Technological autonomy not autonomous technology:
A call for collaboration for organizations and groups working in open source and grassroots agricultural technology and innovation.

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Summary:

This working paper is a call for collaboration between organizations and networks working in open source and grassroots agricultural technology and innovation, in relation to the ongoing consolidation of Ag-tech by industry and bio/digital Big tech. Concepts like regenerative agriculture and sustainability have moved to the mainstream only to be instrumentalized to justify increased digitalization, labour displacing technologies, and biotechnology ventures (IPES-Food & ETC Group, 2021). Drawing from a foundation of food sovereignty and the rights of people to define their food systems, we propose that technological autonomy is both a necessity to push against the dangerous expansion of corporate-led Ag-tech, and a powerful tool to support small farmers through climate and corporate pressures. Taking inspiration from the grassroots innovations networks around the world who are already demonstrating an alternative future for agricultural technology, this paper is an invitation for different actors to come together in order to articulate a perspective on technological sovereignty, and to strengthen and connect existing grassroots innovation networks.

The digital economy and Ag 4.0

The environmental, social, and economic unsustainability of the current industrial agriculture system have long been critiqued by movements working to transform food systems. As climate tipping points approach, calls for a just, sustainable transition are increasing, and agriculture is a key part of many transition strategies. Indeed there is a growing acknowledgement of the transformative potential of farming and the role it can play in realizing many of the Sustainable Development Goals set out by the UN (FAO, 2019).

In global forums such as the UN Food Systems Summit or the UN Food and Agriculture Organization's (FAO) Science and Innovation Forum, the rhetoric of sustainability, innovation and food security have been the watchwords of state, institutional and industry leaders. Although this language appears to align with calls for systemic change, civil society and peasant organizations across the world have highlighted that the vision for the future of farming emerging from these actors continues the legacy of market priorities, corporate consolidation, and industry-led technological solutions that have brought us to the current crises (FOEI, 2022). Notably, agricultural innovation and technology have moved to the forefront of discussions. For example, the Director-General of the FAO suggested that the organization's work is to rapidly scale out the digitalization of agriculture (FAO, 2021).

This position mirrors that of institutions, corporations, and private organizations, such as The Bill and Melinda Gates Foundation, which has set a target to bring half of all smallholder farmers

onto digital platforms within a decade. Described as digital agriculture, this emerging innovation falls under the broad umbrella of what has been called the 4th agricultural revolution by the World Economic Forum, or AG 4.0 (Klerkx et al., 2019). From big data and precision farming to robotics and biotechnology, AG 4.0 technologies have been increasingly embraced by governments, institutions and industry as a profitable panacea for addressing issues stemming from the current industrial food system.

The promises made for AG 4.0 are that increases in efficiency through digital innovation and technology will reduce chemical and water usage, offer labor-saving technologies, improve supply chains and stave off environmental damage, all while feeding the growing world population and strengthening the global economy. With the longstanding trend of industrial technology leading to increased scale and consolidation of the food system, proponents of AG 4.0 fail to critically assess the ramifications these technologies will have on the majority of food producers. By aggravating issues related to data access and privacy, erasure of traditional knowledge, corporate control over farm practices, and forced migration to urban centers, AG 4.0 threatens to further centralize the food system under a new biodigital hegemony (IPES-Food & ETC Group, 2021).

The image of the future at the heart of AG 4.0 usually includes one farmer, armed with a crew of artificially intelligent machines, managing a vast monoculture using extensive remote data collection. This vision leaves no future for small-scale food producers, farmworkers, or agroecological farmers, who often find that digital tools are not designed to meet their needs and that they cannot compete with the increasing scale of industrial farms. The AG 4.0 vision of the future has already moved from corporate and institutional imagination into reality with increased automation of farm machinery and a surging use of corporate-backed digital tools in countries where industrial agriculture dominates.

Moving beyond narrow sustainability metrics

Though sustainability and access to healthy food are pressing issues, how we reach these objectives is of vital importance. The report underlines the growing potential of agroecology and the food rights movements that have coalesced around the Declaration of Food Sovereignty put forward at the Nyéléni summit in 2007 (Nyéléni, 2007). The Nyéléni Declaration articulated a vision beyond notions of food security and sustainable development, declaring the rights of people to culturally appropriate food and the right to define their own food systems.

While the widespread implementation of AG 4.0 technologies may claim to contribute to some narrowly-defined measures of environmental sustainability and food security (e.g. carbon sequestration promises), the impacts of these technologies constitute significant setbacks to advancing food sovereignty. It is clear that the technology emerging under the banner of AG 4.0 is driving food production away from peasant control, reorienting it towards extraction based models, while claiming to enhance economic efficiency and narrow sustainability metrics rather than true democratic governance and community ownership.

With all this damage AG 4.0 technologies are still unlikely to meet sustainability promises, since they serve as a vehicle for deepening the control of agribusiness and tech corporations who promote soil-depleting pesticides, fossil-fueled machines and energy-sucking digital technologies. These supposedly sustainable technologies are set to harm the small and agroecological food producers that feed the majority of the world and already use sustainable practices. Despite these concerns, support from industry and governments for technological solutions continues to accelerate, using pandemic recovery and climate transition as an excuse (FAO, 2020).

Grassroots alternatives to technological development

In response to this big tech vision of the future of food and agriculture, social movements and peasant organizations have been mobilizing in support of technological sovereignty (Clerc & Jarrige, 2020). Just as food sovereignty, based in agroecology, embraces both traditional knowledge and peasant know-how, technological sovereignty draws on the long standing practices of farmers building their own tools and technology founded on local knowledge. This approach stands in stark contrast to the industrial model of external, profit-oriented, expert-driven research and development that often does not account for regional and local specificities (Giotitsas, 2019). Rather than top-down development, technological sovereignty calls for grassroots innovation (Seyfang & Smith, 2007), an approach which centers the experience, traditional knowledge, and skill of food producers.

While this form of innovation is not a new phenomena, the difficulty of sourcing appropriate technology for small-scale and diversified food systems has spurred the growing movement of peasant-led innovation networks that are developing and sharing novel technologies and practices adapted to their agrecological farming system. Although grassroots innovation often prioritizes accessibility and affordability, it would be a mistake to mischaracterize it as exclusively “low tech”. Indeed a better term for the breadth of approaches is “wide tech” (ETC Group). That is to say, grassroots agricultural innovation does not stand in opposition to what is typically considered high tech, but seeks to find ways to appropriate the range of technologies and practices to suit the needs of farmers. Information ,communications and digital technologies have been an important catalyst in the networking, sharing, and prototyping of these emerging technologies and practices (Bauwens et al., 2020).

Grassroots agricultural innovation networks

l’Atelier Paysan works with farmers across France to build custom tools and infrastructure adapted to the needs of small scale farms (Giotitsas, 2018). The organization hosts collaborative fabrication and training events where farmers gather to produce their own equipment. The plans for the technology are shared under creative commons licenses and hosted online.

The HoneyBee Network in India has documented over 100,000 examples of grassroots innovations over the last 27 years (Honeybee Network, 2015). The organization conducts rural walks throughout the country collecting, documenting and sharing peasant-developed innovations and traditional knowledge through online databases and print publications produced in local dialects.

Farmhack is a U.S based organization that serves as an open source repository for farmer-developed tools which allows anyone to add, modify, or contribute to the database.

CAPÉ, a co-operative of over 200 farms in Canada, collaboratively designs and develops small scale farm technology, from tractor implements to greenhouse automation tools. The co-op works with regional technical schools and institutions to host fabrication events, where the cost of the final tool is dramatically reduced in comparison to those available on the market.

Prolinnova is a network of organizations in Africa, Asia and the Andes collaborating to promote participatory innovation for agriculture and natural resources management. Prolinnova influences national policies, works with researchers to spread participatory methods, and hosts events that showcase farmer-led innovation and strengthen the work of their members (Prolinnova, 2021).

These networks have spawned similar sister organizations across Europe such as the Tzoumakers in Greece, and Farmhack Scotland and England.

While diverse in approaches, what unites these organizations and networks is their shared emphasis on peasant and farmer-led innovation, ecological sustainability, peer to peer exchange, and creative commons and open-source diffusion models. What's more, this form of innovation goes beyond technology. In responding to a lack of appropriate tools, these grassroots innovation networks are simultaneously developing novel forms of organization, production, and knowledge exchange that trouble profit motivated, competitive models of innovation. The result is an emergent socio-technical ecosystem that supports agroecology, strengthening local and regional economies while contributing to a growing innovation commons. In addition to this vital innovation infrastructure, these networks can also foster critical discourse as well as participatory technology assessment. **It is therefore not a question of whether another vision of innovation and technology in agriculture is possible. As the ongoing work of these organizations demonstrates, it is already happening.**

Comparing AG 4.0 versus grassroots innovation	
AG 4.0	Grassroots Innovation
Technologies are developed by corporations	Technologies are developed collaboratively

and aim to replace human labor	by and with food systems workers for self-empowerment
Technologies are privately owned, often by big agribusiness and tech corporations	Technologies are open source
Technologies are designed for factory-scale, monocultural farms, leading to land consolidation	Technologies are designed for small-scale and diversified farms
Technologies promote “sustainable” techniques such as conservation agriculture that are promoted by agribusiness	Technologies serve agroecology, and value traditional knowledge and the knowledge of food producers and workers
Technologies are difficult to repair or modify, and often require specific proprietary inputs to function properly	Technologies are adaptable and accessible
Technologies funnel profits to ag-tech and agribusiness corporations	Technologies support local and regional economies
Digital technologies collective vast amounts of financial, personal and environmental data on behalf of large corporations	Data use and access is designed by users

Technological sovereignty as a integral part of food sovereignty

The Nyéléni declaration of food sovereignty emphasizes the rights of people to not only have access to healthy, culturally appropriate food, but the right to define and govern their food systems. Traditional knowledge along with technology and innovation are an integral part of agroecological food systems. Therefore, the right to define the trajectory of technological innovation must be considered a critical component of the rights of people to define their own food systems. This right emphasizes that agroecological technology is not only a question of what technology should be developed, but how it is created and who is involved in the process.

Across the world peasants and other small-scale food producers continue to design and build tools and technology that support vibrant agricultural systems that are socially, environmentally, and economically just. For food sovereignty movements and food producing communities to resist exploitative technologies, these alternative systems of innovation that create appropriate and adaptable technology must be uplifted.

Now is the time for organizations, networks, and communities that have been developing these grassroots agricultural innovations to come together to articulate a shared perspective of how to describe, protect and strengthen community, farmer and worker-led technology. Following the example of the Nyéléni Declarations on food sovereignty and agroecology which brought

peasant rights to the forefront, a collective understanding of technological sovereignty rooted in agroecology has the potential to serve as a vital counter narrative to dominant technology and innovation models aiming to define and disrupt the future of food and agriculture. Just as the reality of AG 4.0 grew out of the corporate and institutional imagination, our unified envisioning has the power to spread the reality of technological sovereignty for farmers and food systems workers around the world.

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