Impacts: Net Zero and Equity—the special case of agriculture

In a separate Brief, we've outlined the particular challenges associated with residual emissions, and commented on questions of which emissions are 'hard to abate'. We argued that elite arguments of technical complexity, and purported economic hardship for key sectors, get the lion's share of attention in defining 'hardest to abate'. This in turn sets the stage for what scientifically is an unacceptably high level of residual emissions that would have to be removed or 'netted out', with the 'hard to abate' debate thus becoming a proxy permission for continued emissions. That Brief also referenced the difference between 'survival' and 'luxury' emissions. We address those challenges more deeply here.

Food production, food security, and 'hard to abate' emissions

A very large proportion of food production emissions are actually not that hard to abate. A huge literature exists of opportunities for emission reductions through increased equity in landholding patterns; agroecological transitions; de-commodification and re-localization of food production; reducing animal agriculture production volumes as a result of lowered per-animal emissions; and dietary shifts. Clearly, much more could be done to bring agriculture-sector emissions down as close as possible to 'real zero' and that is the

necessary direction of travel in agriculture. [See CLARA's Missing Pathways, Section 3, at pp. 25-35].

Since a dramatic reduction in the agricultural sector's emissions is needed, correlated with a shift to agroecological approaches, it's first worth asking to what extent spending priorities in agricultural research and development reflect that need. Unfortunately, as recently shown for Africa by CLARA member Biovision and IPES, most R&D spending is for refining agroindustrial approaches, rather than in reducing reliance on synthetic nitrogen fertilizers and improving adaptive capacities at the farmstead level.

And while there's little dispute that historically the availability of cheap nitrogen fertilizers has been a boon for yields—the so-called 'Green Revolution'—this has been achieved at a very high cost for people and planet. Some of the most damaging greenhouse gases—with global warming potentials far exceeding that of carbon dioxide—result from the production and use of synthetic nitrogen fertilizers. Further, the startling productivity gains associated with earlier applications of synthetic fertilizers have now vanished, replaced by diminishing returns and greatly increased environmental damage, in particular degradation of soils. Similarly, the expanded use of herbicides associated with 'no-till'—one of the agroindustrial approaches embedded in the now-discredited idea of 'climate smart agriculture'—has allowed for the evolution of 'superweeds' that similarly indicate the need for a paradigm shift. Ending dependence on such inputs will be required to abate a significant fraction of the 23% of current anthropogenic emissions that still come from agriculture.

Synthetic Nitrogen Fertilizers and Net Zero

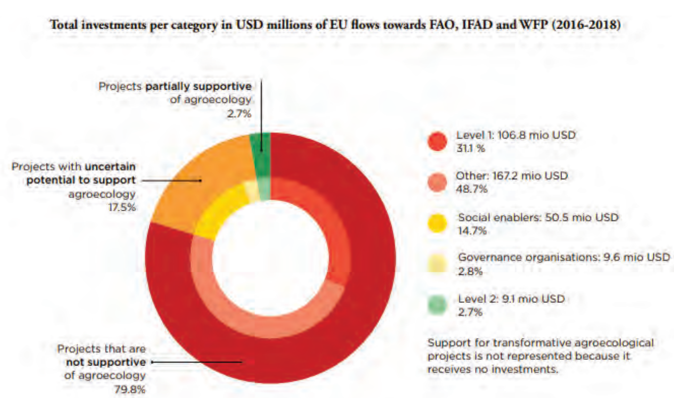
Will emissions from synthetic nitrogen fertilizers be a significant part of the volume of residual emissions in [say] 2030? Probably. At the farm level, pursuing agroecological transitions, there are cost-effective substitutes for fertilizer—such as rebuilding soil health through intensive cover crop use and rotational grazing of livestock.

But the sheer volume of emissions associated with food production in the 21st century indicates that there will be residual emissions in agriculture, even if per-hectare emissions are decreased, until an agroecological transition is completed.

So—'easy to abate' at a farm-practices level, and also through some technological substitutions. But the overall agroecological transition itself will take time, and every 0.1°C rise in global temperature will make it more difficult. Difficult not just in relation to impacts on yields and the resilience of necessary support systems, but also because sequestration capacity in nature diminishes with temperature rise. And this says nothing about the necessary revamp of the actual food systems within which production and consumption takes place, which implicates other sectors.

Residual emissions associated with food production and global food security are more critical for survival than are, for example, air travel or other luxury emissions. We will likely need to use some 'atmospheric space' to maintain on-farm yields, including from a greater diversity of crops, while pursuing landscape level changes that increase resilience. We'll need to safeguard food security while making the break away from high-GHG-input agricultural approaches. None of this will be easy, but, in the words of the great American poet Wendell Berry, 'its hardship is its possibility'.

In the final analysis, we need to turn the 'hard to abate' question around, and ask: what helps to guarantee food security? What can be achieved in terms of equitable, sustainable development associated with a particular volume of residual emissions? Otherwise, 'sustainable development' becomes merely an attribute within overall setting approaches to net zero.



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accepting geoengineering means an unwillingness to looks more critically at other assumptions about things we can still change—such as the pace of energy-sector decarbonization, restoration of natural ecosystems. The biggest change must be in lifestyle –ending devotion to the assumption of endless economic growth. That's what's creating so many of the excess, consumption-based emissions that now need to be ‚removed'!

Corporates know best?

Recent investment moves in geoengineering by both Big Tech, and oil and gas companies, is accompanied by new rhetoric about how these corporations are in the best position to solve the 'mitigation ambition gap' through new technologies. Oil and gas firms are amongst the biggest proponents of geoengineering, and they are currently making investments in CO_2 pipelines for CCS.

But all of these tech-nologies require vast amounts of resources: energy, land, water, biomass, and minerals. To be relevant at all in the context of ‚net zero' removals, the technologies must be large scale. The development of Carbon Dioxide Removal technologies therefore implies the establishment of new transnational extractive industries, create new emissions along the entire industrial chain. Also like is that infrastructure associated with carbon removal will simply reproduce, or deepen, unjust patterns of extraction and exploitation of land and resources in the Global South. Large-scale CDR can have devastating impacts on local communities and natural ecosystems, such as land grabs, human rights violations, and sharp increases in food prices. The prospect of a big expansion of BECCS—bioenergy with carbon capture and storage, a geoengineering approach favored by climate models—would lead to largescale destruction of biodiversity and natural ecosystems and their replacement with monoculture biomass as feedstock for energy production.

Conclusion

From the plethora of „net zero" plans and pledges that are currently being submitted or promoted by governments and corporate actors, it is evident that „net zero" does not actually mean zero emissions (real zero). Instead, virtually all net zero pledges rely on some form of carbon dioxide removal. Such ‚removals' may be achieved in nature, or through the use of large-scale Carbon Dioxide Removal technologies. A few of these technologies may still be ‚unproven'. But the more common experience here is that geoengineering experiments have been very difficult to scale, for reasons of high cost, logistical complexity, and/or an inability to quantify or ensure the permanence of ‚removals'. Our greatest concern is that were some of these barriers to be overcome, this would merely reveal the unacceptably high social and enviornmental impacts associated with pursuing these technological solutions.

APPENDIX

Carbon Dioxide Removal (CDR) technologies

Some of the Carbon Dioxide Removal (CDR) geoengineering technologies that are most frequently discussed are Bioenergy with Carbon Capture & Storage (BECCS), Direct Air Capture (DAC) coupled with Carbon Capture and Storage (CCS) or Carbon Capture Use and Storage (CCUS) technologies, Enhanced Weathering (EW) and Ocean Fertilization (OF).

BECCS is based on cultivating biomass (fast-growing trees or energy crops), harvesting and burning it for energy production, capturing the arising CO_2 and storing it underground in suitable geological formations, such as saline aquifers or depleted oil wells (CCS).

Direct Air Capture (DAC) proposes to use chemical processes to scrub CO_2 from ambient air—a hugely energy- and cost-intensive process. Like BECCS, DAC requires another component that buries the captured CO_2—like CCS or Carbon Capture Use & Storage (CCUS), which essentially means turning the captured CO_2 into some sort of product. Lifetimes of such products vary significantly, and some of the more frequent destinies of such CO_2 are fuel or plastic, in which case the CO_2 is returned to the atmosphere after a very short period of time.

In the context of marine geoengineering, Ocean Fertilization is one of the most frequently discussed technologies: It involves dumping large quantities of iron or other nutrients to enhance the growth of phytoplankton in marine areas with lower primary productivity. The additional plankton would

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