Candidate submission for V0 draft of the HLPE 3rd Note on
Critical, Emerging and Enduring Issues

Topic- The role of agriculture in concurrently delivering ecosystem services and food and nutrition security

Rationale

More than a decade ago, cultivated ecosystems covered ¼ of the terrestrial surface of the earth; six times more water was held in reservoirs than flows in natural river channels; and more than half of the services that ecosystems provide to the world were degraded (Walker and Salt 2006). Today food and agricultural systems are at an inflection point as the rate of productivity gains are slowing and unlikely to meet anticipated growing global population demands for food by the year 2050 (Jones et al. 2021). And although productivity per unit of land area has increased greatly over the past 100 years, there are absolute limits to the amount of fresh water and arable land available (Tittonell 2014; Pretty 2021; Engler 2021). ***Increases in production must be accomplished with fewer resources and under conditions of declining biodiversity and increasing risks to ecosystem health. This means we must better understand coupled human-natural system relationships and find ways to concurrently be productive and effectively protect and renew our natural resources*** as we adapt to unexpected events like COVID disruptions to supply chains, limits to resources and changing market and climate conditions (Morton & Shea 2022). Farmers know there are difficult challenges ahead, are eager to learn more about how to leverage whole system relationships and already are experimenting and embracing new strategies and technologies to improve the sustainability of food systems deliver solutions to Sustainable Development Goals (UN 2021; SfL 2021).

Many food systems stakeholders are calling for bigger thinking and the transformation of current linear systems of agriculture and food into circular systems that better reflect the complex interactions among human and natural systems and their behaviors under stress conditions. Circular systems mimic nutrient and energy flows in closed loop cycles of growth, decay and reuse found in natural systems where one organism's waste is another organism's food. Linear systems of pre-production, production, post-harvest and consumption use land, water, energy, nutrients, labor, and capital as external inputs and discard waste at almost every stage in the process (Jones et al. 2021). It is costly to build landfills and store waste materials indefinitely. More importantly these discards result in the loss of valuable resources-nitrogen, carbon, water, waste byproducts and other raw materials that in circular systems could be managed and reintroduced into productive use and extend the capacity of our resource base to meet expanding agriculture and food needs.

Circular economy systems models and technologies offer alternative transitional paths within food and agriculture value chains to 1) design out waste and pollution (recover discarded wastes for productive uses); 2) continually reuse products and materials; 3) protect and renew natural systems; and 4) provide for economic benefits (Morton & Shea 2022). Minimizing input resources, transforming subsystem processes, leveraging interconnections among associated subsystems, capturing resources for reuse or other system inputs from recovered discarded materials, and harnessing breakthrough advances in biology and digital technologies can increase the circularity of existing systems. Our best hope for finding solutions and managing the changes we are encountering now and in the future is to better understand how complex systems work on many levels (Meadows 2008) and develop innovative collaboration strategies that reinforce structures and behaviors that enable us to achieve shared goals like the United Nation Sustainable Development Goals (UN SDGs) for 2030.

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These goals – an end to hunger, a restoration of water resources, enhancement of biodiversity, ensure livelihoods and a curbing of climate change, among others – conjure a bold vision that is possible only through an ambitious framework that brings humankind together to build a better world, with systematic international cooperation and strategic design to bring human systems into alignment and harmony with natural systems (SfL 2021). Towards this end, agriculture has a unique opportunity to advance a new vision for how sustainably managed farms, ranches and woodlands can deliver near-term and scalable ecosystem service solutions to the "mega challenges" of our times**.**

Key questions that could be addressed in this report?

What enabling polices, programs, partnerships, markets, finance mechanisms are needed to improve the sustainability of food systems and simultaneously scale up the delivery, at a landscape scale, of ecosystems services from agricultural operations?

What are the barriers to the adoption of circular economic systems in the ag sector?

What examples of innovation can be cited to demonstrate the value and importance of ag ecosystem services?

How can producers be rewarded not just for producing commodities, but for the water they filter and store, the carbon they sequester, the biodiversity and wildlife habitat they enhance, the economic growth and local wealth they generate and the improved of life they produce?

How can research processes be prioritized and streamlined to integrate agriculture and forestry with conservation goals and ecosystem services?

How can we expand and accelerate farmer-to farmer experimentation and knowledge sharing on ecosystem services delivery?

What overlapping or contradictory police sand regulations need to be reduced or eliminated?

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Engler, C. 2021. A big impact from big thinking. *Resource, 28*(2), 2. St. Joseph, MI: ASABE.

Jones, J., Verma, B., Basso, B., Mohtar, R., & Matlock, M. 2021.Transforming food and agriculture to circular systems: A perspective for 2050. *Resource, 28*(2), 7-9. St. Joseph, MI: ASABE.

Meadows, D. H. 2008. *Thinking in systems.* White River Junction, VT: Chelsea Green Publishing.

Morton, L.W. and E. Shea. 2022. Beyond productivity: Rebuilding circles of life to deliver multi-benefit goals via circular systems. Circular Food and Agricultural Systems. American Society of Agricultural and Biological Engineers (ASABE) 65(2):411-418 https://doi.org/10.13031/ja.14904 NRES14904 (asabe.org)

Pretty, J. 2020. New opportunities for the redesign of agricultural and food systems. *Agric. Human Values, 37*(3), 629-630.https://doi.org/10.1007/s10460-020-10056-2

SfL (Solutions from the Land) Morton, L.W., J. Hatfield, AG Kawamura, M. Kimble, T. , Lovejoy, P. O'Toole, H. Shapiro, V Vats, B. Williams, F. Yoder. 2021. *21st Century Agriculture Renaissance: Solutions from the Land*. Solutions from the Land. Lutherville. MD. 32 full color pages https://solutionsfromtheland.org/renaissance-report/

Tittonell, P. 2014. Ecological intensification of agriculture: Sustainable by nature. *Current Opin. Environ. Sustain., 8,* 53-61.https://doi.org/10.1016/j.cosust.2014.08.006

UN. 2021. United Nations Sustainable Development Goals. NewYork, NY: United Nations. https://www.un.org/sustainabledevelopment/sustainabledevelopment-goals/

Walker, B., & Salt, D. 2006. *Resilience thinking: Sustaining ecosystems and people in a changing world.* Washington, DC: Island Press.