



A genealogy of sustainable agriculture narratives: implications for the transformative potential of regenerative agriculture

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Abstract

The agri-food system is facing a range of social-ecological threats, many of which are caused and amplified by industrial agriculture. In response, numerous sustainable agriculture narratives have emerged, proposing solutions to the challenges facing the agri-food system. One such narrative that has recently risen to prominence is regenerative agriculture. However, the drivers for the rapid emergence of regenerative agriculture are not well understood. Furthermore, its transformative potential for supporting a more sustainable agri-food system is underexplored. Through a genealogical analysis of four prominent sustainable agriculture narratives; organic agriculture, conservation agriculture, sustainable intensification, and agroecology; we consider how regenerative agriculture's growing momentum can be contextualised within existing narratives and explore the implications this might have for its transformative potential. This analysis reveals that the genealogies of these sustainable agriculture narratives have led to a number of contestations and complementarities which have coalesced to drive the emergence of regenerative agriculture. We also find that, in contrast to agroecology, regenerative agriculture shares with other Global North narratives a limited scope for offering transformative pathways for agricultural production. This is largely due to their inadequate consideration of power and equity issues in the agri-food system. We argue that regenerative agriculture therefore risks inhibiting deeper agri-food system transformations that address both social and ecological challenges and is not the unifying sustainable agriculture narrative it claims to be. Nonetheless, regenerative agriculture could contribute towards a broader plurality of sustainable agriculture narratives that collectively might enable a transformation to a more sustainable, diverse, and just agri-food system.

Keywords Sustainable agriculture · Transformation · Regenerative agriculture · Agroecology · Sustainable intensification · Organic agriculture · Conservation agriculture

Introduction

The global agri-food system is facing serious threats. An estimated 20–40% of the world's land is degraded, affecting nearly half of the world's population. Agriculture is responsible for 80% of deforestation and 70% of freshwater use globally, and is the biggest driver of terrestrial biodiversity loss (UNCCD 2022). Agriculture, forestry, and land use change contribute to 23% of global greenhouse gas emissions (IPCC 2019), and current agricultural practices are pushing the planetary boundary of biogeochemical flows

into the high-risk zone (Steffen et al. 2015). Corporate power and influence in global food governance (Clapp 2021), and the ongoing marginalisation of smallholder farmers and indigenous peoples and knowledges are also embedding social injustice throughout the agri-food system (Jarosz 2014). For several decades, scholars have highlighted how the dominance of industrial agriculture narratives, embedded in extractivist and productivist ideas and discourse (Anderson and Rivera-Ferre 2020), are perpetuating these agri-food system challenges (Friedmann and McMichael 1989; Bernstein 2016). Industrial agriculture narratives support an agri-food system where the farm is treated like a factory (Horrigan et al. 2002), and food is commoditised and produced at a mass scale (McKenzie and Williams 2015).

To address these challenges, and tackle the dominance of industrial agriculture, there has been a call to transform the agri-food system to one that is more sustainable and just

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(FAO 2021). This sustainable agri-food system transformation requires structural and systemic changes to patterns of consumption and production (El Bilali 2019) and the mindsets and priorities of actors (Seymour and Connelly 2022). As part of this transformation push, industrial agriculture has been challenged by different sustainable agriculture narratives that are more focused on environmental and social outcomes (Janker et al. 2018). These narratives have extensive histories with different supporters and drivers, and include agroecology, natural farming, permaculture, biodynamic farming, organic farming, conservation agriculture, carbon farming, climate-smart agriculture, low external input agriculture, circular agriculture, biological farming, ecological intensification, and sustainable intensification, among others (Oberč and Arroyo Schnell 2020). Despite their ever-increasing number and often decades long legacies, no sustainable agriculture narrative has been capable of fully challenging the dominance of industrial agriculture. Nevertheless, more sustainable agriculture narratives continue to emerge, aiming to accelerate action towards an agri-food system transformation (Sumberg and Giller 2022). The latest of these narratives, marked by a notably rapid rise in prominence, is regenerative agriculture (RA).

Since around 2015, RA has gained increasing exposure in both academic circles and general media as a more sustainable way of growing food and fibre (Newton et al. 2020). It has been promoted by non-government organisations (WWF 2020; The Nature Conservancy 2021), governments (Department of Primary Industries and Regional Development 2020), celebrities (Kiss the Ground Movie/Big Picture Ranch 2022), farming organisations (National Farmers Union 2021), international institutions (UNCCD 2022), and agri-food corporations (Soloviev 2020). However, concerns have been raised about the prominent role of these corporations in promoting RA (Wozniacka 2019; Gordon et al. 2023), the scientific evidence that supports its sustainability claims (Giller et al. 2021), its lack of acknowledgement of indigenous peoples and knowledges, and the potential risk RA poses in sidelining existing sustainable agriculture narratives that have less powerful backers (Fassler 2021).

While the rise of RA has been described and the structure of its discourse unpacked (Gordon et al. 2021), there is a gap in the current literature in terms of contextualising its rapid emergence. Furthermore, there has been limited questioning of the extent of RA's transformative potential for the agri-food system. It has been described as potentially an 'umbrella' term which could unite existing sustainable agriculture narratives (Seymour and Connelly 2022), however this notion has not been considered in sufficient depth. Situating RA alongside other sustainable agriculture narratives and their attempts to challenge the dominance of industrial agriculture is therefore an important task to anticipate the

role of RA in achieving the necessary transformations of the agri-food system to address its social and environmental challenges.

In this paper we take a genealogical approach (McMichael 2009; Walker and Cooper 2011) to ask, (1) how RA can be contextualised within the lineages of four other prominent sustainable agriculture narratives, and (2) what these genealogies indicate about how RA might contribute to, or inhibit, a sustainable agri-food system transformation. To do this, we first provide a summary of RA's rise to prominence, before mapping the genealogies of the sustainable agriculture narratives; organic agriculture (OA), conservation agriculture (CA), sustainable intensification (SI), and agroecology (AE); to contextualise RA and consider its transformative potential using a transformation approaches framework by Scoones et al. (2020).

We argue that RA has coalesced through the limitations facing the sustainable agriculture narratives analysed. Highlighting how sustainable agriculture narratives have been dominated by Global North and corporate actors, diluting their ability to drive transformation in the agri-food system and significantly challenge industrial agriculture. The exception to this is AE, which is instead restricted in its transformative potential due to the unequal power dynamics of the agri-food system that oppress Global South and small-scale actors. Within this context, we argue that RA is at risk of falling into a similar trap that befell OA, SI, and CA, where the predominant actors in the narrative become corporations and the Global North institutions they dominate (Clapp 2021). Such a trajectory would reduce the transformative potential of the RA narrative and risks exacerbating issues of injustice and inequity in the agri-food system. Furthermore, RA's rapid rise to prominence risks distracting agri-food system actors from the transformative potential of more established narratives, such as AE. While RA may add further diversity to a plurality of sustainable agriculture narratives and is demonstrably attracting powerful agri-food system actors, it is by no means the unifying narrative that it has been claimed to be, nor the catch-all solution to sustainable agri-food system transformation.

Background: the rise of regenerative agriculture

The term 'regenerative agriculture' was coined in 1979 by Medard Gabel, though the terms were already being used in conjunction through the 1970s (Giller et al. 2021) as part of broader 'regenerative' discourses which had emerged through design and architecture (Gordon et al. 2021). The first definition of RA was by Robert Rodale and Richard Harwood of the Rodale Research Centre as being a farming

practice that was ‘beyond organic’ (Giller et al. 2021). The first peer-reviewed scholarly mention of RA was in 1986, where it was linked closely with both organic and low-external input agriculture (Francis et al. 1986). However, the term remained relatively fringe until the mid-2010’s where it has seen a demonstrable rise in publicity and popularity. News mentions of RA have doubled every year since 2015, and from a total of seven academic publications on RA between 1986 and 2016, 52 were published between 2016 and 2020 (Giller et al. 2021). The trailer for a documentary featuring Hollywood A-listers on RA, *Kiss the Ground*, currently has over 9.5 million views on YouTube (*Kiss the Ground Movie/Big Picture Ranch* 2022), and a number of RA organisations have been established such as Regeneration International (Soloviev and Landua 2016). The term is also being increasingly used by various governments and agri-food corporations in their sustainable agriculture programs and policies (O’Donoghue et al. 2022).

While its definition remains in dispute, RA is now generally understood either as practices such as minimising soil disturbance, integrating livestock, maximising soil cover, rotational grazing, and lowering external inputs (Newton et al. 2020). Or, as principles that centre around going ‘beyond sustainability’ (Gibbons 2020) to rejuvenate landscapes and farms through enhancing ecosystem processes such as water, nutrient, and carbon cycles. Occasionally, definitions also include social elements such as restoring the health of communities and farmers (Newton et al. 2020).

Recent scholarship has started to explore RA’s origins and definitions (Soloviev and Landua 2016; Newton et al. 2020; Schreefel et al. 2020; Fenster et al. 2021; Giller et al. 2021; Gordon et al. 2021; O’Donoghue et al. 2022), as well as the motivations of regenerative practitioners at the local scale (Gosnell 2021; Dipu et al. 2022). Regarding RA’s transformative potential, Loring (2022) considers pathways to a regenerative agri-food system which is flexible and diverse with a focus on conserving environmental cycles. In addition, Seymour & Connelly (2022) emphasise the more-than-human ethic of care in RA as central to its transformative potential. However, little research has been conducted on why RA has risen so quickly to prominence, its place among other agriculture narratives, the broader social-ecological drivers of its rise, and what these factors might mean for its role in agri-food system transformation. To help address these gaps, we will explore in this paper the descentance of RA amongst other sustainable agriculture narratives to help shed further light on its rise to prominence and the potential implications of these findings for its transformative potential.

Method and conceptual approach: genealogical narrative analysis and transformation pathways

This paper applies a genealogical approach to analyse sustainable agriculture narratives, exploring where they have descended from, how they have changed and morphed over time, their current state, and their transformative potential using Scoones et al.’s (2020) framework (see Fig. 1). The narratives chosen for analysis, OA, CA, SI, and AE were selected both for their relative prominence in terms of sustainable agriculture (Schreefel et al. 2020; Kassam and Kassam 2020) and their relationship to RA. We have used the term ‘narrative’ to describe them, rather than sustainable agriculture practices or movements, as narratives play an important overarching role in bringing separate parts of a phenomenon, such as its activities or actors, into a cohesive whole (Kaplan 2016). Narratives give meaning and create discursive frames (Béné et al. 2019) through which to unite the movements, principles, and practices of sustainable agriculture and capture key events and actors (Anderson and Rivera-Ferre 2020). Narratives also play an important role in sustainability transformations. They function as justification for particular interventions, providing idealised approaches for navigating systems towards sustainability and creating pathways for change (Luederitz et al. 2017).

There has been an abundance of research on agri-food system narratives. This research commonly frames these narratives in terms of binaries such as strong and weak, open and closed (Bell and Bellon 2021), conventional and alternative (Beus and Dunlap 1990), security and sovereignty (Jarosz 2014), mechanical and ecological (Gosnell 2021), industrial and agrarian (Wilson 2007), or extractive and regenerative (Anderson and Rivera-Ferre 2020). While these binaries can be useful for categorising narratives, they do not always capture the different elements that make up a narrative. Nor do they elicit which actors are invoking the narrative, in what context, and for what purpose. Only sometimes are these narrative analyses considered in the context of agri-food system transformation (Jarosz 2014; Anderson and Rivera-Ferre 2020; Bell and Bellon 2021). Distilling the nuances of narratives beyond binary comparisons is therefore important for understanding where emerging narratives, like RA, may be headed.

In addition, while there is ample historical analysis that has been conducted on sustainable agriculture narratives separately, less has been done to critically consider their complementarities and conflicts directly or to contextualise their emergence and evolution in relation to external socio-political and environmental factors. Likewise, there is a lack of research inquiring into the relationship of these narratives

with RA and how their genealogies might help explain the rapid emergence in prominence of RA.

To help address these gaps in the literature on sustainable agriculture narratives, we apply a genealogical approach to consider and compare OA, CA, SI, and AE to help contextualise the RA narrative. Our approach draws from the Foucauldian genealogical method and the notion of writing a ‘history of the present’ (Garland 2014), whereby a critical lens – one that seeks to uncover and challenge power structures – is applied to the past to question the narratives of the now (Michael 1982). A genealogy is an interpretivist approach to narrative analysis which aims to uncover where the narrative has come from, and the triggers (social, political, economic, or ecological) that caused it to emerge. It describes the narrative’s pathway of evolution to the present, which is not necessarily linear and can adapt and change in relation to external factors (Kearins and Hooper 2002). A genealogical approach is not concerned with uncovering essential, empirical truths (Bastalich 2009), and instead acknowledges that narratives come from somewhere and are going somewhere, but the path is not always straight forward or clear (Foucault 1977). A visual representation of the genealogical method is given in Fig. 1. Genealogies have been used to understand narratives in economics (Dean 1992), environmental law (De Lucia 2015), urbanism (Danneels et al. 2020), security studies (Walker and Cooper 2011), and development (Ziai 2015) and have helped scholars to highlight the triggers and lineages of narratives, their

turning points, and their conflicts to better situate them in the present.

To explore what the findings from this genealogical analysis might tell us about the transformative potential of these sustainable agriculture narratives, and therefore that of RA, we use Scoones et al.’s (2020) transformation pathways framework. Transformations involve fundamental changes in the structural, functional, relational, and cognitive aspects of a system, leading to new interactions and behaviours (Patterson et al. 2017). Scoones et al.’s (2020) framework is a useful tool in synthesising the different pathways for transformation and the social, cultural, and political factors involved (Billi et al. 2022). It provides for fruitful comparison between different transformation approaches and the actors, relationships, and socio-technical mechanisms within them, as well as how these approaches interact with one another (Ely et al. 2021).

Scoones et al.’s (2020) framework (see Fig. 1) posits three distinct but complementary approaches to sustainability transformations and the social processes that generate transformative change: structural, systemic, and enabling approaches. Structural approaches focus on changes to politics, economy, and society – calling for an overhaul of the ideological foundations of these structures and fundamental changes to how production and consumption is governed, organised, and practiced. Systemic approaches instead concentrate on specific elements of a system that can be leveraged to trigger change. They are often targeted at specific institutions, technologies, and actors to steer systems

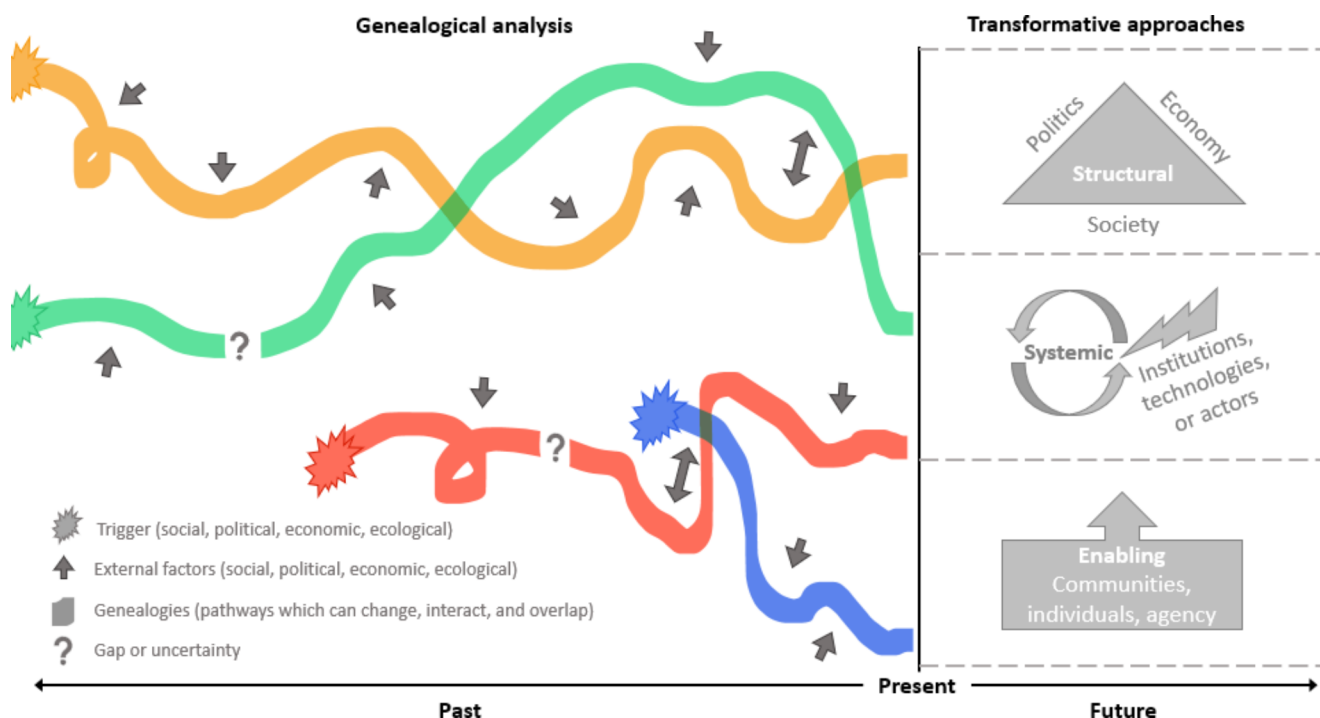


Fig. 1 Conceptual framework utilising a genealogical method (Garland 2014) and approaches to transformation (Scoones et al. 2020)

towards desired goals. Finally, enabling approaches highlight the role of agency in transformations, emphasising the social attributes that empower individuals and communities to take action and build capacity. These approaches, while distinct, can overlap and complement one another. However, each also has its own drawbacks and challenges as will be examined in our application of this framework to consider the transformative potential of the sustainable agriculture narratives explored in this analysis.

Genealogies of sustainable agriculture narratives

Organic agriculture

Of the sustainable agriculture narratives explored here, OA has one of the longest lineages and is arguably the most globally prominent and well-known. However, the degree to which OA has challenged versus conformed to the characteristics of industrial agriculture has changed over time. A radical narrative in its inception, OA has increasingly moved towards a commercialised and conventional approach to food and fibre production which resonates with an industrial agriculture narrative.

Emerging in inter-war Europe and the US, OA was founded on ideals of agrarianism in response to the mechanisation of agriculture and the urbanisation of the rural populace (Vogt 2007). These mechanisation processes and social transformations led to new human-food relations, and the de-ruralisation of European and North American society drove the intensification and commercialisation of agricultural production (Kaplan 2016). This was supported by the discovery of the Haber-Bosch process and advances in chemical manufacturing through World War I which allowed the production of synthetic nitrogen (Paull 2009). Scientific advances were also building an enhanced understanding of soil biology and the role of micro-organisms in soil health. This notion of soil being ‘alive’ and concerns around soil health spurred by widespread land degradation due to industrial agriculture, as well as the principles of biodynamic agriculture which views the farm as a living system, would become the foundations of the OA narrative (Vogt 2007). In coining ‘organic agriculture’ in 1940, UK-based Lord Northbourne argued for a form of agriculture which did not rely on external inputs or treat the land as an inanimate resource to be exploited, instead he states that “the farm itself must have a biological completeness; it must be a living entity, it must be a unit which has within itself a balanced organic life” (Northbourne 2003, p. 58). The OA narrative therefore began with a principles-based focus on supporting soil processes and a holistic view of the farm.

However, OA remained relatively niche during the decades of war and post-war food shortages, limiting its influence on the increasing industrialisation of agriculture. That was until the 1960s, when OA became popularised through association with the environment and counter-cultural movements, riding the wave of concern regarding chemical inputs in agriculture as a result of Rachel Carson’s *The Silent Spring* (Lockeretz 2007).

As it grew, a notable aspect of OA was its institutionalisation through regulatory and organisational systems. A series of scandals regarding false claims around organic produce led to the development of standards and certifications created by organic organisations such as the Soil Association to provide consumer certainty (Schmid 2007). This institutionalisation of the OA narrative continued with the establishment of the International Federation of Organic Agriculture Movements (IFOAM) in Europe in 1972. Its key role being to consolidate and oversee organic certification schemes (Lockeretz 2007). The shift in focus of the OA narrative away from its original principles focus towards more practice-focussed standards and definitions formed a phase which is now labelled ‘Organic 2.0’ (Arbenz et al. 2017). This was marked by increasing government involvement in standard setting, which acknowledged that OA is intended to be a “holistic production management system”, but largely treats it as “minimising the use of external inputs, [and] avoiding the use of synthetic fertilisers and pesticides” (United Nations 1999). This exclusion-oriented understanding of OA has been further exacerbated by consumer concerns around food safety, leading to market-led changes to the organic standards (Reed and Holt 2006) such as the banning of genetically-modified organisms in organic produce (Halberg et al. 2006).

By the 1980s, the number of Global North consumers demanding organic produce began to outstrip the supply available from small-scale farms, food co-ops, and health food stores. Mainstream supermarkets began stocking organic produce (Aschemann et al. 2007), and to help fill the supply gap the Global South quickly became the main export market for organic produce to European and North American consumers (Parrott et al. 2006). In 2019, 88% of organic retail sales were in North America and Europe while 25% of organic agricultural land was located in the Global South (53% if excluding Oceania) (Schlatter et al. 2021). The trade networks of OA began to increasingly reflect those of industrial agriculture, with the Global South producing for the wants and needs of the Global North but with little for their own domestic markets (Halberg et al. 2006). Continuing into the 1990s, organic farms across the world grew larger in scale, becoming increasingly monocultural in their produce, and relying on a growing amount of (organic) chemical inputs (Guthman 2004). Further mirroring the

characteristics of industrial agriculture, organic supply chains became increasingly controlled by large agri-food corporations (Lockie et al. 2006). Concerns were raised that many organic farmers were no longer ‘in it for the right reasons’, with organic and non-organic produce being grown in adjacent fields (Guthman 2019), and farms no longer being treated, like a ‘living entity’, as Northbourne put it.

In reaction to this trend of ‘conventionalisation’ under Organic 2.0 (Darnhofer et al. 2010) and the gradual embedding of OA as a market niche within industrial agriculture, IFOAM has recently proposed a move to ‘Organic 3.0’ (Arbenz et al. 2017). This represents a desire to return to the holistic and ecologically oriented principles on which the narrative was founded. There is also a call for Organic 3.0 to include notions of food justice, addressing issues of inequity in the OA supply chain, and having a focus beyond the farm-gate to rural communities and social wellbeing.

OA has cemented itself as a distinct market niche, one that has further ingrained, rather than significantly challenged, the power dynamics of industrial agriculture and the domination of corporate and Global North actors. Organic 3.0 represents a narrative shift against this trend, and in doing so it is seeking a means of distinguishing itself from Organic 2.0. Adopting the RA narrative seems to present that opportunity. The original coiner of the term ‘RA’ and prominent organic organisation, the Rodale Institute, has retrofitted the RA narrative within their ‘regenerative organic agriculture’ alliance and certification standard (Rodale Institute 2018). ‘Regenerative organic’ is increasingly being used as a means to distinguish between conventionalised OA, or Organic 2.0, and OA which is more aligned to the narrative shift presented by Organic 3.0 (Cabral and Sumberg 2022; Gordon et al. 2023).

Conservation agriculture

CA descended from similar concerns as OA regarding soil health and land degradation. However, rather than calling for a return to more traditional, ecologically derived methods as was the case for organic, CA instead drove the promotion of new technologies as the solution. A key trigger point for CA was the Dust Bowl Crisis of the 1930s, where traditional tilling practices implemented at an industrial scale had caused widespread soil loss and land degradation across the US and Australia (Giller et al. 2015). Calls were made for a technological solution, evolving beyond traditional tilling practices to address the impacts of soil erosion (Vogt 2007). These technologies came in the 1940s with the invention of 2,4-D, a broadleaf weed killer (Derpsch 1998), and direct drilling technology (Kassam et al. 2019). These technologies opened up the possibility of large-scale

farming without tillage, marking a significant transformation in agricultural practices (Triplett and Dick 2008).

The increased technological intensity of agriculture through no-till would become the bedrock from which some of the world’s most powerful agri-food corporations grew. The first successful experiment demonstrating the application of no-till techniques was recorded in 1951 by farmers from Dow Chemical Co. (Derpsch 1998). Dow Chemical has proceeded to become one of the world’s largest agricultural input firms. Dow’s recent merger with Dupont in 2015 created Corteva Agriscience, one of four conglomerates which jointly control over 70% of the global pesticide market (Clapp 2021). Similarly, John Deere worked with farmers in 1953 to test a drill that could plant into untilled soil (Triplett and Dick 2008). John Deere is a global leader in agricultural equipment, with a 20% market share (Chien 2021). This early involvement of agri-food corporations in the genealogy of CA is another point of difference from the OA narrative.

Demonstration farms of no-till agriculture began to crop up across the US through the 1960s, and research on minimum and no-till production was also undertaken in the UK and Europe (Derpsch 1998). Interest in no-till agriculture grew in Brazil as wealthy farmers brought the techniques from the US to stave off the economic and environmental impacts being caused by industrial scale tilling (Kassam et al. 2009). No-till spread further through Latin America to Argentina and Chile (Derpsch 1998), as global concern about soil degradation heightened, reflected in the publication of the World Soil Charter by the FAO in 1982 (Kassam et al. 2014). No-till agriculture became further institutionalised in 1985 through new farm laws introduced by the US government which recognised the role of no-tillage in meeting soil conservation requirements and the establishment of the Federation of American No-tillage Associations for Sustainable Agriculture in 1992 (Derpsch 1998).

To acknowledge farming systems with less, but not no-tillage, the terminology broadened to ‘conservation tillage’ through the 1990s. Soon after, the term became ‘conservation agriculture’ and was officially adopted by the FAO in 2001 (Kassam et al. 2009). The FAO then established the now widespread definition of CA as being based on three principles: minimum mechanical soil disturbance, permanent soil cover, and species diversification (FAO 2017).

Bolstered by support from governments and food governance organisations, and the concerns around land degradation raised in the UN’s Millennium Ecosystem Assessment, CA began to spread further across Latin America, Oceania, East Asia, North America, and Europe (Kassam et al. 2014). This was also supported by the development and increased availability of herbicide-resistant genetically modified (GM) crops in the 1990s (Giller et al. 2015), once again

demonstrating the ongoing role of agri-food corporations in CA.

It is estimated that CA is being practiced on 12.5% of global cropland, and in some regions, such as in Australia, adoption rates are as high as 90% (Kassam et al. 2019). This broadscale uptake is also potentially explained by varied interpretations of the principles of CA, with some viewing it as resource conserving and low-input agriculture, while others understand it to mean highly industrial, GM crop based agriculture (Giller et al. 2015). This latter interpretation has been bolstered by critics who argue that CA, far from being more sustainable, is further embedding negative social impacts for small-holder farmers due to its reliance on chemical inputs and heavy machinery. The power imbalances between food producers and the corporate actors who own or provide equipment and inputs for CA perpetuate socio-economic inequalities in agri-food systems (Westengen et al. 2018). They argue it is further empowering corporate dominance and exacerbating impacts from chemical pollution (Whitfield et al. 2015).

On the other hand, advocates point to the benefits minimising soil disturbance can have for reducing soil carbon loss, which could have significant benefits for climate change mitigation (Kassam et al. 2009). The prominent contribution that agriculture makes to global greenhouse gas emissions and its vulnerability to climate variability has led to increasing scrutiny of its role in mitigating and adapting to climate change (IPCC 2019). While discussion regarding the role of agriculture in climate action has been ongoing for several decades, it seems only in the build-up to COP21 in Paris in 2015 that the potential for soil carbon sequestration to mitigate climate change came into focus, emblemised with the launch of the 4 per 1000 Initiative – Soils for Food Security and Climate (Soussana et al. 2019). The notion of minimising soil disturbance, maintaining soil cover and maximising soil carbon is also common in definitions of RA. However, unlike CA which is largely focussed on cropping operations (Giller et al. 2015), RA also integrates mixed operations and livestock farming. Potentially making RA a more inclusive narrative when it comes to promoting soil health and carbon sequestration. As interest from carbon finance markets and climate governance actors in the potential for farming systems to sequester carbon and establish carbon offsets grows, this may explain the increasing focus on the RA narrative (Gewin 2021) in place of CA. Notably, RA's sudden rise in prominence occurred in the same year as the launch of the 4 per 1000 Initiative. There is also an emphasis in most definitions of RA on minimising external inputs (Newton et al. 2020), in contrast to CA. This may also be attracting those who are concerned with CA's input-heavy practices but are not willing to commit to eliminating synthetic inputs as with OA.

Sustainable intensification

Another technology-oriented sustainable agriculture narrative is SI. However, rather than being triggered by concerns regarding land and soil degradation, as with CA, SI was spurred by issues of food insecurity. While the Green Revolution succeeded in producing more food than humanity had ever grown before, the FAO's World Food Summit in 1996 concluded that a new round of intensification of agriculture was needed to adequately feed the world (Constance and Moseley 2018). Food governance actors at this time were also increasingly focussed on the notion of sustainability, following the publication of the Brundtland Report by the UN in 1987 and its concept of 'sustainable development' (Weltin et al. 2018). A compromise was therefore sought between improving the sustainability outcomes of agriculture whilst enhancing productivity (Constance and Moseley 2018).

The term 'sustainable intensification' was coined by Pretty (1997), who was researching ways to increase the productivity of smallholder agriculture in African countries. The term remained fairly unused through the early 2000s, and largely then only in relation to enhancing agricultural productivity in Africa (InterAcademy Council 2004). In 2006, the World Bank provided a definition for SI as a combination of practices such as integrated pest management, conservation farming, low external input and sustainable agriculture, OA, precision agriculture, and diversification (Constance and Moseley 2018). The term 'SI' was therefore situated in the development field as a general term to describe sustainable agricultural practices that also support the productivist paradigm of increasing food production (Loos et al. 2014).

However, this broad understanding of SI and its relative lack of prominence changed significantly in light of the global food price crisis in 2007/8 (Godfray 2015). As prices of maize tripled, wheat increased by 127 per cent and rice by 170 per cent, an estimated additional 40 million people were pushed into hunger (Mittal 2009). In reaction to concerns regarding food security, the World Trade Organisation's Doha Round on Agreement on Agriculture began to focus in on SI in light of increasing food shortages (Cardwell and Smith 2013). The Royal Society in the UK published a report advocating for SI, which it defined as "global agriculture in which yields are increased without adverse environmental impact and without the cultivation of more land" (2009, p. ix). The FAO's High-Level Expert Forum also emphasised the role of intensifying crop production and ecosystem services to help 'feed the world' in 2050 (FAO 2009a). The FAO included "SI of crop production" as a strategic objective in its *Strategic Framework 2010–2019*, along with calls to intensify fish and livestock

sectors (FAO 2009b). This sudden rise to prominence of the SI narrative among leading food governance actors gave it near instant legitimacy and centrality within sustainable agriculture debates.

Following the endorsement of SI by the FAO there was a cascade of government and scientific institution policies and reports supporting a shift to SI. It remained a key component of aid and development policy, with joint initiatives between governments and civil society driving its uptake such as the joint £70 million in funding by the UK government and the Bill & Melinda Gates Foundation for the *Strategic Collaboration Portfolio for the Sustainable Intensification of Agriculture* (Petersen and Snapp 2015). The notion of SI ‘doing more with less’ was attractive to these organisations as a means of sparing land from conversion to agriculture. Not only could food insecurity be addressed, but land-sparing would help mitigate biodiversity loss, reduce possible future carbon emissions, and potentially allow for the conversion of agricultural land back to its pre-cultivation state (Levidow 2018).

However, while the SI narrative continued to rise on the wave of corporate, government, academic, and not-for-profit support (Loos et al. 2014; Mahon et al. 2017), so too did critiques of the approach and the similarity of the productivist discourse within SI with that of industrial agriculture. SI’s focus on increased efficiency invokes the risks of a Jevon’s paradox, exacerbating rather than restraining resource consumption and ecosystem depletion (Polimeni and Polimeni 2006; Goulart et al. 2023). Furthermore, SI’s lauding of technology-based solutions for the challenges of the agri-food system did little to acknowledge the impacts a reliance on new technologies have had on farmers across the world, as they became caught on a ‘technological treadmill’ (Cochrane 1958). The central role of technology in the narrative also created space for an even greater role for agri-food corporations in production, similar to what has occurred with CA (Godfray 2015). The absence of food justice and sovereignty considerations in SI meant these power inequities would be further exacerbated (Levidow 2018). Also, concerns remained regarding land degradation due to intensive production, with its impacts on surrounding ecosystems, and the maintenance of animal welfare in intensive livestock systems (Chandra et al. 2018).

Once espoused as the pathway towards a more sustainable agri-food system (Altieri 2012), SI has in the last five or so years been removed from sustainable agriculture policies across the public and private sector. While the exact reason for this has not been established in the literature, it appears that the progressively growing view of SI as ‘business as usual’ undermined its transformative zeal. From its peak in media, government, and academic attention in 2015–16, SI seems to have fallen out of fashion (Weltin et

al. 2018). For instance, the FAO’s new *2022–31 Strategic Framework* (the Framework) has dropped the term ‘intensification’ for all production areas except aquaculture. Instead, one of the Framework’s four goals is to strive for “inclusive food and agriculture supply chains at local, regional, and global levels, ensuring resilience and sustainable agri-food systems” (FAO 2021, p. 16). Likewise, the majority of SI’s loudest supporters, including agri-food corporations, have ceased to use the narrative at all (Mahon et al. 2017; Syngenta 2021). The timing of this sudden demise is significant when considering the rapid rise to prominence of RA which has occurred almost simultaneously with SI’s decline. In the case of agri-food corporations, RA seems an increasingly preferred narrative over SI. Major agri-food corporations such as Cargill, Mars Inc., Syngenta, and Unilever are making commitments to support RA. These corporate actors are developing their own targets, programs, and even definitions (Giller et al. 2021). The motivations for these agri-food corporations in adopting the RA narrative remain underexplored in the academic literature. Though there is speculation that it is a greenwashing exercise to sell additional technologies and inputs and may also be related to using soil carbon for offsetting emissions (Wozniacka 2019; Gordon et al. 2023). Support for the RA narrative also seems to be growing in food governance institutions. The UNCCD’s *Global Land Outlook* report’s first edition did not mention the term “regenerative agriculture” at all, but included “sustainable intensification” 14 times (UNCCD 2017). The second edition includes 22 mentions of “regenerative agriculture” and only two mentions of “sustainable intensification” (UNCCD 2022). These examples indicate a change in narrative preference among powerful food governance actors. However, further inquiry into the potential decline of SI, and the integration of its principles into RA, is required to fully understand this trend.

Agroecology

As many scholars have noted (Coolsaet 2016; Rivera-Ferre 2018), the principles and practices associated with sustainable agriculture narratives can be found in traditional and indigenous cultures around the world (IAASTD 2009). These societies approached agriculture with the understanding that social and ecological outcomes are intertwined and interdependent, an idea incompatible with industrial agriculture. However, due to colonial knowledge and value politics, the origins of this mindset and the associated practices were disregarded by most sustainable agriculture narratives, including those described thus far, with the exception of AE (Altieri and Toledo 2011; Coolsaet 2016).

The term ‘agroecology’ descends from the combination of the disciplines of ecology and agronomy. As with the

genealogy of OA, advances in soil science led to a deeper understanding among European scientists around the inter-relationship between agriculture and ecology. In 1928, Russian agronomist Basil Bensin used ‘agroecology’ to describe the need to consider ecological conditions when enhancing farm production. From the 1930s–50s, gradually more calls were made to consolidate agronomy and ecology to help maximise agricultural outcomes in different ecological conditions (Wezel and Soldat 2009). In the 1960s, the acceptance of AE became more established in Western science, regarding the farm more within its social-ecological context as an agroecosystem (Francis et al. 1986). At the same time, the environment movement in the Global North and the peasant movement in the Global South began to raise concerns regarding the impacts of industrial agriculture on the environment. While in North America and Europe these concerns manifested in the rise of OA, in the Global South, Latin America in particular, there was a growing challenge to the Green Revolution by the peasant movement and a call for a return to agroecological practices used traditionally by indigenous farmers (Wezel et al. 2009). This AE movement grew through the 1980s and 1990s in Latin America, institutionalising in groups such as the Latin American Consortium of Agroecology and Development, formed in 1989 (Sarandon and Marasas 2017).

The United Nations Conference on Environment and Development in Rio de Janeiro in 1992 emphasised the impacts agriculture was having on biodiversity, in addition to growing dissatisfaction in the Global South of the social impacts of industrial production driven by the Green Revolution (Wezel and Soldat 2009). The global scale of these issues broadened the view of AE to look beyond the farm-scale agroecosystem to the agri-food system scale. Driving the consolidation of the scientific and social movement arms of AE to consider power relations in the agri-food system and issues of injustice and inequity, as well as the integration of ecology and agronomy (Francis et al. 2003).

Spurred by the growing AE movement, governments in Latin America also began to be involved. For instance, in 2006 the Bolivian government introduced legislation for the promotion of agroecological production for sustainable development (Catacora-Vargas et al. 2017). However, unlike with OA, government involvement did not include an attempt to regulate or standardise AE. There remained a principles-based focus, integrating an ecological mindset into agricultural production.

The peasant movement, in opposition to the Green Revolution and an unjust agri-food system, also continued to gain global traction. Prominent peasant organisations such as La Via Campesina advocated for AE as a key component of the food sovereignty movement, calling for “the right of peoples to healthy and culturally appropriate food produced through

ecologically sound and sustainable methods, and their right to define their own food and agriculture systems” (World Forum for Food Sovereignty 2007; International Planning Committee for Food Sovereignty 2015). Food sovereignty, and the AE narrative associated with it, explicitly challenges the dominance of corporate power, neoliberalism, and globalisation in the agri-food system. It also advocates for the rights of indigenous and small-scale farmers and traditional landholders (Chaifetz and Jagger 2014). This gives AE a strong normative point of difference to other agricultural narratives, as it places at its centre the power dynamics and diverse knowledges and cultures that contribute to global agri-food systems, geared towards a transformative agenda.

AE might have remained confined to the Global South had it not been for the publication of the *International Assessment of Agriculture, Knowledge, Science and Technology and Development* report by the World Bank in 2009 which drew international awareness to the precarity of the global agri-food system. Soon after the report was released, the EU’s Standing Committee on Agricultural Research identified AE as a potential pathway for sustainable agriculture. These publications demonstrated a stronger consciousness of AE as an alternative to industrial agriculture in the Global North (Rivera-Ferre 2018). Further recognition has come from the FAO, who hosted a series of dialogues and symposiums from 2014–2018 on AE (Anderson et al. 2021). In 2019, the FAO approved its ‘10 elements of agroecology’, a principles-based document promoting the central role of AE in a sustainable agri-food system (Barrios et al. 2020). Legislative support for agroecological farming and research has also been implemented in European nations, such as France in 2015 (Bellon and Ollivier 2018), indicating an initial process of institutionalisation of the narrative in the Global North.

While endorsement from Global North nations and institutions, and prominent food governance organisations such as the FAO, may have provided AE with a new degree of legitimacy, the AE movement has been sceptical of what could be perceived as co-option of the narrative by Global North actors. As AE aims to transform the uneven power distributions of the agri-food system, and there is debate as to whether AE should ‘scale out’, spreading its principles through farmer-to-farmer networks, or ‘scale-up’, seeking legitimacy and growth via traditional institutions and policymakers (Montenegro de Wit and Iles 2016). AE has especially pushed back against perceived attempts to co-opt the narrative by agri-food corporations, which could further sideline indigenous, Global South, and smallholder actors (Holt-Giménez and Altieri 2016; Alonso-Fradejas et al. 2020).

AE is also not without its critiques. Concerns have been raised regarding whether low-external input agriculture

based on an agroecological approach can feed the world under current consumption patterns and future nutrition transitions (Bernard and Lux 2017). Building on these concerns, Jansen (2015) also highlights the limitations of AE rejecting ‘a priori’ the large-scale farming systems and food processing supply chains that many economies, particularly in the Global North, rely upon. The focus of AE on small-scale and localised production makes it difficult for commodity farmers producing at a large-scale to find their place in the narrative.

The resistance of AE against influence or input from prominent Global North agri-food system actors and its perceived rejection of larger-scale producers and food processors may have left an opening for the rise of RA (Tuttonell et al. 2022). RA is a similarly ecologically-minded narrative, however it lacks the transformative social and political goals of AE (Gordon et al. 2021). The less radical principles of RA, its ambiguous definition, and its Global North origins could all be contributing to its rise to prominence in countries where AE is less well-known, and the favour among agri-food corporations towards RA (Wozniacka 2019; Sustainable Food Lab 2021). The favouring of RA over AE as a sustainable agriculture narrative in the Global North may not be a conscious choice by RA advocates, but it nonetheless runs the risk of undermining the progression of AE and its transformative goals.

Results: contextualising the rise of regenerative agriculture

The genealogies of these four narratives demonstrate how RA is both similar and different to the narratives explored in terms of its origins and trajectory. Comparing across OA, CA, SI, and AE helps to contextualise RA’s rise among existing narratives. It provides a significant contribution to the current literature on RA, and sustainable agriculture narratives more broadly, in terms of their geographical and social origins, social-ecological triggers, and how they are situated in agri-food system discussions in the present-day. We summarise these similarities and differences in Table 1 and explore them in more detail through this results section. The categories chosen for this comparison align with the purpose of the genealogical method to uncover the triggers of a narrative, their origins, and how they have evolved over time in response to external factors (Kearins and Hooper 2002). In keeping with the critical approach of the genealogical method (Michael 1982), we focus particularly on the elements of these narratives which relate to issues of power and their positioning in contrast to industrial agriculture.

Like OA, CA, and SI, RA has geographical origins in the Global North (O’Donoghue et al. 2022). Its founding actors are similar to OA, CA, and AE in terms of being primarily farmers and farmer groups. Though increasingly interest and support has grown from agri-food businesses as was the case for CA and SI. As with OA and CA, RA was also triggered by concerns around land degradation,

Table 1 Summary of the origins and current status of sustainable agriculture narratives

	Organic agriculture	Conservation agriculture	Sustainable intensification	Agroecology	Regenerative agriculture
Geographical origins	Europe, US and UK	USA	UK, Europe, North America	Latin America, Europe	North America, UK, Australia/NZ
Founding actors	Farmers and farmer associations	Farmers, agri-food businesses	International institutions, governments, academia, agri-food businesses	Peasant organisations, farmers, academia	Farmers
Social-ecological triggers	Urbanisation, land degradation, impacts of chemical pollution	Land degradation, development of new technologies	2008/9 food price crisis, environmental impacts of industrial agriculture	Green Revolution – social and environmental impacts	Land degradation, climate change
Challenge to industrial agriculture	Eliminating synthetic inputs, nature-based agriculture	Ensuring longevity of farm and land productivity	Prioritising environmental outcomes in agriculture	Supporting small-scale, equity oriented, nature-based agriculture	Reducing reliance on external inputs, ensuring longevity of farm and land productivity
Status	Convention-alisation has led to call for ‘Organic 3.0’	Widespread adoption but limited to cropping, criticised for input reliance and corporate domination	Losing popularity due to similarity to ‘business as usual’	Increasing adoption in food governance institutions, resisting co-option by powerful actors, limited uptake in Global North	Rapidly emerging as a dominant narrative, drawing on limitations of existing sustainable agriculture narratives

with an explicit focus on soil health (Schreefel et al. 2020), while also considering livestock systems, unlike CA (Giller et al. 2015). Also in contrast to CA, many RA practitioners call for a minimisation of external inputs. Instead advocating for restoring and working with ecological systems and cycles, similar to OA and AE (Gordon et al. 2021). Also key to RA's emergence has been the focus on soil carbon from the mid-2010s, which similarly bolstered the popularity of CA (Soussana et al. 2019). The rise to prominence of RA around 2015 also aligns with the decline in popularity of the SI narrative (Weltin et al. 2018), the publication of the call for 'Organic 3.0' (Arbenz et al. 2016), and the increasing interest in AE by the FAO (Anderson et al. 2021).

Our genealogical analysis of four sustainable agriculture narratives also indicates how their different approaches to sustainability have led to a number of contestations and overlaps, as summarised in Fig. 2, which RA has the potential to address. For instance, OA and AE both advocate for ecologically minded agriculture, with an aim to work with nature rather than against it. However, OA is in the throes of an identity crisis, with IFOAM and other actors within the narrative seeking a way to differentiate 'Organic 3.0' from the conventionalisation and scepticism associated with 'Organic 2.0' (Arbenz et al. 2017). RA, or 'regenerative organic' as a new hybrid term, is also a means for OA to distinguish between more 'conventionalised' and more

ecologically minded practices and practitioners. On the other hand, AE is seeing its legitimacy in agri-food system governance grow as international organisations such as the FAO throw their support behind it. However, its focus on radical agri-food system transformation has meant that it often remains sidelined in agri-food system and sustainability discussions, such as at COP26 (IPES-Food 2022), and its rejection of corporate co-option means powerful agri-food system actors are seeking an alternative course (Giraldo and Rosset 2018), potentially RA.

On the other hand, as shown in Fig. 2, SI and CA have approached the challenges of the agri-food system with a technology-oriented mindset, seeking to minimise environmental impacts while maximising outputs (Béné et al. 2019). This has opened the narratives up to critiques of maintaining, rather than challenging, the status-quo. Notably, the increased corporate concentration of power over agricultural inputs and their promotion of industrial agriculture (Clapp 2021). This calls into question the extent of the transformative ambitions of these narratives, which has led to a rise in scepticism around CA and a potential decline in relevance for SI. The former's focus on cropping systems has also limited its scope in terms of supporting the transformation to more sustainable practices across other agriculture sectors (Giller et al. 2015). RA builds on many of the principles of CA, whilst also being applicable to a broader set of

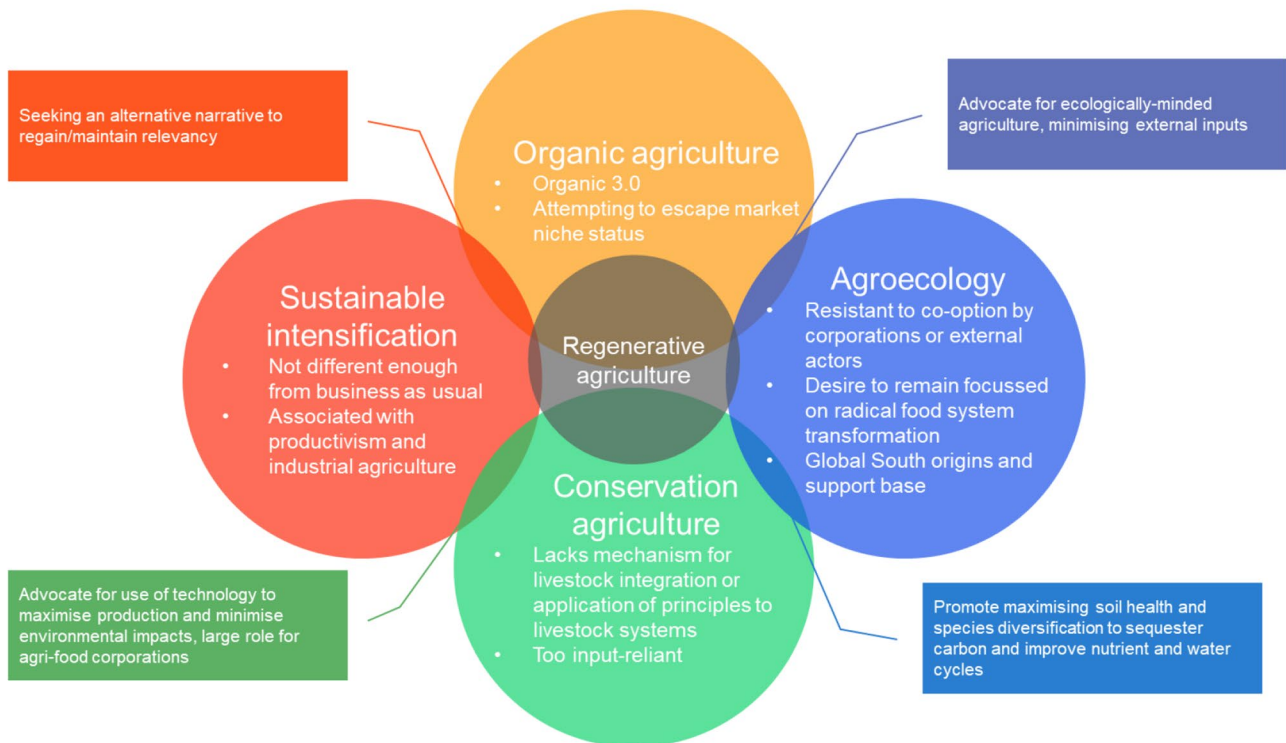


Fig. 2 The current challenges for sustainable agriculture narratives, their overlaps, and the potential gap through which regenerative agriculture has emerged

agriculture sectors. The term ‘regenerative’ is also opaque and undefined (Newton et al. 2020), enabling a comfortable space to align to for agri-food system actors who are seeking an alternative narrative, from for instance, SI.

Discussion: implications of the rise of regenerative agriculture for agri-food system transformation

Sustainable agricultural production is being contested by competing and complementary narratives that are supported by a range of individual, community, government, and corporate actors. Considering the urgency for agri-food system transformation, the growing RA narrative needs to be understood in terms of its approach to this transformation. In this paper we utilised the genealogical method to understand how sustainable agriculture narratives have evolved and contextualise the rise of RA. Here we build on this analysis to explore the transformative potential of these sustainable agriculture narratives, including RA, using the framework developed by Scoones et al. (2020). We demonstrate how RA largely reflects the approach to transformation of existing Global North narratives, and how all narratives but AE lack sufficient recognition of structural challenges that are inhibiting a transformation to a sustainable agri-food system. We then consider the potential benefits of narrative pluralism as a pathway to support agri-food systems transformations.

In exploring how these sustainable agriculture narratives align with Scoones et al.’s (2020) categories of structural, systemic, and enabling approaches, it becomes again clear that overlaps and differences exist between them (see Table 2). SI and CA are distinct among the narratives explored in this analysis with respect to their focus on techno-scientific solutions for sustainable agriculture. Both therefore reflect a systemic approach in their focus on a particular element of the agri-food system, in this case the conservation of soil and unfarmed land. But in so doing they diminish the role of politics and power asymmetries (Godfray 2015; Whitfield et al. 2015) that emerge in techno-oriented pathways (Scoones et al. 2020). In particular, these narratives are silent on the prominent role of agri-food corporations which

create power imbalances in agricultural input and distribution systems (Clapp 2021). There are elements within the RA narrative that share this systemic approach with SI and CA. In particular, the advocacy within RA for minimum and no-till cropping (Newton et al. 2020), and the prominence of holistic grazing advocates in RA (Giller et al. 2021). Likewise, OA’s focus on non-synthetic inputs as a key element of sustainable agri-food system transformation, particularly under Organic 2.0 (Arbenz et al. 2017), means that it also partially aligns with the systemic approach.

Secondly, of the narratives we have analysed, four have factors that align with an enabling approach which focuses on empowering individuals and communities to take action in transformations (Scoones et al. 2020). OA, CA, AE, and RA all originated from farmer actors and have provided a consistent role for farmer voices and action within their narratives. These narratives have helped to drive awareness of sustainable agriculture through supporting individual farmer action, challenging the dominance of industrial agriculture practices and technologies, and providing a unifying narrative through which to collectivise and build momentum.

However, as reflected in broader transformations debates (Cretney and Bond 2014; Blythe et al. 2018) what enabling approaches must also acknowledge is that power dynamics can impact how inclusive a transformation might be. Of these enabling approach narratives, the three which have arisen from the Global North; OA, CA, and RA; lack a targeted consideration of power inequities or issues of justice and have permitted significant influence of corporations among other powerful food system actors in their development. While there are actors within the OA and RA narratives, particularly Black, Latinx, Asian, and indigenous practitioners (Carlisle 2022) who argue for more radical social change, their perspectives remain marginalised (Gordon et al. 2023). AE is the only one of these narratives which fulfils entirely the categorisation of an enabling approach as it explicitly exposes the required shifts in power dynamics to support alternative agri-food systems. This also means that AE is the only narrative which explicitly invokes a structural approach to transformation, as it challenges the ideological and political underpinnings of the agri-food system (Wezel et al. 2009). Yet this structural focus of AE creates a direct challenge to the larger production scales and

Table 2 A comparison of how each of the sustainable agriculture narratives align with the transformation approaches of Scoones et al. (2020)

Legend:

✓ Aligns with approach

~ Partially aligns

	Structural approach Changing the political, economic, and social foundations of a system	Systemic approach Targeting specific system elements for change	Enabling approach Empowering individuals and communities to take action
Organic agriculture		~	~
Conservation agriculture		✓	~
Sustainable intensification		✓	
Agroecology	✓		✓
Regenerative agriculture		~	~

commercial supply chains that many farmers and communities rely upon (Jansen 2015). This could lead to tensions in achieving equitable transformations as some local food systems have been designed for, and are supported by, the large-scale, export-oriented food commodity markets that AE seeks to disassemble.

Some scholars have proposed RA instead as an overarching and unifying narrative, inclusive of other narratives such as AE and therefore embedding its transformative elements (Seymour and Connelly 2022; O'Donoghue et al. 2022). However, there are inherent issues in considering RA as the umbrella term for sustainable agriculture narratives. While RA may present a path forward for narratives seeking to maintain relevance or recover from past critiques (such as with OA, CA, and SI), there are ongoing contestations among these narratives, and within RA itself (Gordon et al. 2023), as to whether agri-food system transformation can be achieved through techno-scientific or social-ecological means (Béné et al. 2019). There are also questions regarding who is involved in the sustainable agri-food system transformation and how, which the current state of RA thinking and practices fails to resolve in its relative silence regarding social and power dynamics.

There is also a risk that RA might perpetuate barriers to agri-food system transformation as opposed to challenging them. For instance, RA's Global North origins and the increasing role of corporate actors in the narrative's development (Gordon et al. 2023). This is reminiscent of other sustainable agriculture narratives, such as SI and CA, whose systemic approaches to transformation have been dismissed as being business-as-usual. RA's lack of acknowledgment of structural considerations such as issues of equity and justice in the agri-food system are also in contrast with AE (IPES-Food 2022). The rise of RA, another narrative from the Global North, may therefore contribute to crowding out Global South voices such as the AE narrative, and their calls for improved social, as well as ecological, outcomes in the agri-food system. Doing so would perpetuate an ongoing cycle of oppression of marginalised voices in agri-food system institutions and processes (Winslow 2017). This lack of acknowledgement of the key role that diverse knowledges and voices play in achieving transformations and the significance of power and political dynamics (Blythe et al. 2018; Scoones et al. 2020) also inhibits RA's unifying abilities and transformative potential.

However, if currently marginalised voices in the RA narrative, who are calling for more radical social action, are given a more prominent and equitable platform, RA may prove a stepping-stone for mainstream farmers towards the ideas of justice and equity promoted by AE (Gosnell 2021; Gordon et al. 2023). But given the current socio-economic climate within the agri-food system which supports the

ongoing dominance of corporate and Global North actors (Clapp 2021), this pathway seems unlikely without strategic intervention to undermine corporate co-option of the RA narrative and create space for more diverse voices and knowledges (Gordon et al. 2023). In addition, the rise to prominence of RA and the gaps it addresses does not necessarily mean that the other sustainable agriculture narratives described here are no longer relevant, or that there must be one unifying narrative to the exclusion of all others. Scoones et al. (2020), emphasise the importance of a plurality of pathways for transformations, that "no matter how specific the context, there is never only one relevant, viable path" (2020, p. 70). A plurality of sustainable agriculture narratives could provide the opportunity for an inclusive dialogue which gives space for a variety of perspectives, experiences, knowledges and actors in the agri-food system (Kassam and Kassam 2020; Turnhout et al. 2021).

This plurality would also reflect the diversity of the world's agri-food system in which there are over 570 million farms, of which 72% are smaller than one hectare, but with the largest being the size of small countries (Lowder et al. 2016). Diversity in the agri-food system is also depleting as a result of industrial agriculture. Of the more than 6,000 different plant species cultivated for food, just nine contribute around 66% of total crop production, and 26% of the world's livestock breeds are believed to be at risk of extinction (Jones et al. 2021). A plurality of sustainable agriculture narratives could therefore help support the reinvigoration of biocultural diversity in food systems and a greater range of production systems, enhancing social and ecological outcomes (Argumedo et al. 2021; Hertel et al. 2021). As the issues and solutions for sustainable agriculture are inherently place-based (Loring 2022), the more locally grounded and culturally appropriate sustainable agriculture narratives are, the more likely we can achieve an agri-food system transformation towards sustainability (Gosnell 2021; Sumberg and Giller 2022). Therefore, in appropriate social-ecological contexts, RA could present a viable and more sustainable alternative to industrial agriculture (Tittonell et al. 2022). However, the politics that a plurality of perspectives brings cannot be ignored (Scoones et al. 2020), pointing towards a need for ongoing resistance against power dynamics that might further neglect marginalised voices and undermine the benefits that knowledge diversity would bring to agri-food system transformation.

The outcomes of our exploration into the genealogies of sustainable agriculture narratives and RA therefore present a platform for future enquiry into this emerging narrative. There remains an ongoing research agenda to explore further the contestations within the RA narrative and the motivations of actors who are promoting particular interpretations of RA, particularly within the corporate sector. There is also

a need to determine whether RA actors are conscious of and acting upon its critiques regarding corporate co-option and lack of a justice and equity focus, and what interventions could be undertaken to address these trends. Likewise, other potentially relevant narratives such as biodynamic agriculture, permaculture, or climate-smart agriculture and their genealogies and transformational approaches could be explored to further contextualise RA. Further work to distinguish the geo-political and social-ecological contours of sustainable agriculture narratives could also assist in better embedding and encouraging transformative narratives within appropriate local contexts and fostering productive plurality in sustainable agriculture.

Conclusion

The genealogies of sustainable agriculture narratives have descended from shared concerns regarding the impacts industrial agriculture has on society and the environment. Bolstered by the cultural force of the environment movement, injustices caused by the Green Revolution, and concerns about food security, they have diffused across the globe, involving increasingly broader sets of actors and advocates. Concerns around productivity, the development of new technologies, and increasing awareness of the power inequities of the agri-food system have added further complexity to the sustainable agriculture debate. The threats of climate change and biodiversity loss have heightened the urgency for change.

By exploring the genealogies of prominent sustainable agriculture narratives; OA, CA, SI, and AE; we have shown how these narratives have evolved to provide critical context for the rise of RA. The gaps left by the contestations within and between these narratives has helped facilitate RA to quickly come into prominence. RA helps to bolster the drive for ecologically minded agriculture, supporting enabling approaches to agri-food system transformation, and provides the opportunity to redefine narratives which are losing relevance. However, given the contestations that exist, it is difficult to see how RA can be an ‘umbrella term’ for the agri-food systems transformation.

Our analysis indicates that RA’s Global North origins and lack of recognition of inequities in the agri-food system risks helping to drown out, rather than empower, the marginalised voices represented by enabling and structurally transformative narratives such as AE. The growing corporate interest in RA may also indicate that it is simply the new narrative to cover up ‘business as usual’, just as SI and CA were before it. Nonetheless, the increasing number of sustainable agriculture narratives, including RA, with their more holistic and ambitious agendas may indicate a turning

of the tide against industrial agriculture. This plurality of narratives could help to navigate the transformation towards a sustainable agri-food system, but only if equity, justice, and diversity are central to this transformation pathway.

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