Nature 3.0: blockchain for extraction or care?

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Co-designing multispecies food commons for through blockchain

In the Autumn of 2019 a group of citizens interested in sustainable urban food systems gathered at Spitalfields City Farm in East London to co-design a food commons with the help of blockchain prototypes. Farm staff and volunteers worked with artists, community organisers, researchers, technologists and activists towards a shared goal: to discover whether decentralised tech might hold a piece of the puzzle to address some of the myriad injustices that afflict the global industrial food system. The event was organised by the authors, as part of a funded research project called: Algorithmic Food Justice.

Unsustainable inequalities are threatening all life on earth. One million species are threatened with extinction and we have lost over 75% of all cultivated crop diversity. These losses are rooted in human activities, with industrial agriculture being a major driver, contributing to degraded soils, polluted waterways, and ultimately threatening food security for all life on the planet. The global industrial food system encloses and extracts value from our planet's resources, concentrating benefits in the hands of a few major players and driving unsustainable human and ecological inequalities.

Blockchain is being optimistically touted as the solution to many complex problems, including sustainable food systems, where it is being used to increase food traceability, safety and provenance, and in inventory management in supply chains. Examples such as Provenance[1] and BeefLedger[2] promise a future in which specific products can be traced immediately, help reduce food waste and track contaminated food easily and quickly, while preventing the sale of fraudulent food products. In these futures, blockchain is harnessed to intensify monocultural, industrial agriculture, doing little to distribute profit more equally, or farm more

[1] *Turn Positive Social and Environmental Impact into Brand Value,* Provenance website, Accessed 31st December 2021, https://www.provenance.org/

[2] BeefLedger website, Accessed 31st December 2021, https://beefledger.io/

sustainably. Other examples such as Nori[3], Regen Network[4] and GainForest[5], claim to use blockchain to incentivise regenerative land use, carbon capture in soil, and the reversal of destructive land use practices that contribute to CO2 emissions such as clearing forests for monocultural crop production.

But there are significant doubts as to whether the technology is appropriate, sustainable, or feasible to use in real world settings, particularly in small scale agriculture, who produce up to 80% of the world's food, according to the United Nations Food and Agriculture Organization (UN FAO). Worse, we know that it is primarily ~~already~~ being used in neoliberal models of agriculture, potentially accelerating extraction and exploitation[6]. Typically, the vision for blockchain in agriculture tends towards a deterministic or techno-optimistic view of the ecological and social problems that we face within food systems, one in which the technology provides the solution; complexities and possible negative impacts of such solutions remain unexamined. They reduce the problem of unsustainable food systems to one of provenance and tracking, solved through technologically-mediated digital marketplaces, where the power lies in the hands of investors. Blockchain is coupled with technologies such as AI and sensors to optimise and centralise agricultural production, as well as provide wealthy urban consumers data about food provenance and safety at a price beyond the reach of most people in the global community (ibid). In these ways the technology does little to address societal and governmental problems around access and food security. The benefits remain in the hands of an elite few and, rather than technology providing a solution to the problems of governments or communities, the inequalities are amplified (ibid).

Algorithmic Food Justice was our response - a participatory design research project that resisted a techno-optimistic approach to blockchain as a fix or solution. Instead it attempted to examine the potential for blockchain to help reconfigure values from profit to care, redress power imbalances and inequalities, and suggest more sustainable and fair food systems.

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[3] *The Nori Carbon Removal Marketplace*, Nori website, Accessed 31st December 2021, https://nori.com/

[4] *Platform for a Thriving* Planet, Regen Network website, Accessed 31st December 2021, https://www.regen.network/

[5] *Sustainable Smart Contracts for Our Natural* World, GainForest website, Accessed 31st December 2021, https://www.gainforest.app/

[6] Xiaowei Wang, *Blockchain Chicken Farm: And Other Stories of Tech in China's Countryside*. (FSG Originals x Logic, 2020)

Because information systems are social systems, we approached technology as a means to explore existing conditions and reflect on alternatives. We were drawn to blockchain because of its potential for "radical regulation"[7], forcing us to consider, not only non-humans as individual actors, but also the interdependencies between multitude more-than-human actors in an ecological web and in which ecological balance is incentivised through, for example, tokenisation, smart contracts and distributed autonomous organisations (DAOs), and the radical consequences for regulation and redistribution of power. Such blockchain facets suggest an alternative basis for creating new value systems and embedding the interests of non-humans such as seeds, soil and water into decision-making processes through computation and automation. We wanted to explore whether it was possible to reconfigure the relationships between food, blockchain, and value, and open up new possibilities for algorithmic approaches to a sustainable food justice system.

Therefore we drew on alternative governance models from the commons to explore ways that a *more-than-human* perspective can bring different stakeholders to the decision-making table and create a fairer and more sustainable food system. We use the term *more-than-human* to refer to a perspective in which the human is no longer at the centre, but in a web of relations with other actors including animals, plants and earth systems such as the water cycle.

Creative futuring with grassroots communities: three speculative participatory design workshops

The project involved three workshops that we devised and facilitated (together with Ruth Catlow from Furtherfield) in 2019 at Spitalfields City Farm, an urban agricultural community in east London. We drew around forty diverse participants from different communities with whom we had worked with over the years in participatory engagements and had established relationships. This included relationships that Sara had developed through a series of participatory design research projects with the farm and other urban food growing communities in east London around emerging technologies such as Internet of Things and interactive digital systems; as well as artists and activists that were drawn from the networks of Ruth from Furtherfield. These people had become familiar with our participatory and inclusive ways of working. It was because of these established relationships that we had

[7] Chris Elsden, Inte Gloerich, Anne Spaa, John Vines, and Martijn de Waal. 2019. Making the blockchain civic. *interactions* 26, 2 (2019), 60–65.

nurtured over the years that so many people were prepared to come to something that may otherwise have seemed alienating and overly technical.

We used playful and creative activities to open up a shared imaginative space to experiment with alternative configurations of value and to open up a space where multispecies actors such as humans, plants, animals and soil, as well as technologies and their infrastructures, can take part in a thriving food commons of the future.

This urban agricultural community, as with others like it, is especially alert to issues around food justice. They also offer a uniquely rich source of challenges and resources. Spitalfields City Farm is in the inner east London borough of Tower Hamlets, one of the most economically deprived boroughs in the UK. It is characterised by high population density, large-scale immigration, ethnic diversity, poverty and huge divides between rich and poor. It also suffers from a range of food-related illnesses. In the face of this challenging context, the farm community has demonstrated resourcefulness, creativity, and adaptability in responding to increasing pressures on funding, land, and labour, creating a welcoming space for connection with nature, and education about sustainable food and caring animal husbandry. Thus the farm offers opportunities to study the possibilities for digital technologies to support more-than-human entanglements and the food commons. Spitalfields City Farm was considered as a test case for prototyping sustainable food futures, but participants also brought their experiences of other community gardens where food is grown.

Our approach used both participation and speculation to bring different people's experiences and forms of knowledge together in inclusive ways, engaging participants who were not familiar with blockchain or other emerging digital technologies, ~~non-technical citizens~~ in complex possible futures with these technologies, and in particular with blockchain. We used fiction and roleplaying to understand the affordances and implications of blockchain and other emerging technologies such as AI and sensor networks, exploring futures beyond participants' lived experience, while remaining grounded in their values, needs and challenges.

Narrative techniques helped people understand the implications of blockchain and how the technology might play out in specific situations, to imagine use cases that are possible but not yet real, and address questions of ethics, values, social interactions and their consequences. In this way we were also able to open up a space in which we could take seriously the possibility of human and non-human actors having a voice and a stake in a

value system and better understand the inequalities and power imbalances within industrial food systems.

In the first event urban community growers mapped the different multispecies stakeholders of the city farm, now and in the future. They mapped their needs and contributions, and the resource flows between them. Participants from diverse backgrounds were able to draw on their expert knowledge of regenerative agricultural techniques to surface the agencies of other beings and the more-than-human interrelationships on which thriving community growing spaces depend, for example by surfacing our dependencies on soil micro-organisms, worms, and pollinators. By privileging the perspectives of this group of urban community growers these activities allowed for a mode of knowledge production beyond a human-centered perspective of value in food systems. Participants were asked to consider resources beyond those with a financial value, such as volunteer labour, oxygen, time, and care, and to think about who manages those resources. Discussions revolved around the often invisible but important labour of care work that happens in community gardens, which is not adequately recognised or compensated (for example in securing funding for schemes), and is completely elided in industrial agricultural systems.

In the second workshop, we imagined a scenario in which all of London were constituted as a city farm. We used Live Action Role Play (LARP) to open up a playful space to imagine and examine how multispecies actors might take part in governing a future food commons. Set in 2025, in the aftermath of a “Great Food Emergency”, the aim of the game was to transform London from an extractive financial centre into a global city farm in which all of London’s available spaces and infrastructures are turned over to creating a thriving food commons for its biodiverse inhabitants. Participants were given different roles to play within fictional scenarios and improvised an array of new kinds of multispecies relationships, new economies, and radical decision-making processes for sustaining a city-wide commons. Players’ actions were informed by scenarios based on what we learned in the first workshop as well as real-world events, and current facts about food and environmental injustices, as we tried to establish new decision-making systems and urban infrastructures. The LARP was staged as two assembly meetings (one for a local urban farm, one for a city-wide farm) in which players took on representative roles from different committees and discussed items on an agenda based on Nobel-prize winning economist Elinor Ostrom’s design principles for the commons. These principles were based on her studies of how the commons (such as the collective management of natural resources such as fisheries, forests and farmland) can be sustainably managed by a community without intervention by the state or market

economics..[8] We discussed each item on the agenda through a series of scenarios, developed from what Maria Puig de la Bellacasa calls “matters of care”[9] that had arisen in discussions in the first workshop. These matters of care relate to the overlooked, marginalised labours of care that are involved in sustaining nourishing multispecies relations in the city farm.

To illustrate with an example, the plight of pollinating insects arose in the stakeholder mapping event as a matter of care. Here we learned about intensive agriculture, loss of habitats, and pesticides, which were all having an impact on these invaluable species. The game host playing Chair in the assembly meeting introduced the topic for discussion: “*The next item on the agenda is a review of how we’re managing resources, and ensuring that everyone’s contributions are rewarded. … An issue that's come up recently in the sharing policy: so the bees, as you know…have been on strike now for six months.*” They then engage a player in the role-play asking: “*How is the Justice Committee proposing to resolve the dispute between the bees and the gardeners?*” The Justice representative replies, “*We are piloting various multispecies assemblies, to ensure that we give equal voice to all citizens (there are complaints that the human voices are still just too dominant). But also working closely with the Department of Infrastructure to meet the bees’ demands, which on the whole don't seem too wild and quite fair*.” Other members from other committees then joined the discussion, with the Education officer reporting a new schools programme about the essential services provided by the bees, and the speculative roleplay of more-than-human governance issues unfolded from there.

By giving different species different roles and responsibilities within the assemblies the LARP compelled players to imagine a radical reconfiguration of power structures and flows in their efforts to manifest a multispecies food commons. In this process they highlighted conflicted and entangled relations between humans, other species and planetary systems and explored a range of different challenges for commons management.

Despite this, of course we could never entirely forget that the project took place within a human frame, created by human designers and developers and played by human actors. But because we drew on the expert knowledge of growers and their intimate understanding of multispecies relationships in the food web, we were able to shift the narrative to lever

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[8] Elinor Ostrom. *Governing the Commons*. (Cambridge University Press, 2015.)

[9] Maria Puig de la Bellacasa. *Matters of Care: Speculative Ethics in More than Human Worlds*. (University of Minnesota Press, 2017)

open the totalising human-centred, efficiency-driven and profit-motivated visions of algorithmic food governance, and see where shifts can begin to occur.

Building blockchain prototypes for multispecies thriving

In the final workshop we invited groups of artists, designers and technologists who had some familiarity with blockchain to create conceptual prototypes for new types of organisations to manage the more-than-human food commons through smart contracts and Decentralised Autonomous Organisations (DAOs). Groups developed their DAOs based on the scenarios and debates elaborated in the stakeholder mapping and LARP. They used paper-based prompts to flesh out the rules of the DAOs and how it would be managed as a food commons, paying attention to multispecies relations, value flows and fair distribution of resources.

Prototype 1: *DAO-n to Earth*

The first group devised an 'umbrella' DAO, called *DAO-n to Earth,* to coordinate the exchange of tokens (currencies) between all the farms in the (fictional future) London Food Network. The exchange rate is set automatically according to the soil health data of each community, as measured by networked sensors and AI, and calibrated over time. The better the quality of soil in a community, the higher the value of its local currency. Humans are incentivised to take care of the soil, by staking a currency's value to the work done to regenerate the soil in a specific local area. The DAO-n to Earth group designed for soil health above all else, because it benefits a wider group of species (rather than the humans alone). In this prototype care for ecosystem health is woven into the dynamics of food production and exchange. Rather than replacing the growers' expert knowledge to automate the practices of soil care, sensors and automation are used here to measure, verify and incentivise the results and use them in a market exchange.

Prototype 2: *Fellowshit of Dark Matter DAO*

The second group created the *Fellowshit of Dark Matter* DAO, based on a discussion of value as relational and ever-unfolding, an experience which they sought to capture in the design of a socio-technical system that nurtured multispecies relations. Humans can post waste materials and make them freely available to others within the community through an app, thereby earning tokens which can be used within a broader system of value exchange. Users of the app would participate in a weekly ritual, to provide ways for citizens to inhabit multispecies' perspectives, and spot opportunities for waste materials to be used for their own species' ends. This DAO promotes a multispecies 'circular economy' with an expansive sense of value that is not only focussed on material utility but the production of cultural value

and the meaning of unfolding interspecies relationships as they exchange materials and tokens within a digital-physical ecosystem.

Prototype 3: Corn Council DAO

The third group created the *Corn Council* DAO, which seeks to repair the alienation humans experience from the conditions of food production, and proposes a system for repairing the disconnect between humans and other species. The DAO rewards humans with tokens for spending time with plants in a non-instrumental way, as well as for care-taking work such as pruning and watering. Tokens allow members to participate in voting proposals about the farm's management. Each crop in the farm has its own council and the DAOs are managed through an umbrella DAO.

In the afternoon session we invited the community growers and organisers who had provided their insights in the previous events, to bring their expertise of multispecies relations, food-growing, and community governance to bear on the prototypes. In this way we sought to fuse these different forms of knowledge and experience to bring the richest critique possible to an examination of these DAOs and how they might serve local and wider multispecies interests, as well as all the awful things they might do by accident. Knowledgeable growers helped reconfigure tech-focussed imaginings and added important depth and nuance to multi-species relationships and ecosystems by 'stress testing' the DAOs, which we discuss below.

From extraction to care

These events brought people together across very different zones of knowledge to open up a space for rethinking values that are driving ecological and social injustices within global industrial food systems, from human-centered, extractionist and profit-driven (not just in the blockchain space), to care and commons for multispecies stakeholders in the food web. By bringing different experiences of governance into dialogue the workshops opened up diverse valences for people to engage with algorithmic governance and consider new perspectives. For example, the growers' knowledge forced the creative technologists to consider the implications of their prototypes on multispecies communities. At the same time growers were brought into a conversation about technology that they were unlikely ~~wouldn't~~ to have had before. Including those who are not typically included in discussions about the design of emerging technologies is important if we want to address the digital divide, distribute control and autonomy more evenly, and redress the existing imbalances within the global corporate food systems. In these ways the workshop activities created an inclusive space in which a

plurality of human and non-human actors (including soil, animals, computation, and sensors) and their different forms of knowledge were brought to bear on a more-than-human value system represented through algorithmic governance. By bringing together these different stakeholders, the co-design activities and their outputs surfaced alternative configurations of value that allowed for benefit and power to be distributed more equitably between more-than-human actors.

The project surfaced a number of tensions and challenges. Firstly, creating formal accounting systems of value, and introducing external rewards in what was previously informal and intrinsically motivated, risked creating perverse incentives and abuses of power. While blockchains promise to facilitate more equal distribution of benefits, if the system is not set up correctly, bad actors will find a way to corrupt the system and work it to their own ends. Secondly, a more-than-human perspective may not serve those who have historically been excluded from the category of human in the first place, such as people of colour. A feminist ethics of care shows how we might pay attention to neglected humans as well as nonhumans, in order to re-configure value in ways that contribute to more sustainable and just urban food governance. Thirdly, it is still humans speaking on behalf of other actors and making decisions on behalf of non-humans, and it will be humans, subject to prevailing economic and social pressures and incentives, who write the code. We attempted to overcome this epistemological challenge by engaging expert growers with their experience of regenerative agriculture, using decentering techniques such as roleplay to speak on behalf of other species, and a consideration of non-human actors such as sensors, AI and blockchain in our accounting systems. We conclude that, at best, these could work as proxies for non-humans.

In the dominant visions of blockchain-based solutions for more sustainable food systems, convenience and efficiency are prioritised, and the care labour of humans and non-humans alike are erased and undervalued. The danger is that without a variety of stakeholders working on these technologies, accelerationist tendencies and injustices in urban food governance will be exacerbated. By contrast, the workshops in our project produced blockchain prototype systems for urban food futures where labours of care are made visible, valued and accounted for. The participatory speculation with diverse stakeholders suggests alternative futures in which the technology may be embedded into wider cultural contexts that make it possible to reconfigure value from something to be enclosed and extracted, into a system that hinges on care. It is only by moving beyond a human-centered perspective of food governance to recognise the interrelations between humans and non-humans on which all life on earth depends, that we can begin to recognise the diverse value required to restore our damaged planet.