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Empowering through reflection

participatory design of change in agricultural chains in Indonesia by local stakeholders

Kusnandar, Kusnandar; van Kooten, O.; Brazier, Frances

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Empowering through reflection: participatory design of change in agricultural chains in Indonesia by local stakeholders

K. Kusnandar[1]*, O. van Kooten[2] and F.M. Brazier[1]

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*Corresponding author: K. Kusnandar
Faculty of Technology, Policy and Management, Delft University of Technology, Jaffalaan 5, 2628 BX Delft, Netherlands
E-mail: k.kusnandar@tudelft.nl

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Abstract: Participation of local actors has shown to be of significant importance to the uptake of new approaches to agricultural initiatives in developing countries. This paper proposes a new approach to empower local chain actors to work together to understand their own and others' challenges, to pursue common understanding of their situations and challenges, and to then co-create solutions. Reflection on each other's position is crucial to this process, and is core to the participatory approach designed to this purpose. Agricultural chains are the focus of a case study in Indonesia involving both farmers and wholesalers in the chain. Results show that the approach has led to new forms of collaboration between farmers, and between farmers and wholesalers, increasing market potential.

Subjects: Food Science & Technology; Engineering & Technology; Design; Collaborative Design; Rural Development

ABOUT THE AUTHORS

K. Kusnandar is a PhD candidate at Systems Engineering Section, Department of Multi Actors Systems, Faculty of Technology Policy and Management, TU-Delft, the Netherlands. His research focuses on empowering agricultural chain actors through participatory approach. In his home country, Indonesia, he is affiliated to the Research Centre for Science and Technology Development, Indonesian Institute of Sciences (LIPI).

F.M. Brazier is a full professor within the Systems Engineering Section, Department of Multi-Actor Systems, Faculty of Technology Policy and Management, TU-Delft, the Netherlands. Her current research focuses on the design of participatory systems (www.participatorysystems.org), supporting self-organisation and emergence based on the values trust, empowerment and engagement.

O. van Kooten is a full professor at Horticulture and Product Physiology, Department of Plant Science, Wageningen University, the Netherlands. He is also affiliated to Inholland University of Applied Science. His current research focuses on new market strategies and chain partnerships in agricultural sector.

PUBLIC INTEREST STATEMENT

This paper presents a new method of initiative to empower agricultural chain actors to create means for change. The method is based on participation of local chain actors through co-creation activities. Reflection is the core of the method to support multiple actors in the chain to pursue common understanding between them. This common understanding is one of the important elements to the success of co-creation process. This method has been implemented with groups of connected wholesalers and farmers in an agricultural area in Indonesia. Based on this implementation, the method has shown successful to enable farmers and wholesalers to reach common understanding as the basis to improve their chain governance. It can be seen from solutions and action plans, including division of roles and responsibilities, that were co-created by farmers and wholesalers themselves to deal with challenges that they face.

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Keywords: empowerment; co-creation; reflection; participatory; agricultural chains; developing countries

1. Introduction

Agricultural chains in most developing countries face many challenges ranging from farming tradition and traditional chain governance with farmers, wholesalers, traditional market traders, and global market players (supermarkets, exporters, industries) (Moustier, Tam, Anh, Binh, & Loc, 2010; Narrod et al., 2009; Natawidjaja, Rum, Sulistyowati, & Saidah, 2014; Subervie & Vagneron, 2013; Van Hoi, Mol, & Oosterveer, 2009). Most upstream chains are characterised by the involvement of many small farmers with lack of knowledge and capital to produce high-quality produce (Kariuki & Place, 2005; Natawidjaja et al., 2014; Sáenz-Segura, 2006; UN, 2007; van der Mheen-Sluijer & Cecchi, 2011) and wholesalers (in fact local traders who connect farmers to markets) who control farmers through finance, land and market information (Natawidjaja et al., 2014; Subervie & Vagneron, 2013).

Many top-down initiatives to address challenges in chain governance have been developed and financed by governments, academics, and NGOs to improve agricultural chains in developing countries, but most of them have had limited effect (Barrett, 2008; Bingen, Serrano, & Howard, 2003). One of the main challenges with which such initiatives are faced is incompatibility with factors related to local context (Espinoza-Tenorio, Espejel, & Wolff, 2015; Unnevehr, 2015), caused by the lack of awareness to local context when designing the initiatives (Laumonier, Bourgeois, & Pfund, 2008).

This paper proposes an approach in which local context is the basis for change through local actor participation. In this approach, initiatives are designed, developed and performed by local actors themselves (Ostrom, 2010a, 2010b). The basic assumption behind this approach is that involved actors have the capability to learn and to govern themselves to deal with their challenges (Ostrom, 2010a, 2010b).

To maximise the capability of local actors, they need to be connected and to participate to act, to contribute to their communities, to create a participatory system (Brazier & Nevejan, 2014). However, communities characterised by involvement of small actors (with lack of education, power, assets, etc.), need to be empowered to make them aware of their capabilities for change (Angeles & Gurstein, 2000; Farina & Reardon, 2000).

A relatively large number of initiatives have been implemented to empower farmers in developing countries to develop participatory systems to deal with their situations, such as the programmes of farmers-to-farmers training, aka "train the trainers" (Jors et al., 2016; Kiptot & Franzel, 2014; Oumer, Tiruneh, & Tizale, 2014); and farmers field schools (Guo, Jia, Huang, Kumar, & Burger, 2015; Islam, Gray, Reid, Kelly, & Kemp, 2011; Oumer et al., 2014; Settle & Garba, 2011). In these initiatives, however, local actors often do not design solutions themselves, but are given the opportunity to learn of existing solutions, often without the option to connect this new knowledge to their own situation. Therefore, the solutions they learn, most often, do not fit with local actors' characteristics and/or local context (Fisher, Holden, Thierfelder, & Katengeza, 2018; Kiptot & Franzel, 2015).

Initiatives that have included space for local actors to contribute to the design of solutions to deal with their own specific situations have been carried out, both in developed countries (Bots & van Daalen, 2008; Murgue, Therond, & Leenhardt, 2015) and in developing countries (Bene et al., 2011; Bourgoin, Castella, Pullar, Lestrelin, & Bouahom, 2012; Macharia, Thenya, & Ndiritu, 2010; Smajgl, 2010), often focussed on acquiring local actors' knowledge, perspectives, data and information as input to the design of solutions (by others), but not on letting them design the solutions themselves.

This paper focuses on empowering local actors to improve their awareness of their capability for change by working together to co-create (Sanders & Stappers, 2008) solutions to existing challenges that are appropriate for their own situations. This study involves actors who are not only connected horizontally, but also connected vertically in agricultural chains for which power relations are involved: relations between farmers, relations between wholesalers, and relations between farmers and wholesalers. This requires farmers and wholesalers not only have knowledge about their own situation, but also about each other's situations to acquire common understanding, to be able to reflect on each other's position (Andersen, 1987).

This paper presents a participatory co-creation approach designed to this purpose: to empower actors to develop a participatory system, reflecting on each other's position to create solutions on which they agree. To be more specific, this paper focuses on the question whether a co-creation approach that explicitly incorporates reflection can lead to a participatory system for farmers and wholesalers in agricultural chains in Indonesia.

2. Empowering through co-creation process

Empowerment can be described from two perspectives, relational and motivational. From the relational perspective, empowerment is the process of sharing power from one actor to others, while from the motivational perspective, empowerment is the process of increasing the awareness of actors that they have power to cope with a situation (Conger & Kanungo, 1988). Both perspectives are of importance to empowerment within the context of this paper, entailing (Rowlands, 1995): development of a sense of self-confidence and capacity of individual actors; development of the ability to negotiate to influence the nature of relationship; and development of a common understanding and collaboration among actors. Actors need to be able to perceive themselves as capable taking a role in decision-making, to act and take responsibility, and to self-organise themselves to develop a participatory system (Brazier & Nevejan, 2014; Missimer, Robert, & Broman, 2017; Rowlands, 1995).

One of the methods developed to empower actors is co-creation (Bjogvinsson, Ehn, & Hillgren, 2012; Rowlands, 1995; Spinuzzi, 2005). Co-creation is a collaborative activity of actors to create an artefact that is of use to the actors themselves (Frow, Mccoll-Kennedy, & Payne, 2016; Galvagno & Dalli, 2014; Perez et al., 2017; Prahalad & Ramaswamy, 2004; Sanders & Stappers, 2008). Co-creation enables actors to interact with each other, share views and experiences, reach common understanding, and generate agreed solutions (Numa, Toriumi, Tanaka, Akaishi, & Hori, 2008; Yasui, Shirasaka, & Maeno, 2016). All actors are considered to be experts of their own experience, and to play a role in idea generation and solution finding (Sanders & Stappers, 2008), preferably in face to face interaction (Sanders & Stappers, 2012).

The next sections describe the foundation for the design of the co-creation approach: the design process; actor participation; and design of reflection.

2.1. Design process

The co-creation process to empower actors in the agricultural chains is a design process for which different activities are importance, described briefly in this section.

A design process is a sequence of steps in creating an artefact (Howard, Culley, & Dekoninck, 2008; Tayal, 2013; van Boeijen, Daalhuizen, Zijlstra, & van der Schoor, 2014) that can be physical or non-physical (MacLean, Young, Bellotti, & Moran, 1991; Tayal, 2013). The steps are not linear, and each step involves decisions on requirements, solutions, and the process itself (Brazier, van Langen, & Treur, 1996; Howard et al., 2008; Tayal, 2013; van Boeijen et al., 2014).

These three subtasks in the design process are distinguished in the Generic Model of Design introduced by (Brazier, van Langen, & Treur, 1997; van Langen & Brazier, 2006): (1) requirement design; (2) design object design; and (3) design process coordination. Requirements design identifies

requirements based on needs and desires of involved actors (including information such as should have, could have, and will not have, reasoning about their prioritisation for consideration in design object design). Design object design generates possible solutions to satisfy these requirements based on e.g. function, structure, process plan, etc. Meanwhile, design process coordination determines whether the progress in a design process can be accepted and can be continued, backtracked, modified, or should be terminated based on the result of design object and requirements. A design can be changed due to the set of requirements; also the set of requirements can be modified due to the constraints in design options to fulfil requirements. Note there is continues interaction between the subtasks requirements and design object coordinated by the subtask of coordination.

For the co-creation approach this paper proposes, the above implies the need to distinguish discussion about requirements for solutions from discussion about the solutions themselves, and to separately consider the rules of game—coordination of the co-creation process.

2.2. Actor participation in design

At least three levels of participation in design are distinguished in the literature: (1) user-centred design; (2) co-design; (3) participatory design (Tang, Lim, Mansfield, McLachlan, & Quan, 2018). In user-centred design, designers design based on an understanding of needs and interests of users/actors (Tang et al., 2018). In co-design, designers and users/actors work together to design an artefact (Tang et al., 2018). In co-design, users/actors actively contribute to the design of an artefact often in a co-creation process (Tang et al., 2018). The final decisions on designs, are however, the designers (Brown & Wyatt, 2015; Erzurumlu & Erzurumlu, 2015; Stickdorn, Schneider, Andrews, & Lawrence, 2011; Tang et al., 2018). In participatory design, users/actors are given autonomy to take control in every stage of artefact design (Tang et al., 2018) including final decisions on solutions.

Participatory design emphasises the need for participation of users/actors affected by the artefacts designed (Bjogvinsson et al., 2012; Carroll & Rosson, 2007; Clement & Van Den Besselaar, 1993; Kensing & Blomberg, 1998). In participatory design, co-creation occurs through intensive engagement and interaction of users/actors to create artefacts that are of use to themselves (Durugbo & Pawar, 2014; Edvardsson, Tronvoll, & Gruber, 2011; Frow et al., 2016; Gronroos & Voima, 2013; Sanders & Stappers, 2008).

One of the main goals in participatory design is to empower users/actors in democratic and functional participation (Bjogvinsson et al., 2012; Spinuzzi, 2005). Democratic participation refers to involvement of actors in the process of creating an artefact (Bjogvinsson et al., 2012; Rowlands, 1995; Spinuzzi, 2005). Functional participation refers to increasing awareness of users/actors of their ability to contribute to the designed process, of empowerment (Bjogvinsson et al., 2012; Rowlands, 1995; Spinuzzi, 2005).

For the co-creation approach this paper proposes, participatory design is considered to be the most appropriate to engage actors in all stages of activities, and to empower them to create solutions they support.

2.3. Reflection through paraphrase

Core to common understanding of actors in a co-creation process is understanding each other's perspectives (Clement & Van Den Besselaar, 1993; Kpamma, Adjei-Kumi, Ayarkwa, & Adinyira, 2017; Martins, Cherni, & Videira, 2018; Ostergaard, Simonsen, & Karasti, 2018). Understanding, in turn, requires reflection. Reflection is defined, in this paper, as a process of considering others' perspectives, then comparing and assimilating them into their own perspective (Andersen, 1987; Davis, 2003; Frith & Frith, 2012). This process of reflection not only enriches each actor's own perspectives, but increases the level of common understanding between actors (Andersen, 1987; Davis, 2003; Frith & Frith, 2012).

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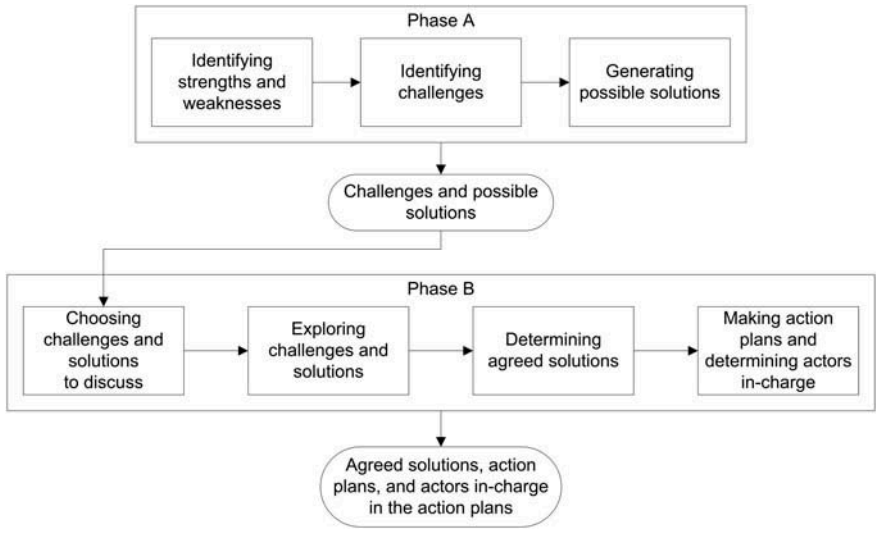

Figure 1. Two phases in the co-creation process.

Many techniques can be applied to increase reflection, one of the simplest is paraphrasing. Paraphrasing entails explicitly re-phrasing an expression whilst keeping the same meaning (Bhagat & Ravichandran, 2008; Recasens & Vila, 2010).

To encourage involved actors to reach common understanding as a basis to develop a participatory system, the co-creation approach in this paper proposes the technique of paraphrasing to facilitate reflection.

3. Design of co-creation process

Based on the choices discussed above in Section II with respect to tasks involved in design, need for participatory design, and reflection through paraphrasing, the following design for co-creation has been designed (Figure 1). This procedure distinguishes two phases.

3.1. Phase A: identifying challenges (needs, desires and requirements) and possible solutions (design solutions)

Three stages are distinguished in Phase A:

(1) Identifying strengths and weaknesses.

In this stage, participants identify strengths and weaknesses of their current situations, writing them on post-it notes, collected on a flipchart. Together they then group similar strengths and weaknesses on the flipchart to acquire a list of aggregated “unique” strengths and weaknesses.

(2) Identifying challenges.

Based on these strengths and weaknesses, participants identify main challenges they face. A challenge is defined as something that needs to be solved to achieve a desired situation. These challenges are also written on flipchart papers as input for the next stage.

(3) Generating possible solutions.

In this stage, participants work in groups to generate possible solutions to deal with the challenges identified. They write possible solutions on post-it notes and place them on the flipchart—one post-it note for each identified challenge. They then group similar solutions on the flipchart to

acquire a list of aggregated "unique" possible solutions. These possible solutions are also written on flipchart papers as input for the next stage.

3.2. Phase B: determining agreed solutions, action plans, and actors in-charge

Four stages are distinguished in Phase B:

1. Choosing challenges and solutions to discuss.

Based on the results of Phase A, participants choose the challenges and solutions that they think are most important. They then together determine which challenges and solutions are to be discussed first.

(2) Exploring challenges and solutions.

In this second stage, participants, in groups, discuss the chosen challenges and solutions. They each, in turn, indicate what the challenges mean for them individually, which barriers they perceive in implementing the identified solutions, and the implications of implementing each of solutions. Discussions are documented by facilitators.

(3) Determining agreed solutions.

In this stage, participants come up with agreed solutions based on the discussions in the previous stage. The agreed solutions can be one of identified solutions or new solutions that emerge. Each time participants come up with an agreed solution, facilitators write the solutions on flipchart papers, confirming that all participants are in agreement.

(4) Making action plans and determining actors in-charge in the action plans.

In this stage, participants devise action plans for the solutions agreed in the previous stage. They each, in turn, propose plans for implementing the agreed solutions with as much detail as possible, and discuss feasibility. Once agreement has been reached on action plans, actors who will be in-charge for the action plans are discussed and determined. Then, the action plans and actors in-charge are written on flipchart papers together with their agreements.

The paraphrasing technique is applied continually. Rule in this technique is that when a participant is talking, other participants listen and are silent. Then, when another participant is going to talk, he/she has to paraphrase what the previous speaker has just said before he/she is allowed to contribute his/her ideas to the discussion.

In each of the co-creation sessions, each group of participants is helped by, at least two facilitators. One of the main tasks of facilitators is to make sure the paraphrasing technique is consequently applied. In addition, facilitators help participants (who are not able) to write their ideas on post-it notes, encouraging silent participants to talk, making notes regarding the process and the content of the sessions, and documenting the process and the output. Facilitators all speak the local language and have knowledge of the local agricultural system.

Another role of facilitators is to provide information to answer specific knowledge questions asked by participants, for example which seeds are best for their situation, methods to measure pH of soil, procedure to establish a formal farmer group, etc. This information can be obtained by search on the Internet or other relevant sources, currently unavailable to these participants, on the basis of explicit request. The information is provided at the beginning of each session so that it can be taken into account by participants in the process of co-creation. The information is factual, and does not involve indications of solutions by the facilitators.

4. Method

The research method deployed is based on research through design, in a case study in an agricultural area in Indonesia, the Ciwidey sub-district, Bandung district, in West Java. This area was chosen because it is exemplary for most agricultural chains in Indonesia in terms of challenges in production and market (Menegay & Darmono, 2007; Natawidjaja & Morgan, 2007; Natawidjaja et al., 2007, 2014).

This case study was performed in collaboration with a local university in Indonesia, with Study Programme of Agribusiness, Faculty of Agriculture, of Padjadjaran University (Unpad). Unpad is a local university with many educational programmes in agricultural sector in West Java, Indonesia, with knowledge of the local situations and also access to farmers and wholesalers.

4.1. Experiment set-up

1. Mock-up session

Ten researchers and research assistants from the Department of Agribusiness, Faculty of Agriculture, Padjadjaran University, were trained during two mock-up sessions to master the procedure and reflection technique to facilitate the co-creation workshops (explained in Section 3).

(2) Implementation of procedure

A series of co-creation workshops with farmers and wholesalers were conducted from April to June 2017. The location of workshops was determined together with the farmers and wholesalers close to their home. Each workshop took about a half day, with about a week between workshops to ensure that workshops do not disturb farmers' and wholesalers' activities too extensively whilst maintaining momentum between workshops.

The procedure described above was implemented as follows:

- **In Phase A**, two workshops were organised for the farmers, and two for the wholesalers. The first workshop focussed on identifying strengths, weaknesses and challenges. Two rounds were organised for the farmers: first with 4 groups of farmers on the basis of their connection to specific wholesalers, and then with 4 mixed groups of farmers (associated to different wholesalers). Note that there was only one round during the first workshop for the wholesaler group. The second workshop focused on generating possible solutions for identified challenges with these same groups (with separate workshops for farmers and wholesalers).
- **In the Phase B**, two workshops were organised with farmers and wholesalers together. Four groups were formed on the basis of farmer/wholesaler relation (farmers together with their wholesaler) to work together to determine solutions, action plans, and actors in-charge for the action plans.

The first workshop began by wholesalers presenting their challenges and possible solutions identified in the previous workshops to "their" farmers, and vice versa. Together they focused on choosing challenges and solutions to be discussed, exploring challenges and solutions, and determining agreed solutions. Specific knowledge questions to be addressed were noted.

Then, the second workshop started by facilitators answering the knowledge questions from the first workshop. Before moving to the next stage, groups reconsider the results of the previous workshop (challenges and agreed solutions) in light of the new information they have received. The new list of challenges and agreed solutions on the flipchart are the basis for discussion and choice of plans of action and actors in-charge in the action plans.

Table 1. The number of farmers in each group in the two phases of the study

	Phase A		Phase B	
	Workshop 1	**Workshop 2**	**Workshop 1**	**Workshop 2**
Wholesaler 1	8	11	9	7
Wholesaler 2	7	9	8	9
Wholesaler 3	3	7	7	9
Wholesaler 4	7	8	9	8
Total	*25*	*35*	*33*	*33*

All 4 wholesalers participated in all workshops of Phase B.

(3) Subjects.

Participants in the co-creation workshops are wholesalers and farmers from Ciwidey sub-district, Bandung district, West Java. The criteria for choice of wholesalers for the case study are: (1) that they sell produce both to traditional markets, and global markets (supermarkets and/or exporters); and (2) they are connected to farmers through formal/informal agreements. Meanwhile, the criteria for farmers is that they are connected to one of the wholesalers through formal/informal agreements.

The composition of the groups in both Phase A and Phase B are depicted below in Table 1.[1] Note that there is some variance in the number of farmers per group.

5. Results

5.1. Phase A

5.1.1. Workshop A1: identifying strengths, weaknesses, and challenges

1. Identifying strengths and weaknesses

In the first workshop of Phase A, with separate workshops for wholesalers and farmers, more weaknesses than strengths were identified (Table 2). On average, wholesalers each identified 1–2 strengths and 4 weaknesses, of which half were categorised to be unique. Farmers in three groups (1, 2, and 4), on average each identified 3–4 strengths and 4–5 weaknesses. Farmers in the group 3 identified on average approx. 13 strengths and 17 weaknesses. For each of these groups, about 30–47% were categorised to be unique strengths and weakness.

In the second round of identifying strengths and weaknesses (workshop with farmer groups), there was an increase in the average of number of post-its written by farmers. On average, each farmer identified 3–6 strengths and 4–7 weaknesses, and about 30–60% of these post-its were identified as unique strengths and weaknesses in each group. In this round, one common weakness emerged, that is the lack of access to agricultural extension services. In the first round, this weakness had only been named in two groups, then, in the second round, it was mentioned by all groups.

(2) Identifying challenges

In this round, the identified strengths and weaknesses were discussed in separate workshops by the 4 groups of farmers and the group of wholesalers. From these discussions, 11 main challenges were identified by wholesalers, and 10–15 main challenges were identified by each group of farmers (Table 2).

Table 2. Number of strengths and weaknesses identified in the first workshop of Phase A

	Number of participants	Number of post-it		Unique		Challenges
		Strength	Weakness	Strength	Weakness	
Workshop with wholesalers	6	10	24	6	13	11
Workshop with farmers (first round)						
- FW 1	8	31	43	10	12	10
- FW 2	7	21	38	10	17	15
- FW 3	3	41	52	14	18	15
- FW 4	7	23	31	9	13	13
Workshop with farmers (second round)						
- Group of farmers 1	7	31	27	11	14	
- Group of farmers 2	7	25	31	12	15	
- Group of farmers 3	7	35	51	18	16	
- Group of farmers 4	4	24	27	16	15	

FW = Farmers of Wholesaler

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5.1.2. Analysis of workshop A1

After the workshops, these identified challenges were categorised by researchers based on their relation to agricultural chains: production, market, logistics and transportation infrastructures, financial infrastructures, and institutions, for the purpose of analysis.

Challenges named by wholesalers with respect to market include price, payment and order system, and access of information. With respect to production, the main challenge named by wholesalers is low quality of produce supplied by farmers. Other main challenges are the (lack of) commitment of farmers bounded by credit, access to formal credit, and access to governmental programmes. The main challenges faced by wholesalers are listed in Appendix 1.

Meanwhile, farmers first named challenges with respect to production encompassing low yield and quality of crops, soil condition, pests and diseases, access to good quality of production inputs, water shortage in dry season, and competition in getting farming labour and renting land. The main challenges named with respect to the market are market access, price fluctuation, access to market information, and payment system from wholesalers. Other main challenges include high transportation cost related to bad condition of road connected their lands, lack of capital and access to formal credit, lack of access to agricultural extension services and government programmes, and the absence of farmer organisation. The main challenges of farmers are listed in Appendix 2

5.1.3. Workshop A2: generating possible solutions

In the second workshop of Phase A, in the round of generating possible solutions with wholesalers, on average, 9 ideas were identified by each wholesaler. After categorisation, about 37% of written post-its were considered to be unique (see Table 3).

Meanwhile in the round of generating possible solutions with farmers, in three groups (1, 2, and 4), on average, each farmer identified 4–5 possible solutions, and in the group 3 each farmer identified on average 10 solutions. After categorisation, about 25–40% were identified to be unique.

Most possible solutions generated by wholesalers deal with challenges in logistics, that is to control supply from farmers bounded by them through credit. It encompasses farmer selection, record keeping and negotiation. Solutions to deal with market challenges are negotiation with buyers and new strategies for volume of supply. Meanwhile, for challenges in production related to produce quality, a solution would be to encourage farmer to use better farming methods and to use better quality production inputs (seeds, fertilisers). Other solutions are to access to formal credit and to establish a formal farmer group to acquire access to governmental programmes (see Appendix 1).

5.1.4. Analysis of workshop A2

Solutions are classified according to the categorisation devised by the researchers as described above for the purpose of analysis. For farmers, more than half of the possible solutions relate to

Table 3. Number of ideas created in the second workshop of Phase A

	Number of participants	Number of	
		Post its of solutions	Unique solutions
Wholesalers	4	37	14
FW 1	11	42	12
FW 2	9	45	19
FW 3	7	70	17
FW 4	8	43	17

Table 4. Number of agreed solutions resulted in the first workshop of Phase B

	Number of participants*	Agreed solutions
FW1	10	3
FW2	9	5
FW3	8	3
FW4	10	6

*) including the wholesaler.

challenges in production. They include farming methods, crop maintenance, maintaining soil quality, producing better seeds, fertilising, spraying, getting access to production inputs, managing water and labour. Solutions to deal with market challenges are contract and transparency in price from wholesalers, planning in farming coordinated by wholesaler, expansion of wholesalers' markets, and government policy in market and price. Meanwhile, solutions to deal with financial challenges are establishing cooperation, and managing and controlling money for farming. The other solutions are related to improving roads connected their land and establishing formal farmer groups to get access to agricultural extension services and government programmes (See Appendix 2).

5.2. Phase B

5.2.1. Workshop B1: choosing and discussing challenges and solutions, and determining agreed solutions

In the workshops of Phase B with wholesalers and the farmers to which they are connected together, paraphrasing was initially a challenge, but was applied strictly. In the first workshop, groups of wholesalers and their connected farmers agreed on 3–6 solutions (Table 4). These solutions deal with production, market, logistics, financial infrastructures, and institutions.

5.2.2. Analysis of workshop B1

In the first workshop, farmers and wholesalers had specific knowledge questions regarding high-quality seeds, methods to kill a kind of pest, method to measure pH of soil, market access, and administrative procedures to establish a formal farmer group.

5.2.3. Workshop B2: determining agreed solutions, making action plan, and determining actors in-charge

Facilitators answered the specific knowledge questions posed during the first workshop at the beginning of the second workshop of Phase B.

In this workshop, in general in each group of wholesalers and connected farmers, there was an increase in the number of agreed solutions. On average, in each group, action plans were devised for approximately half of the agreed solutions. These action plans had on average, one person as actor-in-charge for each action plan (see Table 5).

5.2.4. Analysis of workshop B2

Solutions agreed by groups of wholesalers and connected farmers addressed challenges in production, market, logistics and transportation, financial, and institutions. Most (more than half) agreed solutions are related to production. Agreed solutions created by groups of wholesalers and connected farmers, together with action plans are listed in Appendix 3.

6. Discussion and conclusion

A co-creation approach designed and implemented to empower local agricultural chain actors to work together to reflect on their own situations, to acquire a common understanding of the challenges and to co-create appropriate solutions to deal with their specific challenges.

Table 5. Number of agreed solutions, action plans, and actors in-charge resulted in the second workshops of Phase B

	Number of participants*	Number of agreed solutions	Number of action plans	Number of actors in-charge
FW 1	8	6	3	2
FW 2	10	6	3	3
FW 3	10	3	2	2
FW 4	9	8	3	3

The procedure of co-creation workshops designed in this study supports active participation of both farmers and wholesalers in every stage of co-creation. The procedure of co-creation workshops worked even for participants with marginal education. Facilitators played an important role in this process, supporting farmers and wholesalers to engage and to apply the paraphrasing technique.

In the separate workshops of farmers and workshops of wholesalers in Phase A, the procedure facilitated farmers and wholesalers to learn from their peers to improve their understanding regarding their own situations, and to increase their creativity to generate solutions that could be of use to themselves. These results are in line with Numa, et al. and Yasui, et al. (Numa et al., 2008; Yasui et al., 2016). Facilitated by this co-creation approach (applying reflection) different strengths and weaknesses were identified by different farmers and wholesalers in each group, shared and discussed by farmers and wholesalers and translated into challenges. Then, based on identified challenges, groups of farmers and a group of wholesalers were able to identify possible solutions.

The procedure of co-creation workshop in Phase A improved the willingness of farmers and wholesalers to participate to share their perspectives and experiences regarding their situations. Meanwhile, the implementation of reflection in this process allowed farmers and wholesalers to learn from their each others' perspectives and experiences. These processes (sharing and reflecting) enriched the understanding of farmers and wholesalers on their own challenges. This understanding enables farmers and wholesalers to identify possible solutions for their challenges (Appendix 1 and 2).

In the workshops in which wholesalers and farmers worked together in Phase B, reflection using paraphrasing technique enabled farmers to view challenges from a wholesaler's perspective, and vice versa. Based on these challenges (Appendix 1 and 2), farmers and wholesalers identified shared challenges related to quality management of their chain systems from different perspectives (due to different contexts). Reflection during co-creation workshops contributed to improved understanding between farmers and wholesalers regarding each other's challenges. This common understanding can be implied from solutions and action plans agreed by farmers and wholesalers (Appendix 3). Another important thing in Phase B is the information provided by facilitators to answer specific knowledge questions asked by farmers and wholesalers, as input to the design sessions.

The procedure of co-creation workshops in Phase B that focussed on common understanding through reflection worked to ease the issue of power relations between the actors involved. This approach enabled farmers and wholesalers to be more aware of the importance of working together, whilst respecting a division of roles and responsibilities between them.

In sum, this study shows that the designed procedure of co-creation workshops supported by facilitators has the potential to engage farmers and wholesalers to develop a participatory system to improve their own situations. Reflection contributed to improved common understanding between farmers and wholesalers, despite the power relation. The common understanding supported by information to answer specific knowledge question affected the success of farmers and wholesalers to co-create solutions that are appropriate to their own situation/context.

7. Future research

Regarding the implementation of agreed solutions and action plan, a follow-up programme is needed to support farmers and wholesalers. This programme will necessarily include monitoring visits, meeting facilitations (internal and external, e.g. with market players, with agricultural extension services), and information provisioning for specific knowledge questions. Current research focuses on this aspect in the local context.

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Author details
K. Kusnandar[1]
E-mail: k.kusnandar@tudelft.nl
O. van Kooten[2]
E-mail: olaf.vankooten@inholland.nl
ORCID ID: http://orcid.org/0000-0001-9444-0389
F.M. Brazier[1]
E-mail: F.M.Brazier@tudelft.nl
[1] Faculty of Technology, Policy and Management, Delft University of Technology, Delft, Netherlands.
[2] Department of Plant Science, Wageningen University/ Inholland University of Applied Science, Delft, Netherlands.

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Note

1. Six wholesalers participated in the first workshop but only 4 were willing to involve their farmers and participate in the following workshops.

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Appendix 1. Challenges and solution of wholesalers

Aspect	Challenges	Solutions
Production	1. Most produce supplied by farmers has low quality. 2. Pest and disease causing low supply and a lot of rejected produce. 3. Finding ways to help farmers to improve their farming methods.	1. Farmers do better farming activities (use good quality of seeds, regular fertilising, spraying, crop maintenance, etc.). 2. Find appropriate seeds for their location.
Market	4. Price of Grade A from exporters is low. 5. Payment from exporters takes long time (about 4 weeks). 6. The change of volume order from exporters. 7. Finding markets to sell off-grade produce.	3. Negotiate with exporters regarding price. 4. Lower the supply to exporters to deal with long-time payment. 5. Use off-grade produce that cannot be accepted by market as animal feed.
Logistics	8. Loyalty of farmers to only supply produce to wholesalers who give them credit.	6. Choose trusted farmers in giving credit. 7. Consequences for farmers who are not loyal. 8. Record keeping to control supply produce of farmers who have credit. 9. Talk to wholesalers who are going to buy produce form their farmers. 10. Negotiate with farmers who have credit regarding selling system.
Financial	9. Getting more capital to give farmers credit.	11. Try to get credit from funding institutions that have cooperation with exporters.
Institutions	10. Getting access to government programmes. 11. Better communication with farmers especially about the price fluctuation at traditional markets.	12. Establish a formal farmer group initiated by the wholesalers who involved in the workshop. 13. Ask Unpad to help them in establishing a formal farmer group. 14. Find information how to make a good proposal to apply government programmes

Appendix 2. Challenges and solutions of farmers

Aspect	Challenge	Solution
Production	1. Low productivity. (2 groups) 2. Low quality of produce. (1 group) 3. Dealing with soil condition (e.g. pH). (1 group) 4. Finding technique to intercrop some kinds of crops (e.g. bean). (1 group) 5. Dealing with a lot of pest and diseases. (4 groups) 6. Finding appropriate pesticides for pests and diseases. (2 groups) 7. Price of good quality of production inputs (seeds, fertilisers, pesticides) is expensive. (2 groups) 8. Quota of fertilisers from production input shops is limited. (1 group) 9. Dealing with water shortage in dry season. (4 groups) 10. Dealing with labour shortage in the beginning of rainy season. (2 groups) 11. There is no standard in rent land price. (2 groups)	1. Better farming method. (1 group) 2. Find information about pH soil measurement, then do soil treatment based on pH condition. (1 group) 3. Use pesticide regularly to deal with pest and disease. (1 group) 4. Find information about appropriate pesticides for certain kinds of pests and diseases. (1 group) 5. Kill pests manually. (1 group) 6. Training in producing good quality of seeds. (1 group) 7. Produce and use more compost for fertilising. (2 groups) 8. Government subsidies in production inputs (seeds, fertilisers, pesticides). (1 group) 9. Buy fertilisers as a group (when they have a farmer group) to get more quota. (1 group) 10. Make a stock for fertilisers. (1 group) 11. Wider space between plants in intercropping and select appropriate kinds of crops to be intercropped. (1 group) 12. Build small reservoir to catch water in rainy season to be used at dry season. (2 groups) 13. Local government regulation in organising the flow of water from the sources. (3 groups) 14. Continue to work together to repair irrigation channels. (3 groups) 15. Using pump machines to lift water from sources. (2 groups) 16. Make simple sprinklers. (1 group) 17. Government build good irrigation system. (1 group) 18. Use plastic mulch to maintain humidity of soil. (1 group) 19. Get labour from outside area. (1 group) 20. Reduce the size of cultivated land. (1 group) 21. Do some activities by themselves. (2 groups) 22. Use technology such as tractors to deal with labour shortage. (1 group)

(*Continued*)

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(*Continued*)

Aspect	Challenge	Solution
Market	12. Dealing with price fluctuation. (3 groups) 13. No information about kind of crops planted by farmers in other locations to anticipate a drop in price. (2 groups) 14. No planning in planting crops due to lack of knowledge in predicting price. (1 group) 15. No contract in price between farmers and wholesalers. (2 groups) 16. Farmers do not have market option but wholesalers. (1 group) 17. Price from wholesalers is low. (1 group) 18. Payment from wholesalers is not in cash. (2 groups)	22. Contract in price between farmers and wholesalers. (3 groups) 23. Government regulation in price of vegetables. (3 groups) 24. Information from government regarding planting schedule other farming areas. (1 group) 25. Wholesalers coordinate planting schedule of farmers. (3 groups) 26. Wholesalers should expand their markets to get higher price and to deal with price fluctuation. (2 groups) 27. More transparent in price from wholesalers. (1 group) 28. Government programmes to market farmers' produce. (1 group)
Transportation	19. Bad condition of road connected farmers' land. (2 groups) 20. High transportation cost. (1 group)	30. Continue to work together to improve road. (2 groups) 31. Apply proposal to government to improve road. (1 group)
Financial	21. Limited capital owned by farmers. (1 group) 22. Lack of access to formal funding institutions. (1 group) 23. Requirement of funding institution does not match with farming characteristics. (1 group) 24. Difficulty in managing money for farming activities and for living. (1 group)	32. Establish cooperative that can give farmers credit. (3 groups) 33. Farmers should separate money for farming activities and for living. (1 group) 34. Make record keeping of farming activities. (1 group) 35. There should be funding institutions for farmers. (1 group)
Institutions	25. The absence of farmer group. (1 groups) 26. Farmers do not have a medium for sharing ideas and experience. (1 group) 27. Farmers less knowledge about the advantage of farmer group. (1 group) 28. Farmers have no ideas how to establish a formal farmer group. (2 groups) 29. Limited access and information to government programmes. (2 groups) 30. There is no access to agricultural extension services. (4 groups) 31. Communication between farmers and wholesalers. (1 group)	36. Establish formal farmer groups to get access to government programmes and agricultural extension services. (2 groups) 37. Training in establishing a farmer group. (1 group) 38. Asking agricultural extension to give trainings and field visits. (3 groups) 39. Wholesalers give farmers technical assistances in farming. (1 group) 40. Regular meeting between farmers and wholesalers. (3 groups)

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Appendix 3. Agreed ideas between farmers and wholesalers

Aspect	Agreed solution	Action plan
Production	1. Field experiments to improve produce quality and increase crop yield. (2 groups)	Sharing costs (land, labour and production inputs) between farmers and wholesalers, and appointed one farmer as a coordinator. (2 groups)
	2. Farmers will try one of traditional methods in dealing with one kind of pests (snail): using kipahit* leaves. (1 group)	
	3. Wholesaler will provide water pump to be used by farmers as a group. (1 group)	Farmers are responsible in operational and maintenance costs, and managing the schedule of water pump use. Farmers who are not loyal to the group will have consequences. (1 group)
	4. Farmers buy water pump as a group (If a group has been established) to be used together. (1 group)	
	5. For farmers who cannot cultivate land in dry season, they can work at wholesalers to do post-harvest activities (cleaning, sorting, packaging). (1 group)	
	6. Farmers continue to work together to maintain irrigation channels. (1 group)	
Market	1. To be able to make price agreement, wholesalers will expand markets by supplying to supermarkets, and farmers will commit to make continues supply. (4 groups)	
	2. Farmers involve in post-harvest activities (cleaning, sorting, packing), in order to fulfil supermarket requirements. (1 group)	Wholesalers will train some farmers, then farmers will work together to do post-harvest activities. (1 group)
Logistics and transportation	1. Planting schedule for continuous supply. (3 groups)	Wholesalers will be responsible in making planting schedule based on market demand, and farmers will follow the schedule. There will be consequences for farmers who do not commit. (3 groups)
	2. Farmers continue to work together to improve roads connected their land. (3 groups)	
Financial	1. Wholesalers only give farmers credit in kind of cash, not in the kind of production inputs, but the wholesalers will give information about shops to buy production inputs. (1 group)	
	2. Appointed one farmer to help wholesalers in making record keeping of farmers' credit. (1 group)	
Institutions	1. Establish a formal farmer group to be able to get access to agricultural extension services and government programmes. (4 groups)	Regular meetings between farmers and wholesalers, and appointed one farmer to be a coordinator. Farmers will give contribution for administration cost of establishing a formal farmer group. There will be consequences for farmers who do not commit to their groups. (4 groups)

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