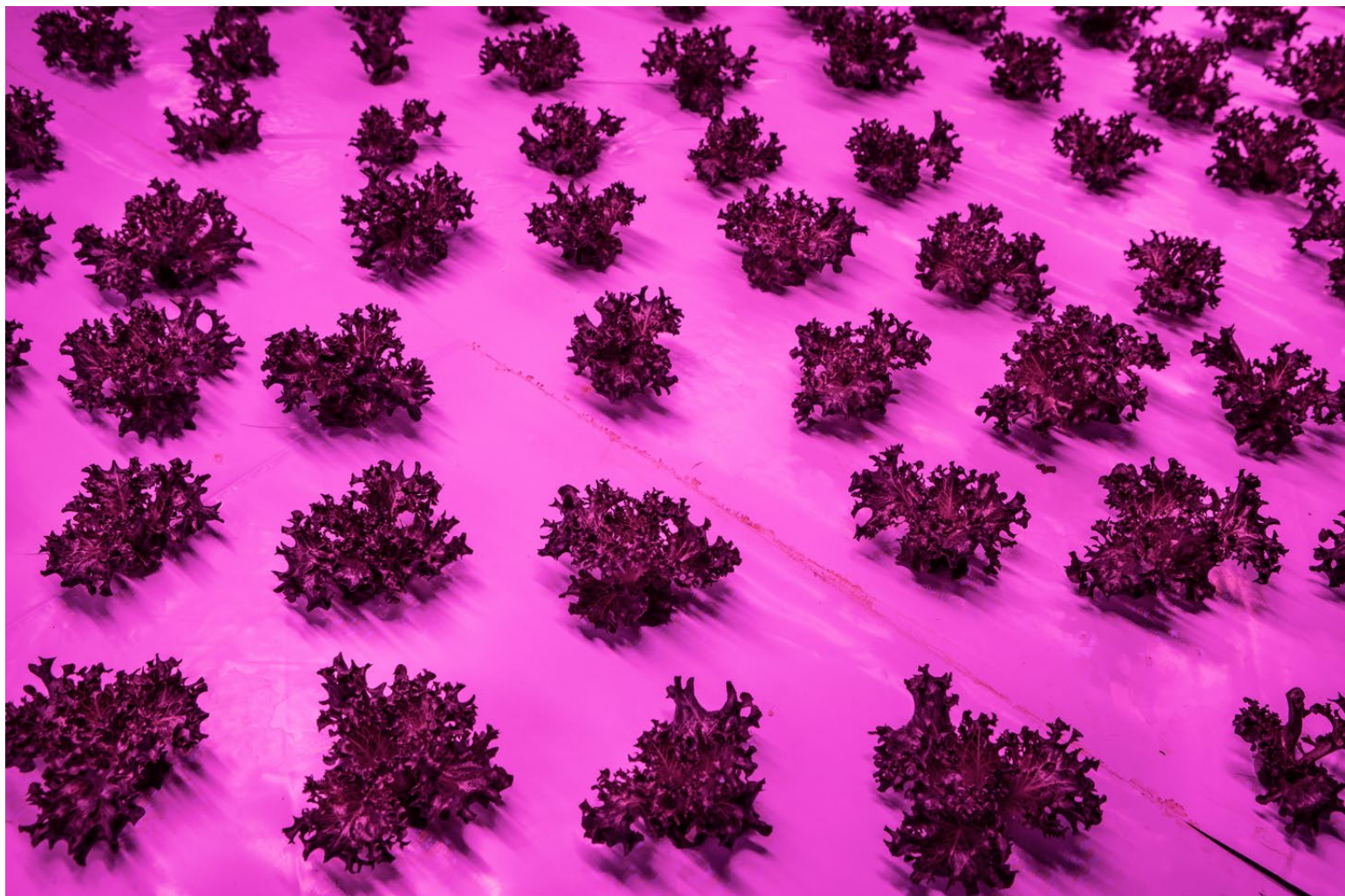




ITALY

Soilless

by Vittoria Lorenzetti





Nemo's Garden, Noli (Liguria). Underwater are highly favourable conditions for agriculture: constant temperatures, high humidity levels and an absence of insects and parasites (thereby avoiding the need to use pesticides). Farming takes place in biospheres, semi-circular PVC structures that are filled with compressed air and anchored to the seabed. Thanks to the temperature differences between the air inside the biosphere and seawater around the structure, the water within the biosphere evaporates and condenses on its interior surfaces.



FARMING WITHOUT FARMLAND

Is there an alternative to farmland? Is it possible to produce healthy and sustainable food without using land? The recent development of hydroponic techniques, under-sea gardens or simply the reuse of coffee grounds as a substitute for fertile soil seem to indicate that the answer is yes – it is possible to farm without farmland.

Green alternatives are emerging amid the progress of precision agriculture, where advanced control systems enable the meticulous management of crops' phytosanitary conditions. New techniques are improving the qualitative characteristics of production and reducing environmental impact to a minimum and simultaneously mitigating the effects of climate change and the dramatic reduction of agricultural land. In Italy, in fact, 28% of farmland is no longer cultivable (due to the massive use of pesticides, droughts and extreme weather events), a percentage that is increasing each day and causing annual losses of around 7 billion euros. On behalf of the future generations it is important to take action early, immediately adopting innovative models that can easily be replicated and implemented even on disused land.



Sofia Micheli, owner of the company Le Fragole di Sofia (Crespino, Rovigo), picks the fruit.



Pordenone. Andrea Alessio and Daniele Modesto, the founders and, respectively, COO and CEO of Zero Farms, in the production greenhouses.



Biologist Francesco Dose works with mint cuttings from the experimental aeroponic system at Zero Farms (Pordenone). In particular, he is studying the influence of the air speed on the leaves of the plants.



Edo Radici Felici, Quarrata (Pistoia). An above-ground facility for growing vegetable species using aeroponic technology.



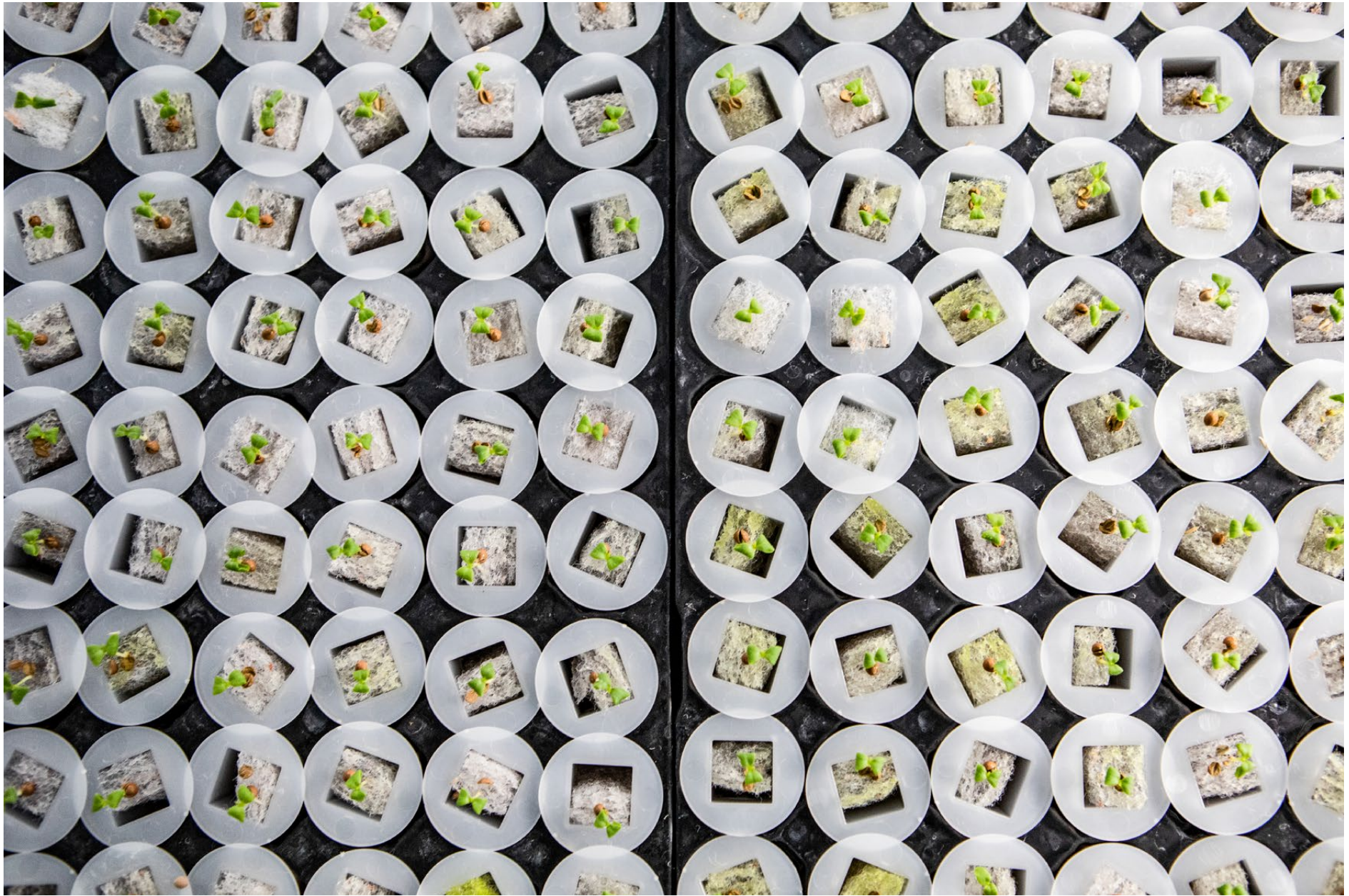
Circular Farm Funghi Espresso, Scandicci (Florence). Mushrooms grown on used coffee grounds: *Pleurotus Cornucopiae* (left) and *Pleurotus Ostreatus*.



Agronomist Davide Calzolari conducts the daily check on the ferti-irrigation system at Zero Farms in Pordenone. Through this system nutrients are nebulized onto the roots of the plant inside the production facility.



Edo Radici Felici, Quarrata (Pistoia). A section of the structure of the floating system. The plants have a life cycle of 18 days. The roots hang in the air and are fed by an irrigation system with nozzles that spray nutrient substances onto the plant.



Edo Radici Felici, Quarrata (Pistoia). Crispy lettuce seeds. The seeds are positioned on a support made from recycled plastic. This support, once wet, does not retain mineral salts, which instead go directly to the roots of the plants.

Orti Ipogei in subterranean Naples. A tourist observes the plants growing 35 metres below ground. Many different types of plants are grown here, including basil. Visits to Orti Ipogei are open to the public and over the years the site's educational activities have attracted the interest of botanists and university researchers.





The Circle Food, Rome. A modular, vertical aquaponic system developed with Nutrient Film Technique (NFT) technology. The system enables the cultivation of baby leaves and aromatic herbs. The system is built in such a way as to let the water flow downwards from above, thereby releasing nutrients from the plants before being purified in the containers where it begins. The aquaponic system involves the symbiotic relationship between aquaculture and vertical cultivation systems.



A View of The Circle's greenhouses with their vertical aquaponic systems immersed in the countryside, near Rome.



Anna Mastellaro and Anita Bonotto, agronomists in the Zero M facility at Zero Farms in Pordenone, check batches of basil, chives, mizuna and other varieties. All the plants are grown in aeroponic facilities without the use of soil and/or substrates.



Agronomist Anita Bonotto analyses the data that the Zero OS software records constantly from the production facility at Zero Farms in Pordenone.



Testing the growth of basil plants in the R&D lab at Zero Farms (Pordenone). The basil is grown on patented supports that do not use soil and/or other substrates. The technology is aeroponic: the bare roots hang in mid air. The photo also shows the LED strips that reproduce sunlight and simulate the cycle of day and night that is essential for healthy growth.



Circular Farm Funghi Espresso, Scandicci (Florence). A container for the fructification of mushrooms on coffee grounds. Lorenzo opens the bags that have completed their 25-30 day dark incubation period. Opening the bags allows oxygen to enter and means moving on to the fructification phase, i.e. the growth of the mushroom (3 sets of produce in around 40 days).



The Circle Food, Rome. A substrate of coconut fibre, clay and perlite, in which aromatic herbs are grown. The roots need to move and space in which to grow.



Mario Sforzini, an employee of Zero Farms in Pordenone, checks the effects of air distribution on the cultivations. The growing environments are isolated from the outside world through a double shell and can only be accessed following a stringent procedure and wearing special clothing.



The Circle Food, Rome. Containers with expanded clay where red mizuna seeds germinate.

A view of the underwater farm Nemo's Garden, situated at around 6-10 metres underwater in front of the beach in Noli (Liguria).





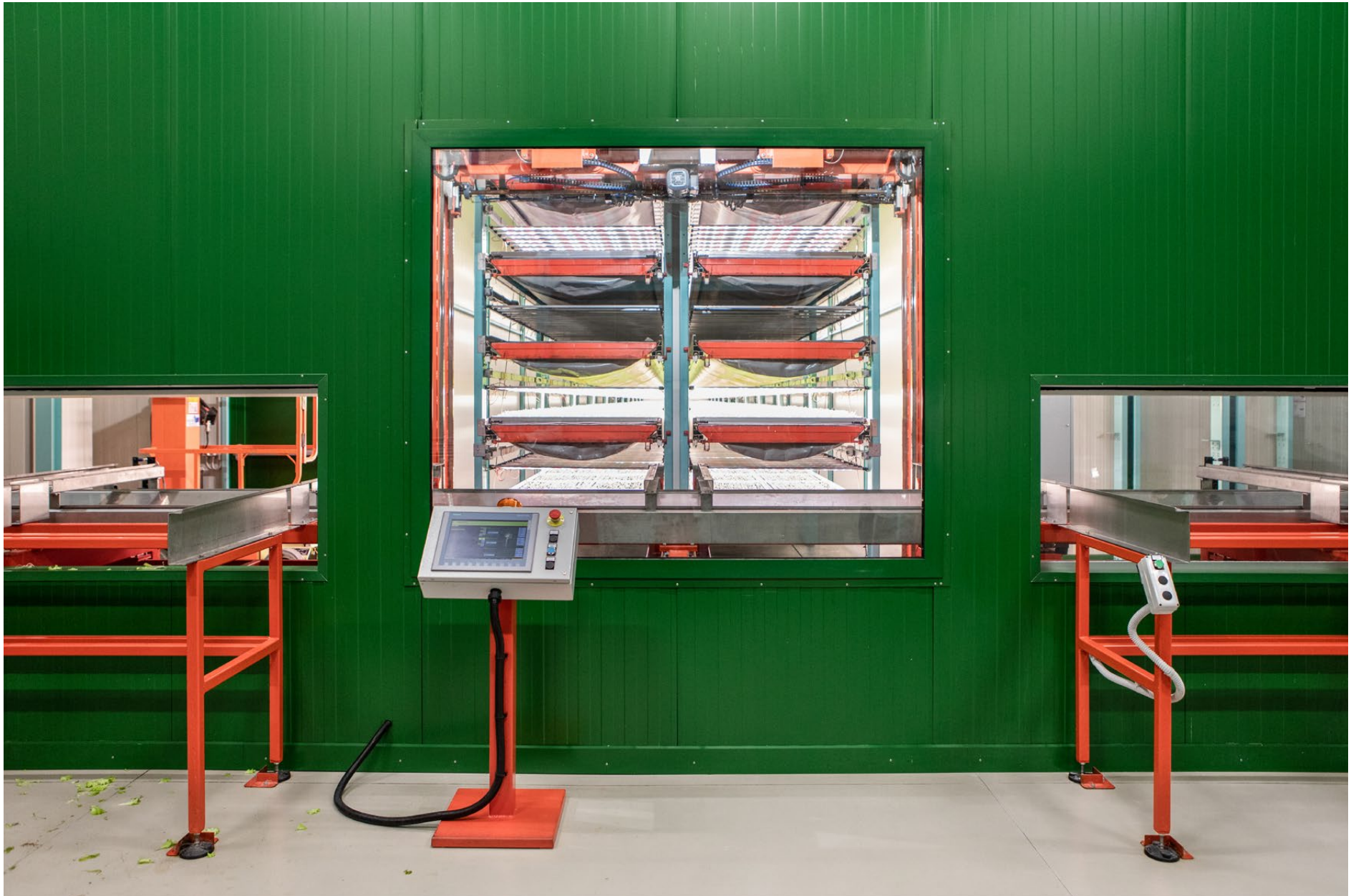
Antonio Di Giovanni, owner of Circular Farm Funghi Espresso, cleans the coffee grounds before using them as a substrate for growing mushrooms.



Edo Radici Felici, Quarrata (Pistoia). The roots of the lettuce retain the nutrient drops. In aeroponic agriculture the roots hang in the air. The nutrients are sprayed onto the roots of the plant that retain the drops.



Edo Radici Felici, Quarrata (Pistoia). Leonardo Lenzi, partner and head of research and development, checks the lettuces before they are harvested and sent to the Coldiretti market.



Zero Farms (Pordenone). The view, during harvesting, of the automated tower named Zero L. This is the technical room where the system is loaded with seeds (window on right) and from where the salad is extracted and harvested at the end of the cycle (window on left).

Francesco Dose, biologist at Zero Farms in Pordenone, holds samples of mint that have just been harvested in the aeroponic R&D lab.



