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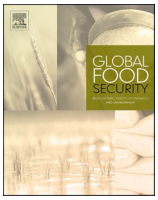

What is 'conventional' agriculture?

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ABSTRACT

Agriculture faces many challenges. In both public discourse and the scientific literature debates about the future are increasing framed in terms of 'alternative' versus 'conventional' agriculture. In this paper we critically examine this framing, and seek to understand how the term conventional has been and is being used. We argue that the category conventional agriculture has little analytical purchase, and that its use is part of a strategy of homogenising, normalising and othering. In effect, the term conventional agriculture has been weaponised. This helps explain the sterile and unproductive nature of much debate about future agricultures. A more productive approach is to focus on where and how different farming systems can contribute to the sustainability of agriculture.

1. Introduction

Imagine a world without adjectives, where traditional agriculture, small-scale agriculture, mechanised agriculture, intensive agriculture, commercial agriculture and industrial agriculture all become simply agriculture. The disappearance of adjectives would be catastrophic for our ability to describe and analyse agriculture, as well as for efforts to advocate for change within agriculture. Imagine a world where sustainable agriculture, climate-smart agriculture, organic agriculture and regenerative agriculture are all reduced to agriculture.

Agriculture and food systems undoubtedly face a variety of serious challenges, from climate change and various forms of environmental degradation, through to the health and welfare of livestock, agricultural workers and farmers. To address these a number of strategies (sustainable intensification, climate-smart agriculture, agroecology), are actively promoted, along with specific combinations of practices including the System of Rice Intensification (SRI), Holistic Resource Management, conservation agriculture, organic agriculture and regenerative agriculture.

In this on-going struggle over the future direction of agriculture, adjectives are in the front line: they clearly matter, and deserve our close attention. For example, in both the scientific literature and more popular texts, the adjective 'conventional' has been increasingly linked to the noun 'agriculture'. The resulting term – conventional agriculture – is used in three ways.

First, in experimental or analytical contexts, conventional agriculture is used to refer to a counterpoise, comparator or 'control treatment' against which alternative agricultures or practices can be tested, compared and contrasted. Here common comparisons include conservation agriculture versus conventional agriculture, no-till agriculture versus conventional agriculture, and organic agriculture (or farming, farms or practices) versus conventional agriculture (or farming, farms or practices).

Second, the term conventional agriculture is used in the discursive construction of the case for alternative approaches to agriculture (i.e. alternative to conventional agriculture) (Giller et al., 2017). When used in this way, conventional agriculture – like the term industrial agriculture – often carries with it a set of implicit assumptions or explicit associations (e.g. Rosati et al., 2020). These include being innately unsustainable, environmentally destructive, greenhouse gas producing, highly mechanised, large-scale, dominated by corporate interests, bad for rural communities, unaccountable and so on. These associations can be particularly important in the discursive construction of the case for radical or 'transformative' change.

Third, in attempting define and legitimise different or new agricultural practices or systems – such as conservation agriculture or regenerative agriculture – some protagonists of alternative agricultures use the term conventional agriculture in a way that is both value-driven and highly normative. Here conventional agriculture is portrayed as homogeneous, strongly conservative, static and old-fashioned, and therefore ripe for displacement.

Whether the adjective conventional is linked to agriculture to create

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analytical comparators, as a discursive device, or to promote a normative view of particular systems or practices, conventional agriculture is seldom conceptualised, probed, problematised or defined. This is in stark contrast with the fact that some alternative agricultures (such as organic agriculture), with which conventional agriculture is often compared, are very strictly defined and codified (including in law).

In this paper we argue that the notion of conventional agriculture is deeply embedded in discourses that promote alternative agricultures as well as the scientific literature. However, in homogenising, typifying and normalising the vast majority of the world's agriculture – i.e. all that which sits outside any of the self-described alternatives – the term conventional agriculture becomes devoid of meaning, and its continued uncritical use hinders debate about the future of agriculture.

The paper proceeds as follows. The next section looks briefly at the history of efforts to name and categorise different forms of agriculture. Following this, five meanings of the word conventional are explored. The next section documents historical shifts in the use of and meanings associated with the term conventional agriculture. This is followed by a discussion of how the term conventional agriculture is abused in current debates and discourse. A concluding section synthesises our findings.

2. Naming and categorising agriculture

There is a long and rich academic literature, from fields including economic geography, agricultural economics, rural development planning and agronomy, that seeks to classify, categorise and name the diversity of types, systems and forms of agriculture. Motivated by different objectives, and using a variety of methodologies, classifications have been undertaken at a range of spatial scales including the world, the tropics, Africa, northern Ghana, Europe and so on (Table 1). For example, Grigg's (1974) classification of world agricultural systems uses a geographical and descriptive classification; Ruthenberg (1976), classifies different agricultures in the tropics on the basis of their land use intensity; Dixon et al. (2001) use a cropping systems perspective to classify agriculture in the developing world; and Kismányoky et al. (2016) use land use to classify agriculture in Europe and China. Hierarchical classification systems are the norm: e.g. Ruthenberg (1976) lists four sub-types of fallow systems: bush-fallow systems, savanna-fallow systems, fallow systems and unregulated ley systems in semi-arid areas, and unregulated ley systems in high-altitude areas. Estimates of the extent, distribution and/or importance of the different categories are usually provided (e.g. Dixon et al. (2001) estimate that the 'pastoral' and 'forest-based' farming systems cover 14% and 11% of the land area of SSA respectively), and the existence of significant diversity within such systems is often noted.

It is striking that neither the notion of 'conventional' agriculture nor anything akin to it figures in any of these efforts.

Table 1
Selected agriculture classification systems.

Author(s)	Area covered	Highest level categories
Grigg (1974)	The world	• Shifting cultivation • Wet-rice cultivation in Asia • Pastoral nomadism • Mediterranean agriculture • Mixed farming in Western Europe and North America • Dairying • Plantations • Ranching • Large-scale grain production
Ruthenberg (1976)	The tropics	• Shifting cultivation systems • Fallow Systems • Ley systems • Systems with permanent upland cultivation • Systems with arable irrigation farming • Systems with perennial crops • Grazing systems
Dixon et al. (2001)	sub-Saharan Africa	• Maize mixed farming system • Tree crop farming system • Irrigated farming system • Cereal-root crop mixed farming system • Agro-pastoral Millet/Sorghum farming system
Kismányoky et al. (2016)	Europe and China	• Arable • Permanent crops • Pastures • Livestock systems

3. Five meanings of 'conventional'

The Oxford English Dictionary[1] and the Merriam Webster Dictionary[2] suggest that the word conventional can have five different meanings. Thus, something might be described as conventional when it relates to or suggests:

M1 A convention, assembly or public meeting (e.g. a conventional religious movement)
M2 A convention, formal compact or agreement (e.g. conventional obligations, as distinct from natural or legal obligations)
M3 A general agreement or understanding (e.g. conventional knowledge); an established social convention (e.g. conventional morality)
M4 That something is ordinary or commonplace (e.g. conventional medicines); or done in accordance with accepted artificial standards of conduct or taste, and thus not natural, original, individual or spontaneous (e.g. conventional behaviour)
M5 That something falls outside a particular clearly circumscribed category (e.g. conventional weapons or conventional warfare, as distinct from nuclear weapons or nuclear warfare)

Meanings 1 and 2 (M1 and M2) are not particularly relevant to the discussion of conventional agriculture. However, M3 – M5 help shed light on the term, with conventional agriculture potentially reflecting: a general agreement or understanding about how farming can or should be done (M3); ordinary or commonplace agriculture (M4); and/or, agriculture that falls outside a clearly circumscribed category (M5).

Table 2 maps these meanings to the three uses of the term conventional agriculture introduced earlier. The use of conventional agriculture to signify an analytical comparator or control, against which an alternative is compared, draws most directly on M5. Here conventional might refer to the use of a practice like tillage, which is generally considered to sit outside the category conservation agriculture (FAO, 2016), or if used at a farm systems level, it might refer to farms that have

Table 2
Meanings of the word conventional and uses of the term conventional agriculture.

	Meaning		
Use	M3 (general agreement or understanding)	M4 (ordinary or commonplace)	M5 (outside circumscribed category)
Analytical comparator	Not important	Not important	**Important**
Discursive device	**Important**	**Important**	**Important**
To homogenise & normalise	**Important**	**Important**	**Important**

[1] https://www.oed.com/.
[2] https://www.merriam-webster.com/.

not met the standards for organic certification (Asigbaase et al., 2021; Berardi, 1978). In contrast, all three meanings are mobilised when conventional agriculture is used as a discursive device or to homogenise, typify and normalise agriculture that is not alternative.

4. Use of conventional agriculture

4.1. Increasing use

The adjective 'conventional' has been associated with the noun 'agriculture' since the early part of the 20th century. Fig. 1, generated using Ngram Viewer,[3] shows the normalised frequency of the term 'conventional agriculture' in the Google Books 'English' corpus from 1920 through 2019. This corpus includes a variety of materials including books, some journal articles, extension publications and others. The figure suggests that the frequency of its appearance began to increase significantly in the 1960s, around the same time as the environmental movement started to gain public traction among the public in the USA (Rachel Carson's landmark book *Silent Spring* was published in 1962).

A more direct view into the academic literature is provided by a Web of Science[4] 'topic' search (covering articles' title, abstract and key words). This search shows a very rapid increase in the number of journal articles using the term 'conventional agriculture' after the year 2000. In addition, these articles increase as a percentage of all articles identified by a topic search on 'agriculture' (Fig. 2). As of May 2021, nearly 1000 publications were identified that referred to conventional agriculture (more than 70% of these were published in the last 10 years), and together these have been cited some 28,000 times. It seems fair to conclude that conventional agriculture has become embedded in the academic literature.

4.2. Shifting meaning

In the 1950s and 1960s, conventional agriculture was most often used to refer to everyday agriculture, or the agriculture of the (then) present (e.g. Brown, 1967; California Institute of Technology, 1956). The term was neither defined or explained, and there was generally no mention of non-conventional agriculture. Where a distinction was made it was to contrast conventional agriculture with emerging technologies like hydroponics. To a limited extent the term is still used in this way (e.g. Cifuentes-Torres et al., 2021). Use of conventional during this time period seems to draw on M4 – representing agriculture that is ordinary or commonplace.

By the 1970s and 1980s the term was increasingly used to identify, and to some extent characterise, agriculture and farming practices that could then be compared to organic. Oelhaf (1978), for example, focused on the differences between conventional (which he also refers to as 'modern') and organic agriculture in the US, and placed particular emphasis on substitution of capital for labour, the size of farm units, and the management of soil fertility and crop pests. Significantly, he insisted that organic agriculture must be understood as a whole system.

Berardi (1978) compared energy production costs for wheat using organic ('low-energy') and conventional ('high-energy') 'farming methods'. Ten conventional farms were compared with ten organic farms. The conventional farms were 'selected from a larger listing of farmers obtained from the New York State Farm Cost Account Project. According to the project director, these farms were representative of the better managed farms in New York State […] They were commercial, full-time farm businesses' (p.368). The organic farms were 'selected from the Rodale Press list of organic growers' and were the only farmers who 'qualified in 1974–1975 as commercial, organic wheat growers in New York and Pennsylvania' (p.368). In this case, the use of conventional reflects a shift toward the sense of M5, as agriculture that falls outside a clearly circumscribed category. The fact that there were only three organic farms in all of New York State within this clearly circumscribed category, out of a total of 31,728 farms with sales of over US$2500 in 1974 (U. S. Department of Commerce, 1977), suggests 'othering' on a colossal scale, and the potential power of the M5 meaning of conventional.

Kiley-Worthington (1981) represents an important step in weaponising the term conventional agriculture. The paper develops the notion of 'ecological' agriculture by contrasting it with 'Western conventional high input agriculture'. Seven 'essential requirements' of ecological agriculture are identified: 'It must be self-sustaining, including in energy […]. It must be diversified […]. The net yield per unit area must be high. […] It must normally be small size […]. The farm must be economically viable […]. The farm should process most of its products […]. It must be both aesthetically and ethically acceptable' (p.349). The clear implication is that conventional agriculture misses the mark in all of these areas. Kiley-Worthington not only uses conventional to mean all agriculture that falls outside her tightly circumscribed vision of 'ecological' (M5), she also characterised conventional agriculture (in the M4 sense of ordinary or commonplace) as failing on multiple fronts.

Pimentel et al. (1983), in their 'assessment of the energy efficiency, yield performance, and labor requirements of organic agricultural technologies compared with conventional agricultural production' (p.360), also take an instrumental approach and construct conventional agriculture as a somewhat obscure foil. Thus, organic farming is defined as 'a production system that avoids or excludes the use of synthetic chemical fertilizers, pesticides, and growth regulators' (p.360), but no attempt is made to characterise the comparator, conventional agriculture. The reader is left to conclude that conventional farming is simply everything that is *not* organic (i.e. M5). To their credit the authors acknowledge the dilemma posed by diversity within these categories by noting that 'Both organic and conventional farmers employ a range of farming techniques, including choices in crops, types of tillage, crop diversity, and presence or absence of livestock' (p.360).

In the intervening years the academic literature referring to conventional agriculture has grown significantly, and it is instructive to look at some of the most widely cited papers within this literature (based on a Web of Science 'topic' search for 'conventional agriculture'). Seufert et al. (2012), cited 807 times, present a meta-analysis of organic – conventional yield comparison studies. An attempt is made to conceptualise or define conventional agricultural systems, with three types being identified from the studies reviewed: 'high-input' (described as 'high input commercial systems'), 'low-input' (described as 'any kind of low-input, integrated commercial systems using conventional inputs but at low rates', and 'subsistence' (see Seufert et al., Supplementary Information p.10[5]). Like other meta-analyses, the authors are constrained by how and at what level of detail the individual studies being analysed define conventional agriculture.

This challenge is acknowledged in the review by Hole et al. (2005) (cited 798 times) of studies that assess the relative impacts of organic and conventional farming on biodiversity. Their response, in line with M5, is to equate conventional agriculture with *not* organic plus reliance on external inputs:

> 'The term "conventional" is widely applied to a range of modern management systems and as such, its exact meaning varies across studies. We take "conventional" to mean any non-organic farming system, characteristic of a particular farming region where a study took place, and that relies on external inputs to achieve high yields' (p.114).

[3] https://books.google.com/ngrams.

[4] https://clarivate.com/webofsciencegroup/solutions/web-of-science/.

[5] https://static-content.springer.com/esm/art%3A10.1038%2Fnature11069/MediaObjects/41586_2012_BFnature11069_MOESM71_ESM.pdf.

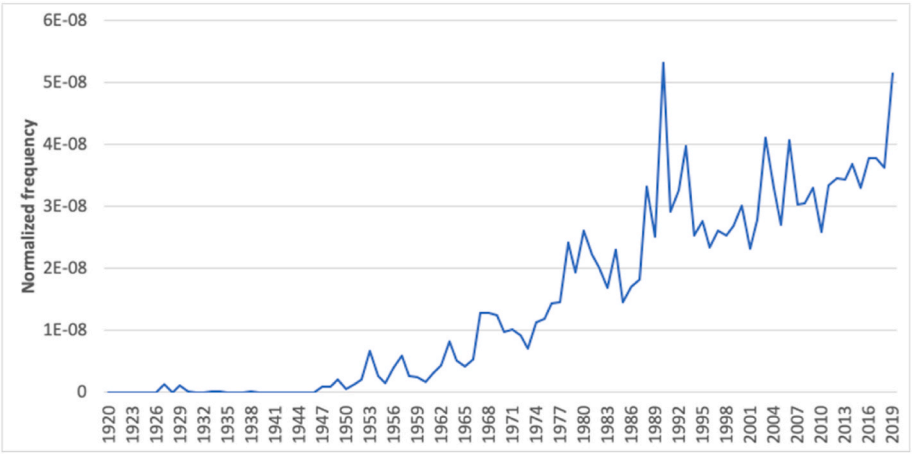

Fig. 1. Results from search of 'conventional agriculture' on Ngram Viewer (as of December 12, 2021).

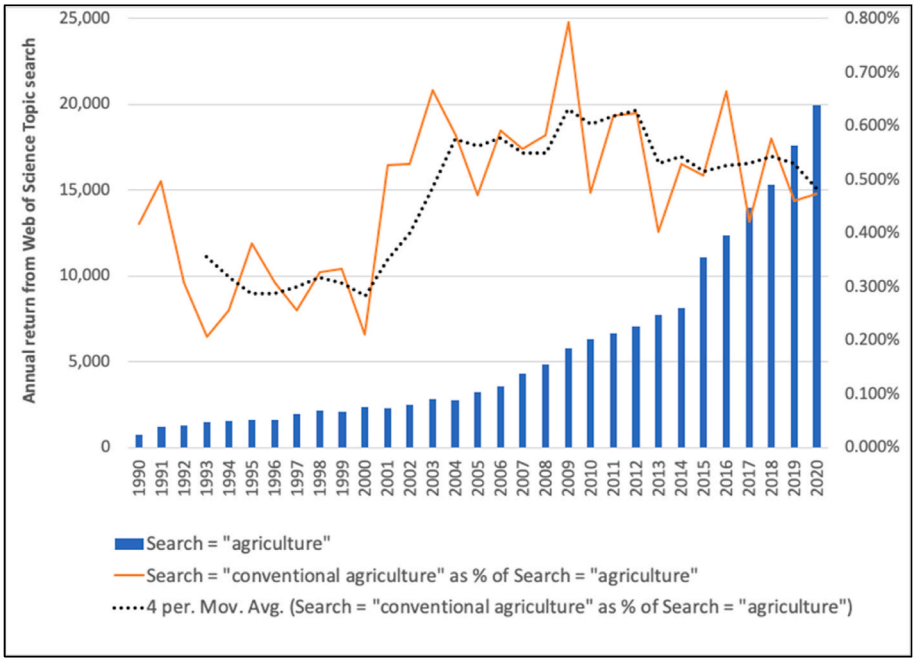

Fig. 2. Web of Science topic search results for agriculture and conventional agriculture.

The combination of *not* organic plus reliance on external inputs is important because it leaves aside systems that are *not* organic but also not reliant on external inputs. This is perhaps a nod to agriculture that has been referred to as 'organic by default' (e.g. Bolwig et al., 2009).

Pimentel et al. (2005) (cited 628 times) report data from the Rodale Institute's long-term experiments which were designed to compare organic and conventional systems. The conventional cropping system is described as being 'based on synthetic fertilizer and herbicide use' (and therefore *not* organic – M5), and because of crop choice and rotation, 'reflects commercial conventional operations in the region and throughout the Midwest (more than 40 million ha are in this production system in North America)' (p.575) (M4). The claim that the system is conventional is also linked to the fact that fertiliser and pesticide applications for corn and soybeans followed recommendations by the Pennsylvania State University Cooperative Extension (i.e. M4).

de Ponti et al. (2012) (cited 406 times) compiled and analysed a meta-dataset of 362 published organic–conventional comparative crop yields. Here, in line with M5, the use of 'chemical inputs' is the defining feature:

> 'In this paper "conventional agriculture" generally refers to any agricultural system in which chemical inputs are used. Conventional agriculture may at present have high external inputs in industrialized countries and low external inputs in developing countries, but it does not rule out any external inputs that may be beneficial for its productivity' (p.2).

Finally, a paper by Reganold and Wachter (2016) (cited 362 times) used the term conventional agriculture extensively, but made no attempt to say what it meant. The fact that the term was used in the papers they reviewed seems to have been sufficient.

We now turn to some of the most recently published papers identified through the 'conventional agriculture' search. In a new 'Review and Analysis' piece in the *Soil Science Society of America Journal*, Al-Kaisi and Lal (2021) follow in the footsteps of Kiley-Worthington (1981) in

weaponising the term conventional agriculture: they extoll the virtues of 'regenerative' agriculture by comparing it with 'conventional' agriculture. Their portrayal of conventional agriculture has two aspects: its characteristics and its negative effects. Highlighted characteristics include:

- 'open systems, where the main purpose is the production of food (i.e., grain and vegetables), which is eventually removed from the farm'
- an imbalance between input and output because 'along with the food products, soil, water, nutrients, and energy are also removed'
- heavy reliance upon 'high input of synthetic fertilisers and other agricultural chemicals, intensive tillage, and mono/limited rotation cropping systems'
- 'high production input costs that include machinery, labor, chemicals, fuel, and tillage equipment' which 'are often not considered by producers, and the focus is on yield only'. This, the authors suggest, gives a 'sense that a conventional system leads to over performance as compared to that of the [regenerative agriculture] system'

The negative effects of conventional systems and practices are described as:

- 'soil degradation, physically and biologically, where a significant amount of soil organic carbon (SOC) has been depleted with strong adverse impacts on soil functionality […] the dwindling of soil biodiversity' […] and a decline in soil health'
- stressing of the soil ecosystem that 'drives declines in SOC and eventually degrades the soil's capacity to overcome climate disturbances, such as drought and severe and frequent wet events', with these events becoming more frequent and having 'a devastating impact on crop productivity' (p.1814)

This kind of characterisation suggests a desire to homogenise, typify and normalise all forms of agriculture that the authors do not consider to be 'regenerative'. The resulting decontextualised and normative portrayal of conventional agriculture provides an easy target for critics.

Sanaullah et al. (2020) review the impacts of conventional and conservation agriculture on terrestrial ecosystem functions including soil health, carbon sequestration and greenhouse gas emissions, cropping patterns and weed dynamics, and environmental degradation. Conventional agriculture systems are described as being 'based on intensive use of agrochemicals to maximize agricultural productions [sic]', and encompassing 'intensive tillage to manipulate the soil physical properties and to control weeds, mono-cropping, and limited recycling of materials'. The suggestion seems to be that just 28 words are adequate or a 'global review' to pigeon-hole (homogenise, typify and normalise) all agriculture covered that is not 'conservation' agriculture. Here it is worth remembering that the homogenised, normalised agricultural that is thus portrayed was estimated to account for 87.5% of global cropland in 2015/16 (Kassam et al., 2019). It is also ironic that the largest areas of conservation agriculture in the world are found in the Americas, Australia and South Africa on (very) large-scale farms employing genetically modified, herbicide resistant varieties of canola, maize and soybean, combined with large inputs of herbicide and fertiliser. This is hidden in the discussion and promotion of conservation agriculture.

Yet another example of an attempt to weaponise the term conventional agriculture is provided by Rosati et al. (2020). According to these authors, 'It is widely acknowledged that the conventional agricultural model, originating from the green revolution and based on crop specialization and on massive use of external inputs and fossil energy, is facing a deep crisis' (p.805). They go on to state that it is 'considered unsustainable from social and environmental points of view and incapable of solving great challenges to sustainability, such as the decline of natural resources and biodiversity, climate change, food security and dependence on fossil energy' (p.806). Even David Connor, a consistent and informed critic of the claims made by proponents of organic agriculture, seems to use the term conventional agriculture uncritically, without comment or explanation (Connor, 2021).

Two additional observations deserve mention. First, it is ironic that in the light of M2, which suggests a formal agreement or convention, organic agriculture, with its very detailed certification codes and rules, could legitimately be considered 'conventional', and perhaps much more conventional than many other kinds of agriculture. Using similar logic, other non-organic schemes, like the UK 'Red Tractor' scheme with its 'certified standards'[6] could also be considered 'conventional' under M2, and presumably there are many other examples. Where does it leave us if both organic and *not* organic (such as Red Tractor) can legitimately be labelled as conventional? Second, Gordon et al. (2021) note the irony in the fact that relative to the length of time that humans have practiced agriculture, 'conventional approaches' (i.e. 'industrial agriculture' involving the use of chemicals and synthetic fertilisers) 'are still new on the agricultural scene' (p.2).

5. The abuse of 'conventional agriculture'

5.1. In experimental and analytical contexts

There are important differences in how and to what degree alternative agricultures are defined and specified. Organic agriculture, for example, is highly codified, with The Soil Association (2021) identifying 14 'general principles of organic production' upon which its certification scheme is based. Ten of these focus on 'positive' but difficult to specify actions (e.g. 'produce food of high quality'; 'work within natural systems and cycles at all levels'; 'to foster biodiversity'). The remaining four specify what *cannot be done* (i.e. no use of external inputs that are not 'organic, natural or naturally-derived'; no [use] of 'chemically synthesised inputs' where alternative management practices exist or natural or organic inputs are available; no use of 'soluble mineral fertilisers'; and no [use of] 'GMOs and products derived from GMOs with the exception of veterinary medical products'). These or similar specifications are the basis of the organic certification process, and in some jurisdictions are written into law.

In contrast, alternatives like conservation agriculture, the System of Rice Intensification and regenerative agriculture are often described in terms of a limited number of 'principles' (Table 3). The suggestion is that

Table 3
Principles of three alternative agricultures.

Alternative agriculture	Principles
Conservation Agriculture (CA)	• Minimal soil disturbance • Permanent residue soil cover • Crop rotations Source: (FAO, 2016; Hobbs et al., 2008)
System of Rice Intensification (SRI)	• Early, quick and healthy plant establishment • Reduced plant density • Improved soil conditions through enrichment with organic matter • Reduced and controlled water application Source: (http://sri.ciifad.cornell.edu/aboutsri/methods/index.html, also see Uphoff et al. (2011))
Regenerative agriculture	• Don't disturb the soil • Keep the soil surface covered • Keep living roots in the soil • Grow a diverse range of crops • Bring grazing animals back to the land Source: (https://groundswellag.com/principles-of-regenerative-agriculture/)

[6] https://redtractor.org.uk/.

farmers should operationalise or adapt these principles to suit their specific circumstances. This approach has given rise to debates about what should 'count' as conservation agriculture or SRI and whether all principles need to be followed. Thierfelder et al. (2016), for example, compare a 'conventional control treatment' with two 'manual systems of conservation agriculture' (i.e. two manual seeding methods), but the description of the conservation agriculture treatments makes no mention of soil cover or residue management. Some have gone so far as to suggest that what really matters is not the specific practices, but whether the farmer thinks s/he is practicing conservation agriculture or SRI (see e.g. Uphoff et al., 2011).

The difference between these approaches is extremely important when it comes to constructing comparisons or controls for experimental work. While it may seem relatively straightforward to separate organic from conventional farmers based on, for example, 'no use of soluble mineral fertilisers', the same cannot be said for 'minimal soil disturbance' or 'permanent residue cover' in the case of conservation agriculture. How minimal is minimal? What counts as permanent?

The recognition of the need for local adaptation is both important and pragmatic, but it complicates any attempt to investigate the performance or potential advantages of these alternatives. For this reason, there has been a tendency to reduce multi-faceted alternatives to a single 'headline principle' – e.g. in the case of conservation agriculture, no use of the mouldboard plough – and conventional agriculture is then essentially defined by the act of ploughing. As we will see in the next section, agriculture differentiates along multiple technical, social and economic dimensions resulting in a great diversity of practices, systems and outcomes that can be observed in every agro-ecology and at every spatial scale. The effect of defining conventional agriculture by the use of the plough is to sweep all of this variation under the carpet.

A similar point is made by Shennan et al. (2017) who provide a useful discussion of the many methodological challenges associated with experimental field plot and on-farm comparisons of organic and conventional systems. They argue that:

> 'Organic versus conventional is a false dichotomy. Outside of researcher-managed experiments, both organic and conventional cropping systems fall along a gradient of input use intensity, scale, and diversification of crops and habitat. Such real-world variation among organic and conventional cropping systems is insufficiently considered in binary comparisons' (p.319).

5.2. In discourse

In this section we argue that wittingly or unwittingly, in both the academic and more popular literatures, the term conventional agriculture is used to construct and perpetuate an 'ideal type' (in the Weberian sense, Aspalter, 2020) in opposition to various alternative agricultures. This is particularly the case when conventional agriculture is used as a discursive device or to differentiate and legitimise different or new agricultural practices or systems. The key characteristics of this ideal type include a high degree of specialization (i.e. not mixed farming), dependence on external inputs (especially fertiliser and pest control products), and high levels of output.

The mobilisation of the ideal type through the use of the term conventional agriculture plays a critically important role in framing the promotion of alternative agricultures by collapsing the high levels of diversity that are observed within farming systems. As suggested in Table 4, this diversity can go well beyond for example farm size and the use of particular inputs (also see Giller et al., 2021). Agriculture takes place within highly diverse historical, biophysical, social, cultural and political environments, and the resulting non-uniformity – of farm size and structure, orientation, productivity, practices and so on – is one of agriculture's abiding characteristics. Nevertheless, with its strong focus on type and level of input use, the ideal type that has been constructed around conventional agriculture overlooks key differentiators like motivation, resource availability, economic geography, and policy context.

Table 4
Examples of the diversity of attributes of farms that can be described as practicing 'conventional' agriculture.

Aspect of farm system	Variants
Land area	• Very small through to… • Very large
Source of labour	• Family • Hired • Sharecrop • [swapping arrangements?]
Intensity of management	• Very low through to… • Very high
Level of mechanisation	• Very low through to… • Very high
Capital intensity	• Very low through to… • Very high
Land tenure	• Traditional/usufruct • Own • Rent • Sharecrop • Borrow • Squat
Level of access to information	• Low through to… • Very high
Crop type(s)	• Annual • Perennial • Tree • Cereals • Grain legumes • Oil seeds • Horticulture • Industrial (coffee, cocoa, tea, cotton, oil palm, tobacco etc)
Number of different crops	• Few through to… • Many
Farm orientation	• Only market through to… • Only own consumption
Importance in livelihood	• Limited through to… • Great
Degree of engagement with global value chains	• None through to… • Very high
Intensity of fertiliser or pesticide use	• None through to… • Very high
Importance of livestock	• None through to… • Very high

To provide a glimpse into this diversity we take two examples, one from the UK and one from Brazil. The first example draws from a 2015 survey of fertiliser use in England and Wales (DEFRA, 2016). The survey was based on a nationally representative sample of holdings larger than 20 ha. It can be safely assumed that the vast majority of the reported crop area was not certified as organic or managed under any other alternative regime. The three crops with the largest number of fields in the sample – winter wheat, winter oilseed rape and winter barley – received total nitrogen applications that ranged from 0 to 300, 0 to 275 and 0–275 kg/ha respectively. On average, application of nitrogen from manufactured fertiliser was reduced on fields where farm yard manure was applied. These reductions were 17, 16 and 23 kg/ha for winter wheat, spring barley and winter oilseed rape respectively. Fig. 3 shows the cumulative frequency distribution of total nitrogen application in

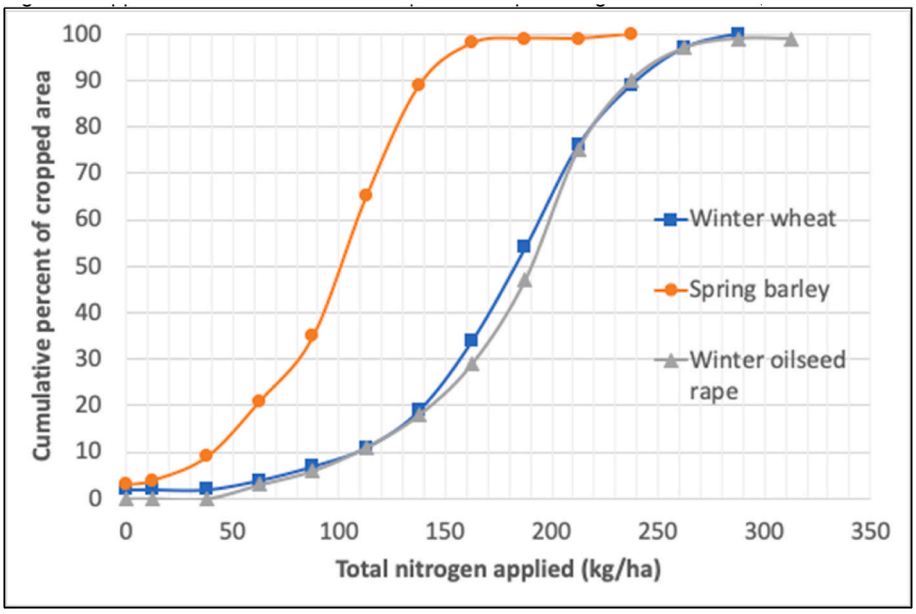

Fig. 3. Application of total N to three important crops in England and Wales (2015).
Source: Modified from DEFRA (2016).

kg/ha. While it is true that over the three crops a maximum of 3% of cropped area received no nitrogen, application across the remaining area varied considerably. In the case of spring barley, the bottom quintile of fields received less than 62 kg N/ha, while the top quintile received more than 125 kg N/ha. As long as conventional agriculture is defined primarily by the use of manufactured fertiliser, despite this significant degree of variation, all of these fields would be considered conventional.

Without distinguishing between conventional and alternative systems (organic land is estimated to comprise 0.5% of all agricultural land in Brazil, see Willer et al., 2021), Fig. 4 shows the monetary value of crop production contributed by different crops across the range of farms sizes in Brazil. The figure is clear – the relative value of different crops varies, across a significant range, with increasing farm size. This begs the question: given variation in important characteristics like crop mix and farm size, and the interactions between them, can the tight coupling of conventional to a few considerations like input use, through the ideal type, be justified and sustained?

Finally, the incongruity of attempts to create a binary, with alternative agriculture (in this case organic) on one side, and conventional agriculture on the other, is illustrated by the fact that conventional agriculture is estimated to account for 98.5% of farmland globally (Appendix Table 1). Thus, the organic – conventional binary is defined by the 1.5%. Can this be justified?

6. Conclusions

The fact that agriculture is facing critically important challenges is beyond question. However, both the scientific community and society more generally struggle to find productive ways to talk about and debate

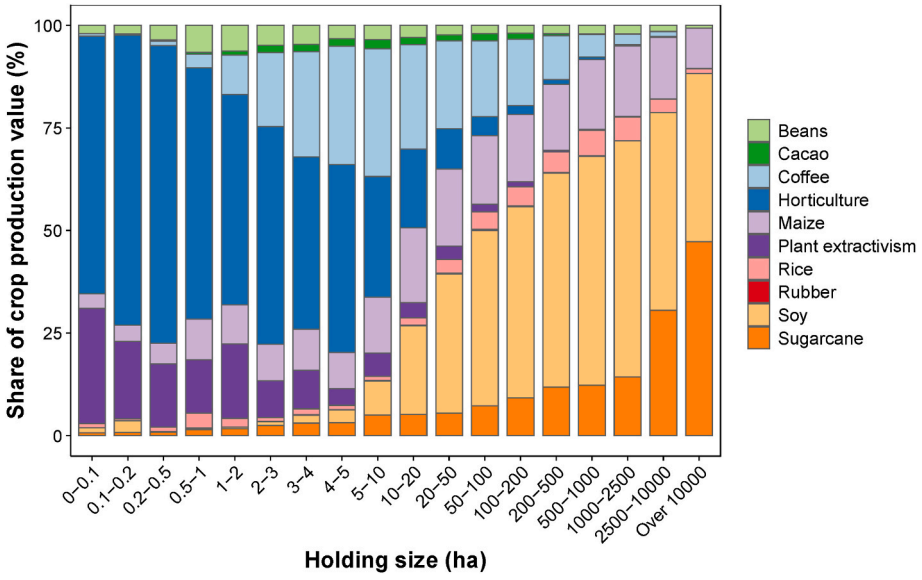

Fig. 4. Value of crop production contributed by different crops across the range of farms sizes in Brazil.
Source: Modified from Giller et al. (2021). Plant extractivism is harvesting and commercialisation based on wild (i.e. not cultivated) plants.

the future of agriculture. A key element of this struggle is the imperative to differentiate, often through starkly drawn dichotomies, in order to cut through complexity, gain attention, dismiss, enrol others and so on.

The politics of naming, differentiating and othering are widely recognised in political and policy discourse. We suggest that these politics are particularly pernicious in relation to agriculture because of the very high degree of agro-ecological diversity, combined with diversity in the historical, socio-cultural, technological, economic and policy contexts in which all agriculture is embedded. Specifically, the discursive construction of conventional agriculture as a uniform normative enterprise is intellectually dishonest, and will do nothing to further the cause of more sustainable agriculture, greater food security or improved soil health. It is deeply ironic that the case for alternative agricultures which, in principle, seeks to foster biological diversity, is so often made by denying the immense diversity that characterises agriculture (Giller et al., 2017). The incorporation of the term conventional agriculture into scientific and public discourse, and growing acceptance of the alternative—conventional binary, resonates with the earlier framing of 'modern' vs. 'traditional' agriculture that was so prominent in colonial and development thinking. The pejorative sense of the adjectives traditional and conventional are at odds with the now widespread recognition of farmers' detailed contextual knowledge, their experimentation, innovation, adaptation and so on.

Finally, we are in complete agreement with Shennan et al. (2017) that 'framing research questions [and we would add *policy options*] around the relative superiority of organic [and we would add *or any 'alternative agriculture'*] or conventional production perpetuates an either/or mentality rather than consideration of where and how each type of management system can contribute to more sustainable agriculture and farmers' livelihoods' (p.319). We have no desire to live in a world without adjectives, but adjectives that can only mislead should have no place in either public debate on the future of agriculture or the scientific literature.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

Table 1
Share of total agricultural land that is *not* organic: world regions and selected European countries.

Region*/country**	Share of total agricultural land that is *not* organic (%)
Africa	99.8
Asia	99.6
Europe	96.7
Austria	73.9
Estonia	77.7
Sweden	79.6
Switzerland	83.5
Italy	84.8
Spain	90.3
Germany	90.3
France	92.3
Netherlands	96.3
UK	97.4
Albania	99.9
Belarus	99.9
Europe	96.7
European Union	91.9
Latin America	98.8
North America	99.2
Oceania	90.4
World	98.5

* Willer et al. (2021), Table 4, p.41.
** Willer et al. (2021), Figure 71, p.234.

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