

Urban Agriculture: Humanity's last chance to secure its habitats and safe cooler climate.

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Good morning. Greetings from Australia, and from our global Regenerate Earth mission.

Our Reality

As we are aware there are now 8 billion of us on this finite planet. 10 billion are projected by 2050.

They all need to eat daily. Only 7 missed meals may separate social stability and chaos.

Over half now live in urban concentrations: up to 80% may do so by 2050.

It follows that securing their safe air, water, food, shelter, habitats and social stability will be critical.

Our threats

However securing these essential needs and outcomes will be challenging partly due to our:

- Changing climate, not just its warming but accelerating dangerous hydrological extremes.
- Degradation of the soils, waterways and bio-systems we depend on for our survival.
- Increased dependence, vulnerability and exposure to such resource shortages and stress.

More threatening than these physical stresses is our impotence to resolve such long known realities. The inertia in our protected status quo that impedes innovation, solutions and change.

Our imperative

We must and can overcome these threats and impediments, but to do so need to focus urgently on:

- Regenerating the resilience and supply capacity of the natural ecologies we depend on.
- Empowering our agency at grass roots, community levels to regenerate them, urgently, now.

As we are responsible for the crises we face and their consequences; we also must be response able.

The natural solution

Rather than continue our impotence, we need solutions and have them in nature if we are prepared to ask and understand how she created the bio-systems and climate we evolved in and depend on.

How she 420 million years ago used microbes, particularly fungi, to colonise and solubilise rocks on land to create soils able to retain water and from that enable the rapid evolution and extension of the terrestrial bio-systems, hydrology and climate we, and our economies, still totally depend on.

How these same pedogenesis processes to **regenerate the Earth's soil carbon sponge** are now our only basis of agency to restore and secure the bio-systems the projected 10 billion will have to rely on to sustain and buffer their safe climate, essential food and resources and stable future.

Understanding key drivers of our problem.

Just as we need to understand how nature created the habitats we rely on, we need to understand what we have done to them and their consequences, specifically to Earth's hydrology and climate.

How our oxidation of these bio-systems by fire, clearing and ever more intensive industrial farming has reversed pedogenesis resulting in the degradation and desertification of soils, their inability to sustain our essential water, food and bio-resource needs degrade and the rise in its CO₂ symptom.

How instead of regenerating the Earth's soil carbon sponge we have and are degrading it and with that the resilience, productivity and life supporting capacity of the bio-systems we depend on.

Harnessing the CO₂ symptom as a resource and basis of agency, for the solution.

As nature did 420 million years ago we too can harness CO₂ from the air and use it to regenerate the Earth's soil carbon sponge to restore the hydrology and productivity of our degraded soils by simply:

- A. Maximizing plant growth and photosynthesis everywhere to convert CO₂ into plant biomass.
- B. Minimizing how much of this fixed carbon is oxidised back to CO₂ by burning or microbes.
- C. Maximizing the bio-sequestration of this biomass carbon into stable soil carbon compounds.

Innovative farmers globally are doing this via natural, less oxidative, farming processes to sequester up to 10 tonnes Carbon per hectare annually back into soils to rebuild their soil carbon sponges.

Extended globally such soil and land regeneration and viable oxidation and emission reductions could rapidly draw down an additional 20 billion tonnes of carbon annually. This can offset twice our fossil fuel emissions. It enables us to achieve 10 btC/an negative net emissions globally by 2030.

Natures force multiplier

While such practical profitable actions can draw down carbon to rapidly regenerate our soil carbon sponges, as in nature their real significance is in restoring the Earth's terrestrial hydrology. It is these natural hydrological processes and their 'force multipliers' that are fundamental as they govern:

- All life on this planet, its productivity, extent, eco-system services functions and survival.
- Some 95% of the heat dynamics and thus climate and stability of the blue planet.
- Our capacity to naturally regenerate bio-systems and safely cool climates in time.

Life, its health, regeneration and survival and the climate is regulated by key hydrological processes. The Earth's soil carbon sponge and the CO₂ used to create it is critical in making that water available.

The natural hydrological cooling of climates.

The Earth's climate, including much of its greenhouse effect, has been regulated by a balance of dynamic hydrological processes that naturally warm, cool and buffer local and global conditions.

We greatly influence local conditions by altering the balance of these processes and effects, via:

- Altering the transpiration of water by plants and its significant surface cooling effect.

- The production of haze micro-nuclei that form persistent warming humid hazes.
- The production of hygroscopic precipitation nuclei that coalesce these hazes into cloud droplets that can reflect substantial solar radiation back into space cooling local areas.
- The coalescence of these cloud droplets into raindrops and their removal from the air.
- The opening of night time radiation windows via this to enable heat to escape into space.

The dynamics of these hydrological cycles, rainfall and its retention by soils also influences:

- The area and longevity of green plant cover, growth and cooling transpiration.
- The exposure, level of solar heat absorption and temperature of these soils.
- The level of heat re-radiation from these soils that drives the greenhouse effect.
- The level of water vapour in the air as the dominant (80%) greenhouse gas.
- The formation of high pressure heat domes by this re-radiated heat and its effect in blocking the inflow of cool moist low pressure air and thereby drought or monsoonal conditions.

We have substantial agency over these processes and effects via our land and plant management. We can use them as now our only practical means to safely cool regions and the climate in time.

Our limitations in doing so

While the substantiated science confirming these processes and how they govern the Earth's climate has been known for decades, our narrow focus and assumptions on the CO₂ greenhouse effect has masked the reality that we are already being impacted by dangerous hydrological climate extremes.

We may have less than a decade to avoid the collapse of key bio-systems due to these impacts. Urgent local grass roots regeneration and buffering action everywhere is needed to do this in time. Our imperative is to empower local community recognition and response abilities for such actions.

The role of urban agriculture

Given that most people live in urban areas which are often highly vulnerable to such extremes and given the lack of effective capabilities or action at higher levels, can communities and individuals buffer and avoid such impacts via strategic urban agriculture and regeneration action; such as?

1. The **regeneration of urban soils, hydrology and forests** to provide shelter, buffer and cool local climates by up to 10oC on hot days via their natural transpiration effects.
2. The **production of local nutritious food** in urban gardens to partly meet community needs and be less dependent on industrial farming and supply chains at risk of extremes.
3. The **safe local treatment of wastes and recycling** of essential nutrients to void pandemic disease risks, create sustainable bio-cycles and be less reliant on vulnerable supply chains.
4. **Reinforcing the preventative health of communities** via the provision of local grown fresh foods with higher nutritional integrity and minimization of disease agents and risks.
5. **Empowering local skills, engagement and equity** as well as social multiplier values via local food growing, service and distribution eco-business generation and strategic autonomy.

Most importantly can urban agriculture give otherwise captive consumers agency and autonomy that they don't currently have in addressing the imperatives they face and securing their safe future?

Can they give particularly youth with limited economic opportunities in stressed economies options to independently develop skills, income, eco-enterprises and networks for their self realisation and as catalysts for essential strategic and structural change on behalf of their disempowered society?

Catalysing action for our last chance.

While the above may define the urgent imperatives before humanity, their natural safe solution, response options and the potential of urban agriculture to empower local action to help address these imperatives; reality dictates that we are running out of time; that we need to just do it, now.

To help catalyse such direct practical action and outcomes Regenerate Earth has designed and would like to make available 'wicking bags' to everyone globally to aid their urban agriculture outcomes.

As illustrated, wicking bags are simple, cheap innovations made from locally recycled waste plastic to massively aid the opportunities for, efficiency of and production from urban agriculture by:

1. Providing everyone, especially children, mothers and poor people without access to land their own 'sovereign soil' that they can generate from degraded subsoils and cycled wastes.
2. Enabling the soil to be relocated via their bags with their owners in flexible arrangements to create viable food and shelter gardens close to their owners in even small or dense sites.
3. Separating the soil in the wicking bag from underlying soils that may be toxic or colonised by tree roots that can out-compete access to the water and nutrients added to garden beds.
4. Increasing the water use efficiency of urban agriculture up to 10 fold by limiting water loss by leaching, evaporation or external competition and allowing the safe reuse of grey-water.
5. Limiting surface weed seed germination and growth by surface mulching and removing the need for surface watering as the deep rooted food plants source their water from below.
6. Inserting worm tubes into each wicking bag to enable the direct in situ pest free composting of organic kitchen wastes with the worm casts and tunnels directly aiding soil bio-fertilities.
7. Enabling pre germinated seedlings of food plants to be continuously inter-planted into the mixed crops in each bags and harvested when ready so as to maximize soil productivities.
8. Allowing simple canopies to be erected over each bag to exclude pests, avoid the need for toxic bio-cides or moderate or extend growing conditions to aid plant growth.
9. Enabling tree seedlings to be raised initially with food plants in the bags that once grown to adequate size can be relocated to establish urban shelterwoods or food orchard plantings.
10. Enabling gardeners and children to flexibly expand or reduce their number of bags and production as desired without impacting the productivity of their remaining bags.

While simple, cheap and highly flexible so as to be of service in diverse sites, the use of such wicking bags has the potential to fundamentally enhance the efficiency, ease, equity and value of most urban and village farming and food production systems. Given that some 80% of the food eaten by humanity already comes from such gardens often via the hard work of poor women, making this much easier, more secure and productive can contribute greatly to securing our future food needs.

Despite some saying we don't have a chance; lets take it and demonstrate that urban agriculture and its innovation, soil regeneration and social empowerment can still address our challenges, in time.