International Food and Agribusiness Management Review
Please cite this article as 'in press'; DOI: 10.22434/IFAMR2022.0032

Received: 17 March 2022 / Accepted: 21 September 2022

Trust in agri-food value chains: a systematic review

REVIEW ARTICLE

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Abstract

Agri-food value chains are complex systems comprising of a network of interlinked and interdependent actors. To foster collaboration between these actors, trust between actors and in value chains is considered to be key. Despite growing scholarly attention an overview of to what extent and how trust is the role of trust in agri-food value chains is lacking. Employing a systematic review, this paper aims to explore the literature on trust in agri-food value chains to provide a solid knowledge basis for future studies into more specific aspects of trust. For our results, 139 papers were analysed published between 2001 and 2020. Studies were mainly conducted in Africa and Europe focussing on meat and vegetable chains. The results show a growing but dispersed field as studies hold a great conceptual diversity and theory building within the field of agri-food value chains is lacking. Based on our analysis we call for developing a coherent body of knowledge exploring the role of trust in agri-food value chains by: (1) employing a dynamic perspective on trust; (2) focussing on trust in agri-food value chain systems; and (3) focussing on the increasing importance of digitalisation for trust relations.

Keywords: trust, agriculture, food, value chain, review
JEL code: D83, Q17, Q18, Q19

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1. Introduction

Value chains have been broadly conceptualised in three ways (Donovan *et al.*, 2015) as a: (1) set of value adding activities through production to retail (Webber and Labaste, 2009); (2) set of actors connected along the chain undertaking activities to produce and transform goods and services delivered to consumers (Riisgaard and Ponte, 2011); and (3) strategic network of value chain actors cooperating within a wider institutional environment and support services (Da Silva and De Souza Filho, 2007). For the purposes of this paper, with its focus on the different conceptualisations of trust among value chain actors, we use the third systemic and relational-based definition (Da Silva and De Souza Filho, 2007). We therefore define agri-food value chains as complex systems comprising a network of interdependent actors that cooperate to capture and create value by responding to consumer demand through a wide range of practices (Da Silva and De Souza Filho, 2007; Higgins *et al.*, 2010), including production, harvesting, bulking, processing, trading, packaging, and retailing of food. Value chains differ in the vertical (primary producer to end-consumer) and horizontal (relationships among actors in the same part of the chain, e.g. farmers or processors) network structure (Trienekens, 2011). This creates a wide variety of value chain types, for example vertical relationships may follow all stages or skip links, e.g. direct to consumer sales by producers. Types of horizontal relationships include farmer cooperatives or price agreements among traders (Trienekens, 2011). Value chains are embedded within a market system, such that their performance is shaped not only by core actors in the value chain, but by actors who influence the institutional context in which value chain actors operate, by setting laws, regulations and policies (e.g. government agencies and standards setting organisations), and support services offered by sector organisations and consultancies (Da Silva and De Souza Filho, 2007).

Value chain actors are therefore strongly interdependent as they rely on each other for the overall performance of the value chain (Fritz and Schiefer, 2008; Trienekens, 2011). Consequently, value chains require interaction, cooperation, and coordination of value chain practices to create more value and avoid the risk of opportunistic behaviour by individual value chain actors seeking to capture more value for themselves (Provan *et al.*, 2007). At the same time, agri-food value chains are rapidly changing with globalisation, often dominated by one or a few powerful players (Adnan, 2013; Fitter and Kaplinksy, 2001; Foley, 2017; Reardon *et al.*, 2009), and affected by the rapid development of digital techniques for data sharing and exchange (Barrett, 2020; Jakku *et al.*, 2019; Reardon *et al.*, 2019). Consequently, increased complexity of value chain cooperation and shifting power relations among actors are witnessed (Clapp, 2018; Clapp and Purugganan, 2020; Meuwissen *et al.*, 2019). As such, value chain actors are increasingly confronted with dynamics that affect cooperation, interaction, coordination and governance of agri-food value chains (Gereffi *et al.*, 2005). In these contexts, trust is seen as a critical enabler and outcome of value chain collaboration (Provan *et al.*, 2007).

In value chain cooperation, various qualities have been attributed to trust. First, trust is seen as a pre-requisite for collaboration or cooperation (Flanigan and Sutherland, 2016; Mankad *et al.*, 2017), enabling the start of value chain interactions. Second, trust is seen as a factor that fosters or, in the case of distrust, harms collaboration (Ayari and Zaibet, 2019) thus reducing or increasing the cost of value chain transactions (Bair, 2008). Last, trust is seen as an outcome or product of value chain collaboration (Mankad *et al.*, 2017). Despite the importance of trust, and the growing attention paid to its role and function in agri-food value chains, it is currently unclear what is known about the role of trust in agri-food value chains, an overview of current knowledge is lacking. Such an overview is relevant for the development of a coherent body of knowledge and research agenda that aims at understanding agri-food value chain cooperation and performance, and the role of trust therein.

Not surprisingly, the importance of trust has already led to calls for further research on the role of trust in relation to specific developments, e.g. digitalisation (Fielke *et al.* 2020), in governance networks (Pilbeam *et al.*, 2012), and collective action to enhance smallholder integration in value chains (Bosc *et al.*, 2017; Kilelu *et al.*, 2017; Soullier and Moustier, 2021). Responding to such calls, this paper aims to systematically

review and explore the literature on trust in agri-food value chains to provide a solid knowledge basis for future studies into more specific aspects of trust. With this review we deepen earlier reviews that highlight the importance of trust in value chain cooperation (Fielke *et al.*, 2020; Misaki *et al.*, 2018; Pilbeam *et al.*, 2012; Zhao *et al.*, 2019), by providing a systematic overview of the qualities attributed to trust, roles, and functions of trust in agri-food value chains, and providing more depth and detail to the often made claim that 'trust is important' (Gichure *et al.*, 2017; McDermott, 2007; Virah-Sawmy *et al.*, 2019). In addition, we identify related directions for a research agenda on trust in agri-food value chains in view of important emerging trends in agri-food value chain research, such as globalisation (Benito *et al.*, 2019) and digitalisation (Charvat *et al.*, 2018; Fielke *et al.*, 2020; Slavova and Karanasios, 2018). Globalisation is the process of interaction and integration among people, companies, and governments worldwide, while digitalisation refers to the socio-technical processes surrounding the use of (a large variety of) digital technologies that have an impact on social and institutional contexts, going beyond the level of a single business or entity (Tilson *et al.*, 2010). For agriculture, it implies linking on- and off farm data and managements tasks throughout the value chain (Rijswijk *et al.*, 2021; Wolfert *et al.*, 2017). For example, in dairy farming on-farm sensors connected to the internet-of-things can monitor animal health and milk quality, which can be consequently connected to consumer information platforms which can access such food safety and animal welfare information, and enable traceability to the source (Rijswijk *et al.*, 2021). Provenance information and adherence to standards through the value chain can be supported by blockchain technologies (Rejeb *et al.*, 2020; Zhao *et al.*, 2019).

The remainder of this paper is structured as follows. First, we will present the conceptual orientation and methods underlying our systematic literature review. Then the results are presented including a discussion of the general characteristics of the studies, with attention paid to where and how trust is studied, as well as the main themes from their conclusions. Following this section, a research agenda is presented.

2. Conceptual orientation and methods

In this section, we will first briefly review the concept of trust, leading to a set of questions that guided our systematic review. Then, we will explain the methods used for the systematic review.

2.1 Conceptual orientation

Over the past decades, trust has been studied in a wide range of academic disciplines (e.g. economics, management, sociology, political science), and contexts (e.g. environmental governance, interorganisational cooperation, conflict, and negotiation), using a range of methods (qualitative, quantitative, and mixed method). Given the diversity of studies, trust has been defined and conceptualised in many ways, resulting in a variety of definitions and approaches. Yet, regardless of these differing conceptualisations, in its most complete form trust is viewed as an expectation from one actor (the trustor) about the specific behaviour of the other (the trustee), at a specific time and in a specific context (Bauer, 2021). As such, trust centres around the relationship between the trustor(s) and trustee(s), often referred to as the subject and object of trust. In the act of trusting, the subject is limited to individuals or groups of individuals, and to some extent organisations. This includes stakeholders such as farmers, or farmer groups, government officials, nature conservationists, retailers, or suppliers. In this definition of trust, other stakeholders such as, governments or institutions are not the subjects of trust, but could be organised in a way that they communicate trust to a greater or lesser extent to other stakeholders (De Vries *et al.*, 2019). The object(s) of trust, on the other hand, can be manifold. In addition to individuals and groups, trust can be placed in organisations, more abstract systems such as institutions, but also information and data, knowledge, processes, and systems. For example, an agri-food value chain can be an object of trust, in terms of consumers trusting that the value chain will provide safe food. Following these different objects and subjects of trust, trust is often specified, most notably in terms of interpersonal trust, inter-organisational trust, and institutional trust.

The wide variety of conceptualisations of trust, also leads to a diversity in how trust can be studied and understood. Following the trust literature, we see that distinctions are made between subtypes of trust, of

which the two most pronounced are relational trust, referring to trust based on shared identities, emotions and relations, and rational trust, trust based on more rational arguments, assessing intention and ability to keep promises, signalled by competencies, and predictability of behaviours (Poppo *et al.*, 2016). For trust in institutions a distinction is often made between ability-based trust, trust that an institution, government, or organisation is capable of performing its tasks, and procedural trust, trust in the procedures prescribed and followed by these institutions (Stern and Coleman, 2015). A second important aspect of the conceptualisation of trust is the relationship with antecedents, or concepts affecting and affected by trust (Gulati and Sytch, 2008). A short explorative inventory teaches us that the list of antecedents is long, however key concepts are uncertainties, expectations, and risk perceptions.

The wide variety of conceptualisations and understandings of trust, and related underlying theories, is the result of trust having been studied in many different disciplines and contexts. That is, trust is a context and issue specific concept (Lewicki *et al.*, 2006).

Gaining an overview of how trust has been studied in agri-food value chains thus requires taking into account the variety of ways trust is defined, conceptualised, and studied, but it also means focussing on the specific trust relationship being studied, i.e. between specific objects and subjects of trust. Last but not least, the issue and context specific nature of trust, forces us to take into account the specific agri-food value chain context in which trust is studied. As such, our analysis of the literature is guided by the following questions:

- In what types of agri-food value chains has trust been studied?
- How has trust been studied and conceptualized?
- What key theories are drawn on in studies of trust in value chains?
- Who are the subjects and objects of trust under study?
- How has trust, and changes in trust, been conceptualised in the context of value chains?
- What are the key-themes in the findings and conclusions of the studies?

2.2 Search strategy

To gain an overview of the state-of-the-art literature on trust in agri-food value chains, we systematically searched existing literature (Webster and Watson, 2002). Taking such an approach we aimed to provide an overview and qualitatively synthesise key findings (Grant and Booth, 2009). For this review, a search string was developed based on the key-concepts of this research, trust and value chains. First, we focused on value chains rather than supply chains. This choice was motivated by the perspective that agri-food value chains are typically characterised by multiple actors contributing to value creation, capture, and sharing among all actors in the value chain, including the end-user (e.g. the consumer). While literature on supply chains focuses more on integration and efficiency of supplier and producer processes (Feller *et al.*, 2006). This, however, does not mean that supply chain literature is totally excluded as some authors use the terms interchangeably in the same publication. Second, a further delineation of search terms, for instance adding 'agriculture' or 'food' was considered, however this resulted in a limited list of records and would exclude relevant papers that focus on specific value chains, e.g. coffee or pineapples, but which do not explicitly mention food or agriculture.

Following the method of systematic literature review (Wolfswinkel *et al.*, 2013) a first search was conducted on May 17th 2019. Using the search string 'trust*' AND 'value chain*', all articles in Scopus and Web of Science were queried (Figure 1). This resulted in 479 records. After duplicates were removed 359 were included for further analysis. In addition, eight papers were added manually based on suggestions from colleagues and literature known to the authors. To ensure the review was up-to-date a second search with the same search string was conducted on June 23rd 2020 focusing on 2019 and 2020 in Scopus and Web of Science resulting in 125 records, after duplicates between search engines and between search one and two were removed, 45 additional papers were included for further analysis.

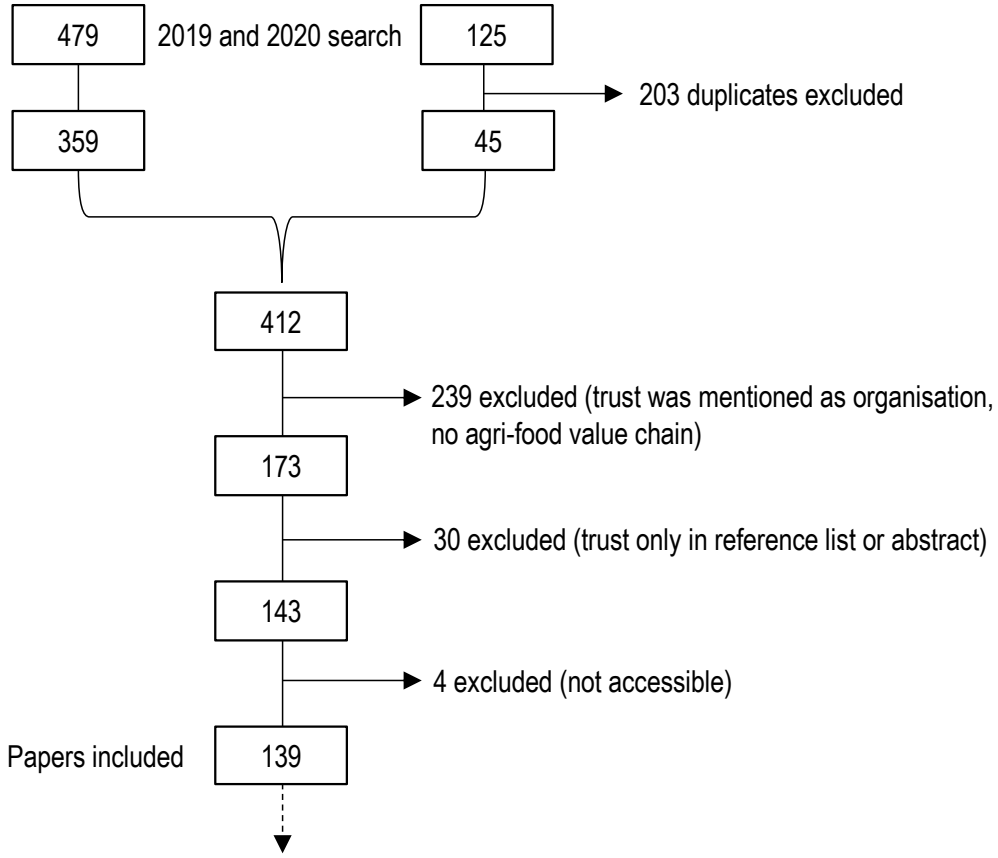

Figure 1. Search strategy.

In the next step, title, abstract and keywords of all 412 records were scanned by the first author for their relevance to trust and agriculture and/or food value chains. Results and procedures were discussed with the whole team. In this round 239 papers were excluded, leaving 173 papers for further analysis. The main reasons for exclusion were that papers did not focus on agri-food value chains, trust was mentioned as an organisation form (e.g. National Trust in the UK), or it was a non-refereed publication (e.g. conference proceeding with only abstract available). If there was any doubt about the relevance of the paper, the total paper was scanned. The remaining 173 articles were checked for relevance by reading the entire article. Based on this last selection round 30 papers were excluded based on content (e.g. trust was only mentioned in a reference in the reference list), and four papers could not be accessed. Leaving a total of 139 records for content analysis (see Supplementary Table S1 for the full list of records included).

2.3 Analysis

For the analysis, the research questions (Figure 2) were operationalised in a list of 19 items (Supplementary Table S2). The analysis was conducted by the first and fourth author and 20 papers were analysed, compared and discussed by both to increase validity of the analysis. For further analysis and synthesis of the data, results were gathered in a master table.

The analysis was conducted in three steps. In step one, all papers were analysed based on basic variables (authors, year of publication, title, journal, and times cited). In step two, all 139 papers were analysed on research questions 1 and 6 (if information was present), and general conclusions on trust, to gain an overview of the total field of trust in value chains. In step three, papers in which trust was studied in greater depth, and therefore played a major role, were selected based on the frequency with which the word ‘trust’ appeared

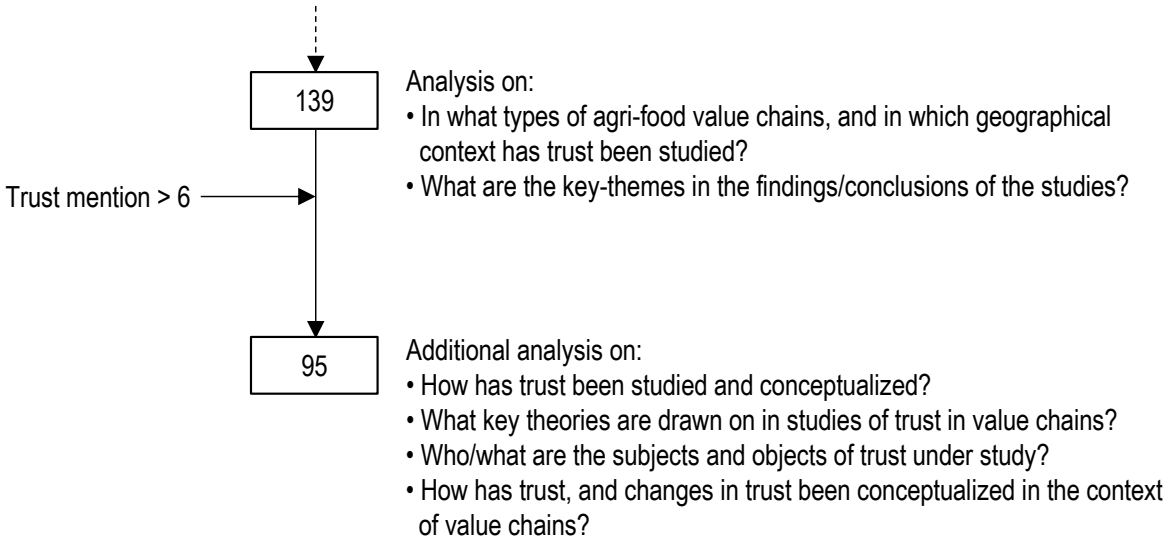

Figure 2. Analysis strategy.

(excluding references). Papers in which trust was mentioned six times or more, were analysed in greater depth. This resulted in 95 papers, which were additionally analysed on research questions 2, 3, 4 and 5.

Steps 1 and 2, together form the basis for sketching the research landscape. Step 3 forms the basis for presenting the specific trust focus in the papers, while the results from research question 6 form the basis for presenting the key-themes emerging from the results. Through iteration between the authors and the data the themes were further detailed and elaborated. Full links between questions and items can be viewed in the Supplementary Materials.

3. Results

In this result section the focus will be first on the research landscape related to analytical question 1. Following that, unravelling how trust is studied and conceptualized (questions 2 to 6) will be presented. Finally, themes emerging from the conclusions and discussions of the papers under study will presented (question 6).

3.1 The research landscape

■ *A growing but dispersed field*

First and foremost, the results show that trust in agri-food value chains is increasingly gaining attention, through methodologically diverse studies, in a wide range of fields. With the first paper focusing on trust in agri-food value chains appearing in 2001, over the next twenty years the number of papers grew steadily, peaking in 2019 with 23 studies (Figure 3); possibly reflecting the inclusion of records until July 2020. Most of these studies originated from agricultural sciences and food sciences (27%), closely followed by business and management, and development studies (11 and 10%, respectively) (Table 1).

The vast majority of papers found (n=108) were empirical and thus based on original data, followed by 22 conceptual papers, three papers combining conceptual and empirical dimensions (Fritz and Fischer, 2007; Hardman, 2002; Rokkan *et al.*, 2003), and six review papers. Many of the empirical, and two of the conceptual papers, were geographically focused on a region (within a country) (n=58), with a national scale the second most common focus (n=35), followed by a global scale (n=33) and then a local scale (within a region) (n=7). Only three papers combined different geographical scales, namely a focus on global value

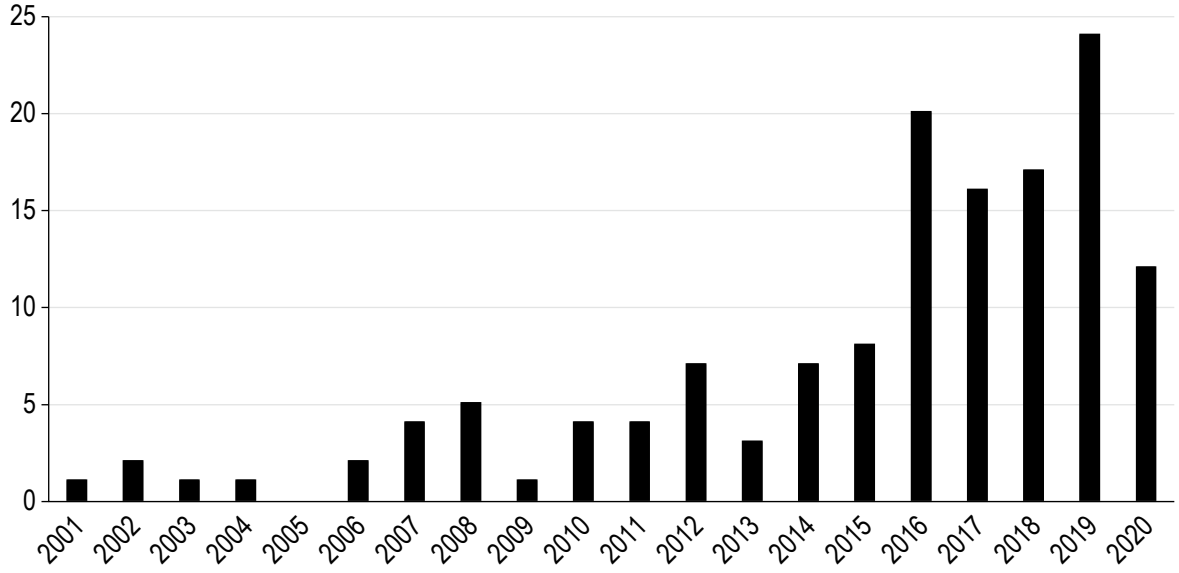

Figure 3. Records published per year focusing on trust (2020 included until mid-2020).

Table 1. Overview of fields trust in agri-food value chains (records included until July 2020).

Field	n	%
Agricultural sciences	37	27%
Food sciences	26	19%
Business and management	15	11%
Development studies	14	10%
Environmental sciences	12	9%
Social sciences	11	8%
Computer and information sciences	9	6%
Economics	8	6%
Geography	5	4%
Other	2	1%

chains with regional studies on cotton in Benin (Glin *et al.*, 2012), potatoes in Bolivia, Peru and Ecuador (Thiele *et al.*, 2011), and tea in Kenya and the United Kingdom (Blowfield and Dolan, 2010).

The most common methods used were case studies (n=39), followed by surveys (n=28). Studies with an experiment or simulation game design (n=4), or participatory design (n=2), or a more conceptual (n=12) basis, were less present. Within the type of data and data collection methods used, we see a similar diversity (Table 2).

■ *Different products, and a strong focus on in-country value chains in Africa and Europe*

Trust has been studied mainly in meat and vegetable value chains. In total 49 different sectors and products have been studied, ranging from fruit (e.g. lychee, pineapples), to vegetables (e.g. kale, sweet potato), and seafood (e.g. tuna, shrimps). In addition, 28 papers focused on trust in agri-food value chains in general, while global value chains were rarely studied (Table 3).

Geographically speaking, most studies were performed within a country (n=97), most frequently in Africa (30%) and Europe (21%). Only nine studies were performed in multiple countries, such as (Fritz and Hausen,

Table 2. Study designs and data.

Design		**Type of data**	
Case study	39	qualitative	23
		quantitative	5
		mixed	11
Survey design	28	qualitative	1
		quantitative	23
		mixed	4
Experiment/game	4	quantitative	4
Conceptual	2	qualitative	2
Participatory	2	qualitative	1
		quantitative	1

Table 3. Value chains under study.

Value chain	**n**	**%**
Fruit	11	7%
Meat	24	16%
Vegetables	16	11%
Dairy	10	7%
Seafood	10	7%
Food	10	7%
Value chain in general	28	19%
Global value chains	7	5%
Coffee/tea/cacao	11	7%
Rice	4	3%
Other	20	13%

Table 4. Overview of locations of studies.

Continent	**n**	**%**
Africa	48	30%
Europe	33	21%
Asia	28	18%
Global	18	11%
Oceania	15	9%
South America	11	7%
North America	5	3%

2009) in Europe across Germany, Poland, Ireland, UK and Finland; or (Pomeroy *et al.*, 2017) in Asia across Cambodia, Malaysia and Indonesia; or (Dawson *et al.*, 2009) in Africa across Nigeria, Cameroon and DRC. In addition, 18 studies focused on global value chains, and only three studies considered trust in global value chains in relation to national or regional value chains (Table 4).

3.2 Unravelling the conceptualisation of trust within agri-food value chains studies

- *A broad methodological range, and no dominant theoretical tradition within studies of agri-food value chains*

Looking at methods used to study trust in agri-food value chains 44 out of the 95 studies measured trust directly (e.g. asking through surveys to what extent farmers trust buyers). Whereas 20 papers studied the role of trust through concepts that are linked to trust in both agri-food value chain literature as well as broader trust literature, such as commitment (Micheels and Gow, 2011), transparency (Gerdoci *et al.*, 2015), compliance (Van der Valk and De Vos, 2016), and power (Leonidou *et al.*, 2008). A second set of authors studied trust indirectly as a part of broader concepts, in particular: (1) relational contracting or Transaction Cost Economics (at least 5 studies (for example see Satria and Li, 2017)); (2) social capital (6 papers); and (3) collective action for value chain cooperation (Abbey *et al.*, 2016). The remaining studies only mentioned trust, without explicitly measuring or studying it. In addition, studies that measured trust directly mostly had a quantitative or mixed methods design (24 out of 44), while research studying trust through related concepts often had a more diverse approach, qualitative (n=8) as well as quantitative (n=8), conceptual (n=3), or mixed methods (n=4).

The diversity of methods to study trust, is also reflected in the theoretical basis. Looking at definitions and theories of trust used to inform the methods, a wide range of sources are found on which these definitions are based. Definitions of trust in that regard are given by 39 studies. Authors often referred to well-known publications on trust from the fields of economics, marketing, management, and psychology (Kumar and Paddison, 2000; Lyon, 2006; Luhmann, 1979; Mayer *et al.*, 1995; Morgan and Hunt, 1994; Rousseau *et al.*, 1998; Williamson, 2002; Zaheer *et al.*, 1998). Interestingly, in defining trust only a few references were made to studies within the fields of agriculture and food studies, and no dominant theoretical tradition has developed in how trust is studied in agri-food value chains.

- *Focus on trust among dominant value chain actors, with trust in digital systems emerging*

The results show that studies on trust in value chains are mainly focused on interpersonal trust (e.g. among value chain actors) (n=43). Looking at who are the subject of trust, studies are focusing mainly on actors directly involved in value creation, capture and sharing: farmers, buyers, sellers, retailers, and middlemen. Sterling *et al.* (2015) for instance, focused on, amongst others, suppliers, retailers, and buyers. Interestingly, trust in governments or government agencies was often not included. One actor represented in many of the studies was the consumer. Several studies focused specifically on trust of the consumer in other value chain actors, organisations, and the value chain as a whole. For example El Benni *et al.* (2019) focused on consumer trust in the infant milk value chain. Lastly, a smaller portion of the studies (n=12) focused on trust among value chain actors in general without further specification.

Looking at the object of trust, a similar diversity can be seen. Most studies (n=66) focus on trust in other value chain actors, e.g. farmers, suppliers, retailers, and buyers. While a small proportion (n=11) of the studies focused on value chain actors in general (e.g. Pilbeam *et al.*, 2012). In addition, 17 studies paid attention to trust in the value chain and its institutions (e.g. Franklin and Oehmke, 2019), however only a few integrated it as part of their study (Fritz and Fischer, 2007). In addition, trust in data, data sharing, knowledge and ways to facilitate this, e.g. through certification, was another important object of trust (e.g. Charvat *et al.*, 2018). Six papers paid attention to this and 23 specifically on digital information. Over time few changes were found in the objects of trust studied, although since 2017 digital technologies as objects of trust and digital information (systems) have become more present.

■ *The reasons, importance, and function of trust within agri-food value chains*

Not surprisingly, the importance of trust was emphasised in all papers. Ayari and Zaibet (2019: 531) for instance state: 'trust is found to be an important factor in contractual decisions between breeders and collection centres on one hand, and breeders and the cooperative on the other'. Interestingly, many statements underlining the importance of trust were general statements only, e.g. trust is important. As such, many of the studies did not state explicitly in which way(s) trust is important, between whom, or why. Notions regarding the importance of trust in value chains therefore often remain abstract when it concerns the objects, subjects, and function of trust.

However, for those studies giving more insights into the importance of trust, analysis shows that trust is linked to several aspects. First, trust was emphasised as a pre-condition for, fostering information exchange among value chain actors (Kremenova and Gajdos, 2019), cooperation and decision-making (Thiele *et al.*, 2011), conflict resolution (Kanaujia and Bhattacharya, 2018), innovation platform function (Landmann and Cadilhon, 2018), transformation to more inclusive value chains, in this case smallholders (Slavova and Karanasios, 2018), and commercial success (Troy *et al.*, 2016). Second, a range of studies stress the role of trust as an (informal) coordination mechanism, for instance in relation to contracts (Bijman *et al.*, 2010), enabling information exchange among value chain actors (Van der Merwe *et al.*, 2017). Third, the role of trust is linked to specific value chain functions or performance, for instance the role of trust in relation to leaders and leadership (Rugema *et al.*, 2018), trust in product standards (Bremer *et al.*, 2016), and trust in outcomes of the value chain, e.g. food safety (see for instance (McCarthy *et al.*, 2016). Last, the importance of trust is linked to trust in and among actors (Folder and Cavaye, 2015). However, it is striking to see that these conclusions often relate to value chain actors directly involved in value creation and capture (e.g. farmers, traders), and end users (consumers). While other actors such as governments and waste processers are less well represented in studies. Moreover, trust in the value chain as a whole, i.e. trust in value chains as a system and related institutions, is also less touched upon (Meijerink *et al.*, 2014).

■ *Three main ways of conceptualising trust within studies of agri-food value chains*

Through the analysis of the articles in the sample, it has become clear that trust in agri-food value chains has been conceptualised in three (nonexclusive) ways: (1) trust as an interactional concept; (2) trust in relation to other factors; (3) trust as part of a broader concept. First, looking at trust in interaction, studies mainly conceptualise the function of trust as facilitating interaction and information exchange. For instance, several studies (Virah-Sawmy *et al.*, 2019) state that interaction is indispensable as a basis for trust, as it facilitates the information exchange needed in value chain negotiations, and trust enables people to be vulnerable, creating room to exchange information that might be more commercially sensitive. Moreover, trust has a risk mitigating function in interaction. These authors argue that trust mitigates risks associated with interaction as, without trust, value chain actor interactions and cooperation are not possible (Hilary *et al.*, 2017). While a last group of authors explicitly focus on the transactional function of trust in interactions, showing that trust thus enables interactions, but at the same time develops through interactions (Agyekumhene *et al.*, 2018).

A second group of authors underline the impact of factors impacting trust and being impacted by trust in actor interactions (Figure 3). The most commonly referred to concepts are uncertainty, risk, power, transparency, integrity, contracts, vulnerability, compliance, benevolence, and openness. These studies largely show how experiences of, for instance, uncertainties, risks, and reciprocity in actor interactions, impact trust development among value chain actors. Glavee-Geo *et al.* (2020) for example, conclude that trust is strongly influenced by power relations, and that power-dependent relationships need a third party for trust to develop between actors. The impact of these intermediary concepts on trust is often complex and iterative (Satria and Li, 2017). From these studies it becomes clear that risk perception, uncertainties and reciprocity can increase the need for trust between value chain actors, while too much risk and uncertainty can also hamper trust between value chain actors. These relationships then, in turn, may influence cooperation in the value chain, the acceptance of new technologies, and as such the value created and captured by value chain actors (Troy *et al.*, 2016).

A third group of authors focus on concepts within which trust is one aspect among others, namely social capital, collective action, or transaction costs (e.g. relational contracting). As part of broader concepts, here again trust is input, enabler, and output. Trust is seen as a key input needed for collective action (Msaddak *et al.*, 2019), but also, as an input that is needed to lower transaction costs (Gerdoci *et al.*, 2015), and as a result emerging from collective action interactions (Msaddak *et al.*, 2019). Moreover, Helin (2012) adds insights on the key role of leaders within collective action, in this case to develop an innovation network, and how through interaction trust in local farmers facilitating the innovation network. Whereas Pachoud *et al.* (2020) show that we should look at different types of trust, both on community and organizational level. As enabler, trust is seen as key for social capital, and transactions. In the first, specific interpersonal trust relations give input to social capital as a more generalised form of trust (Sodano *et al.*, 2008). While as part of transaction costs economics and relational contracting, trust is seen as a social contract acting in direct relation to more formal contracts (Gerdoci *et al.*, 2015). Trust is also an outcome in all three concepts, showing that successful collective action, social capital, and transaction processes can create trust.

3.3 Concluding on trust: three emerging themes

Following our initial inventory and analysis, for all papers (n=139) the key findings, conclusions and discussion were analysed in-depth. Based on this, three interrelated themes were identified through content analysis: (1) trust and information exchange in the value chain; (2) trust in the value chain system as a whole; (3) trust and digital agriculture.

- *Trust and information exchange in the value chain*

The first theme relates to the role of trust in information exchange (Table 5). Information exchange in value chains is critical (Trienekens, 2011), at local-, regional- (Roba *et al.*, 2019), and global-levels (Kremenova and Gajdos, 2019). In addition, Kremenova and Gajdos (2019) see trust and trust building among actors as a precondition for both effective information sharing and to ensure information quality. Other authors add to this a stronger focus on the role of trust in information itself, (digital) information processes and information systems for the functioning of value chains (Agyekumhene *et al.*, 2018). In addition, some take a different approach by unravelling the characteristic of the interrelationship between trust and information exchange, arguing for information exchange that fits the specific context (Agyekumhene *et al.*, 2018; Gichure *et al.*, 2017; Troy *et al.*, 2016). These findings show that in recent years, a perspective is developing in which trust and information sharing are in a reciprocal relationship within value chains. These studies show that a lack of trust can hamper information exchange, while increased levels of trust limit the need for constant information exchange. However, it is also clear that power inequalities, and a lack of transparent information

Table 5. Key trust themes.

Key-themes	Specifications
Trust and information exchange in the value chain	Trust in/for exchange develops over time
	Trust in information processing and information system
	Trust develops in relation to its context
	Trust and information exchange are interrelated
Trust in the value chain system as a whole	Value chain functioning depends on trust
	Trust in value chains partly develops through interpersonal trust
	Value chain trust develops through procedures
	Transparency and certification foster trust in value chains
	Lack of trust hampers value chain transformation
Trust and digitalisation in agri-food value chains	Trust influences the uptake of digital technologies
	Digital technologies change trust relations
	Digitalisation can enhance and reduce trust

flow, among value chain actors can lead to distrust. Especially as systems to share information, are often based on existing relations and can thus, in the case of power inequalities, reproduce and reinforce them, having a negative impact on trust.

The interaction between trust and information exchange is also key to conclusions from another group of authors, that explicitly stress the time-bound characteristic of trust (Table 5). While many authors indirectly talk about trust development, few authors focus on the development of trust over time or how current trust relations have come into being. This is striking as value chain relations are highly influenced by internal and external developments, which are more than likely to influence trust relations. However, the authors that do focus on the time bound characteristic of trust typically discuss trust development in relation to information exchange (Troger *et al.*, 2018). Khoi and Son (2011: 298) for instance conclude that: 'through time the relationship between both actors is influenced by the level of trust and the extent of resource control exercised by exchange parties'. Gerdoci *et al.* (2017: 145) add to these notions, by adding that time is about trust based on past and present experiences, as well as about future expectations as: 'when farmers perceive low levels of uncertainty and high levels of trust, they tend to engage [...] in durable relationships'. In line with these, Glavee-Geo *et al.* (2020: 122) add the notion of the context specific characteristic of trust development by focusing on power relations in the cacao sector in Ghana: 'when trust does develop in power-dependent relationships, some form of third-party enforcement may still be necessary'. Following these authors, trust is a timebound and context specific concept, making it possible to engage in, often vulnerable, enduring relationships, and contexts of power difference.

- *Trust in the value chain system*

Trust in value chains is often discussed in relation to specific aspects of the value chain or actors. However, a second theme emerging from the analysis is trust in the value chain as a whole system of strategic networks of actors cooperating within a wider institutional environment and support services (Da Silva and De Souza Filho, 2007) (Table 5), here shortly referred to as the value chain system. Most of the papers concluded on trust in abstract terms, e.g. stating that trust is a key mechanism for value chain performance in general. In this they do not focus on a specific part of the value chain, but emphasise the importance of interpersonal trust, e.g. concluding that trust among value chain actors enhances cooperation and safeguards against opportunistic behaviour to capture value. Linking this back to our previous analysis, authors mainly focus on actors directly involved in the value chain (e.g. consumers, farmers), and less on governments, food safety agencies, etc. A more recent and smaller proportion of studies conceptualises trust in the value chain as trust in abstract systems (e.g. government, institutions). Typically, such studies focus on consumer trust in specific functions of the system, e.g. food safety and health (El Benni *et al.*, 2019).

Across these studies, we could say that these papers draw conclusions around the importance of actors' and consumers' trust in the value chain as a system in order for it to function properly (see amongst others El Benni *et al.*, 2019). First, authors conclude that trust in value chains is based on procedural aspects such as regular visual checks. Gramzow *et al.* (2018), in their study of vegetable value chains in Tanzania for instance, show that trust in value chains is based on seeing the product during daily interactions, and through transparency around how the value chain is organised. Second, several authors refer to the ability of the value chain to function. Hasler *et al.* (2018) for instance, concludes that trust in the ability of value chains to deliver quality milk, is partly based on interpersonal trust among value chain actors. Focussing on the two key types of institutional trust (ability and procedural (Stern and Coleman, 2015)), these studies show how procedural trust fosters everyday operation of value chains, while trust in value chains in general is not so abstract as it can be extended to specific abilities. Moreover, Gramzow *et al.* (2018) conclude that strong trust in institutions can hamper flexibility, and limit the potential for innovation and transformation of the value chain. In this case the institutional arrangement created strong criteria and norms that proved difficult to adjust in response to buyers demanding higher quality products.

Looking more specifically at trust in the value chain as a whole, a significant set of studies focused on the role of certification and quality control standards in relation to trust in value chains. Such standards can be about GMO food, health (My *et al.*, 2018), sustainability (Ankamah-Yeboah *et al.*, 2016), or transparency around food handling (Kimani *et al.*, 2020). In this context, certification plays a key role (Bernzen and Braun, 2014; Ruben, 2017), as it sets an agreed standard and is perceived as a form of transparency. However, this does not mean that certification is the panacea. Ankamah-Yeboah *et al.* (2016) show that consumers have less trust in new labels, in this case a sustainable fisheries label (MSC label), and that such trust needs time to develop. These studies seem to form a separate line of inquiry, more related to standardisation and certification than to trust. However, for studying trust in value chains they are highly valuable as they show that quality control standards, certification, and transparency have the potential to improve trust relations between actors, or consumer trust in quality of products (El Benni *et al.*, 2019; Kimani *et al.*, 2020), but that this takes time to develop, and may be influenced by the current level of trust in the value chain.

- *Trust and digitalisation in agri-food value chains*

Related to the former, the third theme emerging from the content analysis is the role of trust in digitalisation of value chains. This relatively new field (23 publications since 2010), focuses on studying the interrelationships between trust and value chain digitalisation. Approximately half of the 23 studies are based on empirical data, while the other half are conceptual papers. The studies can be divided in five groups: (1) focussing on blockchain (e.g. Jie and Gengatharen, 2019); (2) focussing on mobile and e-extension services (e.g. Misaki *et al.*, 2018); (3) digital tools (e.g. precision agriculture) (e.g. Charvat *et al.*, 2018); (4) business to business relations (e.g. Canavari *et al.*, 2010); and (5) business to consumer (e.g. Tamm *et al.*, 2016). Looking at the first group, focussing on blockchain, these studies show that blockchain can enhance trust from stakeholders in other stakeholders and intermediaries as it increases traceability and transparency (Kremenova and Gajdos, 2019). Here Zhao *et al.* (2019) adds that to foster trust, blockchains should be decentralised, immutable and foster consensus for it to overcome current systems that are centralised and monopolistic.

The second group, focussing on mobile extension services and e-extension are pre-dominantly conducted in developing countries. These studies largely show an iterative relation between these digital tools and trust, as interpersonal trust between data producers and users is needed to foster the uptake of such tools, while the usage of such tools also impacts trust relations. Slavova and Karanasios (2018) for instance shows that content provided to farmers through e-extension services is not used or adapted because of trust barriers. Misaki *et al.* (2018) add to this that also more general trust attitudes towards government impact the uptake and usage of digital tools by farmers. In addition, Krone and Dannenberg (2018) conclude that the usage of Mpesa (Kenyan money transfer system using mobile phones) depends not only on interpersonal trust but also on institutional trust in the banking system. A final remark is, amongst others, made by Kassem *et al.* (2020) in their conclusions showing that experiences in the collaboration contexts in which mobile and e-extension services are used impact interpersonal trust dynamics and the usage and perceived trustworthiness of the tool and its data. In this line Slavova and Karanasios (2018) conclude that combining digital tools and interpersonal contact is important for trust development, as this hybrid form of collaboration gives room to share experiences and exchange information in a more informal manner.

In relation to digital tools, limited findings can be reported. However, similar as with mobile and e-extension services, trust in relation to digital tools such as precision agriculture is impacting its uptake and usage. Here Charvat *et al.* (2018) shows that trust in data producers and data security is key. The last two groups, business to business relations and business to consumer relations largely focus on the role of transparency in relation to trust. Key finding from these studies is that increased information sharing between businesses or between businesses and consumers fosters trust (Tamm *et al.*, 2016). This includes information sharing in general but the conclusions of these studies also show that the type, quality, content and usage of information is key. Hilary *et al.* (2017) add to this that this relation also works the other way around as a lack of trust limits information sharing (for instance between farms and factory (Watabaji *et al.*, 2016)), which is especially relevant in cases where participation in information sharing is voluntary (Irvine, 2015). Last, Troy *et al.*

(2016) focusses on consumer response to new technologies used in food processing, they conclude that the extent to which these are accepted largely depends on trust in meat processors.

4. Discussion and directions for future research

From an overview of the results of the systematic literature review, three themes are distinguished that form the basis for future research directions. As the analysis is based on 139 papers, the result section, and subsequent synthesis, do not fully capture the nuance and detail of the individual papers (see for an overview of all papers Supplementary Table S1). Nevertheless, the themes can be summarised based on the role and function of trust in three contexts: (1) trust in value chain interactions: a dynamic perspective on trust; (2) trust in value chain systems; (3) trust in digital technologies in value chains.

4.1 Trust in value chain interactions: further developing a dynamic perspective on trust

Trust is increasingly, directly or indirectly, discussed as a concept that develops over time in the context of agri-food value chains (Watabaji *et al.*, 2016). Our results show, that trust among value chain actors develops under the influence of interaction, value chain cooperation, new events, and experiences (Krone and Dannenburg, 2018). Whereas others show how experiences can result in for instance increasing or declining uncertainties, risks, perceived ability and integrity, resulting in changes in levels of trust between value chain actors. For example, Agyekumhene *et al.* (2018) show how trust of lenders to lend to farmers is impacted by uncertainties and risk around maize production due to increasingly unpredictable climate conditions, and Ayari and Zaibet (2019) show how trust between smallholder farmers and milk collection centres is influenced by competence and integrity. However, these studies seldom conceptualise trust from a dynamic perspective. Such a perspective is highly relevant as it focusses on different aspects influencing trust development over time (De Vries *et al.*, 2015; Lewicki and Bunker, 1996). In the context of agri-food value chains, it allows the study of the dydadic relationship between trust and other aspects that characterise value chain cooperation longitudinally, such as changes in risks, uncertainties and power.

Moreover, a dynamic perspective of trust frames trust as a context specific concept (Kadefors, 2004; Schoorman *et al.*, 2007), in other words: trust develops within and in relation to a specific trust context, shaping or limiting options and the space to trust. In agri-food value chain studies, this context is proven to be mostly conceptualised at a regional or local level, e.g. the pork value chain in Hung Yen, Vietnam (Dang-Xuan *et al.*, 2016). As such, these studies show how (altering) local and regional institutional and social contexts create and limit opportunities for trust relations. However, increasingly these local contexts are interlinked with other regions or global networks. This not only has implications for value chain cooperation but also for the way trust should be studied. Understanding trust as a dynamic, context-dependent concept thus requires taking into account the various contexts in which value chain actors operate, being both local and global, or different local contexts that are connected through globalising agri-food value chains.

Such a perspective is relevant for understanding trust in agri-food value chains as it allows the inclusion of the interactions and related dynamics that characterise value chain actor relationships, consequent decisions, and related events. Moreover, it perceives trust as a concept that is situated within specific interrelated contexts, e.g. of value chain governance. In order to do so, future studies should take a historical perspective (Blok, 1978), explaining trust and trust development over time, e.g. through timeline analyses of key events and interactions (Klerkx *et al.*, 2010), and take into account the increasing complexity and interconnection between local/regional and global value chain contexts and actors.

Associated future research questions would be: How does trust develop over time in agri-food value chain contexts? How can trust development, and their interrelationship with value chain performance and governance, be explained in local and global contexts?

4.2 Trust in value chain systems

Trust in value chains is mostly studied by focusing on interpersonal trust among value chain actors (Franz and Rolfsmeier, 2016). As the results show, a smaller portion of the studies focus on trust in the value chain as a whole, also referred to as general trust towards the value chain (Hilary *et al.*, 2017). These rare studies are often about generalised consumer trust in value chains (My *et al.*, 2018). Consequently, the importance of understanding and theorising the role of trust in systems is underexamined. Especially as, of the studies focusing on trust in agri-food value chains in general, only a limited number draw on theories of institutional trust. However, although they do not theorise, they do show the importance of trust in the functioning of the value chain. For instance, by showing the need for trust in the value chain for interactions between actors to take place (Franklink and Oehmke, 2019). The studies included here note that trust in value chains is of key importance for the proper functioning of these systems, and for allowing actors to interact, cooperate and enter contractual relationships.

Taking the institutional context into account is essential for explaining how and why certain changes in value chains take place (De Vries *et al.*, 2015). For instance, the uptake of new technologies or practices, as key transformations in present day value chains. Following our results, we see that these studies largely focus on trust in (digital) technologies, knowledge and interpersonal or inter-organisational trust (Chavat *et al.*, 2018; Zhao *et al.*, 2019). Although they draw interesting conclusions, trust in the institutional context, or in the value chain as a whole has hardly been taken into account. Consequently, it remains unclear if and how, institutional trust, or the lack thereof might facilitate processes such as digitalisation or create lock-ins. In other words, current studies look at how digitalisation or new practices could increase value chain performance (e.g. Karanasios and Slavona, 2020; Kremenova and Gajdos, 2019), without considering institutional trust as a potential barrier or enabler. The question remains if, for instance, digitalisation is needed to improve trust and transparency, i.e. if institutional trust is already high then perhaps digitalisation is less likely to be adopted?

Studying the role of trust and underlying mechanisms is thus key in understanding processes of change, adaptation and transformation in agri-food value chains. Such studies should focus on how trust (or the lack thereof) influences adaptation and transformation processes and vice versa. However, as trust in different objects are often highly related (e.g. trust in individuals, trust in knowledge, trust in new technologies or digital tools), studying the relation between trust in (digital) technologies and institutional trust, for instance by unravelling how the uptake of new technologies are shaped by trust in the value chain as a whole and vice versa are promising.

Research questions associated with this could be: How does institutional trust enable and limit transformations in agri-food value chains? How does trust in knowledge and new technologies or practices relate to trust in value chains as a whole?

4.3 Trust and digitalisation in value chains

The final theme emerging from our results is the role of trust in digitalisation of agri-food value chains. Results from the analysis show diverging and sometimes contradictory findings. Some indicate that trust is enhanced by digitalisation (Steiner, 2017), while others find that a lack of trust limits the uptake of digital technologies (Misaki *et al.*, 2018). That is, trust relationships can foster or limit the uptake of digitalisation and in some cases hybrid forms (analogue and digital) are needed to overcome trust issues (Slavova and Karanasios, 2018). These findings can be explained by looking at the character of digitalisation processes and its multiplicity of impacts on uncertainties, risks and power relations among value chain actors.

Digitalisation is increasingly changing the organisation of and interactions among value chain actors, as existing modes of working, communicating and information sharing, e.g. about data, are replaced by digital means such as digital twins, Internet of Things, and mobile extension services (Alm *et al.*, 2016; Cearley,

2019). As such, digitalisation is a challenging process often implying disruptive changes that go beyond technologies, as they affect ways of working, interpersonal relationships, entire business sectors, markets, and society resulting in uncertain benefits and costs (Agogué *et al.*, 2017). These changes create risks and high degrees of uncertainty among actors directly and indirectly involved in different stages, roles, and contexts of the value chain process calling for a granular level of information to ensure value chains to function and trust to develop (Rejeb *et al.*, 2022).

From the trust literature it is known that, while trust is key in acting under uncertainty, high levels of uncertainty may also result in decreasing trust (Glückler and Armbrüster, 2003). Agyekumhene *et al.* (2018) show in their results, increasingly unpredictable climate conditions create uncertainties amongst maize farmers, affecting trust relations with lenders. Disruptive changes such as digitalisation, and subsequent uncertainties and expectations, can thus lead to low trust in the digitalisation process (including among value chain actors involved in digitalisation). Value chain actors may then resist digitalisation, or develop initiatives to influence trust, and consequently the uptake of digital technologies. Charvat *et al.* (2018) show for example how data sharing and visualisation are seen both as a common interest by value chain actors as well as a threat. As such digital technologies such as blockchain may enhance trust, or replace the need for trust, but in that sense also erodes trust, making the impact of digital tools a bit ambiguous. As such, authors call for information policies to govern the trustworthiness of digitalisation (Keogh *et al.*, 2020).

Building upon the dynamic and context-specific conceptualisation of trust and our results regarding digitalisation of value chains, specific gaps in the agri-food value chain literature can be identified with respect to this topic. Firstly, digitalisation of value chains is a significant change in context that creates new uncertainties and therefore changes trust dynamics – so studies of digitalisation processes over time are needed to understand the interaction between trust and digitalisation, including understanding trust relations and context prior to digitalisation, as well as how digitalisation can play a role in dealing with food safety outbreaks and their devastating effects on trust (Keogh). Secondly, there is a lack of studies taking a more theoretically grounded approach to studying the impact of digitalisation on value chain cooperation in general and trust in specific.

As such, future research could focus on these gaps by studying trust and digitalisation to address research questions such as: How do existing and changing trust relations among agri-food value chain actors influence digitalisation and value chain performance? How does institutional trust influence digitalisation of agri-food value chains? How does digitalisation influence institutional trust in value chains?

5. Conclusions

This research aimed to present an overview of studies of trust in agri-food value chains. A systematic review of peer review publications was conducted focussing on trust in agri-food value chains. Based on these results we conclude that trust has been widely and increasingly studied in agri-food value chains, but does not yet form a coherent body of knowledge as it is scattered across different fields of research and lacks theoretical grounding. More specifically, it can be concluded that trust is studied among a wide range of value chains, but mostly in meat, vegetable and value chains in general on the regional level, leaving room for future studies to study interconnections between local, regional and global value chains in relation to trust. Something that is deemed highly relevant as value chains are more interconnected through globalisation.

The included studies conceptually define trust in different ways: (1) trust as an interactional concept; (2) trust in relation to other factors; (3) trust as part of a broader concept. These are based on a wide variety of theories and authors, from a wide range of scientific fields. This contributes to the conclusion that theoretical consolidation is needed and a more consolidated perspective for studying trust in value chains, taking into account it specificalities. This could, potentially, create a basis for future conceptual work to which this paper aims to contribute by creating an overview but that goes beyond the scope of this contribution. Such

future work could benefit from a dynamic perspective on trust as it takes into account the dynamics and (institutional) contexts that characterise value chain collaboration.

Looking further at the different subjects and objects of trust we can conclude that interpersonal trust, and to a lesser extent inter-organisational trust, are commonly studied, while institutional trust is mentioned as important but rarely theorised and studied. This creates opportunities for studying and theorising the relationship between different types of trust, especially related to digitalisation and the uptake of new technologies and practices in value chains.

Supplementary material

Supplementary material can be found online at https://doi.org/10.22434/IFAMR2022.0032

Table S1. Papers included in review.
Table S2. Summary review protocol.

Acknowledgements

This review was conducted as part of the research programme 'The New Zealand bioeconomy in the digital age' funded by the AgResearch Strategic Science Investment Fund.

Conflict of interest

The authors declare no conflict of interest.

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