha / t of crop; extra T of crop / ha vs. baseline.

5. To improve farmer livelihood:

- Farmer (smallholder) productivity and profit per ha or per field: return on investment.

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